

Arms & Explosives

A TECHNICAL AND TRADE JOURNAL.

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CURRENT TOPICS.

The New Proof Act.—Considering the somewhat ambitious statement in the preliminary notices of the new Proof Act, it is a little surprising to find how few in reality are the proposed changes. The new Act is almost without exception a purely domestic matter concerning the internal management of the Birmingham Proof House. There can be little doubt but that the additional powers granted to the Guardians will place them in a position to do a great deal for the benefit of their trade. The actual accomplishment of good deeds depends, of course, upon a number of factors, but at least the Guardians will henceforward have the power which in the past they have lacked. The position of the Proof Master is left almost without alteration. It is, of course, difficult to harmonise the dual capacity of the Proof Master under the new Act. He will be, as in the past, an irremovable official, whose duties in connection with proof matters, are defined by Act of Parliament. He will also be a sort of trade Society Secretary, acting under the control of the Guardians, but the Guardians will have no more actual power over him in such matters than one has for instance over one's neighbours' children. The two sets of duties are too much intertwined to be placed under separate officials, and yet the Guardians are deprived of the only kind of control which is really effective. Were there a deadlock, the solution is by no means obvious. The appointment of Mr. Thomas Turner, as Proof Master, provides the Guardians with a man of the world for this responsible position and at the same time with a man of alert body and active mental capacity. There is every reason, therefore, to suppose that the Birmingham Guardians have selected for the office a man who will add to the ordinary duties of Proof Master

those of a general guardianship over trade interests, and seeking at all points to initiate movements of benefit to the trade. There is clear evidence that the London Gunmakers' Company have stood aloof from all participation in the preparation of the new Act. One cannot but suppose that a hitch has occurred somewhere by which needed reforms in the working of the Proof Act have been shelved. It is of no particular interest to the London Company how the Birmingham Guardians manage their business, but the co-operation of the London Company would have been needed for the promotion of any changes in the actual working of proof regulations. For instance, we may point out that certain kinds of repair jobs done on guns constitute such guns as unproved, and yet the person doing the job is in no way held responsible for informing the owner that the gun has been constituted unproved, and that the certificate of soundness, of which the proof mark is evidence, has lapsed. Should the owner of the gun at any time sell it, he would be liable to all the pains and penalties for selling an unproved gun. The man morally responsible is the maker, who performs the operation, and yet the Act, which is supposed to be for the protection of the public, in no way guards the public against such an extreme source of danger. It is no exaggeration to say that gross abuses have arisen under these conditions. Surely, before the new Proof Act passes into law there should be an opportunity for strengthening Section III. of the old Act. The only direction in which there appears to be any attempt to strengthen the Act as a whole, is the promotion of the original Act from a purely English enactment to an Act embracing the United Kingdom. This, of course, is very important, though generally speaking, the bulk of the weapons sold in Scotland and Ireland have always been proved according to English law.

Gunmakers as Mathematicians.—One of the most complimentary remarks which has been addressed to us regarding our attempt to frame a series of lectures to young gunmakers was contained in a serious conversation we had with a leading gunmaker. He informed us that the lectures were all very well in their way for Cambridge mathematical scholars, but for gunmakers they were entirely useless. This encourages us to further efforts in the same direction. Birmingham gunmakers fully realise their lack of technical training, and the disadvantages which follow therefrom, and they are taking means to remedy the evil. Naturally, a man whose arithmetic ceases with the multiplication of whole numbers, is likely to be at sea in considering the relation of velocity to pressure. On the other hand, the mathematics which have so far appeared in the lectures up to date, do not go beyond the intellect of an ordinary boy of fourteen. The application of such mathematical treatment to gun problems, has an essential bearing upon certain tasks which face the gunmaker at one time or another during his career. An alert knowledge of the underlying principles of gunnery gives a man such a keen instinct regarding the practical side of his work as to enable him to solve what in the ordinary way would remain mysteries. Obviously the promotion of higher education among gunmakers must be applied to the rising generation of members of the craft. The old-fashioned engineer, whose ability finds its highest scope in patching up an old engine, wasting hundreds of pounds per annum by its inefficiency, would be difficult to convince by means of steam diagrams, as to the bad economy of his misapplied endeavours. In the same way, the gunmaker who has learnt his business by the arduous process of rule-of-thumb, cannot appreciate the true value of a more enlightened mode of procedure. The ready-reckoner system of dealing with matters of science, which is in vogue among sporting papers, is frequently used by gunmakers, who believe they have a true grasp of the principles involved. Surely, if this to some extent proves the application of science to gunnery, there is no reason why the rising generation of the craft should be denied the only means of considering such matters on a sound basis—that of mathematics. A convert here and there is sufficient encouragement for a start, and surely it is not hoping too much to anticipate a time when the gunmaker will know as much about the root principles of his subject as any engineering student who has emerged from his apprenticeship stage. Only the other day we heard of a case where a young engineer was incidentally brought into contact with a cartridge loading problem, which had found an indifferent solution as the result of years of work by several gunmakers. Is it going too far to suggest that a sound knowledge of applied mechanics enabled this young engineer to find a means of achieving the required purpose, which was concealed from the vision of those whose ideas of leverage and cam movements were, to say the least, rudimentary.

THE *Kynoch Journal* number two has duly made its appearance and is crowded with many good things all in good style, especially a certain portion which has infected the editorial department of our paper with a perpetual blush. Our friend "Cyclops" waxes funny at the expense of the *Kynoch Journal*, but then, of course, one must remember that "Cyclops" has hardly been sufficiently long connected with our paper to feel that the kind expressions of the *Kynoch Journal* apply in some measure to his own work.

THE NEW PROOF ACT.

AMENDING THE ACT OF 1868.

THE draft of the new Proof Act, 1868, has recently been issued, and owing to its great importance to the gun trade, we give a precise account of the chief alterations. The new Act is an Amendment of the 1868 Act, and consequently the two must be read side by side.

Section 3 of the new Act confers the following additional powers upon the Guardians of the Birmingham Proof House:—

(A) To carry out experiments with any small arm or explosive and to provide the necessary ground buildings instruments and apparatus and if thought fit to employ specialists for the purpose; and

(B) To give pecuniary assistance to any deserving master or apprentice with a view to encourage the teaching of the art of gunmaking; and

(C) To establish a school independently or in conjunction with any educational or other establishment for the purpose of teaching the art of gunmaking in all or any of its branches; and

(D) To circulate among the members of the Birmingham gun trade or others any book article consular report or paper of interest to the trade and to provide and pay lecturers to deliver lectures and addresses to the trade on matters affecting the gun trade; and

(E) To enquire into the operation of Foreign Proof Houses and obtain particulars of the gun trade in foreign markets; and

(F) To take such steps as may be necessary to obtain any information as to any infringements abroad of English proof marks and prevent the recurrence of any such infringements; and

(G) To oppose any Bill promoted in Parliament which in the opinion of the Guardians would be detrimental to the gun trade or the users of small arms.

Section 4 amends Section 21 of the principal Act, so that instead of all justices for the borough of Birmingham being Guardians, three of such justices shall be annually selected at the licensing meeting to act as Guardians for the ensuing year.

Section 5 amends Section 23 of the principal Act, so that the residential qualification of Guardians shall be extended from within 10 miles of the Borough of Birmingham to 50 miles.

Section 6 amends Section 39 of the principal Act, with reference to rating qualification of those Guardians who are jointly rated in respect of their premises where business is carried on. If the individual share of the rating is below the qualifying minimum, the persons concerned may elect one or more of their number, according to the total rating of the premises, to act as registered members of the trade.

Section 7 amends Sections 38 and 40 of the principal Act, so that the distance qualification of the business premises of the person or Company engaged in the trade shall be extended from 10 to 25 miles distance of Birmingham.

Section 8 slightly modifies and extends the period laid down under Section 42 of the principal Act, during which applications for membership of the Birmingham gun trade shall be lodged.

Section 9 modifies Section 43 of the principal Act, so that the notices stating the time of application for membership of the trade shall also state the place at which such application should be made.

Section 10 modifies Section 46 of the principal Act, so that no fee shall be charged for the application forms for membership of the trade.

Section 11 modifies Section 46 of the principal Act by providing means for filling vacancies in the Registry Board, which occur between the ordinary election and the sitting of the Board.

Section 12 provides that the annual meeting of the Guardians may be held on any day in the month of April, and at such time as the Guardians may appoint.

Section 13 provides that the date and hour of the meetings of the Registry Board, as presented by Section 49 of the principal Act, may be modified by the Guardians upon due notice.

Section 14 modifies Section 61 of the principal Act, so that in voting for various office holders the votes shall be taken by ballot instead of by means of forms signed by those voting in such contested election.

Section 15 amends Section 63 of the principal Act, whereby notices of certain adjourned meetings may be sent by post to the members of the trade, in addition to the ordinary advertisements.

Section 16 amends Section 67 of the principal Act, so that certain days fixed for meetings may be modified if they fall upon Bank Holidays.

Section 17 amends Section 72 by increasing the remuneration of Guardians from 12 to 15 guineas for division among those members attending such meetings.

Section 18 amends Section 77 by removing the sentence which specifies that if the Proofmaster is also a Guardian, he shall be *ex officio* chairman of the Guardians, the chairman being thus elected free of restriction.

Section 19 gives power to the Guardians to frame bye-laws providing for the better execution of the pensioning and granting of gratuities, for which powers are given under Section 79 of the principal Act. The Guardians are also empowered to frame bye-laws for the establishment of an accident or superannuation fund, and for contributions to be made to such a fund by the Guardians.

Section 20 modifies Section 91 of the principal Act, by allowing the Guardians to hold a maximum of 100 acres of land in place of 50 acres, and extends their power for dealing with such property.

Section 21 gives the Guardians power to add such additional sums to the reserve fund, empowered by Section 93 of the principal Act for the rebuilding of the proof-houses as will make up a total of £15,000.

Section 22 repeals Section 94 of the principal Act, which lays down the objects upon which the Guardians are authorised to expend the monies of the Proof House, and directs that any surplus shall be carried to a reserve fund, and further directs that when such funds exceeds £5,000 the Guardians may, and when such fund exceeds £10,000 the Guardians shall, reduce the charges for proving barrels.

The following provisions take the place of those referred to and outlined above:—

All monies other than monies standing to the credit of any special fund received by vested in or belonging to the Guardians shall be applied as follows (namely):—

First in the maintenance repair insurance or improvement of the Birmingham Proof House and of any rifle or other shooting ground or branch proof house of the Guardians in proving and marking as proved the barrels tendered for proof

and in the payment of the salaries and wages of the proof masters and other officers and workmen and servants of the Guardians and of the remuneration of the elected Guardians and in payment of other incidental expenses of the Guardians in the execution of the principal Act and this Act;

Secondly in payment of any superannuation allowances and gratuities granted to officers workmen servants and others in their employment;

Thirdly in contributing such sums (if any) as the Guardians may think fit towards the provision and maintenance if any accident fund or superannuation fund which may be established for the benefit of officers workmen or servants in their employment;

Fourthly in assisting any deserving gunmaker in needy circumstances who is or has been a registered member of the Birmingham Gun Trade and in subscribing to any charitable or benevolent object in connection with the City of Birmingham.

Any surplus of receipts over expenditure after making due provision for the matters aforesaid in any year shall be carried to the credit of the reserve fund.

Section 23 amends section 96 of the principal Act, so that Bank and other public holidays are included among the days when the Proof House may be closed.

Section 24 adds a sentence to Section 98 of the principal Act. The principal Act states that the Proofmaster is responsible for the work of proving, marking, etc., guns submitted for proof. The added words are as follow:—

“but in all other matters and respects he shall be and act under the directions of the Guardians.”

Section 25 amends Section 102 of the principal Act. It adds to the bye-laws which need not be brought before the Recorder of Birmingham for review, and submitted for signature to one of H.M. Principal Secretaries of State before passing into force, bye-laws relating to any accident or superannuation fund.

Section 26 amends Section 107 of the principal Act. It renders it obligatory on the proof houses, upon payment of the requisite charges, to return not only barrels marked as proved, but “also the barrels not found of proof,” which presumably means barrels which have failed to pass the proof.

Section 27 amends Section 118 of the principal Act, which specifies that the proof house may demand and take the appointed sums charged for proof work done. The following is now added in the new Act:—

“In the case of barrels and guns of foreign manufacture an additional sum not exceeding twenty-five per cent. of the prices set out in schedule C may be demanded and taken.”

Section 28 amends Sections 122 and 127 of the principal Act by replacing the word “England” whenever it occurs with the words “United Kingdom.” The sections quoted specify the offences under the Act, and the penalties for committing such offences, etc., etc. The above modification extends the operations of the Proof Act to the entire United Kingdom, whereas the Proof Act was in the past applied solely to England. The mode of procedure in the Scotch and Irish courts is specified in cases relating to the punishment of offences.

Section 29 makes certain slight changes in the matter of registering the proof marks of foreign states.

Section 30 amends Section 138 of the principal Act by enabling any of the Guardians, instead of either of the Wardens of the Birmingham Proof House to swear on information that they have good cause to believe in the existence in a certain of stamps, barrels or other materials which are contrary to the requirements or provisions of the Act.

Section 31 gives the Registry Board power on sufficient evidence to amend any claim for membership of the trade brought before them.

Section 32 is a saving clause expressly laying down that nothing in the new Act shall be taken to lessen the powers and privileges of the Gunmakers' Company of London.

Section 33 specifies that the costs of the present Act shall be paid by the Guardians.

INCIDENTAL JOTTINGS.

1900. We shall commence the 20th century, as we have left the 19th, with arms and explosives and fighting the main topic of conversation. Pessimists say this is a most inauspicious commencement, and prophecy that such an ominous start will bring disasters upon our head. Could we but for a while hark back to a century ago, to hear if the same melancholy broodings oppressed our forefathers at the birth of the 19th century, when things were infinitely worse! All the nations of Europe were mixed up in the struggle. Nelson and Napoleon vied with each other in their triumphs of strategy for their different countries. Millions and millions of pounds were spent, taxation and debt were at their maximum, yet patriotism carried the day 100 years ago, as it will now. The great strides of the past century have inured us too much to ease; our troubles have been so slight that we have grown pettish and hyper-sensitive, and now that the great misfortune of war with white men has fallen upon us, certain sections of the community would anticipate disasters coming our way, rather than look at things in the best light. Mistakes have always occurred, even when they have been crowned with the most brilliant feat of arms. Let us, then, all rally round, and cheerfully emulate the indomitable and sanguine pluck of Tommy Atkins, who never says "die."

ENGLAND'S FRIENDS. There is no time like adversity to prove who our friends are, and who are indifferent to our welfare, and are nursing feelings of animosity toward us. Strangely, some of our most bitter individual critics are Englishmen, but these latter are so few, that the nation can afford to ignore, if not forgive them. Every apple tree bears its big apples and its little ones; some, crabbed and withered, never reach maturity; others, worm-eaten and deformed, will hang on the end, unworth the trouble of picking. The apathetic give us most pause. What of our much-vaunted County Council, our "municipal rulers of Greater London!" Truly, the grand old City Corporation has vindicated its existence, and proved how impossible it would be for the ambitious designs of the Council ever to depose a body of Englishmen who hold the public pulse, and voice the public sentiments, which are echoed by nearly every municipal government throughout the length and breadth of the country—the apathetic ones thus becoming conspicuous. Our foreign friends are exceedingly numerous. The European press does not represent the opinions of those we most care for. Let us therefore rely on the words of our personal friends abroad, rather than the hysterical vapourings of certain of the press who cater for the "canaille." Of all nations, the opinion we mostly value is

that of the most modern—the United States. Here we have a vast population, recently of heterogeneous nationalities, who have not yet lived away long enough to forget the countries of their forefathers. Thus bound by these sentiments, they have discriminated in favour of Great Britain. This is the sort of friendship we value!

WHY ARE WE UNREADY? Every intelligent Englishman is bound to admit that there are two sides to every question, and so it is often asked, when we read the eulogies of the daily press upon the French and other guns used by our enemy, why we do not possess guns of a similar nature, and why in the name of fortune we don't buy some? The answer is complete; we have some better guns than our enemy, we can send plenty more out, of such a character that no make in the world can compete with; but it didn't occur to the authorities that they would be wanted. Fancy a War Office big-wig thinking of anything but a field gun for the field! Bless your dear soul, the intelligence department tells them all about the Boer "quick-firing" and "rapid firing" guns of large calibre, and they never dreamt of them being used for field artillery. They were for the defence of Pretoria, and, when the time comes, we have the weapons to fight against them; but such guns in the field—why, who'd a thought it? However, once we get on the move it is possible that the Boers won't find it so easy to move these heavy calibre guns about, and one would hardly suppose they will care much if they leave them, for surely by now most of them will be worn out. After, say, 300 rounds, they would not be much use for accurate shooting, or even half that amount in warfare may see the end of their lives, considering the proof and practice rounds they have doubtless already gone through.

WEAR OF GUNS. Whilst on the question as to the life of a gun it may interest many people to learn that we cannot go through a campaign like the present one without a constant renewal of the guns, owing to wear. The fate of the guns at the Tugela is nothing so very dreadful, as General Buller will hardly be worse off than Lord Methuen, had the three great battles all been fought with one set of guns. There is always a stock of guns for renewals, and in the case of field guns, after firing 200 to 400 rounds, you can't expect much in the way of accuracy or range. Like a rifle, it is a question of the steel, and in two guns, apparently alike in every respect, you may find one will fire 50 per cent. more than the other before being worn out. It is somewhat of a solace to us to know that the Boer artillery must soon begin to give out with this constant firing day after day, as they are drawing upon their quick-firing weapons at Pretoria, etc. We find ourselves unprepared to cope with these guns, except with the naval guns, which are really only constructed for naval work with garrison and naval mountings. The Continental firms of gunmakers—Gruson, Krupp, Le Crusôt, etc.—mount these guns on field carriages; but they are comparatively heavy, and the ammunition is more difficult to transport. But the Boers seem past-masters in the art of moving heavy weights quickly and efficiently. Our 12-pounder naval gun is 10 ft. long, and weighs 12 cwt., whilst the 4.7 is 16 ft. 2 ins. long, and weighs 41 cwt., not very handy weapons to run over the mountains with!

**ADVANTAGE OF
LIGHT FIELD
GUNS.**

It must not be forgotten that whilst we are outclassed by the Boers using Q.F. guns against our field guns, the latter are exceedingly valuable to an attacking force which is moving long distances from its base. They are so mobile and easily managed, that they are, in a sudden emergency, the first to come to Tommy Atkins' rescue. A heavy gun, or one with high velocity, would require a heavier carriage, and the fuzes are more difficult to fire accurately at such high velocity. The 12 and 15 pounder 3-inch field guns which we employ are mainly for shrapnel firing, and a low velocity conduces to the "searching" qualities of the shell, which is a very valuable asset. The length of the field guns is only about 20 calibres, and they are sighted to 4,500 yards, whereas the naval guns of the same calibre are double the length, and sighted to 8,000 yards. The Boers have very few field guns; the best they have are 15 pounders, which came from a firm only a few miles from Woolwich, and which are magnificent models of up-to-date guns.

**AUTOMATIC
GUNS.**

The Maxim automation 37 mm. (1½ ins.) gun has earned for itself a far greater name than the experts gave it credit for. At short ranges, and when used for stopping a rush, it has proved to be most deadly. We English people never like to move out of our deep ruts. The tactics of Julius Cæsar or Hannibal are far more to us than the views of modern strategists. The Americans, in their late war, bought all these 37 mm. guns they could get, and the Boers show their perspicuity by taking what they consider the best, without a written testimonial to say, "we have tried these guns for 10 years, and recommend them as the best and latest pattern." We want younger men with more "go" in them to suggest what war munitions we should have, and we might well, in this case, go to the young firm, who have not stores of ancient models they are committed to, and get a couple of dozen of these guns from stock, and give them a fair trial in actual warfare. These should move the enemy out of the trenches, and, if these failed, I would suggest that some of our music hall warblers go and sing the "Absent-Minded Beggar." But no! That would be contrary both to the Geneva Convention, and to the principles of civilised warfare.

**WAR
ROCKETS.**

From deadly instruments of modern warfare we pass to the ancient war rockets. These singularly useful munitions seem to be entirely forgotten in the present war. It would require the genius of a Kipling to describe the rocket. If it goes, well and good; but if it happens to stick in the tube, or alter its direction of flight round on to your own men, it is awkward—very awkward, to say the least. They are, however, very powerful and terrifying things, and for incendiary or trench searching purposes they should answer very well. The great objections are, that they don't stand transport very well, and have only a mile range; and if you can get within 20 yards of what you aim at, you do well. I once saw a rocket puncture a board school, and plough up the floor in an independant-minded manner which would have done credit to a shell. A few of these in the Boer trenches would give them the option to get out and be shot, or stay in and get cremated.

**CARE OF THE
DETAILS.**

Sir Wm. McCormack's report in last week's *Lancet*, on the Mauser bullet wounds, is exceedingly interesting; but we notice that Sir William gives the weight of the Mauser bullet as 2.3 grains, Lee-Enfield as 2.5 grains, and the Martini at 4.0 grains. This would give you a bullet about the weight of a homœopathic pill, and it must have astonished the learned doctor to see the hole this feather-weight missile made. I also read in a new journal an article by a Bisley shooting man, whose advice is excellent about target rifle shooting, and the illustrated element is introduced by a group of three dissipated-looking bullets which have been fired into water. In the preceding and succeeding paragraph "careful observation" is enjoined; so I carefully observed one of the bullets, which, regardless of the laws of gravity, was balancing itself at an angle of about 15°, whilst the cannulures would suggest two exceedingly short cartridges and compressed charges; or perhaps these are American bullets got in by mistake, or some other nationality, and, instead of five, one was eight, and the other nine grooves, of most peculiar section. Maybe it is meant for five grooves, and half a one in one case, and a whole one in the other, got washed away in the water into which they had been fired. I see, later on, the author says that, when shooting, you should hold your gun "upright"—unless you happen to have a balloon handy for a target, isn't this rather a long range for an ordinary rifle? Not being a Bisley man, I feel I ought to be told whether it is the vertical or the horizontal plane of the arm which is to be held according to instructions.

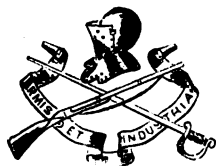
**SWORD
BAYONETS.**

A word about these now highly respected arms would be *apropos* at this time. It may surprise many folk to know that the English bayonet is only a glorified pig-sticker—eminently suitable for Boers (pardon the joke). It is a double-edged blade, about 11½ inches long, flat in section, and about an inch broad at the hilt. This small bayonet is adopted by every nation except France and Russia, who still believe in the long cross section type; and Holland has a fifteen-inch bayonet, thus steering a middle course. The advantages appear to be all with the short type. There is no object in going right through a man, much less to stick two on one skewer, like cat's meat. The cross section is advocated principally owing to its supposed ease of extraction. Among the soldiers the long bayonet was particularly prized, as it made such a good poker, or toasting fork, which was not improving to highly tempered steel—besides which it caused all sorts of scandals about its manufacture.

CYCLOPS.

MR. ARTHUR GREENWOOD, J.P., Chairman of Messrs. Greenwood & Batley, King's Norton Metal Co., Colonial Ammunition Co., Russian Engineering Co., and other well-known concerns was married on the 21st ult.

WE understand that the Geo. Y. Cooper Small Arms and Cycle Co., Ltd., are now in a position to supply guns and rifles of every description, from a common flint-lock to the best hammerless breech-loaders. Mr. Cooper is the grandson of the late Mr. C. Cooper of the old-established firm of Government contractors Messrs. Cooper & Goodman. He is occupying part of the old works which were built in the early part of this century by that firm, where he acquired his knowledge of the gun trade.



THE GUNMAKERS' ASSOCIATION. GENERAL MEETING.

A GENERAL Meeting of the Gunmakers' Association was held at Effingham House on Thursday, November 30th, 1899, at three o'clock in the afternoon, and there were present:— Messrs. C. E. Greener (in the Chair), H. A. A. Thorn, F. Beesley, E. Harrison, and R. T. Woulfe.

MINUTES.—The minutes of the previous meeting were duly read and confirmed.

MESSAGES OF REGRET.—Messages of regret for non-attendance were read from Messrs. J. Rigby, T. W. Webley, Charles Ingram Annan, J. F. Smythe, and J. Tisdall.

MR. H. A. A. THORN.—With reference to the desire expressed by Mr. H. A. A. Thorn to be relieved of his duties as a member of the Executive, and the resolution at the Annual General Meeting expressing the desire of the members that he should continue in that position, the following letter placing on record Mr. Thorn's decision to comply with the wishes of his fellow-members, was read:—

"With reference to my letter of the 22nd of April, and also "of the 23rd ult., acknowledging the unanimous resolution "passed at the Annual Meeting of the 9th of May, I have, "after full consideration in deference to that resolution, and "the wish of many fellow members who were not present at "that meeting, but who have kindly expressed similar "opinions, decided to accept the seat on the Executive for "another year. I will do my best to attend, but hope my "absence will be forgiven on occasions when I find it impossi- "ble to be present."

(Signed) HENRY A. A. THORN.

NEW MEMBERS.—The following candidates for membership of the Association, having been duly submitted for the consideration of the members, their names were brought forward and they were duly elected:—

L. G. Clough, King's Lynn.
C. B. Johnson, Darlington.
S. H. Mackie, Leeds.
T. A. C. Mortimer, Edinburgh.
J. H. Mountstephen, Torquay.
W. Richards, Preston.
J. A. Riley, Halifax.
H. White (Lang & Hussey, Ltd.), London.

VACANCY ON THE EXECUTIVE.—Some discussion arose regarding the vacancy upon the Executive caused by the resignation of Mr. F. T. K. Baker, and the desirability of appointing, from among the London firms represented on the Association but not represented upon the Executive, a member to fill the vacancy so caused. The many important questions which come before the Association, and which are primarily dealt with by the Executive, render it desirable to strengthen the representative character of the Executive as far as possible, and under these circumstances it was pointed out how desirable it would be to secure the representation of Messrs. James Purdey & Sons upon the Executive Committee.

The Secretary was accordingly instructed to communicate this decision to Mr. Athol Purdey, and on behalf of the Association to invite him to allow his name to be brought forward for election upon the Executive.

FRAUDULENT MARKS ON GUNS.—A report was made to the meeting regarding the recent litigation against Messrs. Goff for fraudulently marking guns, and it was mentioned that the net cost of the prosecution to the Association amounted to £33 7s. 6d. Although this was a heavy call on the Association funds, it appeared to be the general opinion that the money had been well spent in the interests of the trade.

A very cordial vote of thanks was passed to Mr. H. A. A. Thorn for the large amount of time and trouble he had devoted to the work of the case, and a similar vote of thanks was passed to Mr. R. T. Woulfe, the solicitor of the Association, in acknowledgement of the success of the professional labours he had devoted to the prosecution on behalf of the Association.

It was arranged that Mr. Woulfe and the Secretary should jointly draft a small pamphlet to place on permanent record the leading facts of the prosecution, and various other matters of interest in connection therewith.

EXPERT OPINIONS BY THE ASSOCIATION.—Mr. C. E. Greener mentioned that it sometimes occurs in the course of a gunmakers' business that questions arise which it would be convenient to refer the questions at issue to a recognised body of experts, whose opinions would carry weight, and he suggested that the Executive of the Gunmakers' Association would be in a position to give authoritative decisions upon various points connected with the manufacture of small arms.

After some discussion it was resolved "That the Executive "or a Sub-Committee of the Executive, shall, on request in "writing of a member of the Gunmakers' Association, and "upon payment of a fee of 10s. 6d. to the funds of the "Association, give an expert opinion on practical matters "relating to the manufacture of guns or rifles, or parts of "guns or rifles."

GAUGE OF GUN CHAMBERS.—After some discussion it was resolved that the Executive should consider the question of size of gun chambers relatively with cartridges, with a view to arriving at practical standard measurements, by which the gun and ammunition makers could be guided.

CONCLUSION OF MEETING.—The meeting concluded with a vote of thanks to the Chairman for presiding.

MESSRS. VICKERS, SONS AND MAXIM, LTD.—A circular has been issued by the Directors of this Company, stating that in consequence of the continued increase of the business a large expenditure is being incurred in new buildings and machinery in Sheffield, Barrow and Erith. They recommend, therefore, the creation of 250,000 further ordinary shares of £1 each. These are to be issued at the price of £3 per share to existing shareholders. An extraordinary general meeting was held in Sheffield on November 30th, to authorize this new issue, and a resolution embodying the scheme was seconded by Mr. Albert Vickers, and carried unanimously. The new shares will increase the amount already in hand for development purposes to three quarters of a million pounds, bringing the total capital up to £3,000,000. At a subsequent special meeting held a fortnight later, the special resolution adopted as above was confirmed,

THE '303 BULLET.

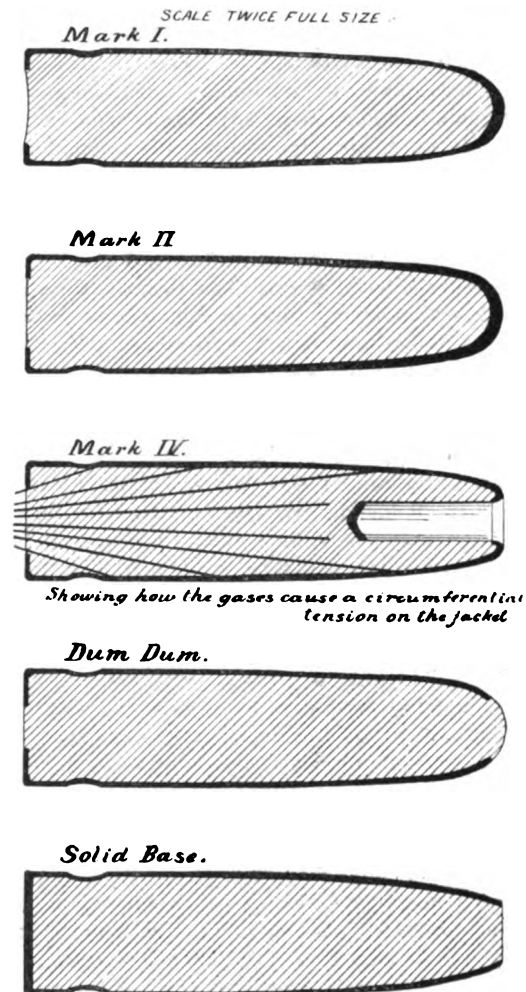
AND so this sweet little thing is one of those horrible bullets! Who ever would dream of such an innocent looking toy going through half-a-dozen men and exploding them all up? Where is the touch-hole? Is it a dum-dum? What explosive is it filled with? My fair inquisitor only strung into one breath samples of the elementary questions generally put by the numberless aspirants to a comprehensive grasp of the war munitions now in use; and of all arms the military rifle is the one with which most of us feel we should be conversant. So we will begin with the business end, the bullet, of and upon which we have heard so much of late, so many editions of which have been issued that one's mind is a perfect jumble of Mark II., IV., V. and dum-dum bullets.

In entering into details of the idiosyncrasies of the individual denominations we should explain to those who are unversed in the nomenclature of war stores that the "Mark II" generally indicates a detail improvement upon the original article. Mark I bullet was the first pattern adopted for service, but this was found to have insufficient "turnover" at the base, and the walls of the cupro-nickel envelope were too thin at the shoulder, so the strengthened up bullet was called Mark II.

This latter bullet went through numerous detail improvements, but had no fresh mark, and certainly the details of Mark I were so slightly altered that only certain radical improvements in the cartridge case at the same time secured its promotion to Mark II. Many and varied experiences has this bullet been through. Its first sufferings were caused by a system of firing into water, this being found the most suitable means of developing "strips," but later, as time went on, this was frustrated by making cupro-nickel of an amphibious quality. Next came cordite, and with it the cannellure; and later the No. 5 Rifling superseded the Metford and gave us all an opportunity of seeing how easily the (then) sharp edges of the rifling could cut the envelopes in firing. Following upon that the slightly hollow base was discarded for a flat base, as wads were found to take passages on the rear of the bullets, held on to the base by the air suction in the hollow. Wads were undesirable passengers as they steered the bullets out of their course. Mark II. is still with us, for this is the bullet we are fighting the Boers with. It is so humane. It gives them every chance to recover quickly, and, in many cases, to go on fighting for a bit after they are wounded.

Mark III., a very promising bullet, died in early childhood, in fact, almost at its baptism. Consequently it never came into active service, and it was soon forgotten on account of the appearance of the notorious Mark IV., which differed from all the previous Marks by reason of the departure from the solid nose to one with a deep cavity formed in the point to enable the bullet to spread when entering flesh, or similar penetrable materials, without "mushrooming." This bullet was a veritable triumph for the Royal Laboratory to whom the honour of its inception and design is due. It was a diplomatic invention, for it reconciled the two parties of bullet experts, who were respectively advocating "penetrative" and "non-penetrative" bullets. Here was one which did both. Its functions were to stop an enemy if it struck him, and it did, and if he got behind a tree to go through the tree and come to rest in the gentleman's carcase the other side. Moreover, it

made better shooting, and at 500 range could be relied upon to give nearly one inch better figure of merit than the Mark II. This may be accounted for by two theories, one that the cavity of the nose created an air column or centre upon which the bullet revolved, and thus prevented a gyratory motion, which the Mark II. may have had, or the displacement of metal in forming the cavity from the nose into the body of the bullet, may have corrected or improved its balance.



Mark IV. fell upon evil times when the rifle associations began their summer shooting meetings, and the climax came at Bisley, when Mark IV. was withdrawn in favour of Mark II., and finally suffered extinction for faults, which, in our humble opinion, were due to manufacturing defects and not errors in design. The trouble it suffered from was the tendency of the core to burst open its shell at the nose, and take a trip on its own account, leaving the shell or envelope in the barrel to do its worst when the next bullet attempted to come through.

The consensus of opinion was "What can you expect; here is a projectile with a hole at each end, a direct inducement for the gases at the back of the bullet to blow the core out through the front." This seemed so logical and convincing that few took the trouble to think the matter out further. But the interested parties were the ammunition makers;

millions of these bullets had been made and successfully fired so that this new development of vicious propensities so late in life led them to look elsewhere for the cause of the trouble. It was apparent that a taper plug, such as a core, could not be forced through a taper socket, such, to all interests and purposes, as an envelope, without sufficient force to distort that envelope; for the core, although only of pure lead, was by all previous experience found capable of resisting any normal strain of firing without "squirting" through the nose.

It was then suggested by the "pot hunting" fraternity, that the weather was very hot, and with the heat of the cordite and friction of barrel the lead core became melted or partly melted, and was blown out in a semi-fluid condition. This theory would not convince anyone who knows the melting point of lead, the fraction of a second it would be exposed to cordite gases, and finally who knows that the strips generally took place within an inch or so of the chamber. So the skin friction theory was discarded on this count without a stain on its character. Having well flogged the components and design of the bullet it was time to have a raid on the rifles, and beyond the fact that in the rifles of some of the crack shots the bore and depth of grooves of the rifling were well on the low side, but within limits of dimensions, nothing was discovered except that the volunteers leave much to be desired in the cleaning of their rifles. (If they were supplied with a proper scratch brush this would not be so). Hereupon it was decided that, for the time being dirty barrels with traces of metallic fouling were partly responsible for causing the casualty—only partly, for nothing could exceed the care with which some of the rifles, in which casualties happened, were maintained in most perfect condition.

Up to this time nothing had been done to locate the trouble with the cupro-nickel envelope. Cupro-nickel's back was weary with its load of sins, it was always in trouble. Managers and foremen spent many weary nights seeking for inspirations which would lead to its reform, and in some firms tons and tons (of cupro-nickel) found their way to the scrap heap before they got past the rolling mills. In some less fortunate quarters the faults were not discovered till the material had been made up into bullets, which stripped and split in firing, and which ultimately came into the market for gun-makers and merchants who so dearly love "cheap goods, under cost price, etc." Seeing that all the Bisley ammunition comes from one source the trade makers were absolved from all blame on this occasion, although some of the makers who cultivate vices of a similar and more varied nature in their nickel, seized the opportunity of a free advertisement to protest with feelings of outraged righteousness, "Please sir, it wasn't me, it was the other boy." We do not presume to form an incontrovertible theory, but we most implicitly believe with our present knowledge that the occurrence of some local defect in the cupro-nickel was the cause of the casualties in these bullets.

If we examine the exterior form of the Mark IV. bullet we may divide it into three sections, which are approximately each about one third of the length of the bullet, the third nearest the base is parallel, the next third is a taper, the third nearest the nose is a cup with a cone body and a hole in the end of it. On referring to the illustration of the Mark IV. bullet it will be seen that the turnover on the base occupies the greater part of the superficial area; next, that the curvature backs it up inside somewhat, besides gripping the

core. Further, the core is wedged tightly into the taper and the cone, and is supported by the turnover of the envelope in the hole in the nose. One might well say with the American in St. Paul's after viewing Nelson's sarcophagus, "Waal, I guess you've got him pretty tight."

We may now enquire what are the functions of that envelope. The object of its existence is to impart rotation to the bullet, since, being a tough metal, it will follow the severe twist of the rifling without metallic fouling, which lead bullets would not do. When we examine the stresses upon the envelope, we find that it has to stand the lands of the rifle being forced into its body by pressure at its base. After the bullet has been fired, we see that the base has become slightly hollow. With this hollow as a radius, upon the axial line of the bullet, one will find an approximate centre from which the lines of force diverge. It is then clear, as shown in the illustration of the Mark IV. bullet, how little, if any, of the pressure is actually transmitted beyond the second third of the bullet, or even to the end of the taper. Clearly then the greatest stress on the envelope will be just above where the rifling first touches the bullet, which is a point about half way up. This is the nearest unsupported part to the point of force, so that the cupro-nickel envelope will at this point be subjected to circumferential tension in the same way as wire round a gun; and if the last annealing in the process of manufacture were overdone, and the metal were soft, one would expect it to yield. Once the support to the lead core is removed it will be unable to withstand the base pressure, and so will follow the form of the expanding envelope, and will correspondingly recede from the base. As it recedes the turnover will offer the core less and less support, till it doubles right up, leaving the core to take the whole of the pressure of the gases. In this way the nose of the envelope breaks away at the cone, splits, and away goes the core, leaving a cylinder of cupro-nickel in the rifle.

Suitable nickel will stand a good deal without breaking. One curious case we saw was of a Mark II. bullet with four equidistant cuts on the shoulder parallel to the axis, the bullet being afterwards put into the forming die to make the cuts invisible. These cuts so weakened the shoulder of the bullet that when fired into water the force of impact reduced the bullet to about one quarter inch diameter, extended the length about a quarter inch, flattening out the curvature, the lead core exuding one tenth of an inch from the base of the envelope. This goes to prove that any slight weakness of the cupro-nickel envelope, will, by force applied either within or without, start a movement which may develop very unexpected results.

The Mark V bullet is the same as Mark IV, except that the core is now a mixture of lead and antimony, which hardens it considerably, so that consequently any similar trouble with the nickel alloy will probably affect the Mark V by causing the envelope to separate in the middle, instead of the core blowing through alone.

We now come to the bullets which are not recognised English patterns, yet are well known. The first of these is the Dum-dum, and when speaking of this bullet we should be assured that it is one and the same bullet, and not subordinate or other species of which many abound. The term Dum-dum has taken the public fancy, and sooner or later it will be catalogued up as classifying all bullets which mushroom upon impact.

The Dum Dum bullet has an open base, and the lead at the nose is left exposed, which, by the way, reminds me of a curious paragraph in a contemporary paper, which, in its sincerest form, flatters *Arms & Explosives*. Under the heading of "Here and There," is an ingenious but unconvincing argument that the Dum Dum is a solid base bullet, because, in manufacture, the firm happen (in their system) to have some solid metal in the base before it is punched out! The same argument would prove the Mark IV. or V. bullet to have a solid nose!! This paragraph, we fear, is neither "Here nor Yonder."

The Tweedy bullet has a solid base and the nose turned away at the point to expose the lead. The core is sweated inside to the envelope with solder. CYCLOPS.

NOTES.

WILKINSON SWORD CO., LTD.—We understand that this Company have acquired a site for a new factory at Acton covering 12 acres. The firm, inform us that a new cavalry sword for troopers has been adopted. It has a longer grip, and a slight re-adjustment of the weight upon the guard has been effected for the purpose of improving the balance.

MR. R. J. HILL.—We understand that Mr. Robert J. Hill, who has been connected with the firm of Messrs. John Hill & Son since the year 1878, and who joined Messrs.



Curtis's & Harvey on the amalgamation, has recently accepted an advantageous offer to take charge of the business department of Messrs. William Bennett, Sons & Co., the well-known fuse manufacturers in Cornwall. The best wishes of the many hundreds who have become personally known to Mr. Hill will accompany him in his new line of work. Mr. Hill should not, of course, be confused with his father, for father and son have been in the same office for so many years.

KYNOCHTOWN.—Excitement was the prevailing feature among the inhabitants when the first public function ever held at Kynochtown took place. This quaint but modern little village has been developing ever since the erection of the Kynoch Thames Factory, and the flourishing community is the result of bringing a new industry to "unhappy Essex." The public function to which we refer, was one in which Miss Kate Chamberlain, the daughter of Mr. Arthur Chamberlain, was the central figure, and the function itself was the laying of the foundation stone of the latest of the developments in the village—the new Kynoch Schools. Through a slight mishap, the ceremony, which was timed to take place at 4.15 on the afternoon of November 18th, was delayed some two hours, and the foundation stone of the Kynoch Schools was laid under decidedly unique conditions. A huge bonfire took the place of the sun's rays, and amid these novel surroundings Miss Chamberlain, after depositing

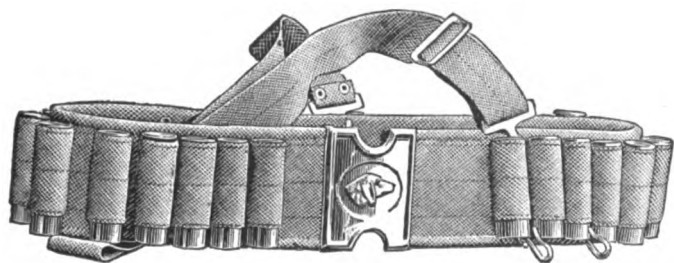
a sealed bottle containing the history of Kynochtown in a cavity specially prepared for that purpose, laid the foundation stone of the new schools spreading the mortar with a handsome silver trowel which had been presented to her by Mr. Cocking. A social gathering in the afternoon, of which an important feature was a suitably furnished sideboard, was greatly appreciated by the Kynoch workpeople, as also was the entertainment given in the evening, which brought a very pleasant day to a close.

SPORTING NEWSPAPERS.—The recent past has been prolific in doings among the sporting papers. *Country Sport* has acquired *Rod and Gun*, which latter has, therefore, ceased publication in a separate form. *Land and Water* has been acquired by Messrs. Lawrence and Bullen, and a company has been registered with £20,000 in ordinary shares and £5,000 in 6 per cent. preference shares to take over the property, the Directors being Mr. A. W. Bainton and Mr. T. W. Fry. There is every reason to believe that, under the new management *Land and Water* will take a position entitling it to stand in the same rank as that ordinarily accredited to the *Field*. Expense will not be spared in achieving a result which present circumstances especially favour. The *Field* has finally lost the services of its respected editor, Mr. Toms, the state of whose health has obliged him to relinquish that position. Mr. William Senior is the new editor, and his work as a journalist throughout a long life is especially notable for his refined articles on angling.

THE DESTRUCTIVE POWER OF BULLETS.—A great deal has been written recently regarding the stopping power of bullets as examined from a medical point of view. A particularly interesting article on this subject appeared in a recent issue of the *Lancet*. The joint authors are Dr. A. Keith, lecturer in anatomy, and Mr. Hugh Rigby, surgical registrar, both of the London Hospital, on the destructive effects of modern military bullets. Mr. Hugh Rigby is a son of Mr. John Rigby, and this no doubt in some measure explains how it is that the rifle part of the article is as accurate as the medical portion. The object of the experiments recorded was to test the statements made by Professor von Bruns to the Peace Conference; but it is all the more interesting now since the comparisons between the Mauser and the British service weapons have a practical bearing upon the Boer war. The paper is profusely illustrated with the records of experiments showing the relative effects of the different forms of the Lee-Metford .303 bullets and the Mauser .276 bullet. The results of these experiments prove that the Mark II has a destructive effect, more than half as much again as that of the Mauser. The destructive effects of the Mark II. and the Mauser bullet converted into expanding bullets are increased three times, but the increase is much greater proportionately in the Mauser. Taking the destructive power of the Mauser as a unit, it is pointed out that that of the Mark II. is nearly twice as great, that of the Mark IV. is exactly twice as great, and that of the Dum Dum over five times as great, the respective ratios being 1.7, 2, and 5.4 to 1. These experiments were carried out upon bars of soap, plaster of Paris set to about the same constituency as the the brain, and upon specially prepared corpses. The latter were used in order to provide specimens for instruction in the London Hospital Medical College as to the effects of

these bullets upon actual flesh and bone. An examination was also carried out as to the destructive effects of Mauser and Webley pistol bullets. The paper concludes with a statement that the authors agree that Professor von Brun's experiments with these bullets were such as to give exaggerated results. Their decision, however, tends towards the condemnation of expansive bullets, since they state that bullets are made to kill; when they fail and only wound it is better that they should produce an effect sufficient temporarily to disable without causing permanent damage. The authors express their thanks to Messrs. E. and J. Rigby for providing the rifles and bullets.

CARTRIDGE BANDOLIER.—The Wilkinson Sword Co., Ltd., have recently acquired the agency for an American invention for cartridge bandoliers. The agency only covers the sporting patterns of this belt, of which we give an illustration. It consists of hemp-woven fabric with pockets complete in a single piece. It possesses many advantages over the ordinary leather bandoliers. It absorbs less moisture and is considerably cheaper and lighter. The Government have shown their appreciation of the same system as supplied to military cartridges by ordering a large supply of these bandoliers for use by our troops. They are a dull khaki colour, and the elastic nature of the material gives them an



effective grip on the cartridges, which, while it enables them easily to be withdrawn, at the same time prevents anything in the way of shake. These advantages equally apply to the sporting patterns, and there is every reason for anticipating that they will be well received by the trade. Incidentally we were shown a valuable application of the system for serving out reserve ammunition. Instead of dealing out the latter in packets the ammunition is packed into a cheap kind of bandolier which, in the heat of the action, the soldier may immediately hang round his shoulders without fumbling with individual cartridges or packets. Generally the new system of bandolier may be described as a glorified Maxim gun cartridge belt.

SAFETY MINING EXPLOSIVES.—At a recent meeting of the Midland Institute of Mining Engineers Mr. L. T. O'Shea's paper on "The Safety of Modern Mining Explosives with special reference to Methods of Testing," which had been read at a former meeting, was again the subject of a discussion. The paper referred particularly to the Woolwich Tests, and its object was to convince members that it is impossible for Woolwich to test explosives under any of the conditions which actually exist in mines. Mr. L. T. O'Shea, who could not attend the present meeting, wrote a letter calling the attention of the meeting to the new special test for explosives. He pointed out that, in his opinion, this

new test was wanting since there were no experiments with dust, which, he stated, greatly increased the sensitiveness of gas to ignition. He said that Woolwich had no apparatus for carrying out such tests with dust, and added that he thought, under the present circumstances, explosives which might be highly dangerous in dusty atmospheres might find a place in the "Special List." He also enumerated what he thought to be disadvantages of the Woolwich Testing Station and its special tests.

THE IMPORTATION OF ARMS INTO TURKEY.—A formal notice has been issued to the public from the Turkish Embassy stating that, in accordance with a recent decision of the Sublime Porte, all firearms, the importation of which is prohibited, will in future be confiscated on arrival at the Ottoman Custom Houses without any obligation on the part of the Imperial Government to pay the consignees the value of the goods.

VOLUNTEER RIFLE RANGES.—A good move has been made at last towards providing the Volunteers with ranges on which the service rifle may be used at long distances. A few such ranges already exist, but the majority of volunteer corps cannot obtain practice up to a thousand yards. The Government has recently decided to include in the Military Works Loan, arrangements for a sum of £40,000 to be provided for the purpose of assisting volunteer corps to obtain ranges on which shooting at long distances may take place.

POCKET CALENDARS.—Messrs. McCarthy Buck & Co. have favoured us with an excellent little pocket diary which they are issuing free to their customers. It is got up in the best style, and useful information to gunmakers occupies odd pages at the beginning, while an accident policy adds to its up-to-date attractions. Messrs. McCarthy, Buck & Co. are getting a great name for their alert enterprise, and this calendar is certainly an indication that the firm do not intend to rest upon their laurels.

EXPLOSIVES FOR THE CAPE.—A proclamation was issued on October 18th last prohibiting the importation of any of various specified explosives. The Agent-General for the Cape has, however, since been advised of the modification of the Order to the extent that upon special permission being obtained from the Colonial Secretary at Capetown such explosives as are to be used for public works and for mining purposes may be brought into the Colony. The special permission will not be granted unless a sufficiently good reason is shown for the importation of such explosives.

WE are notified of the death of Mr. B. T. Moore, M.A., M.I.C.E., F.R.A.S., late of the Thames Ammunition Works. We understand that these works will in future be carried on under the management of Mr. H. G. Ticehurst.

MR. CHARLES LANCASTER informs us that the sales for pigny cartridges exceed the figures of last year by 175,000. It appears that Mr. Lancaster had the special honour of attending on the occasion of the German Emperor's recent shooting in Windsor Park.

WE regret to hear that Mr. F. Tatton, manager of the Royal Carriage Department at Woolwich Arsenal has recently died. It is the general impression that the stress of recent times has had much to do with his fatal breakdown.

LECTURES TO YOUNG GUN- MAKERS.

III.

PRESSURE AND VELOCITY INSIDE THE GUN.

IN dealing with the science of gunnery it is a matter of some considerable difficulty to isolate one particular point and elucidate it in a single short lecture. In the last lecture the principle was explained whereby the mean pressure could be determined which is necessary to impart a given velocity to a projectile of known weight over a given length of barrel. At the conclusion of the lecture it was explained that the splitting up of the calculated mean pressure over the whole length of the barrel could be effected, provided that the velocity of the projectile at different parts of the barrel could be determined. The present lecture will deal with this particular side of internal ballistics.

The publication of pressure tests along the barrel has familiarised most persons with the fact that the powder gases attain their maximum pressure at a point near the chamber of the gun; and that, from that point onwards, until the bullet leaves the muzzle, the gas pressure is a diminishing quantity. By the aid of well-known apparatus a record may be obtained of the side pressure exerted in the barrel against movable plugs or pistons which compress cylinders of lead to a greater or less degree. The amount of compression which one of these "crushers" undergoes is compared by means of tables with the results obtained by crushing similar pieces of lead under a known pressure. In this way fairly reliable comparative results are obtainable. Those who have not studied the question very carefully have a vague idea that there can be no precise comparison between a crushing obtained during the unknown period of compression in the barrel, and the known period of crushing in the testing machine. This vague idea contains the elements of scientific truth, and it follows, therefore, that pressure testing with compressible cylinders, to be of real value, must be conducted with full regard to the shortcomings of the system itself.

Pressure testing by means of crushers is, however, a subject which will need the most careful examination in future lectures. Before the subject of pressure testing can be intelligently considered it is necessary that the groundwork of the laws involved should be carefully reviewed. Even if these laws fall short of actual translation into practical results it must still be remembered that the only way to approach intricate problems is to appreciate the general laws which are concealed rather than annihilated by the host of obscure factors which enter into actual practice.

With the ultimate view, therefore, of subsequently dealing with the measurement of actual pressures within the gun-barrel, it is necessary to study the laws of acceleration which govern the movement of the shot up to the time when it leaves the muzzle. In practice three things at least are expelled from the barrel when a shot is fired. First, the powder charge itself, which, in the form of gas, passes from the chamber to the outside air; secondly, the shot; and thirdly, the column of air in front of the shot: all these are expelled from the gun; but for the time being it is proposed to consider only the shot.

In the last lecture it was shown that a mean gas pressure of '607 of a ton per sq. inch acting upon a charge of shot weigh-

ing 1½ oz. over a length of 28 inches of barrel produced a velocity of 1,150 feet per second. In the present lecture it is proposed to consider the graduations of pressure over different sections of the barrel's length, which produce a velocity at the muzzle of about 1,163 foot-seconds in a charge of shot of the same weight as above. Taking the length of barrel as 30 ins. we will assume that from the starting point of the charge of shot to the muzzle is 28 ins. Applying the formula used in the last lecture we determine that a uniform pressure of '68 of a ton per sq. inch produces the stated velocity.

The only means of ascertaining the velocity attained by a projectile at different points along the barrel is by direct measurement of the time occupied over various stages in its travel. It is unnecessary for our purpose to enquire into the means adopted for this purpose. Suffice it to say that Sir Andrew Noble was among the first to turn the system to practical account for the measurement of gas pressure in big guns, while in the case of shot guns Mr. R. W. S. Griffith has been able to determine valuable *data* by working on similar lines. Sufficiently accurate measuring apparatus is available for measuring intervals of time in hundred-thousandths of a second. In the accompanying table a series of records is shown. The first measurement, which, however, is not used in the table, shows the time which elapses from the ignition of the cap to the arrival of the projectile at 3 ins. from the breech face. Such a measurement gives no indication of velocity, since the bulk of the time so occupied is represented by the gradual production of gas sufficient to impart movement to the shot; and, since the time of ignition cannot well be separated from the time occupied by the shot in travelling from the cartridge to the 3-inch point of measurement, our velocity observations must start at three inches from the breech face.

The table tells us that the shot occupied '00047 of a second in travelling from the 3-inch to the 6-inch point of measurement. A shot which moves three inches in the stated time would require four times that period to move one foot. Therefore '00188 ('00047 × 4) of a second would be the time occupied in moving one foot at the same speed. This may be converted by rule of three into velocity in the following manner:—

In '00188 of a second the shot moves 1 foot. Therefore in 1 second it would move $\frac{1}{.00188}$ feet = 532 ft. per sec. Algebraically the calculation would be expressed as follows;—

$$D = V \times T. \text{ Therefore } V = \frac{D}{T} = \frac{1}{4 \times '00047} \text{ ft.-seconds}$$

when D stands for distance moved in feet, V for velocity in foot-seconds, and T for time in seconds or fraction of a second.

The greater simplicity of algebraical methods is made manifest by the above operations. Instead of multiplying the time measured for three inches by four, in order to convert the result into feet, and then converting the time for one foot into foot-seconds of velocity, we need merely to fill in the values for distance and time in accordance with the formula, and work out the result without further brain puzzling. The first expression is merely the algebraical method of stating the fact that the distance moved is equal to the velocity multiplied by the time of duration of the movement. Its truth is obvious, and algebra enables us to state this truth or equality in another form—viz., in the value of V.

The next time measurement of .00058 of a second for six inches is similarly converted into terms of velocity. The mind finds it difficult to compare a time measurement for three inches with a corresponding one for six inches. But by expressing the two on a common basis of velocity we see that the mean velocity over the three-inch section of the barrel has risen from 532 ft.-secs. to 862 ft.-secs. over the adjoining section of the barrel. The next section of the barrel registers a further increase in the velocity of the shot; and so on to the last six inches adjoining the muzzle. The third row of figures shows the amount of velocity added to the shot from one section to the next. It will be seen that the *increase* of velocity is at its maximum near the breech end of the gun, and grows steadily less as the shot nears the muzzle.

This increase of velocity, known as acceleration, varies according to the propelling force of the powder gases; and while the acceleration is greatest at those places where the pressure of the powder gases is greatest, the two are not in direct proportion, as will now be shown.

In the year 1894 Sir Andrew Noble read a paper before the British Association, in which he explained his methods of deriving the pressures along the bores of big guns from a series of time measurements constructed on a similar plan to those here quoted. Having expressed the development of velocity by means of a curve, he made the simple statement, that "the velocity curve being fixed, the pressure curve of necessity followed." This necessary sequence is probably not so obvious to the tyro in gun science as it is to an authority of the experience of Sir Andrew Noble. Consequently a detailed explanation of the connection existing between the two will not be out of place.

At first sight it would appear that the formula explained in the last lecture, and summarized above would apply. But this is not entirely so, for it requires to be split up into two divisions. The table shows that at one part of the barrel we have a mean velocity of 862 ft.-secs., and that in the next section this velocity has been increased to 1020 ft.-secs., showing a difference of 158 ft.-secs. We must assume, in our present state of knowledge that the average velocity over a given six inches is the actual velocity in the centre of that space. Actually it is not so, since the acceleration is not uniform; but it would complicate the present calculation to go into such detail as would enable us to determine, with any attempt at real accuracy, the position of the mean velocity. We take it, therefore, that from the midway point between 6 and 12 inches to the midway point between 12 and 18 inches, viz., from 9 inches to 15 inches, there is an added velocity of 158 ft.-secs. Now the formula previously explained would appear appropriate for finding the gas pressure required to add this amount of velocity over the given distance. The mistake in this supposition lies in the assumption that it requires the same pressure acting over 6 inches to raise the velocity from zero to 158, as it does to add 158 to a velocity already existing of 862 ft.-secs.

The formula quoted tells us that it requires a mean pressure over 6 inches of .058 of a ton per square inch to impart a velocity of 158 ft.-secs. to $1\frac{1}{4}$ oz. of shot in a 12-bore gun. This velocity represents an energy of 27 foot-lbs. If we work out the energy of the shot moving at 862 ft.-secs., as is done in the fourth line of figures in the table, and also that of the same shot when moving at a velocity of 1,020 ft.-secs., we find that their respective values come out at 811 and 1,136

ft.-lbs. The difference between the two, given in the line of figures marked "added energy," shows that an increased energy has been imparted to the charge of shot over this distance of 325 ft.-lbs., which is many times more than the amount of energy required to bring the charge of shot from a state of rest to a velocity 158 ft.-secs. Now since energy is expressed in foot-pounds, in other words, the product of force and distance, it follows that the distance in each case being the same the force (gas pressure in the case of a gun) must be greater in the one case than in the other. Consequently the determination of the gas pressure over a given section of the barrel's length must be derived from the amount of energy imparted to the projectile over that stated distance.

The energy value in foot-pounds for each value of velocity has therefore been worked out and is shown in the table. The energy formula, already described in the previous lecture, is as follows:—

$$\text{Energy} = \frac{W \times v^2}{2g} \text{ foot-pounds.}$$

The values of added energy, as already indicated, are obtained by taking the differences between the adjoining records.

The ground is now somewhat cleared. We have merely to convert the amount of added energy into the equivalent gas pressure expressed as tons per square inch. Taking the section of the barrel over which there is an added energy of 325 ft.-lbs., it is clear that this amount of energy is represented by a force of 325 lbs. acting over one foot, or double that force (650 lbs.) acting over half the distance, viz., 6 inches. A force of 650 lbs. acting upon an area of .417 of a square inch may be converted into tons pressure per square inch as follows:—

$$\frac{650}{.417 \times 2240} = .69 \text{ of a ton per sq. inch.}$$

The same series of operations may be treated algebraically by the expression: Force (F) \times distance (D) = energy (E).

Transposition tells us that $F = \frac{E}{D}$.

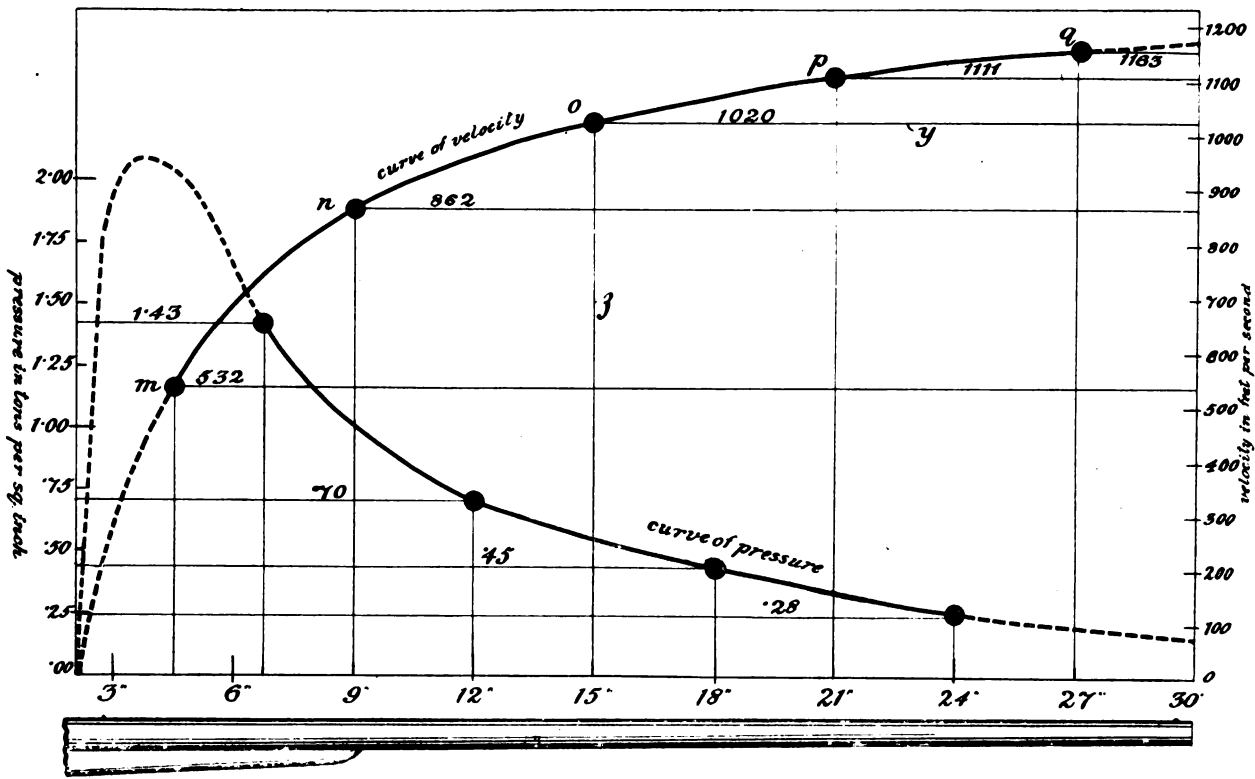
Since we desire to convert force in lbs. into force in tons we must divide by 2,240 and to convert the tons force acting on the bullet into tons pressure per square inch in the gun we must divide by the sectional area (A) of the bore of the gun.

The expression is then laid out as follows:—

$$P = \frac{E}{D \times A \times 2240} = \frac{325 \times 2}{.417 \times 2240} = .69 \text{ of a ton per sq. in.}$$

The other values in the last line of the table are obtained on the same principle, though in the case of the first value of pressure the distance is taken as 4½ inches, since this represents the section measured from the midway point of 3 inches to 6 inches, and of 6 inches to 12 inches.

The proper understanding of many progressive forces and relative values is greatly facilitated by expressing them graphically in the form of curves. Velocity in its relation to the different sections of the barrel over which it is developed may be expressed, as in the table appearing above, in figures; but the true bearing of these figures is very difficult to grasp even by the most mathematically-minded of experts. Expressed as a curve they at once become simple, since the eye can detect general principles more easily than the mind can grasp the same facts expressed in figures. The operation



POSITION ALONG BARREL	3in.-6in.	6in.-12in.	12in.-18in.	18in.-24in.	24in.-30in
Time in Seconds	.00047	.00058	.00049	.00045	.00043
Velocity in Foot-Seconds	532	862	1,020	1,111	1,163
Added Velocity		330	158	91	52
Energy in Foot-Pounds	309	811	1,136	1,348	1,477
Added Energy		502	325	212	129
Corresponding Pressure in Foot-Tons	1.43	.70	.45	.28	

of building up a curve is very simple. A velocity curve taken in its relation with different sections of the barrel becomes a curve of acceleration. Since acceleration is a product of velocity and distance, a series of velocities may be scaled out on the upright side of a rectangle, and distance, represented by the length of the barrel, may be laid out upon the base line of the rectangle.

The table gives us various points of intersection or corresponding values. For instance, the velocity at 15 inches from the breech face is 1,020 ft.-secs. In the diagram there is a certain point *o* at which a horizontal line *y*, drawn from the 1,020 ft.-secs. value on the velocity scale, intersects the vertical line *z* drawn from the 15 inches value on the base line. The four other points of intersection *m*, *n*, *p* and *q*, are similarly plotted out, and the result is a series of points lying within an imaginary curve.

It is reasonable to presume that the unascertained points of intersection lying between those marked off would follow the same general curve, and consequently by joining the points *m*, *n*, *o*, *p* and *q* together by a continuous line we have a curve representing in general characteristics the velocities

along the barrel which correspond with the time measurements shown in the table. The broken portions of the curve show imaginary continuation at either end.

The same graphical principal may be applied to the formation of a pressure curve. The points along the barrel to which the various values of pressure are assigned lie midway between those referring to velocity, since the pressure values are derived from a comparison of the velocity values on either side. The pressure scale arranged on the left vertical line of the rectangle is marked out similarly to the velocity scale. There is no particular reason for the lengths allotted to each ton of pressure, beyond that the length is so adjusted that the resulting curve shall be of convenient form. This also applies to the velocity scale.

The shape of the curves is the main thing to study, and it will be seen that the steepness of the velocity curve at any particular part is greater or less according to the amount of pressure at the same part of the barrel. The vertical distances between the horizontal lines indicate the amount of acceleration over the corresponding portions of the barrel.

In all theoretical considerations of ballistics one must avoid

the fatal error of ascribing undue value to any particular series of calculations. Pressures derived from time measurements do not represent the actual pressure within the barrel. They show only the amount of pressure which is actually effective in the propulsion of the shot. A part of the total pressure exerted by the powder gases is exerted in overcoming the friction of the shot against the sides of the barrel. A further part of the pressure is utilized for the expulsion of the column of air in front of the shot. There are other elements of difficulty which complicate the task of estimating actual pressures from time measurements in the gun; furthermore these complications are in many respects more serious in degree and, at the same time, more difficult to elucidate than in the case of big guns.

Yet, on the other hand, pressure curves based upon velocity curves provide one of the most effective means of standardizing the results obtained from crusher experiments, and they form the most exact scientific basis upon which to study the question of internal pressures in guns.

THE COLT AUTOMATIC GUN CO., LTD.

IN the Chancery Division on Dec. 21, before Mr. Justice North, the case of *Cooper v. The Lancashire Finance Association* was heard. It was a motion by the plaintiff for an injunction to restrain the defendants from in any way dealing with any cash or shares in their hands, or which might be received by them in respect of the flotation of the Colt Gun and Carriage Company, Limited, or by virtue of any of the contracts entered into by them.

Mr. Macnaghten, Q.C., for the defendants, said he was willing to give an undertaking until the trial.

Mr. Henry Terrell, Q.C., for the plaintiff, said he must press for an injunction in the terms of the notice of motion. The plaintiff was the assignee of a Mr. Wright, who in November, 1898, was entitled to the benefit of a contract entered into with an American company called the Colt Patent Firearms Manufacturing Company, who were the proprietors of the Colt automatic gun. This contract provided for the sale to Wright of certain patents owned by the American company for £30,000. Subsequently negotiations were entered into between Mr. H. M. Hyndman and Mr. Jackson, representing the defendant company in this action, and Mr. Wright with a view to the defendant company acquiring Mr. Wright's agreement with the American company. Eventually a letter was written (which was the document on which plaintiff relied) to the effect that in consideration of Mr. Wright going to America and obtaining the cancellation of his agreement with the American company, and substituting one direct with the defendant company for the purchase of the Colt automatic gun for £30,000, the defendant company agreed to pay Wright one-third of the net profits derived from the flotation of the business, such one-third to be paid in cash or kind. Wright went to America and performed his part of the agreement, and the defendant company had had the benefit of the contract entered into with the American Company, and had promoted the Colt Gun and Carriage Company to buy these patents and work them. The defendants now alleged that some of the patents were not subsisting ones, and that one of the most important had been allowed to lapse (which was not true, said Mr. Terrell), and now suggested that Wright had given them some sort of warranty with regard to these patents. The defendants had offered certain terms to Wright, which he had refused, and Hyndman had threatened him that unless he came to terms he (Hyndman) could at any time walk out of the office, and the defendants could repudiate the contract because it was only signed by him.—Mr.

Terrell said the Colt Company, which had been formed to buy these patents, had agreed to pay £300,000 for them—£50,000 in cash and £250,000 in shares.

Mr. Macnaghten said that the Colt patents formed only a part of the business acquired by the new company, as it had also taken up the gun-carriage patents of Lord Dundonald (now in South Africa), and it was absurd to say that the plaintiff was entitled to one-third of the whole profits on the flotation of the new company. The plaintiff was only entitled to a share of such profits as arose out of the sale of the Colt patents.

After some argument Mr. Justice North directed the defendants to give the plaintiff an account of the profits arising out of the flotation of the Colt company, and the defendants expressed their willingness to give an undertaking in the terms of the notice of motion.

CORRESPONDENCE.

DUM DUM BULLETS.

TO THE EDITOR OF *Arms and Explosives*.

DEAR SIR,—I see in *Engineering*, of the 27th October, 1899, an application for a patent by Mr. W. C. E. Sergeant for a small-arms bullet. He states in his specification that the Dum Dum bullet is "liable to stick in the action of certain magazine rifles in rapidly recharging from the magazine, and in some instances the mantlet or jacket is partially-stripped off or strained out of shape in the barrel before the projectile leaves the muzzle, thus impairing the accuracy of flight of the projectile." This I beg to deny *in toto*, as I have made up millions of rounds of ammunition with the Dum Dum bullet for the Indian Government, and have fired many thousands of them, and have never found the faults ascribed to them by the author of the specification referred to above. Certain firms in England have made up so-called Dum Dum bullets without apparently knowing what a Dum Dum bullet was (like the German Tübingen professor), and I have found bullets in India advertised for sale as Dum Dum, though they were not such. Perhaps Mr. Sergeant has had experience of some of these. Messrs. Greenwood and Batley will be able to describe a Dum Dum bullet to him, and the Indian Government would hardly have adopted it, if it possessed the faults quoted in Mr. Sergeant's specification.

Yours faithfully,

N. S. BERTIE-CLAY, Captain R.A.

Dum Dum, November 16, 1899.

APPLICATIONS FOR PATENTS.

NOVEMBER 20—DECEMBER 16, 1899.

- 23,167. Metallic Cartridges. J. Y. Johnston. (Agent for R. W. Scott, U.S.A.)
- 23,168. Means for Firing Guns and Rifles. Also Cartridges for same. J. Y. Johnston. (Agent for R. W. Scott, U.S.A.)
- 23,208. Fuses for Projectiles. J. C. Thompson.
- 23,271. Automatic Fire-arms. Baron A. O. von Augezd.
- 23,300. Telescopic Sights. A. A. Common.
- 23,397. Submersion Regulating Gear for Torpedoes. A. J. van Stockum.
- 23,442. Explosives. J. Ross and W. D. Cairney.
- 23,445. Single-Trigger Mechanism. J. Carter and A. Brunnell.
- 23,449. Apparatus for Compressing Guncotton. A. Hollings.

- 23,464. Cartridge Pouches. A. J. R. Purcell.
 23,475. Safety Rocket Gun and Apparatus. R. Owen and C. D'Esterre.
 23,498.* Expansible Plug for Mine Shot Holes. J. Bovier.
 23,529.* Driving Bands for Projectiles. T. R. Bayliss, and T. A. Bayliss.
 23,585.* Moveable Targets. H. H. Lake. (Agent for E. E. Thresher, U.S.A.)
 23,626. Metallic Cases for Explosive Charges. R. B. Pollitt.
 23,946. Manufacture of Projectiles. J. T. M. Hincecock.
 23,954.* Detonators. J. W. Fowler.
 23,969. Percussion Fuses for Projectiles. J. Wetter. (Agent for E. Rubin and H. Karrodi, Switzerland).
 24,177. Projectiles for Ordnance. J. Stevens.
 24,220. Quick-Firing Gun Breech-Mechanism. A. F. Warren.
 24,257. Bullets. J. Campbell.
 24,291. Ordnance. M. A. Weir.
 24,377. Explosives. L. Wenghöffer.
 24,380. Explosives. J. E. Evans-Jackson. (Agent for U. Ulvisi, Italy.)
 24,418. Pistols and other Small-arms. L. B. Taylor and E. H. Parsons.
 24,425.* Safety Bolts for Lee-Metford Rifles. L. B. Taylor and E. H. Parsons.
 24,561.* Manufacture of Guncotton and Soluble Nitrocellulose. L. Morane.
 24,640.* Cartridge Holders. E. Breuning.
 24,671. Pellets for Blasting. L. Davies.
 24,702. Firing Mechanism for Breech-Loading Ordnance. A. T. Dawson and G. T. Buckham.
 24,811.* Schrapnel Projectile. G. Roth.
 24,870. Breech-Loading Fire-arms. H. W. Gabbett-Fairfax.
 24,921. Explosive Compounds. W. H. Akester and H. H. Price.
 24,995.* Adjustable Try Guns. F. W. Cole.

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

NOVEMBER 25—DECEMBER 16, 1899.

- 21,806 (October 17, 1898). J. Skibinski, Russia. A hand machine for recapping and reloading spent paper cartridge cases. The machine consists of a base, upon which is mounted a vertical standard. Two arms are pivoted to the top of this standard, one of them swinging in a horizontal direction, and the other moving in a vertical plane. The latter has a number of attachments, by means of which the recapping and wadding operations are performed, whilst the former carries a rod, on the end of which is fixed a chuck for turning over the end of the cartridge. Accepted November 17, 1899.
- 22,939 (First application (in U.S.A.) April 5, 1898. Application in United Kingdom, November 1, 1898). S. N. McLean, U.S.A. A gas-operated automatic rifle. This weapon is specially constructed to receive the strain of the discharge in the line of greatest strength, to be distributed equally on every part of the arm. The frame of the rifle is solid, and the gas which actuates the breech mechanism is passed back when the bullet travels over a funnel-shaped opening at the end of the barrel. The gases are guided to an actuating chamber, and are gradually built up until the breech block is forced back. The quantity of gas which passes back may be regulated by the size of the funnel. Accepted November 1, 1899.
- 24,948 (November 25, 1898). A. T. Dawson and T. Thackeray, London, and J. Horne, Barrow-in-Furness. Modification in ammunition hoists used on board ship. The alterations consist in arranging the hoist and its hydraulic crane work in such a way that the cage is locked at the bottom of the lift until released by an operator; also in enabling the cage to travel in a curve at the breech of the gun until it reaches a stop on the carriage. The lift rope is also altered so that it shall accommodate itself to the various positions of elevation or depression of the gun without any alteration in its length. Accepted November 18, 1899.
- 26,149 (November 11, 1898). The Joint Stock Company (Nord-duetsche Munitionsfabrik). A. Totte and P. Pondorf, Germany. An attachment for self-acting machines used for operating upon small bodies such as bullets. Hitherto it was necessary to place the bullets in a feeding groove by hand in order to get them uniformly pointed in one direction. They may, however, be passed through the present device anyhow when those which are pointing in the right direction are allowed to pass, the others being intercepted, turned the right way up and passed on through another channel. Accepted November 11, 1899.
- 26,749* (December 19, 1898). F. Beesley, London. The Beesley Single-trigger Mechanism.
 131 (January 3, 1899). A. T. Dawson, London. A modified breech screw for ordnance breech plugs. The ordinary type of breech screw is made in steps of different radii, but a disadvantage of this kind of plug is that if not turned completely home it is in a loose condition. The present patent deals with a form of screw which is parallel sided, and is divided into a number of segments, each having a curvature, part of which, at the greatest radius, is circular with the axis, the rest being spiral. If this type of plug is not screwed home, there is still in each segment an arc really circular, in which the screw threads are engaged to their full depth. Accepted November 4, 1899.
- 364 (January 6, 1899). A. T. Dawson and C. A. Larsson, London. Various modifications to machine gun mountings, the object of which is to arrange the parts in such a position that the whole gun and carriage, without necessitating the dismounting of the gun, may be converted easily from the firing to the portable condition. The gun may also be dismounted easily and quickly, the trunnions being mounted in a fork head, and so arranged that on drawing back a spring bolt the trunnions may be at once lifted out of their bearing through a gap. Accepted November 11, 1899.
- 2,662 (February 6, 1899). Vickers, Sons and Maxim, Ltd., Sheffield, A. T. Dawson and G. T. Buckham, London. Running out springs for big guns, which are so constructed that they may be adjusted to the desired degree of compression, and when so adjusted can be removed from the gun without the adjustment being altered. The spring may be made in several different pieces working in a tubular casing, through the centre of which passes a bolt. By means of a compression screw at the front end of the casing, the spring is retained at any desired degree of compression, the removal of the rear retaining nut allowing the parts to be removed without alteration of the adjustment. Accepted November 4, 1899.
- 6,701 (March 28, 1899). J. Børresen and S. Sigbjørnsen, Norway. An arrangement for deadening the report, and also for diminishing the recoil in fire-arms. It consists of a perforated sleeve, which is attached to the muzzle, and which contains a number of dish-shaped deflectors, with holes through the centre, through which the projectile passes. The object of the deflectors is to catch the gases as they escape from the muzzle and distribute them laterally. In this way it is claimed that the recoil is lessened and the report is deadened. Accepted November 11, 1899.
- 16,644 (August 16, 1899). G. Becker, Germany. A method of adapting shooting stools for use also as aiming rests by making them in two or more separate parts, which telescope into one another. These parts may be pulled out to any required height and secured by a thumb-screw. Accepted November 11, 1899.
- 16,778 (August 18, 1899). W. H. Bevans, U.S.A. A modified form of sighting for ordnance. The main object of the various alterations is to simplify this mechanism. The sight is adjustable, and is elevated by a circular part which has a slot starting at its centre and continuing in a spiral direction towards its outer rim. This is indexed on its spiral surface and has a cam-like action on a stud which projects through the slot. This stud is gradually pressed outwards on the turning of the slotted piece, and by this means the sight is elevated or depressed. Accepted November 11, 1899.
- 17,041 (August 22, 1899). B. W. Dunn, U.S.A. Modified forms of shrapnel shell and ball. In order to get the balls packed regularly so that iron separators shall not be necessary, the interior of the shell in the present case is formed in such a manner that its cross section represents a hexagon. The balls are all made uniformly with a steel jacket and lead core, and of the same shape. They are thus enabled to be packed into the shell compactly and without the use of dividers. Accepted November 4, 1899.
- 17,520 (August 29, 1899). J. Rupertus, U.S.A. Self-cocking pistol mechanism. The hammer is connected with the main spring by means of a link, and in the normal condition of the spring it pulls the hammer backwards into its cocked position. The

hammer is retained in this position by a dog on the trigger. When the trigger is pulled the pressure is conducted through the link to the main-spring, which is compressed until a certain point is reached, when the link passes over a dead centre and the compressed main-spring is caused to exert its strength in the opposite direction, thus forcing the hammer forward. The dog is tripped by the backward movement of the trigger thus freeing the hammer and allowing it to be pressed forward. Accepted November 18, 1899.

19,017 (September 21, 1899). A. J. Boulton. (Agent for T. C. Orndorff, U.S.A.) A device for carrying ammunition conveniently, consisting of a band of pliable material containing pockets, which is to be worn round the wrist. It is constructed to hold about twenty ordinary service cartridges. Accepted November 4, 1899.

19,448 (September 27, 1899). L. Hellfritsch, Germany. Automatic recoil-operated small-arms. The barrel and breech block are locked by oblique locking nipples, and upon discharge the barrel flies back a certain distance. The breech-bolt rotates in the first part of this movement, and partly unlocks itself from the barrel; but at a certain point the breech ceases to rotate. The barrel is then started rotating, which movement completes the unlocking and allows the breech to finish its backward movement. Accepted November 4, 1899.

19,848 (October 3, 1899). A. W. Savage, U.S.A. Modified parts of the firing mechanism in an automatic rifle. The alterations are principally connected with the firing-pin, and this part is so arranged as to render it safe against causing premature explosions. It is also prevented from interfering with the movement of the cartridges. Accepted November 25, 1899.

* This Specification is more fully described under "Selected Patents," together with those which were held over from our last month's issue.

SELECTED PATENTS.

THE BEESLEY SINGLE-TRIGGER MECHANISM.

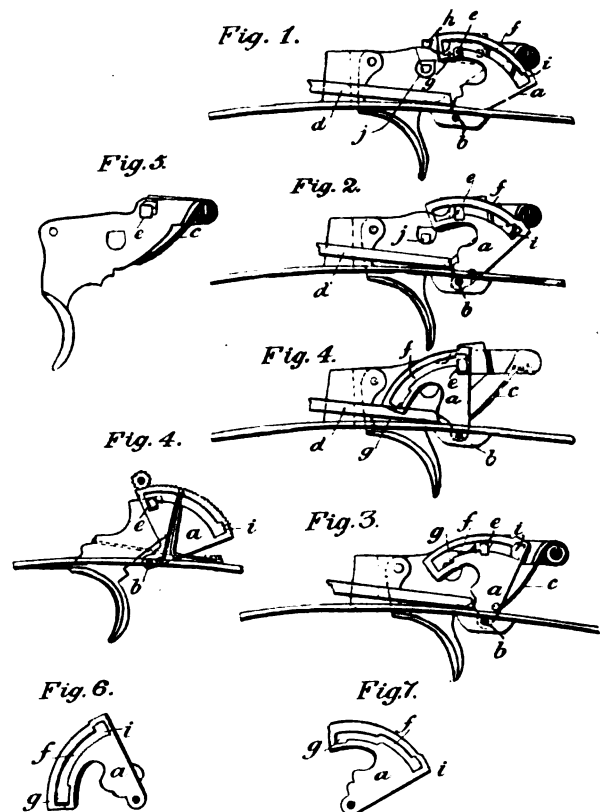
26,749. (Dec. 19, 1898). F. Beesley, London. In the present patent we have a modification of a previous single-trigger mechanism by the same patentee, which was the subject matter of Patent No. 5,404 (1897), and was described in our issue of July, 1897. In the former patent there was a timing apparatus which blocked the working parts for the required time after firing the first barrel, these parts being released by the involuntary pull due to recoil. In the present patent the involuntary pull is not an essential process for the firing of the second barrel.

The timer in the present mechanism consists of quadrant *a*, which may take up either of two positions, one position allowing the firing of the first barrel, and the other that of the second barrel, the parts being locked when the quadrant is in any intermediate position.

In the accompanying drawings Fig. 1 is a view of the mechanism in a position ready for firing the right-hand barrel. Fig. 2 shows the parts after the right-hand barrel has been discharged. Fig. 3 shows the position of the parts as locked by the involuntary pull. Fig. 4 is their position after the involuntary pull has occurred, and in this arrangement they are ready for the left-hand discharge. Figs. 5 and 6 are detailed views of the trigger and the quadrant *a*. Fig. 7 shows a slightly altered form of the quadrant *a*, whilst Fig. 8 is a modified form of trigger mechanism.

The quadrant which is marked *a* in the different drawings, is separately shown in Fig. 6. It is pivoted to the trigger plate *b*, and is urged forward by the spring *c*. It is forced backwards in the opening of the gun against the pressure of its spring by the rod *d*, and it is retained in the position shown in Fig. 1 by a catch. This catch *e* is shown in Fig. 5 to be an extension of the trigger blade. This catch lies within the circular slot *f*, which is cut in the quadrant *a*. The quadrant is held in the position shown in Fig. 1 by

the falling of the catch *e* into the notch *g*, which is cut in the quadrant. When the trigger is pulled the sear *h* of the right-hand barrel is raised (Fig. 1), and the catch *e* rises from the notch *g* and arrests the movement of the quadrant in the position shown in Fig. 2 by coming into contact with the upper face of the slot *f*. The involuntary pull may then occur, the preliminary releasing of the trigger allowing the quadrant to travel forward a certain distance, the pull which follows again jamming the catch against the quadrant in the position shown in Fig. 3. The shooter then involuntarily releases the trigger, and this allows the quadrant to move forward to its full extent, as shown in Fig. 4. When the parts have attained the latter position, the



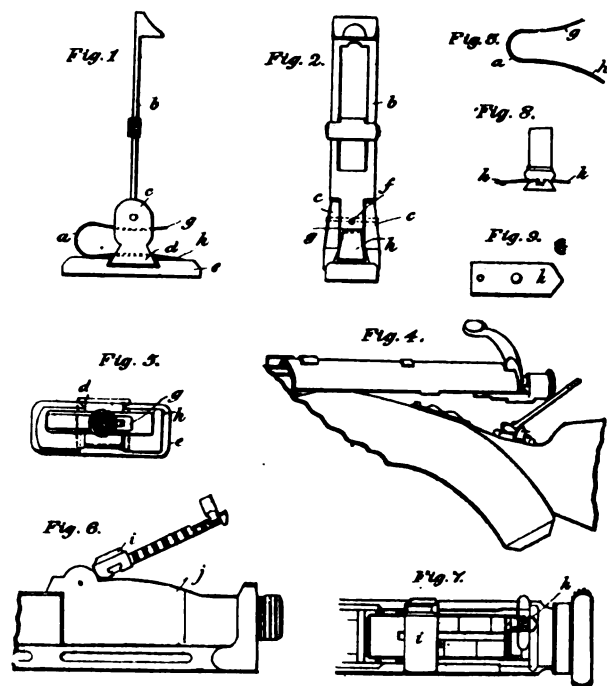
catch *e* lies directly beneath the notch *i* (Figs. 4 and 6) which is cut on the upper surface of the slot *f*. This allows the trigger blade to be raised to a higher position than is possible with the quadrant in any other position. Since the sear *j* of the left-hand barrel is mounted relatively with the trigger blade, so that its release necessitates a greater lifting of the trigger blade than in the case of the right-hand sear, it follows that the additional movement allowed by the notch *i* permits the release of the second sear. This will be more clear if the position of the left sear *j* is studied in the drawings Fig. 1 and Fig. 2. In Fig. 1 it will be seen that the trigger blade is directly in contact with the right-hand sear *h*, and the amount of pull necessary for releasing the sear *h* will only just bring the sear *j* into contact with the bottom of the hole formed for its reception in the trigger-blade. After the quadrant has moved forward to the position shown in Fig. 2, the trigger-blade is in contact with the second sear *j*, but since the further upward movement of the trigger-blade is blocked until the quadrant has completed its movement it follows that the discharge of the second barrel is delayed until the quadrant has had time to complete its movement. In this way so long as the involuntary pull occurs during the time the quadrant is passing from one position to the other, double dis-

charges cannot occur. Further, it is clear that if no involuntary pull occurs the voluntary releasing of the trigger will enable the quadrant to complete its movement by the time the shooter is ready to discharge his second barrel.

It should be mentioned that the upper face of the quadrant slot may be slightly roughed in order to facilitate immediate gripping with the catch *e*. Fig. 7 shows a modified form of the quadrant slot the interruption in the middle providing for a momentary arrest in its movement, whereby the time of interruption is prolonged. Fig. 8 shows another means of effecting the same purpose, the outer surface of the quadrant being provided with teeth operating a small wheel *k*. By this means the movement of the quadrant is rendered more gradual and progressive. Accepted Nov. 25, 1899.

A METHOD OF ATTACHING SIGHTS TO SMALL-ARMS.

25,515 (December 3, 1898). L. B. Taylor, Selly Oak. This patent relates to a method of attaching tangent backsights to rifles of the bolt type, so that the sight leaf, which is mounted on the grip and therefore in the way of the bolt, shall recover itself after having been knocked out of the perpendicular by the bolt in its backward travel. The essential feature of this arrangement is a specially constructed spring. Another form of spring is also described, which is applicable to a special sight principally intended for use with small arms of the Mauser type.



In the accompanying illustrations Fig. 1 represents a side view of an ordinary tangent backsight, fitted with the special spring which is shown in detail in Fig. 3, and Fig. 2 is a back view of the sight. The leaf *b* of the sight is pivoted between two uprights *c* rising from the head *d*. This bed is dovetailed to the rifle or to a block *e* attached to the weapon on the top of the grip. The leaf *b* is provided with the projection *f*, which extends downwardly and bears upon the upper arm *g* of the special spring *a*. The lower arm *h* of this spring, which is shown in detail in Fig. 3, presses the bed *d* down upon the block *e*.

This sight applied as a peep sight in the place for which it is specially constructed, that is on the grip of rifles of the bolt type,

is shown in Fig. 4. It will be seen that the bolt in its backward travel pushes the sight leaf backwards over its centre. The tilting of the sight causes the projection *f* to compress the upper arm of *g* of the spring. Immediately the bolt is returned to its normal position the spring forces the sight to recoil back into its perpendicular position, through its pressure upon the projection *f*. Fig. 5 is a plan of block *e* showing the dovetail joint in detail, and from this view it will be seen that the sight may be shifted laterally across the block *e* for wind gauge purposes. It will be remembered that the lower arm *h* of the spring *a* presses the sight downwards upon the block. The sight is therefore secured firmly in any position laterally.

In Fig. 6 another form of sight, in its elevated position, is shown attached to frame of a Mauser pistol. This is also shown in plan in Fig. 7. The sight is elevated by means of the slide *i* moving up the inclined surface *j*. A peepsight, which may be adjusted laterally, is fixed to the end of the leaf and is secured by means of a dovetail joint similar to that in the rifle sight. The base of this sight, however, is notched so that it shall not be shifted by the recoil of the pistol in firing. The special spring *k*, shown in detail in Figs. 8 and 9, is used to press the sight firmly down upon the leaf in any position across the dovetail.

A similar form of leaf sight, elevated by means of a slide moving up an incline, and fitted with wind gauge sights, may also be constructed for attaching to the grip of rifles. The flat spring, Fig. 9, may be applied to foresights. Accepted October 28, 1899.

THE BRIGHTON SINGLE-TRIGGER MECHANISMS.

852. (January 13, 1899). W. H. Brighton, Wylde Green. The present patent relates to a single-trigger mechanism, in which the essential feature is a toothed sector pivoted to the top of the trigger blade. To this sector is attached an arm, and by means of a toothed rod, which actuates the sector, the arm may be turned to beneath either the right or left sear. The involuntary pull is not an essential operation to arrange the parts after the first discharge, and the specification does not describe any arrangement for preventing this pull discharging the second barrel.

In the accompanying illustrations, Fig. 1 is a general side view of the mechanism, and Fig. 2 is a plan of the same. Figs. 3 and 4 are illustrations of the trigger, and Figs. 5 and 6 show the rod which actuates the sector. The sector itself is shown in detail in Figs. 7 and 8.

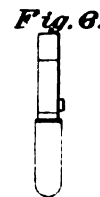
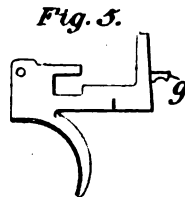
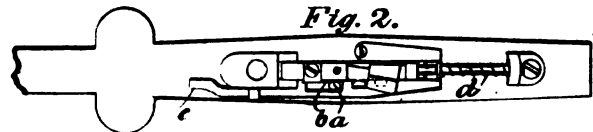
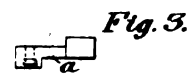
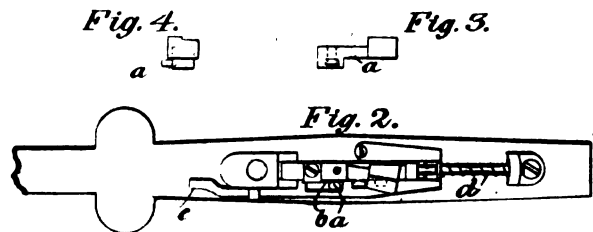
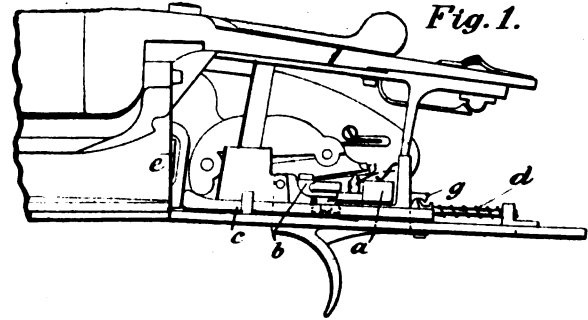
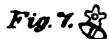
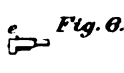
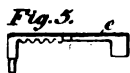
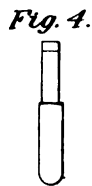
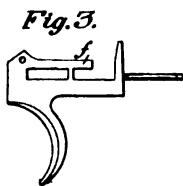
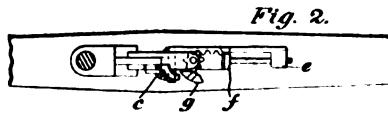
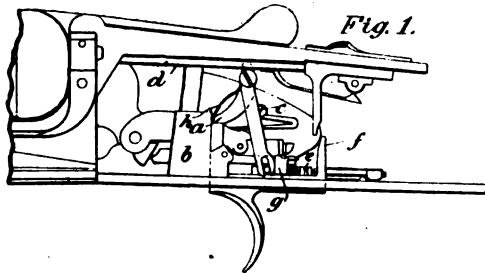
The arm *a*, shown in Fig. 1, is a projection on the breech-pin box *b*, which forms part of the trigger plate. To this arm is pivoted a lever *c*, which has one very short arm engaging with the ordinary top safety-slide mechanism *d*, and its other long arm engaging with the toothed slide *e*, shown in detail in Figs. 5 and 6. This toothed slide *e* works along the rod attached to the back of the trigger blade *f*, Fig. 3, and its teeth are made to gear with similar teeth on the sector *g*, pivoted to the top of the trigger blade.

Assuming the mechanism to be in its uncocked position, upon the gun being opened the turning of the top lever automatically pushes back the safety mechanism in the known way. In sliding back, this mechanism pulls the short arm of the lever *c* back also, and causes the long arm of the lever to pull forward the toothed slide *e*. The slide *e* in its forward travel, being made to gear with the sector *g*, turns the latter on its pivot. The turning of the sector causes an arm which is attached to it to pass beneath the right-hand sear, where it is retained against the action of a spring by the tail of a safety sear provided for that purpose. The gun is in this position ready for the discharge of the right-hand barrel first, and upon the trigger being pulled the sector *g* is raised and the barrel is discharged. The fall of the right-hand tumbler raises the tail of the safety sear and releases the sector which is then immediately caused to turn on its pivot until engaged with the left-hand sear by

the spring *h*, which acts upon the long arm of the lever *c* and pushes the slide *e* backwards. The specification does not describe any method of stopping the involuntary pull, should it occur, from discharging the second barrel. In case it should be desired to discharge the left-hand barrel first after the gun has been cocked, a

of the trigger blade. The involuntary pull immediately follows the first pull, and this second raising of the trigger removes the projection *g* from the path of the slide *e*, which again moves forward, this time to its final position. In travelling forward, however, a slot in the slide is brought into engagement with the projection on the side of the arm *a*. This causes the arm to be rotated on its pivot and brings it beneath the left hand sear.

In cocking the gun after the second discharge the slide is once more pushed back, thus allowing the arm to take up its right hand



lever is provided which is attached to the right-hand lock plate. By means of this lever the safety sear tail is removed from the path of the sector, which is then free to fly over to the left. Accepted October 7, 1899.

6,456. (March 25, 1899). W. H. Brighton, Wylde Green. This patent relates to single-trigger mechanism of that type in which the separate barrels are discharged by means of a switching arm travelling laterally between the two locks. In this mechanism the involuntary pull is a necessary operation to arrange the parts ready for the second discharge.

In the annexed illustrations Figs. 1 and 2 represent side and plan views of the mechanism. Figs. 3 and 4 illustrate the switching arm, Figs. 5 and 6 the trigger, and Figs. 7 and 8 a slide piece through which the mechanism is operated.

The switching arm *a* is pivoted to the top of the trigger blade, and the spring *b* always tends to force it beneath the right hand sear. This arm has a small projection on its side, Fig. 3, which engages with a slot in the slide *c*. This slide *c* is forced into its backward or cocked position against the action of the spring *d*, by the bolt *e* in the opening of the gun. It is retained in this position by the upright *f* which catches behind the tail of the safety sear. Upon the pulling of the trigger to discharge the right-hand barrel, the sear is raised and is thus removed from the path of upright *f*. Under the impulse of the spring *d* the slide *c* starts to move forward after this obstruction is removed, but is caught and stopped after having travelled a certain distance by the projection *g* on the back

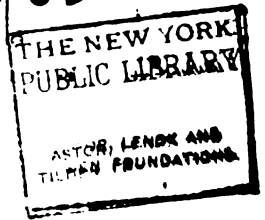
position ready to discharge that barrel. Should it be desired to discharge the left hand barrel first, an arrangement is provided by means of which the slide *c* is disengaged from the safety sear tail and takes up its midway forward position. The second pull of the trigger then discharges the left hand barrel.

Another form of mechanism is also described in this specification in which the slide *c* is dispensed with. An upright lever, the principal part of this second mechanism, pivoted near its top end to a specially shaped trigger blade, is actuated by the ordinary safety mechanism, which, in being automatically pushed back to the safe position causes the long lower arm of the lever to take up a position beneath the right hand sear. The raising of the trigger to fire the right hand barrel allows the lever to swing with a pendulum-like motion beneath the influence of a spring over towards the left. It is retained in a midway position until the involuntary pull raises the trigger a second time, when the spring again urges the lever round on its pivot, this time to its final position beneath the left hand sear. Accepted October 7, 1899.

Arms & Explosives

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CURRENT TOPICS.

Blank Cartridges at Public Entertainments.—We referred in our December issue to the accidental shooting of a native at Earl's Court, which occurred during a performance of Savage South Africa. This accident, it will be remembered, was caused by the projection of an empty revolver cartridge case from the barrel of a rifle, which was used for exploding blank ammunition, the smaller revolver cartridge case having accidentally got into the barrel of the rifle. The inquest following upon this fatal accident led to an enquiry as to the possibility of preventing such accidents in the future. It was suggested that if a bar was placed across the muzzle of the barrel, anything in the form of a projectile would be intercepted. This device was found to be impracticable, since in experiments the barrel was badly bulged, and there was an obvious danger that the muzzle would be blown off. Finally, the chief officer of the Public Control Department of the London County Council took the matter in hand, and he has consulted Mr. John Rigby, and the Chief Inspector of Explosives, regarding it. The result is that Mr. Rigby is conducting experiments in Birmingham with a view to finding a solution of the problem. The proprietors of Savage South Africa have promised to adopt any satisfactory method that is laid before them, and no doubt other public entertainers who use blank ammunition are equally open to adopt the same course. Meanwhile, the natives at Olympia are not allowed to use firearms.

Rifleite Trials.—In another portion of this issue a correspondent expresses certain views with regard to the expert

side of the Rifleite trials, but he confines his attention more to a discussion of the methods of test rather than to the figures themselves. On the latter point he is met by the difficulty that there is a large difference between the standard Cordite cartridge and the standard Rifleite cartridge, when both are fired under normal conditions, and he takes the line that with such a divergence at the start it is a matter of extreme difficulty to arrive at any very definite conclusions with regard to the comparative results which the trials have been conducted for the purpose of showing. He emphasizes this point all the more strongly, because the standard Cordite cartridges show a velocity much exceeding what would secure their acceptance were they submitted to the Government under contract for service use. The particulars of the tests are not given in sufficient detail to enable us to judge with any exactitude as to where the discrepancy has arisen. If we assume that what is called muzzle velocity is in reality observed velocity over the standard distance of 90 feet, being a mean velocity over this distance, then it is quite clear that the standard Cordite cartridges are in reality some 70 to 90 feet over and above the maximum velocity allowed by the Government, and some 40 additional feet over the Government mean. If, on the other hand, the Cordite cartridges are in reality of service standard velocity, then the Rifleite cartridges are much below, since the published figures show them at about the mean required by the Government. Any exact comparison between the two powders is, therefore, rendered a doubly difficult task, for we have to make allowance for bringing the pressures and velocities of one ammunition to the standard observed by the other. This does not, however, prevent us from observing several interesting features of the

trials with Rifeite, since they show that under a severe course of alternate heating and cooling the cartridges, whether fired hot or cold, preserve the standard velocity with an extraordinarily small amount of change. Cordite on the other hand does not show such favourable results, and it is evident that whatever were the standard Cordite velocity, the powder is susceptible to a considerable extent to variations arising from the treatment which affects the other powder so little. By this we do not mean to infer that Cordite has proved more unstable than would in the ordinary way be anticipated. The variations are such as past experience has led us to expect. The trials, therefore, show us that Rifeite has singularly triumphed where Cordite was hardly expected to make a very successful show. The effect of these variations in actual practice is somewhat difficult to arrive at by calculation, but practice tells us that Cordite gives results which are satisfactory to the shooter, though no doubt all will agree that it would be an advantage to remove the susceptibility of such changes, even if it were granted that such susceptibility does not incapacitate to any great extent the utility of the explosive. Particulars, which also appear in the report with regard to a new form of Rifeite, show that still further improvements have been effected in that explosive; and we shall await with much interest the results of its practical trial at the range. We think it necessary to take this opportunity of lodging a protest against the ridiculous over-estimation of the scope of these trials, which notices in the daily press have stimulated. The trials were not a question of Rifeite *versus* Cordite. The latter powder was merely taken as a standard of comparison for the purpose of indicating to what extent Rifeite has scored an advance upon the service explosive. The trials do not profess to be an exhaustive summary of the merits and demerits of the two powders, and did they attempt to do so they would be open to objection on the ground that they were not sufficiently independent, and therefore, authorative. The test was purely one of velocity and pressure under conditions reproducing the effect of ammunition in a hot climate. Alternate heating and cooling spreading over a considerable period with tests at intervals provides an excellent means of reproducing the required conditions, and there is little doubt that to this extent the trials have been suitably arranged and accurately carried out. Further, the tests under those conditions may be accepted as quite reliable in themselves; but to suggest that such a series of trials exhausts all the qualifications and disqualifications of an explosive suitable for military firearms is a mistake, although this mistake is one which has been committed, not by those who made the tests, but by those who have commented upon them. The tests were simultaneously carried out at the factories of the Schultze and Smokeless Companies, who are both commercially interested in cordite, and at the factory of Messrs. Eley Bros., who have no special interest in any individual powder. Every means appear to have been taken to secure accuracy in the work of testing, and we have no hesitation in accepting the figures placed before us, notwithstanding the fact that two of the companies were interested in Rifeite. It was intended that the records should be published, and this in itself provides every necessary guarantee that the trials could be repeated by anyone desirous of inquiring into their accuracy. We understand that the Smokeless Powder and Ammunition Co., Ltd., will

be happy to supply copies of the original report to anyone who addresses them at their office, 28, Gresham Street, E.C.; and this is our reason for not overloading our columns with voluminous excerpts of the individual figures.

The Late Mr. B. T. Moore.—Our readers will remember that in our last issue we recorded the death of Mr. B. T. Moore, of the Thames Ammunition Works. We have since received some interesting particulars of his life. He entered Pembroke College, Cambridge, in 1851, and graduated as B.A. in 1856, obtaining the place of eighth wrangler in the mathematical tripos of that year. Soon afterwards he was elected a foundation Fellow of the College, and he retained his fellowship for some years. After leaving college he was for some time mathematical master of the military class at Harrow, and following this he took up an appointment as professor of mathematics at the Staff College, Sandhurst. Mr. Moore left Sandhurst for the purpose of acquiring a knowledge of civil engineering, and entered the office of a prominent engineer, where he remained for three years. Following upon this period of study he was engaged in various practical branches of engineering. In 1868 he took up the Professorship of civil engineering and applied mechanics at the University College, London. Mr. Moore was the author of several works, among which is a treatise on Mensuration. This work has been much praised on account of its careful exactness and completeness of mathematical demonstration. The last twenty years of his life Mr. Moore spent in the manufacture of ammunition and electrical fuses, and the two large factories which he erected are evidence of the work he has done in this direction. In his private life Mr. Moore found his greatest pleasure in the study of astronomy, and he possessed a fine telescope and observatory. He died on November 18, 1899, at the age of 69, of heart disease.

The military authorities have decided, it is understood in deference to the Peace Conference, to abolish the manufacture of expanding bullets, and have changed the service bullet from the Mark V. to the Mark II. This change it is stated applies solely to warfare with civilised nations.

Mr. Andrew Bennett, of Erich Bank, Persley, was recently granted leave by the Aberdeen County Council to erect a new magazine for the storage of explosives at Dancing Cairns Quarry, near Aberdeen. The magazine will be capable of storing 20,000 lbs. of powder, besides fuses, &c.

Mr. W. Muirhead, who is in charge of the work of destruction connected with the old Vauxhall Bridge, was summoned at the Lambeth Police Court for storing 180 lbs. of dynamite on registered premises, in excess of the limit of 60 lbs. A penalty of £5 was accordingly imposed.

At St. Helen's Sessions the Bold Hall Estate Company were fined for storing gunpowder on unregistered premises. The Inspector stated that there were about 700 lbs. on the premises when he examined the place, although this had only been recently stocked, and he believed that the lapsing of the license was an oversight.

Captain de la Bere, in continuance of a series, delivered another of the lectures on firearms on the 22nd ult. It was entitled "Foreign Rifles," and in the course of the lecture Captain de la Bere reviewed the various arms of different nations, pointing out their points of resemblance and difference, and their advantages and disadvantages.

THE LATE MR. FREDERICK TOMS.

WHEN the year 1900 was but half-an-hour on its course, Mr. Toms, of the *Field*, breathed his last. While, as a journal, we have at times criticised certain of the published experiments and trials made by our contemporary, our admiration and regard for its chief was of the sincerest character. We have too often been favoured with a kindly reception when calling to see him on matters of mutual interest, to feel that anything could alter our respect for his unique attainments as a scientist and a mathematician. His was one of the kindest of dispositions, and this in the face of



THE LATE MR. FREDERICK TOMS.

insomnia and other troubles commonly associated with qualities the exact opposite of those which all recognised him to possess.

His extraordinarily retentive memory was manifest in many directions. At no time, however, were we more struck with it than in connection with a correspondence which appeared in the *Field*, some years ago, with regard to the effect of obstructions in barrels. Certain views were propounded by a correspondent, and an editorial footnote was added by Mr. Toms, for no one else could have written it, stating that the conclusions put forward were fallacious, and recommending the writer to look up a brilliant series of articles on the efflux

of gases under pressure, which appeared in a specified engineering publication of a certain date in the early seventies.

The most active and productive period of Mr. Toms' life was during the time when he acted as lieutenant to Mr. Walsh, the former editor of the *Field*. At a time when gun science was a medley of crude notions, these two, Mr. Walsh, as the guiding genius of practical turn of mind, and Mr. Toms as the mathematical student who turned the record of practical trials into consistent records and comparative results, worked together and evolved order when chaos had reigned supreme. These magnificent efforts, usually recorded in the *Field* over the unpretentious signature "W.—T.," made the reputation of that paper, and firmly established it as the leading authority of the day on all matters connected with shooting.

As it seemed unlikely that a portrait of Mr. Toms would be published unless we assumed that duty ourselves, we communicated with a member of the family, with the result that the splendid likeness here shown was forthcoming. It will serve as a permanent memento among gunmakers of one who did much to advance the dignity of their calling, and who, by his unselfish study of many intricate problems, showed the way to developments which have placed the gun trade of this country in its recognised pre-eminent position. All honour is due to one who has performed such a rôle, not from motives of gain, but inspired by the love of science for its own sake.

RIFLEITE TRIALS.

FROM A CORRESPONDENT.

THE recently published tests upon the well-known powder Rifleite have a certain amount of interest in demonstrating the fallacies which have attributed high pressures and susceptibility under climatic influence, as characteristics of insuperable difficulty. The question in one's mind is whether these fears had not long passed away and Rifleite had grown out of its infantile complaints into a very healthy specimen of a commercial and staple article.

This view seems to have been shared by others, who at once looked upon these trials as competitive between Cordite and Rifleite, and in consequence many allusions in the press gave Rifleite an easy victory—hands down.

"These trials show indisputably how injudicious it is to rely upon one test," so reads the report. In the light of press criticisms, I will go further and say it is injudicious for anyone to comment upon results without considering the *data* and thoroughly comprehending the position of the case before passing sentence.

It is the *data* which are not given which cause me to treat the subject with careful consideration. The first thing in a report of ballistics one looks at is the velocity, and here I find the muzzle velocities, relics of bygone days, ruling the roost in a most abnormal way. No *data* are given of the additions, or formulæ to enable one to gather how much below the minimum some of the Rifleite is, nor how much above the maximum the Cordite is aspiring to reach. The reader is left to assume that the reading of the observed distance might be 90 feet from the muzzle, and that wire screens or discs were used according to the views at each station. At least we must hope that the swinging plate was not used.

The Cordite charges seem to have been weighed with generosity, and it seems a pity the two standards, Rifleite and Cordite, did not both start from scratch instead of handicapping the Cordite. An observed velocity of 1,960 is a very good mean to aim at, and this is what both the standards should have been loaded to, and every precaution as to stabbing, pull on bullet, lubricating, the proper size of disc, etc., doubtless observed by the loading firm, should have been notified, as well as the cap used.

It is from no wish to be hypercritical I mention these points; the report is of experts' trials, no doubt published for other experts to read, and thus it is that these omissions are undesirable.

The pressures are interesting, and the oiled case system is as accurate as any, but it certainly shows that the Government have done well to standardise the base copper system in preference to the side crushers. I think it would have been better to have used static 13-ton coppers instead of the 15-ton, as the former are in more general use, and the comparative results would have been more clear. With an observed velocity of 1,960 f.s., one generally expects a cordite pressure of 13.85 tons; this is a good average mean for all the year.

I am afraid I cannot agree as to the wisdom of confusing "the trade" mind any further with doubts and theories as to "side" and "base" crusher systems. By the trade I mean the gunmakers, and cartridge-filling firms on a small scale. There is, undoubtedly, a generally recognised method of taking pressures of rifle cartridges, and the "Ordnance Factory" standard gun with base pressures is uniformly adopted in this country by every large firm. The military cartridge trade is not an extensive one—you can count the firms of manufacturers on one hand. The powder trade is not large either, but it is double that of the cartridge makers. These firms must and do use the Government type of pressure gun; otherwise they can obtain no comparative results. Nearly all the the military cartridge trade is for the Government. There are only two firms who do much foreign military work, and who, at the same time, sell small quantities in large varieties. There is no opening for more firms, and we fear that any considerable extension of the use of side pressure guns is not to be anticipated.

With regard to the size of coppers and static compression, it would be well to follow the lines of the Government pattern as used by all the large firms. It is not an easy task to make a copper crusher. It should be made from virgin copper, turned, drilled, annealed, and milled on face to a length of .500 of an inch, then statically compressed for one minute, exactly, with a quick action for throwing the static weight on and off without any "hammer" action on the copper. If the copper falls within the specified dimensions it passes; if 75 per cent. are found to do this one is fortunate. All these matters have, however, been exhaustively settled by the military authorities, and there would be no harm in taking their standards as a starting point and basis for the actual trials.

I am at all times pleased to testify to the quality of Rifleite, but this time I will not enter into the figures of the trials from a comparative sense, as the two standards of the Rifleite and Cordite cartridges were not equal at the start, and it is risky work to judge *ad ratio*. In all questions of proof and ballistics the conditions for comparative results must be absolutely correct, and a discrepancy of from 70 to 100 feet per second excessive velocity between the two powders un-

doubtedly due to error in charging, may spoil the whole series. Rifleite is pre-eminently the cool powder, and its absence of flame at the muzzle gives it a distinct advantage over the Brock-benefit manifestations of Cordite.

=====

MR. W. H. HUGHES,
CHAIRMAN OF THE GUNMAKERS' UNION.

At the last Annual General Meeting of the Birmingham and Provincial Gunmakers' Union, the Society reached its third complete year of existence, and Mr. W. H. Hughes, the Chairman of that body, offered to make way for someone else to occupy the position; but his services were so highly



MR. W. H. HUGHES.

appreciated that no one would hear of his withdrawal, and he was in consequence unanimously re-elected. After three years of existence the Birmingham Union has achieved a recognized position as a representative organization in the gun trade, and for this reason we thought it would be interesting to communicate with Mr. Hughes with the object of reviewing the developments which have occurred up to date. Mr. Hughes very kindly consented to place the desired particulars at our disposal, and in order to have an uninterrupted chat we journeyed down to Barnt Green, where he kindly put us up over the week end. So pleasant were our recollections of his picturesque residence, in the heart of Worcestershire, and overlooking some 40 miles of country, that we brought away with us the portrait here reproduced as an enduring memento of a pleasant little trip.

Curiously enough the writer can speak with some authority as to the inception of the Birmingham Gunmakers' Union.

Some years ago, when the Pistols Bill was agitating the minds of the gun trade, the writer called upon Mr. Hughes, in order to have a Sunday afternoon chat regarding the most suitable measures which should be taken by the trade in regard to this unfortunate attempt at restrictive legislation. Mr. Hughes expressed his keen regret that there was no association ready organized to tackle the problem. The London Armourers' Club was at that time a small body representing a very limited class of the trade, and there was no organization which could act with authority on behalf of gunmakers as a whole.

About a year or 18 months later Mr. Hughes's drawing-room was again requisitioned for discussing trade questions. In the interval the London Armourers' Club had expanded into the Gunmakers' Association, and it was anxious to extend its scope by embodying a large contingent from Birmingham. There was one difficulty which could not be met to the satisfaction of Mr. Hughes. In his opinion the interests of the Birmingham trade were far too important to be dealt with by an Association having its headquarters in London, and it did not appear to him, at any rate at that time, that a local branch would get over the difficulty. Very shortly after this conversation, which took place early in the year 1896, the matter was definitely raised at the Annual Meeting of the Birmingham gun trade. It was proposed by Mr. S. B. Allport, the Proof Master, that Mr. Hughes be asked to call a meeting of the trade for the purpose of forming a Gunmakers' Union. This meeting was held on July 28, 1896, Mr. Hughes and Mr. Enos James having devoted their united energies to the work. The alternative policies of forming a separate Association on the one hand, and on the other of joining forces with the London Association were discussed at length, and it was finally resolved that the Birmingham and Provincial Gunmakers' Union should be formed as a separate and entirely independent organization. For the time being it looked as though the London and Birmingham branches of the trade had drifted further apart by the taking of this step, and there is no doubt that, to some extent, this is what happened. On the other hand, no persons ever agree so well as those who agree to differ, and we honestly believe that there is a better feeling between these two sections of the trade now that they meet through their respective Associations in a position of mutual equality.

The first piece of work which fell to the lot of the Birmingham Union was to deal with the unfortunate attack by Sir Ralph Payne-Gallway on Birmingham-made guns, which he sneered at in a scurrilous manner, at the same time showing how little he knew of the subject about which he professed to inform others. The Birmingham Union was strongly supported in its action, and the incident closed the ranks and bound the organization into a homogeneous body. Of course, it was very unfortunate that the first direction in which the Birmingham Association should be called upon to exert its influence should be to protect its reputation, against comparisons, publicly made to the detriment of Birmingham guns as compared with London work. The Persian Gulf prohibition was the next incident which brought the Birmingham Union into prominence. The Birmingham trade had a hard tussle but, unfortunately, they were not able to score any very definite successes against the imperturbable attitude of the Foreign Office.

The relative positions of the London Association and the

Birmingham Union were such as to place the two sections in a position to do little acts of mutual courtesy, and so gradually build up mutual good-feeling such as had not hitherto been noticeable, since there had been no official bodies to give expression to such a policy. In the year 1898 Mr. Hughes was invited by the London Association to attend the Annual Dinner. As the invitation was in his official character as representing the Birmingham Union, Mr. Hughes laid the matter before his Executive, and a very cordial resolution was passed asking Mr. Hughes to accept the London Gunmakers' invitation, as they thought it in every way desirable that the two bodies should act together as much as possible. In the course of the speeches at the Dinner, which took place at the Hotel Cecil on April 29, 1898, Mr. Hughes was cordially welcomed by Mr. Thorn, speaking on behalf of the London Association, and Mr. Hughes's reply was equally cordial, and went to show that it was only in details where the policy of the two Associations might be found to differ. This was an important move in the right direction, and opened the way



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to mutual action in other matters where such a course might appear desirable.

The recent Order under the Indian Arms Act brought the two Associations into contact, but here it seemed that the essential distinction between the interests of those firms who deal with individual customers and those whose business is mainly wholesale was strongly accentuated. It ultimately became necessary for the two Associations to act independently in this matter, but curiously enough this was effected without any ill-feeling whatever. The incident is, therefore, unique up to date, in so far that it shows that the two sections of the trade can differ on a point of policy without any general disagreement following.

Among the smaller matters which have been taken up by the Birmingham Union is the giving of expert opinions by the Executive for the benefit of members. No precise lines have been defined, with the result that the Association may advise on almost any point that arises. For instance, one of the members of the Union was threatened with proceedings for infringing a recently registered trade-mark, consisting of a star. Now, this member had been in the habit of using the

star for years before exclusive property therein was claimed elsewhere, and he laid his difficulty before the Committee. The other members had had similar experience of the general use of the star as a commonly employed marking of guns. The Executive thereupon communicated with the person who sought to uphold the exclusive right to use the star, and informed him that three of their number would be prepared to mark guns in this manner, and place them at his disposal, should he desire to back his claims in a court of law, the Union having decided to defend the case should proceedings arise. The threats at once ceased, and the Union had the satisfaction of saving one of its members from an unpleasant and possibly expensive action at law.

Perhaps the most important line of policy which has been consistently carried out by the Birmingham Union is that of keeping a sharp eye on all matters directly or indirectly affecting the Birmingham Proof House. As an executive body with precisely defined limits of action, the Proof House is only too likely to follow a routine existence. On the other hand, the Gunmakers' Union, while having a considerable representation of Proof House Guardians among its members, is at the same time committed to a more active policy. The result of this is that many important developments which ultimately come before the Proof House Guardians are threshed out by the Gunmakers' Union, and the close harmony which exists between the two organisations has resulted in many valuable reforms being adopted which, without the aid afforded by the Gunmakers' Union, might not have attained the position of prominent trade questions. The advanced policy which is foreshadowed in the recently published draft Proof Act may, in several directions, be traced to the inspiration of the Birmingham Union. Mr. Allport was one of the keenest advocates of a better technical education among gunmakers, and yet it was not until his views had been adopted by the Gunmakers' Union that the idea gained definite shape. The steps so far taken have been somewhat hampered for want of funds, but nevertheless the result has been to educate the trade to appreciate the necessity of such technical training. The draft Proof Act, which was submitted to the trade on the 25th ult., was unanimously approved, and as its provisions gave powers for the spending of the Proof House money on technical education, it is clear how important it was to prove to the trade, in the first place, that such expenditure would conduce to a desirable end.

In the general sketch which we have given of the leading questions which have exercised the minds of the Birmingham Union, it will be seen that a consistent policy of development has been adopted throughout. In these matters Mr. Hughes, both by inclination and by virtue of his official position, has taken a leading part, and the appreciation of the members was appropriately shown last November, when they insisted on his continuing at the helm. It would, of course, be wrong to give the impression that Mr. Hughes alone is responsible for the good work which the Birmingham Union has done, particularly as Mr. Hughes would be the very last to advocate the policy of a one-man show for a trade organisation. Mr. T. N. Tait has been identified with the Union from its very start, while Mr. J. C. Scott, as Honorary Treasurer, is largely responsible for the careful expenditure of the funds, or rather the careful avoidance of expenditure except where there is a definite return. £117 is not a bad record for funds carried forward after three years' existence. There is, however,

another gentleman to whom the credit for a small expenditure and efficient management is due. The Honorary Secretary, Mr. E. J. U. Turner, performs services for the Union which must entail a large amount of work, and it is the absence of secretarial expenses and honorarium which has saved the Union from the necessity of taking its hat off to its banker when it meets him in the street.

It is a matter of some interest in an account which deals so much with the personality of the Chairman of the Gunmakers' Union, to note how real are his interests as a member of the trade. Hughes' guns may not be extensively advertised, but on the other hand large numbers are in use in the country, while in addition the name of Hughes is well-known by export merchants who do a trade in guns and rifles. The firm originated with Mr. Robert Hughes, who was born in the year 1828. He was apprenticed to Joseph Smith, of Loveday Street, and in due course started business for himself in the year 1852. On the death of Mr. Robert Hughes, the three sons took over the business, but Robert, the eldest, retired a short time later, and Mr. W. H. Hughes, and his brother, Mr. A. V. Hughes, have carried on the business, with great success, ever since. Mr. W. H. Hughes has always concerned himself with the business department of the firm, while his brother has taken over the practical side. Apart from the foreign markets, the firm does a large trade among country gunmakers in England, Ireland and Wales.

Returning to the Gunmakers' Union, we may indicate that, while the future opens up many prospects of developments of benefit to the trade, it is extremely difficult to give any indication of what these developments will be. The Union must of necessity deal with things that arise, and having done the work that lies within view, it should be satisfied. There is no particular development to which all eyes are turned, and upon which the persistent efforts of the Association can be directed. The general aim of benefiting the trade is vague in itself. The most clearly defined need of the present moment is that of technical education. A larger question is concerned with the problem of bringing back to Birmingham a share of the world's big contracts, of which at one time it had something approaching a monopoly. At present individual enterprise does not appear able to cope with such a big question, but possibly the future may offer means of providing a united organisation so well developed that many of the big jobs which now go elsewhere may gravitate as a matter of course to the Midland metropolis. There is hardly a single article of world-wide use in the gun line, which is made in Birmingham. Small-bore gallery and hunting repeaters, which are a type of the class of weapon we refer to, come from America, and while there are numerous openings for the sale of types of arms not now made in large quantities, Birmingham has not yet shown its capacity to fill that demand. Possibly the future efforts of the Gunmakers' Union will at some time or another be devoted to the solution of this problem. In the meantime a good start has been made, and the good comradeship which has uniformly marked its internal history up to date is an indication that the main source of strength, cordial union, is theirs.

A COLLIER was summoned and fined at Prescot, Lancashire, for unramming explosives from bore-holes. The bore-holes in question had misfired, and were unrammed by the collier, notwithstanding a warning from the shot-firer not to do so.

INCIDENTAL JOTTINGS.

SHARP-SHOOTERS.

There seems every chance that the valuable and much-needed force of "Sharpshooters," now being organized, will be both strong numerically and in shooting. There is no doubt that, in comparing the regular and auxiliary forces, the larger percentage of volunteers are able to give points in the technical and practical art of rifle-shooting; and they should serve a useful purpose in sniping "snipers." The N. R. A. men may do much to instil respect among the enemy for British skill at the Boer's own game. Among those who are off to the front, I hear, is Mr. T. A. Lockie, of the English Twenty, who is going to uphold his country in this direction. He takes with him the best wishes of all who know him. May he put on a "bull's-eye" at every shot, and later on try his hand at the "running man"! If we don't see him at Bisley this year we shall look for him next, together with many of his comrades, safe and unscathed after their baptism of fire.

SHARP PRACTICE.

It seems a little doubtful, after all, whether the War Office will consent to employ the Volunteer services properly. They are "Saturday-nighters," and consequently don't count. They will be put, in all probability, to guard lines of communication, where they won't get the chance of a shot, whilst the regular Tommy Atkins will be sent to the front to make his '001 per cent. of hits. I don't wish to join in the chorus of "cussing" the War Office up and down, but I consider their treatment of the Volunteers is ungenerous and unworthy of them. The public are getting tired of their fastidiousness, which can only be actuated by motives of jealousy and suspicious fears that it may show up the regulars in an unfavourable light. Pipe-clay and padding won't win battles. It requires the pluck of Tommy Atkins, plus a little more brain in the art of utilizing cover, and taking careful aim when shooting. The leading lights of the War Office must increase their own brilliance, and not "douse the glim" of the others, to make their feeble lights more noticeable. England is an eminently Christian country, and this is one of its most popular forms of practising its professions.

THE INTELLIGENCE DEPARTMENT.

Whilst on the subject of the War Office, I call to mind the statue of the immortal Sidney Herbert, who stands with his back to the front door of that establishment in a meditative attitude, and for all the world looks as though he were thinking, as all of us do, what manner of an Intelligence Department have we got? It is essential that the workings of this department should be secret, and that is why we are wanting to know all about it. Yet, at the same time, we do know that they don't encourage much effort on behalf of any outsiders to enlighten them. They ought to hail information *re* armaments of all nations with pleasure. I wonder if ever they knew how many Englishmen are concerned in the manufacture of war munitions on the Continent who would always be willing to help their country without injuring their employers? I don't imply that these men should be unofficial detectives, but the fact remains that the various trade firms in England get to hear all that is going on in every country, so why should not the Intelligence De-

partment? Of course, a great deal is unreliable, but still the true facts are generally discernible. The Government might, if it liked, have for its own information a periodic list of all war material carried by any British ship from foreign or British shores. This would assist more than wading through the incomplete export returns published. It seems as though their exclusiveness was barring the very information they want; and thus they cut off their nose to spite their face!

THE DAILY WAIL.

Most of us like a fair smattering of horrors and misery worked up into our daily papers, just to feel that we are not too perfect, and that the delicate organisation of our moral courage is being somewhat strained. It is the pinch of salt that leavens our daily meals when larger doses would be nauseating. If our guns are so terribly out-of-date—having told this story and having no suggestions to offer as to how to remedy it—this should suffice, and we might then have a rest from these peevish bickerings, in which attempts are made by sensational journalists to pose as military experts. The impression the ordinary reader gets from these articles is that the French army artillery is the best in the world. Then the Schneider-Canet is described as the French standard gun. It may surprise many to know that the Le Creusot firm is a private concern, like Armstrong or Vickers over here, and that the French army guns are principally built at their own gun factories at Bourges and Puteaux, and the naval guns at Bielle. The shareholders of Messrs. Schneider must be deeply grateful for the free puffs they have had, and it is a pity that the United Ordnance Company, which Mr. Hooley tried to float, which included the Schneider-Canet patents for this country, were so ill-appreciated at the time that the concern fell through.

WHAT IS A QUICK-FIRING GUN?

QUICK-FIRING guns are a class of their own. It is not a generic term for any gun which can fire a number of rounds in a short space of time. The first introduced into the service were the Nordenfolt and Hotchkiss 3 and 6 pounder guns, and shortly afterwards Armstrong designed the 4.7 and 6-inch, and later the 12-pounder for 8 and 12-cwt. guns, and the Woolwich 4-inch gun. This is the total list of Q.F. guns in the service, and covers every purpose for which a quick-firing gun would be required. The main points of a Q.F. gun are as follow:—

1. Special quick-opening and closing breech-action, with firing and extraction.
2. Greater length of bore, averaging 40 to 45 calibres.
3. No obturator, as the brass cartridge case is used.
4. Special cradle and recoil-checking mountings for larger calibres.

Q.F. guns were intended for naval use principally, but are also used in forts as guns of position. The essential idea of the Q.F. gun is a rigidly fixed base, such that the firing cannot throw the gun much off the sighting, thus permitting the firing of a large number of rounds in a minute.

Q.F. AS FIELD GUNS.

DID it ever occur, I wonder, to the lay mind to enquire into the value of a Q.F. gun in the field? Let us investigate this interesting question. To begin with, I agree that the greater length of bore is desirable in field guns, but I don't think "quick-firing" would be of any great value.

Take first the weight of the 12 por. ammunition. A case of 10 cartridges and the necessary shell would weigh over 1 cwt. Suppose a rate of fire of 15 or 20 shots per minute, and then consider the weight of transport, how the movements of an army would be hampered by such cumbersome munitions. When speaking of 4.7 guns, such as are now in the field, it should be realised that the weight of these would be about 60 lbs. per round, not including packing cases. On board ship or in a fort the ammunition is all to hand, and has not to be carried miles in wagons over the veldt.

BUT suppose there was no extra difficulty **YOU MUST AIM BEFORE YOU SHOOT.** In transport, the next question is the important determination of the rate of firing. If the newspapers which have depreciated our guns had attacked the carriages and mountings, there would have been more cause for complaint. Even for garrison purposes there should be means of transporting guns across country, but as there are none for Q.F. guns (except the 12 por. 8 cwt. gun), other contrivances have to be thought of. The 4.7 guns now being sent out are rigged up, by means of adapters, on to 6 in. howitzer carriages. The same has been done for the 12 por. 12 cwt. guns—and this has been temporarily settled for the present. Unless you actually fix your gun mounting to some rigid foundation, the recoil will move the gun, requiring a fresh sighting. You may have a long recoil buffer and a patent trail with automatic spade action, but you can't help the guns shifting at each shot. So you lay your gun with telescopic sights, whilst the range is assessed, and the fuse set, and the time thus occupied confines you to 5 or 6 rounds per minute. Even a Q.F. gun will not aim automatically, and thus its quick-firing capabilities are only theoretical.

These are also a separate class of gun, and until quite recently have been used only with small-arm ammunition. The present **AUTOMATIC MACHINE GUNS.** guns in use in South Africa are the

Maxim .303 calibre	...	...	600 per minute
Colt .303	"	"	400 "
Maxim 37 mm. calibre	...	...	300 "

These have superseded the Gatling, Nordenfelt and Gardner guns, which were machine guns, but not automatic. The .303 Maxim is too well-known to need any description, and the Colt has been freely advertised of late, and is now undergoing its trials. It is a lighter gun than the Maxim, and when used with Lord Dundonald's light galloping carriage should have a use in the field; but we confess a leaning to the well-tryed and trusted Maxim, so long as the ammunition is high-class. The new 37 m.m. has given us a bitter taste of its powers at Spion Kop, where it poured out its 1-pounder shell at the rate of 300 per minute. Fortunately there were only 25 rounds in a belt, so it gives a few seconds interval till the next belt is fixed. I trust we may soon have our guns out there, with plenty of ammunition, for they are very voracious. The limbers on the field carriages for these guns carry 12 belts, and these could be fired in under two minutes; it is essentially a "now or never" emergency weapon.

A correspondent sends me a cutting from **DE ROUGEMONT ECLIPSED.** the *Pall Mall Gazette* of a letter from Mr. Gustave Roos, telling how, in an interview with one of the Lud-Löewe Directors from Berlin, he was told that that firm had sent 30 million rounds of

Mauser ammunition and 60,000 rifles to Pretoria *packed in loco boilers and tenders.* My friend has worked out the particulars of the weight, which are, cartridges, 980 tons and cubical capacity of about 250,000 feet; the rifles would weigh about 322 tons, with a cubical capacity of about 26,700 feet. Now find the number of locos sent from Germany, or if you like, all there are in South Africa. Puzzle: find how this amount can be concealed in them. If the gentleman round the corner who writes "Current Topics" wishes to break out into poetry, this might inspire him, and I suggest that words for this loco sensation, such as "puffing" and "stuffing," "Roos" and "—" seem to be rhythmic and suitable specimens.

CYCLOPS.

NOTES.

MESSRS. ELEY BROS., LTD.—The balance-sheet of Messrs. Eley Bros., Ltd., shows the satisfactory result of £39,079 profit for the year ending December 31, 1899, this representing a small increase on the previous year's results. The distribution, including the interim dividend already paid, makes a total of 30s. per share, or 15 per cent., this absorbing £37,500, the amount carried forward being £16,966, representing an increase of about £1,600 over the amount brought into the present accounts from the previous year.

TRANSVAAL DYNAMITE MONOPOLY.—The Administrative Council of the Zuid Afrikaansche Fabrieken voor Ontplozbare Stoffen, which is perhaps better known under its commoner title, the Transvaal Dynamite Monopoly, has announced the issue of 450,000 new shares, present shareholders having preferential right to subscribe. The proceeds of this issue are to be used to equalize the obligations of the company, but in the first instance bonds amounting to 5,000,000 f., which fell due on the 31st ult., are to be redeemed. The new shares, which were issued at £1 each at par, are to enjoy the same privileges as those now existing, and will participate in the next dividend, provided they are paid up at the time of declaration of the dividend.

NAVAL SHOOTING.—The results of last year's prize firing on the Mediterranean Station have just been issued, and it is interesting to note that the most remarkable item in the shooting was the percentage obtained by the *Scylla*. The gunners of this vessel scored 80 per cent. of hits with 4.7 in. Q.F. guns, of which we are hearing so much in connection with the war in South Africa, and out of total of 70 shots fired no fewer than 56 were hits.

THE NATIONAL RIFLE ASSOCIATION.—The National Rifle Association holds its annual winter meeting at the Royal United Service Institute on February 28th, and it is expected that the Duke of Cambridge will take the chair. Sir Henry Fletcher, the Chairman of the Association, is a very energetic worker in connection with the movement for the establishment of rifle clubs. He has recently addressed a letter to many influential people throughout the country, including members of both Houses of Parliament, the gist of which is a suggestion that, for the purpose of enabling every able-bodied man to become efficient as a rifle shot, the local

authorities in the various counties should have statutory powers given them either to raise money on loan, or to take sums annually from the rates to provide ranges, arms, ammunition, etc., as may be necessary.

H. J. HUSSEY, LTD.—A company was registered on the 22nd ult., entitled H. J. Hussey, Limited, to acquire and carry on business as gunmakers and dealers in guns, rifles, pistols, cartridges, etc. The nominal capital of the company is £7,000, divided into 700 shares of £10 each, and the registered offices are at 81, New Bond Street, W. The first directors are Mr. A. S. Wilson and Mr. H. J. Hussey. The last-named gentleman will be remembered as being connected, until recently, with the firm of Lang and Hussey, of New Bond Street. The interest of the well-known family of Wilson in the new business is shown by the following list of signatories:—A. S. Wilson, Hull; H. J. Hussey, London; H. Harris, London; C. Wilson, Tranby Croft, Hull; F. Dalton, Hull; P. Lambert, Hull; and W. Yeames, Hull.

DYNAMITE SHELLS.—Mr. T. R. R. Ashton, the well-known Australian inventor, has recently been interviewed by several representatives of different daily papers regarding a new invention of his, consisting of a rifled shell, carrying a bursting charge of dynamite or blasting gelatine, adapted to be fired from a smooth-bore gun. In one of these interviews, we notice that Mr. Ashton expresses great surprise as to how the Government, which declined to consider the invention on the ground that it was unsuitable for the services, came by the knowledge that the shell was unsuitable without having tested it. Possibly the Government has decided to bar nitroglycerine for bursting charges, and so take advantage of the experience of more open-minded Powers, who have spent money in arriving at the same decision.

GERMAN ARTILLERISTS.—The German Artillery Testing Committee, says the *Berlin Post*, has decided that in future a technical inspector shall be appointed to take charge of the various costly and delicate instruments which are used in connection with ballistic observations and measurements in ordnance. These were formerly in the charge of artillery non-commissioned officers, but the nature of the apparatus demanded that a man of scientific knowledge should be appointed to look after them. The standard of knowledge which it is necessary that a member of the Committee shall possess is also to be raised, and with this object in view a certain number of candidates will every year be sent to one of the big German gun factories for a period of 70 days to go through a course of gunmaking and testing.

CORDITE IN THE THAMES.—An unfortunate accident occurred recently to a lighter carrying a cargo of 472 cases of Cordite. This Cordite was part of the large order which the New Explosives Co., Ltd., is under contract to execute as quickly as possible for the Government. The Cordite was dispatched by train from Stowmarket to Felixstowe, where it was loaded on to a coasting vessel. It was brought round to the mouth of the river just below Gravesend by this vessel, and was there taken off by a registered explosives lighter, which was painted red and carried a red flag. On the way to Woolwich Arsenal the lighter was run into astern by a steam collier. The barge was so badly damaged that it began to

fill, and shortly afterwards sank near the shore. A number of the cases of Cordite broke loose, and many of them have since been rescued from a life on the ocean wave. The cases were all waterproof, and the contents are not likely to suffer by the immersion.

A NEW FIELD GUN.—Lieut. Anderson, of Woolwich Arsenal, has recently made an important improvement in small-bore ordnance. This improvement enables the 12-pounder quick-firing garrison gun to be used as a field gun. It is reported to have been tried at the Government ranges, and has been found to have an effective range as a field gun of over 10,000 yards. It is further reported that a number of them are to be sent to South Africa mounted on R.M.L. 25-pounder gun-carriages.

SPRINGFIELD ARMOURY RETURNS.—The returns of the expenditure of the well-known Springfield Armoury in U.S.A. for the year ending June 30th last have recently been made public. It is interesting to note that the total amount spent during the year was 2,159,617 dollars. The output of the armoury included 5,000 magazine carbines of the 1898 model; 2,060 magazine rifles 1896 model; and 98,778 magazine rifles 1898 model. Other portions of the product were numerous parts of magazine rifles and carbines of .300 calibre and parts of the .45 Springfield rifles. Among many other things the repair work included 2,409 magazine .300 carbines, 22,070 magazine .300 rifles, 2,508 Mauser 7 m.m. rifles, 39 Springfield .45 rifles, 388 Colt's .38 revolvers and 6,970 Colt's .45 revolvers.

REVOLVER AMMUNITION.—The War Office recently issued a notice to the effect that all Webley Revolver cartridges made between February 5 and April 18 of last year, and marked B on wrappers and labels, having shown serious defects, were to be at once returned, to be replaced by cartridges of other manufacture. This notice was published in the *Morning Post* on the 10th ult., and on the 30th a letter appeared in the same paper from the secretary of the Webley and Scott Revolver and Arms Co., Ltd., in which he pointed out that this paragraph, as published, was likely to damage the company's reputation, and he would like it to be understood that the Company only supply revolvers to the Government. The ammunition is either made at Woolwich or contracted for by the Government with private makers.

THE VOLUNTEER Q. F. BATTERY.—Some information might be interesting at this particular time of the Vickers-Maxim quick-firing field battery, which has been supplied to the Corps of Imperial Volunteers. It is composed of four guns, carriages, and limbers, together with ammunition wagons. The guns are so mounted that they recoil independently of the carriage, and their calibre is 75 mm., or a little under three inches. The breech mechanism is of the screw type, and is operated by a hand lever, one movement of which opens and closes the breech, as the case may be. These guns are exactly similar to those which formed part of the Nile gunboats armament used by Kitchener during the Soudan campaign. Their mountings are, of course different, the boat guns having special naval mounts, while the Volunteers' guns are on quick-firing field carriages. Three types of projectiles are used with these guns, shrapnel, common

shell, and case shot. The shrapnel contains about 160 lead bullets, and weighs 12½ lbs. It is fitted with a time and percussion fuse, which may be timed for an extreme range of 5,000 yards. The common shell also weighs 12½ lbs., and contains about 10 ozs. of bursting charge, which is exploded by a percussion fuse contained in the point of the shell. The case shot is efficient up to 300 or 400 yards, and contains about 355 lead bullets, which, together with the shell, weigh 15 lbs. The muzzle velocity of the projectiles is 1,575 feet per second, and the guns are sighted to 5,000 yards. Some 16 rounds per minute can be fired from each gun. From the battery of four, therefore, 32 rounds could be fired in 30 seconds. If these rounds consisted of case shot, then the 32 shots would be equal to 11,360 bullets from the ordinary small-arm.

THE U.S. NAVY RIFLE.—The United States Ordnance authorities have decided to discard the Lee rifle, which, up to the present time, has been used by the U.S. navy, in favour of the army rifle, the Krag-Jorgensen. The calibre of the Lee rifle is .236, and that of the Krag-Jorgensen .300. The complications arising from the supply of rifle ammunition of different types for the two branches of the service have evidently proved greater than was at first anticipated. The distribution of an arm of uniform calibre will obviate this difficulty, and it is principally for this reason that the change is taking place. The Lee rifle will be gradually displaced by the larger bore weapon, except that all new ships will be immediately armed with it.

GALE'S ANNUAL.—We have taken the liberty of giving a fresh title to the Shooters' Note and Reference Book which has been compiled and published by Mr. A. H. Gale, Honorary Secretary of the Middlesex Gun Club, and presiding genius of the London premises of Messrs. Westley Richards and Co., Ltd. Mr. Gale is a man of great industry and originality. When the question of reprinting the rules of the Middlesex Gun Club came up for consideration, he was faced by the difficulty of getting the members of the Club to take due interest in their book of rules. Mr. Gale, therefore, determined to make the rules so interesting, that the members would have no excuse for leaving them at home. He has consequently added a number of interesting particulars regarding the work of the Club. He has also included the official rules of the I.B.S.A. which are observed by the Club for their shooting competitions. Next follows a list of the chief winners of the leading events at the I.B.S.A. Championship Meetings. The current annual report and balance sheet of the Club comes next, and this, in its turn, is succeeded by a list of the Club members. Live pigeon shooting records and Bisley records are the next two items, following which is a series of the best individual performances that have been made at the Middlesex Club. After these particulars we have a number of statistics of loads and sizes of shot, which are very useful to every class of keen shooting men. Scoring sheets, game registers, and memoranda bring the business portion of the book to a close; but this does not finish it, for Monte Christo has produced a number of spirited sketches exemplifying the etiquette of shooting, and showing the methods by which it is possible for a man to secure a complete monopoly of the ground within a circle represented by the danger zone of his gun. There have been many caricatures

of sportsmen who have no claim to the title, but the twenty or so sketches reproduced in Gale's Annual point a number of morals more clearly than any of these which have come to our notice. This sketch of the book suggests a volume of alarming proportion, but in reality it is of the waistcoat-pocket order, measuring no more than five inches by three inches. Anyone who sends Mr. Gale one shilling, plus a penny for postage, will receive a copy of this interesting little production.

THE .303 CARTRIDGE CASE.

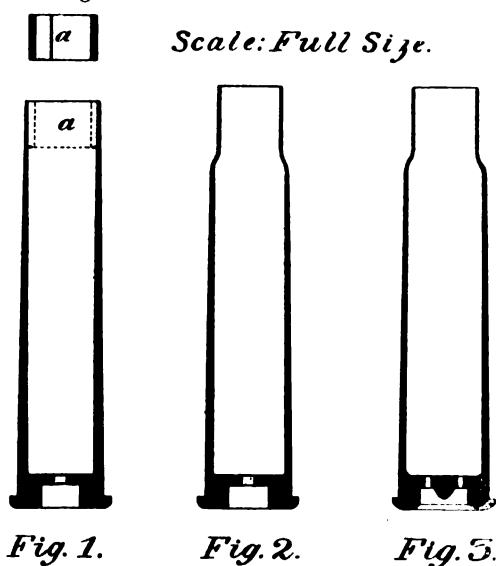
THE original designs of the .303 cartridge were produced in Switzerland by Col. Rubin. The French, German, Belgian, and Portuguese governments having already adopted the new small bore ammunition with compound bullet. John Bull, in 1888, decided upon his pattern. In the last issue we travelled over the ground relating to the bullet, so we will now consider the case.

The first suggestion was for a rimless case and a straight taper body, and specimens of these were submitted for trial, with the result that the taper case was to be retried with a rim head (Fig. 1.) The bullet was held in position by a split ring (a), which was first passed over the bullet and then pressed into the case. This ring bedded against a sharp shoulder or seating in the chamber of the rifle, thus holding it back when the bullet was propelled. The object of this device was to enable the charge, which consisted of a compressed black powder pellet of the largest possible diameter, to be put into the case without any subsequent operation beyond bulleting, the ring being merely an adapter to hold the bullet in the neck of the case. This excellent but simple idea had its disadvantages by reason of the ring getting loose when the bullet had left; and in some cases broken fragments got jammed into the barrel. The next step was, therefore, that of necking the case itself.

This was the opportunity for the practical artillerist to design a shoulder on mechanical and common sense lines, and could one have foretold one fraction of the trouble this shoulder was going to cause, it would have received greater consideration, and one would have been designed more of the champagne than the beer bottle type. The only point which was considered in the first design was to permit of as large a powder pellet as possible, and to provide a form of bottle neck which would not break the edge of the pellet. This is why we have to-day that ugly, unmechanical looking shoulder.

After the adoption of the .303 cartridge case it seemed as though all previous experience in cartridge making could only lead one towards failure. Its manufacture gave rise to troubles which could not be dealt with by any of the recognised rules and regulations which had hitherto governed the work of the cartridge trade. Even now one never knows whether tomorrow a fault will not develop, which may hang about and tax all available ingenuity for weeks in attempts to locate it. Then it may disappear as mysteriously as it came, leaving the poor manufacturer none the wiser, and with a lot of bad marks to his credit for those unsaintlike ejaculations which follow upon unsuccessful efforts.

The immediate causes of failure gave many openings for investigation. The metal, the tools, the annealing—no one seemed to understand any of these where .303 cases were concerned. Having made a perfect-looking case, the firing spoiled it all. The cap-chamber expanded and gave blow-backs, the shoulders cracked, the necks split, the bodies burst, and, in addition, each maker's cases developed some fearful and wonderful individual defect that the others never experienced. The cap-chambers at this time were made for .214 of an inch caps with loose anvils and a centre fire-hole. Oh, those caps! I should observe here that not only was the cartridge new, but the rifle was in its probationary stages, and this did not lessen the difficulties of the cartridge maker. Strikers and other components of the experimental order had to be patiently dealt with. After long struggling the .303 case (Fig. 2) was tortured into something like a success; and once again the benign cartridge maker's face was wreathed with smiles.



To crown this happy state of things Cordite then appeared on the scene, and more lively times ensued, until the black powder conditions, which did not suit Cordite, were eliminated. The loose anvil was condemned, and a solid drawn one formed in the cap-chamber, together with a larger cap .250 of an inch, and two fire-holes were adopted.

The Maxim gun then contributed to the troubles, and a few grains were added in weight to provide stronger walls for the case. It is now several years since any alteration has taken place in the design, and Fig. 3 is the standard pattern of the present day.

The .303 cartridge case is manufactured in all its dimensions to the thousandth part of an inch, except in the length and head, where greater latitude is allowed. This extreme accuracy, with very little toleration, requires great skill in the tool department to keep within the exact requirements. A worn punch or die in one operation may mean extra work for the next and possibly cause over-straining of the metal, which subsequent annealing cannot correct, and thus it will probably lead to failure at proof.

While it is not within the scope of this article to enter into details of the operations or causes of failure, it may be pointed out that the failures are due in most cases either to the quality of the metal or to the annealing. It should be easy

to detect bad machining with reliable standards and speed of working, and when the contingent mechanical conditions are known to be correct; but little can be known of overstrained metal or annealing, and hence the stumbling block.

Certain brands of copper are preferred by many firms for mixing in cartridge metal, and although the standard alloy is 65 to 70 per cent. of copper, and 30 to 35 per cent. of spelter, the margin is wide enough to create errors. The man who stints his copper is as bad as the one who robs the cases of the necessary number of operations. He deserves no pity if he fails; but with the best brands of copper, and when the analysis is apparently satisfactory, it is annoying to find that for some unknown reason the brass is a failure. Electro-deposited copper, one would think, would be free from any deleterious ingredient, and for this reason it has been tried—sometimes with a fair amount of success, at other times it is a failure. In an electrically treated copper ore containing Bismuth as an impurity, the Bismuth will deposit as readily as the copper. Therefore the first analysis should be to ascertain this point. The operation of cropping off the ends of the ingots of cast metal to ensure a clean strip, and examining for scaly, spilly, or blistered spots in the strip greatly conduces to the obtaining of successful results. Rolling the metal to the proper thickness before cupping is also important.

In the annealing process most operatives work by rule of thumb, which is a grave mistake. The man of the future will stand, watch in hand, with an eye on the pyrometer, unless the future will provide us with a mechanical means of ensuring a constant equable heat to every case in the oven. The question of furnaces is one of great importance, and care is needed to prevent sulphurous and other noxious gases, &c., from coming into direct contact with the metal, and to ensure that the top of the annealing pan is not melting when the bottom is of much lower temperature. If these points are ignored failures may develop which may cost endless time to trace to their real source. The theory of the cementing of the crystals in brass is a matter in which the Alloys Research Committee might join hands with the practical metallurgist to the benefit of the community.

The work a cartridge case is called upon to perform entails great strain on the metal. The head has to be very hard to resist expansion in the cap chamber, while the mouth must be soft to allow for necking on to the bullet. The necking operations undoubtedly re-harden the metal locally, and this may make a ring of weak metal on the body anywhere below the shoulder, as the operation of annealing the mouth of the case cannot be confined locally with the required exactitude, and is often carried too far down the body by reason of varying gas or air pressure. This weakness is not apparent except under special conditions, say in the case of the Maxim gun, when extracting commences before the gases are free from the barrel, and then the case separates. When mouth annealing is done with the gas blast, it is doubtful whether certain impure gases do not affect the metal, but in any case direct impingement should be avoided if possible.

Brass at its best can hardly be called a permanent metal, especially when so thin in section and so full of latent strains as a cartridge case. The .303 case is not varnished or lacquered inside, which is a mistake. The American system of tinning all over seems to provide the best preservative, and would appear to add years to the life of the case.

CYCLOPS.

ROUND THE TRADE.

Mr. Paul North, of the Cleveland Target Company, U.S.A., is expected to pay a visit to this country in March next.

The Fleet Street business of Mr. F. T. K. Baker has been removed to 29, Glasshouse Street, Piccadilly Circus, W.

We understand that Mr. T. Page Wood is about to leave the employ of the Normal Powder Company.

We understand that Mr. James Scott, of Birmingham, has married again.

The Schultze Gunpowder Co., Ltd., have now finally established their loading department at York Place, Westminster.

We are pleased to record the fact that Mr. J. C. Irvine, of Messrs. Eley Bros., Ltd., has been elected to the board of directors of this Company.

The furniture and other effects of the late Mr. Samuel Allport were sold by auction at his house near Birmingham on the 30th ult.

Messrs. Curtis's & Harvey have had some very large orders placed with them by the Government for gunpowder, which is to be delivered at Woolwich Arsenal.

We understand that Messrs. Bentley and Playfair are giving up their London showrooms at 60, Queen Victoria Street.

Messrs. G. Pettinger & Co., of Manchester, have recently consulted their creditors in order to arrive at an arrangement with regard to their liabilities.

We understand that a first and final dividend of 3s. 10d. in the pound has been paid in respect of the winding up of the business of W. T. Hancock, of High Holborn.

An explosion occurred at the Faversham Powder Works of Messrs. Curtis's & Harvey on the 1st ult., by which one of the buildings was completely destroyed.

Mr. E. J. Churchill has issued an attractive calendar, and also a celluloid game register and memo tablet, which are both in the best of taste.

We notice that several Birmingham cartridge firms have orders from the Government to supply as many rounds of service ammunition as they can turn out.

The King's Norton Metal Works, and Messrs. Greenwood and Batley, of Leeds, have on hand an order for thirty-two million cartridge cases, which will be loaded at Woolwich.

We understand that Bland's, at West Strand, have recently produced a new punt gun, which marks a useful development in this class of duck destroyer.

Mr. Peter Powell, gunmaker, of High Street, Tonbridge, has recently died. He was one of the old-fashioned sort, for he was co-apprentice with Daniel Cox, of Newbury, to a Birmingham gunmaker of a past generation.

Messrs. Eley Bros. have announced a rise of 2s. 6d. per 1,000 in the price of fully loaded sporting cartridges 12-bore and under, and in proportion for 10-bore and over, as the result of the high prices of lead and shot.

We understand that Mr. F. A. Bales, of Ipswich, has retired from business, having sold his stock by auction, and parted with the premises, which will probably not be used for a gun business.

At a special meeting of the members of the Birmingham gun trade, held on the 25th ult., the new Proof Bill, details of which appeared in our last issue, was approved, after some discussion on certain points of detail.

The firm of Messrs. James Bott & Son, wholesale gun dealers and makers of Birmingham and London, is being wound up in bankruptcy, the proprietors private effects as the stock-in-trade being put up for sale.

A short time ago we referred to the remarkable growth in the sales of Pygmies. We now learn that Parvo cartridges have similarly been very successful during the season just closed.

The Colt revolver of service bore is another arm in active demand. The resources of the American factory are taxed to the utmost, and each consignment received is bespoke long before its arrival.

Ballistite, which does well in Parvos has also been very successful at the gun clubs. Two leaflets, recently issued, provide details of a number of crack events where the powder did first-class work.

In the Grand Prix du Casino, Monte Carlo, Count O'Brian won the first prize with a French powder, Mr. Mackintosh the second with Schultze, and a third shooter using Ballistite, divided the third and fourth.

The question of providing facilities for allowing volunteers and other rifle shots to use the Proof-house ranges near Birmingham, is being considered by the Guardians of the Birmingham Proof-house.

We regret to hear that Mr. A. F. Embleton has fallen a victim to the fashionable malady, though recent reports indicate that we shall shortly see him in his recognised position as the social side of Messrs. Boss & Co., of St. James's Street.

Messrs. Curtis's & Harvey circularize their customers to the effect that in consequence of the increased price of shot, the prices contained in their list of shot-gun cartridges will be advanced 3d. per hundred, this alteration to date from the 30th ult.

Among those who have offered themselves for service in the Imperial Yeomanry, and have passed all the required tests, is Mr. H. E. Churchill, son of our friend, Mr. E. J. Churchill. He is a true chip of the old block, a keen sportsman, and a good all-round shot, besides which he is a first-rate horseman.

The arsenal at St. Heliers, Jersey, was recently totally destroyed by fire. A good deal of damage was done to several pieces of artillery, and nearly a thousand small-arms, belonging to the local militia, and a quantity of cartridges were destroyed.

The Chilworth Gunpowder Company have received an order from the Government to supply 2,000 barrels, or 100 tons, of gunpowder. On completion of the order the powder will be at once sent to South Africa, to be used in the 15-pounder Q.F. guns.

We are informed that The Webley and Scott Revolver and Arms Co., Ltd., could not be busier in their revolver department. They have sold out all their stock, and will soon be turning out 500 revolvers per week, which, at the present time, is not sufficient to meet the demand.

In consequence of the formation of Messrs. Curtis's and Harvey, Ltd., and the resulting taking over of the various Cannonite powders, the existence of the War and Sporting Smokeless Powder Co., Ltd., as a separate concern automatically ceased. The voluntary liquidation of the latter Company is, therefore, in process of being carried out.

With reference to a report that a consignment of revolver ammunition delivered to the Government has been withdrawn, we are informed by Messrs. Eley Bros. that the report referred to ammunition loaded with black powder, and that it cannot be of their manufacture, since they have not supplied any so loaded during the past ten years.

Messrs. Kynoch's works at Witton were recently visited by the Chinese Minister, who has been making an industrial tour of the country. After having inspected this factory he was conducted over the shops of the Birmingham Small Arms Company. He took a great interest in all that he saw in connection with guns and ammunition.

The many friends of Mr. Chas. Jarvis will regret to hear of his sudden death on Dec. 24, 1899. For many years he was the mainstay of the firm of T. F. Wood and Co., gunpowder lightermen. His experience extended over many years, and his knowledge of the complicated details of his calling, due to the necessity of complying with the provisions of the Explosives' Act, was unexampled.

We regret to place on record the death of Mr. Malcolm Graham, who was a member of the well-known firm, Messrs. Hartley and Graham, of New York, the biggest gun jobbers in the world. Mr. Graham was also interested in the Union Metallic Cartridge Company, the Remington Arms Company, and the Bridgeport Gun Implement Company, being an officer, and also a stockholder, in these three companies.

Mr. W. P. Jones has a large stock of partly finished guns and rifles, which are the final residue of the late Mr. Allport's stock. Although these have been in storage since Mr. Allport's retirement many of the weapons are of quite modern style. Under these special circumstances Mr. Jones is in a position to supply actions and barrels of exceptional quality at a low price, while of course he is equally well placed for supplying the same arms in a finished condition.

We hear that the Birmingham gun trade is very active at the present time in the manufacture of non-regulation military small-arms. The demand is principally for a special magazine carbine of a lighter description than the regular arm, and this is intended for the use of officers, both cavalry and infantry. There is also a demand for Snider rifles, and old patterns in stock are selling with great rapidity. The trade in sporting arms has, however, been seriously affected by the presence of so many sportsmen in South Africa.

LECTURES TO YOUNG GUN-MAKERS.

IV. RECOIL.

WRITTEN WITH THE COLLABORATION OF F. W. JONES.

EACH of the three lectures which has so far appeared has been self-contained. The subject of recoil must prove an exception to the rule. In the first place, many preconceived notions have to be sorted out—some modified, others rejected—and, further, several of the laws of motion have to be explained before their proper application to recoil problems can be appreciated. Recoil, while one of the most interesting among the phenomena connected with shooting, is at the same time one of the most complicated to consider on an exact basis. On the other hand, by intelligently sorting out the factors involved, the laws of recoil may be appreciated even by those who may not be able to master the whole of the mathematical reasonings demonstrating the accuracy of the root principles to be laid down. It is advisable to point this out, because it will become necessary to relegate to the position of foot notes certain explanations involving the use of the higher mathematics.

Every shooter who has had experience with different guns and cartridges forms his own views and theories with regard to recoil. It is, therefore, of the greatest importance that all gun makers should understand the factors connected with recoil so as to be able to appreciate their customers' views. It is of equal importance that all who use firearms and desire to understand their peculiarities should possess this knowledge to enable them to form intelligent opinions based upon their experience.

There is no department of ballistics which affords such

opportunities for different views and ideas as that of recoil, and as a consequence we find that on this subject all sorts of theories exist, and the credit of theory as an explanation of practice suffers in consequence. It is in regard to this particular subject we so frequently hear the statement that theory and practice do not agree. It will be instructive to enquire into what is meant by the statement that theory and practice do not agree. Theory is a much abused phrase. It is frequently applied to a certain class of supposed explanations of phenomena, in which there is very little science, a great deal of scientific phraseology, and a liberal supply of imagination. True theory is apt to become discredited while so many plausible caricatures of the reality exist. We must, therefore, disassociate true theory from mere "seemings" or guesses, which are commonly in conflict with practice. A theoretical explanation pure and simple, which is based on our knowledge of established scientific relations, is never in conflict with practice, and only appears so when it is not understood. Correct theory deals only with such facts as can be correctly ascertained from practice, and it applies these facts by means of well-known laws and relations, the accuracy of which has been definitely ascertained.

For instance, if we are considering recoil, and we desire to ascertain the effect upon recoil of variations in the velocity of the projectile, an accurate expression can be framed, and a theoretical estimation of recoil from this point of view can be ascertained. But recoil depends on many other things besides the velocity of the projectile. Consequently a correct estimation of recoil will depend on how far practical observation and experience will enable us to secure absolute values for these other factors. To sum up the distinctions drawn between theory and practice, we may say that theory, or in other words, a scientific explanation, is always correct so far as it goes; but frequently our means of ascertaining all the factors which enter into practice are not sufficiently perfect to enable us to reproduce by theory the results we obtain from practical observations.

A theoretical explanation, as far as it goes, is correct, and only to this extent is it in accord with practice. In considering recoil it will, therefore, be necessary to point out how much is absolutely accurate, and to call attention to that which is necessarily empirical—in other words to that which follows solely from experimental observation. In conclusion we may make it clear that useful theory does not stop short when we reach a point where the conditions are too intricate to permit us to assign by theory an absolute value to a certain factor in a problem. Having isolated that factor, so to speak, experimental observation may enable us to ascertain its value under such a large number of conditions that we may arrive at its true value for every calculation, and in this way we may proceed to clear up the problem of which it forms but a part.

It will not be possible in the first lecture on recoil to get very far with the consideration of actual problems. Consequently it would be as well to indicate the scope and object of the methods of calculation which have been built up, and which will enable the gunmaker to appreciate at their true values different guns and ammunition in their relation with recoil.

We know in a general way that recoil is least, under the following conditions:—(1) A heavy gun and (2) a light charge of shot and (3) a low velocity, other conditions being equal. Heavy recoil follows with the opposite conditions of a light

gun, heavy shot charge and high velocity. From this it is clear that small recoil necessitates three conditions which are objectionable to the shooter, viz., a heavy gun to carry, a small, therefore to some extent inefficient, charge of shot, and a low velocity. Low recoil is, therefore, antagonistic to other desirable conditions of shooting. The result is, therefore, that a compromise must be arrived at in which the advantages and disadvantages are blended, to produce the best all-round efficiency.

By means of the calculations to be explained in future lectures, it is possible to ascertain the true value of recoil under given conditions, the results harmonizing with practical experiments to an extent which demonstrates their substantial accuracy. In order to show how important from the point of view of recoil are the main factors already described, we have worked out certain recoil values under three different conditions. They are shown in the table below:—

	Weight of Gun.	Weight of Shot.	Velocity of Shot. ft. per sec.	Recoil. ft.-lbs.
LIGHT RECOIL ...	7½ lbs. ...	1 oz. ...	1100 ...	24.2
MEDIUM RECOIL...	7 lbs. ...	1½ oz. ...	1200 ...	34.5
HEAVY RECOIL ...	6½ lbs. ...	1¼ oz. ...	1300 ...	49.1

It will be seen how great is the difference when in one case all the conditions are in favour of low recoil, and in another when the tendency is towards high recoil. The middle line of values shows a happy mean of all three factors, and the value of recoil is between the extremes shown above and below. Other tables will be reproduced in due course showing every variation of recoil for corresponding changes in a single one of the factors. But it will be necessary to pause awhile and remember that slow progress is the only sure road to success in a problem of the intricate nature of recoil.

In the first place it will be necessary to obtain a general conception of the means by which recoil is produced, and the method of its development. The late Dr. Walsh evidently possessed a very clear notion of what occurs during the recoil of a gun. Though his conclusions cannot be accepted in their entirety, it is certain that his investigations have indicated, and even inspired, the lines of subsequent enquiries upon the same subject.

He divided recoil into two stages, to which we will add a third. That is to say recoil is developed in two stages, and is still in evidence during a third stage, until the movement has ceased. While the shot is travelling up the barrel the backward movement of the gun in recoil is comparable with that of the shot, except that it is slower. The shot gradually acquires velocity, and the same with the gun in its recoil. The movement of the gases is undoubtedly responsible for a part of the recoil, and we can judge their velocity approximately from that of the shot, but their light weight at a comparatively low velocity renders them a minor factor in the production of recoil during the time the shot is in the barrel. After, however, the shot has left the muzzle the conditions are very different. We have a column of powder gases of known weight and at a high pressure. The departure of the shot leaves them a clear vent, and having great elasticity, they expand with corresponding suddenness. They consequently leave the gun with a very high velocity, and their weight, which is but of minor importance when their velocity is low, becomes of the greatest importance when combined with high velocity. So great is the effect upon recoil of this

high velocity of the gases that of the total recoil in a 12-bore shot-gun about one-third may be attributed to the back action arising from the sudden efflux of the gases.

Consequently, in the above instance, we may take it that about two-thirds of the total recoil is acquired during the comparatively long period when the shot is in the barrel, while the remainder is due to the kick produced by the sudden expansion of the gases after the restraining influence of the shot has been removed. In recognition of these two sets of conditions, Dr. Walsh divided the production of recoil into two factors, that of the push and that of the kick. For the sake of clearness, we have added the third stage of recoil. The latter may be taken as commencing when the gun has received the final impulse of recoil, and it continues so long as there is any movement in the gun. By taking note of this third stage of recoil, it at once becomes apparent that of the total visible movement of the gun in recoiling only a small portion of this movement is produced while the shot and gases are leaving the barrel, and that the remainder is simply due to the inertia of the gun. In exactly the same way that the flight of the shot continues after the propulsive force has ceased to act, so the gun continues to recoil after the forces producing recoil have ceased. We may, therefore, assume say that the gun recoils for one-third to one-half of an inch while the shot is in the barrel, and that it recoils a further, say, one-sixteenth of an inch during the efflux of the gases. To the shooter, we may express it that the gun gradually acquires a certain velocity of recoil during the first half-inch of its travel, and that during a very short additional travel the velocity of recoil would be very much increased. This sudden acquirement of additional velocity is aptly termed "kick." The gun having attained its highest recoil velocity, it is simply a question of resistance—how much further the gun will recoil before being brought to rest.

ACTION AND REACTION.

The essential principle of recoil depends upon the laws of action and reaction. Most of us are familiar with the saying that action and reaction are equal and opposite. Writers of text-books on mechanics find it necessary to devote pages to the demonstration of this truth, but we are constrained to be more brief. If we consider the gun and the shot as two bodies, each subject to the action of the powder gases within the barrel, we conceive the idea of two bodies, each being acted upon by the same amount of force for the same period of time. The force necessarily acts in opposite directions, and produces a repelling action or separation of the two bodies. We may assume for the moment that the force ceases to operate the moment the shot has left the barrel. The gun has received a backward movement, which may be measured by its velocity, and the shot has received a forward movement, also expressible in velocity. Now it is obvious to some and could be demonstrated to all that there must be some kind of equality in these two movements, since they have both been produced by the same value of force acting for the same period of time. That equality is the equality of their momentum.

We know in a general way that the light charge of shot will have acquired a greater velocity than the heavier weight of the gun. Consequently, the above equality is not one of velocity alone. It must take into account the weight or mass of the bodies upon which the force acts. A given force acting

upon two bodies of the same mass for the same time imparts to them the same amount of velocity. If, on the other hand, one body had half the mass of the other, the same force would impart twice as much velocity to the light body as compared with the heavy one. In this way a relation is established between mass and velocity, and it will be seen that what is gained in mass is lost in velocity, and *vice versa*, the amount and duration of force being constant for each case.

By mass is meant the amount of matter contained in a body, and this is expressed by the measurement of its weight. While mass is ordinarily measured by weight, in other words, by the gravitational attraction of the earth upon the mass, there is another form in which mass must be considered, viz., in relation to movement. This is so, since bodies of the same mass or weight acquire the same velocity when acted upon by a given force for the same time. And further, bodies of different weight acquire greater or less velocity in exactly inverse proportion to their weight.

The rate at which velocity is imparted to a body is known as acceleration. The body may start moving from a state of rest, or velocity may be added to an already-existing velocity. In either case the rate at which velocity is added is known as acceleration. Furthermore, whether the body is at rest or in a state of movement, a given force always produces equal acceleration in bodies of the same weight, and inversely proportionate acceleration to bodies of different weights. It is necessary to remember the precise distinction which exists between velocity and acceleration. Velocity is measured in feet per second, while acceleration is measured in feet per second added during each second. Velocity is, therefore, quantity of velocity; and acceleration is rate of adding velocity. Thus we see that to find the velocity of a body upon which a force has been acting we require to know the accelerating value of that force, and the time it has been acting.

It is now advisable to express the equality of action and reaction by means of algebra. So far we have mainly dealt with the amount of velocity imparted by a given force acting during a given time. It will, for the moment, be necessary to deal with acceleration rather than velocity. Since a given force acting upon bodies of equal weight adds equal velocity in equal time, it is clear that the acceleration, or rate of adding velocity, of this force is the same for all bodies of the same weight. We can now consider the effect of a force in relation to the mass and acceleration of the body upon which it acts.

Let us express the various factors in the following manner:—

F = force expressed in pounds.

m = mass in pounds.

f = acceleration in feet per second added during each second.

t = time in seconds.

v = velocity in feet per second.

We may now say that a given force F imparts a movement to a body, which may be expressed by $m_1 \times f_1$. Again we may say that the same force F acts upon another body of different mass. The mass of the two bodies being different we know that the acceleration will also be different. In the second example we will, therefore, designate the mass of the second body as m_2 , and its acceleration as f_2 . While the values of m_2 and f_2 are different from those of m_1 and f_1 , we

know that the product is the same since the force F is equal in both instances. We have now arrived at the following result:—

$$F = m_1 \times f_1 \text{ and } F \text{ also} = m_2 \times f_2.$$

As things which are equal to the same thing are equal to one another, we know that

$$m_1 \times f_1 = m_2 \times f_2 \tag{1}$$

We have now algebraically expressed the previously-explained truth that a given force acting on two bodies of the same or different mass produces in them the same value of $m \times f$. Since we wish to take time into account, we may expand F by multiplying it by t to express the duration of the force over a given period. This is made clear by supposing that a certain force will impart an acceleration f to a body in one second. In two seconds it will add an acceleration equal to $2f$ feet velocity, and in t seconds it will add $t \times f$ feet velocity. So that if v be the velocity added in t seconds, then $v = f \times t$.

We may now add to Formula No. (1) an expression taking into account the duration of time t of the accelerating force.

$$m_1 \times f_1 \times t = m_2 \times f_2 \times t \tag{2}$$

Since $f \times t = v$ we may rewrite our Formula No. (2) with the sign for velocity in place of the values $f_1 \times t$ and $f_2 \times t$, making them v_1 and v_2 respectively. Thus

$$m_1 \times v_1 = m_2 \times v_2 \tag{3}$$

This is another way of saying that when a force acts on two bodies during the same time the momentum of each body at the end of that time is equal. Here we come back to the old truth that action and reaction are equal. It is advisable that this truth should be grasped in its full mathematical sense before attempting to proceed further. The essential points of the demonstration have been explained, but nothing but careful thought and attention will ensure their taking root in the student's mind.

A few general remarks are now necessary to show the bearing of this truth upon problems connected with the recoil. We know that the gun is driven backwards, and that the shot is driven forwards. By ascertaining the velocity of the shot, its weight being known, we can find at once the value of $m \times v$ for the shot. Since action and reaction are equal and opposite, it would seem that the $m \times v$ of the gun would be the same as that of the shot; and knowing the weight of the gun and the value of its $m \times v$, it would appear a simple matter of arithmetic to find the velocity of recoil and thence the recoil energy of the gun. But this is one of the stumbling blocks to the student of recoil.

The shot is not the only thing driven forward by the action of the powder gases, though the gun is the only thing driven backwards. In the first place we have the wads in the case of a 12-bore gun, but as these travel to the muzzle with the shot we can allow for them by adding their weight to that of the charge of shot. The powder gases are the difficulty. Before the gun is fired the powder charge is snugly arranged in the cartridge. By the time the shot has reached the muzzle the powder charge, now in the form of gases, has spread itself over the whole length of the barrel, and its centre of gravity has moved from the cartridge to about the middle of the barrel. This is a forward movement, the $m \times v$ of which must be taken into account in judging the $m \times v$ of the gun. When the shot leaves the muzzle of the gun the powder gases pass out of the gun at a velocity which

has to be ascertained before we can obtain the complete value of $m \times v$ for the powder gases.

Knowing that the $m \times v$, in other words, the momentum of the gun is the combined $m \times v$'s of the bodies driven forward in firing, it is necessary to analyse the conditions of their exit in the hope of obtaining their respective velocities. Science imparts to us the knowledge that if we can only obtain the necessary particulars by experiments or otherwise, we can find the true value of $m \times v$ for the gun. Theory and practice will not agree if we fail to get the true values of m and v under each set of conditions, but if our efforts break down, it will not be the fault of theory, but the fault will be ours for an incorrect rendering of the values to be analysed.

We will conclude the first lecture on recoil by pointing out that the momentum of the gun, viz., its $m \times v$ is equal to the following values of $m \times v$ added together:—

(1) the $m \times v$ of the shot and wads; (2) the $m \times v$ of the powder gases up to the shot reaching the muzzle; and (3) the $m \times v$ of the powder gases from the time of the shot leaving the muzzle until they have passed into the open air.

We will include the three values of $m \times v$ as given above in the following formula:—

$$(gun). \quad (materials\ ejected). \\ m \times v = m_1 \times v_1 + m_2 \times v_2 + m_3 \times v_3, \&c. \quad (4)$$

It is quite true that action and reaction are equal and opposite, but the present difficulty is to find the value of the various actions in order to derive that of the reaction or recoil. In the lectures to follow these points will receive attention.

(To be continued).

CORRESPONDENCE.

WATERPROOF CARTRIDGE CASES.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—I note in your issue of 2nd October, 1899, page 159, a notice of a patent taken out by Messrs. Kynoch, Ltd., Birmingham, for waterproof cartridge cases.

A machine, which seems to be similar to the patent described, was invented by the writer five years ago, for rolling the paper tube, and has been in operation in our works here since that time, and we prefer it to any other mode of manufacture. At the same time we also used the paraffin, or other wax, for waterproofing our cartridge cases, but gave this mode of manufacture up, as it proved too expensive, taking into consideration the price received for the empty shell. Perhaps Messrs. Kynoch may have improved on our mode of waterproofing cases, so as to reduce the cost, and make it possible to turn out a waterproof paper shell at a cost which would enable it to compete with the ordinary paper shell.

Yours truly,

THE COLONIAL AMMUNITION CO., LTD.

A. C. WHITNEY, Manager.

Auckland, N.Z.,

Nov. 16, 1899.

THE TWEEDIE BULLET.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—In your last month's issue, a letter appears under the signature of "Cyclops," in which he says:—"The Tweedie bullet has a solid base, and the nose turned away at the

point, to expose the lead. The core is sweated inside to the envelope with solder."

The Tweedie bullet of 1891, Patent No. 22173, is a solid-base bullet, made by construction to expand on impact; but the Tweedie bullet of 1889, Patent 902, is not a solid-base bullet. It is the Government pattern—open base, partially open base, or other compound bullet, having the front part of the case weakened to produce expansion on impact by thinning the case over the front part; by making cannelures round in the case at or about the shoulder; by cutting longitudinal grooves in the case, or otherwise weakening the case at that part.

Captain Bertie Clay took out a provisional patent for what he called the Dum Dum bullet in 1897, but on his complete specification being filed I opposed the granting of it, and Captain Bertie Clay had to disclaim, and agreed to disclaim, all contained in my patents—i.e., the obtaining of expansion on impact in compound bullets.

The other points claimed in his patent—the use of the cannelure near the base, the more or less open base, and the reduction of the base by coning, are all constructions that have been previously exposed,—have been, and can be used by anyone.

MICH. TWEEDIE.

Major-General.

Jan. 13, 1900.

P.S.—I might mention that the difference between M. III. and M. IV. Government bullets is that, though otherwise similar, the case in M. III. was made of its normal thickness at the front, and failed to expand, as required, on impact; in M. IV. the case is *thinned* at the front part, so as to insure the desired effect.

APPLICATIONS FOR PATENTS.

DECEMBER 18, 1899—JANUARY 13, 1900.

1899.

- 25,123. Gun Stands. G. F. Marson.
- 25,127.* Small-arms. C. Ramus.
- 25,242. Blasting Explosive. J. W. Weston and J. C. Hamilton.
- 25,249. Ordnance. J. Worthington.
- 25,261. Bullet-proof Material. T. Macdonald.
- 25,262.* Cartridge Cases for Explosives. C. H. Curtis and Curtis's and Harvey, Ltd.
- 25,401.* Small-arms. P. Bourguet.
- 25,483. Rifles. R. H. R. Rimington-Wilson.
- 25,538. Rifle Sights. J. R. Sinfeld.
- 25,548. Percussion Fuses. J. A. Rowe.
- 25,605. Revolvers. G. R. Cawley. (Agent for *A. J. R. Glasford*).
- 25,658. Gun Carriages. J. B. Leatherbarrow and T. B. Margetts.
- 25,665. Ordnance. W. H. Schwartz.
- 25,669. Discharge of Shells from Ordnance. S. Leather. (Agent for *D. R. S. Galbraith*).
- 25,686. Blasting Cartridges. F. Render.

1900.

- 26. Sights for Small-arms. T. Brown.
- 82. Bullets. W. Wells.
- 212. Manufacture of Picrates. A. C. Girard.
- 213. Explosive Substances. A. E. Girard.
- 214. Explosives. A. E. Girard.
- 263.* Machine for Loading Feed-bolts for Machine Guns. J. Imray. (Agent for Colt's Patent Fire-Arms Manufacturing Co.).
- 272. Weapons. J. Pool.
- 312. Automatic Fire-Arms. H. W. Gabbett-Fairfax.
- 344.* Ordnance. C. A. Jensen. (Agent for *E. W. Anderson*).
- 375. Range Finders. A. A. Common.
- 478. Field Glasses for observing the Gases of Combustion of Smokeless Powders. F. W. W. Baker.

495. Single-Trigger Mechanism. W. Baker.
 538.* Cartridges. C. A. Bailey and E. S. Coe.
 571. Shells. J. Hicken.
 613. Shells. G. J. Batters.
 655. Electrical Means for Training Ordnance. G. E. Vaughan.
 (Agent for J. A. Vaughan).
 664. Bruch Mechanism of Ordnance. W. Poulson.
 681. Loading Apparatus for Ordnance. R. Matthews.
 702. Combination Pocket Gun and Cartridge Holder. W. P.
 Thompson. (Agent for R. M. G. Phillips).
 743. Ammunition Boxes. W. Rothschild, G. D. Smith, and
 J. A. Wilding
 808. Guns for Discharging Explosive Shells. E. M. T. Boddam.
 827. Ammunition. C. J. Miller.
 833. Projectiles for Ordnance. T. Cloke.
 836. Torpedo Steering Mechanism. A. E. Jones.

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

DECEMBER 23, 1899—JANUARY 13, 1900.

- 19,714 (Sept. 16, 1898). A. T. Dawson and L. Silverman, London. A method of adapting the well-known Maxim **automatic machine gun** mechanism to guns of larger calibre, especially to those of about 1½ inches. With bigger bore guns there is naturally a heavier recoil; and to meet this the present **breech mechanism** is provided with a hydraulic buffer, which is so arranged that it may be recharged with liquid without removing it from the gun. Another device is provided consisting of a finger or arm for preventing the premature return of the cartridge carrier, which might cause the point of the shell in the carrier to be brought into contact with the detonator of the succeeding cartridge in the feed-box. Accepted Dec. 16, 1899.
- 25,737 (Dec. 6, 1898). B. Tower, London. This patentee, described in two former patents, Nos. 14,208 of 1886, and 20,220 of 1889, a method of maintaining a gun mounted on a ship on a constant plane. The latter specification described the **mounting of a gun** on the plane maintained constant by this method, and the present patent deals with a modification of the arrangement. Instead of mounting the gun on the steadying apparatus, as heretofore, the steadying apparatus is connected with the gun cradle. By this arrangement the gun is still held steady, but it may recoil without disturbing the steadying apparatus. Several details described in the former patents are also modified. Accepted Dec. 6, 1899.
- 25,838 (Dec. 7, 1898). J. E. Evans-Jackson (Agent for U. Alvisi, Italy). The manufacture of a series of **explosive substances** in which perchlorate of ammonia, the subject of the patent, is the principal feature. The patentee has discovered a law with regard to the action of perchlorate of ammonia in explosive mixtures, and its application is governed by this law. He finds that when perchlorate of ammonia is added to substances which are themselves explosive, or when it is substituted for other oxidising salts used in the preparation of explosives, the result is an increase in the propulsive power, an increase in the breaking power, and an increase in the ratio between breaking and propulsive powers. Several explosive compounds containing this substance are described in the specification. Accepted Dec. 7, 1899.
- 403 (Foreign application June 28, 1898. Applications in United Kingdom Jan. 7, 1899). T. C. Fenton, U.S.A. A rammer for **heavy ordnance**. This consists of a series of tubes arranged telescopically. The inner tube carries the rammer head, and the outer tube is secured to a frame or mount, which contains the operating mechanism. The tubes are run out and drawn through a series of gear-wheels, which may be so arranged as to be operated by hand or driven by steam, hydraulic, or electric power. Accepted Dec. 23, 1899.
- 1,113 (Jan. 17, 1899). A. T. Dawson and L. Silverman, London. Cartridge feed-belts for automatic or **machine guns**. The ordinary belt in use is generally composed of some such material as webbing, and is provided with cartridge pockets made either of the same material or of metal. The disadvantage of these pockets is that the jerking action of the gun often dislocates some of the cartridges from the belt. The present patent deals with a metal clip, which is rivetted to the belt, and is also covered with the ordinary webbing, so that the insertion of the cartridge jams one against the other. It is claimed that by this method the cartridges are held securely. Accepted Dec. 2, 1899.
- 1,639 (Jan. 24, 1899). A. Kiechwald (Agent for Fried. Krupp, Germany). A form of liquid recoil brake for **gun carriages**, consisting of two recoil brakes and a running out cylinder so arranged as to be as compact as possible. In the usual brakes, which are provided with a separate running out accumulator, the recoil brake cylinder is generally connected with the accumulator by means of pipes containing the valves. This arrangement occupies considerable space, and is also difficult to keep fluid tight. The present system is claimed to rectify these defects. Accepted Dec. 23, 1899.
- 1899 (Jan. 27, 1899). H. F. Land, Bradford. A method of using **compressed gases as a propellant force**, in addition to the ordinary gunpowder in cartridges. The specification does not describe any method of retaining the compressed gases in confinement within the cartridge. Accepted Dec. 2, 1899.
- 2,568 (Feb. 4, 1899). The Morris Tube Ammunition and Safety Range Co., Ltd., and A. J. H. Wyatt, London. In two former specifications, Nos. 4,843, of 1883, and 9,356, of 1885, was described a method of putting a small barrel in the bore of a large gun for **practice shooting**. The present patent deals with a method of centering the small barrel within the bore of the gun. The centering parts consist of three pieces of metal, which are attached radially by links to two nuts, screwing towards one another on left and right screws. The turning of the barrel after its insertion into the breech causes the pieces to be forced outwards by the turning of the nuts towards one another, and thus each piece is made to grip part of the bore of the gun. Accepted Dec. 9, 1899.
- 2,664 (Feb. 6, 1899). Vickers, Sons and Maxim, Ltd., Sheffield, A. T. Dawson and G. T. Buckham, London. The construction of ammunition wagons and limbers for **field guns** in such a manner as to combine great strength with lightness. The axle of the carriage is constructed on strengthened lines, in three parts, and enclosing this is a strong light girder, in the shape of inclined side-plates, which are attached to the wagon. The wagon itself is formed of a strong framework covered with light plates, and its interior is fitted with angle-iron shelves for ammunition trays. The bottoms of the trays are made with hollows, to receive projectiles, and the lid has inwardly projecting ridges to steady the projectiles. Accepted Dec. 23, 1899.
- 3,464 (Feb. 16, 1899). R. Matthews, Manchester. A method of operating **ordnance**, so that in the event of the failure of the power employed for running the gun in and out, the gun may be run out by hand. It is retained in the run out position, so that there is no danger of its running back and injuring the gunners, by means of another contrivance, which consists of a trip-gear held in engagement with a projection by a spring. The trip-gear, however, does not prevent the gun from recoiling on discharge. The recoil overcomes the spring, and allows the gear to disengage itself from the projection. Accepted Dec. 16, 1899.
- 8,967* (April 29, 1899). H. J. Blanch, London. Single-trigger Mechanism.
- 11,364 (Foreign Application, Nov. 5, 1898, application in United Kingdom, May 31, 1899) H. L. J. C. Turc, France. Apparatus connected with the launching of **torpedoes**. The side of the ship is provided below the water-line with a rotary lock consisting of two cylinders. One cylinder is fixed, and has two opposite apertures, and the other cylinder turns inside the fixed one, and is only provided with one aperture. The movable cylinder only uncovers one aperture at a time, and is adapted to communicate with the interior of the vessel for charging, or with the exterior for launching, on its being rotated. This arrangement only occupies half the space of the ordinary launching apparatus. Accepted Dec. 23, 1899.
- 13,014 (June 22, 1899). A. P. J. P. Jacobs, Belgium. A **pouch or magazine**, arranged to hold a certain number of cartridges, from which the cartridges may be taken by a single mechanical movement. A spiral spring always tends to press the cartridges down towards the bottom of the magazine, and, upon the opening of a door, a spring carrier arrangement expels the lowest cartridge through the opening. Accepted Dec. 23, 1899.
- 16,431 (Aug. 12, 1899). A. Stevens and W. S. Penney, Ramsgate. A modified form of brake applicable to **gun carriages**, which consists of two pivoted braking surfaces adapted to grip a suitable part of the wheel or axle. The braking surfaces are connected by rods to the operating lever, and these rods

are so arranged with a universal joint connection that either one of the brakes, or both, may be put into action. Accepted Dec. 9, 1899.

17,517 (Aug. 29, 1899). E. M. Capps, U.S.A. An **automatic machine gun**, which has a number of barrels into which the cartridges are fed by a vertical cartridge carrier working in slides. The carrier is composed of thin metal, and the cartridges are arranged in horizontal series corresponding with the breeches of the barrel. The mechanism is so arranged that a premature discharge cannot occur. There is also a novel range-finding sighting apparatus attached to this gun. Accepted Dec. 23, 1899.

18,516 (Sept. 13, 1899). S. Fülöph, and M. J. Lackovic, Austria. An **explosive compound**, the chief constituent of which is fresh horse-dung. This, it is claimed, is a slow-burning powder, and has great potential energy, being thus adapted for loosening large masses of rock and coal. It is made up of 60 parts of horse-dung, 26 parts of saltpetre, 10 parts of flowers of sulphur, and 4 parts of colouring matter. These proportions are by weight. Accepted Dec. 16, 1899.

21,987 (Nov. 3, 1899). G. P. Schneider, Germany. A method of **boring blast holes**, so that the direction of the fracture caused by the explosion shall be regular. A special tool is described for this purpose, and it consists of a saw, by means of which longitudinal cuts are made in the bore-hole in the direction the rock is needed to be split. These cuts, it is claimed, cause the gases to exert their energy in the required direction. Accepted Dec. 9, 1899.

* This specification is more fully described under "Selected Patent."

SELECTED PATENT.

THE BLANCH SINGLE-TRIGGER MECHANISM.

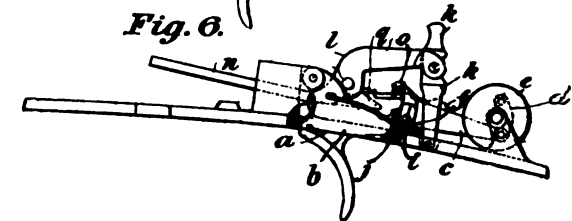
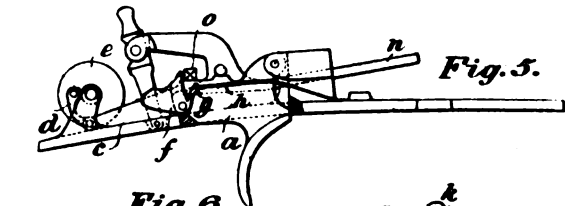
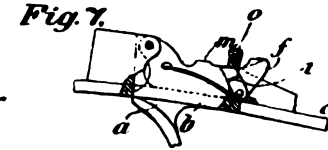
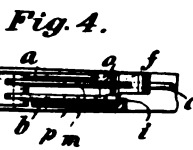
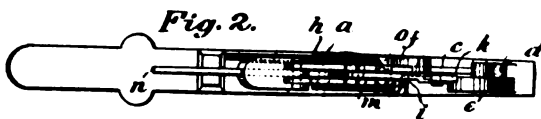
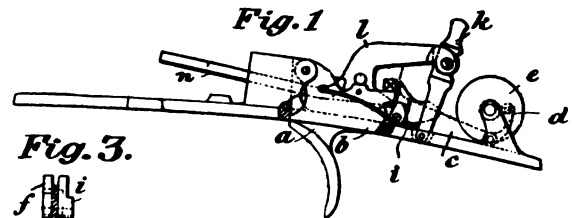
8,967. (April 29, 1899). H. J. Blanch, London. This specification describes a novel system of single-trigger mechanism, which, although only operated by means of one trigger, contains the usual pair of trigger-blades. In this mechanism it is not necessary that the involuntary pull should occur to place the parts in position ready for the second pull; but an arrangement is described which locks the parts for a sufficiently long space of time to allow the intermediate pull to pass without discharging the second barrel.

In the illustrations of the mechanism Figs. 1, 5, 6, and 7 are side views of the parts in different positions. Fig. 3 is a section through the pawl *f*. Fig. 2 is a plan, and Fig. 4 a plan of a portion of the mechanism.

From Fig. 2 it will be seen that the mechanism contains two trigger-blades *a* and *b*. The blade *a*, operating the right-hand lock, has an extension *c*, to the end of which is pivoted a link *d*, which in its turn is pivoted at *h* to the wheel *e*. This wheel arrangement to be described later on, locks the parts after the first pull, so as to intercept the involuntary pull. In Fig. 5 also is shown the pawl *f*, which is pivoted to the blade *a*. The pawl has a lip *g* and a spring *h* bears downwardly upon this lip, always tending to rotate it in a forward direction. The pawl also has a projection *i* on its side, shown in section Fig. 3, and this projection is so arranged as to slip under the shoulder *j* of the left-hand trigger-blade Fig. 1. The safety trigger locking mechanism is a simple combination of the lever *k* with the arm *l*, which is operated by the ordinary safety slide on the grip. The triggers are locked by means of the lateral projections *r* on either side of the arm *l*, engaging with the portion of the trigger-blades *m*. The rod *n* communicates with the top lever bolt, and in the known way the safety is automatically pushed back into the locking position upon the opening of the gun.

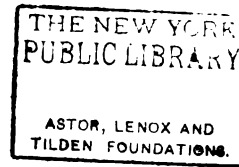
We will now describe the operation of the parts during the firing of the two barrels. In Fig. 1 the mechanism is shown in the cocked position and ready for the discharge of the right-hand barrel. The first operation is the pushing forward of the safety slide to release the trigger-blades. Then upon pulling the trigger, the right-hand blade *a* is raised, which takes the sear *o* up also, and discharges the first barrel. The raising of the blade *a* causes its projection *c* to

turn the wheel *e* on its centre. The wheel then assumes the position shown in Fig. 6. It will be noticed that, were it possible, a little more turning of the wheel *e* would cause the pivot of the link *d* to pass over the dead centre of the pivot of the wheel. In this position it would be impossible for the spring *h* (Fig. 4) to force the trigger-blade *a* downwards into its former position. But this link *d* is so arranged in connection with the wheel, that in the raised position its top pivot all but reaches the dead centre of the wheel axle, assuming such a position that there is a momentary delay before the pressure of the spring *h* tending to force the blade



downwards is felt. It is during this delay that the involuntary pull occurs, which has consequently no effect beyond pressing the projection *c* of the blade tightly up against the centre of the wheel. The right-hand sear is locked in its raised position after the first pull by the fallen tumbler, and it will be seen that the pawl, which has hitherto only been kept in its backward position against the pressure of the spring *h* by this sear *o* is now free to fly forward. In its forward position the projection *i* on the pawl comes into engagement with the shoulder *j* on the left-hand blade *b*, as shown clearly in Fig. 7, and upon the trigger being again pulled the second barrel is discharged.

The mechanism is cocked in the opening of the gun by a projection *q*. Fig. 6, on the safety mechanism. The turning of the top lever automatically pushes the safety mechanism back, and in so doing the projection *q* comes into contact with the pawl *f* and rotates it against the action of its spring into its backward position. Here it is secured by the sear tail *o*, which is released by the cocking of the tumbler. Accepted December 9, 1899.



Arms & Explosives

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CURRENT TOPICS.

Chamber and Cartridge Gauges.—It is now a somewhat widely-known secret, if by chance there has ever been any secrecy in the matter, that the Gunmakers' Association is energetically concerning itself in bringing to a satisfactory conclusion the recent discussions regarding chamber and cartridge gauges. There is no desire on the part of the Association to strike a new line—in fact, rather the reverse. The intention is to build up a series of leading measurements of chamber and cartridge sizes, such as will harmonize with one another, and give the best results in practice, and at the same time will introduce no serious variations such as would relegate existing weapons to the lumber room. The main idea is, therefore, to define existing practice within narrow limits, so as gradually to weed out the extreme sizes, which do so much to worry the poor gunmaker, and drive the cartridge maker to distraction and reduced dividends. In Belgium and France they appear by united action to have led the way to cartridge standardizing, but on lines which appear to us paltry. There seems to be very good evidence for supposing that the object of departing so widely from the English approximate standards is to bar English cartridges in these two Continental countries. These tactics are generally of the boomerang character, for they often end by striking their author on a particularly tender spot. In a general way, Continental competition with English cartridges is of very little avail. In fact, so great is the trouble experienced by their purchasers in this country, that many of them swear never again to be worried into taking advantage of the some-

what lower prices. We do not think that we shall be accused of blind partisanship for goods of home production when we point out that this mainly arises not from any particular defect in quality, but merely from the fact that no cases will adapt themselves to gun chambers unless there is a suitable relation between the respective dimensions of the two. The closing to English manufacturers of the two markets where pin-fire guns still reign supreme will hardly worry us much on this side, though our Continental friends may regret the action on their part which closes the British market to cases which must of necessity split in use.

Incorrectly Marked Firearms.—In our advertisement columns appears the full text of a document signed by Messrs. Ralph Lazarus & Sons, the well-known firm who do a big business in firearms of all descriptions at their four premises situated in various parts of London. The document sets forth that last December a gun, marked "J. Rigby, Maker, Dublin," was sold as a genuine second-hand Rigby gun. The Gunmakers' Association appear to have been the purchasers of this gun, and to have brought the matter to the notice of Messrs. Lazarus, who now apologise for the offence, and admit their liability to the extent of refunding the amount paid for the gun. They also pay the solicitor's fees, and have remitted a further £10, which the Association has transmitted to the *Daily Telegraph* Fund for Widows and Orphans of Soldiers engaged in the War. The document contains a statement that the offence was committed unknown to the principals, which of course explains why the Association have allowed the matter to be settled out of court. We have had an opportunity of examining the gun, and it appears that

a very serious breach of the rules of fair trading as set forth in the Merchandise Marks Act has been committed. The gun is a type of a very peculiar form of restoration. The action was in its day of good quality, the engraving being well executed and giving the gun a certain appearance of style, although it was not manufactured by Messrs. Rigby. A gun-maker would class such a weapon as practically valueless, since the old-fashioned nature of the locks would render it a waste of money to do any extensive operations of resuscitation. In spite of this the gun bears evidence of having been fitted within a comparatively recent period with new barrels and a new stock, which give the weapon, to the eye of the uninitiated sportsman, an appearance of sound condition combined with good, original workmanship. The fact that the engraving has been executed since browning shows that the false naming of the gun was subsequent to its renovation. All these facts combined serve to explain how it was that £7 10s. was charged for a gun which would be worse than useless to a sportsman willing to spend this amount upon a gun. The publicity which has been given to the case should make Messrs. Lazarus more careful in future as to the class of gun they expose for sale in their premises.

"A Neglected Discovery."—There has recently been an energetic attempt to bring the Russell system of rifle sighting into prominence. The *Times* led the way by an article from its Bisley correspondent, and questions in the House brought the matter still more prominently into view. We have no intention of disregarding whatever favourable reports may exist relating to the use of this device. It consists of a flap or shield attached to the side of the rifle barrel, and it serves to mask the foresight from the view of the left eye. In this way the right eye has an undisturbed vision of the sights without the necessity of closing the left eye. In theory there is little doubt that the invention appears to answer a useful purpose, but in practice we cannot accept a few statistics of improved shooting, arising from its use, as a proof of its desirability for service adoption. If the system possessed any really solid merits, it would at least have attained considerable vogue among sportsmen and others not fettered by War Office regulations. As a matter of fact, in spite of a fairly considerable experience, we have never come across the device in actual use. To us the reason for its non-adoption is clear enough. In the first place nature devises an eyelid for the purpose of masking the sight of the left eye when desirable. This obviously introduces into shooting the disadvantage that the entire field of view obscured from the right eye by the interposition of the barrel and sights is a *terra incognita* to the shooter. This certainly has its disadvantages. For instance, if the sights are used for a longer range than that for which they are adjusted, the shooter aiming above his object aims without seeing it, and possibly, if alive, it may move away before he fires his shot. But shooters of experience generally recognise the desirability of keeping both eyes open in the act of shooting. The brain certainly receives a somewhat confused image of two rifle barrels and two foresights; but a very small amount of training develops the right optic into what is known as the "master eye." In other words, with equal eyesight, though the two sets of images may be of equal intensity, the brain power is so much concentrated upon the image transmitted

by the right eye that there is no possibility of aligning the foresight with the left eye. To mask a portion of the field of view, as Mr. Russell proposes, besides introducing a somewhat objectional excrescence upon the rifle, not only conceals the foresight, but also a good deal of the field of view which is obscured to the other eye by the barrel. The advantage of firing with an unobstructed vision from both eyes, is that to the brain the barrel has a sort of shadow-photograph, or semi-transparent appearance, and the left eye can thus carry information to the brain as to what is going on in that portion of the field of view which is obscured to the right eye. The Russell obstruction neutralises a large part of this benefit. In fact it conceals from view the part which is of main importance, viz., the small area which lies immediately below the tip of the foresight. Possibly, in a very elementary stage of training, Mr. Russell's device might be of considerable value, and if it increased the proportion of shooters who aim with both eyes open, it would no doubt serve a useful purpose. In the course of time the shooter would have trained his "master eye," and then the device would no longer be necessary. In the case of those shooters who are so very much stronger in their left eye than in their right eye, it is a question whether it would not be preferable for them to close the left eye entirely rather than use it even to the limited extent permitted by Mr. Russell's obstruction.

Improvements in Military Equipment.—A very interesting article appeared in *The Times* of the 27th ult. regarding certain modifications in military equipment which the experience of the present war has shown to be necessary. Apart from the general points connected with the extension of the Kharko colour to all utensils and clothing carried, the bulk of the comments refers to matters connected with the rifle and ammunition. In the first place, it seems that an exposure of the rifle to the full glare of the sun for a period of twenty minutes is sufficient to heat the exposed metal on the sides of the action so as to render it too hot to handle. Another very important point is concerned with the stowage of the ammunition. The deadly nature of modern rifle fire necessitates the adoption of the prone position under nearly all conditions of fighting. The present form of pouch then presses uncomfortably against the ribs of the soldier, besides being underneath him where the cartridges are difficult to reach. This has given rise to the custom of placing a handful of cartridges on the ground ready for use, with the result that ammunition is likely to be wasted by not being collected before moving to another position. It also seems that when open, the pouch allows the cartridge to fall to the ground, even when stepping through wire entanglements or other obstructions. The use of the service rifle under ordinary conditions seems to be limited by the cut-off to single firing, so that a more handy system than at present exists for drawing cartridges singly from the pouch or other receptacle seems to be desirable. The cartridge-holder, whatever its form, must be equally handy when the shooter is in the prone position. No definite suggestions are put forward in the article referred to above, though the qualifications of the bandolier system appear to be most favourably considered. Perhaps, however, it will ultimately be found that we should have done better in the first place to have adopted a rifle applicable to the clip system of loading.

Liquid Air as an Explosive.—M. Axel Larsen is the author of a very interesting article in the January issue of *Cassier's Magazine* on the use of liquid air as an explosive in the blasting operations connected with the tunnelling of the Simplon mountain. M. Larsen's relation with the Carbonite Syndicate in its earlier days is a guarantee that he possesses the requisite knowledge for dealing with his subject, and on reading the article one is pleasantly struck with the simple language in which he has managed to clothe the scientific aspects of the problem he elucidates. Generally, his verdict is not one leading us to anticipate a very rosy future for liquid air combined with carbonaceous materials for use as an explosive. It seems that the conditions which obtain in the Simplon tunnel operations are exceptionally favourable to its use—in fact, not such as may be expected to recur very frequently in practice. It appears that the explosive is made up into cartridges six inches in diameter, and even with such a bulk as this their life is limited to the bare time that suffices for charging the hole and preparing the igniting arrangements. It is certainly possible to store the cartridges for about a couple of weeks in special receptacles, but the real test is concerned with the life of the cartridge after its swaddling clothes are removed prior to its use. It also appears that liquid air, in its explosive combination, is one of the most dangerous of all blasting agents. On ignition there is no certainty as to its action, and more likely than not it will burst into spontaneous explosion. Even nitroglycerin explosives are not so sensitive as this, so that we must regard this interesting scientific development of the refrigerator with more than ordinary caution. That its use is limited, at any rate for the present, to giant cartridges is obvious, since the smaller sizes would obviously deteriorate long before they could be connected up for the explosion.

The Krupp works are to be extended at a cost of somewhere about a quarter of a million pounds.

Professor E. H. Rennie, who for some time past has held the post of Inspector of Explosives to the South Australian Government, has given up this position. He is succeeded by Mr. W. A. Hargraves.

An inquiry was held at Elland, on the 10th ult., into the death of a clay miner, who was killed by an explosion of gelignite during the ramming of the hole. The evidence went to show that the explosive was in a frozen condition at the time of ramming, so accounting for its apparently undue sensitiveness.

A fatal accident, caused by the explosion of 38 lbs. of powder, occurred recently at the national harbour works at Dover. At the enquiry held into the affair the jury added a rider to their verdict to the effect that more adequate supervision should be exercised in connection with the blasting operations carried on at the cliffs.

A certain inventive and talented lady presented Lord Roberts with a bullet-proof shield prior to his departure for the war, and, naturally, received in reply a polite letter of acknowledgement. The shield consisted of a very thin plate of aluminium covered with sheep skin, and from the fact that the shield was seriously injured by a bullet from a saloon rifle, we can only imagine that Lord Roberts would rather trust to the proverbial pocket Bible for protection against bullets than to this shield. It is rumoured that Court influence has been solicited in order to bring the shield to the front. Possibly the lady inventor would be better advised if she confined her attention to portable warming pans and picnic equipment.

THE RIFLE CLUB MOVEMENT.

THE Volunteer movement had its first development in a time of panic, when complications abroad appeared likely to threaten the safety of our own country. From small beginnings, and in spite of official neglect, the Volunteer organisation has thriven amazingly, and in the hour of need its services have been requisitioned for the fighting of the country's battles. If we may judge by analogy, we are entitled to assume that the present popular movement towards the formation of rifle clubs throughout the country will equally brave the innervating influences of half-hearted or over-discriminating official support. Very few realise how bad the average marksmanship of our Volunteers really is. In order to express our own opinion on the subject, we should compare the proficiency attained by the average Volunteer as about equal to that acquired in another branch of sport, by an ordinary member of the community after his first week's tuition at a cycle school. It is at last beginning to be realised that rifle shooting, in many of its aspects, may be learnt at short ranges, and with rifles and ammunition not of costly character. In fact many of the essential arts of military shooting are better learnt under these conditions. It is the general custom to fire in the off-hand position at short ranges, and a very little experience soon shows that the best results are not obtained by pausing too long in aiming. As a rule the arm becomes fatigued, and steadiness disappears, while the shooter is innocently waiting until he can steady the foresight when in alignment with the bull. Surely the training which teaches a man to fire the moment he has properly aligned his sights is preferable in these days of magazine arms, to the method which allows practically unlimited time to the shooter, comfortably sprawling at full length on the ground. Rifle clubs, as an educational influence in shooting, will serve a useful purpose, and would, in an emergency, enable the country to make use of many who, in the ordinary way, would hardly be worth their keep as combatant soldiers.

The value of short-range rifle shooting, both alone, and as a supplement to long-range shooting, is so obvious to the class for whom this paper caters, that it would be waste of time to enlarge thereupon. The main question here to be considered is the lines upon which rifle clubs can be organised, so as to become not only a permanent institution, but a popular sport enjoyed by the many millions who have a vague, and in some cases, a definite longing to qualify as marksmen. As an amusement, carried on under cover, it would be second only to billiards, while conducted under conditions of somewhat longer range, it would take many into the outlying suburbs, where an afternoon pleasantly occupied in the open air, would appeal to a wide range of individuals. When one really looks round, it is astonishing how few openings there are in the vicinities of our large towns for occupying the mind, and breathing fresh air, in combination with a small expenditure. The more violent sports are necessarily put aside soon after manhood is reached, and golf appears to remain the only amusement at which old and young can meet on a common footing of equality and good fellowship in the enjoyment of a sport fascinating to all. But golf is seldom within the reach of the middle classes of restricted means, and the membership of any of our suburban clubs is confined to a well-

to-do body of comparatively limited number. Rifle shooting is not open to these objections. A guinea, or half-guinea, subscription per member, would defray the general expenses of any ordinary club, and still leave a fund available for prizes and other forms of encouragement to competitors. So long as heavy stakes could be avoided and gambling be discountenanced, the cost of an entire afternoon's sport in the way of ammunition and so forth, would not amount to more than two to three shillings. With the aid of local funds for the equipment of a ground, there is no reason why there should not be established within the next year some thousands of flourishing clubs.

The whole success of the rifle club movement depends mainly upon the attitude to be adopted by the Government. The National Rifle Association, as the accepted authority on these matters, will no doubt be in a position to exert considerable influence upon Government action. If the special facilities granted to clubs are to be in any way whatever limited to volunteers, then a very important source of strength will be lacking. Speaking from a very large experience of clay-bird shooting clubs, we are convinced that the backbone to rifle clubs will be a class of men who would not, for one reason or another, be eligible for the national defence. On the other hand it is among these that the more regular attendants of a club are to be found, and upon their efforts the success of a club will depend. Securing by their aid both social and financial support on the one hand, and regular attendance on the other, the existence of the club will be assured; and then it will form a centre of attraction to the younger men, who require competition and other inducements to become regular attendants in their turn at the club meetings. The middle-aged man who fancies himself as a rifle shot, is bound to wish to supplement his powers by trying all kinds of variations in his equipment. Different sights and different bores of rifle, varied loads of ammunition, all will be tried in their turn to secure the most perfect results; and in this way interest will never fag. The governing authority must be prepared to allow a fair margin of latitude in these respects, and must not attempt to bind the members down too much on the lines of military regulations. While artificial aids to shooting must not be allowed to develop into excesses, minor variations should be encouraged rather than checked. If the authorities can see their way to encourage rifle shooting on broad lines of toleration as regards details, then marksmen will be a self-educating and self-supporting class; but all the Government grants and all the patriotic encouragement of local bodies will not convert rifle shooting into a sport if its conditions are governed by too much red-book. Red tape is a bad thing in its way, but red-books will be worse if they occupy too prominent a part in the regulation of rifle clubs.

The Mayor presided at a meeting at West Hartlepool, and it was decided to form a local rifle club.

Mr. Walter Winans, the well-known revolver shot, is not inclined to favour the automatic pistol for use in warfare. He strongly recommends either the Russian model Smith and Wesson, or, for English regulation ammunition, the Colt cavalry revolver. These views have been quoted in the text of a letter written to *The Times* by Mr. E. Clementi-Smith, the honorary secretary of the Middlesex Rifle Association.

THE LATE MR. JOHN DENT GOODMAN.

IN the the person of Mr. John Dent Goodman the City of Birmingham has lost one of its most prominent citizens, and the gun trade one its admired leaders. He died on the 11th ult. from the after effects of an attack of influenza. The commercial and other interests of Mr. Goodman have been so numerous that his prominent connection with firearms is apt to fade into insignificance, and yet he has been for 45 years the head of the largest arms manufacturing concern in the



THE LATE MR. JOHN DENT GOODMAN

gun trade, his chairmanship of the Birmingham Small Arms Company entitling him to this distinction. Both in character and in appearance he was a true type of the English gentleman. Thoroughly straightforward and so kindly disposed to all, these virtues, combined with his ability, won for him the respect of everyone. Born in the year 1816 at Peterborough, he was partly educated in Birmingham, and definitely commenced business life in that town in 1831. His career was a series of successes from start to finish, and his mind seemed able to master the principles of all he undertook, not only in commercial lines, but also in educational, political and philanthropic movements.

Mr. Goodman's connection with the gun trade was of long standing. In 1828, while in the employ of a firm of merchants, he entered into partnership with Mr. J. R. Cooper, and, subsequently, with that gentleman's brother, Mr. Charles Cooper, the business being carried on at first under the name of J. R. Cooper & Co., and afterwards under that of Cooper and Goodman, until 1888. From an early period he took the lead

in matters connected with the trade. At the meeting held on March 15, 1855, to arrange for the promotion of the Act of Parliament establishing the Birmingham Proof House, he presided, and on March 10, 1856, at the first meeting of the trade held under the Act, he was appointed chairman for the year.

The year 1855 also saw the origin of the Birmingham Small Arms Company, with which, through all its vicissitudes, Mr. Goodman remained prominently associated. On the breaking out of the Crimean War, the Government being urgently in need of arms, called upon fourteen firms in Birmingham to furnish a supply. These firms subsequently became an association under the title of "The Birmingham Military Arms Trade," with Mr. Goodman as chairman. The association was succeeded in 1861 by the Birmingham Small Arms Company, whose works at Small Heath were opened in 1862. In 1873 the metal works at Adderley Park were purchased by the company, the manufacture of ammunition was added, and the company became "The Birmingham Small Arms and Metal Company." The company, in all its phases, has had Mr. Goodman for its chairman, his chairmanship counting from January, 1855, when the association, from which the company sprung, was formed, having extended over a period of 45 years. Owing to the irregularity of Government employment, the company experienced periods of depression, and during the five years, 1879-83, no dividend was paid. Mr. Goodman, however, never lost the confidence of the shareholders, and their faith in the shrewdness and capacity of their chairman and his colleagues has been justified by the flourishing position into which the company was ultimately piloted. In 1897 the shareholders showed their gratitude to their veteran chairman by presenting to him a costly service of plate.

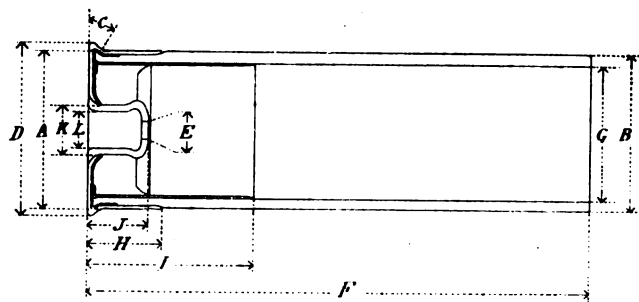
Mr. Goodman was naturally regarded as the chief authority on the Birmingham gun trade. He remained until his death an *ex-officio* guardian of the Proof House, and during his active connection with that institution, he rendered valuable services to the trade in several ways. The Corporation Museum of Arms was founded by him. In 1876 he obtained from the War Office a grant of seventy or eighty specimens of the arms of different periods, and a collection illustrating the various stages in the manufacture of the Enfield Rifle. Subsequently, the Corporation having no funds which could be used for the purpose, he induced his fellow guardians of the Proof House to purchase the valuable collection made by Cavaliere Callandra, a member of the Italian Parliament. The Museum of Arms thus formed was for some time located in Newhall Street, under the management of the Proof House authorities. In 1876 the collection was presented to the Corporation, and was exhibited for some years at Aston Hall. On the opening of the Corporation Museum and Art Gallery, the arms, with some modern examples, were placed in the gallery, of which they form one of the most interesting and useful features. On the British Association visiting Birmingham in 1865 and 1886, Mr. Goodman furnished to the handbooks then prepared valuable articles on the history of the gun trade.

When it is realized that the above summary of the late Mr. Goodman's work in connection with the gun trade formed but a relatively small part of his life's work, it becomes clear how great must have been his capacity and endurance. It is some satisfaction to feel that the connection of the name of Goodman

with the trade will be continued in the person of his son, Mr. E. M. Goodman, who has been a director of the Birmingham Small Arms Company for a considerable time.

GAUGING OF CARTRIDGES.

IN view of the great interest now taken in the promotion of a more exact system for gauging cartridges, we have obtained permission to reproduce the following figures and illustration relating to the dimensions of 12-bore cartridges. The figures form part of a specification which is being issued to manufacturers inviting tenders for a large quantity of ammunition.



	Highest.	Lowest.	Amount of Latitude.
A. Diameter under Rim	'809	'804	'005
B. Outside Diameter of Paper Tube	'794	'789	'005
C. Thickness of Rim	'072	'069	'003
D. Diameter of Rim	'880	'875	'005
E. Diameter of Flash Hole	'086	'084	'002
F. Length of Case	2'560	2'530	'030
G. Internal Diameter of Paper Tube	'727	'732	'005
H. Depth of Exterior Metal on Base	'375	'345	'030
I. Depth of Interior Metal Lining	'845	'815	'030
J. Height of Cap Chamber	'312	'292	'020
K. External Diameter of Parallel Part of Cap Chamber	'250	'245	'005
L. Internal Diameter of Cap Chamber	*	*	'001

Further requirement:—That the Rim D shall be concentric with the Brass Tube A within a margin of error of '003.

* These two dimensions to be arranged according to the existing practice of the manufacturer.

It was officially stated by Mr. Wyndham in the House of Commons last month that a minute inquiry had been made into the cause of the failure of Mark IV. ammunition at Bisley, and that, as a consequence, its manufacture had been stopped.

The shareholders of the Creusot gun works must be greatly benefited by the present war, for it is stated that the factory has received more orders during the last two months than during the previous five years. Montenegro and Spain are among the latest new names upon their books.

Mr. Patrick Henderson, a gunmaker of Dundee, was fined, on the 16th ult., for having kept gunpowder and cartridges on unlicensed premises. The same day his son, James Henderson, was also fined for a similar offence in respect to gunpowder and cartridges kept for sale in a shop at Overgate.

INCIDENTAL JOTTINGS.

WHO SAID "A RANGE?" To play upon words similar in sound but different in meaning is described as the lowest order of wit, but I feel sure of absolute when I explain that I am referring to the London County Council and its proposal to aid the Volunteers in finding ranges. This august body, which has been conspicuous by its apathy to military or patriotic matters, now pricks up its ears, and one may be forgiven for wondering whether it has not been deceived by the cry of every London Volunteer Corps for "a range." The London County Council has educated us into the belief that it is in a position to arrange all matters that concern a great city. Possibly it aspires to such an all-embracing monopoly that rifle arrangements come naturally within its scope. However, I will not enquire too deeply as to how it came about that it has now agreed to give its valuable aid. One naturally asks how the result will be attained? In taking a map of the county of London, in order to search for eligible sites, casual observation suggests that the only open spaces that are in any way suitable are already in use for the purpose—Wornwood Scrubbs in the west, Plumstead Marshes in the east, Wimbledon in the south; but the north—I give it up.

HOW WILL THEY ARRANGE? It has always been one of the most refreshing features of the County Council that no one can ever tell what it means to do, or how it intends to do it. If, by any chance, it can discover a "progressive" scheme, which will involve a sufficiently great expenditure of money, we may be sure that the Council will maintain its reputation. When the scheme is crystallized it will doubtless be unique in its originality. Perhaps it will prove to be the Blackwall Tunnel on Saturday afternoons or Sundays, though, perhaps, an even more progressive scheme may be mooted. For instance, the projected tunnel under the new boulevard connecting Holborn and the Strand, might be equipped for use as a shooting range, as well as for the accommodation of telephone, electricity, gas, water and other mains or services. I should suppose also that the works department might undertake to manufacture the necessary cartridges—doubtless of varying grades, from the mildest "Poplar" brand to the most violent "Battersea" cough drops. But should the Councillors use the ranges free? Well, yes, if they could be trusted with a loaded fire-arm, but from what we know of the average C. C., he would want nothing less than Howitzer firing for his lofty aims. Further, it would be necessary for the Chancellor of the Exchequer to waive his right for the ten shillings specified by the Gun Licence Act.

SHORT RANGE SHOOTING. A variety of opinions are ventilated as to the value of short ranges as a factor in the education of the rifle shot. Much may be said in their favour, on account of cheap cartridges being suitable for such work, and consequently that shooting is brought within the reach of many to whom money is an important consideration; but the great question is whether they teach anything beyond the drill. Can one become an efficient shot after a probationary course with the small rifles that would be used? My reply is, that if you practice with

an air gun in your back garden at cats and sparrows, you will learn a great deal more. You find out how to judge ranges and how to take aim at moving objects, which seem to me far more important than shooting at fixed ranges under abnormal conditions of target illumination and so forth. The same remark applies to ranges for full-sized ammunition. Every man knows the distance to an inch, and the target is stationary. As a good shot he may get 75 per cent. of bull's eyes at 1,000 yards, but of what avail is this in South Africa shooting Boers. Considering that a 1,000 yards Bisley bull's eye is 3 feet across, a marksman may, even with correct range and everything in his favour, miss the man he shoots at at a similar distance, when such shooting at Bisley might win a Queen's prize. Still, proficiency at Bisley must carry a man some distance in the direction of practical marksmanship, and while some forms of training are preferable to others, it follows, as a matter of common sense, that every kind of experience has its definite value as compared with the little or no experience which is now the common order of things.

REVISING SHOOTING CONDITIONS.

When all the world is talking of rifles and bullets, and smokeless powder and small-arm materials, why neglect that important factor, the man who stands at the back of the rifle. When the newspapers and gun-makers bring to our notice a discrepancy in sighting of the rifles, we throw up our eyes in pious horror, never thinking that out of an average of 1,000 gallant soldiers there are barely 50 to whom such a refinement can be of any value. It is a lamentable fact that rifle shooting is not what it should be, and, moreover, instructors of musketry (even this ancient name hangs on) are tied down by a code of rules, which does not permit any deviation. Surely some one ought to step out of the official groove and organize a system of training, which will be of greater value. The N.R.A. is in a difficult position by reason of its relations with the military powers, and the War Office would doubtless resent, by the withdrawal of its support, any innovations coming from this estimable body.

WHAT ABOUT THE TRADE? When a man wants to become a sportsman he goes to his gunmaker, who coaches him up in the elementary rules of shooting, and after that he takes a few courses at clay pigeons, and later is promoted to rabbit shooting or some other form of rough shooting of a similar character. That man learns that the object of shooting is to hit something every round. He knows, as a rule, whether he hits it, and this from personal observation. Further, he must adjudge his own distance and also the allowance for moving objects. Well! But what has this to do with rifle shooting, you ask. I say everything. After all, enemy are only big game at longer distances, and let all rifle aspirants begin as sportsmen do, and thus gain an intelligent interest in the sport, which in times of war becomes a very valuable asset. Go down to a rifle volunteer drill hall any night and see the recruits shooting their pitiful courses on the Morris range. I was a spectator for an hour so lately in a Midland city whilst the same farce was enacted. The poor recruits don't appear to know at "what o'clock" they hit. The number of marks alone are put up, and out of their five miserable rounds they are blindly shooting all over the target trying to find the bull's eye. Fancy this as a *training* compared with that of the sportsman!

**VOLLEY
FIRING.**

The military man who reads this will doubtless utter a supercilious smile [One cannot utter a smile.—Ed. *A. & E.*] and remark "Fancy an army of sportsmen shooting how and where they like!" Now a word as to the demoralizing effect on an enemy of the volley. Here you have a number of rounds, coming at an identical moment on a mass of men, the range is specified, so that all they have to do is to await the word of command and shoot as from one gun. What a lovely thing a diagram of a battle-field volley would be. The chances are that the range would be misjudged, and that all the lot would go wrong, unless we suppose that a proportion of the 50 per cent. or so who were not ready at the word of command might by accident deliver their moral effect at the right place. The conscientious marksman wants a second or two to "find" the alignment of the object he desires to hit. The Boers in their most deadly fusilades work like sportsmen. They shoot rapidly, but not in volleys, and every time they shoot they want to hit something, whereas Tommy Atkins is as proud as he can be, if his volley goes off in one instantaneous crack. As regards accuracy, well that, so to speak, is up another street.

CYCLOPS.

NOTES.

MINERS' SAFETY FUSE MATCHES.—Our attention has recently been called to the success which has followed upon the introduction of the miners' safety fuse matches by Messrs. William Bennett, Sons & Co., the well-known fuse manufacturers, of Cornwall. The match consists of a slightly cone-shaped tube, with a firing composition at the smaller end. The match is inserted thimblewise over the butt end of the fuse, so that the igniting mixture comes into contact with the fuse composition. The exposed end of the tube is then rubbed on the prepared surface of the match-box, and a slight spitting indicates that the fuse is alight. Ignition so obtained does not result in the production of flame, so that all danger of igniting combustible gases in the mine is obviated. This invention (Pope's Patent) should become widely used, in view of its cheapness and simplicity, combined with a certainty of action which compares favourably with the more dangerous methods where a flame is present.

MESSRS. ELEY BROS., LD.—The twenty-sixth annual general meeting of the shareholders of this Company was held at Cannon Street Hotel, on the 6th ult. Mr. Charles Eley presided, and, in moving the adoption of the report, said that the shareholders had reason to be gratified with the result of the past year's working. There had been an enormous increase in the price of materials all round, but, as he explained at their meeting last year, the Company had a large amount of stock on hand which had been bought prior to the advance. They had, therefore, saved the increased prices which had since had to be paid. Despite the greatly increased competition, Mr. Eley explained that the trade of the company had extended, and they were able to maintain the position which they had held for so many years. Mr. E. F. Quilter seconded the motion, which was carried unanimously. A dividend of 20s. per share, tax free (in addition to the interim dividend), was afterwards declared. A question was asked by a shareholder as to whether the Company had

derived any benefit from Government orders. The Chairman said they had a Government order in hand at the present time, but he could not say whether the Company would derive much benefit from it. He did not think the profits would be increased materially by this order, since the Company would be such heavy losers in connection with sporting ammunition as a direct result of the war.

WALKERS, PARKER & CO., LD.—The accounts of this company for the past year show a net trading profit of £18,696, which, added to the £12,410 brought forward from the previous accounts, makes an available total of £31,106. The directors do not declare any dividend out of this fund, but, on the other hand, there are cheering signs that the company is steadily improving its position, and will shortly be in a position to take in hand the clearing off of its arrears of cumulative preference dividends which rank in priority after the £350,000 of 4½ per cent. debentures.

RUBURITE EXPLOSIVES CO., LD.—The report of this company for last year shows a profit of £6,960, as compared with £5,264 last year. This provides for the payment of a further dividend on the cumulative preference shares which, together with an interim dividend paid in September last, clears up the arrears of cumulative dividend for the six months ended June 30, 1897. £696 has been transferred to the reserve fund, and £1,374 has been carried forward. The increase in the amount carried forward, as compared with the £24 of last year, is a precautionary measure connected with the enhanced prices of raw materials. The directors and other officials of the company deserve the sincerest congratulations for the manner in which they have tackled the serious position which arose as a consequence of the litigation in which the company was involved by the owners of the Bellite patent.

HARNESSING A NEW FORM OF ELECTRICITY.—A New York man, according to the *Army and Navy Journal* of that city, has invented an electric gun. The gun tube is wound with insulated wire, through which a current is sent, and magnetic attraction is thus set up progressively in advance of the projectile along the tube. The shot is thus drawn forward by a series of magnetic influences, each increasing the velocity of the projectile. The operation of such a gun obviously involves the utilization of a new form of electrical magnetism at present undreamed of in the philosophy of existing electrical engineers.

A MAUSER PISTOL DISPUTE.—A certain amount of mild amusement is at the disposal of those who care to spend an odd five minutes in reading the gun advertisements in *The Field*. In one column Mr. W. J. Jeffery advertises a certain type of short-range Mauser pistol, guaranteed of the latest pattern, and he offers it for sale at £4 10s. In another column Messrs. Westley Richards & Co., Ltd., who have been appointed sole agents for the Mauser automatic pistols, warn the public that the short-range pistols advertised elsewhere are not of the latest pattern, and, while recommending the standard variety at the price of £5 5s., they offer to supply the others at £3 10s. Mr. Jeffery suggests that no pistol is required for longer distances than 100 yards, while Messrs. Westley Richards point out that the long-range pistol is

accurate and effective for 500 yards when used with the holster which forms a stock for long-range shooting. The tangle is unusually complicated, but, presumably, sufficient information is placed at the disposal of the sportsman to enable him to arrive at some sort of a conclusion. Of course it is fairly clear from the earlier advertisements that Mr. Jeffery is regarded as having cut prices by offering a certain type of pistol closely resembling the one ordinarily in use at a large reduction on the price recommended to the trade by Messrs. Westley Richards. The latter firm, in due course, retaliated by offering the short-range type of pistol a pound cheaper than Mr. Jeffery's price, and it looks as though Mr. Jeffery will not come down to the rock-bottom terms, and so trade purely for the honour and glory of the thing. The whole incident only differs in detail from the old problem of exclusive agents controlling the market supplies of a weapon when there are possibilities of outsiders securing direct consignments from the manufacturers.

THE WAR OFFICE AND ITS TROUBLES.—The *Financial Times* regrets to notice that the Chinese War Office is almost as impractical as our own. To justify this statement an incident is quoted in which a German, engaged at a high salary to superintend the manufacture of smokeless powder, is the central figure. On his arrival in China he had to wait two months before he could commence work, but, when all the arrangements were complete, the authorities suddenly decided that they would not have a powder factory at the place originally decided upon, in spite of the fact that it was already nearly completed. The German was accordingly transferred to another town, where, presumably, he will have to cool his heels until another new factory is built.

MILITARY INVENTIONS.—Dr. A. Conan Doyle, the well-known novelist, is the latest advocate for the reform of that department of the War Office which deals with military inventions. As may be seen from our list of applications for patents appearing on another page, this gentleman recently applied for a patent to protect an invention relating to a method of calculating the angle at which to hold a rifle so that a bullet may be dropped into a trench at any given range. According to his letter in the *Times* of the 22nd ult., Dr. Doyle communicated with the War Office briefly stating of what his invention consisted. He received a formal letter from the Inspector-General of Ordnance in answer to his communication, informing him that the Secretary of State for War would not trouble him in the matter. Dr. Doyle says that his invention might be the greatest nonsense, or it might be epoch-making, but he certainly considers that he should have been given an opportunity of explaining or illustrating it. Even if the idea had been tried before, he considers he might at least have been informed of it. With all due deference to Dr. Doyle, we cannot help pointing out that general indications as to the scope of his invention would, of themselves, be sufficient to enable the Government experts to arrive at a decision. The bullet of the service rifle has a known angle of descent for every range, and it is quite certain that by aiming at the trench itself the ordinary sight would effect all that the rifle could be capable of performing. If, on the other hand, Dr. Doyle's intention is to fire the bullet nearly vertically in the air and allow it to fall into the trenches by its own

weight, then, of course, the invention would be the "greatest nonsense," first, because it would be absolutely impossible to estimate the travel of a bullet under such conditions, and second, because its velocity of fall would be too small to render it of material service if it did happen to strike as desired. It is rather the fashion to go for the Government at the present time, but it is the duty of those having more than ordinary knowledge to protect them when unjustly attacked.

CORDITE FACTORY IN INDIA.—The site upon which the new Indian Cordite Factory is to be erected has, at last, been definitely settled. It is situated in the Arvenghat Valley, among the Neilgherry Hills, and the ground and its surroundings are admirably suited for accommodating such a factory. A large waterfall is situated not far away, and this will provide the necessary power for driving the turbines, and thus actuating the dynamos for providing electricity with which the factory will be installed for motive and lighting purposes. It is estimated that the factory will take about three years to build and equip, and the machinery necessary for the manufacture of Cordite will be purchased in England. At present the '303 cartridges are made in India, but the bulk of the Cordite has to be imported. The Government factory at Waltham Abbey cannot supply it in sufficient quantities, and orders, have, therefore, to be placed with private firms. This is rather costly, so that when Cordite is manufactured in India its Government will effect a great saving; and this is not the only advantage that will accrue to the Indian Government, since the equipment of the native troops in the near future with the '303, using Cordite ammunition, will create a big fresh demand for this explosive. It is to be hoped that manufacturers in England will be able to make up the deficit by an increase of orders for home consumption.

THE NATIONAL RIFLE ASSOCIATION.—The annual report of the National Rifle Association shows an improving state of finances by a surplus on the year's work of £535, which has been carried to the credit of capital account. The winter general meeting, which took place on the 28th ult., was presided over by the Duke of Cambridge, who showed his usual keen interest in the doings of the Association. Some discussion took place with regard to the altered conditions in the Queen's Prize, whereby the shooting at 200 yards will be done in the standing position at a 12-inch bullseye. Major the Hon. T. F. Freemantle was able to give excellent reasons for the adoption of the change. Reference was made during the course of the proceeding to the energetic steps which are being taken by the N.R.A. to promote the formation of rifle clubs throughout the country, and it was announced that the special sub-committee would be shortly prepared to issue the set of model rules for the guidance of such organisations. In the course of his speech, Sir Henry Fletcher, the chairman of the Association, referred to the efforts which he and others were making to secure a relaxation of the provisions of the Gun Licence Act, in favour of properly-organised clubs. He put forward excellent reasons for the belief that the Chancellor of the Exchequer would be able to carry out, to the satisfaction of the Association, the promise made in the House—that he would carefully consider the available means for securing the exemptions generally asked for.

ROUND THE TRADE.

Nobel's Explosives Co., Ltd., have registered the word "Kolite" as a trade mark.

Mr. William Richards, gunmaker of Preston, is interesting himself in the formation of a rifle club.

During the past month extensive alterations and additions have taken place at Messrs. Osborne's premises in Great Scotland Yard.

Several firms in the trade are becoming quite alarmed at the accumulation of orders for South Africa, which cannot be shipped until the termination of the war.

Sir John R. Heron-Maxwell, for many years Chairman of Messrs. F. Joyce & Co., Ltd., has just lost his wife. Great will be the sympathy extended to the genial baronet.

The Bisley Rifle Meeting opens on Monday, July 9th, and the I.B.S.A. Championship Meeting will be held at the London Sporting Park on the five days following Whit Monday.

In the midst of the agitation for more suitable rifle ranges for our Volunteers, we notice the Crystal Palace Company is organizing competitions at their practice grounds at Sydenham.

The flotation of H. J. Hussey, Ltd., New Bond Street, W., is now, we understand, an accomplished fact. The directors are Messrs. Arthur Stanley Wilson, H. Harris, and H. J. Hussey.

It is announced that a licence to manufacture high explosives has been refused the De Beers Co. It is generally supposed that this arises from the opposition of the Bond influence in South Africa.

Although the war is more particularly affecting the firms engaged in the manufacture of Cordite, etc., we hear that most of the sporting powder manufacturers are fairly busy for this season of the year.

Ruby Brand is the latest addition to the ranks of the smokeless powders. One of its main fields of activity will be in connection with the Tom Thumb cartridge, which obviously belongs to the pygmy-parvo-dwarf-blagdonette category.

We understand that Part II. of "Sporting Guns and Gunpowders" will shortly be published. It will be remembered that this book contains extracts concerning scientific gun matters which have appeared in back numbers of *The Field*.

Mr. Charles Ingram Annan, of Glasgow, has been laid up with an attack of influenza, which followed from a cold caught during the Glasgow Championship Meeting. Although he is now much better, he is still unable to leave the house.

Messrs. G. G. Bussey & Co., the well-known manufacturers of gun cases, &c., have been exceedingly busy lately turning out a great number of revolver holsters, cartridge belts, and such like accoutrements for the equipment of the Imperial Yeomanry.

We are informed that the works where Cannonite is made, which are situated at Trimley, near Felixstowe, will be transferred at about the end of the present year to the site occupied by the Tonbridge Gunpowder Works, which are also the property of Messrs. Curtis's & Harvey.

Mr. Charles Ingram Annan recently organized a very successful shoot at the grounds of the Scottish Shooting School, and large contingents, taking into account the time of year, attended the meeting as representatives of England and Ireland, the birds and other apparatus giving every satisfaction.

On Wednesday the 14th ult., the Chinese Minister, when on a visit to Glasgow, inspected the extensive works of Nobel's Explosives Co., Ltd., at Stevenston, Ayrshire. On the following Friday he was conducted by Sir Andrew Noble over Sir W. G. Armstrong, Whitworth & Co.'s large arsenal at Newcastle-on-Tyne.

The date and objects of the Boer armaments seem to worry the Liberal Press a great deal, and Mr. Webley's experiences in Pretoria in 1894, and later, in 1896, have been generally

called into requisition lately to prove that it was between these two dates that the greater portion of their armaments were secured.

There is a certain automatic pistol known as the Browning. The Colt Company have the American rights and the Herstal Factory the European rights. Great Britain is apparently neither a European nor an American State; consequently there is considerable difficulty in deciding what arrangement to make with regard to this unfortunate omission.

A circular, signed by Messrs. D. J. P. Haines and C. W. Pike, informs various persons interested that the Edgbaston Inanimate Bird Shooting Gun Club is prepared to organize a rifle club, Messrs. Westley Richards & Co., the proprietors of the ground, being prepared to make the necessary arrangements if sufficient encouragement is forthcoming.

From all quarters we hear that the sporting gun trade is seriously affected by the present war. An article in the *Birmingham Argus* states that this year's business in sporting arms, following as it does upon the indifferent trade of last year, has caused great stagnation in this branch. The prospect is, however, cheering, since there are indications of a boom next year.

The Churchill's, father and son, have recently made their bow to the world in a new guise, viz., as big game shooters. They were called in as executioners of the celebrated "Charley," who ran amuck at the Crystal Palace. Four express cartridges of bore .450 did the trick, but it would require a game carrier of unusual dimensions to remove the proceeds of the day's sport.

Colt's Patent Fire-arms Manufacturing Co., of Hartford, Conn., has just received an order for 6,000 new revolvers, while, in addition, they have supplied 940 of their new service pattern to the Canadian War Dept. for the use of the troops proceeding to S. Africa. These little items, added to the big demands at the London house, referred to in our last issue, are keeping the works very busy.

It was stated in the course of a debate on the War Estimates in the French Chamber of Deputies, that General Deloye, who has re-organized the French artillery, has by a slight modification so much improved the French service rifle, as to give it a claim to be considered superior to any other rifle in existence. In about six months' time it is hoped that the new pattern arm will be in general use.

Messrs. Curtis's & Harvey, Ltd., have registered a trade mark which consists of a device containing a large diamond as the principal feature. The diamond is in the centre of an oval, and the words "Sporting Smokeless Gunpowder" surround it. Above the oval appears the name of the firm, and below it the Amberite device and other words. The complete design has evidently been prepared for use as a label.

We are sorry to hear of the death of Mr. M. Hitchcock, which occurred on January 18th, at Hartford, U.S.A. Mr. Hitchcock was at one time prominently connected with the Remington Arms Company, and later with Sharp's Pistol Company, but for the past few years he has been engaged in the manufacture of knitting machines. His daughter married Mr. H. F. L. Orcutt, of Messrs. Ludw, Loewe & Co.

When the Streatham detachment of the 2nd East Surrey Volunteers recently attended a church parade we came to the conclusion that Mr. Theodore Rigby is the tallest man connected with the gun industry. To maintain as far as possible the uniformity of the ranks the sergeant had grouped around him the six-footers of the corps, but even then one had a vision of a pair of shoulders standing out from a sea of helmets.

Messrs. Bentley & Playfair write to inform us, in reference to our Note in the last issue, that they are not going to give up their London premises at 60, Queen Victoria Street, E.C., and that they will continue at the same address under new management. Our Note was based on the fact that the show-rooms have for some time been untenanted, most of the furniture having been removed, two gun cabinets which remain having been sold or offered for sale by Messrs. Bentley & Playfair themselves.

LECTURES TO YOUNG GUN-MAKERS.

V.

RECOIL (*Continued*).

WRITTEN WITH THE COLLABORATION OF F. W. JONES.

In order to analyse the various factors of recoil it will be necessary to deal first with the conditions prior to the shot leaving the muzzle. In all the demonstrations which follow we must assume that the gun is capable of unresisted recoil—in fact, under such conditions as would exist if the gun were suspended by two strings attached to a beam some distance above the gun. The relations of recoil developed under these conditions will be considered subsequently in connection with recoil resisted by devices for holding the gun. The recoil due to the movement of the shot itself presents no particular difficulty, and it will, therefore, be necessary to turn our main attention to the powder gases. After ignition of the charge, and up till the shot leaves the barrel, we may assume that the products of combustion are of uniform density throughout the barrel to the rear of the bullet.

In order to arrive at a conception as to the state of the gases while they are propelling the shot along the barrel, we may consider a particular time at which the shot is in process of being ejected. Obviously, the gases nearest the projectile are moving with the shot, and at the same velocity as the shot, while the gases nearest the breech are moving backwards with the gun, and at the same velocity as the gun. In this way we realise that the column of gases in the course of its expansion finds, as it were, a vent in two directions—viz., forward in following up the shot, and backwards with the gun. It is clear that these two movements must be judged relatively with a fixed point not affected either by the movement of the gun or of the shot. If the two ends of the column of gases are moving in opposite directions, it is clear that, at any instant considered, there must be some intermediate position having no movement whatever in relation with the independent fixed point. For convenience we will call this the stationary layer.

In the annexed diagram (Fig. 1) we have illustrated the conditions described. The bore of the gun is marked m , and the shot n . The stationary layer is supposed to be situated where the dotted line o intersects the barrel. For the benefit of those who enjoy the study of mathematical problems we have demonstrated in Appendix A to this lecture a truth which we state here without further explanation. It is that at any instant during the passage of the shot up the barrel the momentum of the projectile, and that of one half of the powder charge, is equal to the momentum of the gun added to that of the other half of the powder charge. Here we have our old friend action and reaction are equal and opposite, but this time it is in more than ordinarily complex form.

Algebra will, however, do much to sort out the tangle. Therefore let

V = velocity of the gun in recoiling.

y = velocity of the shot.

M = weight of gun.

m = weight of shot and wads.

w = weight of powder charge.

It will be remembered that in the former lecture we set out a number of momenta representing the individual values of

the momenta of the materials ejected from the gun. These we referred to as $m \times v$'s. In other words, their value is the product of their mass expressed in pounds weight multiplied by their velocity. What we now want to do is to find the momentum of the powder gases in relation to the momentum of the shot, in order that by adding these two momenta together we may deduce that of the gun, which must be equal to their sum.

It will be remembered that in the previous lecture it was explained that since the gun is the only thing that moves backwards, its momentum must be equal to the added momenta of the materials ejected in a forward direction. This appears to be contradicted by our statement that a portion of the powder charge moves backward with the gun, and,

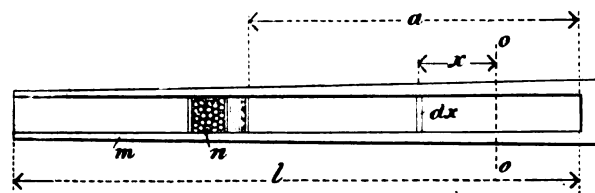


FIG. 1.

as a matter of fact, the contradiction exists. But we may justify our previous general statement by showing why we may ignore the momentum of that portion of the powder charge moving backwards with the gun. In the first place, its velocity cannot be greater than that of the gun, and as its weight, say 21 grains, is to that of the gun, as, say, one is to 2,500, we see that its momentum may be ignored in a value where the momentum of the gun is included. This exclusion only refers to the part of the powder charge moving backwards, for in the portion moving forwards we have very different conditions. First of all, the weight of 21 grains is not quite so insignificant when compared with that of a charge of shot. In fact, the weight of half the powder charge to that of the shot is about as one is to 20. Secondly, the velocity of the forward half of the powder charge, being governed by that of the shot, has considerable value from the point of view of momentum. Consequently, we may revise our general summary of the relation mentioned above by saying that the momentum of the gun at any time while the shot is still in the barrel is equal to the momentum of the shot (including the wads) added to the momentum of half the powder charge. Thus—

$$M \times V = \begin{array}{l} \text{(gun)} \\ \text{(shot and wads)} \end{array} + \begin{array}{l} \text{(half the powder charge)} \\ \frac{w \times y}{2} \end{array} \quad (5)$$

If we assume that the various values used in the above equation apply to the gun and charge at the moment when the shot is leaving the muzzle, it will be seen that we have obtained a statement for the recoil of the gun in terms of its momentum. This does not include the second stage of recoil, but it is important to realise that the first stage has been duly worked out. The arithmetical value of $M \times V$ follows from the values which practical experience or observation enables us to give to every letter used on the other side of the equation.

At this stage it will be useful to show why the column of air in the barrel need not be considered as a serious item among the materials driven forward in firing, and, therefore,

need not be taken into account in calculating recoil. The weight of a column of air, 30 inches long, inside a 12-bore gun, is about 4 grains, which is about one-hundredth of the weight of the shot and wads. Its momentum is, therefore, negligible in quantity, even if we assume the whole of it to be ejected at the same velocity as the bullet.

The consideration of the recoil due to such a minute movement is in no way complicated by the fact that the column of air probably exerts a greater resistance to the movement of the shot than would be the case if air were not elastic, because, were this so, its resistance to expulsion would be in proportion to its mass alone. But, as a matter of fact, we may be quite sure that the air exerts a resistance against the shot in excess of what is due to its weight. In other words, the air adjoining the shot is compressed, the shot being slightly retarded, and, consequently, a portion of the force of the powder gases is expended in overcoming such resistance. This compression of the air, and its retarding effect upon the shot would not affect recoil any more than any other form of resistance, such as the friction of the shot and wad against the barrel. Pressure which does not result in movement is not of account in recoil problems, because recoil is itself simply a kind of reflection or reflex action of other movements in an opposite direction. Having explained this point in such detail, the matter should not be dismissed without referring to a secondary influence upon recoil due to any resistance, which requires additional pressure by the powder gases to overcome it. The greater the pressure required to overcome various frictional resistances, and impart a stated velocity to a shot-charge of given weight, the greater, other things being equal, is the pressure of the gases at the moment when the shot leaves the muzzle. This additional pressure may be caused either by the powder charge being increased in proportion to the work required of it, or in an automatic manner by the more complete combustion of the grains. The higher the muzzle pressure the higher must be the velocity of the efflux of the gases, and hence the greater is the recoil in its second stage, viz., that of the "kick."

We now have a fairly accurate equation relating to the momentum of the gun and of the materials ejected at the moment when the projectile leaves the barrel, and it now remains to consider the additional recoil on the gun, owing to the self-expulsion of the powder charge.

At the moment when the shot leaves the muzzle the gases confined within the barrel are at a certain state of tension, which is manifested by their pressure. When the restraining influence of the shot is removed, the gases leave the barrel with a certain average velocity. The weight of the gases multiplied by this velocity gives us the momentum of the gases for the "kick" stage of recoil. Unfortunately, this velocity must, for the moment, receive the honour conferred on unknown quantities. We will therefore say let

$Z =$ the average velocity of efflux of the powder gases.

We may now express the momentum of the powder gases after the shot leaves the barrel as $w \times Z$. This completes our statement of the momenta of ejected materials. We will, therefore, re-write Formula No. (5) with the whole of the momenta shown.

$$M \times V = m \times y + \frac{w \times y}{2} + w \times Z \quad (6)$$

Elementary algebra tells us that this formula may be written in a simpler form as follows:—

$$M \times V = m \times y + w \left(\frac{y}{2} + Z \right) \quad (7)$$

It will be seen that we have enclosed within brackets the value for half the velocity of the powder charge at the moment when the shot reaches the muzzle added to the velocity of the powder charge on its exit from the muzzle. The sum of these two amounts has obviously a certain value, and it will be convenient, for the moment, to drop the use of the sign Z , and deal for a time with a fresh sign representing the value of Z , combined with the other quantity shown in the brackets. Therefore let

$A =$ this combination.

It will be seen that the value A refers to a sort of combined or average velocity of the gases representing their movement, both before and after the shot leaves the muzzle.

We will now re-write the last formula replacing the values shown in the brackets with our new symbol A . Thus:—

$$M \times V = m \times y + w \times A. \quad (8)$$

It should be mentioned that this formula is in general use for the purpose of demonstrating the factors upon which the momentum of the gun depends. The value of A is the only item on the right hand side of the equation, which cannot be directly ascertained by measurement. If we could make an experiment for the purpose of ascertaining the velocity of a gun free to recoil, then, knowing its mass or weight, we could obtain the value of $M \times V$. Then, with this knowledge at our disposal, we could find the value of A , since all the other items on both sides of the equation are available in the form of numerical values.

But a knowledge of the value of A would not aid us much in calculating the amount of recoil under diverse conditions, such as different lengths of barrel, different methods of loading and different kinds of powder. We know, as a matter of course, that the value of A would vary if any of these conditions (and, in fact, others as well not mentioned) be altered. Since one of the main objects of recoil calculations is to find means of ascertaining the precise effects upon recoil of every one of these factors individually it is clear that when they are inextricably mixed it would be quite impossible to estimate the effect of any single one of them.

By a close examination of all the conditions which might be expected to govern the value of A , it might be possible to secure reliable means of treating all the factors except the one varying with the particular powder used. Every powder has its peculiar characteristics of combustion, expansion and progressive cooling, and it would be virtually impossible to obtain a value representing these features, such as could be used in recoil calculations. Experiment here comes to our aid. If we satisfy ourselves that we have correctly treated, from the point of view of recoil, such factors as the effect of length of barrel, then we can make up a formula, of which the only quantity which would remain unascertainable might be expressed by a sign, the value of this sign varying for every powder. Having our formula expressing recoil under these conditions, experiments would provide us with the value of $M \times V$, and then knowing all the other values in the formula except the powder factor, the latter could be ascertained. Experimenting, say, with Schultze powder, the value of the special factor so obtained should be accurate for all

other calculations where this powder is used. By comparing the values of the formula under varied conditions, and checking the answers with the results of experiments, we have ready to hand a means of proving the sound basis of the calculations, by the aid of which the formula is made up. In other words, we fill in the sign applying to Schultze, and calculate a number of examples, and we test the result with experimental records. If we find that the formula gives a near comparison with the experimental results, then we may be fairly certain that the formula will be equally true for other calculations that we have not the means of checking. Such a factor, sign or value is known as a constant.

We must now add two fresh signs for explaining a new law, which is worked out in Appendix B. Therefore let

- p = the pressure, expressed in atmospheres, of the powder gases at the moment when the shot leaves the muzzle.
- a = the volume of the gun barrel in cubic inches.
- A_1 = a fresh constant to correct the result according to the powder used.

Appendix B shows a method of stating the value of Z , which, as before mentioned, expresses the average velocity of efflux of the gases. We, therefore, put forward without further explanation here, the following rule, which is best expressed algebraically:—

$$Z = A_1 \times p \times \sqrt{\frac{a}{w}}$$

The values on the right-hand side of the formula giving the average velocity of the efflux of the gases, have only to be multiplied by w the weight of the powder charge to obtain an equation for the $M \times V$ of the powder at the "kick" stage of the recoil. We will, therefore, replace the letter Z used in Formula No. (6), with the more detailed expression of its values shown above. The formula for the total recoil of the gun in terms of its momentum, thus becomes

$$M \times V = m \times y + \frac{w \times y}{2} + A_1 \times p \times w \times \sqrt{\frac{a}{w}} \quad (9)$$

If this formula is carefully examined, it will be seen that the whole of the signs on the right hand side, with the exception of the signs $A_1 \times p$, may be put down in figures obtainable from measurements of a simple character. The value of $A_1 \times p$ can be secured by experiment, and the "constant" so obtained, should be correct for all calculations referring to the same powder.

So far we have dealt with recoil in terms of its momentum, viz., the product of its velocity and weight. Now it is fairly clear that momentum must be regarded as only a means to an end, because the term carries with it the implication that the recoil is the same whatever may be the relative values of mass and velocity, so long as the product of the two is equal. The difference is, however, very important, because when we increase the mass of the gun, we reduce its velocity of recoil to a corresponding extent. Conversely, when we reduce the weight of the gun we similarly increase its velocity of recoil. Now we know that the momentum of the shot is about two-thirds that of the gun the remaining one-third belonging to the powder gases, and yet we are quite certain that there must be a much greater difference than is suggested by this proportion between the movement of the shot and that of the

gun, since we know that the shot in its movement is capable of producing effects such as are beyond the power of the gun in its recoil. A charge of shot would blow a hole in the shoulder of the shooter, while the gun recoiling against the same spot produces no serious effects. The difference which exists is the difference of energy. Thus, although in the case of a 12-bore, the gun has the greater momentum, yet the energy of the shot is about 40 times greater than that of the gun.

It was shown in our second lecture that, while the energy of a moving body is directly proportional to its simple mass or weight, it is proportional on the other hand to the square of the velocity. We need not labour a point already so fully explained, which is to the effect that if we interchange the velocity and weight of two moving bodies, their energies will not remain the same. In the case of the gun we have a low velocity and a heavy weight, while with the shot we have small weight and high velocity. The formula described in the second lecture for expressing the movement of bodies of known weight and velocity in terms of their energy is as follows:—Energy of a moving body

$$\frac{\text{weight or mass } (w \text{ or } M) \times \text{velocity squared } (v^2)}{2 \times 32.2 \text{ (2g)}} \text{ ft.-lbs.}$$

In the case of the recoil of a gun, we have found a means of arriving at the value of its movement expressed as the product of its mass or weight and its velocity—in other words, its $M \times V$. To derive the energy represented by the $M \times V$ of a body, we need first of all to know its mass or weight, and if we divide $M \times V$ by M the answer is V , the velocity of recoil. Then, if we square this velocity, and multiply by M and then divide the whole by $2g$, we have converted momentum into energy. Expressed algebraically, our calculation is as follows:—

$$\text{Energy} = \frac{\left(\frac{M \times V}{M}\right)^2 \times M}{2g} = \frac{(M \times V)^2 \times M}{M^2 \times 2 \times 32.2} \text{ ft.-lbs.}$$

The calculated value of $M \times V$ in the only form in which it is available to us has been shown in Formula No. 9. Consequently, we must insert the values there shown in place of the $M \times V$ in the above formula. Then we have a complete equation, expressing the recoil of a gun no longer in terms of momentum, but in terms of energy. Thus—

$$\text{ENERGY OF RECOIL} = \frac{\left(m \times y + \frac{w \times y}{2} + A_1 \times p \times w \times \sqrt{\frac{a}{w}}\right)^2}{M \times 2 \times 32.2} \text{ ft.-lbs.} \quad (10)$$

For fear of misunderstanding it should be explained that the M on the top line has been cancelled by the conversion of M^2 into M on the lower line.

There are many virtues about formulæ. In some respects they are similar to snap-shot cameras. You press the button and the formula does the rest. Applied to the case in point, it is clear that in the alarming-looking formula above there is nothing more complicated than simple addition and multiplication. It is preferable to understand the principles upon which the formula is constructed, but, in the absence of such knowledge, it may still be used to work out the result, which

is available to anyone who will deal with the signs and values according to the instructions contained in the formula itself.

We will conclude the second lecture on recoil by showing the real meaning of Formula No. (10), in the construction of which we have been patiently engaged. First of all, the signs $m \times v$ are products of the mass and velocity of the shot, the momentum of the shot thus contributing its due value to the recoil of the gun. The signs representing the weight of the powder-charge, multiplied by half the velocity of the shot, give us the momentum of the powder-charge up to the time when the shot reaches the muzzle. The only complication about this value lies in the fact that we take the velocity of the powder gases as half that of the shot. Appendix A shows how complicated a matter it is to explain this truth satisfactorily to the mathematical mind. Fortunately, to the lay mind the truth is equally obvious. At the moment when the shot has reached the muzzle the powder gases are evenly distributed over the entire length of the barrel. Their centre of gravity is obviously in the centre of the distance along which they are distributed. Since the centre of gravity of the shot-charge has travelled from the cartridge to the muzzle during the time that the centre of the powder-charge has moved from the cartridge to the centre of the barrel, it is clear that the shot has moved with twice the velocity of the powder. We are justified in regarding the centre of gravity of the powder-charge as in the middle of the barrel, because some parts of it have not moved at all, and still remain in the cartridge, while others have moved the entire distance travelled by the shot. The various intermediate portions of the powder gases balance one against the other, so as to produce the average movement represented by the assumption that the net result of all these movements is equal to half that of the shot.

The remaining series of values represent the $M \times V$ of the powder gases after the shot has left the barrel. The sign A_1 may be taken as representing the elasticity or power of rapid expansion of the powder gases when they are free to fly out of the muzzle. It is obvious that this value must vary with different powders. For instance, we might have water at an enormous pressure, and yet when the compression is removed the water would expand to only a trifling extent, while air at the same pressure would expand to many times its original volume. It is the same with powder gases. The products of combustion of gunpowder are largely solid, as is indicated by its smoky qualities. Since the solid particles of smoke would not expand on being released from pressure, it is clear that the expansion of the gaseous part of the products of combustion would not have the same power as a similar amount of gas not containing solids. Secondly, it is well-known that, in expansion, gases become cooled, and consequently their power of taking up heat from surrounding bodies is largely augmented. Since the powder gases have a high temperature, and a large amount of their pressure is due to their temperature, it is clear that the cooling effect which accompanies expansion produces a further contraction of their volume. These inter-relations of expansion and cooling are impossible to trace in theory, and consequently we must seek the aid of practical experiments to give us a value which will properly represent the sum total of their effect, such as will be accurate for any particular powder under consideration. The sign p refers to the pressure of the powder gases at the moment when the shot leaves the muzzle. This, again, is

subject to such an intangible series of actions and re-actions that we must again take refuge in a constant. Therefore we rely upon experiment to give us an accurate value for $A_1 \times p$. It should be understood that these views are not put forward as absolute scientific facts, but rather they are intended to give some idea of the difficulty of arriving at exact values, so justifying the employment of constants.

The sign w represents the weight of the powder charge, and its presence needs no further explanation because the sign for weight must enter into every calculation of momentum. The values so far noted are multiplied by the square root of a fraction, the numerator of which a is the volume of the gun barrel, and the denominator w the weight of the powder charge. A little consideration will show that this fraction takes into account the effect of the form of the gun barrel upon recoil. Naturally, the "kick" element of recoil will diminish with the increasing volume of the barrel, produced either by lengthening the barrel or using a larger bore. This is because a large volume of barrel provides for a greater expansion of the gases, and hence a lower pressure at the moment when the shot leaves the muzzle, and the lower the muzzle pressure the lower the velocity of efflux of the gases. Equally simple is the fact that the greater the weight of the powder charge the greater will be the amount of powder gases in the barrel, and hence the higher their pressure. The fraction is, therefore, a simple manner of taking into account the fact that the amount of recoil due to the efflux of the gases is oppositely affected by the volume of the barrel and the amount of the powder charge. The accuracy of the arithmetical processes adopted in the formula must be taken for granted by those who are not prepared to follow the series of mathematical reasonings set forth in Appendix B. The object of squaring the values shown within brackets and dividing by $M \times 2 \times 32.2$ in order to convert momentum into energy, has already been explained so clearly that any attempt to summarize the reasons already given for the procedure would result in useless repetition.

If gunmakers will cultivate the patience to devote time and intelligence to the clear understanding of what has been explained in such detail, they will succeed in mastering the difficulties surrounding the due appreciation of problems of recoil. These difficulties present themselves to him throughout his career in so many forms that it will surely be worth his while to get at their root principles. Once that is accomplished the subject will present but little further difficulty. In our next lecture we shall show the bearings of our recoil formula upon a number of practical conditions connected with variations of loading and so forth, such as will show how useful is intelligent theory when applied to the elucidation of practical problems.

(To be continued.)

APPENDIX A.

After ignition, and until the bullet leaves the muzzle, we may assume that the products of combustion are of equal density throughout the barrel to the rear of the bullet. Referring to the diagram (Fig. 1) and the various factors for which signs are given, we may suppose that the base of the shot at the instant considered, is distant a from the breech. Then obviously the stationary layer is

$\frac{y}{y+v} a$ from the projectile and $\frac{v}{y+v} a$ from the breech. Now consider a layer dx situated between the stationary layer o and the bullet and distant x from the stationary layer. Its velocity will be $x \frac{v+y}{a}$ its mass $\frac{w}{a} dx$ and its momentum $\frac{w}{a} \frac{v+y}{a} x dx$. The

sum of all these elements going with the projectile up to the muzzle equals:—

$$\frac{w}{a^2} (v + y) \int_{x=0}^{x=\frac{y a}{v+y}} x dx = \frac{w}{2} \frac{y^2}{v+y}$$

Similarly the sum of the momenta of all the gases going with the gun will be

$$\frac{w}{2} \frac{v^2}{v+y}$$

The algebraical sum in the direction of the projectile will be

$$\frac{w}{2} \left(\frac{y^2}{v+y} - \frac{v^2}{v+y} \right) = \frac{w}{2} (y - v)$$

Consequently at the time when the projectile is just leaving the muzzle we have

$$M V = m y + \frac{w}{2} (y - v) \text{ or } \left(M + \frac{w}{2} \right) V = \left(m + \frac{w}{2} \right) y$$

Ignoring $\frac{w v}{2}$ we obtain Formula No. 5 of the lecture.

APPENDIX B

If the atmospheric pressure outside the muzzle of the gun is taken as constant during the emission of the products of combustion, and if the temperature of the products in the barrel is regarded as constant during emission than the velocity of efflux (Z).

$$Z = \sqrt{\frac{p-1}{2g \Delta \rho}}$$

Where g = acceleration due to gravity (say = 32'2)

Δ = density of products in barrel

$$\Delta = \frac{w'}{a}$$

and other signs as noted in the lecture.

$$\text{Therefore } Z = 8 \sqrt{a} \sqrt{\rho} \sqrt{\frac{p-1}{w}}$$

and the momentum

$$Z w = 8 \sqrt{a} \sqrt{\rho} \sqrt{\frac{p-1}{w}} w$$

In a gun, however, p and w vary as the products are ejected. At the moment when the projectile leaves the muzzle we have the pressure and charge in barrel p and w respectively. At a later period when, say, a layer dx, distant x from the breech reaches the muzzle, these terms become p' and w'.

We can assume, without any serious error, that p-1 varies direct as w, consequently during emission the ratio $\frac{p-1}{w}$ remains constant, and the value of Z thus varies directly as \sqrt{p}

Consider again the element dx when it arrives at the muzzle, we have

$$\text{its velocity} = 8 \sqrt{a} \sqrt{\frac{p-1}{w}} \sqrt{p} \frac{x}{l} \text{ and its mass} = \frac{w'}{l} dx$$

$$\text{The momentum thus} = 8 \sqrt{a} \sqrt{\frac{p-1}{w}} \sqrt{p} w' \frac{x^{\frac{3}{2}}}{l^{\frac{3}{2}}} dx$$

and the integration of all these elements where x varies between l and 0.

$$= 8 \sqrt{a} \sqrt{\frac{p-1}{w}} \sqrt{p} w' \int_l^0 x^{\frac{3}{2}} dx$$

$$\text{or } Z w = 20 \sqrt{a} \sqrt{\frac{p-1}{w}} \sqrt{p} w$$

Without serious error we may put p-1 = p, and Z then becomes approximately.

$$Z = 20 p \sqrt{\frac{a}{w}}$$

or making it exact by multiplying by a constant

$$Z = A_1 p \sqrt{\frac{a}{w}}$$

CORRESPONDENCE.

"RIFLEITE" TRIALS.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—Your correspondent, when reviewing the above trials, evidently intended to take a course of his own. In doing so, however, he appears to have overreached himself, and in some respects may have misled your readers. It is for this reason I should like to make a few observations, if you will kindly allow me a little of your valuable space.

In the first place there could be no doubt in the minds of the readers of the report that the trials were made mainly to see whether "Rifleite" cartridges would be deleteriously affected by storage under any climatic condition. It was not a question of "Rifleite" versus "Cordite," and the information thrown on the behaviour of the latter powder, under certain conditions, was altogether incidental and by the way.

As your correspondent states, it is essential that the reader should understand the ballistic data, and in the light of recent press criticism, the data seem to have presented no difficulties, except to your correspondent. To him the world of ballistics is evidently small, and gyrates very closely round Woolwich.

It was because the reader was not left to assume that the reading of the observed distance (whatever that may mean) might be 90 feet, all velocities were corrected to the muzzle. As a matter of fact each station observed the velocities over different ranges, and had observed velocities been stated, the report would have been complicated and unintelligible, as one and the same velocity at each station would have been represented by three different figures. It was, however, really immaterial for the purpose of these trials, whether the observed or muzzle velocity was given. All that was necessary was to show the difference from test to test, so that as long as some uniform method of stating the velocity was adopted, the purpose of the trials could be followed out.

Your correspondent also makes the curious statement that muzzle velocities are "relics of bygone days," but surely he cannot have expected either you or your readers to accept this as correct. It is true that experimenters using the same chronographs and the same range, do not take the trouble to express their results in muzzle velocities, when dealing with the same cartridge, but the world is larger than your correspondent imagines, and there are other cartridges than the British Government '303, and many other chronographs built and engraved for other ranges than 180 feet.

Powder makers and cartridge loaders, who are not tied hard and fast to Woolwich, and desire to be understood by their foreign correspondents, always take the trouble to express their results in muzzle velocities by the usual tables.

In the report in question, trouble was taken to make the figures intelligible to all, whereas, according to your correspondent, the experts who signed the report ought to have apologised for having adopted a course outside the official groove.

I suppose, too, it would have been too much to expect your correspondent to attempt to ascertain if the average muzzle velocities were really within the Government specification for '303 cartridges. Bashforth's tables must surely be among the classics of his library, along with Horace and Homer.

At our Barwick factory, where the range is 180 feet, and in other respects the same as at Woolwich, the average observed velocities of the standard cartridges were

Rifleite	...	1,943 f.s.
Cordite	...	1,980 f.s.

both within the Government specification.

A little investigation would have saved much, but then your correspondent would not have had any "straw" men to destroy.

Your correspondent is equally at sea with regard to pressures. It must be news to him to learn that base pressure taking is the exception rather than the rule, both in and out of England. Moreover, experts, who would know, tell him that England is the last place to which they would look for scientific details re pressures, and that they would never accept as final our military authorities' views, even if exhaustively settled.

It was an object of the trials to decide on some fixed method of testing, and the Woolwich crushers and base system were suggested for adoption. Your correspondent says the interested firms *must* and *do* follow this plan. The report infers they ought but do not.

As will be gathered from the rules attached to the report, so-called 15-ton crushers are not compressed enough. The 13-ton crushers your correspondent suggests should have been used, would have been greater in error according to scientific views on pressure taking, and they have nothing to recommend them except that the trials in this respect would have followed the usual service form. This is a great consideration in the eyes of your correspondent, but fortunately for the value of the report on the trials, had no great weight with the experts who undertook the tests.

I am, yours faithfully,

THE SMOKELESS POWDER AND AMMUNITION CO., LTD.,
L. G. DUFF GRANT,
London, Feb. 27, 1900. Secretary and Manager.

DYNAMITE SHELLS.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—My attention has been drawn to a paragraph in your current issue referring to that portion of my invention which refers to the safe projection of high explosives in shells, fired from ordinary guns, with the usual service charge of powder. The rifled shell, smooth bore gun, and so on, are quite supplementary, and not necessarily connected with the question of the bursting charge in the shell. I have fired over 250 shells of various kinds from guns, rifled and smooth, large and small, and the bursting charge was in every case gelatine or gelifinite, with never a single premature. I am ready to do the same thing now should I be allowed. Your remark that "possibly the Government has decided to bar nitro-glycerine bursting charges, and so take advantage of the experience of more open-minded powers, who have spent money in arriving at the same decision," reminds me of that fox who barred those grapes which we have all heard of.

Neither this Government nor that of any other country can, at the present moment, fire gelatine, nor even dynamite, under my conditions. But one or two Powers that I could name are "open-minded" enough to give me a trial; and the results will be seen by and by.

It is within the knowledge of those "in the know," that the British Government, some time ago, tried their level best, aided by the highest experts, to accomplish what I have done, only to be met by failure and the destruction of guns. Fox and grapes again! "He tried and tried and tried in vain." My opinion, backed by my own experience and that of many others I know, is that the War Office has one formulæ for all offers, "Not suitable, &c.," and when the weary inventor gives up the struggle and allows his patent to lapse, the Authorities pounce upon his *unsuitable* idea and work it gratis.

Yours faithfully,

31, Woburn Place, W.C.,
17th February, 1900.

T. R. R. ASHTON.

REVIEWS.

The Blasting of Rock in Mines, Quarries, Tunnels, etc. By A. W. and Z. W. Daw. Published by E. & F. N. Spon, London. Price 15s.

A recently issued circular came into our hands, showing us that, by some curious oversight, we had not before come into contact with this useful handbook on blasting. Although we are upwards of a year after its first appearance, we hasten

to set right the omission, as we feel it a bounden duty to keep our readers duly informed as to the appearance of any new literature on this subject.

The work appeals especially to the engineer, the miner, and the quarryman, and the intention is to formulate simple rules, showing the most economical and effective modes of applying explosives to rock-blasting work. It is astonishing how exactly the lines of resistance of rock and its lines of fracture may be worked, and how usefully this knowledge can be applied to the effective placing of the boreholes.

Although it must be recognised that the authors treat their subject purely from the engineer's point of view, at the same time a certain amount of technical information has been introduced regarding the different types of explosives and their use. It is generally evident that they have made a careful study of this side of their subject, and have adopted the very wise course of placing themselves in touch with the leading manufacturers in the line. The result is a freedom from petty technical errors, and a sense of proportion regarding the explosives noticed. As a rule, space has not been wasted over the description of explosives which have hardly passed the laboratory stage, and the result is that the information given is direct and to the point.

Mémorial des Poudres et Saltpêtres. Tome X. Officially Issued by the French War Office. Published by Gauthier-Villars, 55, Quai des Grands-Augustins, Paris. Price, 13 frs., post free, from the Publisher.

A new volume of this classical publication has recently been issued. If the reputation of France as a country of exact methods of research into explosives and their properties rested upon no other proof than the periodically-issued volumes of this *Memorial*, even then we should have no option but to accord to our neighbours a front position in the science.

The present volume, like its predecessors, contains a number of articles of extreme interest to scientific workers in explosives. Unfortunately, the highly mathematical treatment with which all matters are approached, very much limits the classes to whom the volume can appeal. But many of us find life too short to spend hours with pencil and paper patiently following the series of mathematical reasonings upon which the ultimate conclusions are based. In a sense, it is clear that somebody must keep in touch with the higher developments of the scientific portions of an industry. Such persons are few, and there is but little need for a regiment of them. Their use to the world, as it occurs to us, is to reason out and reduce to exact laws the conditions which practical developments bring to the front. Few inventions are achieved by pure mathematics, and yet invention would probably be checked in its progress if our scholars of science ceased their labours.

If approached in this spirit there can be little doubt that the 90 pages devoted to "The Resistance and the Mode of Construction of Ordnance:—Deformation of the Gun in the vicinity of the Obturator" is profitably laid out. A good many practical workers are labouring to overcome the numerous difficulties which constantly arise in the manufacture of ordnance of ever-increasing power and rapidity of fire. Having carried the design up to a certain point, the mathematician tells them why they have been successful, and where they have unknowingly struck upon the correct, or nearly correct, way of doing a thing. The practical man is very pleased to

hear how scientific he has been without knowing, and having been educated up to the principles upon which his latest development works he is able to find practical remedies for any little weaknesses that develop, and so gather force for another leap into darkness. We admit that mathematical formulæ are seldom so bad as they appear, but roughly speaking, and granting our ability for the task, our fee for reading, marking, learning, and digesting the 90 pages of Col. Gossot's and M. Lionville's article on ordnance would be somewhere about fifty guineas. One would in the ordinary way require a comfortable fortune to be able to indulge in these studies from pure love of science.

And yet it is a curious thing that Vieille's and Sairau's contribution to the internal ballistics of shot guns which appeared in the *Memorial* some years ago, has been the guiding star of most of our practical researches aiming at the improvement of our guns and our smokeless powders. Even the lecture on recoil, which appears in another part of this issue, is to a large extent inspired by their work. The late Mr. Allport was never tired of expressing his appreciation of their studies, and he founded many of his conclusions upon the laws they formulated.

We have somewhat digressed from the precise lines of a book review, and consequently we must return to actualities. Not being in a position to do adequate justice to the contents of *Tome X.* of the *Memorial* within the space at our disposal, we will conclude this notice with the headings of the chief articles of interest other than that already referred to. They are as follow:—"Velocities and Pressures of Different Charges of Smokeless Sporting Powders." "Nitrification of Cellulose." "Enquiry into Accidents resulting from Delayed Explosion of Charges of Grisonnite in Mining Operations." "The Underground Storage of Dynamite in Mines."

APPLICATIONS FOR PATENTS.

JANUARY 13,—FEBRUARY 17, 1900.

946. Fire-arms. H. Hawgood.
 947. Small-arms. J. V. Hulme.
 987. Double-barrel Guns. J. W. Fraser.
 1,019. Small-arms. C. Heywood and B. Gee.
 1,027. Fuses. F. L. L. Lefranc.
 1,080. Projectiles. H. C. Sanders.
 1,091. Apparatus for Conveying Explosives. W. Peck.
 1,122. Detection of Explosive Gaseous Mixtures. J. G. A. Rhodin.
 1,197. Fittings for Shooting Practice in Buildings. H. Kitchen.
 1,211. Lyddite Shells. C. E. Smith.
 1,338.* Small-bore Cartridges. W. Brand.
 1,363. Sword Knots. J. T. Musgrave.
 1,389.* Gas-checks for Ordnance. W. L. Wise. (Agent for *The Skodawerke Aktiengesellschaft*).
 1,390.* Breech-mechanism for Ordnance. W. L. Wise. (Agent for *The Skodawerke Aktiengesellschaft*).
 1,567.* Repeating Fire-arms. F. R. von Mannlicher and Otto Schönauer.
 1,616. Caps for Armour-Piercing Projectiles. A. Riechwald. (Agent for *Fried. Krupp*).
 1,629. Ordnance. H. V. Simpson.
 1,674. Range-Finder. W. J. and J. G. Harrison.
 1,716. Explosive Projectiles. W. F. Robitson.
 1,785. Shells. G. J. Wilson.
 1,853. Rifle Rest. D. McDonald.
 1,857. Rifle Sights. L. B. Taylor.
 1,860. Rifle Magazine Filler. E. F. Banfield.
 1,879. Armour Piercing Projectiles. A. Riechwald. (Agent for *Fried. Krupp*).
 1,883. Fire-arms. F. Tobisch.
 1,888. Explosive Factories. G. Beneké.

- 1,932. Recoil Reducing Apparatus for Ordnance. W. S. Simpson.
 1,942. Projectiles. C. H. T. Alston.
 1,953. Shells. W. G. Potter.
 1,995. Telescopic Sights. W. J. Jeffery.
 2,002. Fire arms. C. H. A. F. Lockhart-Ross.
 2,053. Brakes for Ordnance. A. Riechwald. (Agent for *Fried. Krupp*).
 2,069. Quick-firing Gun. C. F. Hengst.
 2,130. Manufacture of Ordnance. A. H. Emery.
 2,131. Manufacture of Ordnance. A. H. Emery.
 2,180. Loading of Lee-Speed Rifle. H. Greener.
 2,317. Foresights for Small-bore Fire-arms. C. S. Southin.
 2,348. Projectiles. G. H. Newell.
 2,349. Projectiles. G. H. Newell.
 2,350. Manufacture of Projectiles. G. H. Newell.
 2,358. Distance Fuses for Projectiles. G. Klumak.
 2,359. Fuses for Shell. A. T. Dawson, G. T. Buckham, and S. V. Dardier.
 2,386. Breech Mechanism for Automatic Fire-arms. H. W. Gabbett-Fairfax.
 2,392. Rifle Rest. W. S. Simpson.
 2,430. Detonation of Explosives. J. W. Weston and J. C. Hamilton.
 2,454. Direction of Rifle Fire. A. C. Doyle.
 2,490. Small-arms. C. Heywood and B. Gee.
 2,498. Back-sights for Fire-arms. J. B. Carslake.
 2,567. Range-finder. J. L. Crawford.
 2,600. Swords. F. M. Mole.
 2,616. Targets. J. Brightmore and F. S. Goodwin.
 2,626. Machine Guns and Mountings. W. S. Simpson.
 2,636. Gun Carriages. H. C. Sheppard.
 2,650. Single-trigger Mechanism. W. Baker.
 2,654. Targets. E. G. Peyton.
 2,681. Targets. F. G. N. Mills.
 2,728. Aerial Torpedo. J. Karstairs.
 2,735. Rifle Sights. E. H. Parsons and L. B. Taylor.
 2,766. Time Fuzes for Projectiles. H. H. Lake (Agent for *Ramus-Hagbart Quæsting, Norway*).
 2,768.* Projectile. J. Simmonds and A. Peniston.
 2,776.* Guns. J. F. Meigs and S. A. S. Hammar.
 2,777.* Gun Carriages. J. F. Meigs and R. P. Stout.
 2,778.* Gun Carriages. J. F. Meigs and R. P. Stout.
 2,779.* Gun Bearings. J. Strauss.
 2,852.* Machine Guns. F. M. Garland.
 2,882. Automatic Fire-arms. C. H. R. Clausius.
 2,912. Fire-arms. W. Fogge and The Henry Rifled Barrel Co., Ltd.
 2,960. Small-arms. O. Jones.
 2,982. Wad-punches. J. S. Beeman.
 2,993.* Rifle Sights. F. Cavill.
 3,002. Projectile. J. Shaw.
 3,007. Rifle Practice Apparatus. W. T. Blanchett.
 3,027.* Automatic Small arms. T. Schouboe, S. C. Jensen, and C. H., and A. Christenden.
 3,053. Rifle Sighting. A. F. Downey.
 3,066. Magazine Rifles. E. Talbot.
 3,088. Single-trigger Mechanism. C. O. Ellis and E. W. Wilkinson.
 3,125. Miniature Target Practice. W. J. Jeffrey.
 3,165. Small-arms Attachment. H. Hallows.
 3,206. Ordnance Rammers. Sir W. G. Armstrong, Whitworth & Co., Ltd., and C. H. Murray.

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

JANUARY 13—FEBRUARY 17, 1900.

- 1,246 (1899). **Machines for filling cartridges into feed-belts.** J. Ramsey and Charles Salmon, Erith. In two former specifications (Nos. 19,227 of 1891, and 4,349 of 1896) a machine was described for filling feed-belts with cartridges of that kind in which a paper-covered bullet is employed. A difficulty was experienced with the machine, inasmuch that, on thrusting the cartridge into the pocket of the belt, the paper often got stripped from the bullet and collected near the mouth of the cartridge. The present patent deals with a loose tube, which is employed to work in conjunction with the pocket-opener attached to the machine. The tube remains in the opened belt pocket after the opener has retired and receives the bullet, thus preventing the edge of the pocket damaging the paper. Accepted Jan. 6, 1900.

- 2,663 (1899). **Worm gears for training guns.** Vickers, Sons and Maxim, Ltd., Sheffield, A. T. Dawson and G. T. Buckham, London. The worm gear for training guns is so arranged that, in case of accident, the worm can be detached, leaving the gun free to be trained by other means. The spindle of the worm is made in two parts, the ends of which meet in the middle of the worm. The other ends of the spindle pass through the bosses of bevel wheels, and are so arranged that the spindles must turn with the wheels. The turning of the bevel wheels turns the worm, and thus trains the gun. Should the worm gear be injured the two parts of the spindle may be withdrawn out of the worm by the loosening of two securing nuts. The gun may then be trained by other means. Accepted Jan. 20, 1900.
- 2,698 (1899) **Sighting ordnance at night.** L. K. Scott, Farnborough. A method of obtaining greater speed in the laying of ordnance at night by operating the search light, which was heretofore used separately, automatically with the line of sight of an automatic sight. The automatic sight referred to was described in former patents—Nos. 159 of 1894, and 7,584 and 18,731 of 1898. By this method the finding of the target and laying the gun are simultaneous. Accepted Jan. 13, 1900.
- 3,617 (1899). **The manufacture of the bodies of shells.** T. Smith, Aston. A method of producing the body part of shells of the cylindrical pointed type by a stamping process. A solid blank of steel or other metal of a suitable size and shape is heated to a certain temperature, and when in this state it is forced into a female die. By means of a conical peg or male die the metal is displaced in the centre of the blank, and is caused to fill up the sides of the die. A conical-ended hollow blank is thus produced, which is finished off by other operations, consisting principally in elongating the walls by rolling. Accepted Jan. 6, 1900.
- 4,338 (1899). **Breech mechanism of ordnance.** Sir W. G. Armstrong, Whitworth & Co., Ltd., and A. G. Hadcock, Newcastle-on-Tyne. A means of reducing the angle necessary to allow the cone on the obturating pad to swing clear of the breech opening, and also of shortening the length of the vent and the total length of the breech plug. This is performed by projecting the inner portion of the back end of the barrel rearwards, and by forming a corresponding recess in the front end of the breech block. Accepted Dec. 30, 1899.
- 4,617 (1899). **Apparatus for raising projectiles to turret guns.** A. T. Dawson, London, and J. Horne, Barrow-in-Furness. A method of transferring projectiles to the hoist from the places where they are stored by an overhead traveller, which conveys them to a truck or bogie travelling round the hoist trunk. The truck is provided with suitable gear, through which it can be operated by hand or other means. Accepted Jan. 6, 1900.
- 4,900 (1899). **Ball-bearing gun mountings.** Sir W. G. Armstrong, Whitworth and Co., Ltd., and R. Brankston, Newcastle-on-Tyne. A modified ball-bearing gun mounting, in which the principle is, that there is ready access to the balls, which may need to be cleaned or renewed. The underside of the carriage is provided with a vertical pivot, which fits into a socket in the fixed pedestal. The pedestal contains a groove in which the balls are placed, and the base of the carriage is of an oval form of such dimensions that a few of the balls are always uncovered. Accepted Jan. 6, 1900.
- 5,005 (1899). **Means for fastening the doors of torpedo tubes.** Sir W. G. Armstrong, Whitworth & Co., Ltd., and E. W. Lloyd, Newcastle-on-Tyne. In order to press the door against the end of the torpedo tube with great force, two semi-circular straps are used, which are hinged by means of a link at one end. The other ends are forced together by means of a lever, which is capable of exerting great force over a small distance through an adaptation of the "knuckle joint." Accepted Jan. 6, 1900.
- 5,349 (1899) **Range finding instrument.** A. B. Brown, Edinburgh. The adaptation of an ordinary sextant, with a particular form of gearing, to measure angles subtended by objects at a distance, the heights of which are known. The distances corresponding to the angles so found are read off on a graduated dial plate. Accepted Jan. 27, 1900.
- 5,557 (1899). **Disappearing targets.** H. Doerr, Dr. R. Arens, Germany. A target composed of some brittle substance, such as cement or earthenware, adapted to break up and disappear upon being hit. The target is hollow, and the internal space is completely filled with water, and the opening through which the water is poured is closed with a plug. When the target is hit the water displaced by the bullet, exerts a pressure on the walls, which causes the target to burst. Accepted Jan. 27, 1900.
- 5,707 (1899). **Electric fuses for firing explosives.** G. Smith and D. Corrie, Polmont. A simplified electric fuse. When used with a detonator, the detonator tube of copper is first charged with fulminate. Flashing powder is then introduced, and among this the electric wires are inserted, with the insulating materials covering them up to their ends. To secure the wires in this position the mouth of the copper case is compressed around them; but care is taken to keep the wires separated. Accepted Dec. 30, 1899.
- 5,760 (1899) **Manufacture of explosives.** W. J. Orsman, Gathurst. An explosive particularly adapted for use in dusty mines, which is composed of lamp-black thoroughly incorporated with di-nitro-benzole. This mixture is then compounded with about eight to twelve times its weight of dry powdered nitrate of ammonia. Accepted Jan. 13, 1900.
- 6,551 (1899) **Slings for lifting shells.** Sir W. G. Armstrong, Whitworth & Co., Ltd., and J. Honner, Newcastle-on-Tyne. In a former specification No. 16,655, of 1898, the present patentees described a band sling for shell. In place of this arrangement another form of sling is described, which is secured round the shell through the medium of eccentrics, embraced by straps on a plate carrying countersunk lugs adapted to enter holes in the other end of the sling. The weight of the shell secures the belt in its closed position. Accepted Jan. 27, 1900.
- 7,026 (1899). **A percussion primer for ordnance.** A. T. Dawson, London, and J. Parker, Dartford. The construction of a primer, which may be inserted into the charge in a gun, and fired by a blow. The front end of this primer is charged with some fine grain powder, and behind this is screwed an anvil piece having a central vent lined with meal powder. The rear face of this anvil takes the percussion cap, which is exploded by a striker secured against premature discharge by a thin wire. The wire is broken upon the striker receiving a sharp blow. Accepted Jan. 27, 1900.
- 9,040 (1899). **Automatic small-arm mechanism.** G. Luger, Germany. An automatic locking device for securing the movable barrel and the trigger mechanism of automatic small arms at the "safe." This device is spring actuated and always comes into engagement automatically. It is, at the same time, unnecessary to shift any slide to release it, as the pressure of the hand on the back of the butt when pulling the trigger performs this operation. Accepted Jan. 27, 1900.
- 16,734 (1899). **Automatic fire-arm mechanism.** F. R. von Mannlicher, Austria. An arrangement of that type of automatic fire-arm breech mechanism in which the powder gases, liberated through a hole in the barrel, operate the breech-bolt by means of a gas piston working in a gas cylinder. In the present arrangement the gas piston is enabled to effect the unlocking of the breech bolt by a push of such strength that, after a certain distance, the breech bolt is left to complete its backward travel under the impulse it has acquired from the push of the piston. By this arrangement the gas piston stroke is very much shorter. A loading strip for the magazine is also described. Accepted Dec. 30, 1899.
- 22,083 (1899). **Cases for packing ordnance ammunition.** E. Müller, Switzerland. A magazine arranged for receiving and carrying ordnance ammunition for use in the field. The magazine is composed of some such material as wicker, which is secured over a wood frame, the dimensions of which are suited to the size of projectile and charge which the magazine is intended to carry. By the use of this case the projectiles and charges are carried conveniently "in battery." Accepted Dec. 30, 1899.
- 22,479 (1899). **Automatic revolver mechanism.** G. C. Dymond (Agent for H. F. Landstad, Norway). An automatic revolver, having a cylinder with two chambers, each of which communicates in turn after each shot with the magazine containing the cartridges, which is situated in the butt of the revolver. The hammer mechanism is re-cocked automatically by the recoil, and the cylinder is revolved by the lifting of the trigger. Accepted Jan. 13, 1900.
- 23,498 (1899). **An expansible plug for mine shot holes.** J. Bovier, Belgium. A plug adapted for use in tamping shot holes. It is composed of a series of split cones made of wood, in which male or female wedge surfaces engage with one another forming a solid but expansible plug. The expanding or fixing apparatus consists of a screw tool, which is introduced into an aperture running through the centre of the plug. The turning of this tool jams the plug tightly up against the sides of the hole. Accepted Jan. 6, 1900.
- 23,529 (1899). **Driving bands for projectiles for ordnance.** T. R. and T. A. Bayliss, Lifford. A copper driving band,

which is adapted to contain a lubricant to be exuded in the bore of the gun in front of the driving band. The inside of the front edge of the band is cupped or chamfered, and into the cavity thus formed between it and the side of the shell the lubricant is placed. The pressure created between the bore of the gun and the band upon the firing of the shell, causes the lubricant to be squeezed out. Accepted Dec. 30, 1899.

- 23,585 (1899). **An indestructible flying target.** H. H. Lake (Agent for E. E. Thresher, U.S.A.). An indestructible bird target, adapted to take the place of live pigeons. This target is of the shape of a pigeon, and travels along a cable with its wings outstretched. When it is struck by shot the wings collapse, and the bird suspended then with its head hanging down continues its travel to the end of the cable. Accepted January 12, 1900.
- 23,954 (1899). **Detonators for fuses.** J. W. Fowler, New Zealand. A detonator, which is so constructed that it may be fixed to the fuse without fear of explosion. The nitroglycerin is placed in a well at the bottom of the cap, and it is so protected from friction arising when the fuse is forced into the top part of the cap. The cap is also covered with a shield of india rubber, which secures it to the fuse, and also protects it from explosion by concussion. Accepted Jan. 6, 1900.
- 24,425* (1899). **Safety bolts for Lee-Metford rifles.** L. B. Taylor, Birmingham, and E. H. Parsons, Bourneville.
- 24,561 (1899). **Apparatus for use in manufacture of gun-cotton.** L. Morane, Paris. All the operations of nitration, up to the time when the nitro-cellulose is placed into water, take place in one apparatus, which is described in this specification. The apparatus is provided with a ventilator, through which the acid vapours are driven into a condenser, and this arrangement prevents them escaping into the air of the work-room. The draining of the nitrated cotton and its removal to the press *a e* also obviated, and the work is rendered more rapid. Accepted Jan. 27, 1900.
- 24,640 (1899). **Cartridge clip for loading rifles.** E. Breuning, Germany. A clip for holding cartridges, in which each cartridge is held by a separate spring. These springs are stamped out in the bottom of the holder, and they exert an even pressure on the whole of the cartridges during their insertion and withdrawal from the clip. Accepted Jan. 13, 1900.
- 24,811 (1899). **The manufacture of schrapnel shell.** G. Roth, Austria. The chamber containing the bursting charge in schrapnel shell is usually made stronger than the rest of the shell to withstand the explosion. In order to get over the difficulties experienced in the manufacture of the thick walled casing, the present patentee places a series of shells, one within the other, until the required thickness of wall is attained. Accepted Jan. 13, 1900.

*This specification is described more fully under "Selected Patent."

SELECTED PATENT.

SAFETY BOLTS FOR LEE-METFORD RIFLES.

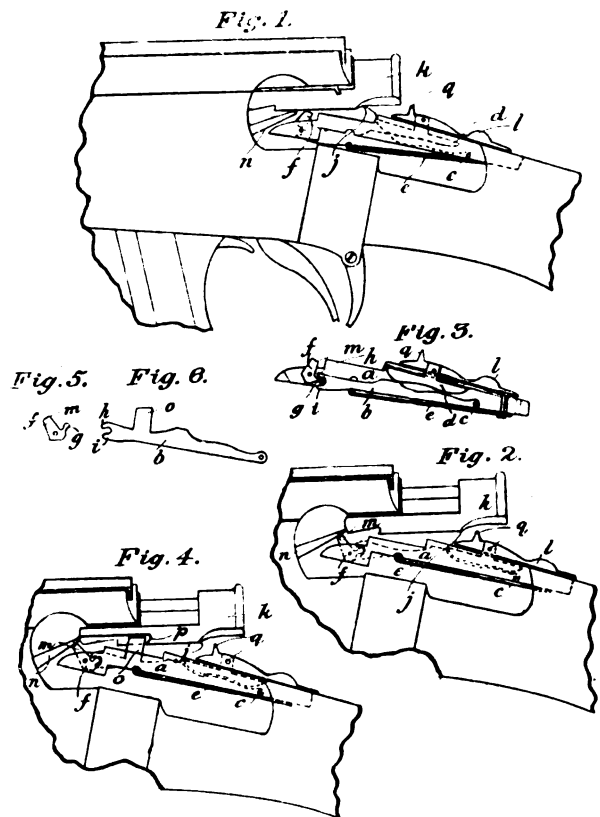
24,425 (1899). L. B. Taylor, Birmingham, and C. H. Parsons, Bourneville. In a former patent specification, No. 5,627, of 1898, the present patentees described a safety-bolt applicable to rifles of the Lee-Metford type. The safety-bolt mechanism referred to in the present patent is an improvement upon the older invention, for which it is intended as a substitute. The safety is situated on the grip of the rifle, and is operated through a thumb-piece. The breech bolt, in its backward travel to eject the spent cartridge, automatically pushes it back, and this movement locks the trigger mechanism.

In the annexed drawings, Fig. 1 shows the mechanism after the rifle has been fired, and Fig. 2 shows the position of the parts when locked. Fig. 3 is a sectional view of the mechanism detached from the rifle. Fig. 4 shows the safety bolt with a supplementary catch *o*, which works in conjunction with a bent in the cocking bolt, and Figs. 5 and 6 illustrate in detail the two principal parts of the mechanism.

The whole of this safety mechanism is contained on a strap or frame *a*, which is let into the top of the grip, as may be seen in

Figs. 1, 2 and 4, where part of the rifle is shown as cut away to expose the safety mechanism. The limb *b* works in the centre of the strap *a*, and is pivoted to the latter at *c*. The limb *b* is so arranged with the slide *d* that the backward or forward movement of the latter causes the limb to be raised or depressed according to the position of the sliding piece upon it. The limb *b* is always urged upwards by the spring *e*, which is secured to the underside of the strap *a*. The actual locking limb *f*, which is called the rocking bolt, is pivoted to the frame *a*, and its tail *g* lies within the forked ends *h* and *i* of the limb *b*.

Upon drawing back the breech bolt to open the rifle, the inclined under surface *j* of the cocking piece *k* comes into engagement with the projection *q* upon the thumbpiece *l*, which forces the latter into



its backward position as shown in Fig. 2. The backward movement of the thumbpiece causes the slide *d* also to assume a rearward position. The spring *e* is then enabled to exert its force and push the limb *b* round on its pivot into the raised position. This movement of the limb *b* actuates the rocking bolt *f*, which is revolved upon its pivot, and is caused to take up the position shown in Fig. 2, with its nose *m* beneath the sear *n*. The trigger mechanism is thus effectually locked. The rocking bolt is turned back to its original position by the pushing forward of the thumbpiece.

In Figs 4 and 6 a secondary and additional locking piece is shown. This consists of the upstanding projection *o* on the limb *b*, which is so arranged with the bent *p* cut in the cocking piece *k* that it prevents any forward movement of the cocking piece until after the limb *b* has been depressed by the sliding forward of the thumbpiece.

The safety may be rendered non-automatic by the removal of the projection *q* on the thumbpiece. With this projection out of the way the breech bolt does not come into contact with the thumbpiece in its backward travel. Accepted January 13, 1900.

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CURRENT TOPICS.

The Dispute between the Brothers Maxim.—To an impartial observer, the spectacle of two brothers engaged in a dispute for precedence can never fail to produce a painful effect; but in a case where the conflicting parties bear a name that is celebrated throughout the civilised world in association with the most famous death dealing machine known in any age, the unseemliness of the fraternal squabble is barely capable of adequate expression in words. Unfortunately, the apparently perennial quarrel now waging between Mr. Hiram Stevens Maxim and Mr. Hudson Maxim as to the priority of their respective claims in regard to the development of smokeless powders, seems impossible of settlement by either of the disputants. Each has selected certain well-known publications as vehicles for the prosecution of the controversy, and so far the matter seems to stand much as it was at the outbreak of the wordy warfare. Under the circumstances, friendly intervention from outside appears to offer the only complete solution of the difficulty; and it may even excite surprise that this simple method has not already suggested itself as a means of bringing the new Tweedledum and Tweedledee into agreement. There should not be any pressing need to adjudicate very closely as to the rival claims. Surely both sides might be induced to regard honours as easy, provided they were approached in the proper spirit. Whether or not our suggestion for a private arrangement be feasible, surely a still shorter cut to the desired end is open to one of the two parties, irrespective of the opinions of the other. A controversy carried on by a single individual would rapidly burn

itself out, and we are quite sure that the brother who first sees the desirability of ceasing to uphold his own claims for the approval of posterity would not suffer in professional reputation by so doing. At all events, it would be as well to bear in mind that a reputation, no matter how honourably acquired, cannot for ever stand firm against that most insidious form of undermining, in which the engineer is himself the possessor of the reputation attacked.

Newspaper Testimonials.—Once upon a time we were present at a press trial of a new machine gun, which completely broke down on account of what seemed to us to be defects of design. We consulted a fellow pressman as to the most desirable course to pursue in reporting the trial, and finally we asked him what he would do for his paper, and whether he would report events as they had happened. He explained to us that such a thing would be impossible, since some weeks previously he had committed his paper to the statement that if the Maxim gun had killed its thousands, this new gun would kill its tens of thousands. For the reputation of his paper he could not go back upon such a statement. This conversation returns to our mind on reading the article which appeared in the *Daily Mail* of the 13th ult., from which it appears that the representative came away convinced that in the Webley revolver British officers have a most serviceable weapon, and that there can, therefore, be no ground for the recent statement that many of them have discarded the Webley in favour of the Mauser. This is a rather inconsequent argument, and some people would term it a *non sequitur*. We also learn that experts are of opinion that the two weapons referred to cannot be fairly compared, as they occupy entirely

different fields of operation, the revolver being essentially a weapon intended for use at close quarters. Presumably, in the opinion of the experts, the Mauser is intended for other purposes than use at close quarters. We do not wish to be understood to give an opinion either way. We wish only to call our readers' attention to the above statements in order to compare them with the much advertised article in the *Daily Mail* of December 15, 1899, in which the following words occur:—"Mauser pistols, which we believe to be altogether superior to the Webley and other English revolvers." In its recent article, the *Daily Mail* representative apparently endorses the opinions of the experts after witnessing trials which "abundantly proved the efficacy of the Webley W. G. revolver." It is hardly our province to attempt to sort out this tangle of mutually opposite statements, but we feel it necessary to lodge some sort of protest against random assertions of opinion which are published to the world as though they were the well-considered and deliberately expressed judgment of one who, while competent to judge, has gone to the pains of mastering the facts. Such random assertions discredit the views of a paper which tries to express an honest and expert opinion on a matter of public interest.

Ball-bearing Guns.—We are frequently indebted to our American contemporaries for particulars of the latest thing in ordnance. The most recent example is the ball-bearing gun described by a Cleveland journal. The ordinary form of rifling is replaced by spiral grooves, in which steel balls are free to move in a longitudinal direction. We can hardly describe the arrangement as simple, because there are a number of practical difficulties in its application which rise to our mind, and the solution of which is by no means obvious. Still, one may forgive a daily paper for avoiding technicalities, and consequently we may devote attention to the results obtained from such guns. Unfortunately, our information will be of but little interest to Woolwich officials, who evidently know all about the gun, for we read that negotiations have been nearly completed with the Government of Great Britain, and that "it is within the range of possibility that actual field tests of the gun will be made in South Africa." The careful reservation of the writer entitles his statement to every credence. The gun will be an undoubted acquisition to our services, for do we not read that "so easily does the projectile start on its death-dealing flight, that the shock is reduced to a minimum." Possibly this is a little vague, but we return to definiteness when we hear that after the gun had fired 2,310 rounds, its loss of efficiency was only 3 per cent. Velocity results are not quoted, but in their place we hear that the range of the projectile has been increased 80 per cent. The ball-bearing system does not break down when the grooves are filled with sand, for it seems that, like emery on a bicycle chain, the grooves merely had a little better oiling. We do not desire to pose as cycling experts, but even so we must call attention to the use of emery as a lubricant for metal bearings.

The Regent Street Polytechnic is one of the first organizations to take an active interest in the rifle-club movement. A most successful club has been formed under the presidency of Sir Owen Roberts, 200 members already having been enrolled. The club is provided with an indoor range, and an outdoor range will shortly be placed at the disposal of the members.



THE GUNMAKERS' ASSOCIATION. GENERAL MEETING.

A GENERAL meeting of the Gunmakers' Association was held at Effingham House on Thursday, March 1st, 1900, and there were present:—Messrs. C. E. Greener (in the chair), H. A. A. Thorn, W. R. Leeson, A. H. Gale, and R. T. Woulfe.

MINUTES.—The minutes of the previous meeting were duly read and confirmed.

MESSAGES OF REGRET.—Messages of regret for non-attendance were read from Messrs. C. Rosson, W. Richards, J. Tisdall, C. Ingram Annan, John Rigby, and T. W. Webley.

CANDIDATES FOR MEMBERSHIP.—The following candidates for admission as members of the Association were unanimously elected:—Messrs.

Herbert John Blanch (J. Blanch & Son), London.

John Tolhurst Musgrave (Wilkinson Sword Co., Ltd.), London.

Charles Boswell, London.

Three other applications for membership were not quite in order, as the names of the proposers had not been arranged beforehand, and it was therefore decided to hold them over till the next meeting. It was also decided that the application form for membership should be remodelled so as to avoid any misunderstanding as to the formalities of election.

INDIAN ARMS ORDER.—The Secretary reported having received the following letter from the India Office with reference to the memorial which had been lodged with that department:—

The Secretary of the Gunmakers' Association.

SIR,—“With reference to your letter of the 29th ultimo, I am directed by Lord George Hamilton to inform you that a copy of the Memorial of the Gunmaker's Association, dated the 10th January last, will be forwarded for the information of the Government of India, who have now under their consideration the Rules affecting the Importation of Arms and Ammunition into India.”

I am, Sir, your obedient Servant,

(Signed) HORACE WALPOLE.

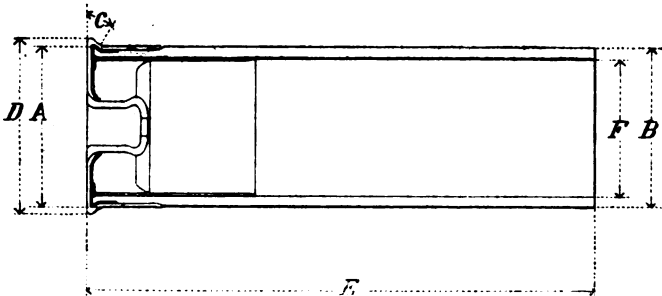
London, Feb. 27, 1900.

CORRESPONDENCE re BURST GUN.—The Secretary read a letter which had been addressed to the Association by Mr. R. King, of Norwich, asking whether the Association would be prepared to report as experts regarding a gun which had burst in use, seriously injuring him. The Secretary was instructed to inform Mr. King that the Executive reported only on matters referred to them for consideration by members of the Association, and to suggest that Mr. King should consider the advisability of securing the assistance of a member of the Association in bringing the matter forward.

CHAMBER GAUGES.—With reference to the resolution passed at the last general meeting that the Executive be instructed to consider a series of chamber and cartridge gauges to be recommended for adoption to the gun and

cartridge manufacturers, the Executive reported that the matter had been very carefully considered, and the following series of standard sizes had been arrived at :—

PROPOSED DIMENSIONS OF 12-BORE GUN CHAMBERS AND CARTRIDGE CASES.



	Minimum Gun Chamber.	Maximum Cartridge.	Minimum Cartridge.
A. Size under Rim...	... '811 inch	'809 inch	—
B. Front End of Chamber	'798 inch	'794 inch	—
C. Thickness of Rim ...	'074 inch	'072 inch	—
D. Diameter of Rim ...	'882 inch	'880 inch	—
E. Length of Case ...	—	2'56 inch	2'53 inch.
F. Internal Diameter of Paper Tube ...	—	'734 inch	—

It was also resolved to lay down that the rim should be concentric with the case, within a margin of error not exceeding .003 of an inch.

N.B.—It should be understood that the dimensions A, B, C, D, and F apply equally to cartridges and chambers exceeding in length the nominal 2½ inches.

The object of the Executive has been to define, in the first place, a series of minimum dimensions for the gun chamber and second a series of maximum and minimum sizes for the cartridge. The maximum sizes for the cartridge have been proportioned to the minimum chamber sizes, so as to provide a sufficient margin of difference to ensure free extraction of the cartridge cases. It will be seen that in no case is this margin less than .002 of an inch. The Executive have not yet been advised by the ammunition manufacturers how near they will be able to work to the specified maximum cartridge sizes; in other words, what allowance or latitude they require between the specified maximum sizes and the corresponding minimum sizes. It will be important to settle this before long, because the satisfactory chambering of a gun depends upon a knowledge of the smallest cartridge the gun will be required to shoot. The Executive do not consider it necessary or advisable to attempt to bind the trade down to a specified series of maximum chamber sizes, especially in consideration of the number of guns in existence which are used for 12-bore ammunition, and which, for one reason or another, have chambers much in excess of the sizes here recommended. When a gunmaker definitely knows the minimum size of the cartridge, he can see from the minimum size of the gun chamber what will be the greatest expansion that a cartridge falling within the specified limits of size can undergo in firing. He is then in a position to know how closely he must work to the minimum chamber sizes in order to secure reliable extraction of fired cases. The responsibility of the ammunition manufacturer, so far as regards the dimensions of his cases, will cease when he has conformed with the standard maximum and minimum

sizes. The gunmaker, on the other hand, will be able to ensure good extraction, because he will require to adapt his sizes to suit one case, and not several, as things are at present.

In the course of the discussion it was mentioned that 16 and 20-bore cartridges were in a hopeless state of variance, but the question of dealing with other sizes was not pressed, pending the settlement of 12-bores.

SPURIOUS GUNS.—The attention of the meeting was called to an apology, signed by Messrs. Lazarus & Sons, respecting an improperly-marked fire-arm. The text of the apology is as follows :—

Re MERCHANDISE MARKS ACT, 1887.

We hereby admit that the double-barrelled hammerless gun, sold to The Gunmakers' Association, of Effingham House, Arundel Street, Strand, London, at our Edgware Road shop, on the 18th day of December last, as **second-hand Rigby gun**, and having engraved thereon the name of "J. Rigby Maker, Dublin," is **not a Rigby gun**, and that the name so engraved thereon as aforesaid is a **false trade description** within the meaning of the above-named Act. We **apologise** for the offence so committed, which was done unknown to us, and hereby undertake not again to sell or expose for sale any gun so **fraudulently and improperly marked**, or to which a false trade mark or trade description has been applied.

The Gunmakers' Association are at liberty to **destroy** the said gun. We have **returned to them the price paid** for the same, and have also handed them a cheque for **Ten Pounds** to pay to the fund for the **Widows and Orphans** of Soldiers engaged in the present war. We also agree to **pay their Solicitor's costs**.

Dated this 5th day of February, 1900.

(Signed) R. LAZARUS & SONS,
86, Bishopsgate Street Without, E.C.

Witness:

REGINALD T. WOULFE,
37, Bloomsbury Square, London.
Solicitor to the Gunmakers' Association.

The above apology sufficiently indicates the nature of the offence committed and the lines adopted by the Executive for bringing such practices to an end. Reference was made to another case which is in process of development, and the hope was expressed that those firms whose names have been improperly used, and on behalf of whom the Association has taken action, will see their way to contribute towards the heavy expenses which have already been incurred by the Association in its efforts to stamp out the practice of fraudulently marking guns.

THE NEW PROOF BILL.—The attention of members of the Association was specially drawn to the provisions of the new Proof Bill, and several of the members appeared to be of opinion that there are a great many objectionable features in the Bill. A large portion of the gun trade, directly or indirectly, pays fees to the Birmingham Proof House for the proving of guns; and the existing Acts contain clauses for limiting the proof charges as nearly as possible to the bare cost of proving guns and carrying on the business of the Proof House. The new Bill seeks to remove these regulating clauses, and gives power to the Guardians to spend money, obtained for the proving of guns, on numerous objects not incidental to the work of proving guns. Among such openings for spending Proof House money may be mentioned the Birmingham charities, the collection and distribution of statistics, and the pensioning of aged or unsuccessful members of the Birmingham trade. As a matter of general principle, it appeared to the members present to be a wrong policy to tax

the trade as a whole by means of unduly high charges for proof, in order to benefit a single and limited section of the trade. It was therefore decided that the Secretary should issue, together with the minute of this meeting, a copy of "Arms and Explosives" for January, 1900, containing particulars of the new Proof Bill, and that the Secretary should invite the members of the Association to consider the probable effects of the amending Bill very carefully, and communicate their views thereon to the Association, in order that steps may be taken, if necessary, to deal in Parliament with such clauses of the Bill as may be considered detrimental to the interests of the trade at large.

CONCLUSION OF MEETING.—The meeting concluded with a vote of thanks to the Chairman for presiding.

THE SAFETY OF THE BICKFORD PATENT FUSE AND LIGHTER.

IMPORTANT PROSECUTION BY THE PROCURATOR- FISCAL.

A MINING case of considerable interest and importance was brought before the Linlithgow Sheriff Court on the 1st ult., by the Procurator-Fiscal, against Mr. Robert Thomson Walker, manager of the Kinneil Collieries, the charge being that Mr. Walker allowed two firemen, during the month of November last, to fire shots in a certain seam of the colliery which contained indications of the existence of a dangerous amount of gas, the method adopted for firing the charges not being "electricity, or other means equally secure." The real point at issue lay in the fact that Mr. Walker used the Bickford patent fuse and lighter, a speciality of the well-known firm of Messrs. Bickford, Smith and Co., Ltd., and the counsel for the defence, at the outset of the case, drew attention to this fact, and desired to narrow the issue to meet this particular attack.

Evidence was supplied by the first witness, a fireman employed by the Kinneil Coal Company on the day shift during the period mentioned, to the effect that, though he had written authority from the manager to fire shots during the months of October and November, no shots had, as a matter of fact, been fired in those months in the particular section complained of. Such shots as had been fired were effected by means of the Bickford lighter, which was used in every part of the mine. This form of lighter was provided by the owners of the mine, and had superseded the electric system some time ago.

At this point, the counsel for the prosecution stated his contention that where the electric system was employed it was less liable to abuse. That was to say, he maintained that the danger of unskilful handling was much reduced in the use of the electrical battery.

Continuing his evidence, the witness said that they had commenced the use of the Bickford lighter and fuse two years since, and had used the lighter continually and systematically during the intervening period, the experience being that it was always a perfectly secure and safe method of firing shots. He had worked for upwards of 60 years in mines, and had

seen and tried various forms of explosives and means of firing them. He believed that the Bickford lighter was about the safest thing he had ever used, and he had never seen sparks come out of the fuse and lighter when it was properly adjusted. Every system, if not properly handled, was dangerous, and he had never had any difficulty in so adjusting the Bickford fuse and lighter so as to make its use perfectly safe. The witness further chronicled a series of experiments which had been undertaken with a view to ascertaining whether an accumulation of gas could be ignited by means of a spark, such as might be given off by a carelessly-handled lighter, and, from the experience thus gained, found that there was no danger to be apprehended from sparks.

In view of the evidence given by this first witness, it became apparent that the original complaint, definitely locating the use of the Bickford lighter in one particular section of the pit, could not be maintained, and the counsel for the prosecution therefore applied for leave to amend his charge by changing the *locus*. After some discussion, the case for the prosecution was then closed on a point of law, and the Sheriff gave a verdict of "Not Guilty," with judgment accordingly.

Before the proceedings terminated, however, the counsel for the defence urged that this was a case which raised a very interesting scientific question, and both parties had probably been at some expense in bringing skilled gentlemen to speak of the relative merits of the two systems of firing shots. It was a matter upon which there was some controversy, and it was desirable to have it definitely and authoritatively settled. They should have been very glad indeed of his lordship's judgment on the matter after hearing the evidence, because, from information in his possession, he thought there could be no doubt of the safety of the Bickford fuse and lighter. But, in view of the difference which apparently did exist, he would suggest to his lordship whether it would not be well to make a representation to the Home Office that some investigation should really be made into the relative merits of the two systems, and so endeavour to have some order or regulation issued by the Home Office which might allay this controversy. In the order issued, the Home Office did not limit the method of ignition, as legitimate, to the electrical apparatus. The order expressed that there were other means which were equally secure against the ignition of inflammable gas. In point of fact, that was inserted as a result of evidence given before the Royal Commission in Mining, and the Bickford fuse, it was admitted, met this want.

The Sheriff, in reply, said that he would be very pleased to forward any representation, the terms of which, he presumed, could quite easily be arranged between the prosecution and the defence. He supposed that it was desired to have the matter settled in an authoritative way, and at the Home Office there were officials eminently qualified to settle it.

A meeting of gunworkers was held in Birmingham recently to protest against the passing of the Bill now before Parliament to amend the Proof Act. The gunworkers suggest "further amendments more in accordance with justice and equity for artisans of the trade." They think (1) they should have a hand in the management of the Proof House; (2) power should not be sought to expend money contributed by workmen and employer to the advantage of the latter; and (3) the clause dealing with the proposed addition of 25 per cent. to the cost of proving foreign-made guns, is inadequate to stamp out the practice of marking foreign guns with the English proof mark and selling them as English made guns,

THE BIRMINGHAM PROOF HOUSE RETURNS.

ACCORDING to the Balance Sheet and Statement of Accounts of the Birmingham Proof House for the year ending December 31st last, there is a falling off in the profits of £210, as compared with the preceding 12 months, the figures being £534 and £744 for 1899 and 1898 respectively. The total revenue for each of the two years shows no immediately corresponding difference, there being a variation of only £59 on this side, so that the disproportionate falling off in profit is almost entirely accountable to an increase of expenditure, one section alone, the rifle shooting range, causing a difference of £130, which is more than covered by a somewhat vague item, "incidentals," for £133.

There is a most remarkable falling off in the number of provisional proofs, which shows most strongly in the table given below. On the other hand, the number of definitive proofs have increased to an equally noteworthy degree, so that the total, while not equalling the totals of the two previous years, stand at a higher level than was attained in the four years prior to 1897. Following out the practice adopted on former occasions, the subjoined particulars show a comparison of several successive years, as regards the relative number of provisional and definitive proofs.

	Provisional.	Definitive.	Total.
1892.. ..	219,504	159,582	379,086
1893.. ..	212,694	122,577	335,271
1894.. ..	173,878	125,395	299,273
1895.. ..	182,514	146,277	328,791
1896.. ..	160,684	164,214	324,898
1897.. ..	176,535	225,580	402,115
1898.. ..	219,559	173,380	392,939
1899.. ..	63,251	312,262	375,513

It may be noted here that the Proof House authorities have this year adopted a new system in their classification of proofs which, if continued from year to year, may render an analysis of the condition of the gun trade in Birmingham far more easy to obtain; while, if the reader is to be placed in a position to gauge exactly how far the isolated details of 1899 differ from those of preceding years, a considerable amount of labour will be entailed. For our part, pursuing as closely as possible the same plan as was adopted last year, we give hereunder a table showing the classification of the provisional proofs under different headings, arranged side by side with the corresponding figures for 1898.

PROVISIONAL PROOFS.

	1898.	1899.	
Twisted Double and Single Birding and Rifle Tubes	69,760	48,302	decrease 30 %
Plain Iron and Steel Double and Single Birding and Rifle Tubes	14,791	9,906	decrease 33 %
Plain Iron and Steel Military Tubes	14,302	5,043	decrease 65 %
African Barrels	119,834	—	—
Unclassified in this Abstract	872	—	—

The classifications in the foregoing, for 1898, are distributed differently from those adopted last year, in order to meet the

conditions of the new classification placed on record by the Proof House. In each of the three items common to both years, there is a very marked decrease, as can be seen, while two items which appear under 1898, are blank as regards 1899. The unclassified proofs refer to single pistol barrels and toy cannons only, and are therefore unimportant as conveying any impression of the gun trade; but it is significant that the proofs of African barrels, which bulked so large in the figures of 1898, are entirely unrepresented in the later year. Nor can it be imagined that this item has, through the new system of classification, been permitted to merge into any of the three headings recorded for 1899, or, at all events, to such a degree as to show any appreciable effect in changing the results of comparison. It will be noted that after the total absence of African barrels from the list, the next most striking decrease is in respect to plain iron and steel military tubes, which show a falling off in number of no less than 65 per cent.

As regards definitive proofs the balance is well nigh restored, as the result of an altogether exceptionally busy year, the following table giving the necessary qualifications:—

DEFINITIVE PROOFS.

	1898.	1899.	
Muzzle-loading Twisted Single and Double Birding and Rifle Barrels	8,961	24,948	increase 180 %
Do. Plain Iron and Steel Single and Double Birding and Rifle Barrels	2,985	9,876	increase 230 %
Do. African Barrels	—	139,642	—
Breech-loading Double and Single Birding and Rifle Barrels	62,409	70,760	increase 13 %
Do. (Foreign)	2,825	2,532	decrease 18 %
Do. (Nitro-proved or proved with Nitros) (Supplementary)	5,641	7,102	increase 26 %
Military Barrels	11,367	4,508	decrease 61 %
Do. (Foreign)	7,246	6,935	decrease 5 %
Pistols and Revolvers	63,595	54,087	decrease 15 %
Unclassified in this Abstract	223	—	—

In this table it will be seen that a large number of African barrels have passed the definitive proof, as against none in 1898, and this item, therefore, more than counterbalances the transverse deficiency under the heading of provisional proofs. A striking increase is shown in the definitive proofs of muzzle-loading twisted barrels, and relatively, though not numerically, a still greater increase is manifest in muzzle-loading plain iron and steel barrels. The supplementary proofs, viz., nitro-proved barrels, or those proved with nitros, also show a substantial increase, and the same holds good with regard to breech-loading double and single birding and rifle barrels. All other items show a decrease, military barrels especially showing a marked decline of 61 per cent.

It is distinctly a matter for congratulation that the Proof House has seen the wisdom of revising the general scheme of its report more or less on the lines which have been repeatedly urged in this journal, and especially last year. To those interested in the gun trade, a report of this nature is naturally of greater or less value in direct relation to the clearness of its classification, and the facilities afforded for a direct and ready comparison of one year's figures with those of another. Perhaps it is not hoping too much if we foresee a time when the classifications contained in this notice, which have cost

some considerable time and labour in the making, may be capable of being transferred direct from the Proof House authorities' own report. The final report admittedly contains a certain amount of tabulated information over and above what is given in the balance sheet and accounts now under review; but if the final document, which will be issued some time hence, contains more comparative tables sub-dividing the different classes of barrels proved, there is no doubt that more useful information as to the progress of the trade would be given than is available for a publication not having access to the original figures from which the abstracts appearing in the balance sheet and accounts are built up.

INCIDENTAL JOTTINGS.

1900 AS A SPORTING YEAR.

Gunmakers will, I fear, deserve all the sympathy we can give them, now that so many shooting men are out at the front. It is hardly likely that the war will be over in time to make the preparations necessary for a successful season. Perhaps in some ways the breathing space afforded them will be of service in order to study the wants of the future range shooters, and form clubs, and to look into that important item of shooting—the cartridges. I have on a former occasion noticed how amazing it is that gunmakers spend so much time and money in perfecting and sighting their guns and rifles, but do not pay nearly as much attention to the cartridges, which have an important bearing on the ultimate result. I often wonder gunmakers do not institute a testing establishment of their own, and formulate standard velocities, pressures, recoil, &c. I am, of course, aware that some firms have divers sorts of testing apparatus, and, like their guns, all are excellent, but nothing is really standardised, since most things are governed by individual taste. Consequently the testing results are absolutely valueless for comparative purposes.

We are glad to see that Major F. L. Nathan is now comfortably installed as Superintendent at the Waltham Abbey establishment. It is only fair to the Government and to that officer that the experience he has gained during his years of assistantship should be turned to the best account, and we trust his term of office there may be prolonged for many years to come. The town of Waltham Abbey should prosper with the large amount of work at the factory and the three shifts of workpeople in 24 hours, which is now instituted in some of the departments. The old gunpowder factory, with its stately avenues of trees and well-wooded grounds, is a strange contrast to the bare Cordite works, with its brick walls, straggling pipes, and acid-perfumed atmosphere. It strikes one as an unwelcome change from that pastoral country. Cordite factories look more at home upon the sand dunes of Ayrshire or Cornwall, or the flat marshes of the Thames.

Whilst the budget is still in our minds, **PAY, PAY, PAY.** and the cost of the South African war is being counted up, it would be interesting to take a retrospective view of what the previous great wars have cost. England in the past 300 years has spent the trifling sum of £1,359,000,000 in extending her empire and building and maintaining her supremacy, to say nothing of

aiding, by armed assistance or otherwise, weak-kneed continental nations in squabbling over that time-honoured game, "The King of the Castle" in the European playground. If blood and gold are the price of a great nation, surely we have fairly paid our reckoning; and so after many years of comparative peace, if we are told that the millions we are now asked for, is a sum outside the benefits to be received hereafter, or suggest national ruination, we can estimate roughly the cost of these luxuries from some of the statistics of the last 200 years.

THE COST OF WAR.

At the commencement of the 18th century when fighting our much respected next-door neighbour in the war of Spanish succession, the Duke of Marlborough managed to effect a successful issue at a cost of £182,000,000, and 70 years later we spent £121,000,000 in the American War of Independence. A few years after, early in the 19th century, Napoleon spent £255,000,000 in quarrelling with the whole of Europe, whereas, in generous assistance with large sums of money and actual participation in thwarting France, this country paid out £831,000,000. In 1854, when England was fighting side by side with her old enemy in the Crimea, we spent £69,000,000, France £93,000,000, and Russia lost £142,000,000. The highest war expenditure, however, of modern times was undoubtedly that of the American Civil War, when the enormous sum of £740,000,000 was expended. The Franco-German war cost France £316,000,000.

A GOOD PROSPECTUS.

Can you wonder, therefore, that in the spring-tide of war the aspiring financier's thoughts lightly turn to arms and explosives. What lovely visions of untold wealth! He rushes round to his nearest statistical friend to find out what amount of material is required, to verify if possible his extravagant hopes. He finds that in the Franco-German war the Germans fired some thirty million rounds of small arm, and 363,000 rounds of artillery ammunition, and managed to kill or mortally wound some 77,000 sons of France. This seems rather a small amount of ammunition for so great a result, but he consoles himself with the thought that the Germans were splendid marksmen, and turns to the previous great war, which is the American Civil War. Here, at any rate, is something more encouraging, for the Ordnance Department, Washington, issued 782 guns, 2,360,000 equipments, and 12,000 tons of gunpowder, 4,022,000 rifles, and 1,021,000,000 rounds of rifle cartridges.

A DROP OF COLD WATER GRATIS.

It is often discussed how few manufacturers of war material and ammunition there are outside the Government to cater for the possible enormous requirements a great war would entail. There are only two rifle and two big gun firms; but the production of the latter is very great, and approximately some half dozen firms each making shells, cartridges, quick-firing ammunition, &c., have served their apprenticeship to the vicissitudes of Government procedure, and cheerfully accept the conditions of working at break-neck speed for part of the year and starving the remainder, unless they have a good business outside the Government requirements. But now the war brings as fresh recruits firms full of hopes and fine promises, quick deliveries, low prices and lofty ambitions; but alas! the sunshine of their

prospects is yet unobscured by the heavy clouds of inspection. I commend this to those who contemplate investments in new concerns—you may beat your swords into ploughshares, but you cannot beat your ploughshares into swords. You want special metal and machinery for that. The war will not last for ever, and then what will be done? It is not a question then of dividends, but how to clear interest on capital outlay.

Pity the sorrows of the "Correspondent" **EXPER(T)ENTIA** who commits the indiscretion of taking a **DOCET.** course of his own, and not following the eulogistic line taken by other papers upon the recent publication of trials of Smokeless Powder. With unobserved velocity he has brought upon his head the 15-ton side crushers of the interested Company. His cold standard criticism has been met with a "round," doubtless from the "hot" oven, which by now may have created a wish within him that all smokeless powder makers were in a constant hot climate, "from whose bourne no traveller returns." I shall, however, probably read this number to see whether the correspondent, undeterred by the force of a Bashforth argument, refuses to be muzzled, or whether, from the shelves of his classical library, he has studied the "meditations of Marcus Aurelius" with exhilarating doses from Dr. Watts before replying.

Have you read that column in last Wednesday's **THE TIMES** called "Cordite in a Hurry?" **IN A HURRY.** I recommend it to explosive experts as a curiosity. It retails how on board a ship the magazine caught fire, due to the spontaneous combustion of Cordite. Whether Jack Tar extinguished the tender flame with a fog horn, or flicked it out with his cap, is left for the reader to guess. The article then proceeds to show how, in the hurry to obtain Cordite, the Government buy anything of that name, which accommodatingly keeps its ballistic and chemical requirements until it has passed the tests, after which it sows its wild oats, eventually goes to ruin, and now is degraded and convicted with the crime of self-incendiarism. Having stated that "inspection is a farce" one naturally looks for the proof to follow, which is to the effect that so bad is some of the Cordite that the Government have actually rejected 30 per cent. of one manufacturer's supply! Can anyone help admiring such consistency? It shows that the open-minded writer was free from all prejudice, and was willing to see both sides at the same time.

Anyone who has run across that distinguished officer who presides over the destiny of submitted war stores will smile at the *Times* writer's nervous apprehensiveness. There is no individual who has done more to raise the standard quality of munitions than Colonel Hadden, the Chief Inspector. He knows exactly what is wanted, and takes very good care he gets it. Both Ordnance factories and contractors have learnt it is as easy for him to say "No" as "Yes," and his firm decisions indicate no middle course. Consequently he is looked upon with respect. Doubtless many have anathematised him freely to themselves after a disappointed interview, but all the same they all admire a "strong" man. It is, therefore, cheap criticism to assume that the inspectors do not understand their work, and that the

scientific staff of chemists at their disposal cannot detect impurities in Cordite, where, by the way, the very chemists, for whom the *Times* correspondent expresses praise, were once employed.

ANCIENT HISTORY.

Comment was freely expressed by those who attended the excellent lecture of Sir Andrew Noble at the United Service Institution, on account of the eulogistic tone in which two prominent chemists, who gained such notoriety at the time of the Cordite trials, were commended. To many who have carefully read the history of the invention of Cordite, the significant and possibly inadvertent omission of the late Mr. Alfred Nobel's name left a feeling of incompleteness. I also see in the article I have alluded to in the *Times* that the writer calls attention to a couple of unrewarded chemists who have saved the nation a round million. Why rake all this subject up again? The cost of the trials was possibly as great as the remuneration the Government was free to fix as a "reasonable offer." The day of reward to the inventor of Cordite is popularly considered to have gone past when Mr. Nobel died.

CYCLOPS.

NOTES.

F. JOYCE & COMPANY (LIMITED).—The twelfth annual general meeting was held on the 22nd ult., Mr. William Stacey presiding. The chairman, in dealing with the accounts for the year ended 31st December last, stated that the net balance available, including £488 brought forward, was £2,796. Ample provision had been made for bad and doubtful debts, which amounted to considerably more than in 1898, although they were not so large as in 1897. The item of investigation account was explained by the fact that Mr. Hobbs was nominated to examine the company's affairs, and that gentleman's charges came to £90 odd. With regard to the stock-in-trade, £21,741, he said that that figure represented material, labour, and a small sum which was called "first handling." The stock was valued on a far more conservative basis than formerly. As usual, an amount had been written off against the leasehold buildings, so that when the term of the leases expired there would be nothing to meet on that account whatever. The item of goodwill had also been further reduced, and now stood at £7,300. Speaking of the arrangement which had been made with the company's competitors as to the selling price of their manufactures, he said that it had worked very satisfactorily. As, however, the arrangement did not come into force until the latter part of March, the advantages derived therefrom were obtained for only about nine months of the period under review. Moreover, owing to the greater cost of raw material the increase in the selling price which was agreed to had not yielded the full results expected. He believed that the company would do better in the future. In conclusion, he moved the adoption of the report. Mr. John Parnell seconded the motion. A discussion ensued in which one shareholder said that it seemed to him that the proposed dividend of 4 per cent. had not been earned, but that the profit shown was a paper profit only. Mr. J. Cooper (auditor) remarked that it would not be judicious for trade reasons to disclose certain

figures relative to working, but he could assure the shareholders that the profit had been actually earned. The accounts exhibited the true position of the company, and he was pleased to find that they were so much better than those of the previous year. The report was adopted.

SAFETY WADS FOR SHOT HOLES.—We have received a pamphlet from Messrs. Kynoch, Ltd., relating to a special safety wad for use with high explosives in coal mines. The wad is composed of a non-combustible material which before being placed in the shot hole is saturated with a fire-extinguishing chemical. One wad is placed at the back of the cartridge, and one or more with holes punched through their centres are placed in front of the cartridge. The stemming is then inserted after the wads. Upon the firing of the shot the flame from the cartridge is at once controlled by the gases given off by the wads, and the temperature is reduced to below that at which a mixture of fire-damp and air or coal-dust is ignited. The wad has been specially adapted for use with the explosive "Kynite."

NOBEL-DYNAMITE TRUST COMPANY (LIMITED).—An extraordinary general meeting was held on the 22nd ult. at the offices, Winchester House. Colonel Du Plat Taylor, who presided, remarked that the chairman of the committee (Mr. T. Reid) fully explained on a former occasion the large number of companies in which this company directly or indirectly held shares, representing the whole of the capital in some cases down to comparatively small portions of it in others. Those companies were further linked with this company owing to the fact that one or more of the Nobel-Dynamite directors served on the board of each of such companies, to the obvious advantage of the shareholders' interests; and, of course, in that capacity the directors received fees from the various companies in accordance with their several articles of association. Moreover, the general managers of the chief companies concerned served on this company's board, thus securing uniformity of management, without which the complicated business could not be efficiently conducted, and those gentlemen were paid for such services by their respective companies. As stated by the chairman at the meeting held in August last, the directors decided to follow the advice of the counsel holding the extremest view as to the manner in which the emoluments in question required the shareholders' approval, and that was why it was proposed to alter the articles by inserting powers for the directors to retain the remuneration they received as directors or managers of the companies in which this company held shares. It was intended that the amounts which the directors so received should every year be shown in the balance-sheet of this company. On the motion of Mr. Wigan, seconded by Mr. Milne, a resolution amending the articles in the manner alluded to was passed unanimously.

WALKERS, PARKER & CO., LTD.—The ordinary general meeting of this company was held on the 8th ult., Mr. William Newell presiding. In moving the adoption of the report, the chairman said he thought the shareholders would all admit that it was a great improvement on any former statement submitted to them. Business, he said, had been exceptionally good during the year, and no doubt the shareholders had been looking forward to the declaration of a dividend. He sympathised with them, and said that although

the large amount of £31,000 had been carried forward, it was not possible for the directors to recommend any distribution, for the reason that every penny was required for working the business. Until the bankers' loans were considerably reduced, either by the accumulation of profits or by the introduction of fresh capital, the only course open to the board was to carry forward the amount. A discussion followed the seconding of the motion, in the course of which the chairman, in answer to a question, said that since the date of the balance-sheet the £53,000 of bank loans had been reduced to £10,000. Mr. Lee, the seconder of the motion, stated that the directors would no doubt in time be able to formulate a scheme by which further capital might be obtained for the company, but it was of no use trying on the basis of the balance-sheets which had been issued of late years. The business was formerly grossly neglected. The motion was eventually adopted *nem. con.*

A NEW AMMUNITION FACTORY.—Messrs. Greenwood and Batley, Ltd., and the King's Norton Metal Co., Ltd., have given formal notice of application to the London County Council, as the local authority, for assent to the establishment of their new factory for the manufacture of ammunition, which is to be installed at Plumstead Marshes, close to the Abbey Wood railway station. The County Council have, in accordance with that notice, fixed upon Friday, the 6th inst., for hearing the application and receiving the objections of any persons who may have reason to dissent from the establishment of the factory, the time arranged for the hearing being 3.30 p.m., and the place the offices of the Council at Spring Gardens, Charing Cross. Objections must, in the ordinary course, have been lodged with the Clerk of the Council seven clear days prior to the hearing of the matter. It is rumoured that the object of installing the new factory is to relieve some of the pressure upon the accommodation for loading 303 cartridges at the Greenwich factory of the Henry Barrel Company, a portion of which is leased by the Companies above referred to for the prompt loading of Government cartridges.

COTTON POWDER CO., LD.—According to the report of this company, placed before the shareholders last month, the gross profit shown in the trading account for the year ending December 31st, 1899, amounted to £17,114 3s. 4d., which, by the deduction of office charges, &c., leaves a net profit available of £9,315 9s. 3d. Of this amount debenture interest accounts for £661 11s. 5d., and the remainder, added to the balance brought forward from 1898, but less to the extent of £2,227 1s. 8d. depreciation written off buildings, leaves a net total of £6,652 7s. 9d. The directors are consequently in a position to recommend the declaration of a 5 per cent. dividend on the ordinary shares, in addition to 14 per cent. on the A and 10 per cent. on the B preference shares. Of the remainder sufficient is set aside to raise the reserve fund to a round sum of £4,000, leaving a balance of £995 4s. 5d. to be carried forward. It is satisfactory to note that the £2,500 for which the company was indebted to its bankers at the date of issue of the last report has since been cleared off, together with a further sum of £400 towards the cost of replacing the buildings damaged in the explosion a short time ago. In accordance with the powers obtained four years since, new share capital to the extent of £2,730 has already been provided, together with £2,000 of 8 per cent.

second debentures; but in view of the substantial increase of output during the last twelve months of over 50 per cent., it is proposed to issue a further sum of £10,000 in second debentures. The cordite branch of the business is reported to be in a very satisfactory condition.

CHILWORTH GUNPOWDER CO., LD.—The balance-sheet of this company for the year 1899 shows a net profit, after paying all expenses and deducting an allowance for depreciation of buildings, plant, &c., of £7,367, to which must be added £210 brought forward, the result being a total available balance of £7,577. After paying a dividend of 10 per cent. there remains a balance to carry forward of £125. This company continues to maintain the strong position favourably commented on last year, its total assets amounting to £199,489, with a total share capital of only £74,520. An allowance of £37,058 is made for sundry creditors, £7,577 is placed to the balance of profit and loss, as above mentioned, and the remaining total of £80,333 is put aside for explosions assurance and reserve funds. The buildings, plant, &c., are written down to £7,246, stock is valued at £28,084, and cash and bills in hand amount to £6,415, so that there is a balance of £157,744 placed to the account of sundry debtors and investments, of which two-thirds at least may be judged as attaching to the latter item.

MESSRS. VICKERS, SONS & MAXIM, LD.—Continued increase in the business done by this company in all its branches has led the directors to advise that, in addition to the recent issue of 250,000 ordinary shares, a further 500,000 ordinary shares should be created at a premium of £1 10s. per share, making the total share capital of the undertaking £3,500,000. According to the report of the directors, there remains a balance of profit on the year's trading, after payment in August last of the interim dividend on the preferred, preference, and ordinary shares of the company, of £305,296, and after payment of dividends on the preferred stock and preference shares, and a final dividend on the ordinary stock, making a total of 20 per cent. for the whole year, the sum of £44,046 is carried forward. The total assets of the company, including the Spanish factory, are set down at £5,119,247.

SCHULTZE GUNPOWDER CO., LD.—The balance-sheet of this company has recently been issued, and it appears that the profit earned during last year amounts to £17,081, which with the amount brought forward makes a total of £21,621. The preference dividend has absorbed £8,125, leaving an available balance of £13,496. This amount has been applied to the payment of 5 per cent. on the ordinary shares, which absorbs £8,125, while £1,144 has in addition been paid out for the superintendent's commission and bonus to the employes of the company. The balance of £4,227 is carried to next year's account. From the directors' report it appears that excellent prospects of a good game season were spoilt by the war, which has taken many users of the gun out of the country. In spite of this, however, it is satisfactory to note that the company has been able to pay a substantial dividend upon its issued capital of £325,000. It is also satisfactory to note that the company is engaged upon an active policy of development. The Redbridge nitrating factory is now in full operation, while in addition the cartridge-loading factory is already self-supporting, although established within but a recent period. It appears that the scheme of

amalgamation with the Smokeless Powder and Ammunition Co., Ltd., was not sufficiently advanced at the time of closing the accounts in order to allow for the arrangements made for that purpose to appear in the balance-sheet. The directors report that a great improvement in the company's powder has recently been introduced, and that the new product will be placed upon the market in time for next season.

UNPROVED REVOLVER BARRELS.—The Birmingham Proof House officials have recently been actively engaged in bringing to book certain persons who have been selling unproved revolvers. Two cases are reported from Liverpool, in one of which Messrs. Bunney & Co., Ltd., of Church Street, Liverpool, were summoned for keeping for sale five revolvers, the barrels of which were not proved in accordance with the Proof Act. Mr. Rowlands, who appeared on behalf of the Proof House, stated that, from information received, a clerk was sent down to Liverpool and found the revolvers to which we have referred. Mr. Cornett, on behalf of the defendants, pleaded guilty, but said that his clients were entirely ignorant of the law on this point, nor had they any knowledge of what a "proof-mark" was. When they were informed they had some difficulty in obtaining a copy of the Act, which was not even in the Law Library. Mr. Rowlands said that a caution against this kind of thing had been advertised in a Liverpool journal on January 4, and periodical warnings were given in various publications. Defendants were fined £12 10s., including costs.—In a similar case to the above, J. M. Bennari, also of Liverpool, was summoned for exposing ten unproved revolvers for sale. The defendants pleaded that these revolvers had been pledged and not bought for sale. A similar penalty of £12 10s. was also imposed in this case.

THE NEW EXPLOSIVES CO., LD.—The 14th ordinary general meeting of this company was held on the 15th ult. Mr. C. W. A. Goodfellow presided, and, in moving the adoption of the report, he expressed the directors' regret that the dividend recommended was not higher than 2½ per cent. He explained at length that several circumstances had combined to cause this, greater competition and increase in the expenses of manufacture being the chief. He went on to say that the method of compressing and moulding guncotton had been viewed very favourably by the Government, and the board had, during the past few weeks, decided on the erection of the necessary plant on a large manufacturing scale at the Stowmarket factory. After a short discussion, to which the chairman replied, the motion was unanimously adopted.

ROBURITE EXPLOSIVES CO., LD.—The tenth annual general meeting of this company was held on the 1st ult. Lt.-Gen. Sir John Stokes occupied the chair, and, in moving the adoption of the report, he alluded regretfully to the loss the company had suffered by the death of Vice-Admiral Colomb. With regard to the operations of the company during the past year, he was pleased to say that business had increased, the net profits being about £1,700 above those of 1898, this in spite of the fact that prices had been cut to meet competition, and that the price of material had increased. The balance sheet, he pointed out, was certified by the auditors "subject to depreciation of patents or goodwill if any." He pointed out that the patents had rather appreciated since the settlement of the company's accounts two or three

years ago. The new patents for Amvis and Roburite had still eleven years to run, and their goodwill, he said, had certainly improved since the Government had put an embargo on explosives generally by having a permitted list. The motion was carried, and a further dividend was declared on the preference shares, discharging the arrears of accumulative dividend for the six months to June 30, 1897.

COLT GUN AND CARRIAGE CO., LD.—The statutory general meeting of this company was held on the 5th ult., under the presidency of the Earl of Westmorland. In the course of his address, the chairman remarked that the required amount of working capital had been fully subscribed, and all their conditions of the contract had been fulfilled. So far, the formal assignment of the foreign patents had not been secured, but in view of the fact that there were over 50, it would be understood that the position was rather difficult. With regard to the financial position of the company, he said he could not give with absolute accuracy the present figures, but he could say that already a trading profit had been shown.

SIR ANDREW NOBLE ON MODERN EXPLOSIVES.
At the Royal Institution, on the 23rd ult., Sir Andrew Noble gave a lecture on "Some Modern Explosives," the Duke of Northumberland being in the chair. He opened with some general remarks about smokeless powders, such as Cordite and Ballistite, showing samples of the various forms in which they were prepared, and illustrating by means of experiments the products and effects produced by their explosion. After having touched generally upon the great advances made in ballistics by the improvement of old powders and the introduction of new ones, the lecturer referred to the enormous strides that had been made in artillery by the introduction of new explosives. Regarding the erosive effect of new explosives, he explained that Cordite was not more erosive than, say, Brown Prismatic, which was itself a very erosive powder; but as much higher energies were obtained with Cordite the erosion was materially higher for a given number of rounds, although it was of a strikingly different character. Sir Andrew Noble concluded by giving some figures regarding the number and velocity of gas molecules liberated by the explosion of a charge in a gun. No doubt this lecture will eventually be reproduced in pamphlet form, and we will then take the opportunity of publishing a fuller account of this interesting matter.

WEBLEY & SCOTT REVOLVER AND ARMS CO., LD.

In their report issued early in last month, the directors report that the profits of the year's trading, although showing an improvement on those of 1898, are still disappointing, but they have felt justified in recommending the distribution of nearly the whole sum at their disposal, in view of the present prospects of future business. After making provision for repairs, maintenance and depreciation of plant, machinery, tools and buildings, and setting aside a sum for bad or doubtful debts, the profits amount to £11,630, which, with the balance brought forward, makes a total of £12,445. Of this, all is available for distribution with the exception of a previous allocation of the interim dividend on the preference shares at the half-year, and after payment of the final dividend on those shares, and a dividend of 2½ per cent. on the ordinary shares,

a balance of £302 is carried forward to the new account. In glancing over the different items entered on the Company's balance-sheet, one detail seems to call for special comment. The amounts deducted for depreciation under various heads are not computed on the basis of the actual value of the various assets at the beginning of the year, but on the original valuation plus the addition made from year to year. To make this plain, a concrete case may be taken, that of the office furniture, which is accounted to suffer 10 per cent. depreciation in each twelve months. On January 1st, 1897, this was assessed at a gross value of £1,452 18s. 5d., and the deduction of 10 per cent. gave it a book value, twelve months later, of £1,307 12s. 7d. Additions to the stock brought the assessed value up to £1,344 7s. 3d. In preparing the balance-sheet for the year ending December 31st, 1898, however, instead of deducting the specified 10 per cent. from the last named sum, which represents the value of the furniture at the beginning of the year in question, the original value of the furniture plus additions of the first year, altogether £1,489 13s. 1d. are placed together, and, with further additions made during the second year, are then made subject to a deduction of 10 per cent. for two years, or 20 per cent. in all. In the third year, ending with last December, the same process is pursued, and a deduction of 10 per cent. for three years, or 30 per cent., is made from the original value of the furniture, plus the additional stock accumulated in the three years. A more ordinary method of computing depreciation would be to make a deduction on the value as reckoned at the beginning of the year, without regarding the addition to stock since made, all of which could scarcely have suffered 10 per cent. depreciation of value. The particular case in point, perhaps, shows no very marked discrepancy between the methods, a matter of perhaps £40 extended over three years, but it may be readily conceived that the same principle, applied as it is to all the Company's property, and if pursued indefinitely in the future, may well result in a disproportionately excessive depreciation.

ANNUAL GENERAL MEETING OF THE COMPANY.—REPORT BY LORD EBURY.

At the third ordinary general meeting of shareholders in the Webley and Scott Revolver and Arms Co., Ltd., held on Tuesday, March 13th last, Lord Ebury presiding, the following report was submitted by the Chairman. He pointed out that, at the last general meeting of the Company, he had to deplore, in comparison with previous years, a serious reduction in the volume as well as in the profits of the business, his suggestion at the time being that the year 1898 had been an exceptional year, during which the business had suffered from a combination of adverse causes which were not likely to recur. It was, therefore, not without a keen sense of disappointment that he found himself unable to report any sensible recovery of turnover, or any adequate increase of profits; and this, notwithstanding that for two-and-a-half months of the twelvemonth now under review the country had been at war, and consequently it might be expected that the Government would have exceptional need of the Company's services. The central fact was, that the Government, after placing the Company in serious embarrassment by permitting their requirements to lie dormant from March to August, at the end of the latter month, and in the early part of September, gave them two orders, but the two together were insufficient in amount to justify the use of the whole of the machinery. Moreover, the order contained

a new specification for steel, which, although it was not difficult, was hindering to comply with, because it took a considerable time to get the new sample approved. Hence it happened that deliveries on account of these orders did not commence till the 27th of October, and the entire deliveries to the Government throughout the twelve months were £2,200 less in value than they had been in the previous year, when the Government's requirements had fallen so far below the average of recent years. Since the turn of the year there had been a wholesome change in the situation; orders had come in freely from more than one direction, and the whole of the machinery had now abundant occupation for a considerable time to come. The speaker assured his hearers that the Company's officials had not been remiss during the past year in endeavouring to persuade the Government of the mutual advantages which would arise if they would exercise a little more foresight in the estimation of their requirements. Quite early in the year, Mr. Webley and the speaker sought and obtained an interview with a very influential member of the Cabinet, but not being connected with the War Office, he could do nothing more than promise that the views expressed should be put forward. Since then there had been communication, both personally and by letter, with more than one highly-placed official at the War Office upon the same subject, and the cogency and force of the arguments used had received verbal, and some practical recognition. He believed that the War Office would be quite willing to comply with their reasonable requests, were it not for the obstructive influence which the Treasury exercises upon the spending departments. But in that respect there may soon be some relief, because the Prime Minister, in the speech with which he opened the Session, called pointed attention to the subject, and when a Prime Minister calls attention to a grievance it is reasonable to assume that it will not long remain unremedied. The earlier months of the war, which were the later months of the year, imparted considerable impulse to the private revolver trade, but the greater part of what was gained in one direction was lost in another, because the sporting trade was naturally affected in proportion as the impression grew—which eventually turned out well-founded—that the sportsmen's weapons would soon be exchanged for those which are in use in Her Majesty's service; and when the books were closed for the year it could claim no greater advantage over its predecessor than a slight increase in turnover, and somewhere about £1,400 of additional net profit. In the past, as in the previous year, although in both the Company obtained some slight Colonial support, the absence of foreign contracts was an unwelcome feature of the situation. During a period of 18 months, several promising negotiations crumbled into dust, and, becoming gradually convinced that it is impossible to create or maintain a foreign trade through the medium of local agents who have no exclusive responsibility to their principals, the Company took a step in the appointment of Major Higgs with a limited commission to work up the Company's foreign trade and commerce in the far East. At our last meeting some economies were pre-shadowed as likely to arise from amalgamated staffs and concentrated operations so soon as the buildings were completed, which the contractor promised for the end of July. For various reasons, which were not specially his fault—amongst them the plasterer's strike—the buildings were not ready for occupation until September, and as that is an exceedingly busy time in the sport-

ing trade, it was felt that the business of Messrs. Scott might suffer if that moment were selected to bring up their plant and machinery to the main buildings. The move was therefore deferred for a time, but it had since been carried into effect. Meanwhile the fact that the need of economy had not been lost sight of is attested in this balance sheet by the fact that the additional net profit accrued during the year had exceeded the additional gross profit by rather more than 90 per cent. As already indicated, the past year has witnessed the completion of that fine range of buildings in which the united businesses of Webley, Scott & Ellis are now accommodated under one roof. It was estimated that those buildings would cost £13,000; they were as a matter of fact completed for £12,400, and so much had the value of building material and labour risen during their construction that if the operation had been deferred till now, they would have cost £2,000 more. Suitable, however, as these buildings are for the purpose for which they are intended, they nevertheless lack one advantage—one of those advantages from which manufacturers so often find the benefit by bringing themselves right up to date. Fortunately, this Company is provided with an ample working capital, and in order that a part of the balance in hand may be remuneratively used, they have contracted, at an expense of from £5,000 to £6,000 for a complete electrical installation both for purposes of light and of motive power. There is very little doubt that the interest on the outlay will be more than recouped by the relative economy of electric power as compared with gas power in operations of the scale of those proposed. The Chairman then proceeded to go into the figures and examine the items of expenditure in the profit and loss account. The first and second items, which were controllable items, showed a decrease, as compared with last year, of £710. The third item showed an increase of £200, attributable to the mission of Major Higgs. The fourth showed a saving of £150, and also the fifth. Embracing as it does the entire administration of the Company, or of the three Companies, it was necessarily large, and until the condition of the Company becomes more prosperous it is sure to excite attention and create remark. He could fully sympathise with the impatience felt at having to pay directors' salaries, managing director's salary, secretary's salary, expert adviser's salary, and departmental officers' salaries, but was not this the inevitable burden of a joint stock undertaking? The next item was that for income tax, the decrease of which is to be regretted as, of course, it follows the decrease in profit. The next three items were more or less automatic and uncontrollable items, chiefly connected with depreciation and various small reserves, and they showed a collective increase of £530. The amount written off preliminary expenses was the same as last year, and the balance to profit exceeded last year's by £1,380. Turning to the other side, the gross profit, which had an application to the immediately preceding item, showed an increase of £720. The rent and interest were less by £46, and the transfer fees by £12. Following on now to the balance sheet, the capital authorised and subscribed remained the same as last year; the creditors showed an increase of £664, which was the balance due on the building account; the reserve fund for bad debts was increased by £200, which was the amount put to it last year; but the revenue account was some £4,000 less, because in the year 1897, £6,099 was brought forward, whereas last year only £815 was brought

forward. Turning to the other side, the freehold land and buildings showed an increase of £6,850 during the year—money expended in building. The plant, machinery, and tools, although a great deal had been added to them in the course of the year, stood in the balance sheet, as the result of ample depreciation, at £1,000 less. The office furniture, fixtures, and fittings, in consequence of the large addition to the offices, had increased by £600. The stock in hand was less by £1,720, which was due to the exhaustion of the revolver stock at the close of the year. The debtors were more by £5,000, and that was very much for the same reason, because there were certain credits given, and the business was huddled up to the end of the year. The cash and bills in hand and at bankers were £7,500 less; and the patents, goodwill, licenses and trade marks were increased by the sum of £1,100 due to the purchase of patents and goodwill of the barrel business.

Mr. Davies called attention to the fact that the directors' fees and general office expenses amounted to over £5,000, while the ordinary shareholders were receiving, in the shape of dividend, only £4,000. He thought that under the circumstances it would be a graceful act on the part of the directors if they relinquished part of their fees. He also thought something should have been written off the goodwill account, and that an unnecessary amount had been spent in building.

The Chairman replied that the building was absolutely necessary to carry out the admitted objects of the Company, and added that it was unreasonable to suggest that the directors should give up fees to which they were entitled, and which they had not forfeited by any dereliction of duty.

The resolution adopting the report was then put by the Chairman, and carried *nem. con.*

ROUND THE TRADE.

The Home District Rifle Meeting will be held this year at Bisley and Pirbright on Saturday, May 5th.

Messrs. T. Bland & Sons have recently removed from 430 West Strand to the adjoining premises, 2, King William Street.

Messrs. F. Joyce & Co. have added 10 per cent. to the cost of central and pinfire cartridges for revolvers and rifles in consequence of increased price of raw material.

We understand that Mr. J. F. Barker has secured the agency for "Mullerite" gunpowder, manufactured by Messrs. Muller & Cie. of Liège.

We are informed that the business of Mr. F. T. K. Baker, of Glasshouse Street, W., has been sold, and that Mr. W. J. Jeffery is now interested in it.

The Birmingham and London Proof Houses have registered the marks of the St. Etienne and Paris Proof Houses, which are, therefore, now recognised in this country.

An entirely new thing in the clay-bird line, a hand trap or thrower, has recently been protected by those well-known clay-bird shots, the Brothers Pike.

Mr. H. Beesley, late with the firm of F. T. K. Baker, has now accepted a position with Messrs. Moore & Grey. Mr. Julius Goodman has lately been appointed manager of this concern.

Mr. Charles Lancaster has lately been honoured with warrants of appointment from the Emperor of Germany, the Prince of Wales, and Prince Christian. Mr. Lancaster already holds warrants from the Queen and the late Prince Consort.

A large number of Birmingham citizens have become enrolled as members of a rifle club recently established in that city. Two ranges, one of 300 yards and another of 100 yards, have already been secured.

The loading and storage departments connected with Messrs. Nobel's London business is to be extended this year in consequence of the increasing demand for Sporting Ballistite cartridges.

Mr. Remington Wilson has invented a service rifle shortened to about the length of an ordinary cavalry carbine, and a bucket for carrying it. This invention he has submitted to the War Office officials for their approval.

It is with feelings of regret that we record the death of Mr. Alexander Blair, gunmaker of Glasgow, who died from influenza, on the 22nd ult. The business will in future be carried on by his only son, Mr. J. F. Blair, who has a good practical knowledge of the trade.

It is stated that notwithstanding the refusal of the Stellenbosch magistrate to grant a licence to the De Beers Company for the erection of an explosives factory in South Africa, the company is proceeding with its erection, and intends appealing to the Governor against the magistrate's decision.

A programme of pigeon shooting and other competitions for revolvers and rifles in connection with the Paris Exhibition recently came into our hands, and it is clear that effective use will be made of the large collection of the world's shooting experts who will be present at the show.

Messrs. Debenham, Storr & Sons, Ltd., held an auction of a large and miscellaneous collection of fire-arms at King Street on the 30th ult. A good many gunmakers were to be seen inspecting the stock, which was rather old-fashioned as a general rule, though here and there were specimens of more modern guns of a cheap character.

Amberite has been seen well to the fore in this year's shooting at the Gun Club. Some particularly good scores have been made through the medium of this powder, among which we notice 41 straight, put up by Mr. Ford, 35 straight, made by Mr. Hodgson-Roberts, 33 straight, made by Capt. Radclyffe, and 27 straight, made by Mr. Walsh.

We referred in our last issue to the new "Ruby" Brand as a special gunpowder to be used in the "Tom Thumb" cartridges. Messrs. Curtis's & Harvey inform us, however, that this is a bulk smokeless powder which is to be loaded into cheap nitro cases. A special "Tom Thumb" gunpowder is manufactured by this company for use in short cases.

Messrs. Eley Bros. issued a circular to their customers, bearing date March 6, 1900, informing them that in consequence of a further increase in the price of copper, lead and tin, the gross prices of various solid metal rifle and revolver cartridges, cases, and bullets, and also of coiled brass rifle cartridges, will be advanced 10 per cent. from the date quoted.

The Surrey County Gun Club have transferred their headquarters from Wimbledon to Malden, and now occupy part of the capacious Blagden Shooting School belonging to Messrs. Cogswell and Harrison. The opening meeting of this Club was held on the 31st ult., and the members expressed their great approval of this admirable ground and also of the arrangements which been made here for their comfort.

An "Army and Navy" exhibition is to be held at the Royal Aquarium from May 24th to July 7th of this year, and a section will be devoted to exhibits of arms and ammunition. With regard to explosive substances these will not be permitted, but they may be represented by dummies or models. The charge for floor space is from 2s. 6d. to 5s. per square foot, according to area and position, with a minimum of £5. Mr. C. Lancaster, Messrs. W. J. Jeffery & Co., and the Colt Gun Co., are among those who have already taken spaces.

We have received from Messrs. Curtis's & Harvey, Ltd., an excellently printed pamphlet containing a reprint of an article by Donald M. D. Stuart, which appeared in the *Colliery Guardian* early this year. The article relates to the permitted gunpowder, "Bulldog" brand, which was referred to in our last September issue, and gives a number of interesting particulars regarding its composition, strength and efficiency for coal and stone blasting.

Mr. J. A. Fellows, a gunstock maker, trading as William Scott & Co., of 24, Lancaster Street, Birmingham, was publicly examined on the 14th ult. His debts amounted to £5,602, and his assets £591. His failure is said to have been brought about through giving bills to the dealer from whom he purchased stocks before the goods were delivered. In this way he signed bills, the values of which were not represented by the actual value of the goods when delivered.

Mr. Oliver, whose ordinary occupation is the management of the gun business of W. W. Greener in the Haymarket, is the fortunate inventor of the ingenious contrivance here illustrated. He has applied his knowledge of ejector guns to the automatic removal of cigarette stumps from the holder. So accurately is the tripping of the ejector accom-

plished, that a man sitting in the middle of the room may safely eject his cigarette stub into the fire.

Messrs. Fuller, Horsey, Sons and Cassell, of 11, Billiter Square, E.C., have been instructed, by order of Mr. Justice Cozens-Hardy, to offer for sale by tender the works of Accles, Ltd., of Perry Bar, near Birmingham. The ammunition works, cartridge factory, cycle factory, and range for heavy ordnance comprising the works cover an area of 135 acres. Tenders are to be sent to Master Whitehead, Mr. Justice Cozens-Hardy's Chambers, Room 706, Royal Courts of Justice, London, on or before April 10th, and may be for either the entire property or for any one of the three lots divided up as shown in the particulars of the sale to be obtained from the above-mentioned firm.

REVIEWS.

Experts on Guns and Shooting. By G. T. Teasdale-Buckell, late Editor of "Land and Water." Published by Sampson Low, Marston & Co., Ltd., London. Price 14s. net.

This book is likely to be of special interest to members of the gun trade in so far that a very large proportion of its contents consists of the recorded opinions of various members of the trade in connection with the sporting and technical aspects of their business. The articles are reproduced from the pages of our contemporary *Land and Water*, and it will be remembered that most of them appeared under the heading which forms the title of the present book. Necessarily the work covers a large amount of ground; and a great variety of interesting reading matter is available for those who desire to refresh their memory regarding a number of debated points connected with gunnery.

In several of the pages the name of our own paper figures somewhat prominently, for instance, in connection with single-trigger guns. We did not at the time refer in any detail to the criticisms made by our contemporary, though, obviously, having stated our case in the original article, we were, if necessary, prepared to go into fuller detail. The author of the book, as the then editor of *Land and Water*, was, of course, perfectly entitled to make such comments as he thought fit, and he was equally at liberty to reproduce those

opinions in book form; but, on the other hand, we cannot ignore the fact that the subject-matter of his comments might have deserved a more extended enquiry before being placed on permanent record in book form. This does not appear to have been the course adopted, for the original remarks are reproduced practically verbatim.

While on a course of criticism, we cannot help pointing out that the time is now past for keeping open the sore caused by a certain letter in the worst taste which was addressed to us by a member of the editorial staff of a well-known sporting paper. At the time we felt it necessary to publish the letter in question as a protest against such behaviour, and the object of our action having been attained, we allowed the matter to drop, and have never referred to it since. Unfortunately the articles which were published in *Land and Water* dealing with this correspondence, re-appear in the present book, and we feel bound to express the opinion that a serious work, concerning the technical views of recognised experts, should not contain matters of personal controversy which have long since ceased to occupy the minds of those most intimately concerned.

Treating the book as a whole, we have no hesitation in recommending it to the attention of our readers. Obviously it must be accepted with all the limitations incidental to the methods of its compilation. It does not, as we read it, profess to say the last word upon the scientific topics discussed. Generally the tone adopted is that of sketchy criticism and speculative argument regarding the fundamental laws controlling the use and construction of fire-arms and their accessories. But among this class of light reading there is a substratum of valuable information, which has been gleaned from all quarters and ably dealt with, so as to interest the sportsmen as well as the gunmaker.

Sharp Shooting for Sport and War. By W. W. Greener, with an Introduction by Wirt Gervare. Published by R. H. Everett & Co., London. Price 1s. and 1s. 6d.

This little volume makes its appearance at a peculiarly apposite moment, when the excursions and alarms of war are so much in evidence, and there seems to be so crying a need for men who, above all things, have the capacity to shoot straight. Mr. Greener expresses the opinion that every able-bodied man has that capacity, provided that he is willing to learn and practise, and the object of this brochure is to convey the necessary hints, so far as mere paper and printing ink—with brains behind them—can effect the purpose desired. With regard to the opening chapter, entitled "A Practical Policy," one can only urge that, while doubtless desirable, the conversion of the British into a nation of sharpshooters is somewhat too Utopian a scheme, despite the proposed State assistance. In dealing with the actual subject of sharpshooting, Mr. Greener is on safer ground, and the information that he imparts cannot fail to be of great service to the would-be marksman. He is distinctly in favour of something better, even for the rough-and-tumble of military service, than the existing adjuncts of the military rifle, and certainly it seems reasonable to assume that any man qualifying for the greater niceties of a real sharpshooter should be capable of utilising and taking care of the necessarily more delicate adjuncts made requisite in order to give his skill full play. Accordingly, he devotes to the subject of various forms of sights and their uses a degree of attention that should render this portion of

his book of considerable value to the novice, for whom he chiefly writes; and with the same end in view he deals with the questions of rifles and ammunition to an extent that would be necessary were he writing only for an expert reader, or even one previously acquainted with his exhaustive work on "The Gun and its Development."

On the subject of ranges, the formation of rifle-clubs and competitions, Mr. Greener gives many useful hints for the benefit of the amateur. Ranges of full dimensions to meet the requirements of the service rifle are, unfortunately, almost entirely beyond the reach of the ordinary citizen, unless he be a millionaire—and therefore somewhat extraordinary—but a remarkably good substitute, so far as the first principles of marksmanship are concerned, can be obtained on a far less ambitious scale, and information is given as to the various means by which this result may be obtained. Of course, the extent of range procurable to a great degree decides the choice of weapon, and possibly also the status of the rifle-club. As regards the conduct of the latter, Mr. Greener evidently writes from knowledge, and some of his remarks are specially valuable. The club should meet strictly "for business," not as a social gathering, and interest in the object of its formation should be maintained by frequent series of competitions, both among the members and with other clubs. Above all, "get an indefatigable secretary and use him well, and whenever there is anything of interest, do not forget the local paper." Herein appears to lie almost the gist of this particular department of the subject.

The appendices added to this little book are of importance rather to the expert marksman than to the beginner, but Mr. Greener evidently hopes that a careful study of his instructions previously given will lead up in natural sequence to the conclusion. At all events, he has certainly produced a very valuable guide and handbook, and both he and Mr. Wirt Gerrare have adduced many cogent reasons why a more extended interest in sharp-shooting should be aroused throughout the length and breadth of the land, when once the possibilities of the situation are taken into account.

Sporting Guns and Gunpowders, comprising a Selection from Reports of Experiments, and other Articles, published in the "Field" Newspaper Relative to Fire-Arms and Explosives. Compiled by the late Editor of the "Field." Part II. Published by Horace Cox. Price 5s.

An attempt to frame a serious review of this work would entail an article somewhat in the nature of the *Times* leaders which appear on the commencement of a new year, and embrace the historical developments of the year just closed. We have always refused to take a second place among the ranks of those who admire the exceptionally valuable information concerning the development of the gun which appears week by week in the columns of our contemporary the *Field*. At times we have received their views with criticism, but no objection to individual details, amid such a mass of information, could detract from our appreciation of the painstaking work which is recorded in the columns of the *Field* in connection with their shooting department. It is only when the shooting matter of our contemporary is sorted out and collected into book form that we can appreciate the enormous mass of work turned out in the course of a period of years. To many of us the back numbers of the *Field* are a valuable source of reference concerning many points of special interest in con-

nection with guns, powders, and so forth. So cumbersome did our file of back numbers become that we finally determined to remove the shooting matter and place it in a scrap book, so as to obtain greater concentration; but even so our collection during the past five years occupies the bulk of a large family bible. It is, therefore, extremely welcome to us to have ten years or so of the articles which have appeared in the *Field* in the form of a handy little volume occupying a modest corner in our book case.

Although a great deal of work has obviously been done by way of classification, there is in this book little of the cohesiveness which belongs to a comprehensively written work dealing with gunnery, such as might bear comparison with text books on other scientific subjects. Probably the nature of the material here reproduced practically in full could not be digested into a consecutive work. Consequently, taking the book as we find it, viz., a scrap book from back numbers of the *Field*, we duly appreciate its advent, and hope to make good use of its contents for reference purposes.

Obviously the objections we have from time to time taken to various articles which have appeared in the *Field* equally apply to the same material in its reproduced form, but these objections do not vitiate the value of the book from the point of view in which we regard it. Possibly in some places the work of reproduction might have been better accomplished. For instance, on page 347 we find a description of certain rather obvious improvements to the Smith Chronograph, which may be very interesting in their way, but are rather out of place when the chronograph itself is not described, and is practically unknown even by name to nineteen out of twenty of the probable readers of the book. If the Smith Chronograph were as well known as the pressure gun, particulars of detailed improvements might be of general interest, but the kind of improvement here described would in our opinion have been quite sufficiently dealt with by means of a letter to the manufacturers, calling their attention to the openings for improvement in their instrument which experience had shown it necessary to introduce.

The publisher's note at the commencement of the book contains a touching reference to the death of Mr. Frederick Toms, who died before the completion of the present work. It would have been a happy rounding off of a notable career had he been allowed to finish the condensation into the present volume of what may well be termed his life-work. He completed Part I., but Part II. has in some measure been delegated to others. At any rate, the credit is his for the painstaking mathematical work by which many gun problems have been solved, and while of course he has received able assistance in his task, no one will deny our right to accord to him the credit for assembling the results in their true mathematical values, and so enabling us to follow him in his conclusions regarding the underlying laws, which are thus brought more or less into clearness of view.

LECTURES TO YOUNG GUNMAKERS.

OWING to the pressure upon the space in this issue, the sixth of the series of Lectures to Young Gunmakers has, unfortunately, had to be held over. It will, however, appear in our next number, and will form the third part of the lecture dealing with recoil.

CORRESPONDENCE.

"RIFLEITE" TRIALS.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—I read with some surprise the letter in your last issue from Mr. Duff Grant, who writes on behalf of the Smokeless Powder and Ammunition Co., Ltd. As the author of the article which appeared in your February issue on the Rifleite trials, I was quite prepared to find a reply to some of my criticisms, but I must express astonishment at the tone adopted in Mr. Grant's letter, which at times becomes almost abusive. I will not depart from the discussion of the scientific points at issue in order to engage in wordy warfare with Mr. Grant. Although to some extent hampered by having written anonymously, I at least owe it to the editor of *Arms and Explosives* to show that I did not write in the ignorant and unreasonable style which is imputed to me.

Mr. Grant sneers at me for quoting Government standards, which he seems to think emanate from Woolwich, though, doubtless, he means Hythe, where the small-arms experimental work is carried out. Personally, I consider that in dealing with the Government small-arm cartridge, Government methods are worthy of every consideration, and I might add worthy of a little more appreciation by Mr. Grant, whose bad opinion of the British scientific methods of testing may arise partly from ignorance of the testing work which is conducted.

My original article gave sufficiently clear explanations of my criticisms to render it unnecessary to cover the ground a second time, but in the matter of my objections to the serious differences between the velocities of the standard Rifleite and standard Cordite cartridges, something more may well be said. I will quote a passage from Mr. Duff Grant's letter, in order to recall the point to memory. He wrote as follows:—

"I suppose, too, it would have been too much to expect your correspondent to attempt to ascertain if the average muzzle velocities were really within the Government specification for 303 cartridges. Bashforth's tables must surely be among the classics of his library, along with Horace and Homer.

"At our Barwick factory, where the range is 180 feet, and in other respects the same as Woolwich, the average observed velocities of the standard cartridges were

Rifleite	1,943 f.s.
Cordite	1,980 f.s.

both within the Government specification.

"A little investigation would have saved much, but then your correspondent would not have had any 'straw' men to destroy."

I have taken the liberty of italicising a passage in the above extract. Mr. Grant appears to have averaged the whole of the observed velocities taken with the standard cartridges, and even then he is only 10 feet within the Government maximum of 1,990 f.s. The object of averaging results is, of course, to eliminate instrumental errors, and a convenient number of rounds for this purpose is anything between three and ten, the Government practice being to take five. To average the entire readings of a long series of trials destroys all possibility of judging the results, and for this reason I consider that Mr. Grant's averages can only have been quoted for the purpose of misleading your readers, and covering up the error in the trials to which I called attention.

For the above reasons Mr. Grant's assertion that the Cordite cartridges gave velocities within the Government specification is, therefore, still unproved, because by the Government specification the average velocity of each batch of five cartridges must be under 1,990 f.s., and this is not the same thing as an average obtained from some 140 rounds. Mr. Grant refers in his letter to the care taken to make the report clear upon the detailed arrangements for conducting the trials, but I have found much difficulty upon many points, including the above estimate of rounds of standard Cordite cartridges fired at Barwick.

Bashforth's law for converting observed velocities may be used for proving the assertion I have made to the effect that the velocities of the so-called "standard" Cordite cartridges do not fall within the Government specification. Mr. Grant will no doubt agree with me that the Government standards of 1,910 f.s. for the lowest observed velocity, and 1,990 f.s. for the highest, may be converted into muzzle velocities of the following values:—Highest, 2,052 f.s.; lowest, 1,968 f.s.

I can now compare these muzzle velocities with those recorded in the report of the "Rifleite" trials. At each station 21 sets of averages were taken with standard Cordite cartridges. At Barwick 11 of these were above Government specification, at Eyeworth four, and at Angel Road nine.

I do not need to argue as to what would be the chances of a batch of cartridges with such velocities as these, and consequently increased pressure, passing the Woolwich inspection. Rejection pure and simple would be their fate, notwithstanding Mr. Duff Grant's ingenious method of chopping off the heads of those which are too tall.

Yours etc.,

"THE CORRESPONDENT WHO WROTE THE ARTICLE."

THE DUM DUM BULLET.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—General Tweedie writes in your paper of February, 1900, a letter which is extremely misleading, making assertions therein which I have several times refuted in other papers, but at a distance of 8,000 miles it is difficult to carry on a correspondence in a magazine or newspaper; and, consequently, General Tweedie has things much his own way, but when he published my disclaimer in the letter under reference he should have gone on to say also that I completed my application (which was granted) with the words:—"And I declare that what I claim is the construction of compound bullets, as described with reference to the drawing, whereby the advantages above set forth are attained." One of the advantages thus set forth was the mushrooming of the head. I presume General Tweedie does not claim that his patent for an expanding compound bullet prevents anybody else having an expanding compound bullet also. If he does, how about the M. IV. Woolwich bullet? Is that an infringement of his patent?

General Tweedie again persistently ignores the explanation I have given in papers in replies to his letters regarding the coning of the base, which is done in the Dum Dum bullet to reduce the wear on the rifle. This bullet was first made near the base end like the Tweedie bullet, except that the former had a hole in the cupro-nickel at base, and it was found that a rifle would not fire accurately after a few hundred rounds (about six or seven) owing to the metal at the base being so hard and unyielding that it wore away the rifling of the barrel,

General Tweedie has said before now, and will probably repeat, that this wear is due to Cordite. How comes it then that when the base is coned, the rifle will last for accurate shooting over 3,000 rounds? Before I introduced the coning at base for this purpose, I am certain it was never done; if so, I would be glad if General Tweedie would say when and where. Personally, if I were going on a long shooting trip, I would carefully eschew all bullets with solid bases, as the majority of those in the trade have, and I hope General Tweedie will allow that I know something of the subject I am writing about, as I have had 12 years' experience in cartridge making, and have for years past kept careful records of the wear and tear on service rifles of the ammunition fired in them.

N. T. BERTIE-CLAY, Capt. R.A.

Dum Dum, 8th March, 1900.

APPLICATIONS FOR PATENTS.

FEBRUARY 19—MARCH 17, 1900.

- 3,223. Telescopic Sights. W. H. Harvey.
 3,248. Torpedo Apparatus. B. Ijungstrom.
 3,267. Magazine Rifles. T. R. R. Ashton.
 3,301. Explosives Mixer. C. S. Whitelaw.
 3,365.* Mounting of Guns. G. Ehrhardt.
 3,366.* Trunion Bearings for Guns. G. Ehrhardt.
 3,477. Rifle Sights. H. Greener.
 3,486. Case for carrying Shooting Requisites. A. Ransom.
 3,512. Small-arms. W. Moseley.
 3,526.* Sporting-Gun Mechanism. H. Siber.
 3,614. Telescopic Sights. A. A. Common.
 3,655. Explosive Shells. M. A. Wier.
 3,712. Small-arms. C. H. Sharp.
 3,775.* Fire-arms. S. E. Fischer and S. Bennett.
 3,802. Range Repeater. J. Carson.
 3,912. Range Finders. H. L. Aldis.
 3,990.* Sights. A. R. Douglass.
 4,004. Location of Arms firing Smokeless Powder. W. R. Swain.
 4,032. Cartridges and Cartridge Machines. H. F. Land.
 4,049. Breech Mechanism for Ordnance. Sir W. G. Armstrong, Whitworth & Co., and Sir A. Noble.
 4,050. Shells for Ordnance. G. H. Jones.
 4,097. Rifles. E. Harrison.
 4,099. Gun Carriages. Kynoch, Ltd., and E. W. Anderson.
 4,149. Ejecting Mechanism. T. Styles and J. Clifford.
 4,152. Ordnance. W. G. Potter.
 4,153. Gun Carriages. W. G. Potter.
 4,204. Explosive Shells. W. E. Rowlands and W. G. Hay.
 4,205. Cartridge Belts for Machine Guns. W. E. Rowlands.
 4,216. Small-arms. J. Davis.
 4,231. Ordnance. W. G. Potter.
 4,253. Loading Mechanism for Ordnance. A. Reichwald. (Agent for *Fried. Krupp*.)
 4,255. Elevating Mechanism for Ordnance. A. Reichwald. (Agent for *Fried. Krupp*.)
 4,256. Fire-arms. J. J. Greenough.
 4,283. Small-arms. O. Jones.
 4,341. Hand-thrower for Clay Birds. J. F. and C. W. Pike.
 4,399.* Automatic Small-arms. G. Luger.
 4,438. Shells for Ordnance. W. G. Potter.
 4,439. Breech Mechanism of Ordnance. W. G. Potter.
 4,440. Quick-firing Ordnance. W. G. Potter.
 4,441. Automatic Fire-arms. W. G. Potter.
 4,442. Torpedo Apparatus. W. G. Potter.
 4,585. Ordnance Ammunition. J. M. Kerring.
 4,589. Explosive Projectiles. J. O. Ince.
 4,593.* Manufacture of Nitro-Explosives. W. D. Borland.
 4,623. Elevating Mechanism for Ordnance. A. Reichwald. (Agent for *Fried. Krupp*.)
 4,659. Projectiles. A. Donald.
 4,690. Gun Barrel Coolers. W. H. FitzGerald.
 4,697. Range Finders. A. J. Boulton. (Agent for *H. Rose*.)
 4,701. Projectiles. W. G. Potter.
 4,702. Breech Mechanism for Ordnance. W. G. Potter.
 4,707. Weapons. J. Morris.

- 4,757. Small-bore Weapons. A. du Lac and W. Pirrie.
 4,861. Ordnance. W. S. Simpson.
 4,915. Shells for Ordnance. J. A. Bragg.
 4,947. Ordnance. W. G. Potter.
 4,970.* Automatic Fire-arms. R. Kjellman and H. Fischl.
 4,980. Small-arms. F. Rhodes.
 5,099.* Automatic Fire-arms. S. N. McClean.
 * These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

FEBRUARY 24—MARCH 17, 1900.

- 24,662 (1898). **The manufacture of explosives.** A. Luck, Dartford. A method of increasing the stability of nitroglycerin explosive compounds by using in the place of the whole or part of the nitrates now used in such compounds other esters of cellulose, such as the acetate, the butyrate, or the benzoate, or mixtures or compounds of these. The acetate employed with the nitrate in sporting powders of this description, serves to restrain the speed of combustion. Accepted Feb. 22, 1900.
 2,926 (1899). **Blasting cartridges.** J. Macnab, London. This patent deals with a blasting cartridge which contains several modifications on cartridges described in two former specifications, Nos. 9,688 of 1893, and 16,777 of 1897. Several forms of the cartridge are illustrated, and the main feature in them all is the combination of a charge of high explosive, in either a finely powdered or a compressed form, intermixed with a quantity of some suitable form of carbon, with some cooling substance such as ammonium nitrate, which is contained in separate tubes. Both the explosive and the cooler are contained in one cartridge, which is fired by an ordinary fuse. Accepted Feb. 9, 1900.
 3,625 (1899). **Target operating mechanism.** T. Harris and A. E. Mite, Bristol. The target proper and the dummy are so mounted that they are adapted to turn about a spindle, and their relative weights about balance one another. The arrangement of targets on the spindle is something similar to that of the cranks of a bicycle, except that the targets are at right angles to one another, and not in a straight line. The pulling down of the target automatically raises the dummy, and when in either position the targets are locked by a lever. Accepted Feb. 17, 1900.
 3,848 (1899). **Firing mechanism for small-arms.** J. W. Fraser, Cullybackey. In the gun illustrated in this patent, the ordinary triggers, usually situated beneath the grip, are dispensed with. The gun is adapted to be fired with the left hand, and for this purpose the sears are put into communication with the end of the fore-end through sliding rods, the ends of which are provided with buttons. The pressing of the buttons raises the sears and discharges the gun. Accepted Feb. 21, 1900.
 4,020 (1899). **Gas-check bands for projectiles.** F. Stubbs and L. Burrows, Sheffield. The driving band ordinarily used with projectiles in ordnance is supplemented by what are called sealing bands, the object of which is to prevent the gas escaping past the projectile. These supplementary bands exert no rotative effect upon the projectile, and so remain gas-tight throughout the projectile's travel up the bore. Accepted Feb. 23, 1900.
 5,807* (1899). **The Southgate Single-trigger mechanism.** T. Southgate, London.
 5,674 (1899). **Laying and firing ordnance.** H. H. Lake. (Agent for *T. M. Foote, U.S.A.*) An electrical device for automatically laying and firing ordnance. The apparatus is controlled by the sighting telescope, and the aiming of this at the object to be fired at automatically causes electrical controllers to operate a series of clutches. Through the medium of these clutches a motor is enabled to move the gun in a manner corresponding to that of the telescope. Accepted Feb. 10, 1900.
 7,257 (1899). **Appliance for stacking rifles.** A. Milne, Caterham Valley. An appliance consisting of a sort of circular gun-rack, made in two semi-circular parts, which is adapted to be strapped round a tent pole. The top of the rack is provided with holes to receive the rifle barrels, and the butts rest on the bottom of the rack, which is suspended from the top by a number of ropes. Accepted Feb. 10, 1900.

- 7,302 (1899). **Ejector mechanism for drop-down guns.** A. Wilket, Belgium. Upon opening the gun after discharge, a lever pivoted to the barrel lump is actuated by a rod caused to project out from the face of the breech by the fall of the hammer, and this causes the ejector to extract a certain distance. The complete opening of the gun causes a spring to slide down an inclined surface on the end of the extractor leg, and to give to the extractor a sudden flip, which ejects the spent cartridge. Accepted Feb. 10, 1900.
- 7,592 (1899). **Target and mantlet apparatus.** W. D. Trick, Swansea. This apparatus is an improvement on a former target arrangement described in Patent No. 243 of 1898. It consists of the combination of bullet proof mantlets with a target store-house, all arranged in such a position that no shadows are thrown on to the targets. The targets are worked from the mantlets through the medium of levers, the raising or lowering of which swing the target frames inwards or outwards. Accepted Feb. 24, 1900.
- 7,737 (1899). **Shrapnel shells.** Sir W. G. Armstrong, Whitworth and Co., Ltd., and A. G. Hadcock, Newcastle-on-Tyne. A method of reducing the spreading of bullets in shrapnel when the shell bursts. This is carried out by enclosing them in a separate cage made of soft metal, on to the exterior of which strips of metal are fixed. These strips fit into rifling, twisting in an opposite direction to that of the gun, on the inside of the shell. When the shell bursts the cage is given an opposite rotation to that of the shell, and the spreading action caused by the rotation is thus reduced. Accepted Feb. 10, 1900.
- 7,860 (1899). **Mechanism of breech loading ordnance.** P. M. Justice. (Agent for F. J. Haeseler, U.S.A.) A series of modified parts of ordnance, the principle of which consists of a new form of breech block. This is substantially conical in shape, but its engaging surface is divided up into a series of spiral steps, upon which spiral screw-threads are cut. These steps engage corresponding steps on the breech of the gun, and it is claimed that by this arrangement of the surfaces it is only necessary to turn the breech block about a small angle of its axis to have all the threads completely engaging those in the gun. Thus greater strength is insured and a lighter breech block may be used. Accepted Feb. 24, 1900.
- 7,930 (1899).* **The Greener single-trigger mechanism.** H. Greener, Birmingham.
- 8,046 (1899). **Loading mechanism for automatic guns.** A. T. Dawson and L. Silverman, London. A method of accelerating the working of automatic guns by arranging that the cartridges drop directly from the hopper into the carrier, instead of being transferred horizontally or indirectly as heretofore. The hopper is, therefore, arranged immediately above the carrier, so that the cartridges will drop directly from one to the other as they are released by the liberating device in the hopper. Accepted Feb. 17, 1900.
- 16,152 (1899). **Safety mechanism for small-arms.** F. Néuber and J. Tambour, Austria. The lock sears in this mechanism are always automatically locked by a stop actuated by a spring. The withdrawal of the safety stop is effected in the act of gripping the rifle to fire it. A lever beneath the grip is connected with the stop, and the act of pressing it causes the stop to become disengaged. Accepted Feb. 17, 1900.
- 16,157 (1899). **Projectiles for ordnance.** H. S. Maxim, London. In a former patent, No. 28,093, of 1896, the present patentee described a flexible metallic cap, provided at the base of a projectile for compressing, through the medium of the powder gases, an obturating pad or gas check. The present patent deals with a method of forming this cap in two pieces, instead of in one, as before. The two pieces are subjected to hydraulic pressure to secure them together. Accepted February 24, 1900.
- 19,320 (1899). **Method of cutting shooting coats.** P. N. E. Tombleson, London. A method of cutting a shooting coat so as to allow the back to stretch when the arms are put forward to raise the gun. The material is cut at an angle between the warp and the weft sets of threads, instead of on the square, so that the strain on the material is in the direction in which the stuff can stretch. Accepted Feb. 17, 1900.
- 19,906 (1899). **Cartridge loading.** J. L. Brewer, U.S.A. In the base of the cartridge a hollow, conical, perforated cone of metal is placed, with its apex downwards, and situated immediately above the flash hole. When the powder is filled in, a greater surface is exposed to the flash of the cap than in the ordinary case. It is claimed that this arrangement decreases recoil, breech pressure, and fouling, and increases the velocity. Accepted Feb. 17, 1900.
- 20,156 (1899). **Cartridge magazines for ordnance.** F. M. Garland, U.S.A. A cartridge box, the interior of which is so arranged that several rows of cartridges may be placed therein. The formation of the magazine is such that each cartridge is caused by its own weight to fall in turn to the single outlet. Accepted Feb. 24, 1900.
- 24,995 (1899). **Adjustable try guns.** F. W. Cole, London. An adjustable try-gun for fitting purposes, in which the joints for altering the length, bend, or cast of the gun are so constructed that any wear or tear which may occur is taken up or compensated. The gun is thus always rigid; and it is also built in such a manner that it is of the same weight and balance as the average ordinary gun. Accepted Feb. 10, 1900.
- 25,262 (1899). **Cartridge cases for explosives.** C. H. Curtis and Curtis's and Harvey, Ltd., London. A method of closing cartridge cases used for explosives. A circular cup, the exact size of the inside of the cartridge case, is used for this purpose, and this is placed at the top of the case. The upturned edge of the cup, together with the top of the case, is then turned over in a similar way to the end of a sporting cartridge case. After the cartridge is loaded with the explosive, the other end is closed in the same way. Accepted Feb. 3, 1900.
- 538 (1900). **The formation of cartridges.** C. A. Bailey and E. S. Coe, U.S.A. A cartridge in which the brass base is a separate and removable part. The paper case, which is provided at its end with a brass screw, is screwed into the base. By this arrangement the most expensive part of the case, *i.e.*, the base, may be used any number of times. Accepted Feb. 10, 1900.
- 1,338 (1900). **Cork wads for cartridges.** W. Brand, Broxburn. A cork wad for use in small-bore cartridges. The wad is lubricated, and, being compressed within the cartridge, it expands on entering the barrel, and is thus rendered gas-tight. It is claimed that the lubricating power of the wad keeps the barrel of the arm practically cool. Accepted Feb. 24, 1900.

* These Specifications are more fully described under "Selected Patents."

SELECTED PATENTS.

THE SOUTHGATE SINGLE-TRIGGER MECHANISM.

5,087 (1899). T. Southgate, London. In our issue for February, 1898, we published a description of the system of single-trigger mechanism dealt with in a former patent by the above patentee, No. 2,955, of 1897. The present specification describes a modified and very much simplified form of this mechanism, the parts chiefly receiving attention being those connected with the interception of the involuntary pull, and those which, through the medium of a thumb-piece, are made to alter the position of the parts when it is desired to fire the left-hand barrel first.

In the annexed illustrations Figs. 1 and 2 are side and end views of the right-hand tumbler, to which the cam arrangement *a* is attached. Figs. 3 and 4 are plans of this tumbler showing the cam *a* in connection with the part *b*, which is pivoted at its centre to the trigger plate. The cocking of the mechanism is accomplished through this part *b*, which is rocked on its pivot by the tumbler when being cocked. Figs. 5, 6, and 7 show the mechanism in different positions mounted on the trigger plate. Fig. 8 is a view of the lever *b*, shown in detail, and in Figs. 9, 10, and 11 the "selective" arrangement is illustrated. The parts which prevent the involuntary pull discharging the second barrel are shown in detail in Figs. 12 to 16.

In Fig. 6 the mechanism is shown in its uncocked position after the second barrel has been discharged. Upon opening the gun to extract the spent cartridges, the right-hand tumbler *c*, in being cocked in the known way, automatically presses the lever *b* round on its pivot by means of the cam attachment *a*. This action will be readily understood on reference to Figs. 3 and 4. The turning of the lever *b*, which is shown drawn to a larger scale in Fig. 8, causes the rod *d* to press against an outstanding projection on the arm *e*, which is pivoted to the top of the trigger-blade *f*. The arm is in

this way rocked round on its pivot, and is caused to take up a position beneath the right-hand sear. The mechanism is, in this position, locked through the rod *d* and the lever *b* by the tumbler *c*, and is ready to discharge the right-hand barrel first; but we must explain that, in being rocked over, the arm *e* is caused to force back the vertical head-plate *g* against the action of its spring *h*, the

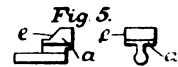
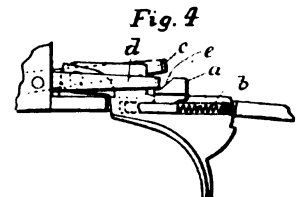
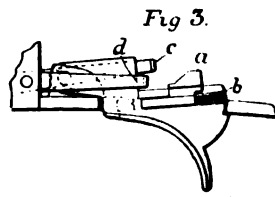
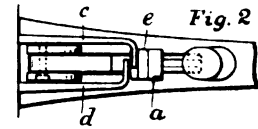
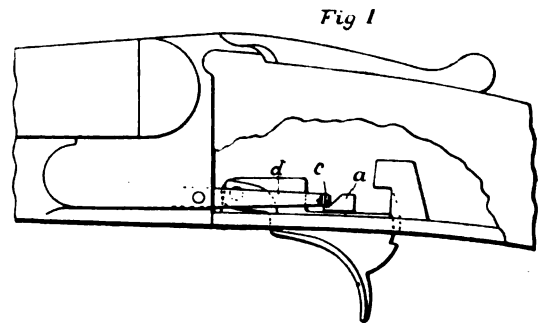
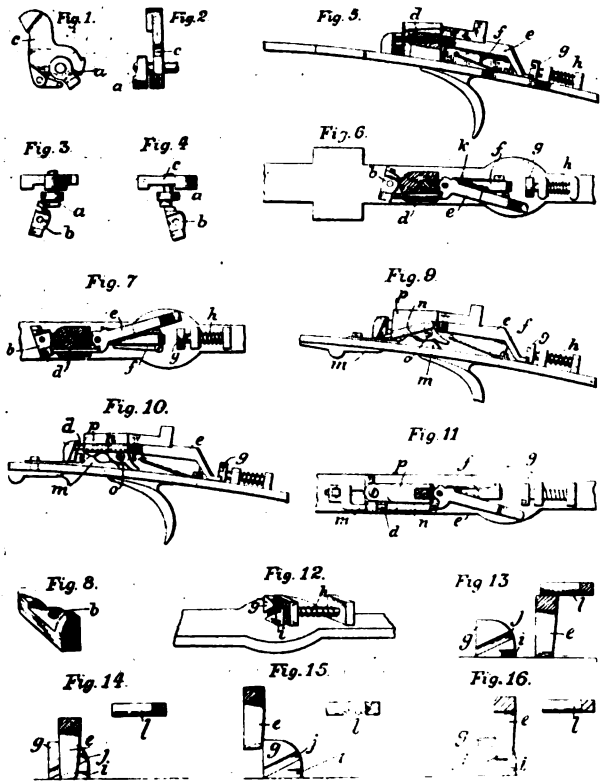
left-hand position under the impulse of the spring *h*. The shooter is thus enabled to fire the left-hand barrel first, and after pushing the thumb-piece forward the parts are again placed in the right-hand position ready for the discharge of that barrel. Accepted February 3, 1900.

THE GREENER SINGLE-TRIGGER MECHANISM.

7,930. (1895). H. Greener, Birmingham. This patent relates to a system of single-trigger mechanism in which the recoil following the first discharge is utilized to prevent the involuntary pull discharging the second barrel. The mechanism is very simple, and consists only of three parts—the single trigger, upon which is mounted a sliding block, and a spring which actuates the block.

In the appended illustrations, Fig. 1 is a side view of the mechanism, and Fig. 2 is a plan. Figs. 3 and 4 show the parts in different positions after the discharge of the first barrel and before the discharge of the second, and Fig. 5 shows in detail the sliding block *a*, by means of which the separate sears are raised.

The principal part in this mechanism is the sliding block *a* (Fig. 5), which is carried in a slot in the top of the trigger blade. This block is always urged forward by the spring *b*, and in Fig. 1 it is shown resting beneath the sear *c*, ready to discharge the right-hand barrel upon the raising of the trigger. The recoil following upon the discharge of this barrel throws the block *a* backwards against the action of its spring to the position shown in



normal position of this plate being such, that, if rigid, it would obstruct the lateral travel of the arm. The end of the arm is enabled to force the head-plate out of the way by sliding up the inclined plane *i*, as illustrated in Fig. 14.

The head-plate, which is shown in perspective in Fig. 12, is so formed that the arm *e* is detained in its right-hand position after the first discharge by the vertical side of the piece *g*, so long as the trigger is kept in its raised position (see Fig. 15). But immediately it is dropped the end of the arm *e* is presented to the bottom of the slot *j*, which is cut on the face of the head-piece. The spring *h* then comes into play, and forces the arm up the slot (Fig. 16), and over towards the left-hand position. In this way the arm is raised between the two sears, and the time occupied in its travel up the slot allows the intermediate pull to pass off harmlessly. After having completed its travel up the slot, the arm drops, and is forced beneath the left-hand sear *l*, as shown in Fig. 13. Upon opening the gun after the second discharge the mechanism is again cocked in the manner explained.

In Figs. 9, 10, and 11 the "selective" mechanism is illustrated. This is controlled by the thumb-piece *m*, the movement backwards or forwards of which actuates the part *n* pivoted at *o* to the trigger box *p*. When the thumb-piece is in its forward position the mechanism operates in the ordinary way, firing the right-hand barrel first. When, however, the thumb-piece is pushed in a backward direction towards the butt of the gun, the part *n* is caused to revolve on its pivot to the position shown in Fig. 9. In this position the end of the rod *d* is raised out of the way of the arm *e*, which, with this obstruction removed from its path, is forced to fly over to

Fig. 3, and before the spring has had time to recover itself and force the block forward to beneath the second sear *d*, the involuntary pull has taken place. After the recoil has passed, the parts assume the position shown in Fig. 4, the block *a* now taking up its position beneath the sear *d*, ready for the subsequent raising of the trigger to discharge the second barrel.

The mechanism is cocked in the action of opening the gun, when the sear tail *c* is forced down upon the inclined face *e* of the block, thus pushing the latter back into its original position, shown in Fig. 1. Accepted February 17, 1900.

Arms & Explosives

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CURRENT TOPICS.

Mr. Hiram S. Maxim.—In an article last month we deplored what appeared to us to be the attacks and counter attacks between the brothers Maxim, of which various periodicals, English and American, have been the scene. Since then we have received a visit from Mr. Hiram S. Maxim, which places the matter on a somewhat different footing, though it does not alter the fact that some journals are consistently for Mr. Hiram S. Maxim, and others against him. Our own view of the whole question is that Mr. Hiram Maxim's reputation as an inventor and as an engineer rests on such solid foundations that any efforts to prove the facts, or to make them clearer, is unnecessary. In fact, such efforts are, in our opinion, harmful to Mr. Hiram Maxim, in so far that they tend to suggest that advocacy is necessary in order to prove the value of what he has accomplished. It is thus, more or less, a question of save him from his friends, since such articles as have appeared, giving the dates and other particulars of Mr. Hiram Maxim's inventions, only prove in detail what has always been recognised in general principles. Such articles, therefore, serve only to suggest that Mr. Hiram Maxim is providing the material for replying to attacks made against him elsewhere by his brother, and to the outsider they give the impression that both brothers are actively engaged in the campaign. Whatever, therefore, may be the motive causes of the two sets of articles, we stated last month, and we now repeat, that it would be better for them to cease.

Mr. Hiram Maxim has always been a favourite victim of the interviewer, and it will always be interesting to hear particulars of his successful career, but only so long as there is nothing to introduce the question of his brother's attacks upon him. It was a matter of some surprise to us to hear that the real name of the brother is Isaac and not Hudson. We attributed many of the difficulties which have arisen to the accidental resemblance in the public mind of the names Hudson and Hiram when combined with the same surname, and when quoted in relation with military armaments. The public mind would never have mixed up the names "Isaac" and "Hiram," and it is, therefore, a matter of no little regret that Mr. Isaac Maxim did not stick to his own name when he came to England to boom a system of throwing high explosives. Of Mr. Isaac Maxim, as a scientist who has accomplished something of recognised value, we cannot speak with experience. We have met him personally, and have, therefore, known him as the ingenious exponent of the efficiency of shells charged with large quantities of high explosives, and projected by means of a multi-perforated explosive propellant. But as to his share in their production, and their efficiency in use, we have not dived into details. At any rate, they are not a recognised feature either of land fortifications or naval armaments. So far as the matter interests us, we have endeavoured to state the facts, and we will conclude by suggesting that the kind friend who favours us with Mr. Isaac Maxim's marked articles could find a more speedy method of securing a place for them upon the waste-paper market than by sending them to their destination *via* Effingham House.

Water as an Explosive.—It would almost seem as though we must consider the advisability of reserving a special column for the notice of new inventions. Our Patent columns would hardly serve for treating those discoveries, the complete specifications of which are officially published in the news columns of the daily press. The latest of the new explosives is water. It seems that by disassociating this element into its component gases we produce an explosive which is, we forget how many times, stronger than dynamite. One remembers, as a school-boy, seeing the electrical decomposition of water, and the more or less haphazard methods of proving that one bulb was filled with hydrogen and the other with oxygen. It is a little difficult to realise wherein lie the possibilities of the new explosive. Certainly oxygen in combination with other substances is explosive, but, even so, one requires concentration of bulk in order to have comparative strength, and yet one would think that we already know a good deal about the suitable forms in which this element is available. The practical applications of the water cartridge are a little difficult to realise; but in any case we believe that it would indefinitely postpone the miners' eight-hours' day. The idea of preparing a series of shots, and then waiting while the electric current turns the water into an explosive, seems too absurd, and yet the position becomes actually tragic when something goes wrong, and the engineer in charge is called upon to take measures for getting rid of the faulty shot, and finds that all the trouble has been over a matter of half-a-pint of plain water, which has failed to decompose. The inventor might at least have provided us with a somewhat more exhilarating fluid than water.

Co-operative Rifle Manufacture.—The reports that gunmakers have met together in Birmingham for the purposes of formulating a scheme for the production of rifle components, with a view to their subsequent assemblage as service arms, struck us at first as a belated first of April yarn. We were so far honoured as to be sought for the purposes of an interview by the representative of one of our enterprising evening papers, and we were prepared with a budget of facts to prove the whole thing a *canard*, in case our co-journalist should call again. But evidently he had found a more interesting case to pursue in another direction. Since then the circumstantial reports that have come to hand from Birmingham suggest that something or other has been discussed. There is nothing absolutely impossible in the production of the service rifle in a number of different factories, and yet the more that the scheme is examined in detail the less it is apparent how the difficulties of detail will be overcome, within commercial limits of cost. One's conception of a machine tool factory for the infinite production of a single fixed type of weapon, is a harmoniously designed works so organised that there is perfect balance among all departments. The raw material may be traced through from the start until it emerges as the complete article at the other end. The entire factory strikes one as a delicate organisation for which one requires to take the human body as a parallel. Can this be replaced by a heterogeneous scattered series of producing centres, each having its own standard of workmanship and methods, and yet combining to produce the harmonious finished article? We think not.

THE INTERNATIONAL SHOOTING COMPETITIONS AT THE PARIS EXHIBITION.

THE organisation of the shooting competitions to be held at the Paris Exhibition this year has been entrusted, by contract, to the Union of Shooting Societies of France, the committee of which has now issued a definite programme of the meeting. It will take place at the camp at Satory, from Wednesday, July 19th, to Monday, August 7th, and will comprise 24 classes, with 11,000 prizes of a collective value of more than 200,000 francs.

There will be 130 targets, of which 60 are at a range of 200 metres, 10 at 300 metres, and 35 at distances of from 20 to 50 metres for revolvers and pistols, also 25 targets at 12 metres for the 6 mm. carbine. For service pistols, a competition has been organised to be shot at dummy targets, at the word of command, according to the rules of "Le Pistolet" Society, which will be shot off at the butts at Vincennes on July 18th. This will consist of 24 prizes, worth about 3,000 francs, half the value being contributed by the promotion board of the Exposition, and half by "Le Pistolet" Society.

The promotion board of the Exposition has also commissioned the Society "Le fusil de Chasse" to organise a meeting for clay-bird competitions, which is to take place at the short practice range on the Isle of Seguin, at Billancourt, and which will comprise a national meeting on July 8th, 9th, and 10th, with a total of 30 prizes, having a value of 2,500 francs, and a grand international meeting, to be held on July 15th, 16th, and 17th, with a similar number of prizes of the same collective value.

According to present arrangements, which may, however, be modified by the committee appointed to consider the matter, a pigeon-shooting competition will be held at the "Cercle" in the Bois de Boulogne, at which will be offered the Grand Prix du Centenaire, to be competed for on Monday, June 19th, with a value of 10,000 francs, the conditions being one pigeon at 25 metres, and the entrance 20 francs; and also the Grand Prix de l'Exposition Universelle, to be shot for on June 25th, 26th, and 27th, the prize competed for being 20,000 francs, to which will be added a pool of 10 louis per man. This competition will be six pigeons at a distance of 27 metres.

Prizes, included under 24 classes, consisting of 173 prizes in money, and 60 prizes in works of art and medals of a total value of 10,000 francs, will be competed for by teams of artillery, using practice tubes, at the butts at Vincennes. In addition, there will be other competitions in archery, both with the long bow and cross bow, and in falconry, during the period from May to September.

A new device for carrying cartridges is in course of trial by the War Department of the United States in the form of a wristlet encircling the forearm and holding twenty cartridges. This wristlet in itself weighs less than half-an-ounce, and it is suggested that two may be placed on the arm at one time without inconvenience, with a certain number in reserve in the pocket.

CLAY-BIRD SHOOTING.

BY PAUL NORTH.

ENGLAND may truthfully be said to be the home and cradle of the shot-gun, and has always been foremost in perfecting the gun and also the ammunition used in it. It contains an exceedingly large number of manufacturers of gunpowder, shells, and shot, who are always keen to pick up trade in their particular line in any part of the world. The goods they manufacture are unexcelled by similar makers elsewhere.



At the same time England is the home of a very large and increasing class that enjoys the use of the shot-gun to a very great extent, and that annually spends large sums of money in pursuit of the sport. It also contains another large class that cannot afford the expensive luxury of game shooting, but which could be educated to indulge in clay-bird shooting, with a resulting increase in the trade in sporting goods, and with incidental benefit to the

country, owing to the increased number who would become familiar with the use of firearms, a very desirable state of affairs in time of war. At the present time, when game shooting is over, thousands of guns are returned to their makers to be taken care of during the close season, and they lie in their cases for several months, utterly useless to the manufacturers as far as the consumption of ammunition is concerned, and, of course, not wearing themselves out to the benefit of the gunmaker.

Here is a condition of affairs that must be most unsatisfactory to the trade, and it only requires a long pull and a strong pull all together to bring about a beneficial change. There is a business amounting to five or six millions of cartridges annually, in addition to a sale of a large number of guns, all of which is only waiting development. This trade can be started and worked up without the expenditure of a single additional pound in the way of advertising or other expense by the manufacturers if only they will realize the fact that, as far as the consumption of guns and ammunition is concerned, one clay-bird shooter is much more to them than half a dozen live pigeon shooters, and is more easily developed from what one might call the raw material or non-shooting class.

If every gunpowder, shot, and ammunition maker would in all his advertising, both in papers and trade circulars, constantly and persistently reiterate a statement to the effect that his line of goods is particularly adapted for clay-bird shooting, and at the same time give records made by the same, he would by so doing keep before the shooting and non-shooting public the fact that there was such a sport as clay-bird shooting, and the effect would in time be bound to follow. If every gunmaker would at once begin to state in his regular advertisements that his guns were particularly adapted to clay-bird shooting, or that he made a speciality of guns suitable for that sport; if every powder manufacturer would in the same manner advertise the fact that his powder gave par-

ticularly high velocities, regular and even patterns, especially desirable in clay-bird shooting; if every ammunition maker would advertise that his cases and cartridges, loaded specially for clay-bird shooting, had all the requisites for obtaining the best possible results; and finally, if all the shot manufacturers would advise all clay-bird shooters to insist upon having cartridges loaded with their shot, as, on account of superior roundness and hardness, it gave the best and most regular patterns, it would not be long before this flood of varied advertisements, which need not cost an additional penny, would attract the attention of gun owners and users; and having attracted their attention the desired result is half accomplished.

The manufacturers have all spent money, and spent it well, in promoting the I.B.S.A., and the interest in clay-bird shooting is gradually increasing, but very slowly. In the past year there has been a great decrease in the cost of clay birds and traps, and an improvement in the quality. The sport can be made to go provided that concerted action is taken by all interested in the result, who are at present somewhat inclined to sit down and say, "Oh, yes, we would like to see the sport become popular, but we are afraid it never will," which is the position taken by the majority of the trade in England to-day.

The above plan is not a new and untried one, but is the plan adopted by manufacturers in the United States with the greatest success, and the result in 1899 was that over 30,000,000 clay birds were consumed, and the anticipated increase to 35,000,000 in 1900 is by no means an undue estimate of the expected developments. As mentioned above, it will cost nothing to try the experiment, and will, by varying the present set form of the advertisements, attract attention, to the direct benefit of the advertiser, and will in time be sure to lead to very largely increased interest in the sport.

The sporting papers, seeing the trade were all interesting themselves in developing clay-bird shooting, would devote more space in their columns to the club records, and so assist the desired end.

INCIDENTAL JOTTINGS.

WE KNOW THAT MAN.

If there is any man in this world who is entitled to grumble, it is the man who has everything! For he has something to grumble at. This is incontrovertible logic. But what about the man who has nothing? The science of the necessary laws of thought and reasoning permit him the same grumbling privilege, but he grumbles at the other man's something. It is the latter man with whom we generally sympathise; but at the present time our feelings are in favour of that particular man who has everything—the steel-maker. He has all the work he can do, and yet he is grumbling, because he fears that the Government may one day start operations in his line, and thus rob him of his trade. He is on the watch for every eddy which may indicate in which direction the wind will blow, and although he may often be mistaken, he will not lose any chance of resisting what might appear to him to be a step taken towards cutting down his trade; and I don't blame him.

It was only a rumour that got abroad that **HE COMES FROM SHEFFIELD.** Woolwich were asking for a 3,000 ton hydraulic press, but this caused the member for Sheffield anxiously to enquire in the House of Commons if the arrangement of 1885 was to be broken, with the consequence that the Government would make their own steel for heavy guns. Mr. Wyndham courteously assured him (in Mr. Wyndham's inimitable assuring manner) that the old Nasmyth hammer was worn out, and that the Government desired to get something up-to-date in its place. But Sheffielders are hard to convince. They know the Government methods too well. Therefore they must have a deputation and emphasize their opinions in an unmistakable and orthodox manner. There must be no middle course: Woolwich shall not manufacture the steel, nor steal the manufacture, and there's an end of it.

PENETRATION AND RESISTANCE. Of course there is another point from which the matter may be regarded, but we will continue for the moment to consider the Sheffield view of the affair. Hundreds of thousands of pounds have been spent on magnificent machinery to cope with this special trade, and often it is idle for want of continuous work. To take away the main part of the trade would mean utter ruin; for so sure as the gun forgings went, armour plate would follow. Sheffield is fighting all the world for supremacy of its manufactures, and well it holds its own. Only recently we heard that Krupp had made an impenetrable armour plate. The next news was that Hadfield had pierced it with one of their new shells; and so it goes on—first the Sheffielders challenge all comers, in the way of shells, at penetration tests, and next they produce plates of incomparable resistance. These are the men who mean to defend their interests, and tough customers they will prove themselves to be to anyone who attempts to encroach upon their trade.

THE OTHER VIEW. Woolwich has had a secret longing for years to manufacture its own steel. "Why," they say, "should we have to go to the trade for every piece" (above a certain weight and size). "As gun makers we are entitled to make our own, to our own secret ideas, and not be handicapped by buying what Sheffield, one of our chief competitors, cares to give us. Naturally all their efforts will be to impart every advantage to their own guns." And the parsimonious rate-payer will agree in somewhat the following strain:—"Why put large profits in the pockets of the few, when they might go to reduce taxation? Consider, also, the Admiralty orders for armour plate, we could save a fortune by making it ourselves." To all this, the obvious reply is "perhaps."

THE HONOURABLE COURSE. If it be found in the course of time desirable that the Government should produce their own forgings and plates, etc., they should offer to purchase various works in Sheffield at a price which would compensate for loss, as undoubtedly having induced these firms to lay out large amounts of capital for the Government convenience, they are morally bound to find them employment to pay for it. But there is a tendency with the Admiralty and

War Office to "encourage" (*sic*) manufacturers in various lines. They give a first order or so, and then drop the poor man as soon as his work is efficient and beginning to produce some remunerative result, in order to "encourage" someone else! "Strings to their bow" is what this immoral system is called. Base ones, to wit.

Sir Wm. McCormack gives us some interesting particulars of his experiences at the **BOER BULLETS AT THE FRONT.** war. One fact is very comforting—that he has never yet seen a wound made with an explosive bullet! One wonders what this means. I suppose a "split-nose" bullet does not come under that category, and the chances are that if it did the damage it would do would be so little greater, by comparison, than in the case of the ordinary bullet, that it would not be noticed. In fact, the difference in their effects would be very slight if the manufacturers put an ordinary thick-nose envelope on the bullet, as is usual, for this destroys its expanding qualities. Our soldiers may be thankful for this, since such bullets require the resistance of a stone wall, at least, for the expansion to come into play. The poor fellows who get hit with barbarous Martini bullets are the men who fare worst. It will have to be a terrible sort of small-bore bullet to compete with one of these, though, going a stage further back, the Martini is humane beside the Snider. In years to come our rifles will be constructed to hit automatically every time. Query, shall we then shoot with needles?

All accounts agree that some Boers don't mind Lyddite as an explosive. I suspect it is those who keep a respectful distance from it. No doubt many of the earlier shells have not burst quite up to standard; but on the whole the Boers seem always willing to give it plenty of room to operate. It appears that Lyddite, like Tommy Atkins's pertinacity, makes them sick; but for Lyddite they take vinegar, which is supposed to allay such nausea. By the way, is vinegar contraband. It is amusing to read that the fumes paint any who come within its area a yellow colour. Doubtless this carries the principle Kharki covering to its ultimate conclusion; but possibly the Boers do not see it in this light.

SMALL ARMS BUT BUSY HANDS. All things come to those who wait, and now the rifle makers are getting more work to do—in fact they are all very busy—as the whole of the reserve supply is likely to be wanted, and it is therefore well to take time by the forelock and prepare. Enfield Lock is quite a hive of industry, working at its (now) numerous manufactures of rifles, machine guns and mountings, base slugs and fuses, etc. I always thought it a pity that Enfield threw away the pistol work. This may account for the diversity of opinion as to the merits of the various pistols, with no Government-sanctified production as a model. Why do not the Enfield staff bring out a pistol which combines all the virtues of the Webley, Bouchart and Mauser, with none of the disadvantages—all the doctors disagree. Now, Enfield, decide!

CYCLOPS.

NOTES.

CLOSING OF AN INDIAN AMMUNITION FACTORY.

—Since the 1st ult. the gunpowder factory at Kirkee ceased work, the Cordite machinery having been sold by auction, and the staff transferred temporarily to the Small Arms Ammunition factory until the new Cordite factory at Coonoor is completed. Major Babington and other members of the staff are now in England studying the manufacture of Cordite, and Serjeant Downs has also come over to learn shell filling with Lyddite, the making of which will subsequently be started at Kirkee on a portion of the old premises. It is contemplated to transfer the Presidency Arsenal from Bombay in the near future, and with that end in view Colonel Campbell has selected such buildings and machinery as he considers suitable for the purpose.

AN IMPROVED IGNITER FOR BLASTING CHARGES.

—Under the test of practice, the makers of the Meinhard igniter have been able to improve considerably on the original design, and claim now to have brought out a new pattern, in which economy, ease in manipulation, and security against explosion are very marked features. In its latest form, the igniter consists of a drawn-steel tube, in which is a striker or bolt actuated by a strong spiral spring. To set the striker, it is drawn backwards, then compressing the spring, until a suitable shoulder is made to engage in a recess in the locking disc closing the end of the tube. The other, or forward end of the tube, is closed by a solid piece having a central hole for the insertion of the fuse, which, when inserted, is held in a position by means of a spring. The fuse is ignited by a detonating cap placed on a nipple fitted in line between the striker and the fuse, a half-turn of the striker after it has been set, in the manner already indicated, sufficing to release it so as to strike the detonator smartly. A sliding sleeve over the fore part of the tube allows of ready access to the interior for the proper firing of the fuse and the detonator, and while, when all is ready for action, this sleeve completely closes the tube, a special vent is provided for the escape of the gases resulting from the ignition, so as to notify that proper ignition has taken place. In all, the apparatus measures only eight inches in length, and the detonators occupy a correspondingly small space, so as to be capable of easy transport. The manipulation of the igniter is remarkably simple, and liability to miss fire is almost impossible as the detonating caps are rendered damp-proof. A series of trials serve to show that the appliance is both safe and trustworthy under a variety of test conditions.

A NEW NAVAL GUN-MOUNTING.—Trials were made in the early part of last month, on board H.M.S. *Drudge*, experimental gunboat attached to Portsmouth, of the new Armstrong mounting for the 12-in. wire gun, Mark IX., which it is proposed to fit on the battleship of the *Formidable* type. The main ideas are, of course, to secure greater rapidity of fire, and increased ease in handling the heavier guns, and these results are to be achieved by the adoption of a lesser elevation for the loading position, and by the introduction of a new system of ramming the charge home. Hitherto, the heavy gun mountings in the service have been arranged with

the main loading position at the maximum elevation of the gun, 13½ degrees, and the necessary tilting of the gun to this elevation, and its subsequent depression to the firing position, occupies an appreciable interval of time which it is sought to eliminate. In the new trial mounting, the loading position is at an angle of 4½ degrees only, this being the smallest angle at which the water used for washing out the breech after each round will run from the chamber of the 12-in. gun. This angle is also convenient for charging the gun, as it allows the rammer to be snugly stowed away, and affords sufficient cover for the loading operation to be out of sight, while it is equally suitable for the easy opening and closing of the breech, and the insertion or extraction of the primer. As the most usual angle at which guns of this calibre are likely to be employed may be judged to range from 3 to 4 degrees, the slight additional elevation to the loading position will occupy a barely appreciable space of time, so that the net saving in this respect is calculated as from seven to eight seconds per round. A new rammer of the chain type, adopted from the trial pattern already made at Woolwich and fitted on the *Royal Sovereign*, is also a part of the new mounting, and on the double operation of ramming shot and charge, a further saving of from three to four seconds per round is expected, and on these figures it may be possible to fire the guns so mounted at intervals of 1 min. 30 secs. Improvements are also devised in the arrangement of the cage for supplying the ammunition to the gun, which may increase the rapidity, but certainly the efficiency and ease of working. It should not be lost sight of, moreover, that in cases of necessity the hydraulic machinery may be dispensed with, and the gun entirely man-handled. In the trials which have already taken place on April 5th, six rounds were fired, with complete success, so far as the mounting itself was concerned; but the horizontal training of the gun under test caused a cracking of the plates in the bows of the *Druid* at the sixth round, which rendered it necessary to postpone a more extended trial, pending repairs.

NATIONAL EXPLOSIVES CO., LD.—At the ordinary general meeting of this company, held on April 25th, Mr. Athol Thorne, the chairman, was able to recommend the payment of dividends in the following proportions:—9 per cent. on the preference, 11 per cent. on the ordinary, and £4 5s. per share upon the deferred shares, including the interim dividends paid upon the two former classes of shares in August last. This is the fourth consecutive year in which these rates of dividends have been paid upon the preference and ordinary shares. An amount of £1,497 is written off the property account for the year, that being the sum which has been expended during the period on additional buildings and plant, in addition to which £4,800 has been spent in repairs and renewals, and paid for out of revenue. The property account is thus kept down to £90,000, and the factory has been kept in a state of high efficiency. After placing a sum of £2,500 to reserve account, bringing this fund up to £12,500, there remains from the profits of the year's trading a balance of £733 to be carried forward. With regard to present and future prospects, the Chairman was able to report the receipt of large contracts, which necessitated working day and night at full capacity, and the prospect of a further substantial increase of business has been forestalled by the making of suitable preparation. Apart from the approaching abolition of the Transvaal dynamite monopoly, the present large contract with the British Govern-

ment for the supply of Cordite is likely, the Chairman thought, to be followed by others. Needless to say, the report and accounts were received with applause, and adopted by a unanimous vote.

MESSRS. HOLLAND & HOLLAND, LD.—As the result of the second year's trading, the directors of this company recommended that, after paying a dividend of 5 per cent. on the preference shares, and writing off the preliminary expenses, a sum of £1,369, an amount of £2,000 should be placed to the reserve fund. A dividend of 10 per cent. for the half year ending December 31st, 1899, on the ordinary shares of the company, provides, with the dividend already paid for the first six months, an average of 8 per cent. for the whole year. These various apportionments leave a balance of £1,038 to be carried forward to the next year's account.

BIRMINGHAM GUNWORKERS AND THE NEW PROOF HOUSE BILL.—On the 19th ult., a meeting of artisans employed in the Birmingham gun trade was held in that city for the purpose of considering the action to be taken by workers in the trade with reference to the private Bill to amend the Proof House Act of 1868, which is now before Parliament, but owing to the incident of the meeting with the holiday season, there was a comparatively small attendance. Mr. W. C. Foulkes presided, and proceeded to explain some of the provisions of the Bill. He pointed out that one clause provided for the spending of the £20,000, or a portion of that sum, now in hand as profits on the Proof House, in building and maintaining a school, and in assisting youths to attend it, as apprentices to the art of gunmaking. The promoters of the Bill claimed that this course was necessitated by a dearth of workers, and while he admitted that there often was such a dearth between May 31st and August 1st, he was sure that there were gun workers enough in the trade to make each year all the guns which the employers could sell between January 1st and December 31st. He thought that the purpose of the school was to accentuate the greatest evil of the trade—the shortness of the working season; and he asserted unhesitatingly that the only way to increase the number of skilled workers was to improve their condition. Following the chairman's remarks, Mr. S. G. Middleton emphasised the point that the workers did not oppose the educational object of the school, but claimed a right to a share in its control. They asked that one-third of the representation on the Board of Guardians of the Proof House should be formed of working gunsmiths. At present, the property qualification was so high that it was impossible for any ordinary worker to obtain a seat; yet several of the Guardians were not skilled men. The amendments to the Bill also defined a working gunsmith, and provided that all foreign-made guns should be indelibly marked as such. These amendments had been submitted to the employers, but there did not seem to be any overture on their part to settle the matter. He thought that it would be possible, if a conciliatory spirit were manifested by the other side, to come to terms in regard to the Bill; but, having started, the workers did not intend to go back. They had taken up arms against the Bill, because they believed it to be unjust to them.—Subsequently, a petition to Parliament, which will enable the artisans to be represented by counsel when the Bill comes before Committee, was approved, and

Messrs. E. Evans, F. Wakeman, W. C. Foulkes, G. Law, G. Horton and S. G. Middleton were appointed as a committee to act on behalf of the gun workers in opposing those clauses of the Bill to which objection is taken. A further step was taken, by endeavouring to obtain an interview with Mr. Chamberlain, but the Colonial Secretary was unable to receive the proposed deputation, owing to an attack of influenza. The deputation was more successful with Mr. Powell Williams, M.P., to whom they had an opportunity of explaining their views as above set forth, and they were assured that their representation should receive careful consideration. Appointments have also been made to wait on Mr. Jesse Collings and other members of Parliament representing the city of Birmingham.

A COMBINED HOLSTER AND DRINKING CUP.—The Wilkinson Sword Co., Ltd., of 27, Pall Mall, S.W., have recently brought out an ingenious combination of the ordinary pistol holster and a metal drinking cup, made under Musgrave's Patent, No. 967, 1900, which possesses considerable



claims to favourable notice. As can be seen from the accompanying illustration, which shows the combination *in situ*, a metallic cup having the shape of a truncated cone, and so proportional as to fit more or less closely to the snout-like lower portion of the holster, is the principal novelty of the

device, and it is held in position by means of a projecting stud, which engages in an eyelet in the adjustable strap shown. The attachment is at once secure and capable of being readily unloosed. There are undoubted advantages in this form of drinking cup over those of the pattern usually employed. For one thing, the new vessel occupies practically no space, and is consequently never in the way, as contrasted with the ordinary drinking cup, which has to find room in the haversack or elsewhere, and it is also more ready to the hand for immediate use. Moreover, the fact that its interior space is almost entirely occupied by the holster renders it little likely to incur any serious accidental damage. It can scarcely be doubted that this simple little combination of two necessaries will prove a boon and a blessing for men on active service, on the score both of utility and convenience.

INSPECTORS OF EXPLOSIVES AND THE LOCAL GOVERNMENT (IRELAND) ACT, 1898.—An interesting ruling in connection with this Act was given at the Wexford Assizes in an appeal case brought on behalf of Petty Sessions Clerks, who were also Inspectors of Explosives, against the Wexford County Council. On February 5th, the plaintiffs sued the County Council for certain sums amounting to five years' salary, assessed them by the respondents as compensation for abolition of office, but subsequently refused payment. The County Court judge on that occasion held that the inspectors were clearly entitled to compensation for loss of office, but that such compensation should be by way of superannuation, and not a bulk sum to be paid at one time, and consequently he dismissed the Civic Bills. On appeal, Mr. Justice Johnson affirmed the decision of the County Court Judge, without costs, except in the particular case argued, which would carry costs.

RELICS OF THE LATE COL. CUNDILL.—We were fortunate enough the other day to come across a few pamphlets and other papers belonging to the late Col. Cundill, which, by a curious series of coincidences, came into the hands of a friend of ours. The gem of the collection was a copy of the first edition of Cundill's Dictionary, copiously annotated throughout with a series of additions and notes, evidently bearing upon the production of a later edition. Another interesting item was a pamphlet entitled, "Sprengel on a New Class of Explosives," dated August, 1873. The cover contains a note presenting the work to Dr. Dupré, with the compliments of the "much obliged author." What we believe to be the late Sir Vivian Majendie's signature also appears upon the cover. Three copies of what we take to be the original of the Cundill Dictionary of Explosives are also included in the collection. They consist of hundred-page reprints from the proceedings of the Royal Artillery Institution, bearing date 1888. It will be remembered that the cloth-bound dictionary followed a year later, with blank leaves for extra notes, and contained the author's supplement, bringing the contents up to date. Some rather personal marginal notes appear in a copy of Messrs. Nobel's pamphlet on the Settle Water Cartridge of 1887. The following paragraph is a case in point. The pamphlet read:—"In view of the danger attending the use of dynamite, gun-cotton, tonite, gun-powder with the water cartridge, Nobel's Explosives Co.,

"Ld., consider they are justified in prohibiting the employment of the Settle Water Cartridge in conjunction with any explosive compounds other than Nobel's Gelatine-Dynamite and Gelignite." Col. Cundill's marginal note reads:—"That is to say that the water cartridge is *not* to be trusted unless used with a special explosive which they state to be almost safe by itself. They proved too much. Of course, it is really a trade dodge only, but if I choose to buy the tubes (and the patent is of doubtful validity) who can prohibit me from using any authorised explosive in it?" Another work is a reprint of Sir Frederick Abel's presidential address before the British Association gathering at Leeds in 1890. This has not any special personal interest beyond being a presentation copy from the author. Two other papers, read by Sir Frederick Abel before the Institution of Civil Engineers and before the Royal Institution respectively, conclude the list.

HOTCHKISS ORDNANCE CO., LD.—According to the report submitted by the directors of this Company, the total profit for the year ending December 31st last, after meeting all working and establishment charges, amounted to £34,190. After deduction of the sum of £6,200 for interest on debentures, a balance of £27,990 remains, which, with the addition of £7,630 carried forward from last year, gives £35,620 as available for distribution. From this sum it is proposed to pay a dividend of 5 per cent. on the issued preference shares, and 2½ per cent. on the issued ordinary shares. Of the remainder, £1,500 is to be provided for service of the sinking fund for the new debenture stock, and £926 for the legal and other charges arising therefrom. After placing £10,000 to reserve, a balance of £6,719 would remain to be carried forward. The reserve of £10,000 is considered advisable as a set off to the reduction in the working capital of the French company, a sum of £12,695 having been spent during the course of the last financial year in additions and improvements to the plant at St. Denis, with a further probable outlay during the present year of £5,000. A re-arrangement of the debenture debt of the Company has now been effected. It is satisfactory to learn that the general business of the Company for 1899 has been fair, and that important orders for the automatic machine gun have been received. Two new types of ordnance, the Hotchkiss Automatic 37 m.m., and the Hotchkiss Semi-Automatic 47 m.m. gun, have been produced by the technical staff in Paris, and have yielded satisfactory results in testing. At the general meeting of the Company, held on April 10th, Mr. Parsons explained the reason for the comparatively small amount of profit. In the first place, the Company has no works in England, and on that account war material supplied to the British Government would be in the nature of contraband at this time; and, moreover, the Government were not in the habit of dealing with middlemen. The Board did not consider this position satisfactory, but could not recommend the erection of works in England until they are sure of receiving sufficient contracts from the Government. At present, the Government is only executing surplus orders for small naval guns for this country. Mr. Parsons further reported that the automatic gun had been adopted by the French Government, and was likely to be taken up elsewhere. The dividend of 2½ per cent. was adopted.

IMPROPER MARKING OF GUNS.

THE GUNMAKERS' ASSOCIATION

VERSUS

MCCARTHY, BUCK, AND COMPANY.

A PROSECUTION brought by the Gunmakers' Association, of Effingham House, Arundel Street, Strand, London, W.C., against Messrs. McCarthy, Buck, and Co., who trade as "The Wholesale Arms and Ammunition Trading Company," came up before Mr. Alderman Bell at the Mansion House, on the 5th ult., for offences specified in four summonses under the Merchandise Marks Act, in respect to the marking of a gun with the name "Richards, London," this name having been placed upon the gun subsequent to the sale, but prior to the delivery, to a pawnbroker in Hastings.

Mr. Frank Safford was instructed by Messrs. Wakeford, May, and Woulfe, as counsel for the Gunmakers' Association, and Mr. G. H. Scott appeared for the defendants. At the outset, Mr. Scott, on being questioned as to whether the case should be tried on indictment, or be dealt with summarily, elected the latter alternative, and formally pleaded not guilty to the four summonses.

The history of the case, as laid out by the prosecution, was briefly to the following effect:—Mr. Gale, London manager of Messrs. Westley Richards and Co., Ltd., the only gunmakers trading in London under the name of Richards, having heard that a gun marked "Richards, London" was exposed for sale at a pawnbroker's shop in Hastings, went down to that place on January 13th of this year to inspect the gun. On seeing it in the window, he went into the shop, and purchased it for £3 10s., having at once recognised that it was not of his firm's make, and immediately laid the matter before the solicitor to the Gunmakers' Association, in order that action might be taken on behalf of the Association for a contravention of the Merchandise Marks Act. On application, the pawnbroker who sold the gun gave information that he had purchased it from Messrs. McCarthy, Buck, and Co., merchants and manufacturers, of 40, St. Andrew's Hill, London, so far back as September 19th, 1898. The gun, with others bought at the same date, was not marked at the time of purchase, but was subsequently delivered to the buyer marked "Richards, London."

This prosecution was divided into four summonses:—First, for applying a false trade description with the meaning under Sec. 3, sub-section 2, of "signifying the merchandise or manufacture to be of some person other than they really are"; second, for applying that false trade description with the meaning in Sec. 3, sub-sec. 3; third, for "causing," under Sec. 2, sub-sec. 1, clause (f), this clause reading "causing any of the things above-mentioned to be done"; and fourth, under Sec. 2, sub-sec. 2, for the act of selling—"every person who sells any goods to which any false trade description is applied."

Mr. Albert Henry Gale was the first witness called, and said that he was the London manager of Messrs. Westley Richards and Co., Ltd., of 178, New Bond Street, W., and that there was no other firm of gunmakers in London of the

name of Richards. He then gave formal evidence as to seeing the gun in question exposed for sale in a pawnbroker's shop-window at Hastings and purchasing it, obtaining at the same time a receipt for the money paid, A52 being entered thereon, that being the wholesale vendors' number. The transaction took place on January 13th of this year. The gun was not one of Messrs. Westley Richards' guns, though marked with the name "Richards, London," and was, in his opinion, of the commonest type. His firm had been in the trade since the year 1812.

At this point, a question of the relevancy or otherwise of further evidence arose, the prosecution seeking to bring into the case the matter of another gun similarly marked and sold through the same medium, as an indication of the general character of the business which had existed between the defendants and the pawnbroker at Hastings. Eventually Mr. Gale gave evidence to the effect that, on January 26th, he received from a Mr. Brown another gun, known as A51, which had been bought from the same pawnbroker for £4 7s. 6d., and which also bore the inscription, "Richards, London." This appeared to be of precisely similar make to A52, and was consequently not a product of his firm. Messrs. Westley Richards and Co., Ltd., make two qualities of double-barrelled hammer guns, which are sold at £42 and £25 respectively, in addition to which they also make a cheaper gun, of which a few are sold, the price being £10 10s.

In cross-examination, Mr. Gale stated that his firm had never, in Birmingham, London, or elsewhere, sold a gun of the same description as A52. He should say that the gun in question was a new gun, but in the course of re-examination he said that he did not think that the ordinary public would know whether it were new or second-hand.

Mr. Henry Augustus Stratford, the Hastings pawnbroker, was then called, and gave evidence that he had been in communication with the defendants, as vendors of guns to himself, for about eight or nine years, the business relationship having arisen through Mr. Thomas, a former member of the firm, showing his samples. The firm was then styled McCarthy, Thomas, and Co. On the 19th of September, 1898, the witness went to Messrs. McCarthy, Buck and Co.'s place of business in London, and chose the gun known in this case as A52, together with four or five others. None of the guns at that time were marked, and in reply to a question asked by the managing man, as to whether he would have them marked, he had said, "Yes, as before." Previously, guns had been supplied to him marked with various names. This gun was invoiced to him as A52, "one double-barrel breech-loading gun, 12-bore, central fire, £2 10s. 6d."

The next witness was Mr. Henry Alfred Alexander Thorn, trading as Charles Lancaster, 151, New Bond Street, London, who gave evidence as to the usual practice of marking guns with the name of the maker on the top rib between the barrels. On examination of the gun, he stated that it was not a Westley Richards' gun. Cross-examined, he thought that it was perfectly obvious that this gun had been marked after it was browned. He did not think that anyone buying the gun on the strength of the mark would notice this detail, but a gunmaker would notice it.

After some discussion, Mr. Brown, who had previously been mentioned as the purchaser of the gun numbered A51, bought from the same pawnbroker, was sworn as a witness, the object of the prosecution in calling him being to show whether

an ordinary member of the public would rely upon the name, "Richards, London," as evidence that a gun so marked was made by Messrs. Westley Richards & Co., Ltd., of London. He stated that his wife had bought the gun as a present to him, at a cost of £4 7s. 6d. He had shot "on and off" all his life, and on seeing the gun marked "Richards, London," he was led to believe that it was manufactured by Messrs. Westley Richards & Co., Ltd., and would therefore be a good one, "because they are good gunmakers." As a matter of fact the gun burst in use, and after trying first to have it repaired in Hastings, the witness sent it up to Messrs. Westley Richards & Co., Ltd., presuming them to be the makers, in order to have the burst barrel replaced.

The case for the prosecution here closed.

For the defence, Mr. Scott said that he did not propose to call evidence. He was bound to admit that the mark of "Richards, London," was put upon the gun A52, under the circumstances already explained in evidence. He laid stress, however, on the point that the gun was bought before being marked, and that it was subsequently delivered to the purchaser marked, without any increase in price being made for the marking, his argument based on this fact being, that as between the firm supplying the gun, and the pawnbroker to whom it was sold, there was never any intention to defraud, and there was a total absence of a consideration which gave the vendors any benefit from putting that mark on the gun. He could not, nevertheless, conceal from himself the fact that there might have been an intention to defraud, if it could be thought that the name "Richards, London," on a gun of this character could by any possibility deceive anyone into thinking that he was buying a Westley Richards' gun; and on that ground, taking the ruling of a precedent case to the effect that the deceit goes on beyond the first purchaser, he admitted that the defendants had unwittingly committed an offence against the Act. With reference to the offence, however, Mr. Scott, drew attention most strongly to evidence elicited in cross-examination of Mr. Thorn, as regards a conversation which had taken place with Mr. McCarthy after the conclusion of a similar case (*Regina v. S. Goff & Co.*, which was reported in the December issue of last year), in which, counsel suggested, Mr. McCarthy had expressed considerable surprise at the ruling, that the placing of a fancy name, other than that of the actual maker, on a gun, without any intention to make a personal profit, was an offence under the Act. The gun in question, he pointed out, had been sold and was out of Mr. McCarthy's possession before the date of the previous trial referred to, but since that time Mr. McCarthy had, the counsel said, been most careful to abstain absolutely from putting any name on a gun that could possibly be an infringement of the Act. Finally, on the assumption that the Court might be of opinion that an offence under the Act had been committed, Mr. Scott expressed, on behalf of the defendants, their sincere regret to the Court for having committed the offence, and also their most ample apology and sincerest regret to Messrs. Westley Richards & Co., Ltd.

The Alderman acknowledged that the apologies made on behalf of the defendants had considerably impressed him, and he therefore delivered judgment, imposing a fine of £5 on each of the four summonses, this being the amount of the full penalty on one. He also allowed £10 10s. costs on one summons, making a total disbursement for the defendants of £30 10s.

ROUND THE TRADE.

We are sorry to hear of the death of Mr. Adamson, late with Messrs. Daniel Fraser & Co., of Edinburgh, which was brought about through a cancer on the stomach.

We understand that Mr. W. W. Greener's book on sharpshooters has been a wonderful success. No less than 10,000 copies have been sold, with the result that a new edition is in active preparation.

We regret to record the death of Mr. W. Gregory, the well-known optician, which occurred on the 2nd ult. Mr. Gregory, whose firm occupies the position of official opticians to the National Rifle Association, was always especially interested in optical appliances as applied to shooting, and was a well-known figure at the Bisley meetings.

On April 6th, Mr. Ralph Hancock applied to the Justices at Rochford to appoint a day to hear an application for permission to establish explosive works at Waterside Farm, Canvey Island. The Bench agreed to hear the application on May 23rd, and in the meantime the fact that the application was to be made was to have full publicity given to it.

Messrs. Curtis's and Harvey, Ltd., have forwarded a neatly-bound and useful little pocket-book and calendar, suitable for the waistcoat pocket, which they are presenting to customers. It is leather-covered, and, in addition to the features already mentioned, contains various useful items of information for the benefit of shooting men generally.

Messrs. Vickers, Sons & Maxim, Ltd., have bought several hundred acres of land on Walney Island, on a portion of which they intend to build from 1,000 to 1,500 houses, for the use of the workmen employed at their establishment. The new colony has already received the name of "Vickerstown," and was inaugurated in due manner on April 1st by a dinner given to the employes of the company.

The Swansea Safety Fuse Co., Ltd., advertise a trade mark in a recent *Trade Marks Journal* relating to safety fuses for blasting purposes. The device contains as a centre a representation of a burning fuse with the words "Spit fire brand, blue tube through centre of fuse" beneath it. This is surrounded by a border consisting of an ornamental arrangement of fuse.

Tenders are invited by the Brazilian Government for the installation in that country of a factory for the production of smokeless gunpowders or for the supply of such powders. The Secretary of State for Foreign Affairs has been notified to this effect by a despatch from H.M. Consul-General at Rio de Janeiro, and further particulars may be obtained on personal application at the Commercial Department of the Foreign Office between the hours of 11 a.m. and 5 p.m. any day.

Messrs. Joseph Braddell & Son, shooting and fishing tackle manufacturers, of Castle Place, Belfast, have published a list of shootings and fishings to be let during the current year, which should prove of great interest to those concerned. The catalogue embraces a wide range of districts in "the most distressful country," and is calculated to engage the attention of those true patriots who think that under present conditions in our relations with Foreign Powers our own little islands are deserving of some patronage and concentration of the circulating medium.

Mr. H. F. L. Orcutt, London Agent of Messrs. Ludw. Loewe & Co., Berlin, notifies a change of address from 145, Cannon Street, E.C., to 30 and 32, Farringdon Road, London, E.C., as from April 26th. The new premises, which cover an area of 10,000 square feet, will be set out in the several departments of offices, stock rooms, and show rooms, in the latter of which a complete line of the well-known Berlin firm's machine tools will be shown in actual operation. They are also to be stocked ready for immediate delivery, together with the small tools and gauges which form a section of the firm's specialities.

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The Gunmakers' Association will hold its annual dinner this year on Wednesday, May 9, at the Trocadero Restaurant, Piccadilly. The annual general meeting is to be held on the afternoon of the preceding day. For Wednesday afternoon a visit has been arranged to the Royal Small Arms Factory, at Enfield, and the party, comprising various members and guests of the Association, will leave Liverpool Street about mid-day, returning after an inspection of the Factory in time to get ready for the dinner in the evening.

THE FATAL EXPLOSION AT DOVER ADMIRALTY HARBOUR WORKS.

THE report of Captain M. B. Lloyd, H.M. Inspector of Explosives, in reference to the explosion of gunpowder on the works of the new Admiralty Harbour at Dover, has now been made to the Home Secretary. This explosion came about on January 14th last, and resulted in six men being severely injured, so much so that one subsequently died from the effects of his injuries. According to the evidence, two holes had been bored for blasting purposes on one of the "benches" on the face of the East Cliff, and before the men engaged in this task had cleared off, a cotton bag containing 28 lbs. of gunpowder was brought down, and was exploded by a match thrown into it by one of the borers, with the result already mentioned. On careful investigation Captain Lloyd finds that the casualty was due, primarily, to one of the men smoking contrary to the rules, the match with which he lighted his pipe being carelessly thrown down, presumably on the bag of powder. He does not, however, wholly exonerate the contractors from a share of blame, both for allowing the charges of powder to be brought down to the bench in cotton bags, and for permitting the bags to be brought to the spot before the borers had left their completed work. The duty of socketing and charging the holes, he points out, rests entirely with the chargeman, and if a reasonable interval, such as the 30 minutes enjoined in Rule 9 of the Quarries Act, were observed, there would be no necessity for bringing the powder down until after the socketing was finished. Under the circumstances, therefore, H.M. Inspector could not report that the contractors, Messrs. Pearson & Son, had taken every precaution for the prevention of accidents by explosion. He agreed with the jury's verdict of accidental death nevertheless, inasmuch as the evidence was not sufficient to substantiate a charge of culpable negligence.

CORRESPONDENCE.

"RIFLEITE" TRIALS.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—I am sorry my letter, criticising the statements and views of your correspondent under the above title, should have been taken as a criticism of the writer. This was quite foreign to my object, and I am sorry where I have given offence.

In addressing you I desired only to point out to your readers where your correspondent made errors. First, in assuming our trials were valueless because they did not conform in all details to the British Government methods, and second, that it was not true that the Cordite cartridges used as a standard were unserviceable, and that under Government proof "rejection pure and simple would have been their fate."

I am quite prepared to leave the evidence of the trials in the hands of the readers of the report, and to comment only on the more serious imputation with respect to the Cordite cartridges used. This statement, when made evidently by an expert and in a journal like yours, renowned for its accuracy, cannot be allowed without objection being made; nor can the supposed further evidence on this point detailed in your correspondent's letter in your April issue be allowed to pass in silence.

In the letter referred to your correspondent states:—"I can now compare these muzzle velocities with those recorded in the report of the 'Rifleite' trials. At each station 21 sets of averages were taken with standard 'Cordite' cartridges. At Barwick 11 of these were above Government specification, at Eyeworth four, and at Angel Road nine."

This is obviously a misleading statement. I do not say it is purposely so, but really your correspondent should take more care. It is true 21 sets of averages of the "Cordite" cartridges were taken at each station, but 14 of these were in the *pressure-proof barrels*, and therefore absolutely unreliable for, and never intended for, fixing the average velocity of the cartridges; and this your correspondent should have noted. The remaining seven sets were shot in the *rifle*, and the average observed results obtained are detailed below:—

OBSERVED VELOCITIES.

Series.	A station, 50 ft. range.	B station, 164 ft. range.	C station, 180 ft. range.
1	1,982	1,923	1,967
2	1,984	1,934	1,992
3	1,983	1,946	2,030
4	1,970	1,923	1,968
5	1,970	1,958	1,970
6	1,976	1,960	1,974
7	1,989	1,979	1,949

Your correspondent would have your readers believe 21 series out of 63, or one-third, were outside the Government velocity limits. The above figures show that only two series were outside these limits, and one of these by only two feet. Moreover, although at station "C" the velocities were near the high limit, yet at stations "A" and "B" they were near the low limit; and consequently in these latter the pressures should be below the standard.

Further comment is not necessary, but I think your readers will agree with me that, as all experts could have ascertained from the report, the "Cordite" cartridges gave serviceable results. Your correspondent makes misleading and erroneous statements when he tries to show the "Cordite" cartridges would have been rejected if submitted to Government proof. The "Cordite" cartridges were well to Government specification, and all statements to the contrary are made in direct opposition to the results detailed in the report.

I remain, Yours faithfully,

THE SMOKELESS POWDER & AMMUNITION CO., LTD.,
L. G. DUFF GRANT,
Secretary and Manager.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—I have received a duplicate of Mr. Duff Grant's last letter, which I understand has been sent at his suggestion, and I thus send you my reply, so that they may be published simultaneously.

It must have struck those of your readers who read the report of the trials, that the very essence of the trials were the velocities as well as the pressures; in fact, the title, "Programme of Velocity and Pressure Tests carried out simultaneously, etc.," leads one to believe this was so, and, further, we find on page 4, paragraph 5, "The velocities should bear a strict relation to the pressures—but the "side" proof barrel will not be *so exact!*" But where an adverse criticism is suggested, Mr. Grant implies that it is "misleading," and quietly supplies us with a fact which practically repudiates the whole of the report. He tells us that two-thirds of the series of averages are "absolutely unreliable," as being fired in proof barrels.

But surely, Sir, it is a little late in the day to tell us this, considering that the table of averages (Table 5), and the summing up and verdict (Page 5), which up to now have been the text of every eulogistic press report, contain solely and only those velocities which Mr. Grant says are "absolutely unreliable." The worthy one-third has been excluded entirely, and we do not see any indication of one single round of "hot" or "cold" cartridges (I mean those specially treated) having been fired in the rifle.

I now come to the question of whether the Cordite cartridges, which were made up specially as a standard and fired in the rifle (Table 3), were serviceable or not.

Mr. Grant says that at Station "C" "only two of the series were outside the maximum limits, and one of these by only two feet." This is a point I cannot agree upon. I am of opinion that four out of the seven series are above the maximum in the table, and the reason we do not agree on this point is that Mr. Grant's system of converting observed velocities to muzzle velocities shows an addition of over 70 feet seconds, while my calculations, which I believe to be correct, give an addition upon the minimum observed velocity (1910 f.s.) of 51 f.s., and upon the maximum velocity (1990 f.s.) of 54 f.s. I will refer to the Cordite standard again, but will deal now with the Standard Rifleite fired in the rifle, and see what can be said for it. At station "A" five out of seven are 18 f.s. (mean) below the minimum; at Station "B" out of seven one is at the minimum, and four others are below; with Rifleite "loaded at the time" at Station "A" the whole lot are 39 feet (mean) below the minimum, and Station "B" two out of six series (by Mr. Grant's calculations these would all be 21 f.s. lower, and thus additional rounds would be below the limits.) Now add the fact that nine rounds of these low velocity cartridges were apparently fired to obtain the standard pressures, as against three rounds of the Cordite, and I think your readers must admit that my contention, that the standards are unequal, is a fair one. Table 3 does not establish any comparative result between the rifles and the pressure barrels (except the latter in the operations of taking pressures) nor does the report show that the rifles were tested with a standard one from time to time, or were ever standardised at all!

If Mr. Grant will not allow me to quote any velocities but those on Table 3, he surely will not object to my pointing out the standard pressures of the Cordite, which are mostly abnormally high. In Table 1, Base Pressures, two out of seven series at Station "C" are above the specification maximum, and the average of the lot is only 2 tons below the maximum. At Station "B" they are, all but one, abnormally high, but at Station "A" three series are normal. It is

exceedingly rare to find .303 Cordite cartridges giving over 14.5 tons, even when the velocity is at the maximum, whereas 15.5 tons would reject any series.

With the "side" pressure of 21 series (of Cordite) at the three Stations 13 are above the maximum, but this I pass over.

In conclusion, let me point out that I have said no word of disparagement to Rifleite, nor praise for Cordite, but I am none the less of opinion that as comparative tests, their value is considerably discounted by the initial differences of the standards, and the absence of data and particulars as to the standardization of the various materials and instruments used. To a cautious enquirer it is clear that such differences at the starting point relegate subsequent treatment of the comparative results to the region of assumptions and theoretical imaginings.

I am, Sir,

Yours faithfully,

THE CORRESPONDENT WHO WROTE THE ARTICLE.

P.S.—In last month's issue, end of 6th paragraph, the corrected muzzle velocities should read 2,044 f.s. and 1,961 f.s.

THE DUM-DUM BULLET.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—I regret the tone of Captain Bertie Clay's letter in your issue of April. There is nothing misleading in my letter of the 13th January, 1900, to which he alludes; and I ask anyone reading his letter to refer to the letter to satisfy himself that this is so.

The object of the letter, which was in your February number, was to explain that "Cyclops," in alluding to the Tweedie bullet, made under Patent 22,173, 1891—a solid-based expanding compound bullet—had omitted to add that there was also a Tweedie bullet made under Patent 902 of 1889, the claim in which is to obtain expansion on impact in a compound bullet having an *open base* by weakening the front part of the case by thinning, &c.

When Captain Bertie Clay filed his complete specification I had the right for two months to oppose the granting of the patent. I exercised this right, having previously warned him that I should do so; and the result of this was that Captain Bertie Clay had to disclaim all contained in my patents as to obtaining expansion on impact in compound bullets by thinning the case over the front part, exposing the lead in front, &c., &c.

I then pointed out that the use of the cannelure, the more or less open base, and the reduction of the base are constructions that have already been exposed, and can be used by anyone.

Captain Bertie Clay now asks me when the coning of the base has been exposed. I refer him to Patent No. 9,577 of 1884 (compound bullets), and quote from that patent (page 4, lines 1 to 3):—"Fig. 1 shows the casing on shell M of the projectile in its simplest form. On the right-hand side it is shown with its rear end made very thin, so that it will readily enter the grooves of the rifling without deteriorating them."

I also refer him to No. 19,912, 1893, in which he will see the base of a compound bullet still more coned. Mind, I do not agree that the destruction of the barrel is caused by the base of the bullet being of full size. As I have said before, and

repeat now, the destruction of the barrel is caused by the bullet allowing the gas to pass between it and the barrel, which causes "erosion," a well-known destructive effect under given circumstances, which was produced by black powder before the nitro-powders had been thought of. It is, however, probable that "Cordite," having a nitroglycerine component, and therefore being a very hot-burning explosive, would increase the "erosion," but only if there is room for the passage of gas between the bullet and barrel.

The gas is prevented from passing between the bullet and barrel by the use of a cannellure near the base, which causes the bullet to expand into the barrel and completely fill it up.

I am not an advocate for the solid base. I prefer the open base, as it gives the bullet a better balance. At the same time, the solid base can be used without detriment to the barrel, provided the bullet is properly made with the necessary cannellure. All compound bullets that are made to give expansion on impact by weakening the front part of the case by thinning, &c., &c., as named in my specification, come under my patent of 1889.

I admit that after twelve years in a Government factory Captain Bertie Clay should be able to form a correct diagnosis of the intricacies of cause and effect, but I cannot admit that the mere fact of anyone holding an official appointment is in itself proof of an encyclopædic knowledge of all matters connected with an important department of science.

MICH. TWEEDIE,
Major-General.

April 14th, 1900.

REVIEW.

The Story of the Volunteer Movement, 1859-1900. By William Harnett Blanch. Published by John Blanch & Son, London. Price 2d.

It is somewhat singular that no writer dealing with the rise of the Volunteer movement seems to date further back than the historic year 1859. Mr. Blanch, it is true, makes mention of the formation of "rifle clubs and such-like organisations" which had sprung into existence in various parts of the country before that time, notably about 1845, when threats of a foreign invasion began to disturb the national mind; but this reference barely acknowledges the historic fact that at the time when Napoleon Bonaparte was storing up his flat-bottomed boats in Channel harbours for the wholesale invasion that never took place, there was a distinct movement in the direction of forming volunteer corps, the public schools themselves joining in the enthusiasm, and enrolling cadet companies among the boys. Needless to say, this was before the fateful year of Waterloo. Apart from this omission, Mr. Blanch has compiled a most interesting little history, in which the leading landmarks in the movement, and the official obstacles which have so frequently tended to hinder its development, are plainly set forth. He is especially strong, in dealing with the present and future of the volunteer forces, on the points of increased facilities for practising marksmanship, and on the better appreciation by the authorities as to the value and meaning of the movements. Unfortunately, the latter is just the critical matter of the situation, as past experience only too plainly shows.

APPLICATIONS FOR PATENTS.

MARCH 17—APRIL 14, 1900.

- 5,218. Breech-loading Small-Arms. T. R. R. Ashton.
 5,223.* Automatic Firearms. G. Roth and C. Krnka.
 5,258. Revolving Gun. J. S. Macdonald.
 5,395.* Quick-firing Guns. J. H. Barry and R. G. Pemberton.
 5,426. Explosive Compounds. S. B. Earle.
 5,437. Field Gun Carriages. S. O. Cowper-Coles.
 5,442. Smokeless Explosives. W. H. Akester and H. H. Price.
 5,454. Rifle Carrier for Cycles. G. T. Speir.
 5,457.* Ordnance. F. W. Brooks.
 5,508. Ammunition Carrier. N. W. Wallace.
 5,574. Projectiles. A. Howse.
 5,641. Fish Torpedoes. T. W. Just.
 5,701. Explosive Oil Shell. F. Rowbotham.
 5,777. Magazine Firearms. G. M. Brand.
 5,830.* Manufacture of Explosives. R. Hadden (*Agent for Vereinigte Köln-Rottweiler Pulverfabriken*).
 5,840. Revolvers. G. R. Crawley (*Agent for A. J. R. Glasfurd*).
 5,873. Quick-firing Guns. A. T. Dawson and L. Silverman.
 6,056. Breech-loading Firearms. A. W. Schwarzlosz.
 6,109. Explosives. A. Haller.
 6,132. Cartridge-loading Machine. L. Chambon.
 6,140.* Automatic Guns. A. Glisenti.
 6,212. Pistol Holster. G. Martin (*Agent for J. M. Martin*).
 6,335.* Safety Device for Firearms. J. Tambour, C. Colbert, and F. Neuber.
 6,370. Projectiles for Ordnance. W. G. Potter.
 6,433. Projectiles. A. G. Strathern and J. A. Gow.
 6,498. Gun Mountings. W. E. Rowlands.
 6,557. Rifling in Ordnance. W. G. Potter.
 6,589. Gynatory Missiles. J. Gardner.
 6,600. Shooting Caps. R. H. R. Rimington-Wilson.
 6,644. Machine Guns. J. Formby.
 6,647. Automatic Gun Mechanism. A. T. Dawson and L. Silverman.
 6,825. Extractor Holders for Rifle Bolts. T. R. R. Ashton.
 6,932. Range-finders. J. G. Lorrain (*Agent for C. T. Beauvais*).
 6,937. Manufacture of Explosives. A. Luck.
 6,940. Projectiles. J. W. Graydon.
 6,960. Rifle Carrier for Cycles. A. Haskins.
 6,992. Gun Holder and Hinged Cleaning Rod. S. H. Mackie, trading as Lindsey Bros.
 7,006. Manufacture of Projectiles. J. Holding.
 7,029.* Apparatus for Transferring Heavy Ordnance from Carriage to Firing Position. W. L. Wise (*Agent for The Skoda-werke Actiengesellschaft*).

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

MARCH 24—APRIL 21, 1900.

- 4,507 (1899). **Manufacture of explosive compounds.** G. Beneké, Southport. An explosive manufactured from nitrate of ammonium compounded with some sensitive oxidizing agent, such as chlorate of potash. The oxidizing agent is used in the form of a special carbon carrier, and it is doubly coated with resin or pitch to insure safety in handling from friction or percussion. Accepted March 1, 1900.
 6,445 (1899). **Shot-gun metal cartridge cases.** H. J. Blanch, London. A method of efficiently stopping the mouth of metal cartridge cases by using a metallic wad provided with a beaded edge. The top of the case is turned over on to this edge, and a close-fitting joint is thus obtained. This method of closing does away with the sharp edged finish heretofore experienced with this case, and also obviates the necessity of using cases with exposed paper turnovers. Accepted March 24, 1900.
 6,803 (1899). **Winch-gear for ammunition hoists.** Sir W. G. Armstrong, Whitworth & Co., Ltd., and L. Newitt, Newcastle-on-Tyne. A modification of ammunition hoists described in Patent No. 3,314 of 1898. The hoist is worked by two bevel wheels without teeth, either of which may be brought into

- contact with another bevel wheel attached to the shaft of a motor. An automatic tripper-gear is fitted to prevent the hoists over-running in either direction. Accepted March 29, 1900.
- 6,881 (1899). **Targets.** T. B. Burns, Bristol. A target to which is attached a hinged wing. The combined height of the two is greater than the depth of the trench; but when lowered into the trench for marking purposes, the winged portion is so constructed that it may be turned over by the marker, the whole target thus concealed. Accepted March 30, 1900.
- 7,362 (1899). **Gas-checks for projectiles.** H. S. Maxim, London. In order to prevent gases passing the projectile and so setting up an erosive action on the bore of the gun, semi-plastic obturating rings have been used. These are supplemented in the present patent by a movable metal ring situated on the base of the projectile, and adapted at the instant of firing to force the semi-plastic ring outwards against the bore of the gun. Then, as the projectile moves along the bore, the metal ring acts as a plunger and causes a quantity of fatty material, contained in a cavity in the projectile, to be continuously supplied to the semi-plastic ring. Accepted March 31, 1900.
- 8,473 (1899). **Means for adjusting the elevation of ordnance.** A. Reichwald (Agent for *Fried. Krupp, Germany*). A method of adjusting the elevation of ordnance by means of a pointer, which is set to correspond with the required elevation of the gun. The barrel of the gun is then either raised or lowered until a point on the elevating curve attached to the barrel coincides with the end of the pointer. Accepted March 24, 1900.
- 8,761 (1899). **Pistol-swords.** B. Reyes, Mexico. A pistol-sword in which the pistol is so attached to the hilt that the hand-guard protects the trigger. For the purpose of firing the revolver separately, it can be detached from the sword-blade by the pressing of a knob which disengages the catch. Accepted March 1, 1900.
- 9,003 (1899). **Grouping apparatus for blasting fuses.** W. Bennett, Camborne. The arrangement of a set of fuses in groups for a series of shots, so that each, when fired from a common source, is independently ignited at determined intervals of time. The igniters which contain and ignite the fuses are coupled together in a metal case, containing apertures through which the ends of the igniters project. Accepted March 3, 1900.
- 9,062* (1899). **Explosive compounds.** C. H. Curtis, London, and G. G. André, Glenlean.
- 9,341 (1899). **Field gun carriages.** Sir W. G. Armstrong, Whitworth & Co., Ltd., Sir A. Noble, and R. T. Brankston, Newcastle-on-Tyne. Elevating gear applicable to the type of field gun carriage, which may be taken to pieces and carried over rough roads. All the parts of the gear are attached to the elevating bracket, which is dropped into place on one side of the carriage. The gear is then ready for working without any further fixing to the carriage. Accepted March 3, 1900.
- 9,342 (1899). **Breech mechanism of ordnance.** Sir W. G. Armstrong, Whitworth & Co., Ltd., A. G. Hadcock, and S. M. Murray, Newcastle-on-Tyne. Breech mechanism for quick-firing guns, more especially those in which the obturator is of the De Bange type. For the purpose of allowing the breech block to be swung directly clear of the opening upon the turning of the screw, the shaft upon which the carrier arm swings works in a movable bearing instead of a fixed one. The block may thus be pulled rearwardly a certain distance before being swung open. Accepted March 3, 1900.
- 9,481 (1899). **Envelopes for containing charges for ordnance.** A. Reichwald (Agent for *Fried. Krupp, Germany*). The envelope containing the propelling charge for ordnance is saturated before being made up with a solution of smokeless powder compound. When so treated, the fabric, without losing any of its density or flexibility, becomes easily combustible, and does not leave any appreciable residue in the gun. Accepted March 3, 1900.
- 10,071 (1899). **Manufacture of Explosives.** H. S. Maxim, London. An explosive composed of nitrated gun-cotton pulp, ground to great fineness under edge rollers, together with 2 per cent. to 15 per cent. of resinous material. This compound is then pressed into blocks of suitable size for use in ordnance. The object of the added resinous matter is to prevent or diminish erosion, which it does through its richness in carbon. The carbon di-oxide which is given off from the present cordite, and which erodes the gun barrels is thus displaced by carbon mon-oxide. Accepted March 3, 1900.
- 10,405 (1899). **Caps for projectile noses.** H. V. Simpson, Norwood. A method of attaching securely the penetration caps to the noses of projectiles. A ring is formed near the nose as part of the projectile during the process of casting. This ring is screw-threaded, and the cap may then easily be fixed. An advantage of this cap is that a fuse may be inserted in the nose a few seconds before the insertion of the projectile in the gun. Accepted March 24, 1900.
- 9,578 (1899). **Mountings for quick firing guns.** A. T. Dawson and G. T. Buckham, London. This specification describes a quick-firing gun mounting, modified greatly in detail and embodying several improvements described in former patents—Nos. 23,854 of 1895, 2,662 of 1899, 10,606 of 1896, 2,663 of 1899, 24,262 of 1897, and 20,611 of 1898. Accepted March 24, 1900.
- 11,026 (1899). **Breech mechanism of ordnance.** A. T. Dawson and G. T. Buckham, London. A cartridge extractor for breech-loading guns of the interrupted breech-screw type. The extractor consists of a bar having a lip engaging the cartridge flange. The turning of the breech-screw during the opening of the gun withdraws the bar a certain distance, and the swinging out of the block causes the bar to receive a kick. This withdraws the cartridge some distance, and the extraction is completed by the withdrawal of the bar by hand. Accepted March 24, 1900.
- 12,093 (1899). **Automatic guns.** The Hotchkiss Ordnance Co., Ltd. (Agents for *L. V. Benét and H. A. Merici, Paris*). Mechanism for automatic guns. All the operations of loading, firing, extracting, ejecting, and cocking are automatically performed. The parts of the mechanism are so made that they may be dismounted or assembled without the aid of tools. Some ninety odd paragraphs set out the claims of the inventors, and the specification is illustrated by a large number of drawings. Accepted March 10, 1900.
- 13,247 (1899). **Mining caps and cartridges.** W. E. Miller, U.S.A. A protection from damp for caps or cartridges, consisting of a thin rubber tube adapted to be stretched over the cap. The tubes are conveniently carried in a rolled up condition on a staff, and they are easily transferred from the staff to the cap before it is required to insert the latter in the borehole. Accepted March 24, 1900.
- 14,717 (1899). **Expanding projectiles.** H. S. Maxim, London. In order to prevent the lead being blown through the nickel casing in that type of bullet which is provided with a longitudinal hole in its nose, the hole is made of slightly smaller diameter, and its edge is turned inwardly to form an internal flange. Within the casing a strong cap of hard metal is placed, so as to cover the hole in the nose. This cap is also provided with a flange, which engages with the flange on the casing, and so prevents the nose of the case splitting upon firing. Accepted March 3, 1900.
- 15,597 (1899). **Torpedoes.** E. Gathmann, U.S.A. Means are provided in fish torpedoes whereby the detonator fuse, which in the ordinary way is secured against longitudinal movement along the fuse-way to the interior of the torpedo, may be actuated by the resistance of the water to the movement of the torpedo and the holding device released. The fuse is then permitted to take up a rearward motion along the fuse-way towards the bursting charge, which is exploded by the fuse upon the impact of the torpedo. Accepted March 17, 1900.
- 15,639 (1899). **Automatic gun-loading mechanism.** A. T. Dawson and L. Silverman, London. In the loading mechanism, described in Patent No. 8,046 of 1899, the cartridge magazine was so arranged with the carrier that the cartridges dropped one by one into the carrier, their weights liberating a spring piston, which acted to throw the cartridge into the chamber. It has since been found that there is a liability of the cartridge rebounding on dropping, and consequently they were not truly directed into the chamber at times. The present patent deals with a modification of the carrier, on which an arrangement of flanges prevents the cartridges from jumping. Accepted March 17, 1900.
- 263 (1900). **Loading feed-belts for machine guns.** J. Imray (Agent for *Colt's Patent Fire Arms Manufacturing Co., U.S.A.*) A machine for loading cartridges into feed-belts, in which the belt is firmly held, while the pocket is opened by means engaging the fabric externally. The machine then inserts the nose of the cartridge into the opened pocket. The pocket is released after this operation, and the belt is moved on by feed wheels. A piston then pushes the cartridge completely home. Accepted March 17, 1900.

- 344 (1900). **Ball-bearing rifling for ordnance.** C. A. Jensen (Agent for E. W. Anderson, U.S.A.) The bore of the gun is provided with spiral grooves, in which are placed hard steel balls. Each spiral ends at the muzzle in a straight run, which is provided with what is called a recoil cushion. This consists of a cylinder working in the groove, which is always urged towards the breech of the gun by a spring. The balls give the smooth-faced projectile a rotary motion upon firing. Accepted March 3, 1900.
- 702 (1900). **Pistol pocket and cartridge carrier.** W. P. Thompson (Agent for R. M. G. Phillips, U.S.A.) A leather holder is described, which is provided with a tube to contain a reserve magazine of cartridges. Attached to the holder is a spring, which is adapted to catch under the rim of the pocket of a coat, so as to prevent the accidental removal of the pistol when being carried in the pocket. Accepted March 10, 1900.
- 836 (1900). **Steering mechanism for torpedoes.** A. E. Jones, Austria-Hungary. The mechanism described in this patent is a modification of torpedo-steering apparatus described in Patent No. 12,169, of 1897, and consists of a special arrangement for causing the torpedo to move in the water at any predetermined angle to the axis of the discharging tube. Accepted March 17, 1900.
- 1,389 (1900). **Gas-checks for ordnance.** W. L. Wise (Agent for The Skodawerka Aktiengesellschaft). A gas-check for ordnance, which consists of an obturating socket adapted to contain the charge. This socket has a tubular extension, which receives the igniting medium, and by means of this extension the socket may be removed from the breech, and used any number of times. Accepted March 3, 1900.
- 1,390 (1900). **Breech mechanism of ordnance.** W. L. Wise (Agent for The Skodawerka Aktiengesellschaft). In order to prevent the accidental opening of the breech, and to prevent firing when the breech mechanism of the gun is not completely closed, the parts are so arranged that a projection on one arm of a two-armed lever used for opening the breech, is forced into a groove when the breech is closed, where it is held by a locked hook. A safety bolt secures the firing pin when the breech is partially opened, and this device is released when the breech is completely closed. Accepted March 24, 1900.
- 2,777 (1900). **Carriages or mountings for ordnance.** J. F. Meigs and R. P. Stout, U.S.A. The gun is so mounted that in the firing position it is supported beneath the axle of the wheels. Being in this position it is claimed that the recoil pulls the two wheels and the special trail against the ground. For the purpose of transportation the gun may be shifted to a position above the axle. Several other modifications are explained, the object of which is to obtain greater stability in firing, and a reduction in the weight of the whole, so tending to make the gun and carriage more portable. Accepted March 31, 1900.
- 2,779 (1900). **Gun bearings.** J. Strauss, U.S.A. The gun bearings described in this specification are constructed so that they have every capacity for withstanding the shock of recoil, and yet offer the smallest possible resistance from friction to the turning of the gun in elevating or depressing it. The ordinary trunnions are used, and are mounted in the usual way. These take the shock of recoil; but from the faces of these project supplementary trunnions, which have ball-bearings. There is thus only rolling friction in the moving of the gun to elevate or depress it. Accepted March 24, 1900.
- 2,852 (1900). **Automatic machine guns.** F. M. Garland, U.S.A. A single-barrelled automatic gun, in which the barrel recoils on firing. A spring draws the barrel forward after the recoil is spent, and this movement advances the cartridge belt into the case, and moves the breech block backward for extracting the empty shell and compressing the loading spring. The empty case is pressed away by a lifter, which thus releases the breech block, and allows it to fly forward, taking with it a fresh cartridge, and cocking the hammer in its travel. Accepted March 31, 1900.
- 3,365 (1900). **The mounting of ordnance.** G. Ehrhardt, Germany. A method of mounting or dismounting heavy ordnance by means of rollers arranged in combination with rails on the gun-platform. The removal of the gun from the mounting is performed on these rollers, and the gun is received on a movable carriage. Thus the gun may be transported to any desired spot. Accepted March 31, 1900.

* The above specification is more fully described under "Selected Patent."

SELECTED PATENT.

A GUNPOWDER FOR ARMS OF ANY CALIBRE.

9,062 (1899). C. H. Curtis, London, and G. G. André, Glanlean. This patent relates to the manufacture of an explosive which may be regulated so as to adapt it for use in arms of any calibre.

The basis of the explosive is ammonium picrate, which is itself only feebly explosive, but is capable of being wholly resolved into gases. This substance is safe to manipulate, not being very liable to be exploded, either by a blow or by friction. In one respect, this salt of picric acid is very deficient, inasmuch that it does not contain sufficient oxygen in its composition to entirely burn the carbon constituent. But this deficiency furnishes an opportunity of regulating the explosiveness of a mixture of which the picrate forms the base. An oxygen carrier is, therefore, added in proportions which must be determined with reference to the duty which the finished explosive is required to perform. The heat and rate of combustion may be varied within wide limits, and the initial pressure in the gun-barrel and the velocity of the projectile may, to a great extent, be regulated by this means.

It is proposed by the patentees to use as an oxygen carrier barium nitrate, and a mixture of this, with the picrate, forms a suitable propelling explosive. But it has been found to be advantageous to incorporate also a small proportion of nitrocellulose with the mixture mentioned, in order to obtain a means of quickening the combustion. An alteration in the quantity or the quality, or both, of the nitrocellulose would bring about a change in the readiness of the explosive to ignite and also in the rate of combustion after ignition; and the heat could be regulated by altering the proportion of the picrate to the nitrate. The explosive may thus be standardized and adapted for use in several classes of small-arms, and also for use in heavy guns. A "restrainer," or means for retarding the explosion, is obtained by adding some such substance as mineral jelly.

The proportion of barium nitrate most suitable for small-bore military rifles is between .70 and .80, that is, about .75 to 1 of picrate. For shot-guns 1.20 of nitrate to 1 of picrate has been found to be preferable. To quicken combustion a small amount of potassium nitrate may be substituted for a part of the barium nitrate, and the following are the proportions which have been found most suitable:—For use in rifles, one part of ammonium picrate, and .70 of barium nitrate with .05 of potassium nitrate. For shot-guns, one part of ammonium picrate, and 1.05 of barium nitrate with .15 of potassium nitrate.

In order to maintain a given heat of combustion and at the same time regulate within certain limits the rate of combustion, and also to make the powder as nearly smokeless as possible, guncotton may be added. The guncotton may be of any grade from low to high nitrogen contents—the higher the grade the quicker the rate of combustion. A rifle powder compounded on these lines may be made up in the following proportions:—

Ammonium picrate	..	..	..	..	1.00
Barium nitrate	..	..	..	..	0.60
Potassium nitrate	..	..	..	..	0.05
Guncotton (about N. 13 per cent.)	..	..	..	..	0.15

This powder, granulated to the required degree, has been found suitable for use in such rifles as the Lee-Netford, Mannlicher, or Mauser.

In the manufacture of the explosive, the above ingredients are first thoroughly mixed together, and then incorporated beneath edge-runners or other suitable means with about 5 to 8 per cent. of water. This compound is then pressed into thin cakes, and granulated in the usual manner for fine grain powder.

For ordnance, the explosive, compounded in suitable proportions easily determined, is pressed into cakes, which may be perforated or not, as may be required. The amount of compression which the cakes receive is another method of regulating the rate of combustion. Accepted March 31, 1900.

Arms & Explosives

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CURRENT TOPICS.

The Service Pistol.—In our last issue our correspondent "Cyclops" put forward the suggestion that the frequent controversies regarding the relative merits of revolvers and automatic pistols might be set at rest were the Government to manufacture a pistol of its own containing the good points of each, and so to some extent bring the controversy to an end. Since then various facts have been brought to our notice by Messrs. Webley which place the matter in a somewhat different light. It is pointed out that where our contributor suggests that Sheffield manufacturers should not be cut out by the Government when they have laid out so much capital in producing Government material, he loses sight of the fact that the Webley Company are in an exactly similar position. Had it not been for the spirited enterprise of Messrs. P. Webley & Son some years ago, the revolver trade in this country would probably have utterly collapsed, with the result that our army and navy might have been obliged to obtain its supplies from America or Germany. The firm worked hard for more than two years in making models for the Government before the Webley Mark I. was adopted, and quite recently they have undertaken considerable expenses in increasing the efficiency of their plant. Purely for the purpose of Government contracts the company acquired fresh land upon which to build a factory entirely devoted to revolver work. The output has admittedly satisfied both as regards efficiency and workmanship, and on these grounds the company are of

opinion that Government has no need to change a position of affairs which is admittedly satisfactory, while there are other departments which would be well worth the expenditure of any surplus energy that may be available.

The Gunmakers' Association.—It proved a very pleasant addition to the annual meeting and the annual dinner of the Gunmakers' Association to visit the Enfield Rifle Factory on the afternoon of the 9th ult. It gave those who attended an opportunity of a little friendly converse on things in general, besides which it was a pleasant way of spending an afternoon, with a dinner in prospect for the evening. Mr. Edgar Harrison took the chair at the dinner, and was supported on the right by Mr. R. W. S. Griffiths and on the other side by Mr. C. E. Greener. The toasts usual on such an occasion were duly honoured, but this particular year they had a special interest of their own. The Association was in the fortunate position of being able to look back upon a good year's work well done, and of a character to appeal to the bulk of the members. Such an excellent opportunity of pointing a moral was not lost. The chairman made it perfectly clear that those gunmakers who have not yet joined the Association, and so aided in finding funds for the work it performs, have not played a very liberal part towards the industry from which each and all derive their livelihood. Turning to other speakers it was no doubt a source of satisfaction to Mr. Edwinson C. Green, of Cheltenham, to receive such a hearty welcome, in view of the fact that two years ago he vigorously criticised the work of the Association at a time when he considered that it hardly rose to a sufficient sense of its

responsibilities and opportunities. This year his verdict was distinctly favourable, but, in indication of much needed reform in the trade, he suggested that gunmakers should be registered, as a proof of their competence, so as at least to be on a level in this respect with a plumber who mends our drains. With this, and other speeches, a very cosy gathering drew to a close, the members one and all agreeing that the Oak Room at the Trocadero is a more suitable scene for this function than the more spacious apartment which adjoins it.

NORMAL POWDER AND AMMUNITION CO., LD.

A REPORT of this Company, covering a period of about 18 months, dating from the issue of the last report, has recently been circulated among the shareholders. Following the previous custom, the directors have not issued a balance sheet. We have not had the opportunity of seeing any original documents relating to this Company, but what seemed to read like the directors' report appeared in the *Financial News* of the 14th ult., and is reproduced below. It seems that while the Company's business has developed from the point of view of turnover in loaded cartridges, the profits arising from this business have not been sufficient to cover working expenses.

The directors therein announce that negotiations have taken place regarding a scheme of amalgamation with the London Sporting Park. Among the reasons put forward in favour of this course is the following:—"The meeting of the Inanimate Bird Shooting Association yearly at these grounds (London Sporting Park) will give sportsmen from all parts a chance of making themselves acquainted with the superior qualities of Normal Powder." Personally we cannot quite see how this works out, unless the scheme includes an amalgamation with the Inanimate Bird Shooting Association as well as with the London Sporting Park. Perhaps, however, space would be wasted in pursuing the amalgamation too far, since we have it on excellent authority that the negotiation fell through during the preliminary stages. The *Financial Times*, as distinguished from the other financial paper quoted, had a rather strong article dealing with the Normal Company, entitled "Shooting Backwards," in its issue of May 19. In the course of the article reference is made to a balance sheet supplied to a shareholder on demand in accordance with his rights. From the particulars that appear, it seems that the past 18 months' working has resulted in a loss of £6,348, which is in addition to that shown in a balance sheet to September 30th, 1898, amounting to £9,592. This makes the total trading loss for the years ending with March, 1900, £16,000 out of the total public subscription of £25,000. The assets, apart from goodwill, appear to stand at £6,164, made up as follows:—Factory, £1,338, machinery, £728, furniture, £191, sundry debtors (less creditors), £1,213, stock, "as per manager's list," £2,357, and cash, less bills payable, £337. It also appears that £4,500 of debentures have been issued, which, with interest accrued thereon, make a first charge of £4,641 against assets as above set forth of £6,164. It is not stated for what purpose the debentures were issued nor by whom they are held.

The directors, in presenting their report, covering the period from October 1, 1898, to March 31 last, think it is due

to the shareholders to explain why this has not been issued before, and beg now to state that the reasons have been the following:—The first report issued having comprised the work of the company from its beginning (March 11, 1897) to September 30, 1898, or rather more than 18 months, it was thought expedient to make the present report also for about the same period, so that a comparison of the progress of the business can be made:—Sales of sporting cartridges and their equivalent in powder, from March 11, 1897, to September 30, 1898, 3,225,135; from October 1, 1898, to March 31, 1900, 5,126,978, which leaves an increase during the past 18 months of 1,901,843 cartridges. This increase of the sales of cartridges shows that there has been no falling off in popularity of the Normal Powder, and, as a further proof, we must state that the number of the shareholders has during the last 18 months increased by 130, and stands at the present date at 1,412, the majority of these being sportsmen using the powder. Further progress, in introducing the Normal Powder abroad, has also been made, and we may mention that in Kashmir the Normal Powder has got the whole trade, and amongst the countries in Europe from which extensive orders have been received since the last report have been Italy and Holland. The second reason for the delay in the report has been that negotiations have been going on with the London Sporting Park, Ltd., of Hendon, N.W., with a view of amalgamation, and it is hoped with success. The directors must confess that the introduction of a new sporting powder is a very expensive undertaking in the face of the very severe competition now existing, and the profits hitherto earned are, therefore, more than swallowed up by the costs of developing the trade, such as advertisements, samples, travellers, &c.; so until the output is considerably increased they regret to say that they can hold out no hope of a dividend. With a view, therefore, of hastening this as much as possible, and in order to more quickly increase the sales, and at the same time to considerably reduce the expenses, the above-referred-to amalgamation has been considered advisable, and offers the following advantages:—That the London Sporting Park hold an option for the purchase in fee of the land on which both their premises and also the Normal Powder Factory stand at what your directors consider a reasonable figure. By this purchase the new company will become possessed of a valuable, and, it is believed, an improving property. Further, it is considered that by this amalgamation, concentrating as it does the staffs of both companies in one place, many economies can be arranged, and, further, that the sale of the Normal Powder will be much enhanced by its connection with the Sporting Park, whose principal business is the development of shooting and instruction in shooting in all its branches. The large number of their clients testifies to the many opportunities which will be offered for disposing of sporting ammunition, and the meeting of the Inanimate Bird Shooting Association yearly at these grounds will give sportsmen from all parts the chance of making themselves acquainted with the superior qualities of Normal Powder. Although still in its infancy, we think it right to mention that we have now also a very superior powder for quick-firing guns, which, from trials already made in Sweden, promises to excel all other powders of this class; and we are glad to state that Sir W. G. Armstrong, Whitworth & Co. have promised to make trials with it in this country. We have lately made some splendid shooting with our rifle powder at the Runemed

ranges with the 0.303 Lee-Metford, and we venture to say there is no better rifle powder in Europe, which has been amply proved in Switzerland, where it has now been the exclusive Government powder during the last ten years.

THE FRAUDULENT MARKING OF GUNS.

A PROSECUTION AT PLYMOUTH.

At the Plymouth Police Court on the 25th ult., before Messrs. J. H. S. May and H. J. Howland, Ernest Alfred Luke, draper and outfitter, of Old Town Street, Plymouth, was summoned on a charge of unlawfully selling to Mr. Robert Routledge a double-barrelled gun, "the barrels of which had not been duly proved and marked as proved, contrary to the Gun Barrel Proof Act, 1868." Mr. Joseph Rowlands prosecuted on behalf of the Birmingham Gun Barrel Proof House, and Mr. F. W. S. Kardon defended.

Mr. Rowlands said that the defendant was summoned for having sold a gun of Belgian manufacture as of English make, with the mark "Barrett & Brown, Bond Street, London, W.," on it, thus indicating that the gun was proved and manufactured by a firm of that name and address. As a matter of fact there was no such firm as Barrett & Brown, gunmakers. The object of the defendant was to get the gun sold as of English manufacture. If he had not had the mark placed upon the weapon there would have been no breaking of the Act, as Belgian-manufactured guns were recognised in this country, but under the circumstances he was liable to a fine not exceeding £20 for each barrel. It would be proved that he advertised the gun in *The Exchange and Mart* as a "double-barrel, eight-bore gun," and, after correspondence, it was sold to Mr. Robert Routledge for £5 10s., as one of proved English make. The gun in the first place cost £4 10s. If the defendant had merely made a mistake, or by negligence committed a technical offence, the prosecutors would have overlooked it; but they had come to the conclusion that it was a deliberate act of misrepresentation on the part of the defendant, done for a fraudulent purpose. Luke must have known that the marking of a gun with the name of a supposititious English firm was an illegal act. A few months after Mr. Routledge purchased the gun it got out of repair, and the fraud was then discovered.

Mr. Thomas Turner, Proof Master of the Birmingham Gun Barrel Proof House, gave evidence that the weapon produced bore the Belgian proof mark, and not an English proof-mark. If it had only carried this Belgian proof mark, the authorities would not have said anything about the matter. However, the words "Barrett & Brown, Bond Street, London," were on the barrel of the gun, and no such firm existed.

Mr. Charles Gardener said that from August 10th, 1898, to February, 1899, he was in the employ of Messrs. Charles Osborne & Co., of Birmingham. Between these dates the defendant purchased twelve guns from the firm, and the gun produced was one of the twelve. When they were sold to the defendant the guns only bore the Belgian mark, and not any English mark. The words "Barrett & Brown" had been

placed on the gun after it was purchased by the defendant. This was not done by Messrs. Osborne, as it was illegal. The gun was made specially for Messrs. Charles Osborne & Co., and none were supplied in that locality except to the defendant.

Mr. Robert Routledge then gave his evidence as to the purchase of the gun. He stated that he required a fowling gun, and saw an advertisement in *The Exchange and Mart* by the defendant, offering a gun for sale. The defendant was written to about the gun, and he gave as the reason for selling that the owner was now living in the town. The letter also mentioned that the gun had only been used a few times for shooting wild-fowl, and that the sum of £5 10s. asked for it was ridiculously low. Having purchased the gun bearing the names of Barrett & Brown, he believed that he had obtained a first-class second-hand English-made gun. Subsequently the weapon got out of repair, and he addressed a letter to Barrett & Brown, Bond Street, London, asking if they could attend to it. He received his letter back through the Dead Letter Department of the Post Office, stating that there was no such firm of gun manufacturers.

For the defence, Mr. F. Kardon said that the prosecution was taken under an Act of Parliament not generally known. He admitted that the defendant had the words "Barrett & Brown" placed on the gun through ignorance of the law, and he had no doubt done wrong in doing so, but he thought Mr. Routledge should have well known that the gun he purchased was not an English gun. The sum of £5 10s. paid by him was not the price of an English gun by any means. In the first place the gun cost £4 10s., and after advertising it he sold it for £5 10s. The purchaser was satisfied with the gun when he received it, and kept it for some time. In effect, Mr. F. Kardon appealed for leniency, stating that the offence had been committed in absolute ignorance, and that the defendant was extremely sorry that he had been guilty of the offence, and wished it to be understood that he had no intention to defraud.

Mr. Rowlands said that the costs would amount to between £50 and £60. The fine should be a substantial portion towards the costs.

The Magistrates said that it was of great importance that the public should be protected against frauds of this kind. They looked upon it as a serious fraud, because defendant had passed off a Belgian gun to a stranger as of English manufacture and English proof. He had certainly attempted to pass this Belgian gun as an English one, whereas he could have sold it, if he desired, as a foreign weapon. In passing off the gun to a stranger, he must have been well aware that he was doing wrong, especially as the fraudulent mark was put upon the weapon. It was necessary that gun barrels should be thoroughly tested and proved in the interests and safety of the public. The defendant was fined £20 towards the costs of the prosecution.

THOSE of our readers who were unable to be present at the very interesting lecture on "Some Modern Explosives," delivered by Sir Andrew Noble, K.C.B., F.R.S., at the Royal Institution, on March 23rd last, will doubtless be glad to learn that the full text of the paper is in course of republication in the columns of our scientific little contemporary, *Nature*. The first instalment of the lecture appears in the issue of the 24th ult.

INCIDENTAL JOTTINGS.

THE RELIEF OF THE NATION.

No journal, however technical, can afford to pass over the incidental relief of Mafeking without a jotting of eulogy—just one more voice to the chorus of praise and congratulation to the brave and intrepid B. P. and his comrades. This siege has had peculiar interest to those who study arms and explosives, for here is a record of the utilisation of every resource placed at their disposal. Mining and ground baiting, runaway trucks charged with dynamite, and finally shells, mortars, and explosives, home made, a description of which in the future will be highly interesting when details come to hand. I hope this instance may become an object-lesson to officers as to the necessity of studying up their Service Chemistry and other text-books, which may be invaluable in emergencies of this sort. I confess it was rather a shock to my system to hear an officer once describe gunpowder as “a mixture of sulphur, brimstone, and hydro-carbon!” Fancy genius of this order at Mafeking!

Methuselah will be an infant to the longevity of B. P. if the latter can only avail himself of the good wishes for long life which have been called down upon his esteemed head. Of this there had been enough and to spare, and “Mr. Bung” will wish for a continuance of good fortune if the benefit will only accrue to him. What with Mafeking rejoicings and the Queen’s birthday, capture of Johannesburg, etc., the British working man has had a bout of “public” indulgence which neither suits his masters nor his wife and family, and I fear the returns of manufactured war stores last week will make the Director of Army Contracts grow pale with anxiety, to say nothing of private work throughout the country, which is all suffering in a similar manner. Jack will never be a dull boy when Bobs can send us such good news.

SOFT NOSE ARMOUR PIERC- ING SHELL.

To those who diligently study the patent records it will be no news that the best method of getting high penetration with a steel shell is to put on a very soft nose. This sounds somewhat anomalous, but I hasten to explain that the soft nose is a false flat one, which fits over the hardened point, its object being to procure a “bed” to hold the point of the shell in position for penetrating. Thus, when striking a very hard substance at an angle (say armour plate), the soft nose “setts up” upon impact, and holds sufficiently by frictional contact for the front of the shell to enter the plate. After this all is plain sailing; the false nose, having done its duty, breaks away, whilst the end of the projectile is finding its way through the plate aimed at. The idea is hardly a new one, but it has been revived in a manner which makes it a practical success.

There is much conflicting testimony as to the value of the bombardment of the *Belle Isle*, and the consensus of opinion is that the Admiralty are disappointed with the results. The old warship no doubt is well smashed up, and the captain of the *Majestic* evidently believes strongly in

the proverb “What is worth doing, is worth doing well.” He did it, and did for it, and, I may almost add, he did for the trials as well. As a time record in sinking a ship it is unrivalled, but it is now a matter of extreme difficulty to allocate the effect of individual rounds, ricochets, direct hits, or the effect of black powder *v.* Lyddite. Collectively, it is very good evidence of the value of our guns and projectiles at short range. But to those who have studied this matter from the effects upon the ships at Santiago, and the Chinese war, very little has been added to our knowledge. This trial being a dead secret we are not in a position to say exactly whether what has leaked out about it is of any importance, because we do not know the real object in view, in other words, the points upon information which were really sought. Possibly a long-headed Admiralty have allowed the public to follow a red-herring scent concerning the inflammability of wood fittings, so justifying an outlay of taxpayers’ money, all the while that they had other fish to fry.

It is an exceedingly fortunate thing that nobody was killed at the explosion attending the fire of picric acid at the chemical works of Read, Holliday & Co. As the matter is *sub judice* I will not venture any opinion as to the cause of the fire, but I am bound to remark that a stone-built shed, 40 feet long, 24 feet wide, with stone slabs for a roof, is hardly the sort of structure one would choose for drying any composition which may, under certain circumstances, be explosive. At present anyone may store five tons or so of picric acid anywhere, it not being looked upon as dangerous, but now that two explosions have taken place, the law should recognise a suitable structure of very light construction, so that the gases may easily escape, or the fire consume the whole building at once and done with it, without danger to the neighbourhood. Because stone is cheap in Huddersfield it is no excuse for building these bomb-like structures for picric acid, or any other chemical of a similar nature.

A SUMMER NOVELTY.

The new “Explosives Committee” comes as a surprise to many who were unaware that there was any serious matter outside the ken of the Ordnance Committee which required special treatment, but it is the *personnel* of this committee which is a still greater surprise, as it is difficult to see what fresh information can be gained from these eminent scientists, who know very little indeed about the matter, and if we except Sir Andrew Noble, it may be said that, brilliant and able though they be in their own special lines, they will, as an Explosives Committee, carry as much weight in practical military circles as an average parish council. This would lead us to reflect as to whether there is not more in the constitution of such a committee than meets the eye. We are most of us familiar with Government methods and motives, and with the behaviour of service explosives, and, therefore, if we are hazarding an opinion which is not borne out in evidence, it is surely justified in the light of previous experience.

With the exception of Capt. Tulloch, the secretary, the members of the committee are prominent lights of the “Royal Institution,” and are among the first ranks of experimentalists, so that perhaps a word or two here may

be *apropos* to call these excellent theorists to mind. The chairman, Lord Rayleigh, is Lord Lieutenant for Essex, scientific adviser to Trinity House, and a great authority upon optics; he is a thorough physicist and chemist, and his name has been prominently before the world of science in connection with argon, and the liquefaction of air, in which he works with Professor Dewar. To the general public he is better known as a purveyor of new milk and fresh-laid eggs, etc. Sir Andrew Noble is an exceedingly able man, and needs no introduction in the world of arms and explosives. Mr. Haldane—let me see—is an M.P. and a Q.C., and his presence on the committee will give it a good legal tone. Sir William Roberts-Austen, of the Royal Mint, and a member of the Education Council, is well known in metal alloys research, and micro-photography of metals. Sir William Crooks, like Sir Wm. Roberts-Austen, is a chemist; he is the inventor of a radiometer, and a competent authority upon bacteria, and his reports on London drinking water often cause us much surprise when we learn how much living matter we can imbibe without any ill effect. Sir William is a great man on spooks, vampires, and the occult sciences, and is President of the Psychological Research Society. Captain Tulloch, the secretary, has been brought into contact with the heads of departments at the Royal Ordnance Factories, where he has served for a short time as secretary of a small inter-departmental committee. He, at any rate, will know where to get any information the new committee may require to guide them.

WHAT ARE THEY GOING TO EXPLODE? You will notice that the "Explosives" Committee are almost entirely new blood in this line. Why? Possibly with a view to give an impartial opinion which may happen to support or dismiss the opinions of well-known experts, and this is a very good way of getting out of a tight place. This committee can unconsciously whitewash over any recently-discovered discrepancies in Cordite; they may discover that equally good results may be obtained with an explosive of the same constituents but less nitro-glycerine, without affecting its ballistics; or it may condemn it altogether, and by impartial opinion relieve the War Department of the responsibility of the heavy expense it has committed the nation to in the manufacture and adoption of Cordite, for another step in a fresh direction, the invention of —! But whatever they do, their task will be an invidious one. The still fresh history of the adoption of Cordite has put every one on the *qui vive* when explosive committees are mentioned, although the honour of the illustrious members of this committee is above suspicion.

There are, I understand, yet two vacancies **"FOR WHAT WE ARE ABOUT TO RECEIVE," ETC.** on this "explosives" committee; perhaps these are reserved for the "explosive" experts which should be forthcoming to save its name. I trust that the two ubiquitous notorieties who have figured freely on committees of this nature for years will not have seats thereon, and will not be in any way interested; but we must not anticipate too early. Having thus discussed the committee and their capabilities as explosive experts, we are led to enquire as to the object of their deliberations and experiments. Officially they are "to ascertain *what are the best smokeless propellants* (notice,

"propellants," not high explosives) for use in existing guns of *all natures*, and in existing small arms, and to report whether any modification in the existing designs of guns is desirable, with a view to developing to the full the powers of any propellant *which may be proposed.*" The italics are my own.

THE OPEN DOOR.

In discussing these probabilities, it must not be inferred, because the committee does not altogether command unqualified approval at the outset, that there is any prejudice which causes a sceptical view to be adopted by those who are interested in their research. It has been reasonably asserted that a committee might have been formed of men who spend their lives in the world of explosives in actual and practical connection with gunnery, and without whose advice and assistance the present committee would be incapable to act. Such men as Col. Hadden, R.A., Chief Inspector, Woolwich; Major Holden, R.A., Royal Gun Factory; Lieut. Dawson, R.N. (Vickers, Son and Maxim); Dr. Kellner (War Office expert). These should have been added to the selection, not necessarily for publication of their views, but as a guarantee of good faith, as the newspapers would say. I should also have liked to see a sub-committee formed, to deal with the propellant only, in which the best of the experts in the powder trade might be included, and before whom the difficulties of the present standard *materiel* be put frankly and fully, so as to reap the benefit of their opinions. The powder trade is terribly hampered by being kept in ignorance of the service requirements, and by the prohibitive cost of carrying out experiments. Here we have a committee with a mandate to carry out such experiments without any given restrictions. Let the smokeless powder companies, however, watch their own interests, and take this tip from

CYCLOPS.

THE PROOF BILL IN COMMITTEE.

A SELECT COMMITTEE of the House of Commons, consisting of Sir Henry Fletcher (chairman), Mr. E. J. C. Morton, and Mr. John Wilson, sat in Committee Room 12 on May 28th to consider the proposals of the Gun-barrel Proof Act, 1868, Amendment Bill. The object of the measure is to amend the Act of 1868, confer further powers on the Guardians of the Birmingham Proof-house, and for other purposes. Mr. Erskine Pollock, Q.C., and Mr. Horace Rowlands appeared for the promoters; and Mr. A. V. Frere represented a committee of Birmingham gunsmiths, who were the only petitioners against the bill.

In opening the case for the promoters, Mr. Pollock explained that the bill was promoted by the Guardians of the Birmingham Proof House, the principal part of whose duty was to see that due proof was made of all gun-barrels manufactured in the neighbourhood of Birmingham, these barrels having to be brought to the Proof House to be proved before they were allowed to be offered for sale to the public. The question of the proof of guns went back to a very early date, and the object of the present bill was to bring the original

Act, amended at various times down to and including 1868, up to modern requirements. Under the Act of 1868 the Guardians of the Birmingham Proof House consisted of all the justices for the borough of Birmingham, three members of the Council of Birmingham, nominated and appointed by the Corporation, and fifteen elective guardians. The guardians had, as a qualification under the Act of 1868, to be master gunmakers, residing within 10 miles of Birmingham, and to have a rateable value of £50 in respect of their premises. The electing ratepayers had also to be master gunmakers, to have a rateable value of £25 in respect of their workshops, and to reside within 10 miles of Birmingham. Section 94 of the Act of 1868 limited the application of the funds of the guardians. Under this bill the promoters sought a beneficial extension of the scheme, in order to perfect the technical knowledge of the gunmakers. This had become very necessary, owing to various developments of recent years. First of all, Birmingham was now exposed to very keen competition from Belgium. So great, indeed, had been the growth of work in Belgium that at the present time a far greater number of gun-barrels was proved there than in Birmingham. This was one of the reasons why it was sought to establish a technical school, it being thought by the guardians that, above all things, a greater knowledge should be imparted to the workmen of the manufacture of the guns if Birmingham was to hold in the future the position it had held in the past by turning out the very best work in the world. Another reason actuating the promoters to apply for extended powers in the application of money was the exceedingly great desirability in the opinion of the guardians of expending money in testing the new explosives which, since the Act of 1868, had been brought into use. Again, under the Act of 1868, the guardians had power to acquire 50 acres of land. A considerable portion of the land, however, had been purchased by the Great Western Railway Company for the improvement of their railway station and works; and the promoters now sought power to acquire more land for the purposes mentioned in the bill. As to the proposed alteration in the constitution of the governing body, he pointed out that the number of justices had greatly increased of recent years, and there something like 85. Very few of these, however, attended the meetings, and it was thought better to appoint three justices, to be elected by the justices, instead of having *ex-officio* guardians composed of the whole body. To this proposal the justices offered no opposition—in fact, he believed they were satisfied with the proposals made. In addition to that they proposed to extend the radius within which guardians could be elected. Owing to the great improvement in locomotive facilities of recent years, business men could live at a greater distance from Birmingham than was formerly possible, and it was therefore proposed to increase the distance from 10 miles to 50. It was also proposed to reduce the rating qualification of guardians from £50 to £10. That offer was made with the view of meeting the objection of opponents, but he understood that it had not been accepted. A further important provision was to deal with the question of foreign gun-barrels, Clause 33 of the bill providing that in the case of barrels and guns of foreign manufacture an additional sum, not exceeding 25 per cent. of the prices set out in Schedule C, should be demanded. There were a number of small alterations, but they related mainly to domestic matters. He might state that the scheme of the bill had been submitted to and approved by the War Office, and

that there was no opposition from the Gun Company in London or from the justices, the only petition against the bill being from the working gunsmiths at Birmingham.

Mr. Frere, on behalf of the petitioners, said that they had no objection to a great deal that was proposed in the bill; all they contended was that when these matters so largely affected the Birmingham gun trade the people who were the real makers ought to be represented on the managing body.

Mr. Pollock said that body, as at present constituted, represented those who were responsible to the public for the weapons sold. If an accident happened to one of the public it would be the master gunsmith against whom he would bring his action. Again, it was the master gunsmith who alone understood the whole gun. Certain workmen, on the other hand, were occupied with nothing but the stocks, and each was only responsible for and only understood a particular part. The men, therefore, could serve no useful purpose in being upon the board of guardians. Then there was another thing suggested by the workmen—they asserted that they had contributed to the funds. That was an error on their part. As a matter of fact, the funds had been accumulating since the Franco-German War, and that was the money which it was proposed to apply for technical education. The workmen did not, except in a very limited sense, contribute at all to the society. The money was really paid by the master gunsmiths. Concerning the question of representation, if the guardians could see that the working men would be useful on the governing body they would willingly be admitted; but they could not see that they would. Their admission, moreover, would necessitate a register, entailing considerable expense, and the guardians held that there was no precedent for the adoption of the suggestion. There was, for instance, the case of the Conservancy Board. It often happened that barge-owners had one representative on the board, but one never heard of an arrangement by which bargeowners were to have one representative and the bargees another. In the case of the technical school, however, they might find a certain representation of working men upon the committee useful, and if some arrangement could be made there would be no unwillingness on the part of the guardians to make terms.

The Chairman: But the technical school would have to be provided by the County Council.

Mr. Pollock: No, this would be a technical school established by the guardians to teach gunmakers only, and possibly the County Council might think they ought not to contribute to it under the circumstances.

Mr. Joseph Rowlands, solicitor, Birmingham, law clerk to the guardians of the Birmingham Proof House, gave detailed evidence as to the nature of the proposals, expressing the opinion that the general effect of granting the required powers would be to advance the interests of the Birmingham gun trade. Answering Mr. Morton, witness said the ground of opposition to the admission of the working man to the governing body was the fact that they had no interest in the funds, would not be competent to discharge the duties of guardians, and possessed no technical knowledge.—Mr. Morton: Did the expense and trouble of keeping a register enter very largely into the motive? Witness: It was mentioned.—Mr. Morton: But it was not a very important matter? Witness: No.

Mr. Turner, Proof Master at the Birmingham Proof House,

and a practical gunmaker, thought the nomination of the three justices in lieu of the old arrangement would be for the benefit of the guardians. He thought it would be of no use to have working representatives of the gun trade on the governing board.—Mr. Frere: If you admit them as skilled men to the management of the technical schools, why not to the board of guardians? Witness replied that that was a matter for the guardians.—Mr. Morton: Have you gone the length of determining what their representation on the committee of the school should be? Witness: That has not been decided. This concluded the case for the promoters.

Mr. Middleton, a working gunsmith, secretary to the Gunmakers' Union, and member of the Aston School Board, examined by Mr. Frere, said it was absolutely necessary, in the interests of the gun trade, that the working man should have representation on the board of guardians if the extended powers were granted. Provided there was proper representation to all classes the workmen did not object to the general provisions of the bill.—In cross-examination witness cited the County Council, the School Board, and the Board of Guardians as cases in which working men had administrative powers. The Chairman: Do you know one man whom you seek to put on the board of guardians as a representative who has a complete knowledge of the whole of the trade? The witness thought there was not a single member of the board of guardians who could make a complete gun. Witness informed Mr. Wilson that the guardians constituting the governing body were for the most part large employers in Birmingham.

Mr. Martin Kelly, baker and flour dealer, of Birmingham, and a member of the Birmingham City Council, thought it proper that the working gunsmiths should have representation on the board of guardians, in view of the extended powers it was proposed to confer upon them.

Mr. Evans, gun action maker, Mr. Wakeman, president of the National Sporting and Gunmakers' Union, and Mr. Foulkes, gun-action filer, gave corroborative evidence.

Mr. Frere briefly addressed the committee, urging that the working gunmakers, possessing as they did a distinct interest in the trade, were entitled to representation on the governing body, and pointing out that all they sought was the admission of three representatives in an elected body of fifteen.

Mr. Pollock submitted that the reduced rating qualification proposed in the bill adequately met the case.

Mr. Morton, addressing Mr. Pollock, said a good many negative reasons had been given against the representation of the working gunsmiths. Were there any positive reasons besides the difficulty of registration? It had been asserted that the working gunsmiths could do no good on the governing body. Would they do any harm? It seemed such a small point—all that was asked for was three representatives. He understood that there would be twenty-one members in all. Were the justices more likely to be valuable than the proposed working men?—Mr. Pollock replied that a large number of the gunsmiths were justices of the peace, and the probability was that those would be selected by the justices who were best qualified to serve.

The committee then deliberated *in camera*, and counsel were informed by the Chairman that they found the preamble proved, subject to three working gunsmiths being nominated by the City Council to form three additional guardians.

At this stage the Committee adjourned till Tuesday, June 19, to consider the clauses.

NOTES.

MR. CHARLES LANCASTER.—Mr. Charles Lancaster, of 151, New Bond Street, London, W., has shown praiseworthy enterprise in so promptly bringing out a comprehensive catalogue and price list of his well-known rifles and guns which are now on exhibit in the British Section (Palais des Forêts) at the International Exhibition, Paris. Adopting a plan, the advisability of which unfortunately appeals to only a few British manufacturers, Mr. Lancaster has in his compact, well got up and excellently printed little book given full information on all vital points relating to his manufacture in three different languages—English, French and German—thus adapting the list for well-nigh every European visitor's use and instruction, and almost equally for the whole civilised community of the world. Altogether, there are no fewer than twenty-eight different species of small arms in Mr. Lancaster's exhibit, ranging from high-grade rifles and shot guns down to the hammerless .577 double-barrel, breech-loading pistols, rifled on the Lancaster oval smooth-bore system, of which this manufacturer makes a speciality. Instructions as to giving measurements in ordering a new gun are provided in ample detail, also in three languages. Mr. Lancaster's agents at the Exhibition are Messrs. Henry Johnson & Sons, whose address is 46, Boulevard de Latour Maubourg, Paris.

A COMMITTEE ON EXPLOSIVES.—As the principal guest at the annual dinner of the Iron and Steel Institute, held on the 9th ult., Mr. Goschen made an important announcement with regard to the formation of a Committee on Explosives instituted by the Admiralty. He said the department of which he is the head did not think that they had reached perfection in any way. They knew that their war-like appliances were open to great improvement, and they were anxious to have the assistance of chemists, metallurgists and other scientific men of the country, in considering the question of explosives. He was able to announce, with reference to that, that the Government had determined to appoint a committee of scientific men to enquire in an absolutely independent way into possible improvements in explosives. He was glad to say that they had secured the services of Lord Rayleigh as chairman of the committee, and they wished that committee to carry out trials with a view to discovering what were the best smokeless propellers for use in guns of all descriptions, and in small arms, and to report whether any modifications in existing designs of guns were desirable with a view to developing to the full the powers of any propeller that might be proposed. Sir Andrew Noble, of the Elswick Company's Works, Mr. Haldane, Q.C., M.P., Sir W. Roberts-Austen, Sir William Crookes, and Captain Tulloch (Secretary), will also form members of the committee.

A PROPOSED NEW EXPLOSIVE WORKS IN CHESHIRE.—On the 9th ult. the Northwich magistrates, in response to an application made by Mr. Fells, formerly manager of the Salt Union, fixed a time for hearing the application for their assent to the establishment of an extensive explosives factory at Newbridge, Winsford. In the course of the application it was explained that the proposal

was to manufacture electrical fuses, detonators, fulminate of mercury, &c., on a plan at present exclusively confined to Germany, and the erection of the factory would provide a new industry for Winsford, and also increase the navigation of the River Weaver, and create fresh railway traffic.

A HAND-THROWER FOR INANIMATE BIRDS.—A little appliance, which is a novelty—at least, so far as this country is concerned—was shown at the Middlesex Gun Club recently by Messrs. Westley Richards & Co., Ltd., the idea being to provide a simple and inexpensive means of throwing clay birds without recourse to the customary trap. This device, which is somewhat awkwardly styled "The 'All-Angle' Bird Flinger," is illustrated in the accompanying block, and consists, as can be seen, of a "hand," attached to a leather-covered handle much of the size and shape of a



tennis-racquet handle. The holder consists of a combination V and coil-spring, simply formed of steel wire, with a rubber stop revolving on a pin, to assist in loading and retaining the bird. With very little practice, it is possible to throw birds from this apparatus to a distance of from 40 to 60 yards, at any desired angle, so that it is evident that the thrower will prove a most valuable means of practice and sport in instances where the setting up of a trap is out of the question. For example, it can be employed in an ordinary garden or field without any further arrangement than the provision of a sheltering mound or wall between the thrower and the shooter, and for overhead practice at "rocketters" a boy perched on a barn roof could supply unlimited opportunities for the display of skill. With the present steady growth of inanimate bird-shooting in all parts of the country there should be a great demand for so simple a thrower on the part of sportsmen who are not so fortunately situated as to have ready access to the ordinary trap installation, and who, by means of this inexpensive appliance, operated by a reasonably smart boy, can obtain an almost equal degree of amusement.

FUMELESSITE, LD. v. PELHAM-CLINTON.—Mr. Justice Lawrance, sitting with a special jury, on the 25th ult., heard the action brought by Fumelessite, Ltd., against Mr. Charles S. Pelham-Clinton, financial agent, to recover from him certain sums of money alleged to be payable to them under two agreements dated May 17th, 1899, and for damages for the alleged breach of those agreements. The defendant denied liability, and also denied the breach of agreements. Mr. Duke, Q.C., appearing for the plaintiffs, said that his clients were the owners of an invention for the manufacture of a high explosive called Fumelessite. The defendant was introduced to the managing director of the Company, and was engaged to proceed to Canada and the United States, with a view to obtaining purchasers of the Company's patents in

those countries. He returned, and gave the names of several intending purchasers, and representatives of the Company subsequently proceeded to America to demonstrate the capabilities of the explosive, but found that the firms whose names had been given by the defendant had no intention of becoming purchasers. The plaintiff company claimed to be indemnified by the defendant in respect to the expenses thus incurred, which amounted to £220, and also in damages for breach of agreements.—Mr. Robson, Q.C., M.P., for the defendant, submitted that Mr. Pelham-Clinton had merely acted as a commission agent, and that there was no guarantee on his part that the persons he introduced would become purchasers.—The jury returned a verdict for the plaintiffs for £151, and judgment was given accordingly.

THE IMPORTATION OF ARMS INTO TURKEY IN ASIA.—H.M. Consul at Bussorah, in a report issued on the 25th ult. by the Foreign Office, states that though the introduction of military weapons into Turkey was prohibited, there was for many years a very brisk trade in them throughout Turkish Arabia, and large quantities of Martini-Henry rifles, revolvers, and ammunition were smuggled through Persia. This source has now been cut off, and the importation even of sporting weapons into the district is a matter of no small difficulty. Cheap double-barrelled guns, whether muzzle or breech loaders, find a ready sale at about £1 10s. and £3 respectively, and are usually of Birmingham make. Revolvers are of Belgian manufacture. Percussion caps are still introduced across the Persian frontier.

MESSRS. ELEY BROTHERS, LD.—Messrs. Eley Bros., Ltd., have issued their price list for 1900, containing full particulars of their various specialities in ammunition and other sporting and shooting requisites. Owing to the increased cost of metals the Company has been compelled to raise the price of cartridges and bullets all round. Special care is taken to find the most suitable caps for the various kinds of smokeless powders, and the leading varieties are all proved with and standardised by Eley's special primers, including "Schultze," "E. C.," "Amberite," "Cannonite," "Ballistite," and "S. S." In addition to a large range of cartridges for military, sporting, and practice purposes, Messrs. Eley Bros., Ltd., make specialities of Irvine's gunlock tester, the Repautrap, and other appliances for clay-bird shooting, also steel traps for vermin, &c. The Company's list is well got up and excellently printed, and contains clear and explicit particulars, and represents in every way a model of what price lists should be.

THE PROPOSED EXPLOSIVES FACTORY ON CANVEY ISLAND.—At Southend, on the 23rd ult., Mr. Ralph Hancock, of Gloucester Road, West Green, London, N., applied to the County Bench of Magistrates for permission to erect works for the manufacture of explosives on Waterside Farm, Canvey Island. Mr. J. J. Parfitt represented the applicant, Mr. Corrie Grant objected on behalf of Messrs. Nobel, Ltd., and Mr. W. Gregson appeared for the Canvey Island Commissioners. Mr. Parfitt said that the draft licence was carefully considered by the Home Office, who gave their consent. There were already explosive factories near the proposed site, Messrs. Kynoch's, and some distance away there

was the Pitsea explosive factory, and also Messrs. Nobel's magazine store. The real objectors to the application were Messrs. Nobel's. Mr. Gregson, at this stage of the proceedings, said that he agreed with Mr. Parfitt that the structures should be at least 125 yards from the sea wall, and on that understanding would withdraw his opposition. The Rev. H. Hayes, Vicar of Canvey Island, said he saw no objection to the proposed explosive works, which would give employment to a number of people. In the course of examination, Mr. Frank Genene, Chief Clerk of Nobel's Explosive Agency, said that hardly a person in Benfleet knows of the existence of his Company's magazines. After hearing various evidence, and despite Mr. Parfitt's drawing attention to the fact that he had the support of the Vicar of Canvey Island, and that no opposition was raised by the Railway Company or the local authorities, the Justices took twenty minutes for consideration, and finally refused the application. Mr. Durant gave notice that the decision would be the subject of an appeal.

PROHIBITED EXPLOSIVES.—On the 21st ult., at Merthyr, John Thomas, colliery workman, was summoned by the Dowlais Iron Company for a breach of the special rules at No. 2, Vochriw Pit, in attempting to fire a shot—he not being a duly-appointed shotman; in igniting a match in the mine; in having attempted to fire a shot in the mine, and not reporting the same to his superior officer, and that it had missed fire; and in using a prohibited explosive—all these offences being committed on the 10th ult. Mr. Charles prosecuted, and said the defendant had admitted he used a match and also compressed powder. The use of compressed powder was prohibited by an order of the Secretary of State. Defendant made a statement on oath, and the Stipendiary said the defendant was working in utter disregard of the company's rules. It seemed also from his own showing he was constantly buying powder. Defendant was ordered to pay the maximum fine of £2 in each of the four cases, or go to gaol for an aggregate period of two months. Time was allowed to the defendant to pay the fine.

KING'S NORTON METAL CO., LD.—In submitting to the shareholders of this Company the balance sheet for the year ending March 31st last, the directors are of opinion that the results shown are very satisfactory. The profit on the year's trading amounts to £23,428, to which has to be added £761 brought forward from last year, making a total available for distribution of £24,182. Of this, the directors propose to appropriate £3,500 for depreciation account, and £5,500 as a provision for new plant. After making these appropriations, payment of dividend is recommended at the rate of 7 per cent. per annum on the preference share capital, and of 10 per cent. per annum on the ordinary share capital, and, in addition, a bonus of 10s. per share on the fully-paid ordinary shares, and of 8s. 6d. on the ordinary shares having £8 10s. paid up as on the 31st March last. This will leave a balance of £654 to be carried forward. The building and machinery continue to be maintained in a high state of repair and efficiency, £3,975 having been expended on repairs and improvements during the past twelve months, and charged to revenue account. It is satisfactory to note that a factory loading licence has been obtained by the King's Norton

Works, which has considerably enhanced the value of the Company's property. As a consequence of the great development of the Company's business, a resolution is to be put at an extraordinary meeting of shareholders, following the annual general meeting, to authorise an increase in the capital of the Company by the issue of 11,000 ordinary shares of £10 each, thereby increasing the authorised capital to a total of £250,000.

ABBEY WOOD FACTORY.—The second public enquiry which has been held under the Explosives Act, 1875, concerning the appeal of Messrs. Greenwood & Batley, and the Kings Norton Metal Company, from the decision of the London County Council refusing to approve the granting of a licence for an ammunition works at Abbey Wood, was held on the 25th ult. by Capt. Thomson, H.M. Chief Inspector of Explosives, assisted by Major Cooper-Key and Captain Desborough. The result will be announced in due course. The expert evidence heard during the case was as interesting as the opposition was amusing. But the opposition was decidedly weak, as may be inferred from the fact that the principal opposers, the Erith Town Council, voted the lavish sum of £10 10s. to cover experts' fees and expenses. But this sum went a long way towards providing the Court with mild amusement. The only serious element was the alleged War Office objection, that the factory might one day interfere with the extension of Woolwich Arsenal. This, however, is somewhat remote.

ROUND THE TRADE.

Messrs. Westley Richards & Co., Ltd., have taken over the agency for the Savage Arms Co.

Mr. W. R. Hillsden, of the Kynoch Company, has recently returned from his honeymoon.

The annual outing of the employees of Mr. Atkins, of Jermyn Street, took place on Saturday, the 2nd inst.

Messrs. Charles Osborne & Co., Ltd., have issued their new season's price list of U.M.C. ammunition, which is got up in first-class style.

Early in April, Mr. John Robertson was the recipient of an interesting memento by one of the clients of Messrs. Boss and Co., the firm being Mr. Robertson's *alter ego*.

We have received from the Schultze Gunpowder Co., Ltd., a circular referring to their new "Imperial powder." A limited quantity is being offered to the trade for the use of pigeon shooters, but, for general consumption, the powder will not be placed on the market until early in September.

To take the place of the Amberite Cup which was presented by Messrs. Curtis's & Harvey for competition at the Gun Club, and which was won outright on the 10th ult., the Nobel Company have presented one of the same value, to be shot for with Sporting Ballistite.

Messrs. Gale & Polden, the well-known military publishers, will shortly issue an interesting *souvenir* of the Bisley rifle meetings, consisting of a series of excellent photographs of scenes during the meeting, which will appear to all as life-like and characteristic in the extreme.

It is understood that the directors of the E. C. Powder Co., Ltd., intend to recommend the payment of a final dividend of 3s. per share. This, with the interim dividend of 2s. per share already paid in January last, makes a total of 5s. per share, or £8 6s. 8d. per cent. for the year ending March 31st last, free of income tax.

THE EXPLOSIVES IN COAL MINES ORDER.

By an Order dated April 7th, 1900, the Secretary of State for the Home Department has amended the Explosives in Coal Mines Order of July 24, 1899, by the addition of Pit-ite and Stowmarket Gelignite to the Schedule, the following being the wording of the amending order:—

WHEREAS by Section 6 of the Coal Mines Regulation Act, 1896, it is enacted that a Secretary of State, on being satisfied that any explosive is, or is likely to become, dangerous, may by order prohibit the use thereof in any mine or in any class of mine either absolutely or subject to conditions, and whereas in pursuance of this power an Order has been made by me entitled "The Explosives in Coal Mines Order, of July 24, 1899."

I hereby, in pursuance of the power conferred on me by the said section, make the following Order amending the Order aforesaid:—

- (1) The Explosives in Coal Mines Order of July 24, 1899, shall be amended and shall take effect as if the explosives named and defined in the schedule to this Order were named and defined in the schedule to that Order, and in all respects as if the schedule to this Order formed part of the schedule to that Order.
- (2) This Order may be cited as the Explosives in Coal Mines Order of the 7th April, 1900.

M. W. RIDLEY,
One of Her Majesty's
Principal Secretaries of State.

Whitehall, 7th April, 1900.

SCHEDULE.

Pit-ite, consisting in every 100 parts by weight of the finished explosive of not more than 27 parts and not less than 25 parts of thoroughly purified nitro-glycerine, with not more than 33 parts and not less than 30 parts of nitrate of barium and nitrate of potassium, or either of them, and with not more than 39 parts and not less than 36 parts of wood meal, and with not more than five parts and not less than four parts of moisture, with or without not more than half a part of sulphuretted benzol, and not more than half a part of carbonate of sodium and carbonate of calcium, or either of them, and with no other ingredient; the whole being uniformly incorporated and of such character and consistency as not to be liable to exudation.

Provided—

- (1) That the explosive shall be used only when contained in a non-waterproofed wrapper of parchment paper.
- (2) That the explosive shall be used only with a detonator or electric detonator fuse of not less strength than that known as No. 6 (*i.e.*, the detonator or electric detonator fuse to be used shall possess an effective detonative strength as great as, or greater than, that of one containing 15 grains of a composition consisting in every 100 parts by weight of 80 parts of fulminate of mercury and 20 parts of chlorate of potassium);
- (3) That in addition to the marking on the outer package required by an Order of the Secretary of State, made under the Explosives Act, 1875, and in force for the time being, such outer package shall bear the words, "As defined in the List of Permitted Explosives"; and further, that each inner package shall be clearly marked with the words "Permitted Explosive, to be used only

with not less than No. 6 detonator," and also with the name of the explosive, the name of the manufacturer, the date of manufacture, and the nature and proportion of the ingredients; and

- (4) That the explosive, if in a frozen condition, shall be thoroughly thawed in a safe and suitable manner before use.

Stowmarket Gelignite, consisting in every 100 parts by weight of the finished explosive of not more than 63 parts and not less than 61 parts of thoroughly purified nitro-glycerine, with not more than five parts and not less than four parts of nitro-cotton, carefully washed and purified, not more than 27 parts and not less than 24 parts of nitrate of potassium, not more than eight parts and not less than five parts of wood meal, and not more than two parts and not less than one part of moisture, and with no other ingredient; the whole to be uniformly incorporated and of such character and consistency as not to be liable to exudation.

Provided—

- (1) That the explosive shall be used only when contained in a non-waterproofed wrapper of parchment paper.
- (2) That the explosive shall be used only with a detonator or electric detonator fuse of not less strength than that known as No. 6 (*i.e.*, the detonator or electric detonator fuse to be used shall possess an effective detonative strength as great as, or greater than, that of one containing 15 grains of a composition consisting in every 100 parts by weight of 80 parts of fulminate of mercury and 20 parts of chlorate of potassium).
- (3) That in addition to the marking on the outer package required by an Order of the Secretary of State, made under the Explosives Act, 1875, and in force for the time being, such outer package shall bear the words "As defined in the List of Permitted Explosives"; and further, that each inner package shall be clearly marked with the words "Permitted Explosive, to be used only with not less than No. 6 detonator," and also with the name of the explosive, the name of the manufacturer, the date of manufacture, and the nature and proportion of the ingredients; and
- (4) That the explosive, if in a frozen condition, shall be thoroughly thawed in a safe and suitable manner before use.

BIRMINGHAM GUNWORKERS AND THE NEW PROOF HOUSE BILL.

ON April 30th a deputation of the gunworkers of Birmingham waited upon the Guardians of the Proof House with respect to the private Bill now before Parliament for amending the Proof House Act of 1868.

Mr. L. G. Middleton, speaking on behalf of the deputation, said that three alterations in the Bill were asked for:—

- (1) They were prepared to forego any opposition to the proposed school of gunmaking providing they had a share in the control of the establishment; (2) general representation of skilled labour on the Guardians—in other words, a third of the representation was asked for. The third point demanded by Mr. Middleton was that all foreign-made guns should bear a distinct and indelible mark showing their origin, and thus prevent imposition such as is frequently practised now-a-days, whereby weapons bearing the Birmingham proof mark, but

made up abroad, are sold as Birmingham-manufactured arms.

In reply, Mr. Joseph Rowlands, on behalf of the Guardians, forwarded to Mr. Philip Baker, who is acting as solicitor to the gunworkers, a letter containing detailed criticisms of the three proposed alterations, to the following effect:—

“In regard to the first point, the sole object of the Guardians is to provide a technical education for young men who desire to be trained in the art of gunmaking, which they deem to be absolutely necessary if the gun trade is to be retained in the city of Birmingham. The Guardians are aware of the objections of the working gunsmiths to the taking of apprentices, but their object in proposing to provide technical education is not to obtain cheap labour, but labour of the highest quality. In regard to the second point, the Guardians desire me to point out that the definition of a working gunsmith in your proposed amendments would include men working as gunstockers, screwers, finishers, &c., who would not have the remotest interest in the proving of the gun. The only section of the workers in the gun trade who may be said to be affected by the proving of the gun are the master breech-action makers, and these the Guardians desire me to point out are now entitled to representation under the existing Act of Parliament, but the Guardians feel there is some ground for the objection which was pointed out yesterday that the rating qualification is rather high for this section of the trade. In reply to the third point, the Guardians see no reason why guns of foreign manufacture should not be stamped with the name of the country of origin; but their view is that the Merchandise Marks Act applies to those guns at the present time. As the result of the negotiation, therefore, I am to point out that the Guardians are willing to meet the men in regard to the qualification for registration as a member of the Birmingham gun trade, and also for election on the Board of Guardians by reducing the rating qualification to £10. The Guardians also admit the reasonableness of the suggestion that the working gunsmiths should be represented on the management committee of any school which the Guardians may establish under Clause 3 of the Bill, and they will be willing to consent to an amendment to this effect.”

These concessions have not produced the desired effect, for the men point out that they require a definite representation on the Board of Guardians of the Proof House. The reduction offered by the Guardians in the qualification for a seat on the Board is regarded as a step in the right direction, but it would be practically impossible for a working gunsmith to obtain a seat on the Board even with the reduced qualification. The men also urge that they should nominate, say, one-third of the Board of Guardians.

At a further meeting of the Guardians of the Proof House, held on the 5th ult., it was decided to decline to agree to the nomination of working gunsmiths on the Board of Guardians, but there was no objection to their nomination on the School Committee, where it was thought they could do good service. There was also a disposition to consent to an alteration of Clause 3 of the Act, so as to permit pecuniary assistance to be given to a deserving working gunsmith with a view to teaching the art of gunmaking. The employers state that the working gunsmith is rapidly disappearing.

It is still maintained that, unless further concession is made to the workmen, they will oppose the Bill.



GUNMAKERS' ASSOCIATION.

ANNUAL GENERAL MEETING.

MAY 8, 1900.

THE Annual General Meeting of the Gunmakers' Association was held at Effingham House, on Tuesday, the 8th day of May, 1900, at three o'clock in the afternoon, and there were present:—Messrs. John Rigby (in the chair), F. Beesley, C. Ingram Annan, H. White, J. T. Musgrave, T. W. Webley, H. J. Blanch, E. Harrison, C. E. Greener, H. W. Holland, H. A. A. Thorn, and Reginald T. Woulfe (solicitor).

MINUTES.—The minutes of the previous Annual General Meeting were duly read and confirmed.

MESSAGES OF REGRET.—Messages of regret for non-attendance were read from Messrs. J. F. Smythe, W. R. Pape, H. W. Gibbs, S. Grant, T. A. C. Mortimer, L. G. Clough, and E. C. Green.

ELECTION OF NEW MEMBERS.—The following candidates for admission as members of the Association, having been duly proposed and seconded, a motion for their election was unanimously passed:—Alexander Brown (Alex. Henry & Co., Edinburgh); Henry Hodgson, Ipswich; A. E. Cole, Devizes.

REPORT AND BALANCE SHEET.—The Report and Balance Sheet for the year ended March 31st, 1900, having been circulated among the members, were taken as read. The chairman referred to several matters connected with the expenditure of funds during the period under review, and summarized in general terms the financial side of the year's work. In due course a resolution was duly proposed, seconded, and unanimously passed, approving the Report and Balance Sheet as printed and circulated among the members. A suggestion by Mr. Thorn that the Report and Balance Sheet, together with an application form for membership, should be sent generally to gunmakers throughout the country was adopted.

ALTERATION OF RULES.—The following proposed alterations in the Rules having been duly circulated among the members beforehand were unanimously approved:—

1. That Rule 5 be amended so that the Executive shall consist of 15 members, including the Treasurer, six of whom shall be elected from members carrying on business outside London.

2. That Rule 14 read so that members carrying on business outside London or Birmingham who join the Association during the latter half of the Association year shall pay half a year's subscription on account of that year's membership, so extending the principle to the whole of the members of the Association.

A suggestion by Mr. Thorn was adopted that the revised rules, and list of members should be forthwith reprinted for circulation among the members.

ELECTION OF OFFICERS.—The following officers were appointed to serve during the Association year 1900-1901:—

Hon. Treasurer, Mr. H. W. Holland.

Hon. Auditor, Mr. H. White.

Solicitor, Mr. Reginald T. Woulfe.

Secretary, Max Baker.

Executive, Messrs. C. Ingram Annan, H. J. Blanch, C. Boswell, F. Beesley, A. H. Gale, C. E. Greener, H. W. Gibbs, E. Harrison, H. W. Holland, W. R. Leeson, J. T. Musgrave, J. Rigby, J. F. Smythe, H. A. A. Thorn, and T. W. Webley.

The re-appointment of Mr. R. T. Woulfe as solicitor was accompanied by a cordial expression of thanks for his valuable services rendered during the past year, especially in connection with the prosecution of offenders under the Merchandise Marks Act, where his careful attention to the details of the cases undertaken had ensured the success achieved by the Association.

The re-election of Mr. Holland as Hon. Treasurer was accompanied by the expressed hope that, in spite of his frequent visits abroad, Mr. Holland would still consent to continue to take charge of the Association's finances, and so retain his active connection with the management of the Association. Mr. Holland thereupon expressed his willingness to comply with the wishes of the meeting.

The services rendered by Mr. Gale as Hon. Auditor were acknowledged by the members present, but as Mr. Gale had been elected a member of the Executive, and would thereby become a party to the voting of expenditure, it was arranged to elect Mr. H. White as his successor, in order that the accounts should be audited by an independent member of the Association.

In re-electing the Secretary, a resolution was unanimously passed granting him a special honorarium of Ten Guineas in recognition of the exceptional amount of work which had fallen upon him during the past year.

DATE OF MEETINGS.—It was resolved that General Meetings of the Association should be held on the afternoons of the third Tuesday in the months of June, September, and December, 1900, and March 1901, and further that an Executive Meeting should be held on the third Thursday of every other month during the current Association year.

CHAMBER AND CARTRIDGE SIZES.—The following resolution was unanimously passed:—

“That the Executive is hereby instructed to call a meeting of the gun and cartridge case makers for the purpose of finally settling the chamber and cartridge sizes to be adopted as standards, and that such meeting shall consist of such members of the Executive as are present at the meeting, but not less than a quorum, and delegates from Messrs. Eley, Kynoch, and Joyce; and further, that two representatives of the Birmingham and Provincial Gunmakers' Union shall be invited to attend for the purpose of expressing at the conference the views of that Union.

CONCLUSION OF MEETING.—The meeting concluded with a vote of thanks to the Chairman for presiding.

THE SEIZURE OF AMMUNITION IN THE PERSIAN GULF.

JUDGMENT IN THE COURT OF APPEAL.

In the Court of Appeal, before Lord Justice A. L. Smith, Lord Justice Vaughan Williams, and Lord Justice Romer, judgment was delivered on May 24, in the appeal brought by Messrs. Fracis, Times & Co., against Captain Carr, R.N., who was in command of *H.M.S. Lapwing* in or near the Persian Gulf in January, 1898. The action was brought to recover damages for the seizure of ammunition belonging to the plaintiffs, on board the s.s. *Baluchistan* in the Persian Gulf, on the strength of a nominal prohibition against the importation of arms into Persia, which had been in existence since 1881, and which in practice had only been used to substitute an arbitrary impost for a regular Customs duty.

Briefly, the facts of the seizure were as follows:—In the autumn of 1897 rumours became current as to an outbreak of hostilities on the North-west Frontier of India, between the Indian Government and the Afridis, and in consequence of this, the plaintiff's shipments were marked “Bahrein *via* Bushire—optional Muscat,” so that the consignments might be delivered at either port. A shipment of arms and ammunition so marked to the value of about £600 was made per *Baluchistan* in November, 1897, and while the vessel was at sea, between December 7th and 11th, the Persian Government, acting, it was said, at the request of the British Government, seized at Bushire arms and ammunition, valued at about £30,000, which belonged to the plaintiffs. On information of this, the plaintiffs had the arms taken out of the *Baluchistan* at Port Said, but were unable to stop the ammunition; but the commander of the vessel by instruction altered the destination of the ammunition to Muscat by obliterating the other marks. However, on January 13th, 1898, within two miles of the shore off Muscat, the steamer was stopped by *H.M.S. Lapwing*, and the ammunition was seized. This was done apparently under a proclamation issued by the Sultan of Muscat, an independent sovereign, whereby permission was given to British ships of war to confiscate arms found in ships within the territorial waters of Muscat, if it should appear that the arms were intended for Indian or Persian ports.

Messrs. Fracis, Times & Co. stated that they had never received any warning against sending arms or ammunition to Muscat, until the seizure of the ammunition in question by *H.M.S. Lapwing*; that they had carried on their trade in arms and ammunition in a perfectly open manner; and that none of it had reached the Afridis.

On April 15th, 1898, a Muscat Court, consisting of the Prime Minister and the Commander-in-Chief, inquired into the seizure, and held that it was valid.

Subsequently the case came into an English Court, before Mr. Justice Grantham with a special jury, and the jury found that the goods were for Muscat only, and not for Persia or India; that a reasonable man would have believed them to be for Persian or Indian ports; that the plaintiffs shipped the goods *bona fide* and in the ordinary course of business; that the trade was carried on with the knowledge of her Majesty's Government; that the words “Muscat—optional” were added to the port marks before the ship left London,

that they were added with the *bona fide* intention that the goods should be landed at Muscat, if desirable; that the plaintiffs were bound by the act of the ship's agents in altering the marks at Port Said; and that there was no evidence that the plaintiffs were notified of the proceedings of the Sultan's Court at Muscat. Upon further consideration, however, Mr. Justice Grantham held (1) that the proclamation of the Sultan of Muscat had the force and authority of a proclamation issued by a fully-constituted Sovereign power; (2) that the defendant could rely upon it by way of defence if the seizure of the goods was contrary to the English law; (3) that the goods were not goods which were made liable to seizure under that proclamation; (4) that the Court of the Sultan of Muscat had jurisdiction entitling it to deliver a judgment *in rem*; (5) that the judgment or decree of the Court had the force of a judgment *in rem*; that (6) the onus lay on the plaintiffs to prove that no notice of the proceedings had been given to them, and that they had failed to prove it, they having a partner in Bushire who would hear of the seizure, and a regular agent at Muscat; and he came to the conclusion that, even if the plaintiffs did not have direct notice they did get notice, and did have an opportunity of appearing before the Court, and abstained from raising any objection to the seizure at Muscat, and could not now contend that the seizure was illegal or that the judgment was contrary to natural justice. He accordingly gave judgment for the defendant.

Against this judgment, which was delivered on June 19th of last year, the plaintiffs lodged an appeal, as above mentioned, and on the 24th ult. Lord Justice Vaughan Williams read the judgment of the Court allowing the appeal. After recapitulating the evidence of the case, his lordship went on to consider the point of the defence based on a State document issued within the State of Muscat on April 15th, 1898, this being the order for inquiring into the circumstances of the seizure. He gave it as the finding of the Court that they were not satisfied that this document issued by the Muscat Court was an adjudication by a court of justice determining the *status* or ordering the disposition of goods seized within Muscat territory; and they wished to add that, even if they were so satisfied, they would hesitate to hold that our Courts ought to give effect to a judgment as to which there was no evidence of any public notice of the intention to hold the inquiry which resulted in the judgment. There was no confiscation validated at the instance of either the Sultan or the captors. As to the second point of law—that, in order to maintain an action in the courts of this country for a tort committed abroad the act complained of must be an act that is wrongful by the law of the country where it was committed and also by the law of this country, the Court held that by the law of Muscat, at the time when the plaintiffs were deprived of their goods by the defendant, the seizure could not be justified, and was therefore unlawful; for the only seizure which was then lawful (if any) was that of munitions of war sent to India or Persia, which these goods were not. The permission was not, nor was the seizure thereunder, an act of war, or reprisal, or embargo, or a preliminary to war. It was something done by permission of the Sultan for the purpose of carrying out an agreement made by the Sultan with a foreign Government. The second point of defence, therefore, in the Court's judgment, also failed.

It only remained to deal with a point based on inferences of facts drawn by Mr. Justice Grantham. The learned judge

said:—"In my opinion the plaintiffs have failed to prove that no notice was given to them, or that they had no opportunity of appearing before the Court, though they had every opportunity of doing so (that is, of giving such proof), and as the jury were unable to answer the question definitely we must look to admitted facts to see whether or not the plaintiffs had proved any presumption of want of notice or knowledge that the Court would sit or was sitting. The plaintiffs themselves are silent on the matter." What the learned judge meant by this statement was not quite clear to the Court. If it had been proved that the proceeding which took place was a judicial proceeding the onus would be on the plaintiffs to show that they had no notice or knowledge, but the answer of the plaintiffs denying that they had notice did not seem to be limited to a denial that they had formal notice, and the Court thought it was on the defendant to suggest, on cross-examination, that the plaintiffs had notice by knowledge, either personally or through their agents. But the point was of no great importance as, in the Court's judgment, there was no judgment *in rem*, and admittedly there were no proceedings *in personam*. Mr. Justice Grantham further found that the plaintiffs wilfully or deliberately abstained from raising any objection to the seizure at Muscat, and could not, therefore, now contend that the seizure was illegal or that the judgment was contrary to natural justice. It was not easy to see how the fact that the plaintiffs wilfully or deliberately abstained from raising any objection to the seizure at Muscat could, even if proved (which, in the Court's opinion, it was not) be said to have induced the defendant to alter his position or the Court of Muscat to have altered its position. There was no evidence that the plaintiffs or their agents were present at the time of the seizure, and the condition of the port-marks, of the bills of lading, or the ship's manifest, can hardly amount to a representation that the goods were going to a Persian or Indian port *via* Muscat, although it may have been reasonable, as the jury said it was, to believe that the goods when they arrived at Muscat were intended for a Persian or Indian port. The appeal was therefore allowed, and judgment entered for the plaintiffs.

The inquiry as to damages, we believe, has been arranged.

APPLICATIONS FOR PATENTS.

APRIL 17—MAY 12, 1900.

- 7,038. Cartridge Bandolier. M. Pedersen.
- 7,132. Rifle Rests. H. B. Smith.
- 7,167. Explosive Projectiles. E. Scriba.
- 7,247. Back Sight for Rifles. W. Rowthorn.
- 7,270. Ordnance. W. S. Simpson.
- 7,271. Mounting for Machine Guns. J. Formby.
- 7,295. Screens for Fire-arms. H. Meyer.
- 7,300. Miniature Cartridge Adaptor. J. K. Ewart and W. K. Webster.
- 7,330. Projectiles. C. A. McEvoy.
- 7,334. Quick-firing Gun Carriages. A. G. Bagot.
- 7,338. Projectiles. J. M. Chapman and A. Egan.
- 7,464. Repeating Fire-arms. L. Bouchet.
- 7,472. Bolt-Lock Rifles. S. Lee and R. C. Pudney.
- 7,473. Cartridge Carrier. S. Lee and R. C. Pudney.
- 7,517. Shells. A. C. Wright and J. H. Brindle.
- 7,582. Sighting and Firing of Small-arms or Ordnance. A. Gajardo.
- 7,583. Explosives. H. E. Sturcke.
- 7,670. Magazine for Military Rifles. B. T. L. Thompson.
- 7,685. Telescopic Sights. A. A. Common.

- 7,713. Explosives Mixtures. E. A. Le Sueur.
 7,731. Rifle Cartridges. A. Haller.
 7,849.* Rifles. G. Hammond and E. Lastreto.
 7,966. Straightening Apparatus for Small-arm Barrels. F. H. Langworthy and J. Jackson.
 7,968. Brakes for Ordnance. A. Reichwald (Agent for *Fried. Krupp*).
 7,969. Envelope for Charges for Ordnance. A. Reichwald (Agent for *Fried. Krupp*).
 7,970. Ammunition Hoists. A. Reichwald (Agent for *Fried. Krupp*).
 7,972. Ammunition for Small-arms. E. J. Burnett.
 8,018.* Rifle Carrier for Cycles. D. J. M. Rose.
 8,045.* Rifles and Revolvers. J. Wheeldon.
 8,154.* The Laying of Ordnance mounted on Truck-carriages. A. Torricelli.
 8,170. Automatic Guns. G. Hookham, E. W. Anderson and Kynoch, Ld.
 8,180. Projectiles. J. M. Strachan.
 8,183. Ejecting Mechanism for Drop-down Small-arms. W. Baker.
 8,236. Targets. J. G. Glover.
 8,274. Fuzes for Blasting. H. J. Haddan (Agent for *Fabrik Elektrischen Zünder G.M.B.H.*)
 8,359. Explosive Compounds. C. O. Lundholm and J. Sayers.
 8,376. Apparatus for Boring Shot-holes. W. George.
 8,393.* Barrel-locks for tilting Guns. E. Schlegelmilch.
 8,456. Casting of Projectiles. H. Burrows.
 8,462. Time Fuzes. A. Reichwald (Agent for *Fried. Krupp*).
 8,482. Projectiles. W. H. Lock and J. R. Quain.
 8,496. Projectiles. A. B. Tubini.
 8,566.* Cartridge Loader for Magazine Fire-arms. P. Mauser.
 8,620. Rifle Clips for Cycles. W. Lawson.
 8,715. Rotating Shell for Smooth-bore Guns. E. M. T. Boddam.
 8,716. Spirit Level Quadrants for High Angle Firing Guns. A. Reichwald (Agent for *Fried. Krupp*).
 8,718. Try-guns. J. Robertson, trading as Boss & Co.
 8,729. Ordnance. A. H. Hollis.
 8,758.* Explosives. T. Jevlev.
 8,761. Miniature Cartridges. R. W. Glanville.
 8,764. Projectiles. P. M. Staunton.

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

APRIL 26—MAY 19, 1900.

- 7,714 (1899). **Manufacture of detonator tubes.** O. Williams, Australia. In order to prevent the fragments of the detonator tube, which become distributed among the ore, amalgamating with the mercury in the process of separating the gold from the ore, the tube is made of a composition of 91 per cent. of copper and 9 per cent. of metallic arsenic. This substance is proof against amalgamation with mercury, and does not interfere with the proper amalgamation of the gold with the quicksilver. Accepted April 7, 1900.
- 7,712 (1899). **Carriages for ordnance.** W. H. Wright, U.S.A., W. Rothschild, and G. D. Smith, London. A gun carriage which is so constructed that the gun and ammunition are balanced when mounted upon it, the weight upon the horse being either nothing at all or very slight. The gun is mounted on a cranked axle, and by means of a set of guides and springs the balance of gun and carriage is such that the shaft of the carriage remains normally in a horizontal position. Accepted April 12, 1900.
- 8,282 (1899). **Sighting device for fire-arms.** C. L. Eastlake, Long Sutton. A spirit level is attached to the barrel of the fire-arm just behind the back sight for short range shooting, and in front of the forepart for long range shooting. By this means it is possible for the shooter to observe when firing whether the weapon is being held true and not canted either to one side or the other. A particular method of securing this level to the rifle by means of a metal band is set out in the claim. Accepted April 20, 1900.
- 8,758 (1899). **Projectiles for ordnance.** A. T. Dawson and G. T. Buckham, London, and L. Silverman, Crayford. A gas check, secured to the projectile behind the driving band, which consists of a ring provided with flanges between which is placed some plastic substance of a lubricating character. The flanges are of such section that, although they offer sufficient support to the plastic substance between them, little force is required to make them take the rifling, so that they are not liable to be torn off during the passage of the projectile up the bore. Accepted April 26, 1900.
- 9,482 (1899). **Rammer for ordnance.** A. Reichwald (Agent for *Fried. Krupp, Germany*). A rammer for ordnance, which consists of a series of toothed rods, telescopically connected together. These rods are operated by means of a toothed wheel, with which the rods successively engage. When fully extended each rod becomes automatically locked, and the action of turning the toothed wheel in the opposite direction to close up the rammer again automatically disconnects each rod. Accepted April 28, 1900.
- 9,891* (1899). **Single-trigger mechanism.** G. F. Whitby, London.
- 11,526 (1899). **Ordnance for transport.** A. T. Dawson and G. T. Buckham, London. The gun described is made in a number of sections, which are adapted to be easily taken apart for convenient transport. The barrel or inner tube is a separate part, over which is clamped, by means of a separate locking ring, a jacket made in halves and carrying the trunnions, locking lugs and sight brackets. The breech mechanism, which is another separate portion, is screwed on to the jacket. Accepted April 7, 1900.
- 11,973 (1899). **Light gun carriages.** A. T. Dawson and G. T. Buckham, London. A mounting for light artillery made in several different parts, which may easily be separated without the aid of tools. The separate parts are the wheels carrying the axle, the trail, and the elevating gear. The trail carries bearings which receive the trunnions of the gun, and in the normal position the gun is locked into these bearings, but may be easily dismounted by depressing the gun until stopped by the axle. Similar bearings beneath the trail receive the axle, which is locked into the bearings until the gun is dismounted. Accepted April 14, 1900.
- 12,852 (1899). **Miniature ammunition apparatus for ordnance.** The Morris Tube and Ammunition and Safety Range Co., Ltd., and A. J. H. Wyatt, London. In Specifications Nos. 4,846 of 1883, and 9,356 of 1885, arrangements were described for fitting inside the bore of a large gun a small tube for firing small projectiles. The present specification describes a modification of the centring apparatus for the small barrel, which allows it to be inserted into the chamber of guns in which both the bore and the breech opening are smaller than the chamber. Accepted April 21, 1900.
- 13,754 (1899). **Covering for barrels of small arms.** J. W. Ottley, Englefield Green. In order to prevent the barrel of a rifle or gun when heated by continuous firing burning the hands, strips of asbestos are used, which are laced along the barrel, or in the case of a rifle barrel are secured by means of clips. Accepted April 7, 1900.
- 13,799 (1899). **Recoil brakes for ordnance.** A. Reichwald (Agent for *Fried. Krupp, Germany*). A modification of the recoil brake of that type in which a spring absorbs the recoil of the gun and again returns it to the firing position. In cases where there was a very long recoil, very long springs had to be employed to take it up, and in order to diminish the length of these springs the movement of the recoiling part of the gun is transmitted by means of a rope and pulley connection to the springs which are used for running the gun forward again. Accepted April 28, 1900.
- 13,965 (1899). **Trunnion bearings for ordnance.** A. Reichwald (Agent for *Fried. Krupp, Germany*). In that type of trunnion bearings out of which the gun is taken in a horizontal direction without being lifted, the covers of the bearing receive the whole of the recoil. In order to prevent the recoil wrenching these covers off, they are, together with the bodies of the bearings, provided with lateral projections, which are embraced by firmly-secured retaining-plates. The recoil is transmitted through the plates from the bearing covers to the body of the bearings or to the gun carriage itself. Accepted April 28, 1900.
- 14,122* (1899). **Lock mechanism for small-arms.** N. Pieper, Belgium.

- 14,771 (1899). **Sighting telescopes for ordnance.** A. Reichwald (Agent for *Fried Krupp, Germany*). Telescope attachments for ordnance, the principal feature of which consists in so connecting the telescope with its supporting bar that the mechanism for effecting the lateral adjustment of the telescope is isolated so that it shall not be affected in any way by the firing of the gun. Another feature is a device to facilitate reading the lateral deflection of the telescope. Accepted April 28, 1900.
- 16,040 (1899). **Electric detonator fuses.** G. Smith and D. Corrie, Polmont. A fuse in which the wires are so fixed that they cannot be pulled out or pushed in. A leaden tube, which may contain the flashing mixture, is clamped on to the wires with a pair of pliers. The fuse head thus prepared is then forced into a small-tapered copper tube, which is turned over on to lead. The taper and the turnover of this tube pressing on to the lead firmly secure the wires. Accepted April 7, 1900.
- 18,389 (1899). **Gun for discharging signals.** W. Teale, Canada. A quick-firing gun adapted to discharge pyrotechnics or signals for marine or military purposes. The gun has a circular-chambered cartridge holder, which is revolved and operated automatically together with the cartridge feed by means of an operating lever. Accepted April 21, 1900.
- 1,567 (1900). **Automatic repeating fire-arms.** F R. von Mannlicher and O. Schönauer, Austria. Modifications in the magazine and cartridge feed device for automatic firearms are described. The magazine is of the cylinder type, and the revolving cartridge feeder which is mounted centrally in the magazine has arc-shaped hollows cut upon its surface to receive the cartridges. The feeder forces the cartridges out of the magazine upon firing by means of a spiral spring. A tray, which may be removed without the use of tools, closes the bottom of the magazine, and may easily be removed for cleaning purposes. Accepted April 14, 1900.
- 2,742 (1900). **Submarine mine firing.** F. Mayländer, Germany. Apparatus for firing submarine mines by means of the Hertzian radiations. It is only by a certain signal given especially for this apparatus that the firing of the mine may be effected. The contact apparatus and a number of cells are contained in a buoy, from which the ignition wires lead directly through a telescopic tube to the mine. Accepted April 14, 1900.
- 3,366 (1900). **Trunnion bearings for ordnance.** G. Ehrhardt, Germany. Trunnion bearings from which the gun may be dismounted horizontally, *i.e.*, without raising it. A half of the fork of the trunnion bearings is mounted on hinges, and upon the removal of a bolt this part may be turned down. With this obstruction removed the gun may be taken away without lifting. Accepted April 7, 1900.
- 2,180* (1900). **Loader for Lee-Speed Magazine Rifles.** H. Greener, Birmingham.

* These Specifications are more fully described under "Selected Patents."

SELECTED PATENTS.

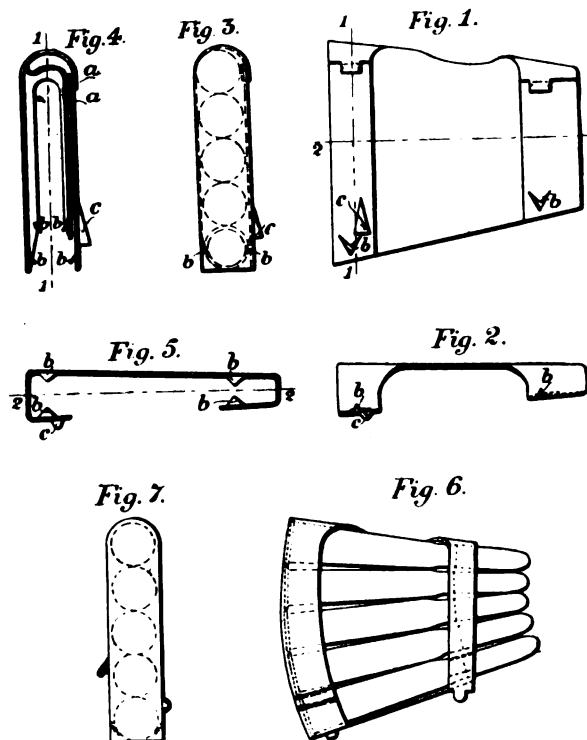
LOADER FOR THE LEE-SPEED MAGAZINE RIFLE.

2,180 (1900). H. Greener, Birmingham. A device is described in this specification which is intended for use as a supplementary magazine or cartridge carrier, from which the cartridges may be transferred by a single movement into the magazine of the Lee-Speed rifle. The magazine of this rifle has heretofore been loaded singly, and had generally to be removed from the rifle in order to load as quickly as possible.

In the accompanying drawings Fig. 1 is a side view of the magazine, or hopper, as it is called; Fig. 2 is a plan, and Fig. 3 is an end view of the same. Fig. 4 illustrates a vertical section of the hopper across the line 1, 1 of Fig. 1, and Fig. 5 a horizontal section across

the lines 2, 2 of Fig. 1. In Figs. 6 and 7 a modified form of this hopper is illustrated.

From the various illustrations it will be seen that the hopper consists of a sort of envelope or case made of some thin material. It is made from one single piece of sheet metal, the ends being turned over on a mandrel to form the sides, leaving the front open as illustrated. The top is then turned over and clenched to the sides, as shown at *a*. The bottom is thus left open for the insertion of the cartridges, and in order to retain them in the hopper, the sides are cut so as to form the four tongues *b* shown clearly in the sections Figs. 4 and 5.



The projection *c*, shown in Figs. 1 and 2, is formed by pressing out the side of the hopper about a quarter of an inch from the bottom, and it is provided to stop the hopper falling too far into the shoe of the rifle when loading.

For loading the rifle magazine, the charged hopper is inserted in the opened breech of the rifle immediately over the magazine. The lower portion of the back end of the hopper is placed between the walls of the shoe, and is supported by the projection *c*, which rests upon the top edge of the shoe. The front end of the hopper rests against the face of the action, and the back end against the extractor on the bolt head. The hopper is thus retained in an upright position, and the cartridges may be forced down into the magazine by the pressure of the thumb which overcomes the resistance of the tongues *b*.

The hopper illustrated in Figs. 6 and 7 is constructed on the same principle as that which has been described, except that the front end is cut away, a narrow strip only being left to carry the noses of the cartridge. The front end of this hopper is supported in the shoe of the rifle by the projection *d*, which catches against the top edge of the shoe. Accepted April 28, 1900.

LOCK MECHANISM FOR SMALL-ARMS.

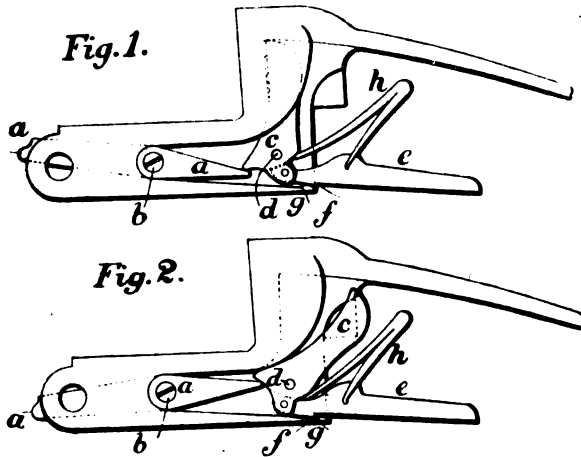
14,122 (1899). N. Pieper, Belgium. A simple lock mechanism is described in this specification consisting of only three parts, a

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movable sear, a tumbler, and a double-armed spring. It is equally applicable to sporting guns, rifles, or revolvers.

In the appended drawings Fig 1 illustrates the mechanism in its uncocked position, and in Fig. 2 it is shown after having been cocked.

Upon opening the gun the turning of the barrel and fore-end about the joint causes the cocking dog *a*, which is pivoted at *b*, to



force the tumbler *c* round upon its axis *d*. Attached to the tumbler is the movable sear *e*, and in turning about its axis the tumbler draws the sear forward and causes the bent *f* in the sear to engage with the hook *g*, Fig. 2, formed in the breech body. The tumbler is by this means retained in its cocked position, the spring *h* being powerless to act whilst the sear bent is so engaged. But upon the raising of the sear by means of the trigger the bent is disengaged from the hook, and the spring then comes into play and forces the tumbler forward, thus causing it to strike the firing pin. The mechanism is again cocked in the way described upon the opening of the gun. Accepted April 28, 1900.

THE WHITBY SINGLE-TRIGGER MECHANISM.

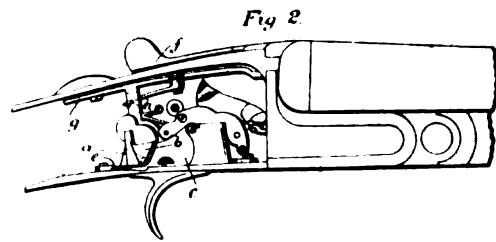
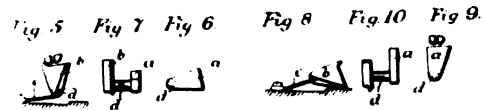
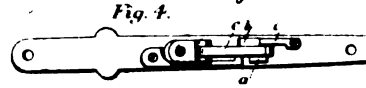
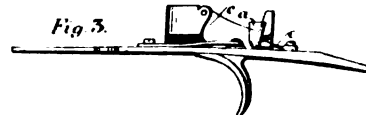
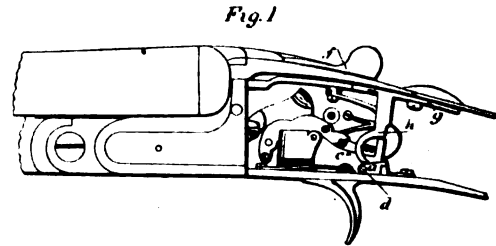
9,891 (1899). G. F. Whitby, London. This patent relates to a system of single-trigger mechanism, in which the parts are so arranged that the patentee claims that a simultaneous discharge cannot occur since the firing of the second barrel is rendered absolutely dependent upon, and necessarily subsequent to, the firing of the first.

In the annexed illustrations, Figs. 1 and 2 are side views of the mechanism with the left-hand and right-hand locks removed respectively. Figs. 3 and 4 are views of the trigger mechanism and the parts attached, and Figs. 5 to 10 are illustrations in various positions during the operation of firing of the two cams *a* and *b*, through which parts the sears are actually raised.

From the various illustrations it will be seen that running through the trigger blade *c* is a shaft *d* (shown in detail in Figs. 6 and 9), upon the ends of which are mounted at right angles to one another the two cams *b* and *a*. These are so arranged that when the cam *b*, on the right-hand side of the trigger, is in an upright position, *i.e.*, perpendicular to the trigger-plate, it is situated immediately beneath the tail of the right-hand sear, whilst the other cam *a* lies horizontally along the trigger-plate. When the left-hand cam *a* is turned up into its vertical position it is brought immediately beneath the left-hand sear tail, and the right-hand cam *b* is caused then to assume a horizontal position. Beneath the right-hand cam *b* is situated the spring *e*, which always tends to tilt the cam *b* forward

to its horizontal position, and it will be seen that in the normal or uncocked position of the mechanism the left-hand cam is always in the raised position as shown in Fig. 3.

Upon opening the gun to insert the cartridges the turning of the top lever *f* pushes back the sliding safety rod *g* in the ordinary known way, and this rod carries with it the leg *h*. In its backward travel the end of the leg *h* comes into engagement with the left-hand cam *a*, and forces it over to its horizontal position. This movement of the cam *a* brings the right-hand cam *b* into its perpendicular position, and by means of an enlargement on the hammer the right-hand sear tail is lifted in the operation of cocking over, and dropped in front of, the extension on the top of the cam *b*. The position of the sear tail and the cam *b* is shown in Fig 5, and it will be seen that after the safety slide is pushed forward to fire the gun, and the leg *h* is removed from engagement with the cam *a*, the spring *e* is prevented from urging the cam forward through the extension on the top of the cam *b* catching behind its sear tail.



Upon the lifting of the trigger, the cam *b* raises its sear and discharges the right-hand barrel, and the freeing of the trigger allows the spring *e* to exert its influence to force the cam *b* forward beneath the uplifted sear tail to its forward position. Presumably the time occupied by the turning of the cams is sufficiently long to allow the involuntary pull to pass off harmlessly, and the cam *a* having taken its position beneath the left-hand sear tails the left-hand barrel is discharged by the subsequent lifting of the trigger.

The parts are again cocked in the manner explained upon the opening of the gun to extract the spent cartridges. Accepted April 7, 1900.

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CURRENT TOPICS.

The New Proof Bill.—In another portion of this issue we give particulars of the attitude adopted by the Guardians of the Birmingham Proof House in connection with the amendments proposed in Committee, as reported in our last issue. It now appears that the Guardians have irrevocably decided to abandon the Bill rather than admit the gunworkers to a representation on the Board of Guardians. It is somewhat difficult to define the exact *status* of a gunmaker who is on the Committee controlling either of our Proof Houses. The Proof House is obviously intended for the protection of the public against faultily-constructed weapons, both of British and foreign origin. At first sight, it seems a somewhat unusual state of affairs for a trade committee to inspect its own goods in the interests of the public, and it is fairly certain that, were the Proof Act of recent creation, a Government department would have been organized to undertake its administration. Admittedly a Government department would have needed to be in close touch with the trade, and in a position to secure the services of competent experts. But such an argument does not involve the necessity of a trade committee, since H.M. Inspectors of Explosives and many other officials exercising regulating functions in respect to various industries have proved competent to carry out their duties, while occupying a position entirely independent of trade regulation. It must, however, be remembered that, while the Proof Act is now generally recognised as a measure intended for the

protection of the public, as a matter of fact the London Proof House was originally started by gunmakers as a means for protecting themselves against the injury to their business caused by the manufacture of inefficient weapons by “divers blacksmiths and others inexpert in the art of gunmaking.” We may take it that somewhat similar reasons were put forward to justify the creation of the Birmingham Proof House, and, therefore, that it exists as a society for the protection of master gunmakers in the legitimate carrying on of their businesses. Under these circumstances, the Guardians evidently do not intend to share the responsibilities of office with a different class having in many directions a different set of interests to promote. When the Guardians propose to create a technical school in order that future generations of workmen shall be endowed with a higher degree of skill, we find that the gunworkers claim a share in the management of such a school, because they, as gunmakers, are necessarily interested in the education of members of the craft. While we fully admit how excellently many members of the working classes have been educated, we cannot ignore the fact that in many instances their powers of judgment have not advanced equally with their education. The masters of all trades have, of late years, been foremost in promoting technical education, and in developing the use of labour-saving appliances. Their most consistent opponents have been the working classes, who, even now fail to realise that had it not been for this the country would by now have sunk to a secondary place among the producing nations of the world. By pursuing their course undismayed by the threats of their workpeople, labour is now, not only

better paid, but more plentifully employed than at almost any other time in our history. Probably the Guardians realise that a workman-managed technical school would savour too much of trade union tactics, and recent correspondence in the Birmingham papers lends support to such a view. Possibly realising this, the Guardians have decided to abandon their Bill rather than have the Proof House become the playground of ambitious trade union organizers. We regret the loss of a useful measure, though, by its removal, the prospects of a properly redrafted Act, amending the weak points of the existing Act, which were ignored in the abandoned Bill, are thereby rendered more promising.

Another Invention.—We have the authority of *The Globe* for announcing that a company will shortly be floated for the purpose of manufacturing a quick-firing gun which costs £1 8s. To our way of thinking, the capital is somewhat large, as, were the company to supply the whole world with quick-firing guns, in its first year of existence the turnover would hardly justify the proposed capital of £180,000. Perhaps, however, the company would be in a position to develop other fields of custom, for we read that a peculiarity about the gun is that it can readily be used as a fowling-piece. What would be the effect of a six-inch shell on a rabbit we are not informed; but, presumably, the difficulty of hitting it could be met by the firing of a number of rounds, 40 a minute being the limit specified. It must not necessarily be assumed that when *The Globe* describes the weapon as a quick-firing gun it is of the class ordinarily known by this name. Our reason for putting forward this caution is that the gun is claimed to be superior to the Lee-Metford, being at the same time one-and-a-half-pounds lighter. We are informed that the board will be a strong one, but it must be strong indeed to raise the company to a profit-earning condition, in spite of the light weight and fowling-piece adaptations of its quick-firing gun.

Skilled Labour in the Gun Trade.—Following the recent action of the Guardians of the Birmingham Proof House in regard to the new Bill, a discussion has been waging in the correspondence columns of a Birmingham daily paper on the subject of the dearth, or otherwise, of skilled labour in the gun trade. Apparently, it is somewhat difficult to arrive at the actual facts, one party stating definitely that skilled workmen are exceedingly hard to obtain, while the other side as strenuously declares that a considerable proportion of workmen are wanting employment. There can be no doubt that in some departments, as for example the sighting of military rifles, the present spasmodic system of giving Government orders to the trade is calculated to produce constant fluctuations in the supply and demand of the labour market. Locality also exercises its influences to the degree that a man, say from Birmingham, naturally feels some disinclination to cut himself off, even temporarily, from his associations by applying for work at, say, Bristol, or Manchester, or even more remote towns, without some definite guarantee that the removal may be worth his while, either pecuniarily or as regards permanence and regularity of employment. A strong argument is sought as showing the precarious nature of this class of skilled labour, to the effect that it is a rare thing for men so employed to bring up their sons in the same trade.

That, however, is a fact that does not necessarily prove anything in particular in this or any other trade, business or profession. A variety of extraneous matter has been introduced into the discussion, including the bogey of foreign competition, and the relation of capital and labour. Narrowed down to the original question, as to the scarcity or otherwise of skilled labour, the answer seems to depend very considerably upon the interpretation put upon the term "skilled labour." The gun trade would provide a pleasing contrast to all other trades did it not include within the ranks of its workers a considerable proportion of men whose title to the adjective "skilled" rests upon a somewhat shaky and self-created basis. These only obtain the temporary employment that is complained of because there is a genuine dearth of really good trained gun workers, and a better supply would speedily cause them to transfer their efforts to some field of labour more suited to their capacities.

"RIFLE SHOOTING FOR THE NATION?"

WITH the above quoted phrase as its war-cry, the Rifle-Shooting Association, Limited (Parent Association), has issued a prospectus to the patriotic public. The capital asked for is a trifle of £100,000, and the object is the establishment of "the first National Range to encourage rifle shooting." This proud intention is announced on the title-page of the prospectus, which also bears the names of two ex-colonels of volunteer battalions, one ex-colonel of the Royal Engineers, and the present C. O. of a volunteer battalion. But the opening paragraph enlarges the scope of the Association by showing its purpose to be the supply "of a public want by acquiring rifle ranges generally, but more particularly a large tract of land, about 400 acres in extent, beautifully situated at Clacton-on-Sea, Essex." As the purchase-price of this large and beautifully-situated plot of land, the exact position of which is duly indicated on an accompanying plan, is put at £45,000, or £112 10s. per acre, and the expenses of the formation of the Association seem to absorb a further £3,000, it will perhaps be better to confine our attention "more particularly" to this initial scheme, instead of widening the issue to "rifle ranges generally." The surplus funds, we are told, will be "available for the erection of permanent huts for camps and necessary buildings, and for vanishing targets, running deer, &c., and working capital." An inclusion of the last-named item seems to be a direct inspiration of genius. These various allocations are proposed for the establishment of "a permanent camp, with huts, in lieu of tents, open from April to October." Such accommodation, the directors feel, will be greatly appreciated by "lovers of shooting," and especially so, apparently, because of its proximity to the seaside. Happy lovers of shooting, who will thus combine the pleasures of accurate marksmanship with the delights attending the murmur of the frolicsome waves! A further advantage which the prospectus, strangely enough, omits to mention, lies in the fact that the range is well removed from the bricks and mortar of the busy metropolis—to the extent of some 71 miles—and that enthusiasts can run down for their little bit of shooting at no greater expense than 10s. for an ordinary

15 days' return ticket, or 7s. 6d. for the week-end. The railway journey each way, also, is only a pleasant little jaunt of from two to three hours. It seems that these charming, inexpensive, and easily-accessible rural surroundings, and the use of the range, will be at the disposal of all volunteer regiments, of all individual members of the Navy, Regulars, Militia, Yeomanry, or Volunteers desiring private practice or making up clubs for the purpose, and of all organised rifle clubs, "especially Village and other Shooting Clubs, which it is wished to encourage." Moreover, the compiler of the prospectus is able to quote from a letter in which the Council of the National Rifle Association express delight at the idea of seeing such ranges erected all over the country.

So much for the purely altruistic intentions of the Rifle Shooting Association, Limited. But there is some glimmering idea conveyed by the prospectus that, in affording all these delights and accommodations to "lovers of shooting," the Parent Association is actuated by commercial, equally with patriotic, motives. There is, in fact, a suggestion that the patriotism which pays is the particular brand to be adopted. It cannot be denied, however, that this is somewhat delicately insinuated. With a most becoming modesty, the prospectus informs us that "it is impossible to exactly foretell the profits of such a scheme as this." The sources of revenue as enumerated would arise from the letting of targets, of huts, and of furniture, from the canteen, from lettings for recreation purposes and sheepfeed, and from the sale of ammunition and the use of rifles. In the latter connection, we are told that rifles will be kept on the ground, "and ammunition supplied—at a percentage above cost price, according as to whether the party purchasing is a member of H.M. service or not. It is hoped that the Government will aid in this respect." Of a truth, "Hope springs eternal in the human breast." After these tender aspirations, it is almost in the nature of a shock to learn that, if the ranges and huts are fully occupied, "£7,000 per annum would be quite a *possible income*." The italics belong to the prospectus, which evidently exhausts its resources in this sublime effort of prophecy, and is unable to explain whether it means the amount to be profit. At all events, no attempt is made to show what the working expenses and other charges would sum up to. To make a final quotation from this singular literary effusion, "it is felt that apart from the strong publicly-expressed patriotic feeling of many, a good interest should be obtained on the outlay while, if total failure ensued—which is not probable—the Association would still possess a valuable asset in an estate growing in value as a building estate, and adjacent to so well-known and popular place as Clacton-on-Sea."

It is far from easy to take this remarkable document seriously. The mixture of so-called-patriotism and pseudo-commercialism would be a fitting subject for laughter, pure and simple, were it not that the prospectus is undoubtedly intended to attract the investing public. There is a certain degree of caution mingled with the ingenuousness of this appeal to sentiment with a "possible income" attached to it. Before considering the possibilities of the income, however, one point deserves attention. The only contract entered into is one made between Mr. J. F. Hucklesby and the Association, by which the large and beautifully-situated piece of land has been provisionally acquired—whatever that may mean—for £45,000. We are also informed that the vendor pays all expenses, including the registration fees up to allotment.

Yet, at the opening of the prospectus, occur the words, "This land, with the necessary expenses connected with obtaining the same, and formation of this Association, will cost £48,000." This seems to mean that between the "provisional" acquisition of the land and the time when it becomes an asset of the Association, there will be a leakage of £3,000, nowhere particularly indicated.

As regards the earning of the "possible income" of £7,000, no details are forthcoming as to how this estimate is arrived at. If we take the accounts of the National Rifle Association as affording some means of providing a basis for an estimate, the process scarcely clears up the matter. In 1898, for example, the N.R.A., which is under Government patronage, had a total gross revenue of just over £20,000. Subscriptions amounted to £1,067, special donations to £380, and special donations for prizes to £1,590. This latter item no doubt aided in the realisation of a sum of £12,413 in entrance fees for the prize competitions, and there was a further revenue from shooters, for pool entries, £2,329, and for practice shots, £148. Camp fees, hut fees and bungalow rents yielded £910, admission of the public accounted for £167, sundries (including advertisements in the programme, exhibiting space, and the rent of a large pavilion to refreshment contractors) produced about £1,105, and, finally, interest on investments produced about £200. Altogether this collection of items makes a total revenue of £20,310. On the other side of the account, prizes, medals and badges and pool payments absorb £13,334, expenses during the annual meeting were £3,408, and general expenses at Bisley, £1,139. Depreciation of plant is put down at £882, sundry items £674, and office expenses reach a total of £1,374. The net balance carried forward was a deficit of £502. It will be noted that in the prospectus under review, there is a pleasing uncertainty as to whether the estimate of £7,000 means simply gross revenue or net profit. The N.R.A., with every possible advantage of patronage and publicity, has a gross revenue of barely three times that amount, yet its net profit on the year 1898 was a minus balance. Moreover, the ground at Bisley constitutes no charge, and is situated in a central position, within easy reach of London, at a special fare of 2s. for the return journey. As regards the proposed scheme at Clacton-on-Sea, we are face to face, at the outset, with a charge for interest on £48,000, the cost of 400 acres of prairie land, situated in a position the exact reverse of central—though this factor seems to be an advantage, judged by the prospectus. The proposed installation will consist of three ranges having maxima of 1,400, 1000 and 500 yards respectively. How many butts will be erected at each range there is no means of judging from this prospectus. The ranges, however, will be open for at most seven months in the year, or say 30 weeks, so that, in order to produce the suggested "possible income" of £7,000, the takings will have to average for the three ranges, profits on sales of ammunition, rent of huts, &c., a sum of £233 per week. To put the matter in brief, it can scarcely be said that the scheme propounded under the style of the Rifle Shooting Association, Limited, holds out any very brilliant prospect to the investing public, nor does it, despite the pseudo-patriotic verbiage of the prospectus, seem to solve the difficulties of affording facilities for rifle-shooting. There are already in existence a number of ranges whose sole drawback is a want of accessibility, and the proposed Association holds out no promise of nullifying this disadvantage in its own installation.

CIVILIAN RIFLE CLUBS AND THE N.R.A.

AN important conference was held at Birmingham on the 27th ult., convened primarily at the instance of the Birmingham Rifle Club, the object of the gathering being to consider the organisation of civilian rifle clubs throughout the country. Though admittedly brought together for the purpose of offering a protest against what were felt to be the quite inadequate proposals of the Council of the National Rifle Association in this regard, yet there can be no doubt that, but for the somewhat tardy movement of that Association, this further and more independent step would scarcely have been taken. The Lord Mayor (Alderman Beale), as president of the Birmingham Rifle Club, occupied the chair at the meeting, and was supported by a sufficiently influential company, which included Major-General Sir Frederick Maurice, whose scheme for the employment of civilian cyclists in national defence has lately attracted considerable attention, a number of prominent local men, and representatives from rifle clubs at Leeds, Hull, Kidderminster, Newport (Monmouth), Redditch, Reading, Clevedon, Charlton, Stourbridge, Guildford, Matlock, Epsom, Kettering, Harrogate, Wolverley, Wolston, Llandudno, Enfield, Falmouth and Stevenage. Many other clubs sent letters of regret that they were unable to be represented, and assuring those assembled of their hearty sympathy, and among other communications was one from Major-General C. E. Luard, president of the Wrotham District Club, in which he pointed out that the Council of the N.R.A., though stating their belief that rifle clubs would be a fruitful source of valuable recruits for Her Majesty's forces, yet issued a set of conditions in response to the request of the Secretary of State for War which were practically prohibitive to the formation of the clubs on sensible lines, and which would preclude men of the poorer classes from participating.

In opening the proceedings, the Lord Mayor remarked that while the question of the formation of civilian rifle clubs was attracting serious attention, they must be cautious against letting the present wave of enthusiasm carry them so far that they would be unprepared for a consequent natural reaction. He advised his hearers to consider the views even of officialism carefully and temperately.

The first resolution was moved by Mr. Burgess, of Epsom, to the effect "that this meeting is of opinion that the scheme proposed by the N.R.A., by request of the Secretary of State for War, on the question of the formation of rifle clubs, is inadequate." In putting it before the meeting he criticised more especially the suggestion that one service rifle should be issued for every ten members of a club, the application of the gun licence to this form of shooting, and the cost of ammunition—1s. 4d. for 10 rounds. Mr. Patrick seconded the resolution, which, after an interesting speech by Major-General Sir Frederick Maurice, was put to the meeting and carried.

At this point the Lord Mayor had to leave, and Mr. Holroyd, of the Birmingham Rifle Club, was moved into the chair in his stead. Mr. Holroyd proposed a resolution, "That this meeting is of opinion that no scheme can be satis-

factory that does not embody the following points:—The issue of a service rifle to each member of a recognised rifle club at vocabulary rates (64s. each), the rifle to become the member's absolute property, and to remain in his possession when paid for and to be free from gun licence, and the issue of a reasonable quantity of ammunition per member of recognised rifle clubs at volunteer rates, viz., at the rate of 1s. per twenty-one rounds." Mr. T. J. Buck, of Reading, seconded the resolution, and remarked that a man must learn to know his rifle before he could shoot with it, for "a man and his rifle should never be separated." Mr. Lodge, of Enfield, thought that every able-bodied man in the country ought to be made to use a rifle, whether he liked it or not, but he considered that under present conditions the expense of the rifle, ammunition, licence, &c., absolutely precluded poor men from joining the movement. An amendment, brought forward by Mr. Abrahamson, was to the effect that the proviso "when used for rifle club purposes only" added after the words "free from gun licence," would be more likely to meet with the approval of the authorities. Mr. Huntly, of Leeds, on behalf of his club, suggested that wherever a rifle club was formed a fund might be inaugurated whereby gentlemen not able to participate actively in shooting might assist financially, so as to permit poorer members to obtain rifles more or less on the hire-purchase system. In reply to a question as to whether the National Rifle Association would permit the use of any other rifle than the military pattern, the chairman pointed out that there was a competition at Bisley in which other rifles were used. The resolution was then unanimously carried.

On the matter of the provision of ranges, Mr. Geo. Alderman, of Birmingham, moved "that this meeting is of opinion that facilities should be given to members of recognised rifle clubs for practice on existing ranges; or, if necessary, suitable ranges should be equipped and maintained by the State, or local authorities empowered to do so, out of the local funds." After some considerable discussion, the resolution was duly carried without amendment.

Another resolution, proposed by Mr. A. J. Bennett, of the Kinver Rifle Club, "that the Government be requested to make a grant to recognised rifle clubs for each member attaining a certain specified standard of efficiency in rifle shooting" also provoked a discussion, the general idea being that they were asking quite sufficient of the Government in petitioning for ranges, cheap rifles and cheap ammunition, and eventually the resolution was put and lost.

The last resolution on the agenda, which was proposed by Mr. T. H. Woollen, was to the purport "that a British rifle union be formed, to be entitled 'The British Civilian Rifle Association.'" He asked that a provisional committee of ten members, with power to add to their number, be elected for the furtherance of this scheme. In reply to a question as to whether this association would be antagonistic to the N.R.A., the Chairman said he thought the idea was to assist the N.R.A. in respect to rifle clubs, and in the general discussion which followed there was a distinct feeling against the promotion of any organisation which would be a rival to the National Rifle Association. Ultimately, after a substitution of the name "British Rifle Union" for the original proposition, the resolution was carried. A representative committee was subsequently appointed for the purpose of drafting a scheme on the lines proposed, and with this step the proceedings of the conference terminated.

LECTURES TO YOUNG GUN- MAKERS.

VI.

RECOIL (*Continued*).

WRITTEN WITH THE COLLABORATION OF F. W. JONES.

In the last lecture* of the present series, dealing with recoil, a formula (No. 10) was explained, by which the energy of recoil in foot-pounds could be deduced from the various factors of the gun and its ammunition which affect the same. Having attained a practical formula for obtaining the exact mathematical value of recoil, it will be interesting to consider the effect of variations in the different factors controlling the energy of recoil in a gun. The term recoil, when applied to a shoulder-gun, generally refers to the physiological effects felt on firing. In other words, recoil is recognised by the push or blow delivered by the gun in the act of firing, and recoil is reckoned to be greater or less according to the violence of the shock. For the time being we must assume that the physiological manifestations of recoil may be accurately expressed in terms of its foot-pounds of energy. We shall deal more particularly with this relation later on, but before doing so it will be necessary to complete our examination of the more mechanical aspects of the theory of recoil.

INFLUENCE OF WEIGHT OF GUN.

It has already been made perfectly clear that the energy of recoil is inversely proportional to the weight of the gun, and, therefore, that variations in the weight of the gun produce variations in the recoil of opposite character. Thus, if a given cartridge produces an energy of recoil of 34 foot-pounds on a 7-lb. gun, then on a 14-lb. gun the same cartridge will produce a recoil of 17 foot-pounds. By doubling the weight of the gun we halve the recoil. The relation is arithmetically simple, and may be expressed in a very obvious formula. Let us say that A is the amount of recoil on a gun having a weight equal to W, and then let us ascertain the amount of recoil due from the same cartridges in a different gun having a different weight, to be expressed by the sign U. We may express the amount of recoil in the second gun by the sign B. Then we know that

$$B = \frac{A \times W}{U} \quad (11)$$

It will be noticed that this formula performs the same operations as were carried out in finding the variation of recoil as between a 7-lb. gun and a 14-lb. gun. The object of expressing this process by means of a formula is to enable us to carry out the same process with the more complicated relations of weight that occur in practice.

Before proceeding further, it is necessary to point out wherein the above calculation is not absolutely correct on theoretical grounds, though in such cases as will come before us the error is so slight as not to be worthy of special attention. When a shot is fired the force exerted by the powder causes the gun to move backwards and the shot forwards. Now, we may take it that so long as the shot is of the same weight and the powder exerts the same propelling force, the

two bodies—gun and shot—will separate at the same velocity. The velocity of separation is the velocity of the shot in one direction added to the velocity of the gun in the other direction. Now, when we took the recoil of a 7-lb. gun as 34 foot-pounds, and that of the 14-lb. gun as 17 foot-pounds, we knew that with the heavier gun the velocity of recoil would be less than with the 7-lb. gun. But, admitting that the velocity of separation remains the same, it must be clear that the amount that the velocity of recoil is reduced must represent an addition of like value to the velocity of the shot. Since the velocity of recoil is so very small by comparison with that of the gun, it follows that the addition of a fraction of this velocity to the shot would leave the energy of the shot practically unaltered.

In granting the existence of this addition to the velocity of the shot when the weight of the gun is increased, we must also admit that the increased momentum due to the extra velocity of the shot causes a corresponding increase in the momentum of the gun in recoil. Thus we find that, while an increase in the weight of the gun causes, according to Formula No. 11, a proportionate reduction of the recoil, there is in reality a secondary reaction at work which makes the reduction of the recoil rather less than the alteration in the weight of the gun would lead us to expect. In all practical examples, where the weight of the gun is many times that of the shot, the difference is unappreciable. But if we were considering, on theoretical lines, the conditions of recoil that would exist where the shot and the gun were of about equal weight, then, obviously, any variations in the weight of the gun would require to be considered in relation with the effects of such variations on the velocity of the shot.

Before going further, it may be of interest to state the precise reason for this change of velocity in the shot. If we imagine a gun of such considerable weight that its travel under recoil while the shot is in the barrel is negligible, then we know that the propulsive force of the powder charge would be exerted on the shot over a length of travel represented by the distance measured from the base of the wad in the cartridge to the muzzle. If, on the other hand, we imagine a case where the gun is light and the travel under recoil is appreciable, then we realise that the powder will act upon the shot over a shorter distance. This is so, because the gases cease to act on the shot when the muzzle is reached, and the backward movement of the gun under recoil causes the shot to arrive at the muzzle after a shorter travel than would have been the case had the gun been stationary. It will now be understood why an increase in the weight of the gun results in the shot receiving the propelling force of the gases over a longer distance, and therefore in the shot attaining a greater velocity before leaving the muzzle. In fact, the distance over which the powder gases act upon the shot is the distance from wad to muzzle, less the backward travel of the gun up to the moment when the shot leaves the muzzle. We have only paid such special attention to this point in order that one may appreciate the true value of the frequently-used argument that the observed recoil with a given weight of experimental gun is of no value in estimating the recoil obtained with another gun of different weight. The relation is admittedly not exact, but for all practical purposes it is sufficient. It is certainly as accurate as are our means of ascertaining velocity and various other factors upon which recoil observations depend.

* March, 1900, issue.

In the course of the two previous lectures on recoil an imposing looking formula was gradually built up as a result of the careful examination of every factor that appeared likely to affect the ultimate result. Mathematics ceased to be of use when an attempt was made to find a value representing the expansibility and other recoil characteristics of each individual powder; and we therefore found it necessary to call these things $A_1 \times \beta$, and trust to practical experiments to find their true value. Fortunately for our purpose, a justly-celebrated series of experiments made in France have been published, and among them we find the records of a series of tests of the velocity of recoil of a gun suspended by strings from a rafter and capable of free recoil. We may be quite certain that the recoil so registered was the absolute recoil with the particular gun and ammunition used, and the whole of these data were published in the account of the trials. By the simple mathematical process of filling in the answer—in other words, the observed recoil—we were able to work out the value of our constant $A_1 \times \beta$, this being the constant for the powder used in the experiments alluded to. Having thus got rid of the unknown quantity, we have been able to work out a table of values showing the effect on recoil due to variations of the weight in the gun, all other factors remaining the same.

EFFECT ON RECOIL OF VARIATIONS IN THE WEIGHT OF THE GUN.

Weight of Guns in lbs.	Energy of Recoil in Foot-pounds.
6	39.6
6½	36.6
6¾	35.2
7	34.0
7½	32.8
7¾	31.7
8	29.7

Careful study of these figures will enable one to appreciate the effect on recoil of each addition to the weight of the gun. Taking 6½ lbs. as the weight of an ordinary light gun, and 7½ lbs. as a heavy gun, we find a difference of 4.9 lbs. in the recoil.

INFLUENCE ON WEIGHT AND VELOCITY OF PROJECTILE.

For recoil calculation we include the weight of the wads when considering the weight of the projectile. The wads of a 12-bore cartridge may be reckoned to weigh 47½ grains, and adding this to 1½ oz. of shot, we obtain a total weight of projectile of 539.7 grains. For the purpose of our comparison we may take as a standard a 12-bore cartridge having the above shot and wads, a black powder charge of 84 grains, a velocity for the shot 1,200 feet per second, and a recoil in a 7 lb. gun of 34 foot-pounds. Assuming our constant for the powder to remain the same as above specified, we obtain the following as tables:—

EFFECT ON RECOIL BY VARIATION OF WEIGHT OF SHOT ONLY.

MV	1 oz. shot	29.0 foot-pounds recoil
1200.	1½	31.5
	1½	34.0
	1½	36.6
	1½	39.3

EFFECT OF RECOIL BY VARIATION OF VELOCITY OF SHOT ONLY.

Shot	MV 1100 ft. sec.	29.9 foot-pounds recoil
1½	1150	31.9
1½	1200	34.0
1½	1250	36.1
1½	1300	38.4

As a matter of fact, the velocity varies as the weight of the shot is altered, and, further, the charge of powder must be varied to give different velocities to the same weight of shot. But by splitting them up in the above way we are better able to show how much each factor contributes to recoil.

WEIGHT OF POWDER CHARGE.

For a 12-bore gun the weight of the powder charge varies with different explosives between about 100 grains and 25 grains, and if we assume at the moment that each gives the same muzzle pressure when giving the same muzzle velocity, we may regard all the factors in formula 10, which was given in the last lecture, as constant, and we may then calculate how the charge of w alone affects the energy of recoil. In the table below we have assumed the above and calculated the recoil, all factors being the same except weight of charge.

EFFECT ON RECOIL BY VARYING POWDER CHARGE.

MV	Powder charge 84 grains	34.0 foot-pounds recoil
1200	42	28.5
Shot	35	27.4
1½	28	26.3
oz.		

For the purpose of the above table, we have taken the muzzle pressure as constant. We will now see what effect a change in the muzzle pressure would have.

Let us take the case of a cartridge charged with 42 grains of powder and having a recoil of 28.5 foot-pounds. From formula No. 10 we obtain a result showing that with an increase of 25 per cent. in the muzzle pressure, the recoil becomes 30.7 foot-pounds, showing a rise of 2.2 foot-pounds. On the other hand, with a decrease of 25 per cent. in the muzzle pressure the recoil becomes 26.3 foot-pounds, showing a fall of 2.2 foot-pounds. There can be no doubt that powders requiring small charges to give standard velocities have low muzzle pressures in comparison with powders requiring a charge of greater weight. This is due to the greater cooling effect of the barrel on the smaller weight of products of combustion. Generally, we may say the muzzle pressure bears some proportion to the powder charge, and, therefore, the table on the influence of the weight of powder charge should be corrected by results obtained from actual measurements of the muzzle pressures.

(To be concluded).

We have received a programme of the International Shooting Competitions to be held this year at Ostend. The season opens on the 16th of this month, and continues throughout the month of August. Mr. L. Brancquaert, of Brussels, has been appointed armourer, in the stead of Messrs. Bachmann & Co,

NOTES.

IMPORTATION OF ARMS AND AMMUNITION INTO CYPRUS.—According to M. Boysset, French Consul at Larnaca, the imports into Cyprus during last year comprised the following items:—Guns and pistols, to the number of 35, £169; sporting powder, £1,150; shot for sporting purposes, £423; sporting cartridges, £160. Sporting powder is imported from England (Messrs. Curtis's and Harvey's gunpowder) and from Athens, and is sold according to quality, the former at from 2s. 6d. to 4s. per lb. tin, and the other at about 1s. 8d. per 100 drachms. Shot is imported chiefly from France, and cartridges from England and Austria.

ARMS FOR CHINA.—It is understood that Chinese merchants have recently placed some considerable orders for revolvers and other small arms with Birmingham makers. Whether these weapons are intended for the regular Chinese soldiery or for the "Boxers" may be a matter for conjecture, but in the light of events the distinction conveys no very adequate sense of difference. It is known, for example, that a supply of 25,000 rifles and two million rounds of ammunition, which was ordered from Germany by the Chinese Government last year, has passed into the possession of the so-called rebels, a fact which seems to argue considerable sympathy as existing between the Chinese Government, personified by the Dowager Empress, and the "Boxer" movement.

THE '303 MAXIM GUN FOR THE NAVY.—It is now decided by the Admiralty to substitute for the '450 Maxim machine gun hitherto in use, a new type having the standard service calibre of '303, capable of taking the Lee-Metford ammunition as supplied for rifles and carbines. This change will simplify the question of ammunition supply. The mounting of the new gun is also more convenient for field service than either the field carriage or the pedestal mounting now employed with the '450 gun.

BREACHES OF THE EXPLOSIVES ACT.—At Hamilton, Lanarkshire, on May 31st, before Mr. Sheriff Davidson, the United Collieries Co., Ltd., were charged with having stored in an unauthorised place at the Greenside Pit, Bothwell, 150 lbs. of gelignite and 100 lbs. of gunpowder. An agent of the company tendered a plea of guilty, and explained that the offence had been the result of carelessness. The Sheriff modified the penalty to a fine of £1. In the same Court, Messrs. James Nimmo & Co., Ltd., coalmasters, were charged with a similar offence, having stored 20 lbs. of gelignite in an unauthorised place at the Avondale Colliery, Dalserf. An agent tendered the plea of guilty, but the Sheriff said that this was a more serious breach of the Act than the previous case, and imposed a fine of £2.

MESSRS. KYNOCH, LD.—The report and balance sheet of this company for the year ending March 31st last was issued just prior to the fourth (16th) ordinary general meeting, which was held on Friday, June 8th. According to the directors' report, the balance sheet shows a net profit for the 12 months of £54,801, to which is added the sum brought forward from the previous year, making in all a total of £69,502 available for distribution. An interim dividend of

2½ per cent. was paid on the preference shares last December, and the directors now recommended the payment of a final dividend on those shares of 2½ per cent., thus making a total of 5 per cent. for the year. On the ordinary shares a dividend of 10 per cent. was recommended, both being free of income tax. The directors' fees absorb a sum of £4,393, and this apportionment leaves a balance of £25,359 to be carried forward. In the course of the report the directors pointed out that the past financial year had commenced rather quietly, and that it was not until nine months had elapsed that the company had begun to feel the effects of the war in the Transvaal. The demand since then for most of the company's productions had been heavy and continuous. This had been met to some extent out of the machinery in excess of ordinary needs that is always kept in hand, but, to a large degree, it had required the provision of increased plant and machinery, which provision, while it had swelled the expenditure of the year, had not yet had time to swell, to a corresponding extent, the income. The directors had not been able to satisfy themselves that any reliance could be placed on the continuance of this demand, even to the extent of a repetition of existing orders when completed in the current year. They had, therefore, protected the company from future loss by charging the cost of new tools and plant to every order requiring such expenditure. In this way a portion of the amount which had been added to capital during the year under review would be written off against next year, as payment was received for those orders which had involved special expenditure. The report further dealt with the development of the company's various properties, and with the generous provisions which have been made for the comfort and well-being of their employees.

THE RE-ARMAMENT OF THE TURKISH NAVY.—It is understood that the Palace at Constantinople is endeavouring to induce Herr Krupp to reduce the terms on which he is prepared to refit the Turkish warships now in the Italian dockyard at Spezzia. While the Sultan has a most decided preference in favour of employing the German firm, it is felt that to do so in presence of the existing great disparity between Herr Krupp's tender and Messrs. Armstrong's lower offer, would be in the nature of an insult to England.

BISLEY RIFLE MEETING.—The programme for the Bisley Meeting of 1900, which opens on the 7th inst. and closes on the 21st, has been issued by the National Rifle Association in the usual compact little handbook. In addition to the regular annual events a new feature is introduced which is of special interest at the present moment, in the form of a daily unsquadded competition with miniature rifles. The entries are unlimited, and are open to all comers, and the special conditions are that the rifles are to cost no more than £3 10s., and the retail list price of the cartridges used is to be only 4s. per 100. Competitors to provide their own rifles and ammunition. Seven shots are to be fired at a distance of 100 yards, in the standing position, at a special target, the details of which, unfortunately for intending competitors, had not been worked out in time for inclusion in the official programme. An inserted leaflet gives notice that the new rules as to position apply to all competitions this year, and not only to those stated in the body of the book; but a careful considera-

tion of the various conditions shows that in not a few instances something is left to be desired on the score of clearness of definition. It is a matter for regret that there seems to be a lamentable falling-off in the list of entries for this year's meeting in consequence, so it is alleged, of the new volunteer regulations, which involve an additional week's training.

RIFLE CLUBS FOR CIVILIANS.—The National Rifle Association states that there are at the present time in existence, or in process of formation, 64 civilian rifle clubs, of which 27 have already complied with the conditions formulated by the Association, and are affiliated to it.

THE SMOKELESS POWDER AND AMMUNITION CO., LD.—This Company has forwarded a new price list of its specialities in smokeless powders for sporting, blasting and military purposes, which displays the usual extensive variety suited to meet all requirements. We are pleased to note, however, that with commendable enterprise the Company has decided to put a cheap smokeless powder on the market to compete with those of this class, mostly foreign, which are now in considerable demand. This "Blue Rival" cheap powder is supplied loaded into cartridges in three qualities, all for 12-bore, the cheapest class being specially intended for export. In this way, there is some possibility, not only of checking the importation of cheap foreign ammunition into this country, but also of meeting it in competition in the export market, where, hitherto, the lower grade of business has been mostly in the hands of continental firms.

LIQUID AIR AS AN EXPLOSIVE.—A paper was recently read by Mr. Axel Larsen, before the Institute of Mining Engineers, on the subject of Liquid Air and its use as an Explosive. The following is an extract from this paper:—Among other peculiar properties of liquid air, it has been found that in combination with carbonaceous substances it forms an explosive compound, and numerous experiments have been made in different countries with a view of applying it to blasting. The first practical trials were made in a colliery in Germany about three years ago. They do not appear to have been very successful, and were soon abandoned. Since then trials have been made at different places, but the most important of these have been made, and are still being continued, in one of the largest explosive works on the Continent, the carbonate factory at Schlebusch. Here many different mixtures were studied, both as regards explosive strength and safety of manipulation, whilst Professor Linde endeavoured to turn the results so obtained to practical account by getting the system introduced in the Simplon tunnel. One of the problems to be studied was to find a suitable carbon carrier, and very good results have lately been obtained with a mixture of equal parts of paraffin and of charcoal. Several modes of preparing the cartridges have been adopted. The liquid air would be taken down into the mine in large "ammunition boxes," the latter preferably on a wheelbase, and sent into the different working places like ordinary empty tubs. Square-shaped wire baskets filled with cartridges would be taken down at the same time, placed in the liquid in due course, and left there. By the time the boxes had arrived at the shot-firing points all the cartridges would be fully soaked, but they would, of course, remain in the liquid until immediately before being placed in the shot-holes.

A cartridge 8 in. in length by 2½ in. in diameter, when filled with a mixture of kieselguhr, tar and tar oil, weighs 11¼ oz. The same absorbed 24¾ oz. of liquid air, thus showing a total weight of 2 lb. 4½ oz. The time occupied for fully soaking the cartridges was about ten minutes. The life of a liquid air cartridge is, unfortunately, but ephemeral when once it has been removed from its vital fluid. A cartridge of the above-mentioned dimensions would have to be fired within 15 minutes to avoid a miss-fire. A larger cartridge would, of course, have a better chance, but a thinner one much less. Liquid-air cartridges are best detonated with a small gun-cotton primer and detonator. Dynamite primers such as are used for blasting gelatine are useless, as they would immediately freeze. The explosive effect to be derived from liquid-air cartridges depends, therefore (1) on the "freshness" of the liquid; (2) on the selection of carbonaceous material; and (3) on the time of exposure. The latter is without doubt the most important consideration, and besides, the most difficult to adapt to the requirements of practice. The rapid surface evaporation soon creates a coating of inert material around the cartridge, which, acting like an empty space, causes a considerable loss of pressure. Again, the absorptive power of the carbon-carrier, as well as the amount of carbon contained therein, are important factors to consider. A carrier rich in carbon, but of inferior absorbent capacity, will, if the cartridge be exposed too long, leave too much carbon monoxide in the fumes to make it safe for underground work. Broadly speaking, it may be said that with certain admixtures, notably of the petroleum variety, and by using highly-oxygenated air, it is possible to obtain an explosive compound of greater strength than blasting gelatine.

AN INTERNATIONAL REVOLVER MATCH.—An international revolver match was shot on the 16th and 18th ult. between two teams, each composed of ten men, representing the United States of America and France. Both teams shot in their respective countries, and the conditions, names of shooters, and results of the match were cabled. Each country named the conditions of one half of the match, and every man of both teams had to shoot five targets of six shots each, first at the French target at a distance of 16 metres, and then at the American standard target at 50 yards. The result of the match shows that the American marksmen are more skilful with the revolver than the French, being 23 points ahead at the short range and 38 at the long range, making in all a lead of 61 points on the total scores. It is interesting to note that in the American team six men shot with Smith and Wesson revolvers of .44 and .38 calibre, and four men shot with the Colt "New Service" .44 calibre revolver. The three top scores and the sixth score were made with the four Colt .44 revolvers, while the remaining positions were appropriated by the shooters using Smith and Wesson's.

NEW EXPLOSIVES FACTORY IN CHESHIRE.—On the 26th ult. Mr. J. M. Fells, of Gracechurch Street, London, applied at the Northwich Sessions and obtained the Justices' assent to the establishment of a new factory at Moulton, near Winsford, for the manufacture of detonators, fuses, fulminate of mercury, and explosives. The site upon which the factory is to be erected has been purchased from Colonel Hayhurst, and the Home Office has approved the draft licence.

THE CONSTRUCTION OF "LONG CECIL."

MR. EDWARD GOFF read a very interesting paper before the Institution of Mechanical Engineers on the manufacture of the celebrated gun "Long Cecil" in Kimberley during the recent siege of that place. In the words of the author, the object in view was to make a gun greater in power than those possessed by the garrison, which were 2.5 in. rifled muzzle-loading guns (7-pounders), and were not big enough to effectually reply to the enemy's 15-pounders, or to make any impression on his works. A gun of about 4 in. bore firing a shell of 25 lbs. to 30 lbs. weight, appeared to meet the case, and to be possible of construction. The possession of a billet of hammered mild steel (originally intended for shafting and ordered as such), 10½ in. in diameter, and 10 ft. long, and of several bars of 6-in. by 2½-in. Low Moor iron in the workshops of the De Beers Consolidated Mines, really suggested to the late Mr. George Labram, chief engineer to the company, the possibility of making the gun, by boring the steel bar to form the tube, to be strengthened by rings, shrunk on, made of the Low Moor iron.

This resulting gun would evidently be of a type similar to an early "Armstrong," heavy for the work done compared with one of a more modern type; but in this case weight was a minor point to be considered, ease and quickness of manufacture being perhaps the leading ideas.

The first difficulty met with was the resistance of the military authorities to the attempt to make the gun, but as this was hardly a mechanical difficulty, further reference to it may be out of place. However, on Christmas Day, 1899, Mr. Rhodes, chairman of the company, gave the order to Mr. Labram to make the attempt. Work was immediately started, and then the difficulty, consequent on ignorance on the part of both Mr. Labram and the author of practical gun design, was first met with. This was overcome by a search in all books available, and the scattered information so obtained was brought together. The sources of information were: The articles on gunnery, &c., in the "Encyclopædia Britannica"; the military treatise on ammunition which had been previously used in gaining information to make shell and cartridges for the 2.5-in. guns earlier in the siege; articles on modern guns in *Engineering*, &c.; and the military "Text Book on Gunnery," brought forward by an enthusiastic volunteer officer, and which proved very serviceable. During the progress of the work in the shops, assistance was also given in many details of gun-shop practice, the form of special tools used, &c., by several of the employés there, whose previous experience in Woolwich Arsenal, the Elswick Works, and elsewhere, was willingly given to forward the work in hand.

Approximate calculations only were made, for two reasons; one that it was not considered necessary to go into very fine calculations when the two principal factors, the powder pressure and the test strengths of the materials to be used, were not known, and could only be estimated, recourse being preferably made to comparisons of the performances of similar guns. The other reason was that time was pressing—the designing and supplying of sketches going on simultaneously with the making of the gun in the workshops.

The stock of powder in the town was of many kinds, ranging from "mealed" to compressed cylinders 1½ in. in diameter by 2 in. long. Most of it had been kept for a long time, much of it over ten years for certain; but it did not appear to have deteriorated, still retaining a good glossy surface.

The cylinder powder (black) was evidently the most suitable for use; but there was not very much of it, so preparations were made to compress the finer powder in blocks, and so form a slower burning powder. The possibility of the compressing not being successful when the stock of cylinders was exhausted, and of having to use all kinds, had to be faced, but there proved to be sufficient cylinders to provide cartridges as long as the gun was fired.

From data available, it appeared that 50,000 lbs. to the square inch would be a suitable maximum pressure to allow for, that being about the maximum pressure calculated, when using a charge of 5 lbs. of powder in the space which would be available for a powder chamber. But while using the slow-burning powder the shell presumably would begin to travel before that pressure was attained. Many charges of 6 lbs. were used while the gun was in action, the maximum pressure due to these conditions appearing to be about 90,000 lbs. per square inch, but, for the same reason, probably the actual pressure reached would not much exceed that obtained from the use of the smaller charge.

A powder chamber of 4.25 in. bore it was found would just contain seven cylinders of powder, four of 1½ in. in diameter, and three of 1¼ in. in diameter, their combined weight for 2 in. of length being just 1 lb. With this diameter of chamber, to obtain a normal air-spacing the length required was about 12 in. Next the breech screw must necessarily be about 5½ in. in diameter, and allowing a length of thread equal to 1¼ diameters, and about 2 in. for obturator, the length of the breech block would be, say, 10½ in. The total length of the steel billet was 10 ft. 0¾ in.; so deducting from this 1 ft. 10½ in. the length available for the bore was 8 ft. 2¼ in., very nearly 24 calibres in length.

Upon this basis the strength was next figured out, and the tube alone first taken. Using a formula for the strength of a thick tube subjected to 50,000 lbs. per square inch internal pressure, the greatest stress in the material was found to be 70,000 lbs. per square inch. This showed, as expected, that the tube could not be used without shrunk rings.

By shrinking on two rows of rings, each 2 in. thick, a reduction of the greatest stress in the tube to about 40,000 lbs. per square inch, and in the rings to 20,000 lbs. per square inch, was calculated, and this it was considered safe to allow. That there was sufficient strength was evident; but the author would like to know really what pressure was attained at any time, the only sign of strain being that the powder chamber was enlarged slightly, and is now barrel-shaped, the diameter at the centre being fully ¼ in. greater than as originally made. This is apparently due to direct compression of the metal, as the outside diameter was carefully gauged when an opportunity was given by some of the rings being removed, and was found to be exactly as made.

The order to make the gun was given on the evening of Christmas Day, 1899, and at the start of work next morning the billet of steel was taken into the machine shop. A lathe of 12-in. centre with bed 14 ft. long was used, the extra length of bed required for working the boring bars and rifling gear being obtained by the use of the bed of a similar lathe set in

line with it, with the headstock removed. This was already in position, being used when working on lengths of shafting, &c.

Most of the men required on the work had to be temporarily withdrawn from the redoubts where they were stationed, forming part of the town guard. During the building of the gun and making of ammunition, the workshops were always under fire from the enemy, many shells, including 94-pounders, bursting around and passing over the building, none, however, actually doing damage; but it was very trying for a man to stay at work hearing shells bursting around, and not knowing whether the next would come inside or not.

While the turning and rough boring was being done, which occupied about a week, the rings were forged, nine being wanted for the first row, 10½ in. in diameter inside (less shrinkage), and four wanted for the outside row, about 14½ in. in diameter. These were all made from the 6 in. by 2½ in. Low Moor iron, a length of bar being cut, bent to a circle, and the ends welded together. As these were finished they were passed on to the machine shop, where they were turned, faced, and bored to gauge.

The trunnion ring was a greater undertaking than the plain rings, and the difficulty of making a satisfactory weld in so heavy a piece of work, with the appliances at his command, was overcome by the leading blacksmith, by working it out of a length of 6-in. by 6-in. Low Moor iron, starting a small hole through the centre, and enlarging by successive heats until he had it to the required size for machining.

By the time the rings of the first row with the trunnion ring were made, the tube was ready to receive them. For shrinking, the tube was held vertically under a convenient derrick in the yard, first with breech end upwards. The ends of the bore were plugged, and a circulation of cold water arranged inside to keep the tube cool. The rings were heated on a plate over a wood fire, the bore being gauged until sufficient expansion was evident, then lifted by the derrick over the end of the tube and dropped into place, the trunnion ring being the first to go on, resting against the shoulder. As a precaution against possible travel endways while cooling, each ring was clamped by longitudinal bolts, and the adjoining one on which it rested kept cooled down by a stream of water from a hose pipe. The tube was reversed to put on those rings in front of the trunnions, and the whole of the first row being in place, it was returned to the lathe, and the outside of the rings turned up to form a seating for the second row over the powder chamber. The process of shrinking these was the same as for the first row, and when they were on the barrel was again returned to the lathe for finishing. The final boring was then begun.

Meantime the question of rifling had been gone into, and the increasing twist appearing more desirable and easier on the gun than the uniform twist, it was decided to make it so.

The rifling was started from the extreme end of the barrel at the breech, so that there was about 2 ft. of length to spare, to be afterwards bored out for breech and powder chamber, so that should a false start have been made with a groove by accident no damage would have resulted. After rifling the bore was lapped out to take off any roughness left by the tool, and then reversed in the lathe and the powder chamber bored out, a double-ended tool being used.

The breech-block screw having meanwhile been made, the inside was cut and the block fitted in. The De Bangé system of obturation was adopted, that appearing to be the most

efficient and easily made. The obturator pad was made of rings of sheet asbestos soaked in melted tallow, and proved quite successful. The breech-block was of hammered mild steel, the same material as the tube of the gun, screwed with a V-thread of ¼-in. pitch, with flattened top and bottom. The handle-bars and plate were one forging, fastened to the screw with six tap bolts. The obturator bolt with mushroom head was made of mild steel, 1½ in. in diameter, shouldered near the middle to 1¼ in. in diameter, and held by lock-nuts in a recess at the back.

It was arranged originally to have an interrupted screw, cut away in three sections, so that one sixth of a turn of the handle-bar would release the breech-block; but consideration of the time to be saved by not cutting it, which it was thought would be at least two days, and the further consideration of strength, induced the author to urge keeping the screw intact, the actual extra time taken in unscrewing the whole way being only a few seconds.

A ¼ in. vent hole was drilled in the gun barrel after the powder chamber was bored and the breech fitted. About an inch at the top was tapped with ¼-in. gas thread, and a copper plug fitted as tightly as possible for the whole length, being screwed at the end to fit the hole. This copper plug had a small hole drilled through it to fit the friction tubes used.

A relieving hole, ¼ in. in diameter, was also drilled through the underside of the barrel from just behind the obturator, to prevent any damage to the thread from the product of explosion, should the obturator ever act imperfectly. But at no time during firing was any smoke noticed coming from it. A flat place, true with the axis of gun, was planed on the top for standing a clinometer upon. A gun-metal casting, bolted to the underside, was cup-shaped to fit the end of elevating screw, which was turned to a ball. This it was found necessary to replace by a hinge joint, as the gun jumped on firing, and the elevator screw, when in an inclined position, tended to fall over, and the cup did not come fairly on to the ball end. The back sight, copied from that of one of the 2.5-in. R.A. guns, was provided with a fine traverse for wind allowance, &c., and was set at an angle of 2 deg. from the vertical (to the right) to allow for "drift" of shell, which was found on firing to be almost exactly correct. The front site on the trunnion was first made as a bead in a small tube, but was afterwards altered to a knife-edge without the tube. This completed the gun itself, ready for mounting on its carriage, as first turned out of the workshops.

Then follows an account of the manufacture of the carriage and of the testing of the gun, after which it was handed over to the firing party, and was in action on January 23rd. While in action 255 shells were fired in all by it, most of them being at ranges of 5,000 and 6,000 yards, these being reached with elevations of 12 deg. to 15 deg. respectively, with a powder charge of 5 lbs., the shell being 29 lbs. in weight. With the same charge a range of 8,010 yards was reached with an elevation of 24 deg. 15 min.

Considerations of space will not allow us to continue this account in relation to the working of the gun and the minor troubles which from time to time necessitated repairs. Almost needless to say they were met with equal ingenuity to that which had marked the construction of the weapon. Those who would be interested to read the full particulars would do well to refer to the detailed account that appears in our contemporary *Engineering* in its issue of the 29th ult.

ROUND THE TRADE.

Mr. R. W. S. Griffith has recently become a liveryman of the Gunmakers' Company.

It is interesting to note that there are now 15 smokeless powders on the market, though probably few gunmakers stock supplies of each.

We are informed that cartridges loaded with Mullerite smokeless powder will be on sale at the pigeon shooting meetings at Ostend and Namur.

The firm of F. T. Baker, of 29, Glasshouse Street, late Fleet Street, is advertising "Baker's expert target trap," which has many features in common with the Eley expert trap.

The clashing of pigeon shooting at the Paris Exhibition and at the Hurlingham and Notting Hill contests has resulted in a considerable falling off in the entries at the English meetings.

A book, entitled "Shooting: with Game and Gun-room Notes," by "Blagdon," will be published about the end of the present month, by Messrs. Cogswell & Harrison, Ltd.

We understand that the issue of the annual report of H.M. Inspectors of Explosives is not likely to be made before August, as various radical alterations in the arrangement of the book have caused considerable delay.

Messrs. Lang & Hussey, Ltd., have recently acquired from the inventor, Mr. G. F. Whitby, the patent rights of the single-trigger mechanism described in our patent columns last month.

"Lanites" and "Cannonite Midgets" are the latest short cartridges we have noticed. These names figure in the advertisement columns of recent Australian sporting journals.

Messrs. A. J. Brown & Co., of 70, Wellington Street, Glasgow, and 3, St. Nicholas Buildings, Newcastle-on-Tyne, have resigned the agency of the Midlothian Gunpowder Co., to take up that of the Elterwater Gunpowder Co., Ltd.

The Oxalate Blasting Powder Co., Ltd., of Gatebeck, nr. Kendal, advertise in recent Trade Marks Journals the words "Aphosite" and "Erzenite," which will be applied as trade marks to explosive substances.

A circular picture of a bull-dog's head is a new device which Messrs. Curtis's & Harvey propose to apply to explosive substances, not, however, including detonators, fog signals, or such like articles, as a trade mark.

Advice has reached us that the price of shot has been reduced. The Abbey Improved Chilled Shot Co., Ltd., have reduced their prices 6s. per ton on chilled shot, 4s. on hard shot, and 2s. 6d. on patent shot.

Several London gunmakers have been agreeably surprised lately by visits from some of our American friends, who are probably *en route* for Paris. Several orders have been placed for guns, which are to be built and got ready for shipment with all possible speed.

The handicap distances at Hurlingham and the Gun Club will be altered next season. At present the minimum distance is 22 yards, and the maximum is 33 yards. The minimum will remain the same, but the maximum will be increased to 35 yards.

The patent double-barrelled rifle, invented by Mr. James MacNaughton, will be used exclusively in the new "MacNaughton" competition at Bisley this year, and also in certain competitions at the Scottish Rifle Meeting. This rifle is fully described and illustrated in our patent columns.

Mr. W. Ellicott, who is on the staff of Nobel's Explosives Co., Ltd., won the Championship at the recent Inanimate Bird Shooting Association's meeting, and very nearly carried off a double event by tying for the Revolver Championship of Ireland; but, unfortunately, as a result of the tie, he fell back to second place.

Messrs. McCarthy, Buck & Co. give an intimation that, owing to the increase which has taken place in the volume of their trade in arms and ammunition during the last few years, it has become necessary to remove into larger and more convenient premises. From the 24th ult. the firm's address has been changed to 11 and 12, St. Andrew's Hill, London, E.C.

The working staff of Messrs. Boss & Co., of St. James' Street, held their annual outing on the 23rd ult. On this day they left Charing Cross in a special saloon for Hastings, where dinner waited them at the Roebuck Hotel. The party remained there for the night, and returned to London the following evening after a very enjoyable trip.

UNDER the style of Boddam's High Explosives Gun Co., Ltd., a new company was registered on the 1st ult., with a capital of £3,000 in £1 shares, the object being to adopt an agreement with Mr. E. M. Tudor-Boddam, and to manufacture and deal in machine, automatic, electrical, gas impulse, and other guns, and arms and ammunition of every description.

Messrs. Eley Bros. have issued a leaflet relating to the all-angle bird flinger which was described in our last issue. It is offered wholesale at 7s. 3d. nett, less 2½ per cent. for cash, the retail price having been fixed at 10s. 6d. each. The Eley target is quoted on the same leaflet, but the bird illustrated in connection with the flinger is apparently not of the Eley pattern.

Mr. Charles Lancaster presented a handsome silver cup, weighing 80 ounces, to be shot for at the Gun Club on Tuesday, the 19th ult., in conjunction with a £3 sweepstake at handicap distances. The event was shot with Lancaster's Walsrode Pygmy cartridges, specially loaded with one ounce of shot and 28 grains of powder, these cartridges having also been used with success in other competitions during the week, and resulting in some excellent scores being made.

On the 24th ult., a fire, said to have been due to the fusing of an electric light wire, broke out in a shed at Messrs. Kynoch's ammunition factory at the Lion Works, Witton. Both the Aston and the Handsworth fire brigades turned out in full strength at the summons, but on arrival at the factory they discovered that Messrs. Kynoch's own brigade had rendered their services needless, the fire being already extinguished. This promptness in dealing with emergencies, on a Sunday morning especially, shows the Kynoch fire brigade to possess a most commendable smartness, backed evidently by an efficient organisation.

THE E.C. POWDER COMPANY, LD.

ACCORDING to the report and balance-sheet of this Company, which was submitted at the seventeenth ordinary general meeting of shareholders on the 20th ult., the net profit for the twelvemonths ending March 31st last was £5,082, which, added to the amount brought forward from the previous year's account, gave a total of £7,228 available for distribution. An interim dividend of 2s. per share had already been paid at the beginning of 1900, and the directors now recommended that a further dividend of 3s. per share be declared, thus making a total for the year of 8½ per cent., free of income tax. This apportionment would leave a balance of £3,103 to carry forward, subject to directors' fees, or £2,503 net. Mr. H. Doughty Browne, the chairman of the Company, presided at the meeting, and at the outset of his speech he was able to congratulate the shareholders on the distinct advance made by the Company during the year under review, the net profit including the amount written off investments, being £5,767, as against £3,821 in the preceding twelvemonths. That result, he pointed out, had been obtained by increased sales, by economy in manufacture, and also by some reduction in the distribution

charges. Competition was as keen as ever, and he thought that they had a right to feel some confidence in the future, because the experience of the year showed that the increased sales were chiefly owing to the excellence of their powder. With regard to the accounts, Mr. Browne drew attention to the fact that while, with the additional profit of £1,800, it would have been possible to declare dividends of 6s. per share, or 10 per cent., as against 4s. in the previous year, various reasons—among them the interruption of business that perhaps may occur during the coming game season, owing to the war and the absence of many sportsmen in the Army—made it prudent to declare a dividend of only £8 6s. 8d. per cent., and to carry the balance forward. A portion of the balance was used in writing down the investment in the American "E.C." Powder Company. Though revenue never benefited by the creation of those shares, which were given to the Company on the sale of the patents to America, he claimed that, as the American company, though doing a large business, is exposed to strong competition, this writing down strengthened the position of the Company, and put the balance-sheet under conditions that could not be assailed. Indeed, he considered that they had never produced a cleaner or more satisfactory balance-sheet than the one now presented. When he first occupied the chair of the Company, their patents stood at £37,000, and now they only stand at £7,500. During his connection with the Company nearly £15,000 had been written off the buildings and plant for depreciation, and he was certain that if they had to start again, it would be impossible to put up the works and machinery except at a considerably larger figure than that at which they stand in the books. At the same time, the works have been maintained in the very highest state of efficiency. In the course of his remarks, the chairman paid a warm tribute to the ability and energy of the managing director, Mr. W. D. Borland, for his labours in the perfection of the Company's speciality.

THE BIRMINGHAM PROOF-HOUSE BILL.

ON May 31st, following the sitting of the Select Committee of the House of Commons, which, as was noted in our last issue, reported the preamble of the New Proof-House Bill as proved, the Guardians of the Birmingham Proof-House held meeting at which it was decided to withdraw the proposed Bill. The attitude taken by the Guardians was that, in so small a Select Committee, the inclusion of two professed labour-members created an unfair preponderance of two to one. Their feelings are also very pronounced in regard to the condition imposed by the Committee, to the effect that the preamble was proved, subject to the nomination of three working gunsmiths to form additional Guardians, on the ground that the board of Guardians is composed of master gunmakers, and that the men have no real interest in the funds belonging to the Guardians. It was resolved, therefore, by eight votes to six in a full meeting, not to proceed further with the Bill. On the other hand, it is the intention of the Guardians to appropriate some of their funds for the purpose of establishing a school to teach the art of gunmaking, without reference to Parliamentary powers. In that event, it is not unlikely that seats may be

offered to working gunsmiths on committees established for the management of the school. A further meeting of the Guardians was held on the 19th ult., at which a resolution was moved to the effect that the decision previously arrived at to abandon the Bill be rescinded. On being put to the vote, however, the resolution was lost, after considerable discussion, by twelve votes to three. The original decision consequently stands, and the Bill will therefore be abandoned unless new circumstances arise which will permit of its passing through Parliament freed from the conditions laid down by the Select Committee. The bill came again before the Committee of the House of Commons on the 26th ult., when Mr. Erskine Pollock, Q.C., announced the decision of the Birmingham Proof House to withdraw the bill. Mr. Frere, on behalf of the working gunsmiths, argued that they had been unreasonably and vexatiously subjected to expense in opposing the bill, and asked that they should be recouped the costs to which they had been put in appearing before the Committee. Mr. Erskine Pollock explained that it was doubtful whether the opponents would have been allowed a *locus standi* at all if the promoters had not agreed to contest it. They had appeared before the Committee entirely of their own accord, and, seeing that they had only succeeded on one point of representation out of many that they had raised, it could hardly be said that they had been unreasonably or vexatiously put to expense. After a private consultation, the Chairman communicated the decision of the Committee not to grant costs.

APPLICATIONS FOR PATENTS.

MAY 14TH—JUNE 16TH, 1900.

- 8,898. Carrier for Small-Arms. M. Pedersen.
- 8,906. Range-Finder. J. Waddell.
- 8,947. Submarine Mines. F. R. Lipscombe.
- 8,981. Self-indicating Targets. G. W. L. Case.
- 8,997.* Breech-loading Ordnance. H. J. Haddan. (Agent for M. B. Madden, E. Burkins, and J. C. Buckner).
- 9,007. Explosives. J. Karstairs.
- 9,010. Attachment for Testing Small-Arms. H. W. James.
- 9,049. Means for Preventing Erosion of Guns. Sir W. G. Armstrong, Whitworth & Co., Ltd., and Sir A. Noble.
- 9,051. Gun-carriage Brakes. W. H. Wright, W. Rothschild, and G. D. Smith.
- 9,070.* Automatic Fire-arms. H. H. Lake. (Agent for J. M. Browning).
- 9,071.* Automatic Fire-arms. H. H. Lake. (Agent for J. M. Browning).
- 9,156. Substitute for Military Rifle Range. J. M. Gray.
- 9,368.* Fire-arms. F. E. Jaeger and C. Bittiner.
- 9,405. Sights for Fire-arms. F. Hellström.
- 9,482. Projectiles. W. G. Potter.
- 9,588. Multi shot Cartridges. R. W. Scott.
- 9,636. Manufacture of Cartridges. F. W. Smith.
- 9,642.* Cartridge Belts. A. J. Boulton (Agent for A. Mills and F. C. Orulo).
- 9,695. Machine Guns. W. G. Gass.
- 9,765. Sighting of Ordnance. R. W. Smith.
- 9,825. Submarine Mines. M. Mercier and S. D. Egen.
- 9,978. Sighting of Small-Arms or Ordnance. A. Gajardo.
- 10,088. Rifle Ranges. J. L. Crawford.
- 10,115.* Torpedo Guiding Apparatus. J. T. Armstrong and A. Orling.
- 10,116. Ordnance Castings. P. Barry.
- 10,126. Propulsion of Torpedoes. F. McD. Leavitt.
- 10,239. Magazine Rifles. H. Harris.
- 10,240. Propulsion of Torpedoes. H. T. Ashton.
- 10,265. Miniature Cartridge Apparatus. J. K. Ewart and W. K. Webster.
- 10,270. Shot-firing Battery. G. Evans.
- 10,301. Projectiles. H. Holmes.

- 10,334. Target-operating Mechanism. W. D. Trick.
 10,381.* Fuse Igniter. A. Kürten.
 10,391.* Automatic Repeating Pistol. N. C. Brodie.
 10,418. Bullets. R. J. Redding.
 10,456. Explosives. J. De Macar.
 10,493. Telescopic Sights for Ordnance. H. H. Lake. (Agent for *The Cataract Tool and Optical Co.*)
 10,510. Target Apparatus. M. Albir.
 10,625. Telescopic Sights for Ordnance. A. A. Common.
 10,635.* Trigger Mechanism for Small-Arms. E. M. Liebert.
 10,651. Ordnance Ammunition. J. Fletcher.
 10,736. Projectiles. J. Luciani.
 10,850. Cartridges. F. W. Golby. (Agent for *E. Quedenfeldt*).
 10,853. Projectiles. H. Burrows.
 10,919. Sights. Sir G. S. Clarke.

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

MAY 26TH—JUNE 24th, 1900.

- 9,416 (1899). **Ammunition hoists.** A. T. Dawson, London, and J. Horne, Barrow-in-Furness. Ammunition hoists for turret or barrette guns, in which the explosive charge and the projectile are raised from the magazine by an endless pair of chains actuated by a motor. The charge and projectile are carried on projecting trays carried by the chains, and are delivered alternately on each side of a single gun, or alternately to two guns mounted side by side. Accepted May 4, 1900.
- 9,440 (1899). **Projectiles.** T. Luciani, France. A projectile in which the nose and base, formed of hard metal, are connected by a rod which is considerably less in diameter than the bore of the gun. The space between the bore and the rod is filled up all round with lead. It is claimed that, compared with the shell of ordinary construction, the friction between this projectile and the bore is much less, the heating of the bore is not so great, and the gun has, therefore, a longer life, the projectile is better balanced, and, being heavier, its penetration is increased. The shapes of the nose and base are also modified. Accepted May 4, 1900.
- 9,660 (1899). **Manufacture of gun-barrels.** H. Ehrhardt, Germany. A method of manufacturing double or triple barrels for guns from one piece of metal. A blank of metal of the required dimensions is taken, and is inserted in a mould. A mandrel comprising two or more rods, according to the number of barrels required, is then introduced, and this displaces the metal and causes it to fill up the mould around the rods. The tubular structure so formed is then drawn out to the required length. Accepted May 5, 1900.
- 10,235 (1899). **Breech mechanism of guns.** Sir W. G. Armstrong, Whitworth & Co., Ltd., A. G. Hadcock, and S. M. Murray, Newcastle-on Tyne. Breech mechanism for quick-firing or other guns, in which the angle of the obturator pad, the amount of material in the breech screw, and the amount of gun cut away in the interruption of the breech screw, are reduced to a minimum. In order to reduce the angle of the obturator pad the carrier arm is pivoted to a second arm, which is pivotted to the gun. During the first portion of the swinging out of the breech block both arms turn about the pivot on the gun, but after the projection is clear of the recess the carrier arms turn about the second arm. Accepted May 5, 1900.
- 11,345 (1899). **Firing of cartridges by electricity.** W. Friese-Greene and P. E. Knell, London. A method of discharging projectiles from ordnance without the aid of explosives. Some material is used as a charge which resists the passage of electricity, and, owing to such resistance, is instantaneously vaporized upon passing a current through it. The electric wires are attached one to each end of the material, which may consist of some such substance as magnesium, lead, or lead alloy. Upon the switching on of the current the resistance set up throughout its mass causes it immediately to vaporize, and so discharge the projectile. Accepted May 26, 1900.
- 11,929 (1899). **Apparatus for transporting gun cotton.** J. Selwig, Germany. A method of transporting gun cotton, which has been freed from surplus acids in the nitrating or acid centrifugals, to the washing-house without employing workmen to carry it, and without having first to plunge it into water. The transport apparatus consists of a pipe, the mouth of which is situated near the centrifugal. Through this pipe water runs continuously. The cotton is thrown into the funnel-shaped mouth, and is carried along the pipe by the stream of water, being collected in baskets at the washing-house. Accepted May 12, 1900.
- 12,316 (1899). **Manufacture of nitro-explosives.** A. J. Boulton, London. (Agent for *J. F. T. Sargent, U.S.A.*). A process for producing nitro-explosives, in which the principal components are starch and nitric and sulphuric acids. The starch is first thoroughly dried in a temperature of between 100 deg. and 140 deg. C., and then, while hot, it is put into a closed container and cooled to below 4 deg. C. For every litre of a mixture of one volume of nitric acid to two volumes of sulphuric, 200 grammes of dried starch are added, and the whole is well mixed. Surplus acid is then removed from the settled mass of nitro compound, which is washed and boiled and afterwards dried. Accepted May 5, 1900.
- 12,464* (1899). **Double-barrelled rifles.** J. MacNaughton, Edinburgh.
- 12,591* (1899). **Manufacture of explosives.** C. H. Curtis, London, and A. H. Durnford, Hanworth.
- 13,171 (1899). **Manufacture of smokeless powder.** R. W. S. Griffith, E. H. Durnford, Eyeworth, and G. H. Wadsworth, London. A purified nitro-cellulose of any degree of nitration is taken and is reduced to an impalpable condition in the presence of water. All its fibrous structure is by this means destroyed. The water is extracted from the mass by centrifugal or other action, more or less being extracted, according to the required consistency of the paste. The paste is then moulded or pressed into any desired shape or form. Accepted May 5, 1900.
- 13,215 (1899). **Depression range-finders.** R. Brotherhood, Oldham. A range-finder adapted for use at such places as coast fortifications, the height above the sea-level of which is known. Attached to the instrument are two telescopes, one larger than the other. The range required is automatically recorded by the movement of the larger telescope when being sighted at the object, and is read off from a scale through the smaller telescope. The angle formed by the line of collimation through the larger telescope and the known base, which is the height at which the instrument is used, gives the necessary clue to the determination of the length of the third side of the triangle. Accepted May 26, 1900.
- 13,460 (1899). **Compound bullets.** L. B. Taylor, Selly Oak. Compound bullets, more especially intended for use in automatic pistols, in which the lead core is entirely enclosed by the metal envelope. The envelope is made in two parts, the fore part or nose overlapping the part covering the back end of the bullet. This method of construction is found to give better results as regards mushrooming than is obtained with bullets which have the ordinary hard, rigid metal nose. Air chambers may be left between the nose of the lead and nose-covering of the bullet. Accepted May 12, 1900.
- 13,670 (1899). **Manufacture of castings for projectiles.** R. A. Hadfield, Sheffield. The mould which has heretofore been used for casting projectiles has been so arranged that in the lower portion the heated steel came into contact with cold iron and quickly cooled, whilst the upper portion came into contact with sand and cooled much more slowly. This method of casting has been found to cause cracks at the junction of the part cast in the chill and the part cast in the sand. In the present mould the chill and the sand parts are so arranged with an intermediate part, composed partly of metal and partly of sand, that sudden variations in the chilling effect are obviated. Accepted May 5, 1900.
- 13,798 (1899). **Gun carriages.** A. Reichwald, London, (Agent for *Fried. Krupp, Germany*). A modified form of the gun carriage for high-angle firing guns, described in Patent No. 25,364, of 1898. The construction of the carriage is substantially the same as in the one described in the specification mentioned, except in the part designed to minimise vertical force caused by the explosion. In the present arrangement any bracing of the carriage to the earth is unnecessary, the recoil being taken up partly by a fluid brake placed between the body of the carriage and the axle, and partly by the buffer springs. Accepted May 5, 1900.
- 15,971 (1899). **Machinery for boring holes in gun mountings.** Messrs. Hulse & Co., Ltd., and H. Bites, Salford. Machinery suitable for boring or internally screwing holes in gun carriages or mountings. The work is secured to a base plate in front of the machine, and the tools are carried on a sliding carriage, which works along a slide bed. Accepted June 2, 1900.

- 22,270 (1899). **Quick-firing guns.** The Hotchkiss Ordnance Co., Ltd., London. (Agents for *L. V. Benét and H. A. Mercié, France.*) A great many modifications of quick-firing gun mechanism are described in this specification, embodying principally means by which the breech is automatically opened upon discharge, and the cartridge case ejected. The improvements consist in automatically locking the breech in the open position, automatically releasing the breech upon the insertion of a fresh cartridge, and means for automatically closing the breech when so released. Accepted June 2, 1900.
- 2,616 (1900). **Self-indicating targets.** J. Brightmore, Tideswell, and F. S. Goodwin, Bakewell. A portable target made of steel, and adapted principally for volley firing. Several bulls are marked on the plate, and each one is connected with a battery and bell, so that it is possible to tell every time a hit is scored. Accepted May 12, 1900.
- 3,486 (1900). **Shooting case.** A. Ransom, Farnham. A shooting case, the front of which is hinged and may be turned downwards. The interior of the case is split up into divisions, each division adapted to carry a certain article, such as scoring book, loose cartridges, packets of ammunition, pencils, orthoptics or binoculars. Accepted May 19, 1900.
- 3,526* (1900). **Method of connecting barrels and breech of shot guns.** A. Liber, Germany.
- 3,990 (1900). **Sights for rifles.** A. R. Douglass, U.S.A. Sights for rifles, in which the back sight has the ordinary notch. The front one consists of a sort of arch, and is so constructed that aim may be very quickly taken. A diaphragm containing graduated sight notches may be attached for fine shooting. Accepted May 5, 1900.
- 4,256 (1900). **Breech-loading small-arms.** J. J. Greenough, U.S.A. A simplified system of lock mechanism for small-arms, in which the movement of an under lever removes the breech block, consisting of a sort of wedge of metal, cocks the hammer and ejects the spent cartridge. The mainspring is double-armed. One arm operates the hammer and the other acts as a trigger spring. Accepted June 2, 1900.
- 4,399 (1900). **Automatic recoil-operated small-arms.** G. Luger, Germany. In a very bulky specification, to which is attached ten sheets of illustrations, a system of improved mechanism for automatic pistols is explained. The principal object of the mechanism is to secure absolute safety for the shooter, while, at the same time, the weapon is always ready for firing. Accepted May 26, 1900.
- 5,830 (1900). **Production of nitrocellulose.**—R. Haddan, London (Agent for *Vereinigte Kolne-Rottweiler Pulverfabriken, Germany.*) A method of preventing nitrocellulose from becoming decomposed by atmospheric influences by first washing it in the ordinary way to free it from acids. It is then, either in a fibrous, or ground, or granulated state, placed with more than its own weight of water into a boiler, and is heated under pressure at about 135 deg. C for about six hours. It is afterwards finally washed again with cold water. This treatment has been found greatly to increase its stability. Accepted May 5, 1900.
- 6,140 (1900). **Automatic fire-arms.** A. Glisenti, Italy. Automatic mechanism for machine guns, rifles, or pistols of the bolt type, in which a piston, actuated by the gas from the discharge, pushes back a rod and sleeve and unlocks the breech bolt. This action ejects the spent cartridge, and the breech bolt is returned to the firing position by a spring. Accepted May 19, 1900.
- 6,335 (1900). **Trigger-locking device for small-arms.** J. Tambour, C. Cobert, and F. Neuber, Austria. A device which automatically locks the triggers directly the grip upon the stock is relaxed. Behind the trigger, and underneath the small of the stock a piece of metal is let into a groove. This metal ends at its forward part in a fork, which is adapted to engage with the triggers. The piece of metal is always pressed outwards by a spring, and when the stock is gripped this is forced upwards, thus disengaging the fork and releasing the triggers. Accepted June 2, 1900.
- 7,583 (1900). **Manufacture of explosives.** H. E. Sturcke, U.S.A. An explosive in which nitrate of ammonia forms part of the composition. The patentee claims that this substance has heretofore been used in such large proportions that the best results were not obtained with it, either as regard effectiveness of the whole compound or the cost of manufacture. In the present specification a number of compounds are set out, but 10 per cent. by weight of ammonium nitrate is about the proportion of this substance used. Nitro-glycerine 15 per cent., wood fibre 10 per cent., sodium nitrate

59 per cent., vaseline 5 per cent., and sulphur 1 per cent. are the other ingredients which form one particular compound. Accepted June 2, 1900.

- 8,045 (1900). **Wire cutting device for small-arms.** I. Wheeldon, Melbourne. In order to provide a soldier with a ready means of cutting barbed wire, a slot is cut on the face of the muzzle of the rifle. Across this the wire stretches and the bullet leaving the barrel does the necessary cutting. Accepted June 2, 1900.

* These Specifications are more fully described under "Selected Patents."

SELECTED PATENTS.

A SPORTING GUNPOWDER.

12,591 (1899). C. H. Curtis, London, and A. H. Durnford, Hounslow. This specification describes the production of cheap smokeless, or nearly smokeless, powder compounds, in which nitrocellulose is the principal constituent.

Before treating the nitrocellulose with a solvent when employed as the basis of a smokeless powder it is the usual practice to dry it first, and this operation is attended with considerable risk of explosion. The dry nitrocellulose is treated with the solvent, and is rendered more or less gelatinous. It is then put through several processes to reduce it to flakes or grains, which are dried in order to volatilize the solvent. Much difficulty has, however, been experienced in getting rid of the last trace of solvent.

The present patentees have discovered a method of dealing more safely with the nitrocellulose, and of completely getting rid of the solvent. When stored, nitrocellulose usually contains about 25 to 30 per cent. of water; and it has been found that if only partly dried, and partial drying is not attended with danger, so that about 12 to 20 per cent. of water is still left, and then, no matter whether the nitrocellulose is compounded with other substances or not, if it is treated with strong solvent—preferably acetone—a degree of gelatinization can be obtained without parting with the water left. By retaining this water throughout their manufacture physical features of great importance are produced in the powder grains. The quantity of solvent employed must be so regulated as to insure that no water or solvent is squeezed out from the mixture.

The process of forming grains or flakes is rendered very easy by the degree of gelatinization attained by this treatment; and, when dried, the grains have been found to contain no trace of solvent whatever, and are hard and compact. They may be employed either for a sporting powder or for other explosive purposes.

The percentage of water retained in the nitrocellulose acts to a certain extent as a regulator, since, when the higher percentage—that is, up to 20 per cent.—is employed the strength of the powder produced is greater and the density lower. The bulkiness of the grains can also be regulated by this means.

Good results have been obtained with explosives compounds into which other substances enter and act with the nitrocellulose partially dried as explained. Compounded with chalk—preferably elutriated—the violent action of the nitrocellulose is moderated and the gaseous products of explosion are increased, the chalk giving off carbon dioxide upon decomposition. The chalk also preserves the powder, since it prevents acidity which sometimes takes place in nitrocellulose powders, and is due to slow decomposition after long storage. When incorporated with saltpetre and charcoal, a mixture of which is itself explosive, a quick and certain ignition is imparted to the nitrocellulose, and combustion is carried throughout the grains with regularity. This mixture also acts as a moderator of the violent action of the nitrocellulose. The proportion of charcoal to saltpetre is somewhere about 80 parts of saltpetre to 20 parts of charcoal.

The method of mixing these compounds is as follows:—Before treating them with the solvent they are first roughly mixed by hand and then are thoroughly mixed under edge-runners until the materials are homogeneous. The acetone is then added, being quickly sprinkled over the material whilst the runners are in motion. The material is by this means rapidly incorporated whilst the acetone is acting upon it. The motion of the runners thus induces a degree of gelatinization with a much smaller quantity of acetone than would otherwise have to be used.

The water contained in the nitrocellulose and the substances mixed with the nitrocellulose tend to regulate the action of the solvent, which, so regulated, gives to the mass a plastic condition. In this condition it is easily crumbled into grains, which are formed by rubbing the mass through sieves after the solvent has completed its work. The grains are then dried and sifted to obtain uniform size. The grains could, of course, be pressed or moulded before drying into any required shape.

Several example compositions are set out in the specification, each of which is said to produce a good powder suitable for sporting purposes. We reproduce these below.

(1)	Nitrocellulose	75 parts.
	Elutriated chalk	25 ..
(2)	Nitrocellulose	50 ..
	An incorporated mixture of saltpetre and charcoal in the proportions given above	50 ..
(3)	Nitrocellulose.. .. .	60 ..
	Saltpetre	30 ..
	Chalk	10 ..
(4)	Nitrocellulose.. .. .	75 ..
	Elutriated chalk	15 ..
	An incorporated mixture of saltpetre and charcoal	10 ..
(5)	Nitrocellulose.. .. .	80 ..
	Elutriated chalk	12 ..
	An incorporated mixture of saltpetre and charcoal	8 ..

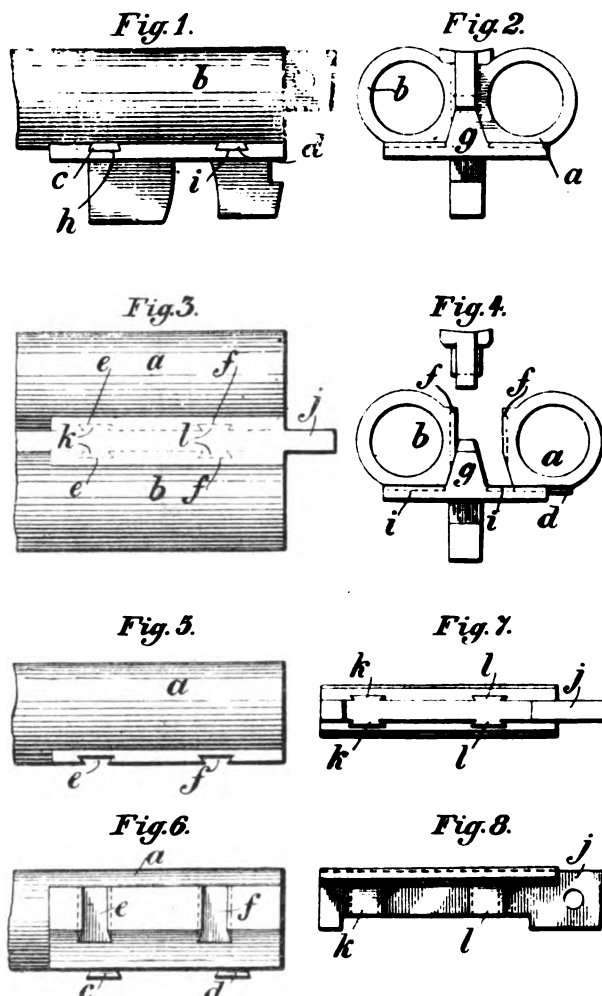
The proportions may obviously be modified for the purpose of producing an alteration in the resulting powder. For instance, in a powder which might be designed for military purposes, the chalk would be reduced, in order to do away with its retarding effect upon the combustion. A more concentrated powder could be produced by increasing the quantity of solvent used, thus obtaining a higher state of gelatinization. Any increase in the proportion of the mixture of saltpetre and charcoal would, to a certain extent, increase the quantity of smoke resulting from the explosion, but the proportionate drop in the amount of nitrocellulose contained in the compound would have the effect of cheapening the production of such a powder. Accepted May 19, 1900.

BARREL BREECH CONNECTION IN SPORTING GUNS.

3,526 (1900). H. Siber, Germany. A method of attaching the lumps and the top rib extension to the breech end of the barrel is described in this specification. It is claimed that in this method of connection there is much more solidity and strength than in the one at present in use, since it is a mechanical coupling which would not come apart even were the soft solder to become temporarily removed by extraordinary heating.

In the annexed illustrations Fig. 1 is a side view, and Fig. 2 an end view of breech end and lumps. Fig. 3 is a plan of the same, and Fig. 4 shows the parts separated. Figs 5 and 6 are respectively plan and side views of one barrel, and Figs. 7 and 8 are views from beneath and from the side of the fixing bar which forms the end of the top rib.

Both barrels *a* and *b* are provided on their under surfaces with dove-tail shaped projections *c* and *d*, and on the sides facing each other with dove-tail shaped grooves *e* and *f*. The projections *c* and *d* are cut along the flats of the barrels in a direction parallel to the breech face, whilst the grooves *e* and *f* are cut on the sides at right angles to the projections *c* and *d*. The part *g* carrying the lumps is provided on its upper side with the grooves *h* and *i*, corresponding with the projections *c* and *d* on the barrels. The end of the top rib

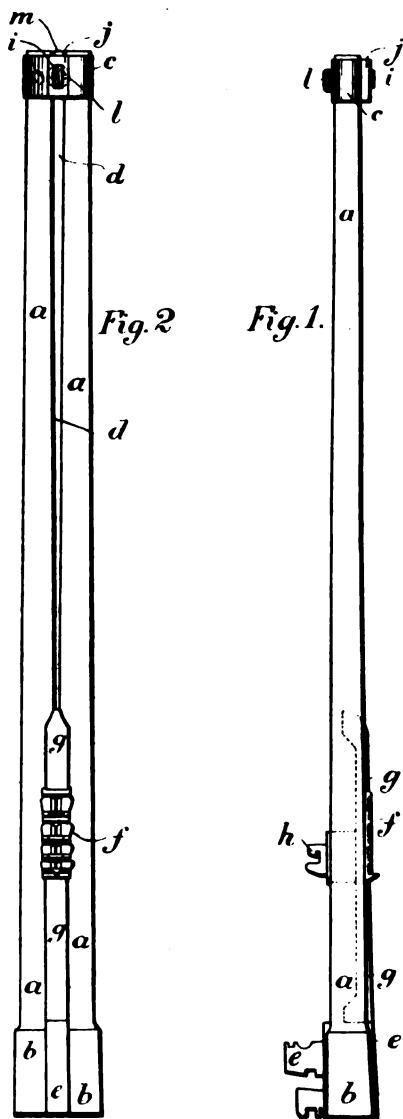


j is also provided with the projections *k* and *l*, which correspond with the grooves *e* and *f* on the sides of the barrels. The method of connection will easily be understood on reference to Fig. 4. The barrels are first slipped into the grooves on the lump piece *g*, and the top rib piece *j* is then inserted between the barrels from above, the projections *k* and *l* fitting into the grooves on the sides of the barrels. This top rib piece *j* forms a sort of locking bar which hold the barrels together securely, and at the same time absolutely fixes in one position the part carrying the lumps, the whole arrangement thus forming a most mechanical coupling. Accepted May 5, 1900.

DOUBLE-BARRELLED RIFLES.

12,464 (1899). J. MacNaughton, Edinburgh. This patent relates to several improvements connected with the fastening together of barrels in double-barrelled rifles, with sights for double or single-barrelled rifles, and with breech mechanism in falling block rifles. The principal modification described is one in which the two barrels in double-barrelled rifles are secured quite independently of

one another, so that the heat of either barrel is not communicated to the other, and each barrel, therefore, expands independently. This arrangement obviates the difficulty of the unequal expansion of the barrels affecting the straight shooting of the rifle, which has been experienced with double-barrelled rifles in which the barrels are soldered to one another by means of ribs, or are otherwise rigidly connected.

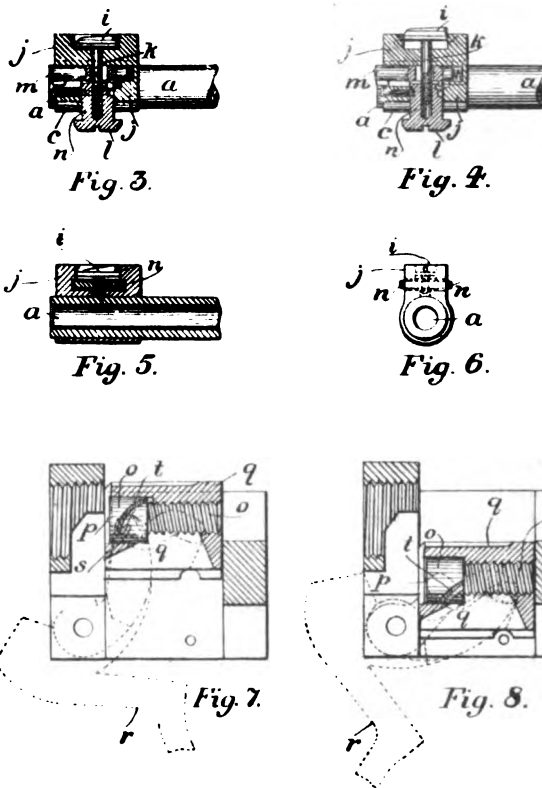


taper of the barrels, so that by pressing the barrels into these sockets they are firmly secured, brazing not being needed. The back sight *f* is secured to a rib *g*, which is held against lateral movement at one end by engagement with the top part of the lump *e*, and at the other end by a projection which wedges between the barrels. The loop *h* is fastened to this rib, and is also held tightly between the barrels.

The sleeve which connects the muzzle ends of the barrels is arranged to carry the foresight *i*. This sight, which is adjustable, slides in a slot in the upstanding block *j* between the barrels. When not in use it is protected by being screwed right down so that it is below the level of the top of the block. The sight adjusting mechanism is fairly simple, as will be seen from the illustrations. The leg *k* of the sight is screw-threaded and works in the screwed shaft of the thumb-screw *l*. This thumb-screw is secured against any accidental rotary movement by the spring bolt *m*, which has to be pressed inwards before the sight can be adjusted by the turning of the thumb-screw. The sight may be provided with a scale so that it can be elevated to any degree for any range. An elevating back sight could then be dispensed with.

The sight *i* is also applicable to single-barrelled rifles; but instead of the adjusting screw *l*, situated between the barrels as in the foregoing case, the screw *n*, running right through the sight block, is used in its place.

In Fig. 7 the falling block in the breech of the rifle is shown in its closed position, and the central plug *o* running through it is a device, the object of which is to withdraw the striker sufficiently to



In the accompanying illustrations Fig. 1 shows the pair of barrels in elevation, and Fig. 2 shows them in plan, the method of connection being clearly shown. In Figs. 3 and 4 sections of the muzzle-connecting links and the adjustable foresight are illustrated, and in Figs. 5 and 6 this foresight is shown as adapted to single-barrelled rifles. A device for clearing the striker from the cap in breech mechanism of the falling block type is illustrated in Figs. 7 and 8.

Referring to Figs. 1 and 2 it will be seen that the two barrels *a* are secured or bound together at the breech and muzzle by means of the twin sleeves *b* and *c*. These sleeves may consist of blocks, formed with two sockets, through which the barrels are passed. The barrels are by this means held apart, the space *d* intervening between the two. The sleeve *b* at the breech is preferably formed with the lump *e* in one piece, the sockets into which the barrels are slipped being made slightly taper to correspond with the

allow the action to be opened without force should the striker become jammed in the cartridge cap. The striker *p* works in the centre of the plug *o*, which is movable by rotation within the breech block *q*. The block is raised and lowered in the usual way by the lever *r*, and in the lowering operation by means of the projection *s* upon the lever and the groove *t*, the plug *o* is caused to rotate through part of a revolution. This movement has the effect of retracting it within the block, the firing pin being cleared from engagement with the cap by this means. Accepted May 5, 1900.

Arms & Explosives

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CURRENT TOPICS.

Frauds at Auction Rooms.—One or two cases have recently come to our notice where guns known to be fraudulently marked have been sold at auctions. Those aware of the true facts of the case, but unversed in the legal remedies available, have allowed the sale to proceed on its uneventful way, thinking that anything less than a prosecution would be unavailing. We are very pleased to record a case where a more obvious remedy was put into force without delay or expense. Messrs. Foster, of Pall Mall, in the ordinary course of their business, issued a catalogue of fire-arms which had been placed in their hands for sale. Among the lots specified were two of special interest. One gun was the supposed production of "J. Manton," the other of "W. Richards, London." These two guns had been identified as forgeries, and the attention of the auctioneer was called to the fact. Obviously such notice would be imperative in so far that it would warn the auctioneer that if he sold the guns he would be subject to the provisions of the Merchandise Marks Act, conditions of sale and other formal notices of irresponsibility notwithstanding. When the lots in question were reached, the auctioneer announced that they would not be put up for sale, as he had been informed, and for which he was obliged, that these guns were forgeries, and, therefore, had been withdrawn. While this incident, in itself, does not increase our fund of knowledge as to the wide scope of the Act already quoted, it at least

creates a precedent which we hope will be taken to heart by all gunmakers who are aware that fraudulently marked guns will figure in an auction. Disregard to such warning should at once be met by purchasing the gun with a view to prosecution, and the penalty would doubtless be heavy, provided that satisfactory evidence were available that fair warning had been given prior to the goods being put up to auction.

The Prohibition of Arms Act.—The rapid progress of this Act through the Houses of Parliament provides complete evidence that it is considered an emergency enactment. It was sprung on us with great suddenness, and the idea was doubtless to carry it into law before organized opposition could check its course. Like so many Acts that have passed in recent years, its true scope and operation will be controlled by Royal proclamation. The Act itself merely gives powers for prohibiting the exportation to countries which may be specified of arms, ammunition, and such military or naval stores as may be used directly or indirectly against her Majesty's subjects or forces. Such powers as are granted under the Act may be of great importance to the country if intelligently used, but, on the other hand, they may create many injustices. China, for instance, has been a large buyer of arms and ammunition in recent years, and obviously such munitions are likely to be used against her Majesty's forces and subjects. On the other hand, the stoppage of English supplies of these commodities would not, in the smallest way, check the Chinese government in acquiring from other

countries all they require. Our English government would serve no useful purpose in stopping such traffic, and our manufacturers would be the only sufferers. It is, therefore, to be hoped that the powers granted under the Act will be exercised with due regard to the ultimate results of partial stoppages of supplies, which will not inconvenience the parties aimed at in the prohibition. It seems that steam coal will come within the meaning of naval stores. As monopolists of this particular brand of coal, it is obvious that any kind of export prohibition would serve a useful purpose. Krupp and Waffenfabrik Mauser may smile at the Act as removing one or two of their most powerful rivals. Let us hope that the use made of the Act by our Foreign Office may not result in granting a trade monopoly to our foreign rivals.

THE BISLEY MEETING.

THIS year's Bisley Meeting has been remarkable in several respects. The new rules enforcing the standing position at 200 yards, and the kneeling at 500 yards, have been met by a general protest in the form of enormously reduced entries. From an examination of the conditions on the spot, we have come to the conclusion that those who have abstained from entering have not done so in order to lodge a sulky protest against the enhanced difficulties of shooting in the new position. It seems rather that rifle shots, who have acquired some proficiency in shooting under conditions that leave plenty of scope for the exercise of skill and judgment, do not care to compete under conditions where the elements of chance are likely to take the place of skill. This is not the place to enlarge unduly upon the details *pro* and *con* of the arguments relating to standing shooting. The position is un-military, and affords less scope for education than the prone position. Furthermore, it so greatly increases the difficulties of acquiring the elementary stages of marksmanship, that it is bound to check interest in rifle shooting throughout the country. In a single word, the N.R.A. have badly blundered, and they must revert to the old order of things, even if, for the sake of their own reputation, they attempt to treat the future rules in the light of a compromise between the two extremes.

The sporting rifle competition did not contain much material for original comment, except in the matter of Mr. MacNaughton's new double rifle. The construction of this weapon was fully described in the patent column of our issue of last month. A double-barrelled .303 rifle, which will make good shooting at 500 yards, is, in our opinion, a great novelty, and one conferring great honour on the Edinburgh gunmaker who has worked it out. In ordinary double rifles it is the rigid attachment of the rib which checks expansion and throws the bullets in a line divergent from the axis of the barrel. In MacNaughton's rifle this is got over by fastening the barrels at breech and muzzle only, the intermediate length being free to expand as the bullet passes down the barrel, without the complications of a rigid connection with the rib.

Colonel Hopton was, as usual, well to the fore in the match-rifle competitions. In a short conversation we had with him he expressed impatience at the ignorant criticisms which are made concerning match rifles, some writers being still of opinion

that they are nothing more or less than shooting machines, and, as such, entirely divorced from all military interest. As a matter of fact Col. Hopton's match-rifle is an ordinary military pattern Mannlicher, with no departure from the standard pattern except in the matter of the sights. The foresight is a hollow bead, and the backsight is of the orthoptic type. Surely such a rifle provides excellent opportunities for the exact study of military rifles, and we believe that Col. Hopton's fondness for match-rifle shooting is largely based upon the professional instruction it affords.

As chairman of the Small Arms Committee, which has been formed to enquire into the improvements that can be made in our service-weapon, Col. Hopton is in a position to make good use of the information he has acquired at the range. It may be news to our readers to hear that the sighting of our service rifle will be materially altered as a result of this committee's deliberations. The present foresight will give place to one of bead pattern, which will be capable of lateral adjustment by an armourer, so enabling the jump of each weapon to be individually determined and allowed for by a suitable lateral adjustment of the foresight. A further modification of the foresight will consist in the fitting of a ring or cover protecting the sight from rough usage, and from the effects of vertical light, which interferes with the aim. A special undercutting of the block on which the foresight is mounted will provide an upright surface of a length which, subtended to a distance of 500 yards, will cover a vertical height equal to the standard height of a man. This will serve as a rough-and-ready range-finder, likely to be of considerable use under service conditions. We believe the committee are still engaged in the examination of various types of lateral adjusting backsights. The idea is to get rid of the un-military practice in target competitions, of pointing a vertical line on the bar of the backsight as much out of centre as will compensate for the windage for the time being prevalent. What is wanted is a permanent line with a screw or other adjustment capable of instant setting to suit the force and direction of the wind prevailing at the moment. It does not necessarily follow that the sighting would be done with a line, since this system arises from the custom of reversing the bar, and so getting rid of the unadjustable V-notch. Thus, it would follow that an adjustable V would serve the same purposes as the line, and in several respects it might be preferable. The main requirement of an adjustable backsight is that it should not add complications to the use of the backsight by recruits and other unpractised persons, who, in the earlier stages of their tuition would be instructed in the use of their rifle with a centrally adjusted V-notch.

At the pistol ranges the Colt revolver, as usual, took premier honours. The number of possibles scored with this weapon was remarkable, and the best possible tribute to its all-round excellence. The Smith and Wesson was also favoured with a number of well-deserved successes. Mr. Wesson and Mr. Axtell, of the parent Company in the States, were both present, and the latter especially shot marvellously well. As the *Times* remarked, the only reason why he did not win the revolver aggregate was because he did not enter for it. The chief interest of the Webley revolver, apart from the target successes of the ordinary type, was that the Fosbery-Webley Automatic Revolver was, for the first time to our knowledge, in actual public use. This self-loader obtained many successes, and won favourable comment from many who tried it. One

or two mishaps occurred with the pistol during the meeting, and the Company have withdrawn it for the time being, as they are confident that their newly acquired experience of different ways which different people have of holding a pistol can be met by certain mechanical adjustments which will make the revolver suitable for all classes of persons. It may also be that other details will receive further attention in view of the teachings of the practical tests to which the revolver was subjected during the Bisley fortnight. When the Company have completed these alterations there will be a public press trial, for which numerous invitations will be issued.

The miniature rifle competition must for the present be considered to have been a failure. Exceedingly faulty construction of the range, and the want of knowledge of the target to be used, left gunmakers and competitors in ignorance of the conditions to be met. Furthermore, we believe that the Greener, Cogswell & Harrison, and Westley Richards miniature rifles, are not yet properly suited to the conditions of standing shooting. Too light altogether for steady holding, and in various other details open to improvement, we believe that the experience of another year will see great changes. The Stevens .25 is the ideal design for such work, and when its merits have been incorporated into arms of English make, with steel instead of cast-iron shoes, a step in the right direction will have been made. The Stevens Company spoil their rifle when three years or so ago they made the barrel detachable. Let our English gunmakers remember that there is no opening in a cheap rifle for the sound mechanical fitting which alone makes a detachable barrel durable and sound. In our opinion there is a big trade to be done in these rifles, and it is at least certain that the most favourable design is worth working out, because design does not cost money, in fact, often saves money.

INCIDENTAL JOTTINGS.

THE UNITING LINK. Despite the foreboding of our Bisley warriors, the ammunition was a distinct success this meeting, and the tropical heat rather gave away last year's theories of the atmospheric effect upon the Cordite. This happy experience has also been the lot of Tommy Atkins at the front, where the .303 cartridge has scored all down the line; in baking heat by day and frost by night, it has built up a reputation which will take some beating. I have interviewed many officers and men who have returned, and they all endorse this opinion. It is pleasant to think that this is now confirmed by the crucial test of Bisley, where every man is alert to discover irregularities.

BLIND MAN'S BUFF. Whatever views one may hold as to the impropriety of discussing the Contracts Committee, it certainly does appear to an interested party that the value of the evidence will be considerably minimised for want of expert cross-examination of the witnesses. What good can come from this promiscuous grabbing at any fact or subject without thoroughly investigating it? First it's "Hay," then "Vinegar," then "Cordite," back to "Vinegar," on to "Horse transport," back to "Cordite," on to "Hay" again, and so on! What committee on earth can report on such a medley of unsubstantiated statements about stores they don't understand.

There is a lot of "grit" in the Committee, and they only want the concern putting upon a business-like line of action, and much good might result from their deliberations.

WHAT THEY OUGHT TO GET AT.

It is obvious that every contracting firm cannot succeed in getting its tender accepted, and it naturally wants to know why, in order that the Committee might ascertain why the successful ones gain War Office favour. It should be—price, quality, time of delivery, or national expediency. So that what is required is, first, that every inspector should fill in a form giving the record of each firm whose contracts come under his inspection, together with a report on complaints or recommendations of such contractors' material from out-stations after passing into service, by which the sinners could be separated from the saints, and every contractor's record would come before the eyes of the Committee. Even then, until the individual cost of inspection is added to every contract, no power on earth can tell which is the cheapest.

IS THE YELLOW PERIL UPON US?

I do not refer to the humourists who write from the country that the corn is turning "kharki," or that the mustard fields are suffused with "lyddite," but to the great Chinese question. It is very possible that the power of these hordes of untrained fanatics is considerably overrated. At the time of the outbreak of the Boer War we under-estimated them, to our cost, and now the Chinese struggle is looked at through a big magnifying glass to make sure the error does not recur. A small race armed to the teeth is of much greater power than a large race indifferently armed. When we speak, in awe-stricken tones, of the millions of Chinese, we forget they haven't cartridges enough to supply a round apiece, and that the only troops of any consideration are those which fringe round the civilised cities and ports; and these can hardly be called first-class fighting material.

CHINESE LAXITY.

Those who know the Chinese well will tell you that they are far too indolent and corrupt to become a military power for many years. They buy first-class machinery for their arsenals, and could make excellent guns, shells, cartridges and rifles quite up-to-date, but they don't. Like children with new toys, they want everything new, but soon drop it, and purchase ready-made material, of which some is good, and the majority is bad; for China has for years been the dumping ground of rubbish which no European country would have. "Commission before quality" is the motto of the Chinese Mandarin. No wonder the Japanese troops fired upon some Russians, mistaking them for Chinese, the other day; they probably recognised some similar national trait.

TO KILL OR TO "WING" THEM?

Whilst on the subject of the Chinese, it is a question whether we should not use Dum Dum or Mark V. bullets upon such barbarians. It has been said in the House of Commons that they would only be used in "Savage Warfare," and John Chinaman appears to answer to that description, especially when he gets the chance of bagging a missionary. Considering that all the ammuni-

tion for the native Indian troops will be made and taken from India, it will have been manufactured under the personal supervision of the Dum Dum inventor, Capt. Bertie Clay; and any report as to its efficiency will make a valuable comparison with a similar report upon the Mark II. from South Africa. The Chinese small-arms are a wonderful collection, representing every age and nation, the "Giant Lee" being most in favour, and the Mauser most in quantity. The arming of China has been looked upon as a big plum for whichever nation's manufacturers happen to get it; but the wily Celestial buys a little from all, and year after year attempts at standardization seem increasingly hopeless.

GUNS IN PROPORTION TO OUR TRADE

England does not mean to be behindhand in the gun competition in China, and, profiting from the South African experience, is mounting 9.2 guns on field carriages. This is a mighty weapon to haul about, to say nothing of carrying the ammunition, which alone approximates about five rounds to the ton in weight. With these and the siege train from South Africa there should be no difficulty in maintaining our own. Add to this the fact that our allies, as well as the enemy, are in many cases using English munitions, which will be used side by side with French, German, Russian, and not forgetting Japanese, productions. This ought to make a fairly representative international competition, if there is any fighting at all, which many folk seem sceptical about.

FOR THE FIRST TIME OF ASKING.

Industrial society is whispering of a coming alliance between a certain Vulcan of renown in Sheffield and the North West, and a coy young thing of ancient lineage from the county of Surrey. If the rumour is correct, I wish the happy pair success and prosperity. Meanwhile the gossips, who speak of Vulcan as a "mercenary creature," are enquiring what dowry beside her own estate the fair bride will bring. Well, this is a matter for Vulcan to tell us. I don't see who else can. What is that you say, "The Explosives Committee?" Oh fie! fie!

CYCLOPS.

THE TESTING OF EXPLOSIVES AT WOOLWICH.

CAPTAIN M. B. LLOYD, who is in charge of the Testing Station, Royal Arsenal, Woolwich, has submitted to the Chief Inspector of Explosives the following interesting report of the working of this department. He begins by pointing out that Captain A. Desborough, who was appointed one of H.M. Inspectors of Explosives on August 15th, 1899, has been associated with him since that date in the working of the Testing Station, and is fully competent to take over the entire charge of the establishment. The remainder of his report is here given in full:—

"The past year has been busier at the Testing Station than I had expected, as, in addition to the ordinary work, which was in quantity quite up to my estimate, I have spent a large amount of time in experiments in connection with the preparation of the Special Test. It will, perhaps, be as well to take this opportunity of recapitulating the circumstances of this Special Test, which came into force by the Home Office Memo. of October 18 last. As stated in the preamble of that Memo., it was brought to the notice of the Secretary of State that owners of mines were desirous of obtaining some official

assistance in the task imposed upon them of selecting one or more of the explosives on the Permitted List, and it was further adduced by some that the present test was not sufficiently severe, and that it allowed the use in fiery mines of explosives which were not safe under such conditions.

"With regard to the policy of classifying the explosives, I submit that this is not a question which concerns us as a department; but I feel that, with regard to the latter portion, I can hardly proceed without protest against the assumption that it is possible to get any explosive which affords absolute safety under all conditions. Such an assumption is most dangerous, and one for the refutation of which every opportunity should be taken. I think it cannot be too widely known that there is not a single explosive on the Permitted List which has not at some time or other caused an explosion of gas at the Testing Station. The safety of any particular explosive, then, depends not only upon its composition and physical characteristics, but even in a more marked degree upon the conditions under which it is used. The conditions making for safety are so important that an apology is hardly needed for repeating them. They are (i.) complete and immediate explosion of the charge; (ii.) correctly proportioning the charge to the work to be done, and avoiding the use of unnecessarily heavy charges; (iii.) careful stemming to ensure that there should be sufficient length, firmness, moisture, and closeness of consistency.

"With regard to these points, the immediate conversion of the whole charge into gas is most important, as cases have been reported where, after the shot has been fired, and there has been a residue left in the hole, this residue has gone on "squibbing" for an appreciable time after it has been exposed by the explosion of the first portion of the charge. This may occur even with a high explosive of a class which is not, as a rule, capable of supporting its own combustion, probably owing to the admixture of hot coal-dust with the unexploded portions of the charge. This can be provided for by the use, with high explosives, of a sufficiently strong detonator, and also with those high explosives which, from their hygroscopic properties, are specially liable to deterioration in store by the systematic using up of the whole of a previous consignment before beginning a new one, so that the explosive used is always as fresh as possible, and with explosives of the powder class by properly confining the charge.

"The rate at which an explosive burns (when it is not detonated) depends, *inter alia*, upon the pressure in the bore-hole; if then, owing to lack of proper confinement, the resistance collapses before a sufficient pressure is attained, the time of burning will be lengthened possibly until the burning explosive is projected into the fiery atmosphere. Again, when an unduly large charge is used, the gases, not having performed so much work, will be at a higher temperature when they issue into the air of the mine; they will not have performed as many expansions, which will also cause the temperature to be higher. The stemming is, of course, all-important, as experiments have shown at the Testing Station the lowest grade of common blasting gunpowder can frequently be fired without igniting the gas if it is stemmed well with puddled wet clay of a good stiff consistency, whereas, as above stated, every explosive tried when fired unstemmed has at some time or other caused ignition of the gas.

"As regards the apparatus itself at the Testing Station, no change has been made during the year, except the introduction of an automatic cut-off in the gas supply devised by our assistant (Brooks), which can be set to cut off the gas when the holder has risen to any desired extent. Among the numerous suggestions which have been made for the alteration of the apparatus, one for which I am indebted to Mr. L. T. O'Shea, who has spent much time and labour in examining and comparing the various foreign testing stations, deserves record. He suggested that the first six feet or so of the gallery should be enlarged to a diameter of six feet, so as to be more in accordance with practical conditions. He adduced in favour of the alteration that it would secure a large amount of confidence from coalowners and colliery managers, and this is so desirable an end that if it were to be attained merely by the expenditure of the money necessary to carry out the alteration, I should have been disposed to ask the

Committee to sanction the alteration; but on enquiry and consideration I came to the conclusion that it would modify the test in a direction in which it is not desirable that it should be modified—that is, in the direction of relaxed severity, the experience of Continental testing stations having shown that the increased diameter of the gallery lessens the probability of igniting the gas. The probable cause for this is that the gas, being able to get away more freely in the larger gallery, the crest of the compression wave is not so high, and more heat energy has to be expended to bring the gas up to the temperature of ignition.

"During the year, the above-mentioned Special Test has been brought out, and the experiments upon which the conditions of this test were based formed a large portion of the work of the Station during the year. This test is not for the present to supersede the old test; but it is imposed upon the product of those manufacturers who wish their explosives to be placed upon the 'Special List,' and was introduced for the purpose of affording colliery managers a certain amount of guidance in the selection of an explosive on the "Permitted List" for use in their pits. The "Special Test" is more severe than the ordinary test in two particulars—the charges are larger and the quantity of gas used in the mixture has been increased from 10 to 15 per cent., and in addition a single ignition of gas is sufficient to cause the failure of the explosive under trial.

"The charges used in the "Special Test" are two, and are respectively one-and-a-half times and twice the charge used under the old conditions. This increase of charge in itself constitutes a considerably severer trial, but from the result of the experiments it does not appear that the double charge is in every case more severe than the charge and a half. For this rather curious result I have not yet been able to assign any satisfactory explanation, but must merely record the observed result of the experiments. It is possible, of course, that the greater percentage of ignitions with the smaller charges found with some explosives may be merely chance, and an extended experience will show that the deduction made from a comparatively small number of shots was incorrect.

"These increased charges have, however, another bearing from the point of view of the efficiency of the Testing Station, in that they cause an altogether disproportionate amount of wear and tear to the cannon. The life of the liner of the cannon has been reduced to about 20 per cent. of the life under the old conditions, and consequently much time will be taken up by the Station being closed for repairs, to say nothing of the cost to the public in renewing material. So far, the "A" tube and wire winding of the cannon have withstood the heavy strain of the repeated detonation of the equivalent of a stemmed shot of four ounces of dynamite without injury.*

"The increase in the quantity of gas used for the mixture also increases the severity of the test to some slight extent, but not very much; I am inclined to think that with some explosives it may slightly reduce the severity, more particularly with such explosives as are deficient in oxygen in their products of combustion, as with these the gaseous products of the explosive itself would be more likely to generate heat by combination with more oxygen in a poor mixture than they would in one in which the amount of hydrocarbons was in excess. But to my mind the advantage of the higher percentage does not rest so much upon this as upon other considerations.

"It is acknowledged that by far the most deadly explosions are caused by the ignition of mixtures in which the oxygen is insufficient to cause the complete combustion of all the carbon in the mixture, on account of the more poisonous nature of the afterdamp, and the greater area usually involved in such explosions, and consequently it is the explosive which is safer in the richer mixture which should be given the advantage. The difficulties of the officer in charge are considerably less in deciding on the question of a doubtful ignition, the larger amount of gas giving much more flame outside the

gallery, as the air in the mixture is insufficient to burn it completely. It is worthy of remark also that the richer mixture produces a much more violent explosion than the old 10 per cent. mixture, although the latter, theoretically, approaches more nearly to the mixture to give total combustion.

"The importance of this marked increase of the visible effects of an ignition is greater than might be supposed. At first sight it might be thought that once the gas was ignited the whole volume of gas in the gallery would explode almost instantaneously. This is not the case. The violence of the explosion varies in almost every degree from what is practically a detonation of the gas, with masses of flames projected from every valve and from the end closed by the paper disc, accompanied by a heavy vibration, which has frequently shaken slates off the roof, to a slight spurt of flame without noise, or with so slight a noise that it is unheard in comparison with the report of the gun. The violent explosions are caused by firing unstemmed shots of any explosive, and the mild ones by stemmed shots of explosives which are near the border line fixed by the test. I am of opinion that this difference is caused by the amount of surface of the explosive mixture which is ignited at the same instant of time. When the wave of explosion starts from a small generating surface, the rate of expansion is slow to begin with, and time is given for a great portion of the mixture to escape from the mouth of the gallery before it can be ignited; but, on the other hand, when the generating surface is large, the explosion wave, travelling as it were on a broad front, and with a velocity exceeding the velocity of sound, overtakes the whole of the gas before it can escape.

"I am willing to admit that this is only theorising, but the theory is borne out by the fact that I experimentally substantiated that if the unstemmed explosive is a slow-burning compressed gunpowder, which, when unconfined, burns rather than explodes, then, by placing the explosive in the muzzle of the gun, a mild explosion is produced, whereas when the pellet is rammed right home, causing it to explode by reason of the pressure generated by its first ignition, the tongue of flame which then issues from the muzzle invariably gives a violent explosion.

"It would be hardly necessary for me to say anything further on the question of the uniformity of the test to the very pertinent remarks made by Major Cooper-Key in his report for last year, were it not that criticisms have been made, both in the press and elsewhere, directed against this all-important point. It is, therefore, advisable that I should point out that the Home Office Testing Station is not, primarily, an experimental station, but, as its name denotes, a testing station, and in a judicial position as regards explosives. The object aimed at is to draw a hard and fast line, and to be able to say that all explosives on one side of this line are safer for use in a fiery atmosphere than any explosive on the other side of this line. If this line be drawn one day in one place and another day in another, and there were a want of uniformity in the test, no workable result would be obtained.

"The method of obtaining equivalent charges by means of the lead blocks remains unchanged. But owing to many representations made, and to the manifest objections to the method, which have been previously commented upon, other methods are to be experimented with, and the whole question gone into in the light of increased experience.

"On several occasions during the past year, complaints have been received that "flame" had been seen at the coal face on firing a "Permitted" explosive, and, in consequence, I carried out some experiments with a view to ascertaining whether "flame" was present under the conditions of the "test." For the purpose of these experiments, one of our guns was up-ended in the open, and a dark night was chosen for the experiment. Charges of oxalate blasting powder, which was one of the explosives against which the above complaint had been made, were then placed in the bore, beginning with the ordinary "test" charge and coming down to about one-third of that amount; each shot was stemmed and fired exactly under the same conditions as in the test, and in each case a rush of incandescent gas was visible for a distance of between 3 and 4 feet from the muzzle. Other explosives were tried,

*While this Report was in course of preparation, two "A" tubes have been cracked, thereby making these two cannon useless.

and in every case a flash of greater or less intensity and volume was observed. A photographer was present on the occasion, but either from the want of actinic rays in the flash, or from want of a suitable plate, the results obtained were practically nothing.

"The results of these experiments go far to show that visible flash from a shot does not necessarily involve danger of ignition of the gas, as under the conditions of the "test," a flash is projected into an atmosphere of far greater sensitiveness than is ever to be found in a coal-mine. The reason for this may be one or both of the following:—(1) The flash may be at such a temperature that, although visible, it is not sufficiently hot to ignite the gas. (2) The incandescent gases may be englobed in a surrounding medium of gases at a lower temperature. In either case, the experiments prove fairly conclusively that the mere appearance of flash is not necessarily a cause for anxiety as to the safety of the explosive for use in a fiery mine.

"In connection with the experiments on which the special test was based, a number of shots were fired in the vertical cylinder for use with coal-dust. These experiments showed that with no explosive that was used is this method of testing so severe as in the gas gallery, as, although several explosives fired the gas which did not fire the dust, in no case was the contrary effect produced, and in the experiments with the dust the stemming was merely poured in over the explosive and not rammed—a condition which would be very severe were it applied to the gas gallery. These shots were stemmed in this manner, owing to the danger of ramming a shot in such a confined space, and in a gun between the feet of the person engaged in ramming; but this danger is small compared with that incurred in the event of a detonator missing, and the shot having to be extracted, as occurred on one

inflamed by the guncotton being thus ignited. It has been tried in the side tube, but there it has not always ignited when an explosion occurred, owing, probably, to the explosion not being transmitted through the tube of smaller diameter.

"I cannot hand over charge of the Testing Station without saying one word of appreciation of the manner in which my decisions have always been received by the representatives of the trade whom I have had the pleasure of meeting there. In the course of my work there I have frequently had to give decisions which have been of very great importance to them, and they have always been received with the utmost courtesy, and my position as arbitrator has thus been rendered as pleasant as possible."

THE 380 MILITARY SMITH AND WESSON REVOLVER.

THIS excellent weapon, which has recently been introduced, does not appear to be so generally known as its merits deserve. We owe it to the courtesy of Messrs. Charles Osborne & Company that we are able to give an illustration of the revolver, together with a description which results from personal handling of the weapon.

As is well known, most of the Smith and Wesson revolvers are built with the ordinary break-down system of opening the breech. The one exception, until the introduction of the present revolver, was the pocket pattern, which has a continuous frame, the cylinder swinging out to the side to eject



occasion. Fortunately, in this instance, the explosive was one which could be drowned with water, and by leaving the charge immersed for several days the operation was carried out without accident; but this is a condition which would not obtain with every explosive, and I must strongly urge that, should it be decided to carry out any further experiments with this apparatus, the position of the gun be altered so as to obviate this risk.

"Another change which I think might now be introduced with advantage is the abolition of the guncotton tell-tales. These have for some time past been quite unreliable; on some occasions they have failed to ignite when an explosion has occurred, generally in wet or foggy weather, and on other occasions one has been fired when no explosion occurred, probably owing to its being struck by a hard lump of the stemming. This has never occurred to both the pieces at the same shot, so no confusion has arisen from this cause in the past, but there seems no reason why, if sometimes one, and sometimes the other, is ignited by the blow of the stemming, both should not chance to be fired by the same shot. This would not, in all probability, deceive the officer in charge; but doubts might be raised in other people's minds, and with the increased percentage of gas it might happen that in some conditions of wind the gas might actually be

the cartridges. The particular method of releasing the cylinder, in the case of the pocket revolver, was to pull the extractor slightly away, when the cylinder could be swung out. It was found that the combined operation of pulling the extractor and at the same time pressing it to the side could be made simpler by subdivision. The arrangement, therefore, adopted in the new weapon is to provide the milled thumb-piece, shown in our illustration, which releases the cylinder, so rendering it much easier to swing out.

Another useful little improvement lies in the striker nose attached to the hammer. Instead of making hammer and striker in one piece, they are now separate, being joined by a pin connection, which allows a slight play to the striker. The double advantage of this device is, first, that the blow on the cap is a direct thrust, instead of a slightly drawing movement, and second, that in case the striker gets broken, the cost of a new striker only is entailed, instead of that of a new hammer.

The revolver contains several other improvements in detail, all of which combine to make the weapon one that will find many friends and admirers.

NOTES.

MIDDLESEX GUN CLUB.—It is a matter for regret that the latest balance sheet of this club, for the year ending June 30th last, shows a deficit of £32. Unfortunately, the list of members seems to have undergone no augmentation, for reasons that are not sufficiently obvious to suggest providing a remedy. That this is in no way due to want of accommodation may be gathered from the fact that the club could easily enough meet the requirements of quite 600 members, whereas it actually has only about one-sixth of that number. Moreover, the working expenses would be little, if any, greater with the full number than at present. One evident result of this regrettable lack of enthusiasts is that the balance sheet shows a sum of £123 expended in prizes, the entrance fees for which amounted to only £58. The annual dinner also resulted in a loss of £5. These two deficits almost exactly cover the profits made by the sale of cartridges and birds, and refreshments, so that the net working expenses of the club have to be met entirely by the annual subscriptions and donations, with the result already indicated. It is to be hoped that the inrush of a fresh wave of popularity, as regards inanimate bird shooting, will set in in time to produce a more satisfactory state of affairs for this well-managed club during the next financial year.

THE ARMAMENTS OF CHINA.—In reply to a question asked in the House of Commons, Mr. Wyndham said that since the year 1895 China had been supplied by firms in this country with 71 guns of position and 11,740 rounds of ammunition; 123 field guns and 49,400 rounds; and 297 machine guns and 4,228,400 rounds of ammunition. Last year a German firm also supplied 460,000 Mauser rifles and 3,000,000 rounds of ammunition. The figures respecting the supplies from this country are not necessarily exhaustive, as the question related to guns. Only a few weeks ago one English house received an order for 20,000,000 rounds of rifle ammunition for China.

RUSSIA AND SMOKELESS POWDER.—From Odessa comes information that the Russian military authorities have placed orders with a Belgian agency for a large quantity of smokeless explosives. These orders evidently arise from the crisis in the East, as the greatest possible speed is to be exercised in the delivery of the material, and it is to be shipped direct from Antwerp to Port Arthur.

TRIGGERS IN COMBINATION.—The Americans are nothing if not ingenious. In this country we have double-trigger guns and single-trigger guns, with a further refinement of the latter in the shape of devices rendering selection of either right or left barrel possible at the will of the sportsman. But a firm "on the other side" finds no satisfaction in these puny efforts. It has brought out a combination double-trigger gun, in which the pulling of the right trigger twice in succession discharges right and left barrels, while the pulling of the left trigger twice reverses the order; or the right and left triggers will discharge right and left in succession, and left and right triggers will reverse the order. To English gun-makers, who mostly consider the single-trigger device quite sufficiently complicated for ordinary practical use, this "com-

bination" trigger arrangement will be rather suggestive of a Chinese puzzle, or the signal-locking mechanism of a large railway junction. At all events, they will probably rest content with their own appliances for the simplifying of the shooter's operations. In this respect the "combination" action bids fair to defeat its own purpose.

DEATH OF MR. THOMAS REID.—We regret to announce the death, on the 5th ult., of Mr. Thomas Reid, Chairman of Nobel's Dynamite Trust Company and Nobel's Explosive Company. Mr. Reid also occupied a similar capacity with regard to the London and Glasgow Engineering Co., the Glasgow Cotton Spinning Co., and other companies. He was Justice of the Peace for Glasgow and the County of Dumfries, and a member of the firm of Messrs. Alexander Reid & Son, dyers. He is to be succeeded by Colonel J. L. du Plat Taylor, C.B., of London, who will act as chairman of Nobel's Trust Company, and by Sir Charles Tennant, who will occupy a similar position in connection with Nobel's Explosive Company.

MESSRS. GREENWOOD & BATLEY, LD.—According to the report for the year ending March 31st last, there remains, after providing for debenture interest, writing off the sum of £1,500 for depreciation on buildings and plant, and making due provision for doubtful accounts and allowances, a net profit of £8,829, which, with £2,956 brought forward from last year's account, gives a total of £11,785 available for distribution. There is no appropriation for reserve, but as against this and the relatively small balance of profit, it should be noted that during the year there has been an expenditure of £9,000, paid out of revenue, on the maintenance of plant and machinery in efficient order. The result of the year's trading is, in effect, that the directors have recommended the payment of a dividend to the ordinary shareholders at the rate of 2½ per cent. per annum on the paid-up capital, leaving a balance of £463 to be carried forward. The company's cartridge-making plant has been occupied to its full working capacity since January last on Government contracts, but the heavy increase in the price of raw materials has served to neutralise an increase in business output.

MORRIS TUBE COMPANIES.—On June 28th, the eleventh ordinary general meeting of shareholders in the Morris Tube-Ammunition and Safety Range Co., Ltd., was held at the registered offices, with Lieut.-General Sir John Stokes in the chair, who announced that the profits had allowed of the distribution of a dividend, which the liquidator had paid. A formal resolution adopting the report of the directors and the statement of accounts was agreed to unanimously, and the proceedings terminated.—On the termination of the above meeting, the statutory ordinary general meeting of the Morris Aiming Tube and Ammunition Company, Ltd., was held, and the chairman, who was also the chairman of the former company, was able to announce that the 5 per cent. debenture stock issue had been fully subscribed, and that the new works were well in hand. This is the more satisfactory in that business to a good extent is in progress, including orders to a considerable value which have been received during the present year. These will suffice to keep the hands in steady work, and the completion of the new factory should

promise good prospects for the future. The meeting being purely formal, no resolutions were proposed, and the proceedings occupied no great length of time.

MARLIN REPEATING FIRE-ARMS.—The Marlin Fire-Arms Co., of New Haven, Conn., U.S.A., have forwarded a descriptive catalogue and price list of their specialities, the style and scope of which might with advantage be more closely followed by some British firms. Each pattern of rifle and shot gun is most carefully described and illustrated, not only as assembled but in every little detail of the mechanism separately, so that the veriest novice in handling guns could, with the booklet in hand, speedily learn all that is to be known respecting the internal working parts of this particular pattern of weapon. The details of ammunition, bought ready loaded, or to be loaded by the shooter himself, and of various forms of sights, are also gone into in detail. In fact, this catalogue is actually a complete little manual on the subject of guns and ammunition, having special reference, of course, to the Marlin repeaters.

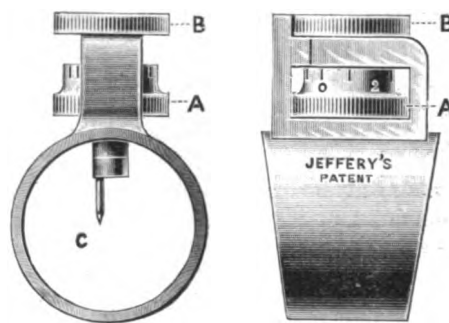
WESTLEY RICHARDS' PATENT BACK SIGHT.—Messrs. Westley Richards & Co., Ltd., have published in pamphlet form a description and illustration of a new patent military wind-gauge sight. There are no unnecessary refinements in this appliance, so that its use under ordinary service conditions would be quite practicable, and would largely enhance the shooting qualities of the '303 rifle. The necessary adjustment is extremely simple both to learn and to effect, and this new adjustable sight makes its appearance just in the nick of time, now that the military authorities are beginning to recognise that really accurate shooting at long ranges requires some more adaptable method of sighting than that hitherto considered adequate for army purposes.

THE LATE MR. JAMES WOODWARD.—We are sorry to have to record the death of Mr. James Woodward, late of the firm of James Woodward & Sons, 64, St. James's Street, S.W., who died on July 7th last at his residence in Maida Vale, at the age of 61. The business, of which he was the principal to the time of his death, was founded by his father about 50 years ago, and was latterly carried on by the late Mr. James Woodward and his brother Charles; but Mr. James Woodward became sole proprietor on the death of his brother about five years ago. The firm has always been famous for the first-class work which it has turned out, and in future it will be conducted by Mr. Charles Woodward, Junr., a nephew of Mr. James Woodward, who will be assisted by his capable manager, Mr. William Evershed.

EXPORTATION OF ARMS.—A new Bill, to be known as the Exportation of Arms Act, 1906, was brought forward by the Lord Chancellor, and is being passed through the necessary formalities as rapidly as possible, its object being to amend the law relating to the exportation of arms, ammunition, and military and naval stores. The Bill provides that "it shall be lawful for Her Majesty by proclamation to prohibit the exportation of arms, ammunition, and military and naval stores to any country or place therein named whenever Her Majesty shall judge such prohibition to be expedient, in order to prevent such arms, ammunition, military or naval

stores being used against Her Majesty's subjects or forces, or against any forces engaged or which may be engaged in military or naval operations in co-operation with Her Majesty's forces." The Act is to be read as one with the Customs and Inland Revenue Act, 1879, and all the provisions of that Act, so far as they are applicable to the exportation of prohibited goods, shall apply as if they were embodied in the new Act.

JEFFERY'S TELESCOPIC RIFLE SIGHTS.—With the gradual improvement in long-range rifles, which are now capable of giving accurate shooting at distances almost unheard of a generation ago, it has been found necessary to supplement the visual powers of the shooter, since human eyesight seems to reach its limitations before the extreme possibilities of the rifle are exhausted. Hence the introduction of telescopic sights, which not only lend themselves to greater fineness of alignment, but equally give clearer definition to the object aimed at. In these the sighting is most usually effected by means of cross-lines formed from spiders' webs or fine gold wire, fixed to the disc inside the telescope. Messrs. W. J. Jeffery & Co., however, have recently introduced a new type of telescopic sight, in which the aim is taken from a fine needle point fitted within the telescope between the object-glass and the front erector lens. The accompanying illustrations show the particular mechanism carrying the needle. It should be noted that the needle C really points downwards, but that to the shooter, owing to its position



within the telescope, it appears to project upwards. The needle is adjusted as to vertical height by means of the milled screw A, the upper part of which is of German silver, and graduated round the edge to facilitate the obtaining of any required elevation. Allowance is also made for wind-pressure, the needle being placed eccentrically on a spindle controlled by a second thumb-screw B, this spindle working inside that which regulates the elevation of the sight. As shown, the needle is to the left of the central line, which would serve to give a wind-allowance of about 20 to 30 feet to the left of the object aimed at, at a thousand yards. On sporting sites, the wind-gauge is not fitted in the type shown, but adjustment of the sight to right or left is effected by means of a small turn-screw fitting in the slot cut in the head of the spindle.

SUPPLEMENTARY NAVAL ESTIMATES.—A Parliamentary paper, giving details of the Supplementary Naval Estimate for 1906, provides for—warlike stores, £709,000; acceleration of certain orders now in progress, £50,200; the purchase of five torpedo-boat destroyers, £350,000; estimated cost of a fleet-repairing ship (to be built by contract), £80,000; purchase of land for the Devonport gunnery

establishment, £40,000; mooring cables for Malta and Gibraltar, £30,000; and apparatus for wireless telegraphy, £9,500; or a total of £1,269,300. The paper goes on to explain that while the present reserves of guns and ammunition, &c., are fully up to the standards hitherto considered sufficient, recent experience has emphasized the necessity for making an addition to the reserves, especially in view of the difficulties sometimes experienced in hastening supplies. Reserves are also to be established on foreign stations, irrespective of the needs of the squadron actually at any station, thus simplifying the relief of ships. The total cost of reorganizing the reserves of naval armament stores is put down at £1,078,000, of which £709,000 is apportioned for the present financial year.

JAMES PARIS LEE.—An appreciative notice of the inventor of the Lee magazine rifle, written by the Hon. James Young, appeared in the *Saturday Globe* of Toronto, Canada, on June 9th, accompanied by an excellent portrait showing Mr. Lee at the age of 68. It will be remembered that we have already given a biographical sketch of this noteworthy inventor, but Mr. Young naturally covers a wider field, and brings details into prominence which, though undoubtedly interesting, would have been somewhat redundant in a technical publication. The story is carried right up to the present day, and of course includes mention of the Lee Straight-pull Rifle of 1895.

AMMUNITION FOR RIFLE CLUBS.—In reply to Mr. Goddard, of Ipswich, Mr. Wyndham stated that the Government will allow to authorised rifle clubs a supply of ammunition at cost price up to 100 rounds per member, and Lee-Enfield rifles at cost price in the proportion of one for every ten members. The question of Morris-tube rifles has not been raised by the National Rifle Association, through which the War Office is dealing with these clubs. As regards the terms on which the use of Government ranges can be granted, this is a subject still under consideration.

ORDNANCE FACTORIES ESTIMATE, 1900—1901.—A revised estimate of the amount required during the year ending March 31st, 1901, to defray the expenses of the Ordnance Factories, has been issued, and shows an increase over the estimate originally issued in February of no less than £141,000, the total now mentioned being £204,000. The increase is distributed over the following votes and to the amounts given:—Wages and police, £1,000; materials and stores, £1,000; machinery obtained by contract, £52,000; and buildings, £87,000.

FIRE AT AN EXPLOSIVES FACTORY.—On the 2nd ult. a serious fire occurred at the Roskear Safety Fuse Works of Messrs. William Bennett, Sons & Co., at Camborne, the origin of the outbreak so far being unexplained. Before the fire was got under, a large wing of the factory was completely destroyed, incidentally involving serious damage to some fifty-two intricate and expensive machines used in various processes of manufacture. Fortunately, no loss of life resulted, as all the work-girls were able to escape quite uninjured from the buildings by means of the safety exits provided for that purpose. At the time of the outbreak, Messrs. Bennetts had on the spot a staff of masons and carpenters at work on some

extension of the factory, and they were at once put to work, after the necessary visit of H.M. Inspector, Major Cooper Key, on the reconstruction of the buildings destroyed, with the result that the damage is now well-nigh repaired, so that this section of the factory will shortly be enabled to resume operations. Unless the Government Inspector is able to throw light on the subject, the origin of the fire is more or less of a mystery, but it is satisfactory to note that no fire has occurred previously in a danger building during the thirty years this factory has been in existence.

LYDDITE FOR INDIA.—As a result, presumably, of official reports sent home from South Africa on the actual effects obtained from the use of lyddite in warfare, the Government has decided to manufacture lyddite shells in the Indian arsenals. The necessary plant will, we are informed, shortly be sent out from Woolwich, in order that the ordnance in the various Presidencies may receive adequate supplies of the new ammunition as promptly as possible.

MARINE TORCHES IN PEACE AND WAR.—We have received from the European representative of the Marine Torch Co., of Baltimore City, U.S.A., a descriptive pamphlet concerning the firm's specialty. The Marine Torch consists of a hollow cylinder made from drawn steel tubing, in sizes varying from three to five inches in diameter, and from three to five feet in length, loaded with calcium carbide. A series of holes at the lower part of the tube allow of the admission of water to the compound, from which acetylene gas is at once generated. Suitable burners at the upper end of the apparatus, acting in conjunction with an igniter, speedily produce a brilliant light, which will last for about an hour. The torch is so adjusted as to float right end upwards, and it can either be thrown into the sea or shot from a special gun to a distance of about two miles, and on contact with the water at once comes into action. Its use is suggested for life-saving or salvage operations, and also for the protection of war ships from hostile attacks. When once in the sea the light cannot be extinguished, so it is stated, until the illuminating agency is entirely consumed. Certainly, if the Marine Torch acts up to the claims made on its behalf, it bids fair to have a successful future before it, and to prove a really revolutionising agent both in peace and war.

COLT'S NEW SERVICE TARGET REVOLVER.—Excellent shooting was shown at Walnut Hill, that Mecca of American sportsmen, on Saturday, June 30th, by Mr. Thomas Anderton, who fired 100 shots at the standard American target at a distance of 50 yards, with a Colt's New Service Target Revolver. The score reached a total of 903 points, which is the highest certified amateur record for that number of shots at the distance, the professional record being only 11 points higher.

NEW ARSENAL AT BARROW.—The new arsenal recently installed by Messrs. Vickers, Sons & Maxim, Ltd., at the Naval Construction Works, Barrow, has just completed a gun carriage for a 27-ton naval gun for the British Government, which is undergoing tests at the Cumberland range of the Company. It is reported that the order for re-arming one of the Turkish ironclads will also be given to Barrow, to include two 9·2-in. guns, mounted on Vickers' patent carriages, of a similar type to that already referred to.

ROUND THE TRADE.

We understand that Mr. H. C. J. Churchill is shortly to be married.

It is stated that a prominent member of the Gun Club will shortly start as an ammunition dealer in Jermyrn Street.

Messrs. Moore & Grey's Aldershot premises recently sustained considerable damage, caused by a fire which broke out in the Arcade.

Messrs. Hanson & Lewis, gunmakers, of 52, Old Hall Street, Liverpool, have consulted their creditors with regard to their affairs.

Mr. O. Evans, formerly with Messrs. Moore & Grey, of Piccadilly, is, we understand, starting in business for himself at Stafford Street, W.

We have received a programme of the International Shooting which opens to day at Spa. Mr. Bobson, of Liege, has been appointed armorer.

Messrs. Moore & Grey, 165, Piccadilly, are issuing a very attractive catalogue, containing prices and descriptions of their guns, rifles, and ammunition.

An interim dividend of 10s. in the £ will shortly be paid to the creditors of Mr. F. T. K. Baker, of Glasshouse Street, and formerly of 88, Fleet Street.

An explosion occurred on the 24th ult. in the cap department of Messrs. Eley's factory at Edmonton, by which four workpeople were more or less injured.

Mr. Jack Dorras, the handy-man of the gunpowder traffic business, met with a serious accident last month, and is likely to be prevented from returning to work for some time.

An exhibition of gamekeepers' dogs is being held on the first two days of this month at the Royal Aquarium, and one or two firms in the gun trade figure in the list of prize donors.

The old-established business of Richard Jefferies, of Norwich, which was offered for sale a short time ago, has, we understand, been purchased by Mr. W. Darlow, of Bedford.

Messrs. F. Joyce & Co., Ltd., have recently issued their price list of cartridges, cartridge cases, and rifle and revolver ammunition. One or two side-lines are also set out in the catalogue.

The sporting gun manufacturers in Birmingham are experiencing a very quiet time, orders being by no means abundant and not nearly so numerous as during corresponding periods in previous season.

We are sorry to have to record the recent death of Mr. Thomas Andrews, gunmaker, of Woolwich. Among his friends he was known to be in failing health, but the end came rather suddenly and unexpectedly.

During the early part of this month, probably on the 18th inst., the gunmakers' assistants who frequent the Gun Club and Hurlingham will hold their annual dissipation, which this year will take the form of a seaside visit, instead of the ordinary shooting competition and dinner.

The Schultze Gunpowder Company's new powder, which is of the nature of a concentrated powder, but is bulked up to measure the same as the Schultze powder now on the market, will not be ready for general issue this year. Small samples, however, can be obtained by the trade.

According to reports from the various gunpowder companies, this season promises to be a record one as far as sales are concerned. We are informed by one of the oldest smokeless powder companies that they have lately received more orders daily than at any other period in their history.

The Schultze Gunpowder Co., Ltd., have recently issued its price list for the ensuing season. A circular from the secretary notifies that powder will in future be invoiced at 380s. per 100 lbs., subject only to the usual cash discounts, instead of at 570s., less 33½ per cent., as hitherto.

The members of the Society of Chemical Industry recently paid a visit to the Royal gunpowder factory at Waltham

Abbey. Mr. Oscar Guttmann, M.I.C.E., conducted the members round, and a highly instructive day was spent in watching the many interesting processes in the manufacture of powder.

The Schultze Gunpowder Company has been very successful lately in the pigeon shooting world. Besides winning several valuable prizes in London, Paris, and Brussels, Mr. H. J. Roberts, on July 23rd, won £4,000 in cash, the most valuable prize ever offered. He killed 24 pigeons straight to obtain this prize, using Schultze in both barrels of a Churchill gun.

Prominent among the many visitors who were noticed at the Bisley camp this year were Mr. Wesson, of the Smith & Wesson Revolver Company, who was accompanied by his son, and Mr. Axtell, the expert shot, who belongs to this firm. This last-named gentleman gave many practical demonstrations of the fine shooting qualities of the Smith & Wesson revolver. Unfortunately, from the trade point of view, the meeting was a failure.

EXPLOSIONS IN MINES.

HOME OFFICE INQUIRY AT MERTHYR.

Mr. H. Cunynghame, C.B., Assistant Under-Secretary of the Home Office, assisted by Mr. F. N. Wardell, Chief Inspector of Mines for the Yorkshire and Lincolnshire District, and Captain Thompson, Chief Inspector of Explosives, of the Home Office, held an inquiry on the 17th ult., at the offices connected with the Cwm Pit, belonging to Messrs. Crawshay Brothers, Ltd., into the circumstances of an explosion which occurred at Cwm Pit on the 4th of May last, when several persons were slightly burned.

Mr. D. J. Metcalfe and Mr. A. C. Pearcey, directors, and Mr. Donald Stuart, mining engineer, Bristol, appeared on behalf of Curtis's & Harvey, Ltd., and Messrs. Crawshay Brothers, Ltd., were represented by Mr. David Abraham, general manager of the Cyfarthfa Collieries, and Mr. Matthew Truran. Mr. J. T. Robson, Chief Inspector of Mines for the South Wales District, and Mr. F. Adams, Assistant Inspector, were also present.

At the outset Mr. Cunynghame explained that it was not usual to appoint a committee of this character to hold a departmental inquiry into a small accident such as had occurred in this instance, but the Home Secretary had thought it expedient that there should be an investigation not merely into the cause of the accident, but into the nature of the fuses and different things employed. The tribunal was perfectly impartial, with no prepossessions in favour of or against any particular explosives. They had come there simply to hear the evidence placed before them, and if necessary to make experiments. The Home Secretary had empowered them to say that no proceedings whatever would be taken against anybody in relation to the explosion, and, therefore, there was no excuse for any of the witnesses not telling the truth.

Evidence was then given showing that on the day in question a shot was fired in the No. 11 heading, the explosive used being "Bulldog," manufactured by Messrs. Curtis's and Harvey, and the fuse one of an inferior make, both having been purchased by a contractor from a local ironmonger. About seven feet from the hole was a crevice in the roof in which a week before gas had been seen, but there was none noticeable on that day. A little beyond, however, there was gas in the face of the coal, which was believed to have been effectually cleared by the extension of a brattice cloth. The explosion was only a very mild one, and, excepting one, all the witnesses who were injured declared there was no report—only a hissing sound—the flame being very bright.

Mr. Abraham was asked whether it would not be a good thing if the owners could supply explosives and fuse to the men direct, and, in reply, he said they were kept at the stores, and could be sold at the same price as the men could get them in town. He added, in answer to another question, that there would be an objection on the part of the men to compulsory

purchase from the owners, because it would be thought there was imposition.

Mr. Cunynghame announced that so far as the evidence was concerned the inquiry was closed, but he said the committee would sit again to hear any observations which might be made to them on behalf either of Messrs. Curtis's and Harvey or of the mines inspectors, and Messrs. Crawshaw Brothers, Ltd.

EXPLOSIVES REPORT FOR 1899.

IN presenting their twenty-fourth Annual Report, H.M. Inspectors of Explosives have to record the loss incurred by the Department in the compulsory retirement, under the Civil Service age regulations, of Colonel Ford, C.B., who succeeded to the post of Chief Inspector on the death of Sir Vivian Majendie. Colonel Ford had been an Inspector since the passing of the Act, having been associated with Sir Vivian in the preparation of the Act, and he had previously been employed as Inspector under the Gunpowder Act, from June 25th, 1873. The position of Chief Inspector is now held by Captain J. H. Thomson, and the vacancy in the department has been filled by the appointment of Captain A. P. H. Desborough, R.A.

The report points out, in its preamble, the fact of the increased growth of trade in explosives during the past year, as shown, not only by the greater number of factories at work, but also by the extended activity of many of the leading establishments already in existence. It is satisfactory to note that the Inspectors are able to comment most favourably on the condition and management of the various factories and magazines visited throughout the United Kingdom, there being no falling off from the high standard previously attained. Such irregularities as have been noted were in most cases unimportant, and in every instance where defects have been pointed out, the occupier of the factory or magazine has shown perfect readiness to remedy them without delay. As regards registered premises in various towns, however, it is found that at many places the supervision exercised by the Local Authority leaves much to be desired. Only three deaths have resulted during the year from accidents by fire or explosion in the process of manufacture, this being below the average of 4.4 during the decade. As the Inspectors point out, it is probable that there are few trades involving risk, in which so low a death-rate, in proportion to the numbers employed, can be shown. In fact, it is a most satisfactory testimony to the efficient working of the Explosives Act, that not only has the number of deaths from accidents in manufacture become largely diminished since the passing of the Act, but that, notwithstanding the constant extension of the trade in recent years, there is a tendency from year to year for the numbers to decrease still further. On the other hand, however, the number of accidents with explosives, under conditions to which the Act does not apply, shows a tendency to increase in more or less direct ratio to the extension of the trade.

MANUFACTURE.—The total number of factories, not including "small firework" or "toy firework" establishments, includes 39 under continuing certificates, and 112 under licence, or 151 in all. After the passing of the Act, 55 factories obtained the continuing certificate, so that of this class 16 have ceased to be, but the number has undergone no diminution during the last twelve months. During the twenty-

four years of the Act's existence, 140 factories have been licensed, the average per year being 5.83. In 1899, the increase was no fewer than 12. On the other hand, 28 have ceased to exist, of which four became extinct last year, though one has been replaced by the extension of another factory, and another by the building of a new establishment. During the year 40 amending licences have been confirmed, as against an annual average of 36. Authorised explosives to the number of 15 have been added to the list, with five placed on the authorisable list. These and other details are more particularly treated in Dr. Dupré's report to the Inspectors. Arising from the 214 visits paid during the year to the 151 factories in existence, only one case of irregularity was met with of so serious a nature as to justify recourse to judicial proceedings, and there has in the same period been no occasion to make a seizure of any explosive in licensed factories. There has been no cause to take proceedings against the occupiers of any small firework factories, but eight cases of illegal manufacture have come under the Inspectors' notice in 1899. In this connection it is interesting to note that, during the year, a series of articles, giving instruction for the home manufacture of fireworks, was started in a journal for boys. Thereupon, the Inspectors wrote to the editor of the journal, pointing out that those articles gave direct encouragement to persons to manufacture in unauthorised places, and would be likely to involve his readers in legal proceedings. The editor at once consented to withdraw the articles.

STORAGE.—Magazines under continuing certificate now number 122, while there are 270 under licence. Since the commencement of the Act, 328 new magazines have been licensed, and the number which existed at that date was 199, of which 135 have since become extinct. Ten magazines were under notice of disuse, and nine ceased to exist during the year. On the other hand, 14 new licences were granted, and nine are still in progress. Eight amending licences were confirmed, and five left outstanding. In the future, applications for amending licences are likely to diminish in number, as the majority of magazines are now licensed to keep all authorised explosives of Classes I to IV. As the result of 405 visits paid to magazines during the year, no legal proceedings have arisen, and in only two cases was it necessary to make seizures. With regard to the 2,199 stores, a series of 91 visits resulted in two cases of legal proceedings, and one seizure. No accident by fire or explosion occurred in connection with either magazines or stores during the year. Registered premises number 29,461, but the Inspectors prophesy a diminution in the number, owing to the falling off in the demand for fireworks. Visits to 359 registered premises resulted in ten seizures for irregularities, eight cases of illegal storage, and several instances have also been discovered in which explosives were kept in premises not properly registered. Five accidents occurred on registered premises, in addition to which was a fire, in which no one was injured, the explosive being safely removed.

PACKING AND CONVEYANCE.—There has been one slight change in the law relating to the packing of explosives, rendered necessary by the requirements of the War Department in regard to the inner packages used for cordite. During the year 26 special authorities for packing explosives were issued, nearly all to meet War Departmental contracts for cordite and picric acid. H.M. Inspectors are of opinion that

a permanent alteration of the law should be made, so as to render these special authorities unnecessary.

IMPORTATION.—The number of licences granted in 1899 was 108, as compared with 114 in 1898. Nitro-glycerine compounds were imported in the following quantities:—

	1898.	1899.
Blasting Gelatine ...	64,500 lbs.	30,000 lbs.
Carl onite	376,000 „	322,000 „
Dynamite	27,500 „	54,850 „
Gelatine Dynamite ...	490,200 „	346,500 „
Matagnite Gelatine ...	25,400 „	45,000 „
Totals ...	983,600 lbs.	798,350 lbs.

Blasting explosives, not containing nitro-glycerine, were also imported to the following extent:—

	1898.	1899.
Dahmenite A. ...	16,100 lbs.	—
Guncotton	—	5,980 lbs.
Pembrite	8,000 „	—
Thunderite	—	10,502 „
Westfalite	153,000 „	124,400 „
Totals ...	177,100 lbs.	140,882 lbs.

The importation of detonators amounted to 13,836,300, a quantity largely in excess of the figures of 1898 or of any of the ten previous years, thus showing that, despite the existence of eight factories in the United Kingdom, a large proportion of the trade is still in foreign hands.

CHEMICAL REPORT.—The carefully prepared report of Dr. A. Dupré, F.R.S., Chemical Adviser of the Department, forms, as usual, a most interesting feature of the current blue-book. A total of 303 samples of licensed explosives, or materials used in their manufacture, were submitted for examination, of which only 13 were rejected, the rejects containing six samples of blasting gelatine, all taken from one particular store, all of which failed to pass the heat test. Otherwise, a failure on this score is now becoming comparatively rare. Articles which do not fall under the head of licensed explosives or their components, were submitted to the number of 13, and Dr. Dupré also examined 24 samples of explosives in connection with the Woolwich Testing Station. The result for the year, therefore, shows a total of 340, the slight falling off of which as compared with the figures for 1898 is due to the considerable reduction in the number of samples of gelatine dynamite submitted for examination. Commendable activity amongst inventors characterised the year, 13 new explosives being examined, and in this respect the chief point of interest centres in the fact that, for the first time for many years, a chlorate mixture, Sodolite, has passed successfully through all the tests. The former case was that of Asphalite, which, however, has never come into practical use. Seven additions to existing explosives were also sanctioned during the year. A special test of Carbonite was made with a view to seeing whether the nitro-glycerine showed any tendency to accumulate at the lower part of the cartridge, but after careful analysis made from time to time during a period of nine months, no appreciable difference between the top and bottom portion of the cartridge could be detected.

WORKING OF THE ACT BY THE LOCAL AUTHORITIES.—H.M. Inspectors visited, during the year, 91 stores and 359 registered premises under the control of local authorities, to find that there was much room for improvement in the local regulations. In fact, out of 100 places to which visits of inspection were paid, no fewer than 32 were classed from “indifferent” to “very bad,” and in those cases a real danger to persons and property exists, from a neglect of the precautions which the Act enjoins. The local magistracy seem to be chiefly to blame for this state of affairs, as they give no encouragement to the executive to institute proceedings, the fines imposed being frequently most ridiculously inadequate, suggestive rather of a mere technical offence than an act of serious menace to the public safety. Carelessness and ignorance are, of course, the chief causes of offence. H.M. Inspectors pay a passing tribute of praise to the action of the Gunmakers' Association in providing each of its members with a printed card of rules, forming “a clear and concise abstract of the law as it affects gunmakers occupying registered premises. The beneficial effect of the issue of these rules is very marked in many of the places we have visited, so much so that, in certain towns where registered premises are on the whole indifferently kept, the premises of gunmakers belonging to the Association stand out in marked contrast to all the rest.”

ACCIDENTS.—The total number of accidents of which the Department had knowledge during 1899 was 191, causing 35 deaths, and injuring 195 persons. An average of ten years gives 147·1 accidents, 37·6 deaths, and 139·7 injured persons per year; but it must be remembered that from 1895 onwards reports of accidents have been included which had not previously come under the Inspectors' notice, and the figures have been still further augmented since 1898 by other instructors to the same effect. As regards the total, moreover, 125 of the accidents causing death or personal injury occurred in the use of explosives, and under conditions to which the controlling provisions of the Act do not apply, such accidents causing 30 deaths, and 158 cases of injury. Under the conditions of the Act, therefore, there is only a balance of 31 accidents, chargeable with 5 deaths and 37 cases of injury. Of the 64 accidents occurring in the course of manufacture, keeping, and conveyance, no less than 33 were unattended with personal injury, whilst of the 127 accidents which happened in the use of explosives, and miscellaneous, only two were free from personal consequences. In factories there was a total of 54 accidents, of which 22 only involved personal injuries, 3 deaths, and 24 people injured. Under the head of keeping, there were 10 accidents, resulting in 2 deaths and 13 cases of injury. The conveyance of explosives produced no record of accidents.

In dealing with the various subjects above classified, the report of H.M. Inspectors of Explosives shows the usual painstaking character. A valuable list of appendices is subjoined to the body of the report, giving very full details of figures under the different headings. Owing to a partial rearrangement and improved classification, the Blue-book makes its appearance somewhat later than was the case last year, but, on the other hand, it carries its own excuse in the improvements wrought by effecting these alterations. Evidence is abundant enough in the body of the report, and in the mass of figures collated in the appendices, that this is by no means the least hard-working department of H.M. Government.

UNITED STATES ORDNANCE REPORT.

THE report of the chief of ordnance of the United States army for the year ending June 30, 1899, has just been published, and the following extracts appeared in a recent issue of our American contemporary, *Shooting and Fishing*. Of the producing capacity of the Springfield armoury, Brigadier-General Buffington, chief of ordnance, says:—

The Springfield armoury is at present the only government factory for small arms. An appropriation has been made for beginning the establishment of another small arms manufacturing plant at the Rook Island (Ill.) arsenal, and the work has been begun. By working two shifts of men ten hours each the Springfield armoury can produce about 500 finished arms per day. During the past year double shifts have been used continuously, though for a part of the time they worked only eight hours each. The production for the year ended June 30, 1899, was 100,228 rifles and 5,002 carbines, against 29,566 rifles and 12,022 carbines during the preceding year.

General Buffington says with regard to the magazine rifle, the calibre .30 magazine rifle gave satisfaction during the war with Spain, and continues to be satisfactory, so far as can be learned, to the troops engaged in quelling the insurrection in the Philippine Islands. Sights with adjustment for windage are now being made at the rate of 500 per day, and they will be supplied with all future issues of magazine rifles.

The board of ordnance officers that visited Camp Wikoff after the return of the army from Santiago, for the purpose of ascertaining the action in service of the arms and equipments supplied by the department, reported that several officers expressed a desire for a clip for more rapidly charging the magazine. In order to meet this demand, study and experiment have been devoted to the subject, and several forms of clips have been tried.

None of them were satisfactory, and the attempt to attach such an appliance has been abandoned as not suited to our system. The testimony of officers who fought at Santiago is that the rifle was used almost entirely as a single loader, the contents of the magazine being held in reserve. This is in accordance with the recognised principle of the gun, which was adopted in preference to many systems using clips. Some believe a gun exclusively loaded from a clip conduces to extravagance in the use of ammunition and ineffectiveness of fire. The U.S. rifle can be fired as a single loader from 25 to 30 times per minute, which is rapid enough for most occasions, and holds a reserve of five cartridges for emergencies.

With a view to adopting a uniform calibre for small arms and machine guns and of a standard and uniform small-arm cartridge for the use of the army, navy, and marine corps, a combined board of army and navy officers was appointed in November, 1898, to investigate and report upon the subject.

The board reported that no sufficient reason existed for any difference in the calibre of the guns used by the two services, and recommended that the calibre of the army rifle, .30 of an inch, be adopted for the navy and marine corps. The Lee straight-pull rifle adopted by the navy belongs to the class of arms that practically require the use of a clip, since the gun is not intended to be used as a single loader, but relies entirely upon the cartridges delivered from the magazine. For the sake of close packing a cannellured or rimless cartridge is used.

The fourth conclusion of the board was as follows: "In considering the standard cartridge the board recognizes that the cannellured case is a suitable one for small arms and machine guns, and that its use in the naval weapons of these classes has been satisfactory; it is further of the opinion that if found practicable at moderate cost to adapt the present army rifle to the use of such a case, a cartridge conforming in other external form and dimensions to the present army cartridge should be adopted as the standard and uniform small-arm cartridge for the army, navy, and marine corps."

The change to a cannellured cartridge case from the flanged head case now used has been investigated at the

armoury, and two rifles for the cannellured cartridge were made, but without satisfactory result. The adoption of this cartridge would introduce two cartridges and two rifles into the service unless all the arms thus far manufactured, amounting to 185,232 rifles and 27,055 carbines, and also all the cartridges on hand, amounting to many millions, were discarded. It was therefore not considered "practicable at moderate cost to adapt the present army rifle to the use of such a case," and the project has been abandoned.

The work of the Frankford arsenal during the past year has been greater than ever before. The war with Spain demanded the utmost exertion to provide the all-important article of small-arm ammunition for our troops. The ordinary manufacture in years past has been about 10,000,000 cartridges. Last year over 37,000,000 cartridges were manufactured, and inspectors from this arsenal at private factories supervised the manufacture of 39,000,000 more.

For some years past a plan for increasing the capacity of the arsenal for making small arm cartridges has been under consideration, and it was about matured when the crisis of the war with Spain emphasized the necessity of an increased output. Steps were at once taken to carry out this plan, and a new cartridge-making plant was rapidly installed, but without interfering with current work, and is now completed. The former capacity of the factory was about 110,000 cartridges per day, working 16 hours. The new plant has a capacity of 250,000 finished cartridges in the same time.

Some of the Mauser cartridges captured in Cuba were sent to the arsenal for examination, and it was found that they had an initial velocity of 2,200 feet per second. Experiments were then undertaken to determine whether the velocity of the service cartridge, which was 2,000 feet per second, could not be increased. It was found that 2,200 feet could be readily obtained without materially increasing the pressure in the barrel. A cartridge giving an initial velocity of 2,200 feet has therefore been adopted, and will be exclusively manufactured in future.

In order to overcome one of the principal objections to the Springfield rifle, a smokeless-powder cartridge was developed for this arm. In order that the sights might not have to be changed, only the same initial velocity as is given by the black powder cartridge, 1,650 feet per second, was aimed at. About 7,000,000 of these cartridges were procured, most of them being made by private corporations. Before issuing any, many thousands were tried in the Springfield rifle, and as no weakness was developed they were thought to be perfectly safe. Some time after their issue to the volunteer regiments in the Philippine Islands very startling reports of serious casualties resulting from the use of this powder were received. In some cases the number of rifles reported injured was as high as 10 per cent. As this information was based upon brief cablegrams and the statements of returned soldiers who had had very little experience with these cartridges, the chief ordnance officer in Manila was called upon to report by cable exhaustively upon this subject. In summing up the result of his investigations, Colonel McGinness says:—

"It will be seen that the number of rifles bursting from the effects of smokeless powder was greatly exaggerated. The commanding officer hears of an isolated case, and from this places his own value on the total number injured without making any personal inquiries into the matter; the number rendered useless in some regiments being variously estimated from 6 to 10 per cent., whereas, all told, not more than three rifles in the total number issued of about 14,000 could be accounted for, and no serious casualties occurred whatever. Personally I fired one of the old rifles turned in from the First Washington Volunteers 1,000 times with smokeless powder (the last five cartridge cases being filed down so that they would burst in the chamber) without apparently injuring the arm. The arms injured will be boxed and sent to the Springfield armoury for examination. In fact, there was no ground for the startling report; the arm here has rendered capital service."

It therefore appears that only three rifles out of 14,000 are known to have been really injured, and that no serious casualties whatever occurred from the use of the Springfield rifle.

REVIEW.

Modern Rifle Shooting: In Peace, War, and Sport. By L. R. Tippins. Published by J. S. Phillips, London. Price 5s.

It would be a mistake to treat this book too seriously. When the author published the earlier edition we were inclined to pass over the errors in scientific matter which the book contained, feeling that a man who could give clear and precise explanations regarding the many points to be studied by the volunteer marksman deserved encouragement rather than acute criticism of details obviously outside his special line of knowledge.

Untaught by the mild lesson we, in common with other reviewers, taught him, he has compiled a new edition, which contains such a series of gross inaccuracies that we can no longer separate the chaff from the wheat. So much does the inaccurate overmaster the accurate, that there is hardly a page not open to exception.

In the ordinary way one would not expect a sergeant of volunteers to pose as a scientific expert, but merely as one who, by the enthusiastic practice of rifle-shooting, has acquired a large amount of general experience of rifle-shooting, together with a practical knowledge of the care of weapons. But here we have a man who tells the Government how to improve Cordite (his suggestion, by the way, would have, if carried out, exactly the opposite effect to that intended), who lays down certain new and original laws on the science of light—in fact, who commits about as many absurdities as there are pages in his book.

There is far too much of personal feeling in this book to recommend the author as a judicially-minded expert. The ranting nonsense which he writes about gunmakers as a class is absurd in the extreme. From the author's point of view, they are the most ignorant and the most fraudulent community in existence. Writers of books on sporting rifles are dismissed in a single sentence as recommenders of So-and-so's goods. Yet when we read the author's own book we fear that he is the last to throw the first stone. On page 115 we read a serious indictment of the cleaning rod most generally in use. In an advertisement at the end of the book we find that the author is prepared to supply, post-free for 2s. 9d., a cleaning rod which has not the disadvantages complained of in the text of the work. When in another place we read of the faults of the ordinary gunmaker, and of the description of the ideal purveyor of rifles, and then of the fact that the author's own tested rifles have given satisfaction to his customers, we begin to wonder whether the rifle-shooting public is as credulous as the author supposes.

That Sergeant Tippins writes about things he does not understand is made fairly clear in Chapter XXIII. In the autumn of last year we gave, in "Lectures to Young Gunmakers," an elementary treatise on the sectional density of bullets. The author evidently read this very carefully, for we find that he has adopted our plan of stating densities in terms of weight per unit area. We chose thousandths of a square inch as a convenient unit of area. By a brilliant stroke of genius the author has chosen hundredths. A table of comparative values, which we compiled as a result of considerable research and correspondence, has been lifted bodily without acknowledgment. It is stated that the table appearing in the book "is the only one published, so far as

the writer knows, which is based on the true effective diameter of the bullet." We find that the true effective diameter of the bullet is not the diameter corresponding with its true area, but the diameter corresponding with the area of the bullet before firing. The diameter of the .303 bullet is taken at .311 of an inch, being the nominal bore plus one depth of the rifling. This is the actual diameter of the bullet before firing, and no account is therefore taken of the metal removed in passing through the rifling. Admittedly, the author says, on page 212, that the original size of the bullet is of no account, but this is probably because he does not know what the original size is. Bashforth, to say nothing of the leading experts of the day, finds that the true $\frac{w}{d^2}$ of the bullet is based upon the diameter plus one depth of rifling, and chronographic records daily prove the accuracy of this procedure. But Sergeant Tippins knows otherwise, for "as the bullet is spinning and advancing" its movement is not that of a screw, but rather that of a screw driven by a hammer. In our ignorance we supposed that a bullet did advance through the air with the movement of a gimlet, but as Sergeant Tippins tells us otherwise we must give way. This corrected diameter invented by the author is presumably the basis for the claims of originality made on behalf of his reproduction of our table. His comparison of the results with different bullets reads curiously like our own, so that presumably our own table was not incapable of arriving at conclusions similar to those of the author. A curious double meaning might be applied to a remark appearing in our original article. The author appears to have read it the wrong way, and after investigation we may have reason to refer to it again in the future.

For fear it should be supposed that our severity of tone in dealing with this book is due to ill-feeling at the plagiarism of the author, we would recommend a perusal of the chapter on sporting rifles as a proof in justification of our condemnation of the work. After giving an incorrect explanation regarding the convergence at the muzzle of the barrel of a sporting rifle, we are informed that this is set right by curving the barrels so as to throw the shots outwards. The author is admittedly on safer ground when he says that the .303 service rifle is not a suitable weapon for rook and rabbit shooting. But when we read that a double-barrelled rifle "is beyond the means of a man who has to earn the money he spends," we are simply shocked. Perhaps, however, the author is a socialist, and reckons that, whatever a man makes, he can only earn at the outside £200 a year. Lyman and Beach sporting sights are not very well suited for fire at moving objects. We truly think the author would have been better employed in writing a treatise on how not to write a book on Modern Rifle Shooting.

APPLICATIONS FOR PATENTS.

JUNE 18—JULY 14, 1900.

- 11,144. Small-arm Carrier for Cycles. O. Thorn.
- 11,239. Rifle supporter. J. P. Hughes.
- 11,275. Small-arm Carrier for Cycles. J. Jarvis.
- 11,311. Targets for Rifle Shooting. W. and E. Douglas.
- 11,421.* Drop-down Guns. F. V. W. Sauer.
- 11,496. Magazine Fire-arms. F. Fortelka and W. Leitner.
- 11,567.* Explosives. J. B. Bernadou.

- 11,604.* Primers for Ordnance. W. L. Wise (Agent for *The Skoda-werke Actien Gesellschaft*).
- 11,605.* Primers for Ordnance. W. L. Wise (Agent for *The Skoda-werke Actien Gesellschaft*).
- 11,613. Targets. G. and G. L. McAlpine.
- 11,651. Firing of Ordnance. C. A. McEvoy.
- 11,811. Telescopic Sights for Ordnance. A. A. Common.
- 11,877. Small-arms. W. Thompson and W. Edwards.
- 11,884. Small-arm Carrier Attachment for Cycles. Rudge-Whitworth, Ltd., J. V. Pugh, V. A. Holroyd, and W. H. Nelson.
- 11,941. Gun-training. W. H. Scott.
- 12,003.* Explosive-firing Apparatus. J. Wetter (Agent for *L. C. Goman*).
- 12,012. Magazine Fire-arms.
- 12,042.* Firing of Ordnance. C. Wieser.
- 12,108. Sighting Device for Ordnance. Sir H. Grubb.
- 12,113. Orthoptics. W. K. Gregory.
- 12,173. Explosives. H. and R. Hawkins and D. W. von Olegau.
- 12,202. System of Sighting for Ordnance. P. W. Maxwell and G. Prescott.
- 12,250. Damp Proof Gun. F. W. Golby (Agent for *P. Spitalis*).
- 12,326. Sights for Ordnance. Sir W. G. Armstrong & Co., Ltd., and R. T. Brankston.
- 12,426. Automatic Guns. W. G. Hay.
- 12,442.* Explosive Charge for Ordnance. J. H. Brown.
- 12,443. Telescopic Sights for Ordnance. A. A. Common.
- 12,506. Torpedoes. T. W. H. Partridge and H. W. D. Ingham.
- 12,536. Charges of Powder. P. Du Buit.
- 12,573. Shoulder Pad for Gun Carrying. A. E. Crowe.
- 12,645. Rifle-carrier Attachment for Cycles. R. F. and J. Alexander & Co., Ltd., and J. Mackie.
- 12,655. Torpedo Steering. C. J. Varicas.
- 12,678. Recoil-checking Apparatus. H. W. Gabbett-Fairfax.
- 12,679. Small Bores. H. W. Gabbett-Fairfax.
- 12,682.* Gun Mountings. P. M. Justice (Agent for *The Driggs-Seabury Gun and Ammunition Co.*)
- 12,683.* Mountings for Artillery. P. M. Justice (Agent for *The Driggs-Seabury Gun and Ammunition Co.*)
- 12,684.* Sub-calibre Device for Ordnance. P. M. Justice (Agent for *The Driggs-Seabury Gun and Ammunition Co.*)
- 12,685.* Firing Mechanism for Ordnance. P. M. Justice (Agent for *The Driggs-Seabury Gun and Ammunition Co.*)

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

JUNE 30TH—JULY 21ST, 1900.

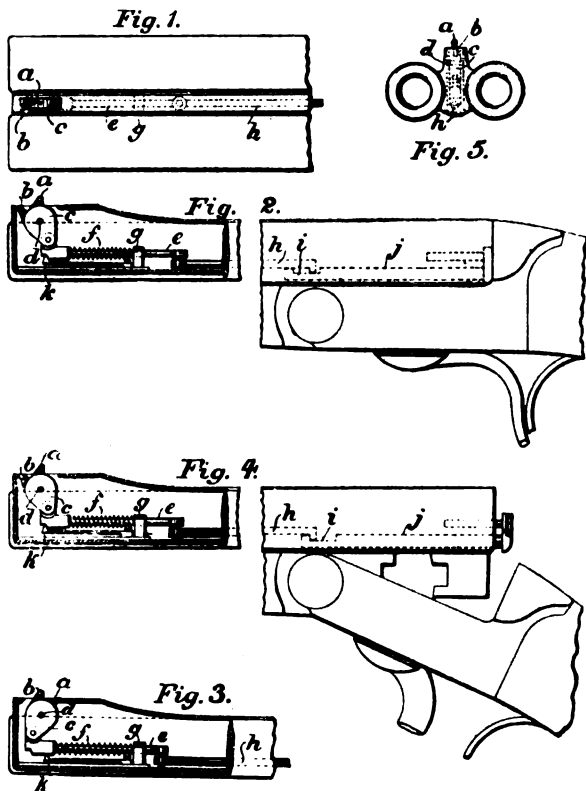
- 6,178 (1899). **Ammunition hoists.** J. A. Harvey. (Agent for *E. Trochain, France*). A modified form of ammunition hoist, the simplicity of the construction of which is the principal point in the patent. The hoist consists simply of an endless chain travelling over wheels situated in the magazine and near the gun. The wheels near the gun are placed in such a position that the chain is caused to approach the base of the mounting at an incline, and by this means the ammunition buckets are presented at a convenient angle for unloading. The whole arrangement is adapted to revolve with the gun mounting. Accepted June 22, 1900.
- 6,429 (1899). **Telescopic sight attachments for ordnance.** A. A. Common, Ealing. A telescope of ordinary form, with cross wires, is mounted on a hinged plate capable of a vertical movement. This plate is operated by means of a cam worked by hand through a wheel, and the zero of a scale marked on the wheel, which is used for determining the exact position of the telescope, is found by means of a spirit level attached to a base plate, preferably situated on the carriage. Accepted June 23, 1900.
- 13,278 (1899). **Manufacture of guncotton.** A. Hollings, Chorlton-cum-Hardy. The apparatus described in this specification is built to overcome the slow and laborious operation of nitrating cotton which is at present in vogue. The cotton is formed into a band composed of superposed layers of thoroughly dried cotton, which is passed through a pair of rollers into a tank containing the acids, where the band is passed up and down over rollers in the tank. The acid is pressed out of the band after this process, and it is then opened out, in order that a jet of water may wash out any remaining acid. This method is more expeditious and uniform than the old one, and to a great extent the acid fumes are prevented from rising. Accepted June 23, 1900.
- 15,959 (1899). **Ammunition hoists.** A. Reichwald. (Agent for *Fried Krupp, Germany*). This is a modified form of the ammunition hoist for warships described in Patent No. 8,887, of 1898. In the hoist therein described the pawls used for lifting the ammunition through the guiding shaft were the same distance apart, so that when the supply shoot was filled with cartridges they were lifted and deposited on the supporting pawls simultaneously. The load was thus thrown upon and taken off the driving machinery very suddenly, and in order to obviate this disadvantage the relative distances of the lifting pawls are made different to the relative distances of the supporting pawls, so that the cartridges are lifted one after the other, and are deposited in the same manner. Accepted June 9, 1900.
- 15,985 (1899). **Construction of ordnance.** V. Frühholz, Germany. A method of securing a lower trajectory for projectiles by constructing the gun in such a manner that its front end is separated from the longer back part. The passing of the projectile beyond the intersection causes the back part of the barrel which is hinged to the stock to be pressed downwards. The explosion gases are thus prevented from acting upon the base of the projectile as it leaves the bore. Accepted June 23, 1900.
- 16,089 (1899). **Bullets for small-bores.** C. S. Walker, London. A compound bullet in which the back part, adapted to take the rifling, is composed of some hard alloy. The front part, composed of some soft metal, is screwed to a central stalk projecting from the base part. In order to insure the bullet taking the rifling, the base is cup-shaped, so that the gases can press the side of the bullet into the rifling. Accepted June 9, 1900.
- 16,294* (1899). **Sights for double-barrelled rifles.** W. Nobbs, London.
- 16,649 (1899). **Tripod mountings for machine guns.** Sir W. G. Armstrong, Whitworth & Co., Ltd., A. G. Hadcock, and R. T. Brankston, Newcastle-on-Tyne. A tripod mounting consisting of three tubular legs and tripod top. The rear leg is fixed to the top, and the front two are hinged to it. The tripod top is surmounted by a carrier, in which are formed bearings for gun trunnions. The carrier works around a pivot, which may be adjusted and clamped vertically through a universal joint in whatever position the mounting may be in. Accepted June 16, 1900.
- 17,425 (1899). **Projectiles.** J. Luciani, France. This specification describes a modified form of the projectiles patented in Specification No. 9440, of 1899. The head and base of the projectile are formed of hard metal, and are connected by a central rod of very small diameter. The space around the rod is filled in with some heavy metal to such an extent that it is not adapted to engage with the bore. The head and base alone engage the rifling, and better obturation against the wall of the gun is obtained by making in the base a cavity of the shape of a truncated cone. The thin wall is thus pressed outwards by the gases. Accepted June 16, 1900.
- 3,775 (1900). **Sights for small-arms.** S. E. Fischer, and S. Bennett, U.S.A. A leaf back sight for rifles, which is operated by means of a slide working in a slot on the side of the rifle. The leaf has a downwardly extending leg, the end of which rests on the longest side of a triangular piece of metal attached to the slide. This side is notched, and as the slide is pushed along, so the sight is raised or lowered through the leaf leg sliding over the inclined plane. The leaf is always urged towards its flat position by a spring. Accepted June 30, 1900.
- 7,849 (1900). **Automatic recoil-operated rifle.** G. Hammond and E. Lastreto, U.S.A. Automatic mechanism for rifles, in which the breech bolt, actuated by the recoil, is adapted to engage, by means of rack teeth formed on its under surface, with a toothed wheel, which supplies the necessary power for returning the bolt to its place. Many other details of automatic mechanism are also described. Accepted June 23, 1900.
- 8,566* (1900). **Cartridge clips for loading magazines.** P. Mauser, Germany.

* These Specifications are more fully described under "Selected Patents."

SELECTED PATENTS.

SIGHTING OF DOUBLE-BARRELLED RIFLES.

16,294 (1899). W. Nobbs, London. The automatic foresights described in this specification are constructed to obviate the necessity for altering or setting the barrels of double-barrelled rifles should they be found not to be shooting the same height or to be shooting across or apart. A separate sight is supplied for each barrel, and the sights are brought automatically into operation in the act of firing and in opening the gun



In the drawings, Fig. 1 is a plan of the sight fitted to the barrel ends, and Figs. 2 and 3 show it in elevation, but in different positions. Fig. 4 is an elevation similar to Fig. 2, but with the breech open, and Fig. 5 is an end view of the muzzle.

The two sights *a* and *b* are mounted on the rock lever *c*, which is pivoted between the barrels at *d*. To the bottom of the lever *c* the rod *e* is attached, which carries the spring *f* pressing against the stop *g*, and adapted always to urge the lever-head towards the breech of the rifle. The lever *c* is in its turn attached to a long rod *h*, which runs through a cavity between the barrels to the breech end, where it engages with the slot *i* in the extractor leg *j*.

When the rifle is opened the extractor is pushed out in the ordinary way, as in Fig. 4, and during this movement, by means of the rod *h*, the rod *e* is caused to pull the rock-lever *c* towards the breech, thus causing the right-hand barrel sight *a* to appear above the level of the box containing the sight mechanism. The rock lever is retained in this position by the spring projection *h*, which catches in the notch on the end of the rod *e*. The sights are then in the position for the firing of the right-hand barrel, and the shock of the firing of this barrel dislocates the spring *h* from its position behind the notch, and allows the spring *f* to exert its power to force the rock-lever round into such a position that the sight *a* disappears, and the left-hand barrel sight *b* appears above the top of the box.

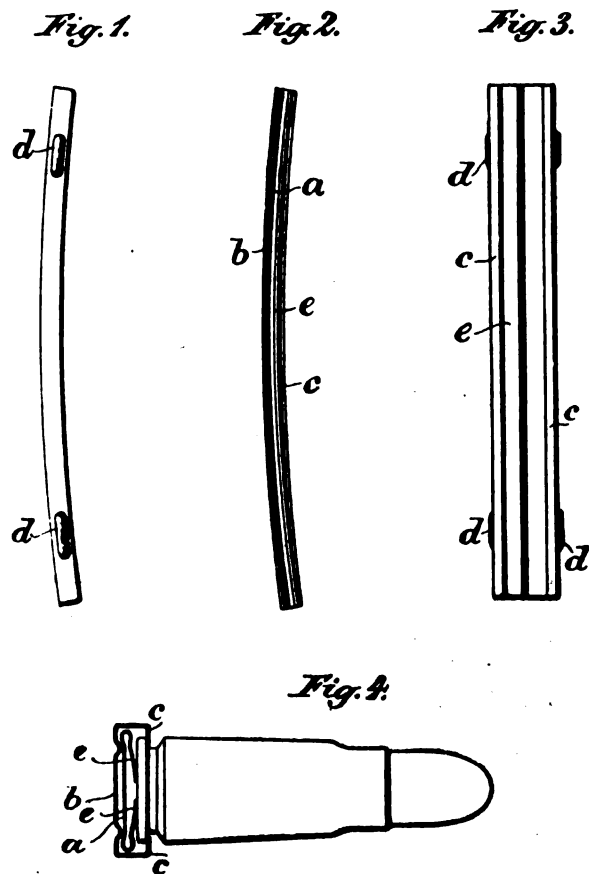
The merit claimed for this arrangement is that no re-adjustment of the barrels with respect to each other is required, any irregularity in their setting being readily compensated by adjustment of the automatic sights. Accepted June 9, 1900.

CARTRIDGE CLIP FOR LOADING MAGAZINES.

8,566 (1900). P. Mauser, Germany. A cartridge clip for loading the magazines of small arms is described in this specification. Its main feature is a spring, which is independent of the body of the clip, and it is so constructed that an even pressure is exerted upon the base of each cartridge. In clips at present in use the spring power is sometimes supplied by a flat spring, which works all right only when the clip is filled with cartridges, or by yielding notches or lugs formed on the base or sides of the clip. The difficulty experienced with these clips is that either the spring power is not uniform, as in the case of a half-emptied flat-sprung clip, or the resilience of the several parts of the material unfavourably affects the firmness of the complete structure as in the other type.

The present clip has been designed to overcome these drawbacks, and a side view of the arrangement is shown in Fig. 1. Fig. 2 is a sectional side view, Fig. 3 is a plan, and Fig. 4 is a cross section of the clip, showing the position of spring in relation to the cartridge.

The spring *a*, formed in the shape of a sheath, is constructed to run along from end to end of the clip or holder *b*, which is a

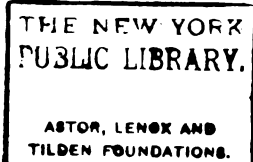


channel-shaped piece of metal with inwardly-projecting edges or flanges *c*, and external nipples *d* on the sides. The ends of the spring are folded over the ends of the channel to prevent it slipping out. By reference to the drawings the action of the spring will easily be understood. The lips *e* of the spring maintain an even pressure on each cartridge, no matter how many are in the clip; and as they are slipped off in succession the rest are easily and smoothly guided along towards the end. Accepted June 9, 1900.

Arms & Explosives

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CURRENT TOPICS.

Paris Exhibition Awards.—The list of successful exhibitors at Paris has recently been issued, and many names, well known in the arms and explosives industries, appear prominently therein. Nobel's Explosives Company were apparently not in competition, and the familiar legend *Hors concours* appears opposite their name. The cream of the honours in the form of grand prizes has been awarded to Vickers, Sons and Maxim for a characteristic display of their numerous types of ordnance, etc., and to the Birmingham Metal and Munitions Company for other exhibits of a warlike character. In the sporting division of the arms business we find that Messrs. Eley Bros. have added another to their long list of exhibition honours. They and the gun making firms of Purdey and Holland receive grand prizes. The gold medallists are Messrs. Westley, Richards & Co., Ltd., W. W. Greener and Charles Lancaster. The Schultze Gunpowder Company receive a gold medal in Class CXVI. and a silver medal in Class LI. The King's Norton Metal Company are successful all down the line. They have three exhibits—one for ammunition, etc., for army and navy purposes, another for general metals, and a third for special metals for sporting ammunition. Their awards are two gold medals and one silver medal. Their collaborators are Messrs. T. R. Bayliss, T. A. Bayliss, and G. W. Mullins. We are pleased to bring the last-named firm into special prominence, because we regard the apprecia-

tion of their work as exceptionally well deserved. The science of the softer commercial metals has no more practical exponent than the managing director of this firm. It would be difficult to find any expert unwilling to acknowledge his unexampled familiarity with their characteristics and properties under all conceivable circumstances. Messrs. Bickford Smith & Company are the recipients of a gold medal in the mining section, and their reputation as fuse manufacturers has received this well-merited endorsement from a competent body of expert judges.

Companies Act, 1900.—A new Act amending the existing Companies Acts has recently been placed on the Statute Book, and is to come into force on January 1st, 1901. It seems to be intended to deal with many of the abuses of company finance, so far as formation and flotation are concerned, and especially imposes new liabilities and responsibilities on directors. For the future no person shall be capable of being appointed a director of a company by the articles of association, and shall not be named or proposed as a director of a company in any prospectus, unless, before the registration of the articles or the publication of the prospectus, he has signed and filed with the registrar a consent in writing to act as such, and has moreover signed the memorandum of association for a number of shares not less than his qualification, or signed and filed with the registrar a contract in writing to take from the company and pay for his qualification shares. Furthermore, a company shall not

proceed to allotment unless previously the minimum amount at which the directors may proceed to allotment has been stated in the memorandum or articles of association, or otherwise the whole amount of the share capital offered for subscription has been subscribed, and the sum payable on application has actually been paid to and received by the company. Before the publication of a prospectus a copy signed by every person who is named or proposed as a director must be filed with the registrar, and the prospectus is bound to contain certain specified details. Statutory meetings, mortgages, and charges, and the annual summary of the company's position, all form subjects for new regulations. As regards auditing, every auditor of a company shall have right of access at all times to the books and accounts and vouchers of the company, and shall be entitled to require from the directors and officers of the company such information and explanation as may be necessary for the performance of the duties of auditors, and the auditors shall sign a certificate at the foot of the balance-sheet stating whether or not all their requirements as auditors have been complied with. They have, moreover, to make a report to the shareholders on the accounts examined by them, and on every balance-sheet laid before the company in general meeting during their tenure of office, and in every such report shall state whether, in their opinion, the balance-sheet referred to in the report is properly drawn up to exhibit a true and correct view of the state of the company's affairs as shown by the books of the company; and this report shall be read before the company in general meeting. There is a special provision imposing penalties on persons making false statements in returns, reports, certificates, &c. The Act may be cited as the Companies Act, 1900, and may be cited with the Companies Act, 1862 to 1898.

REPORT ON THE CORDITE CONTRACTS.

THE Report of the Select Committee appointed to examine into the subject of War Office contracts, together with a chronicle of the proceedings of the Committee, has been published in the usual official form, three months after the date of the order appointing the inquiry. This inquiry extended over twenty-two working days, and involved the examination of more than fifty witnesses, the matter under consideration embracing a wide scope, from hay, diseased meat and clothing to cordite.

As originally constituted on May 1st, the committee consisted of the following members:—Colonel Denny, Captain Donelan, Mr. Elliot, Mr. Firbank, Mr. Houston, Mr. Howell, Mr. Jackson, Mr. Herbert Lewis, Colonel Lockwood, Mr. Lloyd, Mr. McKenna, Mr. Patrick O'Brien, Mr. Paulton, Major Rasch and Sir Robert Reid. On May 15th Mr. Houston was discharged from the committee, and Colonel Mellor took his place. At the outset the committee adopted the following resolutions:—That the committee propose retaining the conduct of the inquiry referred to them entirely in their own hands, but will accept the assistance of counsel when they think it necessary; that all witnesses, except as hereinafter mentioned, will be called and examined by the committee;

that if the evidence of any witness shall affect the interests of any person or body represented by counsel, application may be made to the committee for leave to cross-examine such witness; that if it be desired to call any witness not examined by the committee, counsel must apply for permission to call such witness, who will be examined as the committee may think fit; and that the extent to which counsel may address the committee will be determined at a late stage of the inquiry. With a view to obtaining evidence, the following resolution was also adopted:—That in the case of any person coming forward and making a full disclosure on any subject of inquiry by the committee, the committee will recommend that no punishment or disability shall be imposed upon him in respect of any offence or irregularity which he may admit; and the committee feels sure that the War Office will, as far as possible, give effect to such recommendation, and contractors preferring charges of misconduct shall not be prejudiced thereby in regard to future dealings with the War Office.

As regards the subject of the cordite contracts, the committee investigated in great detail the contracts for cordite which have been made from 1894 to 1900, and particularly a contract made in March of this year. According to the report, in May, 1894, tenders were invited for 200 tons of cordite, and three firms tendered: National Explosives Company, at 2s. 10½d.; Kynochs, Ltd., at 3s.; and Nobel's Explosives Company, at 4s. 6d. Tenders were subsequently invited for 1,200 tons, for which the same three firms again quoted, the only difference in price being made by Nobel's, which tendered at 4s. 3d. per lb. The order for 1,200 tons was placed in equal proportions with the National Explosives Company and Messrs. Kynoch, Ltd., at 2s. 10½d. per lb., delivery to extend over a period of three years. Other contracts for cordite were made from time to time.

On January 20th, 1900, the Admiralty made a requisition for 2,240,000 lbs. of cordite, and on this the Director of Army Contracts invited tenders. Seven firms quoted prices: the National Explosives Company, Ltd.; the New Explosives Company, Ltd.; Nobel's Explosives Company, Ltd.; the Chilworth Gunpowder Company, Ltd.; the Cotton Powder Company, Ltd.; Messrs. Curtis's and Harvey, Ltd.; and Messrs. Kynoch, Ltd. The tenders were submitted to the Admiralty by the War Office, and the Admiralty, on the recommendation of Colonel Pease, the Naval Storekeeper, and Admiral Jeffreys, Director of Naval Ordnance, proposed to allocate the total order between two firms only, the National Explosives Company, Ltd., and Messrs. Kynoch, Ltd., attaching the condition that Messrs. Kynoch's should reduce the price to 2s. 3d. per lb. The Director of Army Contracts objected to the proposed allocation, and wrote a minute to the Financial Secretary to the War Office as follows:—"There are one or two points in the foregoing proposal of the Admiralty to which we think your attention must be drawn. (1) They allot to the National Explosives Company 350,000 lbs. more than the company tender for. This may not be material, as this part of the order is spread into next year. (2) The lowest price at which Messrs. Kynoch tender is 2s. 6d. a lb. The order given to them is accompanied with the condition that they are to execute it at 2s. 3d. a lb. (3) Other firms, including Messrs. Nobel, tendering at lower prices than Messrs. Kynoch, are entirely passed over." Communications passed between the Financial Secretary to the

War Office and the Financial Secretary to the Admiralty, and ultimately it was agreed that the order should be placed as follows:—The National Explosives Company, Ltd., size 50, 600,000 lbs. at 2s. 1½d.; size 44, 160,000 lbs. at 2s.; and size 20, 310,000 lbs. at 2s.; Nobel's Explosives Company, Ltd., size 50, 90,000 lbs. at 2s. 4d.; size 44, 100,000 lbs. at 2s. 3d.; and size 20, 320,000 lbs. at 2s. 3d.; the Cotton Powder Company, Ltd., size 20, 350,000 lbs. at 2s. 1d.; and Messrs. Kynoch, Ltd., size 20, 300,000 lbs. at 2s. 6d.

The representatives of the Admiralty, Admiral Jeffreys and Colonel Pease, who gave evidence before the committee, defended the proposed allocation they had recommended between the two firms of the National Explosives Company, Ltd., and Messrs. Kynoch, Ltd., on the ground that they had larger experience of the two firms, that they preferred to have the Admiralty Orders placed in those hands, and that, had their condition of reducing the price of Messrs. Kynoch, Ltd., to 2s. 3d. per lb. been carried out, they would have got the supply as cheaply. They also pointed out that subsequent large orders for land service have been given out under which Messrs. Kynoch, Ltd., have got quite as large a quantity as they proposed to give them. They showed, furthermore, that the proposed allocation was made by them on their own judgment, and they adhered to the view that it was the best in the interests of the Admiralty, whom alone they had to consider.

An amendment in the form of additional information proposed to be embodied in the report, but the insertion of which was negatived on division, details the history of these contracts at greater length. According to this amendment, "it came to the knowledge of a member of the committee that amongst the firms who tendered for the supply of cordite for the Army and Navy a suspicion prevailed that undue preference was shown to a particular firm of manufacturers, Kynoch, Limited. In order to examine into the possible grounds for this suspicion, a request was made to the Director of Army Contracts, Mr. Major, to furnish the committee with a copy of all documents relating to the demand for naval cordite for which tenders were invited from the firms on the War Office List in January, 1900. The demand was a large one, 2,240,000 lbs., and it was thought that the manner in which this order was distributed among the competing firms would show whether any preference was in fact given to Kynoch, Limited, and if that should appear to be the case, an examination of the responsible officials would guide the committee to determine whether such preference was justified either by past experience of the various firms, or upon some ground of advantage to the public service." The proposed amendment then detailed the figures of the tenders. With regard to orders, the practice is for the Director of Army Contracts to invite tenders from the firms on the War Office List, and on receipt of the tenders he communicates the facts to the Storekeeper-General of Naval Ordnance, and recommends what he considers to be the proper distribution of the order among the competing firms. This recommendation may, or may not, be acted upon, the final apportionment of the order resting exclusively with the Admiralty.

Passing over the preliminary details given in the amendment, the final appointment of the contract in the proportion mentioned in a previous paragraph caused the committee to direct inquiries to the following points:—(1) The proposal of the Storekeeper-General of Naval Ordnance to permit

Kynoch's to reduce their tender price without communication with any of the other competing firms; (2) The proposed allocation of so large a proportion of the total order to Kynoch's, to the exclusion of their competitors tendering at a lower price; and (3) The final order of 300,000 lbs. of size 20 from Kynoch's at so high a price as 2s. 6d. a lb., having in view the fact that, apart from the firms who received some portion of the order, other firms tendering at a lower price were altogether excluded." Admiral Jeffreys and Colonel Pease gave evidence respecting these three points. They showed that there were precedents for the revision of Messrs. Kynoch's tender, all, it must be admitted, referring to the same company. Mr. Powell Williams, Financial Secretary to the War Office, also stated that he consented to the revision only upon the representation of the honourable member for Kilkenny and other Irish members, "that it was very desirable to have the Arklow works kept going." He admitted that the same urgency applied in respect to keeping the other firms employed, and he thought it would have been fairer to Messrs. Kynoch's competitors to have given them the same opportunity for revision. In respect to the second point, both the Director of Naval Ordnance and the Storekeeper-General believed in giving the orders to the two firms of which they had most experience, and furthermore disclaimed any intention of shutting other firms out. They also had knowledge that Army contracts were pending which were likely to give full employment to all the firms. The evidence brought before the committee by other witnesses with regard to this second point scarcely fell into line exactly with the statements of the official witnesses, and is summarised with some detail in the proposed amendment.

The conclusion arrived at by the committee, after weighing all the evidence brought before them, serves to clear the responsible officials from the suggestion of undue partiality in respect to the placing of orders for cordite, for in paragraph 37 of the report, the finding is that "as regards cordite, your committee are satisfied that the orders were allocated with the single object of securing the best results to the public service." A rider is added, as an amendment, to the second reading of the draft report, to the effect that "your Committee, however, consider that in any case in which it might be thought desirable to allow a tender to be modified, a like opportunity should be afforded to all the firms tendering."

GUN ACCESSORIES.—Messrs. G. and J. W. Hawksley, Ltd., of Carver Works, Sheffield, have forwarded their latest revised catalogue and price list of powder flasks, shot-pouches, shot-belts, and all kinds of rifle, gun, and revolver implements. The various items include turnover, recapping and loading machines and appliances, cartridge extractors, barrel and breech-cleaners, cleaning-rods and apparatus, solid cartridge cases, dog and railway calls, powder and shot measures, oil bottles of every description, bullet pliers and moulds, automatic crimpers, turn-screws and nipple keys, resizing tools, game and cartridge bags, gun cases and covers, cartridge magazines, and muzzle-loading implements. A conspicuous feature of this well got-up catalogue is the reproduction of a set of fine engravings of old-fashioned powder and shot flasks. Of course, the price list is issued to the wholesale trade only.

A NEW MANNLICHER RIFLE.

WE illustrate herewith a new mechanism on the Mannlicher system, which is likely to arouse great interest among the trade and sportsmen when the rifle is actually placed upon the market. The Steyr factory have been engaged for some time past in working out improvements in the Mannlicher rifle; and in the particular direction of reducing the compass of the magazine they have had the advantage of studying in a practical way the mechanical working of the Spanish Mauser. In this latter rifle the magazine has been shortened, so as not to extend beyond the woodwork of the stock, by a process of widening the magazine so that the cartridges shall lie zigzag fashion. The only difficulty which is presented by such a form of construction is to ensure the satisfactory feeding of the cartridges into the position where they will come into the track of the bolt ready for being carried forward into the

spring in the centre of the carrier. As the carrier rotates under the pressure of the first cartridge a fresh recess is exposed, and the process of filling continues until all five have been properly located in the magazine. The completely filled carrier is shown in Fig. 3, the spiral spring all the while tending to press the cartridges out of the magazine and into the receiver. It will be noticed in Figs. 2 and 3 that the interior surface of the magazine is made of suitable roundness so as to provide a smooth surface to hold the cartridges in position on the carrier, and at the same time permit their free movement when the carrier rotates. Figs. 2 and 3 show clearly the action of a stop which projects into the diagonal passage forming the entrance to the magazine. This stop is held in place by a light spring, which gives way to the superior force exerted in the filling of the magazine, and also allows the bolt to carry the top cartridge into the chamber. The spring is at the same time of sufficient strength to enable the stop to prevent the cartridges from being pushed out of

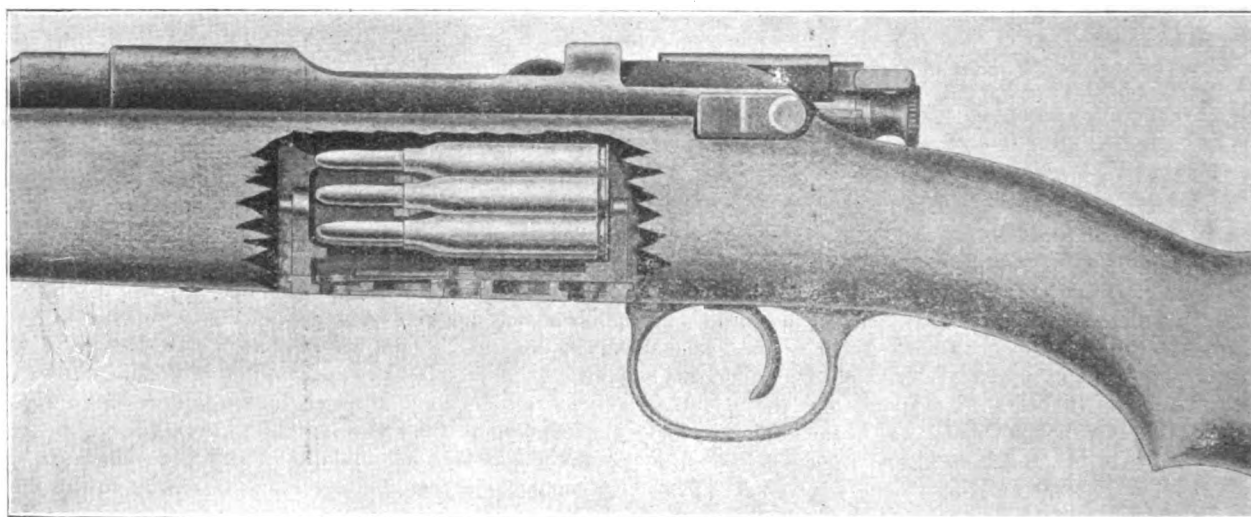


FIG. 1.

chamber. That this system works with very fairly satisfactory results is shown by the fact that our Mark II. service rifle is arranged on the same plan.

The manufacturers of the Mannlicher rifle have adopted another system for attaining the desired compactness of the magazine. They have made use of a revolving carrier, which is illustrated in the cross-sections in Figs. 2 and 3. A clip, in general appearance similar to that for the Mauser rifle, serves to hold the five cartridges at the rim. Two upstanding guides over the rear of the receiver of the rifle are shown in Fig. 1. The clip containing the cartridges is placed within grooves formed in these pieces, this position of parts being shown in cross-section in Fig. 2. In this last-mentioned illustration the sectional form of the carrier is plainly shown. It has five arms, which serve to accommodate five cartridges arranged in a circle, each in its own groove. An extra long extension of one of the projecting wings of the carrier meets the first cartridge which enters the magazine. The stripping of the cartridges from the clip forces them into the magazine, and the revolving carrier rotates against the pressure of a spiral

the magazine by the action of the spiral spring which operates the revolving carrier. A thumb-piece extension of the stop is carried through a hole in the action, where it may be operated by the shooter. Pressure on this thumb-piece serves to depress the stop, so enabling the carrier spring to empty the magazine. The cut-away portion of Fig. 1 shows a side view of the interior of the magazine, and clearly indicates the position of the parts when the magazine is filled.

In passing we may mention that the form of cartridge clip used is interesting, in so far that it has been made in a single piece. The Mauser clip has a flat steel spring for holding the cartridges frictionally in place, while the clip of the late American Lee rifle has a wire serving a similar purpose, which is unlocked when the clip enters the rifle. The spring has been dispensed with by making two saw cuts in the bottom of the clip, and expanding the resulting strip upwards, so as to press against the base of the cartridges. Frictional grip on the end cartridges is provided for by saw-cutting the flanges of the clip and pressing them inwards, so as to grip the case. These bent ends are shown in Fig. 2.

The portion of the magazine represented by the revolving carrier, and the base-plate upon which it is mounted by means of uprights, may be bodily removed from the rifle. The bottom plate lies flush with the woodwork of the stock on the underside of the rifle, and it has a hole into which any pointed object, such as the bullet of a cartridge, can be inserted. This releases a spring clip, and the plate is then free to turn around its centre. This turning of the plate frees it from the circular dovetailed notches which hold it, the plate and carrier then being free to leave the rifle.

Among the detailed improvements of this rifle several are worthy of special notice. The illustration shows that a half pistol-grip has been formed on the stock. Further, a wooden cover, not shown in our illustration, has been fitted over that portion of the barrel which is likely to come into contact with the hand of the shooter, so getting rid of the disadvantages incidental to a barrel being heated by repeated firing. Another little item worthy of comment is that the bolt handle has been hollowed out, so removing an ounce or so of surplus metal from a place where its distance from the axis of the barrel is likely to create undue "jump."

The sights on this rifle are a modification of the type of graduated step sight which has been associated for many years with certain of the Winchester rifles. A hinged leaf is provided with a cross-bar at the top, carrying a V-notch in the centre. This leaf lies in a horizontal position for short distance shooting, and the V-notch is raised by the bearing of an adjustable cross-bar upon suitably sloped surfaces. The sliding cross-bar locks into one or another of the series of notches which have been cut to suit the various ranges. The calibre

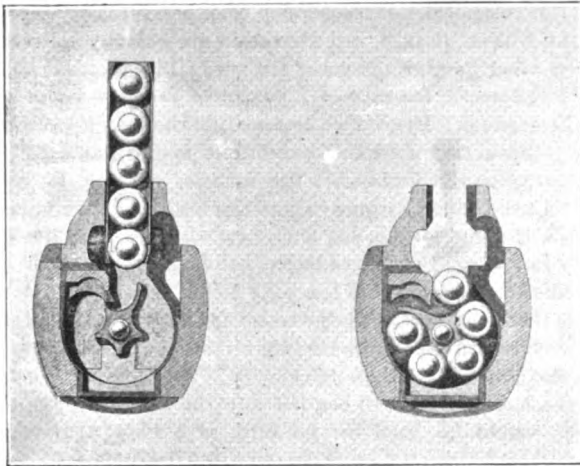


FIG. 2

FIG. 3.

of the rifle is the standard .256 bore, which has become so popular in this country, the ammunition remaining unaltered.

We think the improvements contained in the rifle will become very popular; and the fact that the Austrian Small Arms Factory have had the good sense to make the tools necessary for turning it out in quantities stands in marked contrast to the attitude of our own manufacturers, who, while they complain that the Lee-Enfield is an unmarketable commodity, have not had the enterprise to design a new rifle which would be marketable.

LECTURES TO YOUNG GUN-MAKERS.

VII.

RECOIL (concluded).

WRITTEN WITH THE COLLABORATION OF F. W. JONES.

IN the series of lectures which have so far appeared we have been able to build up a formula showing which are the various factors in governing recoil, and the manner in which they should be dealt with in order to ascertain the energy of recoil in foot-pounds under any given set of conditions. The various factors have been expressed by symbols, and are as follow:—

- M = weight in lbs. of the gun.
- m = weight in lbs. of the shot and wads.
- w = weight in lbs. of the powder charge.
- y = muzzle velocity in feet per second of the shot.
- a = volume in cubic inches of the gun barrel.
- A₁ × p = a constant, the numerical value of which must be ascertained by experiment, and it varies with the powder used.

To determine the recoil that would result from the firing of a given gun and ammunition, the numerical values of the above factors must be set down, and they should then be arranged according to Formula No. 10, which has already appeared, and is as follows:—

$$\text{ENERGY OF RECOIL} = \frac{\left(m \times y + \frac{w \times y}{2} + A_1 \times p \times w \times \sqrt{\frac{a}{w}} \right)^2}{M \times 2 \times 32.2} \text{ ft.-lbs.}$$

Taking a gun of standard dimensions, and supposing a cartridge loaded with a smokeless powder to be fired from it, the following values will serve for the various factors:—

M = 7	y = 1,200
m = 77	a = 12.5
$\frac{1,000}{1,000}$	
w = $\frac{6}{1,000}$	A ₁ × p = 50

Transferring these values to the formula, we obtain the following:—

$$\text{ENERGY OF RECOIL IN FOOT-LBS.} = \frac{\left(\frac{77}{1,000} \times 1,200 + \frac{6 \times 1,200}{1,000 \times 2} + 50 \times \frac{6}{1,000} \times \sqrt{\frac{12.5 \times 1,000}{6}} \right)^2}{7 \times 2 \times 32.2}$$

The only drawback to the use of this formula is that the values for the constant applicable to each of the well-known powders upon the market have yet to be ascertained. The necessary experiments are not difficult to carry out, and, in fact, we believe that such experiments are proceeding at this moment. In the meantime, the results of continental trials on the same lines have provided us with exact values of recoil from which the constants for the particular powders used have been deduced. We refer to Capt. Journé's researches on sporting guns, which were described in Volume III. of the *Mémorial des Poudres et Salpêtres*, p. 308. He suspended his gun from two strings, so allowing it absolute freedom of recoil

in the manner of a pendulum. The velocity of the backward movement was registered by counting the vibrations of a tuning fork of known pitch as traced upon a plate fixed to the gun. The records so obtained provided means for ascertaining the absolute energy of recoil. We give in tabulated form the result of these trials, and also the calculated recoil obtained by means of our formula.

of punishment experienced by the shooter. A series of carefully conducted experiments were carried out at *l'Ecole Normale de Tir*, and they tended to show that the physical sensations of recoil are proportional to the recoil energy developed. This is no doubt perfectly correct when dealing with the same explosive; but with explosives which vary in the nature of their combustion, we think there can

Bore.	Volume of Barrel.	Weight of Gun.	Weight of Shot.	Weight of Wads.	Black Powder Charge.	Energy of Recoil.		Smokeless Powder Charge.	Energy of Recoil.	
						Observed.	Calculated.		Observed.	Calculated.
	cub. ins.	lbs.	grains.	grains.	grains.	ft.-lbs.	ft.-lbs.	grains.	ft.-lbs.	ft.-lbs.
8	17.5	13.0	926	54.0	145.0	48.9	48.5	77.2	39.6	40.4
10	14.2	8.8	713	46.3	115.7	43.5	43.6	60.2	36.1	36.2
12	12.5	7.2	598	41.7	92.6	37.5	37.6	49.4	31.3	31.5
16	10.4	6.7	463	38.6	74.1	24.7	24.9	38.6	20.6	20.8
20	8.3	5.3	369	32.4	61.7	20.3	20.0	30.9	16.7	16.9
24	7.4	4.8	310	29.3	52.5	15.9	16.3	27.0	13.1	13.5

The experimental recoil values reproduced above tell us that the value of the constant for the black powder used is 40, and that for the smokeless, used by Capt. Journée, was 30. Once this constant had been ascertained from one of the records, it was used throughout for the other calculations; and the very close agreement of the observed and calculated recoil provides strong evidence that the formula correctly expresses the theory of recoil. When once the absolute value of recoil has been ascertained with a given powder, and provided the values of the various other factors are recorded, the constant is obtained, and recoils can be calculated with such closeness as to render actual experiment necessary in only exceptional circumstances.

It will be remembered that the constant, as expressed by $A_1 \times p$, consisted of two factors: first, a constant which takes into account the deviation, from atmospheric, of the pressure outside the gun during the emission of the gases; and second, their pressure at the moment when the shot has left the muzzle. The pressure is the motive power which tends to eject the gases from the muzzle, and as it is greater or less, so the motive power tends to produce a more or less rapid efflux. The actual velocity of efflux could be correctly put down were it possible to ascertain, during the whole emission, the difference between the pressure inside and outside the muzzle of a gun; but as the variation of the outside pressure does not follow any known rule, we are compelled to modify our results with an experimental constant such as A_1 . As the gases leave the barrel they expand so as to form a ball of high-pressure gas. The pressure of this ball checks the outflow of the gases, and its value cannot be stated by the aid of theory. Pressure-testing has unfortunately not reached a stage at which we can rely upon the mathematical accuracy of the readings obtained at those parts of the barrel where gases are in rapid movement, and, therefore, for this reason also, the term $A_1 p$ cannot be given an *a priori* exact value.

We have now reached a point at which it will be necessary to consider the bearing of recoil, as expressed in foot-pounds, in relation with its effects upon the shooter. When firing a gun one's own experiences of recoil are purely physiological. A push and a blow are the human interpretations of recoil, and recoil is said to be greater or less according to the amount

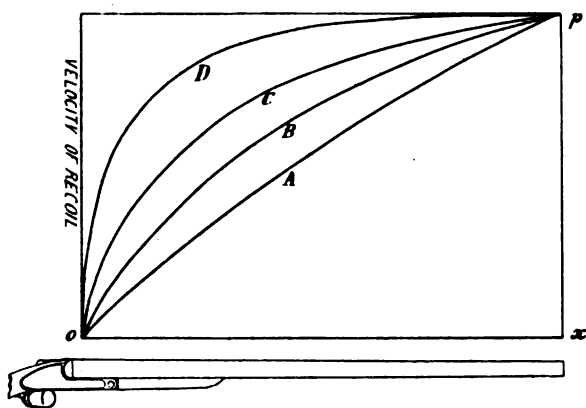
be little doubt that this general expression is not quite correct.

Reverting to the instance quoted where the recoil from a black powder cartridge was 34 foot-pounds, this total recoil was made up of 22 foot-pounds developed while the shot was in the barrel, the remainder, viz., 12 foot-pounds, resulting from the efflux of the gases. Thus about two-thirds of the total recoil was developed while the shot was in the barrel, and as the recoil up to this point is measured from the velocity with which the shot leaves the barrel it is clear that the rate of developing this velocity has an important bearing on the case. If the powder gases develop their pressure very rapidly the gun will, in its turn, rapidly attain its velocity of recoil. On the other hand, if the gases are gradual in their development of pressure, the rate of increase of recoil velocity will also be gradual. Even if we assume that the velocity attained under these two different conditions is the same at the moment when the shot leaves the muzzle, we may be quite sure that the shooter would experience a marked difference as regards the effect upon his shoulder. In one case the gun would move backwards, gradually bedding itself against the shoulder, the resistance of the body being gradually brought into action so as to take up the recoil and distribute the resulting movement over a large portion of the body. In the other case the gun would attain its velocity of recoil possibly before the gun had become well bedded into the shoulder, and the effects would be local in the form of a blow against the shoulder, which would be delivered too quickly for the body to take up the movement. The same conditions would apply where a man would be injured by trying to catch a small weight falling from a considerable height, while he would find no difficulty in catching a weight say four times as great if dropped from a quarter the distance. In each case the energy would be the same; but in the one the effects would be local bruising of the tissue, while in the other no such ill-effects would occur.

In order to express the above truth on an exact basis, we will avail ourselves of the diagram appearing on the next page. The base line ox represents the length of a gun barrel. In the same way that we expressed the gradual development of velocity in the barrel of a shot gun in our third lecture

(January, 1900), we will now show similar curves denoting the proportionate building up of recoil velocity during the time the shot is in the barrel. It was explained in the lecture referred to that the more rapid the development of the powder gases in the barrel, the steeper was the curve representing the acceleration of the shot. As the velocity of the gun in recoil is proportionate to the velocity of the shot it will be clearly recognised that our curve A would apply to a powder with a slow combustion, and with a proportionately easy gradient on the velocity curve. In the same way the other curves, B, C, and D, would apply to rapid-burning powders of high initial pressure, which rapidly develop the velocity of recoil. The fact that all these curves converge at the point P indicates that the velocity of recoil ultimately attained is the same. So the difference between the powders is not a question of work done, but of the evenness with which that work is distributed over a given length of barrel.

Pressure of the powder gases only affects the measured energy of recoil in the manner above noted. Before, however, passing on it may be well to revert once more to the third lecture of this series. It will be understood by students of that lecture that curve A in the accompanying diagram could only be produced by a powder of such even combustion that the pressure curve would be a nearly horizontal line. This would entail a high muzzle pressure, while curves B, C, and D would be developed from a curve of low muzzle pressure. So that, while the curve A is favourable to a gradual development of recoil while the shot is in the barrel, its natural accompaniment would be a comparatively high gas pressure tending to make the "kick" stage of recoil more severe. And the opposite applies, in its several degrees, to the other curves illustrated. The constant in our formula



would in some measure tend to show marked variations of different powders in this respect, as also would the proportion existing between the recoil values before and after the departure from the muzzle.

Physiological recoil has also a psychological aspect. It has often been pointed out that recoil is felt much more when firing at the target than at game, and this is generally explained by saying that the attention of the shooter is directed to recoil while firing at the target, and that, therefore, it appears to be more. We think a more correct explanation is that recoil is not so great if the body, ruled by our experienced sub-conscious self, is allowed to direct the resistance set up by the body. All mechanical actions of the body are done so much better when they cease to be conscious actions and

partake more of the nature of automatic impulses. Take the cases of musicians, typists, composers, etc. Their mechanical actions are impaired if they become conscious ones. This would explain why guns appear to kick more if a shooter's nervous organization is not in good order, or if for any reason the mind prepares the body to meet the recoil expected.

While on this matter we may say that few shooters can stand repeated recoils of 45 foot-pounds, but a good sportsman can take a recoil of 36 foot-pounds all day, and it is only weak sportsmen who suffer from an energy of recoil of 26 foot-pounds.

From what we have said it is obvious that the best method to ascertain recoil experimentally would be by determining the maximum velocity attained by a gun free to recoil. This method is rather difficult to manipulate, and consequently in practice the energy of recoil is generally measured by the distance the gun is moved against a known force or series of forces.

In all our calculations we have assumed that the mass or dead weight of the recoiling bodies is the sole opposing force to be overcome by the impulse of recoil. But if we add to the recoiling parts spring or frictional resistances of known value, we are still able to measure recoil, provided the spring or other force opposing the initial motion of the gun is less than the force tending to move the gun. In these gauges it is necessary to take note of how much of the gun-rest and its attachments is moved equally with the gun, and to bear in mind that in all practical mechanics, when the motion of bodies is resisted by forces, the amount of the resistance is greatest just at the commencement of motion. We have had occasion to test a recoil gauge of this kind where a backward motion of half an inch corresponded to one foot-pound. We have found in this gun that the carriage commences to move between '0010 and '0020 of a second before the shot leaves the muzzle. Now, Mr. Griffith has shown that the shot in a 12-bore gun is in motion in the barrel between '0025 second and '0030 second, so that it would appear as though the force of the powder gases were acting on the gun some time before it recoils.

It is for these reasons that recoil gauges which directly measure energy and not velocity of recoil do not give accurate and regular results. Their readings are generally low, and the more so as the force opposing the movement of the gun is made larger. There is something so absolute and satisfactory about the velocity method of testing recoil, that one loses patience with an apparatus which introduces so many complications as to throw doubt upon the results that are given.

Were it our province to forecast what will be the recoil gauge of the future, we should pin our faith to an apparatus in the form of a simple gun tube or cannon suspended by two cords or steel wires, and provided with satisfactory means for ascertaining the mean velocity between two points, which experiments would show to embrace the region of maximum velocity of recoil. By attaching the cords to beams sufficiently above the gun the maximum velocity of recoil would be attained before the pendulum movement would begin to lower the velocity of the gun by causing it to raise its own weight to an appreciable extent. The mechanical details concerned with the pulling of the trigger without moving the gun and the providing of suitable connections for the operation of the electric circuits of the chronograph have either already been settled, or, at any rate, they do not present any special difficulties.

NOTES.

IMPORTATIONS OF EXPLOSIVES.—In our notice of the annual report of H.M. Inspectors of Explosives we gave only the list of the imported explosives as contained in the body of the report. The appendix, however, contains a more detailed list, from which, for the sake of comparison with the figures of 1898, we extract the following. In 1899 the importation of Cooppal's Powder amounted to 4,700 lbs., as compared with 6,000 lbs. in the previous year. Normal Sporting Powder was imported to the extent of 20,000 lbs., as compared with 12,000 lbs. in 1898. Walsrode Powder shows a total of 6,000 lbs., to compare with 5,400 lbs. in 1898. The importation of Detonators gave a substantial increase to 13,836,300, compared with 10,089,600 for the previous year. This total was made up by the following firms:—Messrs. J. R. Watson & Co., 5,640,000; Mr. C. G. Mueller, 5,253,740; The Alliance Explosives Co., Ltd., 1,125,000; Mr. A. F. Richter, 1,062,500; Messrs. A. J. Brown & Co., 605,000; Messrs. Fleming & Co., 150,000; and Sir W. G. Armstrong, Whitworth & Co., Ltd., 60.

MR. FREDK. WILLIAMS' CATALOGUE AND PRICE LIST.—We have received from Mr. Fredk. Williams, of 32 and 33, Weaman Street, Birmingham, a copy of his new illustrated price list of guns, rifles and accessories. The catalogue opens with a schedule of the marks adopted respectively by the Guardians of the Birmingham Proof House, the Gun Maker's Company, London, and the Liège authorities. Mr. Williams has a very complete list of guns to choose from, including automatic ejector guns, ejector side-lock guns, special pigeon guns, combined rifles and shot-guns, double rifles, featherweights, special nitro-guns, wild fowl and ducking-guns, collector's guns, magazine and repeating rifles, walking-stick and air guns, and others. One or two lines seem to be particularly adapted for use abroad, the specifications being specially made out with that end in view. It is almost unnecessary to note that Mr. Williams supplies the wholesale trade only.

BLASTING OPERATIONS IN AUSTRALIA.—The report of an inquest held at the Melbourne Hospital, concerning the death of a ganger on the new railway line now in process of construction between Lilydale and Warburton, offers a curious parallel to the inquiry held by Captain Lloyd on the fatal explosion at Dover Admiralty Harbour Works, as reported in our May issue, showing that carelessness in the handling of explosives is peculiar to neither side of the globe. According to the evidence, a blasting charge was fired while an open keg containing about 20 lbs. of powder was within 18 inches of the hole, with the result that the keg of powder exploded and inflicted fatal injuries on the ganger conducting the operation. Apart from that, evidence was elicited to show that the kegs were generally opened with an iron pick-head or a chisel, that the powder was ladled from the open keg into the blasting-hole with a pannikin, that the custom was to leave the keg open during the firing of the charges, and that a lock and key were not thought necessary to secure the local magazines. The methods adopted on this particular piece of work were those which the assistant engineer and superintendent of railway construction had been accustomed

to for 20 years. Apparently, this being Government work, it was not under the jurisdiction of the Explosives Act. The Coroner, in summing up, said that there seemed to have been very great laxity on the part of those whose duty it was to look after the explosives. There seemed to have been no provision made for the proper storage or use of them, and men, he thought, should be warned of the extreme danger they ran in the use of explosives. In this case, however, it seemed that the death of the ganger was brought about by his own omission to remove the keg to a place of safety, and no one appeared to be to blame for the occurrence. The jury returned a verdict in accordance with the evidence, and added a rider to the effect that, in their opinion, the Railway Department should frame regulations for the use and storage of explosives, should cause printed instructions to be issued with regard to the matter, and should instruct responsible officers to see that the regulations and instructions be duly observed.

SHIPMENT OF EXPLOSIVES FROM BELGIUM.—According to the regulation introduced by the Belgian Government in 1895, the quantity of explosives that can legally be shipped at Lief Renshoek in any one vessel is 25,000 kilos. of dynamite and 60,000 kilos of powder. Belgian manufacturers and exporters have petitioned the Government to take into consideration the progress made in the manufacture of explosives, and so to modify the existing regulation that in future a vessel should be allowed to receive on board 60,000 kilos of dynamite, and 100,000 kilos. of gunpowder. If this substantial increase be allowed, the petitioners point out that it would be possible to avoid the carrying of passengers on vessels shipping explosives, this referring more particularly to the Congo Line. The Government has referred the petition to a commission specially appointed to consider the question.

ENLARGEMENT OF WOOLWICH ARSENAL.—Despite the fact that the Royal Arsenal already covers 350 acres, and employs 20,000 hands, important developments are in progress with a view to increasing its capacity of output. Practically all the ground of the existing Arsenal is occupied with buildings, and the new workshops now in contemplation, which are estimated to cost upwards of a quarter of a million, will be placed upon additional land which has been acquired to the eastward of the present establishment. The Royal Laboratory Department will obtain extra space for making up quick-firing ammunition, for the Lyddite factory and for ammunition loading; the Royal Carriage Department requires more accommodation for repairing boxes and ammunition cases, for an extension of the wheel factory, and for an enlargement of the drawing-offices; the Royal Gun Factory will receive an increase of the boring mill, with extra space for boring and other machinery, and a new shop in the torpedo factory, which already has the reputation of being the largest workshop in the world; and the Building Works Department will be able to provide extra stores for timber, new buildings for acetone plant, an extension of the electric lighting plant, additional plant for the Royal Arsenal gas works, and for an improvement in the telephone service. Further developments include the erection of new composition buildings, additional powder magazines, and police quarters, on land abutting on Plumstead Marshes, and it is in

contemplation to extend the Arsenal railway system to the new works. During the current year the wages of the Royal Arsenal are estimated to reach the total of £2,000,000, and the present activity promises to continue without abatement for several years to come. The eight hours' day is temporarily in abeyance, and night work and overtime are usual in all departments.

WAR STORES FOR CHINA.—A large supply of war stores, chiefly naval, is already on its way to China. The explosives consist of Mark II. small-arm ammunition—part of an order for 30,000,000 rounds received at the Royal Arsenal—and 4·7 and 6 in. Lyddite shell. Owing to the double event of South Africa and China, the demand for small-arm ammunition has been so great as to reduce the reserve of 303 cartridges in store at Woolwich considerably below the standard stock of 150,000,000 usually kept, and as a consequence orders are being given with some freedom to the various firms on the Government List. Contracts for shell for the quick-firers have also been given out to firms making a specialty of this line of ammunition.

GUNCOTTON EXPLODED BY LIGHTNING.—On the 22nd ult. the Ardeer Factory of the Nobel's Explosives Co., Ltd., Stevenston, was the scene of an alarming explosion. During the midst of a violent thunderstorm, the lightning, which was unusually severe, struck two sheds and exploded about three tons of guncotton which was in process of drying. Fortunately, most of the workpeople were at dinner at the time, well away from the spot, but the masses of debris displaced by the explosion injured two men who were conveying guncotton to the drying-stores, and a third man was cut by broken glass at some distance from the actual scene of the accident. The two drying-sheds, which were built of wood, banked around with sand, were completely demolished, one joist of timber being propelled about 150 yards, and the various materials were scattered in all directions. H.M. Inspector of Explosives has since visited the factory to inquire into the circumstances of the case.

NEW GUNS FOR NEW SOUTH WALES.—Sir William Lyne, Premier of New South Wales, has recently cabled to the Agent-General of the Colony in London to send out four 4·7 guns fitted with carriages for land service in the field, and also to obtain Vickers-Maxim guns to replace the A Battery which is now actively employed in South Africa.

GUNPOWDER ON UNREGISTERED PREMISES.—On the 17th ult., at the Yeovil Town Hall, Mr. William Gidley Godfrey, an ironmonger, was charged with keeping 153 lbs. of gunpowder on premises not registered for the purpose under the Explosives Act. The defendant explained that the powder, which, however, was over the amount the register allowed, had been removed from his properly-registered premises to another building on account of a slight scare of fire. The amount removed had been 73 lbs., which was contained in a Government tin. Since then, and without his knowledge, a premature delivery of a further order of powder had taken place, making a total of 53 lbs. more than was permissible even on the duly-registered premises. It was argued that, while a technical breach of the law was undoubtedly committed, there was a great difference between that and a wilful breach. The defendant further said that he

understood that his properly licensed store was registered in the sense that a dealer was registered. After a private consultation the Mayor said that the Bench had decided to inflict a fine of £5 and costs—£6 1s. 6d. altogether. He also pointed out that directly the powder was returned, defendant would again become liable, and they suggested that it be returned to the company from whom it was obtained.

EXPORTATION OF ARMS AND AMMUNITION TO CHINA.—The new Bill, known as the Exportation of Arms Act, 1900, which was quoted in detail in our last issue, has now taken its place on the Statute Book with an emendation extending the powers of prohibition to "any article which Her Majesty shall judge capable of being converted into or made useful in increasing the quantity of arms, ammunition, or military or naval stores" of any specific country. A first and most salutary use to which the new Act has been put is in the issue of a Royal Proclamation to the following effect:—

BY THE QUEEN—A PROCLAMATION.

WHEREAS by "The Exportation of Arms Act, 1900," section 1, it is enacted that it shall be lawful for Her Majesty by Proclamation to prohibit the exportation of all or any of the following articles, namely:—Arms, ammunition, military and naval stores, and any article which Her Majesty shall judge capable of being converted into, or made useful in increasing the quantity of arms, ammunition, or military or naval stores, to any country or place therein named, whenever Her Majesty shall judge such prohibition to be expedient in order to prevent such arms, ammunition, military or naval stores, being used against Her Majesty's subjects or forces, or against any forces engaged or which may be engaged in military or naval operations in co-operation with Her Majesty's forces:

And whereas We, by and with the advice of Our Privy Council, judge it expedient to prohibit the exportation to China of arms and ammunition in order to prevent their being used as in the said Act stated:

Now We, by and with the advice aforesaid, do hereby prohibit the exportation to China of arms and ammunition from and after the date hereof.

Given at Our Court at *Osborne House, Isle of Wight*, this seventh day of *August*, in the year of our Lord one thousand nine hundred, and in the sixty-fourth year of Our reign.

MESSRS. VICKERS, SONS & MAXIM, LD.—The directors of Messrs. Vickers, Sons and Maxim, Ltd., have declared interim dividends for the half-year ending June 30, of 2½ per cent. (less income tax) on the preferred five per cent. stock; 2½ per cent. (less income tax) on the five per cent. preference shares of £1 each, all paid; and 1s. 6d per share (free of income tax) on the 2,000,000 ordinary shares of £1 each, all paid.

REORGANISATION OF THE TURKISH NAVY.—The contract with Messrs. Krupp having been signed, the rearmament of the Turkish Navy may be considered to be in progress, though there is, of course, reason to doubt whether the transformations about to be wrought will serve to render the renovated ironclads capable of taking their position in the line of battle. Altogether, no fewer than 208 guns are contracted for, comprising four of 21 cm., fifty-two of 15 cm., fifty-six of 7·5 cm., eighty of 5·7, and sixteen of 4·7 cm., all to be built of best nickel steel, and each gun to be supplied with

a nickel steel shield and all the latest appliances. The guns of large calibre are to have hydraulic loading gear, and are to be delivered with 100 rounds of ammunition per gun, while the smaller ones will be delivered with 300 rounds per gun, of course using smokeless powder. The contract price agreed upon is £T648,000, including all expenses for trials of guns and cost of transport from Essen to Genoa or any other selected port, and delivery is to take place within 22 months from the date of signing the contract.

AN AMERICAN AUTOMATIC RIFLE.—The McLean Arms Co., which was incorporated at Trenton, N.J., on July 20th has been formed for the purpose of exploiting the automatic rifle invented by Dr. Samuel N. McLean, of Cleveland, O. In this rifle the waste gases are used to operate the recharging mechanism, and it is claimed that there is no appreciable recoil. A magazine is fitted which holds five cartridges, or the rifle can be worked as a single-loader, but apparently the automatic character of the arm only reaches its full development by the use of an endless belt supplying the ammunition, when, according to the statement made, a maximum rate of 700 shots per minute can be maintained. Unfortunately, the details so far to hand fail to explain how some of the obvious difficulties arising from such possibilities of rapid and continuous fire are provided for, as, for instance, the furnishing of an adequate supply of ammunition and prevention of over-heating the barrel of the rifle.

FATAL EXPLOSION AT A GUNPOWDER FACTORY.—An explosion occurred in the corning-house at Messrs. F. C. Dickson & Co.'s Blackbeck Power Works, at the foot of Lake Windermere, on the 27th ult., which resulted in the death of two men and the receipt of injuries by two others. An explosion at the same works some three months ago caused the loss of two lives.

EXTENSION OF HAYLE DYNAMITE WORKS.—On the 28th ult, on behalf of the National Explosives Co., Ltd., Mr. D. H. Shilson applied to the East Penarth Bench of Magistrates for their assent to an amending licence for the dynamite works on Hayle Towans. He said that the company had found that, in order to carry out the Government contracts for Cordite, in addition to their other business, it was necessary to erect additional buildings. They had applied to the Home Secretary for an extension of the limits, and for permission to erect those buildings, and no objection had been raised to the proposed extension, the draft of the amended licence being at once granted. It now only required the assent of the Bench as the local authority. In reply to the Bench, Mr. Shilson said that the danger area had been increased. There was no opposition, and the application was duly granted.

THE RIGOTTI AUTOMATIC RIFLE.—An Italian officer, Captain Cei-Rigotti, has recently exhibited at Brescia an automatic rifle of his design, which, in the course of demonstration, appeared to give most favourable results. In this rifle a small hole is bored through the lower part of the barrel towards the muzzle-end, and the proportion of gas which passes through the aperture is utilised to work a rotary cylinder, which throws open the breech, extracts the empty cartridge case, and automatically recharges the rifle from the

magazine. The breech then closes, and in the act releases a striker which fires the new cartridge. This set of operations takes place again without requiring any further pull of the trigger until the whole supply of cartridges, which are furnished in clips holding from six to 25, is exhausted. On the other hand, if single aimed fire is desired, there is an intercepting lever which checks the striker, and causes the trigger to come into operation for the firing of each charge. In the tests made by the inventor at Brescia, 15 shots were fired in one second of time without taking the rifle from the shoulder, the bullet thus leaving the barrel with intervals of distance between them of barely 50 yards. The muzzle velocity of the Rigotti rifle is 2,300 feet per second. It is said that the automatic mechanism consists of four parts only, which can easily be adapted to existing magazine arms of the Mauser type without any material augmentation of weight. The rifle has been patented, and is being brought out by an Italian company.

LIEUTENANT COLONEL HOPTON.—Lieutenant-Colonel Hopton has recently been appointed Chief Inspector of Small-Arms. His position as Chief Instructor of Musketry at the Musketry School at Hythe has been filled by Lieutenant-Colonel Pennington.

BIRMINGHAM ARMS AND AMMUNITION COMPANIES.—According to its usual custom, the *Birmingham Daily Post* has just published a table of the local financial and industrial undertakings, which shows in parallel columns the dividends declared so far for the past half year, as compared with the corresponding declarations for the previous half years of 1899 and 1898. With regard to the arms and ammunition companies, which alone concern us, details are given of seven concerns, and of these two show an increase, as against one showing a decrease, while the remainder are stationary. The King's Norton Metal ordinary £10 shares bear an annual dividend of £1 5s. 6d., as against £1 1s. 3d. distributed last year, and Messrs. Webley & Scott declare 2s. 6d. on their £5 shares for the half year, in contrast to no dividend declared during the corresponding period of 1899. On the other hand, special causes have occasioned a drop in the annual dividend of the Nobel's Dynamite Trust Co., Ltd., from £1 4s. paid in 1899 and 1898 down to £1 for the current twelve months. In view of the large orders for war material that have been given out during the last eight or nine months, it cannot be denied that there is something disappointing in the stationary character of the other companies' dividends, but possibly in some cases the effects of those orders have barely had time to show.

MESSRS. J. WOODWARD & SONS.—In referring to the death of Mr. James Woodward we find, on turning up our original memorandum, that a mistake was made in the transcription, whereby we made it appear that Mr. Evershed would be manager, whereas it should have been made clear that the business will be carried on in the future by Mr. Charles Woodward and Mr. Evershed in joint partnership.

GAME LICENCES.—Those who have recently renewed their game licences for the coming year will have noticed an artful addition, no doubt the conception of some duped revenue official. The time of day when the licence is issued is entered in the form in hours and minutes, with the result

that those who have failed to place themselves within the law can no longer hasten to the post office after having given name and address to the ubiquitous and inquisitive official who has challenged their possession of the printed form. If the offence is committed at mid-day it can no longer be cancelled by payment of the dues in the course of the afternoon.

UNITED STATES ORDNANCE REPORT.—II.

APPENDIX 6 of the Report deals especially with the latest model of U.S. magazine rifle and carbine, the principal changes in which have been as follow:—Change in cocking piece, simplifying manufacture, but not interfering with interchangeability; change approved, but tools for manufacture not yet made. Sear spring—Diameter of wire changed from .041 to .047 inch. Cut-off—Thumb-piece polished and left bright after bluing, the spindle to remain blued. Side plate—Polishing inside after case hardening omitted. Stock—Diameter of hole in butt for cleaning rod changed .22 to .24 in. Trigger—Case hardened in oil instead of water; and sear slot increased in width from .24 to .25 inch. Swivel bar and ring have been omitted from stock of carbine. Since the last annual report the daily output of rifles was increased, Feb. 1, 1899, to 400 a day; and this was continued to within a few days of the end of June.

Experimental firings have been made at Granby range with both rifle and carbine, using cartridges giving a velocity of 2,200 ft. per second, partly with a view to graduating the Buffington sight, and also to determine the degree of penetration. For the latter purpose, butts were shot at which were built up of alternate sections of pine wood and air, each 1 in. thick. The penetration of the rifle was found to yield the following results:—At 53 ft. from the muzzle, 56.5 in.; at 500 yards, 24.2 in.; at 1,000 yards, 13.2 in.; at 1,500 yards, 8.6 in.; and at 2,000 yards, 5.3 in. For the carbine the figures at the same ranges were respectively 52.8 in., 23.5 in., 12.3 in., 8.25 in., and 5.2 in., thus showing a remarkable levelling up with the rifle at the longer distances. A test of the Mauser rifle showed a penetration at 2,000 yards of 4.06 in. as compared with the 5.3 in. of the .30 calibre U.S. magazine rifle.

Interesting observations were made on the subject of drift. With ammunition having a velocity of 2,000 ft. per second, the drift of the rifle is to the left, while the drift of the carbine, firing the same ammunition, is to the right. Experiments were made at reduced velocities in order to determine the effect upon drift, and it was found that the tendency of the rifle to drift to the left was reduced with the decreased velocity. In continuing these experiments powder charges were reduced progressively to 34, 30, and 28 grains, and a corresponding decrease of drift was found. With the charge of 28 grains the rifle shot centrally at a range of 50 feet.

With a view to determining the drift, using standard ammunition of 2,200 feet velocity, two barrels were made with left-hand twist and fired at 100 yards range in comparison with two standard barrels with right-hand twist. The results were remarkable, in that the left-hand twist appeared to have no effect upon the drift, which was to the left, and practically the same as that of rifles with the right-hand twist. In order to further test this matter, two rifles have been ordered with twists differing from the standard of 10 inches; one will have a twist of 8 inches and one of 12 inches.

A regular series of firings has been inaugurated in order to determine the drift of the rifle by firing in a calm. These firings have, so far, been made with only two rifles at ranges of 100 and 200 yards. It is to be remarked that the drift of the rifle to the left is considerably greater with the 2,200 foot-velocity ammunition than with the 2,000 feet, which confirms the experiments alluded to above, showing the drift of the rifle to the left decreases with the velocity.

As regards accuracy, a series of firings to determine the accuracy of the calibre .30 rifle with 2,200 foot velocity ammunition has been commenced with a selected rifle, and completed for ranges from 100 to 1,500 yards. In these firings, and also in those made for graduating the Buffington sight, which are carried along together, it is found that some 15 to 20 per cent. of the shots fall low on the target, indicating irregularity in the ammunition.

No firings have yet been undertaken at Granby range to determine the deviation due to wind. It is understood that firings made on the Texas range are to furnish data for this purpose, and until that data has been worked up it is uncertain what should be done here. The computation of trajectories, etc., needed to revise the descriptive pamphlet of rifle and carbine for the new initial velocity of 2,200 feet per second have not, so far as known, yet been made.

(To be continued).

ROUND THE TRADE.

Messrs. W. J. Jeffrey & Co. have recently issued a new edition of their price-list of cartridges.

Herr E. R. von Skoda, director of the great gun factory and steel and iron foundry at Pilsen, in Bohemia, died on August 8 last, of apoplexy.

On August 30 last a serious fire broke out at the Newcastle works of Messrs. Walker, Parker & Co. A good deal of valuable machinery was destroyed.

Messrs. Cogswell & Harrison, Ltd., have applied for registration of the word "Fusilite" as a trade mark in connection with fire-arms, ammunition, and explosives.

Mr. H. W. Williams, an ironmonger of High Street, Barnstaple, Devon, seeks in a recent *Trade Marks Journal* to register the word "Barumite" as a trade mark to be applied to cartridges.

Mr. R. B. Pollitt has recently been appointed works manager of the explosives factory in Cape Colony, which is being erected by the De Beers Consolidated Mines Co., Ltd. It will be remembered that Mr. Quinan is the responsible chief of this new departure of the De Beers Co.

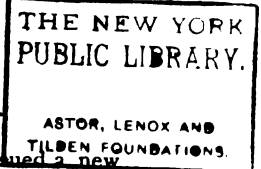
Miss Annie Oakley, the well-known American lady-shot, was recently the recipient of a presentation in the form of a loving cup of gold and silver. It was made on behalf of her friends at her old home at Greenville, Ohio, by Gen. C. M. Anderson.

Messrs. Kynoch, Ltd., have brought out a tasteful little pamphlet, containing full particulars of their smokeless powder, and of the types of cartridges into which it is loaded. The pamphlet is well illustrated, and forms a valuable little reminder to sportsmen of the variety of ammunition they can obtain from this well-known establishment.

The annual dissipation of the employes of the National Explosives Co., Ltd., of Hayle, Cornwall, this year consisted of a day's sports, which took place on Saturday, the 4th of August. Nearly 500 people sat down to the luncheon, which was provided by the Company, and for the various events contested after lunch some handsome prizes were presented.

Messrs. Lang & Hussey, Ltd., of New Bond Street, will shortly place upon the market two new rifles. The sizes of the bores will be .400 and .450, and the first will shoot a 400-grain nickel-coated bullet with 60 grains of Cordite, whilst in the second a cartridge, loaded with 70 grains of Cordite, and a nickel-coated bullet weighing 480 grains, will be used. The actions of the rifles will be of the falling block type.

The London premises, situate in Shaftesbury Avenue, of the Webley & Scott Revolver and Arms Co., Ltd., are undergoing some extensive alterations. The whole building is being taken over by the Company, so that a bigger stock of guns, rifles, revolvers, &c., may be kept for the convenience of the London retail trade. Mr. John Harriss, recently of Trulock, Harriss & Richardson, Ltd., of Dublin, is now Messrs. Webley's London manager.



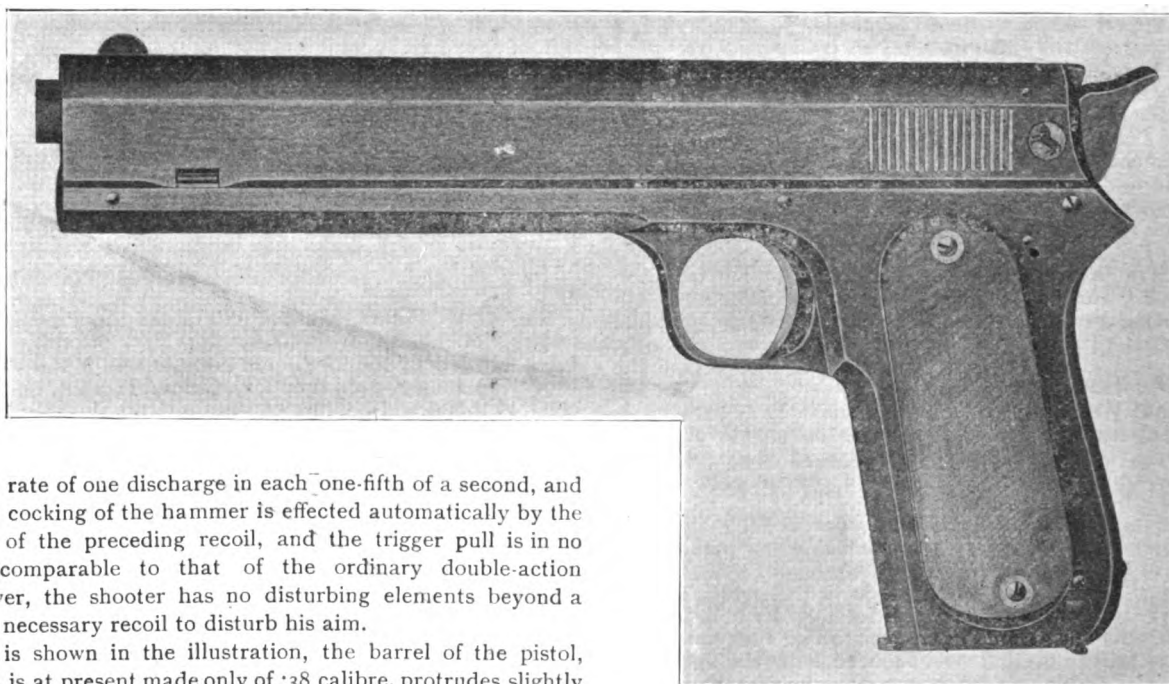
THE COLT AUTOMATIC PISTOL.

IN the accompanying illustration is shown the Colt Automatic Pistol, the right to manufacture which, so far as America is concerned, has been acquired from the patentee, Mr. J. M. Browning, by the Colt's Patent Fire Arms Manufacturing Company, of Hartford, Conn. As now made, however, the title automatic is somewhat a misnomer. The original model was hammerless and purely automatic, a single steady pressure of the trigger sufficing to discharge in rapid succession the whole seven cartridges contained in the magazine. This action has since been modified to the extent of providing a hammer and rendering the pistol only semi-automatic, so that a separate pull of the trigger is requisite for each discharge. In this amended form, the pistol is still capable of being completely emptied in $1\frac{3}{4}$ seconds, that is,

ber and making ready to fire is accomplished by holding the slide with thumb and forefinger at the places provided with corrugations to prevent slipping, just over the stock, and pulling the slide back smartly. This movement cocks the hammer, and the return action carries the top cartridge of the seven in the magazine forward into the chamber and closes the breech. At this point, the pistol is ready for use, except for the fact that a safety device, known as the firing-pin lock, and constituting the back sight—this being shown immediately above and in front of the hammer—requires to be raised. Until this is done, the weapon cannot be discharged.

We now come to the automatic, or at least semi-automatic quality of the pistol. The safety being raised and one cartridge discharged, the resulting force of the powder gases causes the slide and barrel to recoil together under suitable control, until the latter is stopped and the slide, still moving

THE COLT AUTOMATIC PISTOL.



at the rate of one discharge in each one-fifth of a second, and as the cocking of the hammer is effected automatically by the force of the preceding recoil, and the trigger pull is in no way comparable to that of the ordinary double-action revolver, the shooter has no disturbing elements beyond a slight necessary recoil to disturb his aim.

As is shown in the illustration, the barrel of the pistol, which is at present made only of .38 calibre, protrudes slightly in front, and is covered by a slide which is capable of a backward motion, and which effects the necessary motions of cocking the arm, working the breech mechanism and operating the supply of ammunition from the magazine. The magazine itself consists of a metal slide loaded into the stock of the pistol from below, and held in position by suitable clips, and in service it will be practicable to carry several of these magazines ready loaded, so that all that will be necessary to procure a constant supply of ammunition for the pistol will be to perform the simple operation of removing a magazine when emptied, and substituting a new one. To work the pistol from the start, it is first held in the left hand, and the magazine is withdrawn from the stock by releasing a catch at the heel of the stock. The magazine is then loaded with its complement of seven cartridges, and restored to its position, and the pistol may now be transferred to its proper position in the right hand. Now, the operation of loading the cham-

backward, cocks the hammer and ejects the empty shell sideways. On reaching its rearmost position, the slide is again drawn forward by means of a retractor spring, and encounters the second cartridge on its way, carrying it forward into the chamber of the barrel. The slide now engages automatically with the barrel, and the arm is ready for a second shot. This operation takes some time in the recounting, but in reality the whole action, between the firing of one shot and readiness for the discharge of the next, occupies barely one-fifth of a second, as has already been indicated. It should be mentioned that another safety device makes it impossible to release the hammer until the slide and barrel are properly interlocked in their forward position, and this device furthermore prevents the discharge of more than one cartridge for each pull of the trigger.

The calibre of the pistol is, as already stated, at present .38 only, and the weight is 36 ounces. It is used with ammunition loaded with smokeless powder, with a jacketed bullet, and the velocity of the ordinary charge is about 1,260 f. s., with a maximum of 1,350 f. s. with ordinary black powder. A .38 calibre Army revolver has a velocity of only about 750 f. s., but it is found that nothing less than about 850 f. s. would suffice to work this automatic pistol. With the normal velocity of 1,260 feet, the penetration is found to be about 11 inches of American pine. The accuracy of the pistol with this velocity seems to be extremely good.

In practice, the Automatic Pistol seems to be handy and easily controlled in its working, so that it can be fired rapidly or with deliberation as may be desired. A series of tests shows it to be capable of considerable mishandling and bad treatment without impairing its qualities, and that it will stand exposure and rust without serious hindrance to its efficiency. The pistol can be taken apart and reassembled readily enough, and its construction is such as to provide for easy access to the barrel for cleaning.

A word as to the inventor and patentee of the Colt Automatic Pistol. Mr. J. W. Browning, whose portrait is given here, is president of the firm of Browning Bros., of Ogden and



Salt Lake City, and has been intimately connected with the Winchester Repeating Arms Company since 1876, it being stated that every repeating and single-shot rifle and shot-gun brought out by the Winchester people since that date, with the exception of the Lee rifle, has been of his invention. In fact it is estimated that more than one million arms are in existence which embody his specialities, as protected by upwards of seventy patents. Among

other items, Mr. Browning is the inventor of the Colt's Automatic Machine Gun. He is forty-five years of age, and is a well-known sportsman in the West. Of course, in working out his inventions he has had the distinct advantage of having at his disposal the machinery and other help of the fine shops owned by his firm, Browning Bros. It is said that no fewer than 25,000 of the Browning (or Colt) Automatic Pistols have been sold during the last twelve months.

A certain number of these pistols are on sale in this country, but no final arrangements seem to have been made for handling them in a wholesale way. Probably those on the market have been specially imported from the States or the Continent. Possibly in a short period the Colt Company will be able to regularize the position, so that one may know where to obtain the pistol in a wholesale way from regularly appointed agents.

GLASSES FOR SPORTSMEN AND RIFLEMEN.—Messrs. Ross, Ltd., issue an illustrated price-list of their well-known optical instruments, which contains a very complete set of telescopes and field-glasses specially adapted for the use of shooters generally. The Ross double-telescope is practically a binocular glass, having the long range of a telescope with the benefits of double vision and the convenience and portability of an ordinary field-glass. Naval and sporting telescopes are also provided, in considerable variations of

magnifying power and price. For the automatic sighting of large guns at sea, equally with use as an ordinary magnifier, the Ross Gun Director Telescope is carefully designed, while for rifle-range and battery work the "Elcho" rifle telescope, with a capacity to show bullet marks distinctly at 1,000 yards, seems well fitted. A special feature is made of the new prismatic binocular glasses, which are so designed as to allow of independent focussing for each eye, this being maintained when once obtained irrespective of the double focussing for distances. The glasses contain an arrangement of prisms whereby a material shortening of the binoculars is effected with a corresponding increase of handiness and portability. Another speciality is the photoscope, an apparatus consisting of a binocular glass, a lens and shutter attachment, roll holder, two film cartridges for daylight loading, and a focusing screen, whereby photographs may be taken in the field. A variety of ingenious instruments and appliances are included in the catalogue, which do not fall within our scope.

CORRESPONDENCE.

MODERN RIFLE SHOOTING.

TO THE EDITOR OF *Arms and Explosives*.

Sir,—I do not wish to reply in any detail to your contemptuous criticism of my book "Modern Rifle Shooting." But I ask you to give me some show of fair play by allowing me a little space to contradict one or two serious errors.

You claim my table as your own "published last autumn." I wrote mine months before that—in the Easter holidays of 1899. I never saw your table at all, and have not seen it yet. Mine contains no exclusive information. I don't know or care what yours contains, I chose one hundredth of an inch as a unit of area because it is the area of a square of one tenth of an inch side. The square area one thousandth of a square inch has no easily recognised length of side, and was never in my mind at all. The true diameter of the government bullet is as accessible to me as to you, and as well known.

A gimlet advances in wood according to the pitch of its thread, and at a constant rate. A bullet's advance has no relation to its pitch of thread at all, and is never constant. I cannot suppose your reviewer does not know it. I can only surmise that he thinks any stick will do wherewith to beat a dog; and in his haste he has siezed a dirty and rotten one.

I never said the barrels of double rifles were bent outwards to compensate for anything. I might, truly, have said that I have seen one that was so bent to compensate for the ignorance and incompetence of the maker, who charged a big price for it all the same.

I am, etc.

Mistley, Manningtree,
August 20, 1900.

L. R. TIPPINS.

[We mention a few among the many coincidences which led us to assume that Mr. Tippings was indebted to our article for the material he appears to have produced independently of our aid.

1. Of 15 or 20 rifles Mr. Tippins happened to choose the same seven as ourselves, with but one addition, viz., the Snider, which he has inserted on his own account.

2. The velocity of the .236 U.S. Navy Rifle was stated in our issue of March, 1898 as 2,550 ft.-secs. The Winchester

catalogue gives it the same figures. In our article of November, 1899, we stated it at 2,500 through a misprint. Mr. Tippins has fallen into the same error.

3. Eley's catalogue specifies several different weights of bullet for the .500 bore express rifle. Mr. Tippins happens to have chosen the same as ourselves.

4. Messrs. Eley Bros. supplied us privately with the velocity of the .500 Express, viz., 1817 ft.-secs. Mr. Tippin makes it 1,810 ft.-secs. We find that these are observed velocities, and that 1,900 ft.-secs. is about the average muzzle velocity, the other values in the table being generally "muzzle" and not "observed."

5. We stated the nominal bore of the Spanish Mauser at .275 in., and gave the corrected diameter as .2809 in., thus making it appear that the difference .0059 was the depth of rifling, and Mr. Tippins actually states this incorrect depth in his table. Mr. Tippins, in his process of adding two depths of rifling to the bore, has added twice .0059 to the nominal diameter, .275 in., thus making it .2868 in. Now the correct bore is .2756, and the depth of rifling .0053. By adding these two together we arrived at our corrected diameter of .2809. Mr. Tippins' diameter, obtained by adding two depths of rifling to the bore, should, therefore, have been .2862. The error of .0006 is clearly traceable to his want of knowledge of the true bore of the Spanish Mauser, this not having been stated in our article.

6. Mr. Tippins has not made the same mistake in regard to the Mannlicher, the true bore—viz., .2569 in., having been stated in the body of our article, though not in the table.

7. The accuracy of the author's independent research may be tested by the particulars given respecting the Snider rifle. He states the depth of rifling at .012 in. This, we admit, is the depth at the breech, but for his purpose the depth, .005 in. at the muzzle, should have been used. He states the corrected diameter as .600 in., whereas, working on his system, and using correct values, it should have been .587.

8. In referring to the Lee (U.S.) Rifle we stated that at 500 yards there was equality of results as compared with the Lee-Enfield. We thought, when writing this, that we were quoting *verbatim* from a private letter we received from the Winchester Arms Company; but we now find that no specific distance was indicated. Mr. Tippins happens to have guessed the same as ourselves.

We can only add that our columns are open to Mr. Tippins for the purpose of explaining the above coincidences and a number of others which we are prepared to quote. We will not occupy further space by referring to other issues raised by Mr. Tippins. For instance, it is sufficient answer to the last paragraph of his letter to suggest he should refer to page 262 of his book, when he will see before him the very assertions he now repudiates.—ED. A. & E.]

REVIEW.

Shooting. With Game and Gun Room Notes. By "Blagdon." Published by Cogswell and Harrison, Ltd., London. Price 1s. and 1s. 6d. nett.

An interesting addition to the literature dealing with shooting has recently made its appearance under the above title. Evidently written by a man of extensive practical knowledge, whose identity is shielded by the *nom de plume* "Blagdon," the matter contained in this little volume, although more especially written for the benefit of the less experienced type of shooter, and for those who from some cause or another are dissatisfied with their shooting, will no doubt appeal to the interests of every sportsman who uses the gun.

The book opens with a chapter on how to shoot, and the pithy paragraphs and notes comprising this chapter, illustrated by numerous photographs, give a very clear and concise idea

to the young shooter—first, how he should carry his gun in the field, and then, when this and other elementary lessons are learned, the way in which crossing, rising, and driven birds should be taken.

Chapters on gun-fittings, modern guns, and ammunition follow, and the last-named brings to an end what might be called the technical portion of the work. The closing chapters on grouse, partridge, and pheasant shooting are well written, and among the illustrations we notice three by that fine artist, Archibald Thorburn. Pigeon and inanimate bird shooting receive attention at the end of the book, and for the benefit of those who indulge in either of these sports, the official rules connected with each are printed.

APPLICATIONS FOR PATENTS.

JULY 16—AUGUST 18, 1900.

- 12,840. Drop-down Guns and Rifles. J. W. Smallman.
12,854. Percussion Fuses for Projectiles. A. Reichwald (Agent for *Fried. Krupp*).
12,896. Gun Sights. C. Woods (Agent for *A. G. Phillips*).
12,988. Locks for Fire-arms. F. E. Jaeger, and C. Bittiner.
13,000. Trigger Shield for Small-arms. F. Garrett.
13,060.* Motor Gun Carriages. H. J. Lawson.
13,101. Telescopic Sights. E. Dönitz.
13,216. Machine Guns. W. G. Potter.
13,240. Bayonets. H. H. Watson.
13,250. Machine Gun and Carriage. W. H. FitzGerald.
13,276. Sighting Apparatus. F. W. Golby (Agent for *P. Pascolotti*).
13,337. Breech-loading Ordnance. A. T. Dawson and G. T. Buckham.
13,433. Projectile-hardening Process. Sir A. Wilson.
13,450. Machine Guns. W. G. Potter.
13,471. Miniature Tubes for Ordnance. A. T. Dawson, J. Ramsey, and T. E. Riddle.
13,549. Machine Guns. W. G. Potter.
13,550. Small-arms. W. G. Potter.
13,551. Small-arms. W. G. Potter.
13,570. Range-Finders. G. Forbes.
13,584. Sights for Ordnance. A. Reichwald (Agent for *Fried. Krupp*).
13,622. Torpedo Steering. C. J. Varicas.
13,649. Automatic Fire-arms. C. H. R. Clausius.
13,687. Machine Guns. W. G. Potter.
13,754. Gun-cotton Moulding Presses. W. B. Challen.
13,756. Fuse-igniting Apparatus. C. E. Tyack and H. T. Robinson.
13,797. Indicating Device for Ordnance. M. W. Marland.
13,800. Small-arms. W. G. Potter.
13,808. Targets. A. G. Haywood.
13,941. Fuse for Bursting Shell under Water. E. M. T. Boddam.
14,122.* Automatic Fire-arms. G. Roth.
14,123.* Automatic Fire-arms. G. Roth and C. Konka.
14,261. Breech Mechanism for Ordnance. A. Reichwald (Agent for *Fried. Krupp*).
14,262. Fluid Pressure Brakes for Ordnance. A. Reichwald (Agent for *Fried. Krupp*).
14,269. Sighting and Firing of Small-arms or Ordnance. A. Gajardo.
14,313. Apparatus for Adjusting Machine Guns. C. Renier.
14,342. Ordnance. Sir G. S. Clarke, K.C.M.G., F.R.S.
14,362.* Double-barrelled Shot Guns. C. E. Goodwin.
14,403. Small-arm Ammunition. J. H. Kay.
14,471. Cartridge Clips for Magazine Rifles. J. C. Baxter.
14,576. Magazine for Small-arms. O. H. J. Krag.
14,585. Built-up Guns. G. C. Marks (Agent for *G. T. Glover*).
14,599. Fuses for Projectiles. H. V. C. Keeson.
14,674. Gun Carriages. W. E. Rowlands.
14,676. Cartridge Belt. R. M. Presland.
14,695. Safety Device for Repeating Fire-arms. F. Neuber, J. Tambour, and C. Colvert.

- 14,742. Water Jacket for Machine Guns. J. Andrew and W. T. White.
 14,777. Breech Mechanism of Automatic Fire-arms. H. W. Gabbett-Fairfax.

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

JULY 28—AUGUST 25, 1900.

- 9,335 (1899). **Mountings for ordnance.** A. T. Dawson, London, and J. Horne, Barrow-in-Furness. In connection with barbette or turret guns a lift shaft is attached to and revolves with the mounting. The shaft is provided with cages for explosive charges and projectiles, and a bogie for charging the cages is provided in the shell room. Inclines in the barbette or turret for the travel of the ammunition to position behind the gun are also described. Accepted August 3, 1900.
- 9,415 (1899). **Mountings of large calibre guns.** A. T. Dawson, London, and J. Horne, Barrow-in-Furness. Large-calibre twin guns in barbettes or turrets are mounted independently on a turntable, revolving on a roller path carried within the barbette but independent of the structure supporting the barbette. The roller path is protected in this way from destruction should the barbette be distorted or partially destroyed. The guns and mountings are protected by a circular shield, and below the turntable is a chamber from which the ammunition is raised to the gun. Accepted August 4, 1900.
- 9,417 (1899). **Mountings for ordnance.** A. T. Dawson, London, and J. Horne, Barrow-in-Furness. A great many modifications are described in this patent in connection with the mounting of single barbette or turret guns of moderate calibre. The gear for elevating and training the gun, either by hand or motor power, and the machinery for supplying the gun with ammunition, are also described very fully. Accepted August 4, 1900.
- 11,398 (1899). **Trigger mechanism for double-barrelled drop-down small-arms.** J. S. Heath, Birmingham. The two triggers in this mechanism are so arranged that the grasp on the stock need not be relaxed in order to pull off the second barrel. The second trigger is held by a sear in a forward position. The pulling of the first trigger removes the retaining sear and the second trigger, under the influence of a spring, is caused to take up the position which is vacated by the first trigger after the firing of the first barrel. Accepted June 30, 1900.
- 15,312 (1899). **Automatic guns.** Kynoch, Ltd., and E. W. Anderson, Birmingham. The primary object of the present patentees is to produce a more simple automatic recoil-operated gun than any one which is at present in use. A great many parts receive attention, principally the cartridge feed arrangements, and the various modifications are described and illustrated in rather a bulky specification. Accepted July 14, 1900.
- 15,851 (1899). **Torpedoes.** E. Kaselowsky, Germany. A method of steering that type of torpedo in which a straight course is maintained by means of gyroscopes. The course taken by the torpedo when launched depends upon the relative position of the normal position of the auxiliary motor distributing gear to the normal position of the gyroscopic fly-wheel. This patent consists in a method of varying the course of the torpedo either by altering the combined lengths of the rods between the fly-wheel and the side valve of the motor, thus altering the position of the side valve with regard to the inlet or outlet ports, or by leaving the rods unchanged, and by opening and closing the ports of a rotary valve governing the motor. Accepted August 2, 1900.
- 16,595* (1899). **Blasting explosives.** C. H. Curtis, London, and G. G. André, Glenlean.
- 17,055 (1899). **Gun mountings.** Sir W. G. Armstrong, Whitworth and Co., Ltd., and Sir A. Noble, Newcastle-on-Tyne. Two guns are mounted in cradles which are arranged side by side. The cradles are each supported by a pair of trunnions, the axes of which are all in the same line. If necessary the cradles may be coupled together by means of two longitudinal locking keys, and may be sighted and worked as a single gun. Accepted July 7, 1900.
- 18,127 (1899). **Fuses for projectiles.** Sir W. G. Armstrong, Whitworth & Co., Ltd., and A. G. Hadcock, Newcastle-on-Tyne. In order to prevent the time fuse in a projectile turning after the firing of the shell, a supplementary ring, composed of some soft metal, is attached to the fuse-head. This supplementary ring is so constructed that the shock of firing forces two rings or edges formed on the bottom of the main ring into two corresponding serrated grooves in the time ring. The time ring is thus firmly locked and cannot turn during the projectile's flight. Accepted July 14, 1900.
- 18,337 (1899). **Sliding target.** O. Williams, Conway. The duplicate targets are mounted on a framework, and are adapted to slide horizontally in grooves at the bottom and on metal rails by means of upwardly projecting hooks at the top. The marker is enabled by this arrangement to work the targets from a mantlet by means of cords and pulleys without any delay. Accepted July 7, 1900.
- 18,520 (1899). **Igniting fuse for blasting.** E. Fox, Australia. A modification of the method of conveying a spark to the trail of fuse by means of a wax vesta. The old method has two objections: first that a certain amount of fuse is wasted, and second the wax vesta frequently falls out of position after adjustment. The present device is designed to overcome these difficulties, and it consists in attaching a metal head to the end of the fuse. The metal cap is so constructed that it is capable of holding the head of the vesta firmly against the core, and at the same time permits the admission of sufficient air to enable the vesta head to burn. Accepted July 28, 1900.
- 19,544 (1899). **Detonators for signalling.** V. von Newman, Austria. A detonator for railway signalling in which the explosive charge preferably consists of non-shattering stable black powder, the charge being incorporated with ignition caps mounted on nipples. The signal is also rendered visible by combining with the charge some illuminating substance. The detonator case is so constructed that the fragments are not dispersed in all directions, the force of the explosion being downwards, the bottom of the detonator case being made weaker than the upper part. Accepted July 28, 1900.
- 19,695 (1899). **Time fuses.** Sir W. G. Armstrong, Whitworth and Co., Ltd., and G. Stuart, Newcastle-on-Tyne. A method of setting the composition ring of a time fuse whereby no key is required. The fuse may be set in the dark, the setting being regulated by the number of clicks proceeding from a ratchet spring which is adapted to enter teeth cut upon the ring. Accepted August 4, 1900.
- 20,155 (1899). **Machine guns.** F. M. Garland, U.S.A. A recoil-operated machine gun in which the barrel and breech move backwards together for a certain distance after a discharge. The barrel is stopped at a certain point, but the breech block advances backwards still further until it is retained by a catch against the pressure of a spring tending to urge it forward again. The ejecting, cocking and loading operations are performed by the block in the backward and forward travel. Accepted July 14, 1900.
- 22,321 (1899). **Cartridge belts.** W. Lindsey (agent for T. C. Orndorff, U.S.A.) A cartridge belt composed of woven fabric, in which the cartridge pockets form part of the belt. The ends of the belt are provided with some convenient fastenings, so that as the cartridges are withdrawn and the belt gets longer it may easily be pulled in. Accepted August 4, 1900.
- 22,599 (1899). **Disappearing-gun mountings.** A. Reichwald, (Agent for Fried. Krupp, Germany). Disappearing-gun mountings designed to obtain a more favourable path of recoil than heretofore. This is effected by connecting two points of the gun carrier with two points on the carriage by crossed levers. By this arrangement the carrier is caused to swing in an arc of a circle and receives an approximately horizontal motion. For raising the gun again to the firing position a weight, vertically guided, is connected with the lower link pivot of the carrier. Accepted July 28, 1900.
- 25,127 (1899). **Walking-stick gun.** C. Ramus, France. A barrel to which is attached a movable breech, both mounted inside a cane. The breech is arranged in the handle, and is capable of sliding within a tube. A special device is connected with the trigger for preventing any inadvertent firing of the loaded stick. The turning of the handle of the stick releases it, and makes the gun ready for firing. Accepted July 21, 1900.
- 2,735 (1900). **Rifle sights.** E. H. Parsons, Bournville, and L. B. Taylor, Bournbrook. A tangent military back-sight for rifles, so constructed that it is capable of a lateral motion for wind-gauge purposes. The lateral movement is effected by

- bodily moving the leaf of the sight across its bed, and one advantage claimed for this arrangement is that the V is always centrally situated in relation to the leaf. The leaf is attached to a pin passing through the bed and projecting a little beyond each side, so that the leaf may be readily shifted by hand. Accepted July 7, 1900.
- 4,585 (1900). **Projectiles for ordnance.** J. M. Herring, Mapperley. A number of subsidiary shells, each provided with a time fuse, are packed in the main shell with the explosive. The main shell may be provided with either a time or percussion fuse, and when it bursts the smaller shells are scattered and burst subsequently to the bursting of the main charge. Accepted July 21, 1900.
- 4,970 (1900). **Automatic fire-arms.** R. H. Kjellman and G. L. Andersson, Sweden. Automatic recoil-operated mechanism for small arms in which the barrel and breech-frame only recoil. In the breech-frame is mounted a lever which during the recoil is turned upon its pivot and is caused to move the breech-bolt rearwards. The breech-bolt can, therefore, through this lever, be moved rearwardly by hand without at all influencing the breech-frame or barrel. Accepted July 28, 1900.
- 5,099 (1900). **Automatic fire-arms.** S. McClean, U.S.A. In a very long and bulky specification the patentee describes the construction of automatic and semi-automatic fire-arms. The primary object of the construction is to withstand the force of recoil, and for this purpose the mechanism is adapted to receive the strain in the line of greatest strength. Controlling devices for governing the action of the actuated force of the gases on the operating parts are clearly explained. Accepted July 21, 1900.
- 5,223 (1900). **Automatic fire-arms.** G. Roth and C. Krnka, Austria. Modifications in automatic pistol mechanism, consisting in providing means for locking and retaining the barrel in a rearward position until the movable breech-block has been properly locked, and is in position for firing the next shot. Certain modifications in connection with the magazine and cartridge-lifting devices, trigger actuating mechanism, a safety device in connection with the hammer and in the cartridge clip are also described. Accepted July 21, 1900.
- 7,029 (1900). **Transferring heavy ordnance.** W. L. Wise (Agent for *The Skodawerke Actien-Gesellschaft, Austria*). Apparatus for transferring heavy ordnance from the carriage to the firing position. Foot-bearings are sunk into the ground and screwed spindles, the ends of which are adapted to enter the foot-bearings, are inserted into nuts provided in the base-plate of the gun. The turning of the spindles raises the base plate on which the gun is fixed, so that the carriage can be withdrawn from beneath, and the opposite turning of the spindles gradually lowers the gun and base plate to the ground. The gun is remounted by a reverse operation. Accepted July 21, 1900.
- 8,997 (1900). **Breech-loading ordnance.** H. J. Haddan (Agent for *M. B. Madden, E. Burkins, J. C. Buckner, U.S.A.*) A method of obtaining greater rapidity of fire with heavy ordnance by means of a bottomless magazine, which is mounted upon the rear of the gun, and is adapted to deliver the ammunition by means of the carrier to the bore of the gun. Accepted August 4, 1900.
- 9,642 (1900). **Cartridge belts.** A. J. Boulton (Agent for *A. Mills and T. C. Orndorff, U.S.A.*). A cartridge belt composed of woven fabric in which the cartridge pockets are woven integral—that is, in one piece. To prevent cartridges falling out a flap is provided, which also forms a direct part of the woven whole. The modified method of construction of this belt may be used in connection with Patents Nos. 2,495 of 1889 and 20,603 of 1893. Accepted July 28, 1900.
- 10,635 (1900). **Trigger mechanism for small-arms.** E. M. Liebert, Germany. The ordinary trigger beneath the stock is dispensed with in this mechanism, and its functions are carried out by a device situated on the top of the grip. It consists of a sliding arrangement somewhat similar to a safety on a sporting gun, and is worked by the thumb. Accepted July 28, 1900.
- 11,241 (1900). **Small-arms.** F. V. W. Sauer, Germany. A device for small arms, adapted to indicate whether the hammer is cocked or not. It consists of a slotted spindle, the inner extension of which engages with a slot in the hammer. When the hammer is not cocked the slot in the spindle is horizontal with the axis of the gun. When cocked it slants away from the horizontal. Accepted August 4, 1900.
- 11,567* (1900). **Manufacture of explosives.** J. B. Burnado, U.S.A. A method of forming a colloid which may be used itself, after drying, as a powder, or which may be used as an explosive cementing agent, or binder in connection with other materials used in the manufacture of smokeless powders. The method consists in subjecting soluble nitrocellulose and a colloid agent, such as acetone or ether-alcohol, to a temperature equal to or below that of freezing water, and in evaporating off the excess of solvent in the resultant product. Accepted Aug. 4, 1900.
- 11,604 (1900). **Primers for ordnance.** W. L. Wise (Agent for *The Skodawerke Actien-Gesellschaft, Austria*). A primer for electrical and percussion firing in metal cartridge cases, in which a wire is inserted in, and insulated from, the screw body of the primer, and is connected with an incandescing wire, so as not to interfere with the means for percussion firing. Accepted July 28, 1900.
- 11,605 (1900). **Primers for ordnance.** W. L. Wise (Agent for *The Skodawerke Actien-Gesellschaft, Austria*). A compound primer arrangement for ordnance, in which metal cartridge cases are not used. Should the electrical arrangement go wrong the percussive system may be used immediately for firing the shell. The electrical wires are specially arranged so that the means for percussion firing shall not be interfered with. Accepted July 28, 1900.

* This Specification is more fully described under "Selected Patents."

SELECTED PATENTS.

BLASTING EXPLOSIVES.

16,595 (1899). C. H. Curtis, London, and G. G. André, Glenlean. This patent relates to a blasting explosive in which is secured two separate actions, the quick shattering effect of a detonating compound, and the slow rending action of a mechanical mixture of the gunpowder type. These compounded effects are produced by blending two explosives, one of the detonating, and the other of the non-detonating class. The advantages attached to such a compound as this are obvious. When a slow action is required, such as for breaking down coal, the explosive is fired by an ordinary fuse, and when a quick shattering effect is desired, as in rockwork, a detonator is used.

Of the non-detonating class, gunpowder is selected as being the most suitable, and an explosive is compounded of nitrate of barium and nitrate of potassium, or one of these with paraffin coke or a low-burned charcoal, such as slightly-charred woodmeal. The highest grades of guncotton are used to form the detonating portion of the compound; and the patentees have discovered that a mixture containing only 10 per cent. of such guncotton can be detonated; an ordinary No. 6 detonator must, however, be used.

In the manufacture of the explosive the non-detonating mixture is first compounded, and the following is an example of the proportions in which the various substances are mixed:—

Barium nitrate..	..	..	62 lbs.
Potassium nitrate ..	..	..	20 lbs.
Paraffin coke ..	..	..	12 lbs.
Charred woodmeal ..	..	..	6 lbs.
			100 lbs.

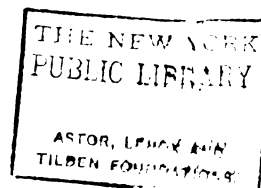
Of this explosive 88 lbs. is taken and is mixed with 12 lbs. of best guncotton, and the whole is thoroughly incorporated under edge-runners. The resulting cake, in its wet state, is then either rubbed through sieves, to granulate the explosive, or it is pressed into pellets.

When an explosive constituted in this manner is ignited by fuse, no detonation takes place. Ignition and combustion occur gradually, and the effects of the explosion are similar to those which are characteristic of gunpowder; but when fired by a detonator the guncotton detonates immediately, simultaneously igniting every particle of the mixture. The result is, therefore, practically a detonation of the whole. It is stated also that this explosive is cheap to manufacture. Accepted July 21, 1900.]

Arms & Explosives

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CURRENT TOPICS.

Gunnery in the Navy.—It is to be regretted that the list of prize-firing returns for the British navy during the year 1899 shows no very decided signs of improvement in the gunnery practice of different vessels, despite the fact that the question of good shooting is now regarded as of paramount importance by every nation which possesses warships. Certainly, the figures for 1899 contrast favourably in the aggregate as compared with those of the previous year, but then the shooting of 1898 was by no means what should be expected of a navy whose efficiency in all departments is of such vital importance. Herewith we give a summary of percentage with the different classes of guns, which can scarcely be regarded as satisfactory. As the result of 252 rounds fired with the 16½ in. (110½ tons) and 13½ in. (67 tons), there was a percentage of 33 hits in 1899 as compared with 29·96 per cent. in 1898. H.M.S. *Sanspareil*, generally considered as one of the most serviceable vessels in the Reserve, has again achieved unenviable notoriety in this class by only averaging 12½ per cent. of hits with her two 110½ ton guns. In the aggregate, the 12 in. wire gun shows no better results than the older and larger calibres, for out of 187 rounds fired, only 33 per cent. scored hits, against 27 per cent. in the previous year. The best shooting in this class was achieved by H.M.S. *Cæsar*, of the Mediterranean Squadron, which scored 11 hits out of 20, and next to her came H.M.S. *Victorious*, on the China station, with the same number of hits in 21 rounds.

On the other hand, H.M.S.S. *Majestic* and *Magnificent*, in the Channel Squadron, scored only three hits in 20 rounds, and two hits in 17 rounds respectively, and H.M.S. *Mars* was only fractionally better with five hits in 25 rounds. With the 10 in. gun 185 rounds produced 33 per cent. of hits during last year. Taking the 9½ in. and 8 in. guns in conjunction, a total of 288 rounds showed a result of 34 per cent. in hits during 1899, as compared with 43 per cent. in the previous year, this being a falling-off which should call for explanation. Finally, the 6 in. gun is credited with 1,277 rounds, registering only 28 per cent. of hits for 1889, as compared with 24 per cent. in 1898. The discrepancies that are to be found between the best and worst results with one type of gun, as say 66 per cent. and 12½ per cent., serve to indicate that it is the men who are at fault rather than the gun. A remedy would undoubtedly be found in making a material increase in the allowance of ammunition for target practice. Experience and expediency both dictate this extra expense on behalf of our sea, equally with our land, forces.

Explosion at a Cartridge Factory.—On the 10th ult. an explosion occurred at the cartridge factory of Messrs. Eley Brothers, Ltd., in Gray's-Inn Road, W.C., which resulted in the death of three persons and the infliction of severe injuries on two others. Pending the inquiry which will in due course be held by H.M. Inspector of Explosives, it would of course be premature to attempt an explanation of the causes giving rise to this fatal accident. From the evidence given at the coroner's inquest, however, it appears that the explosion

occurred outside a muffler, which was utilised for the destruction of waste caps. These caps are sent down from the company's factory at Edmonton for this purpose, and prior to being transferred, are subjected to a prolonged boiling for fourteen days, in order to neutralise the explosive quantities of the fulminate of mercury used in the detonating composition. On the face of it, the inference naturally drawn from the circumstances of the occurrence, tends to the assumption that, either through inadvertence or otherwise, the two boxes of empty waste percussion cap shells, which appear to have caused the disaster, must also have contained a quantity of high explosive. Whether this were so, and if so, how the presence of the explosive escaped detection, will no doubt form features of the Government inquiry. In any event, we heartily sympathise with Messrs. Eley Brothers, Ltd., under the sad circumstances attending the regrettable fatality.

Nitro-Powder under Fire.—A remarkable occurrence took place recently on the other side of the Atlantic which is likely to modify some of the distrust with which modern high explosives are regarded. A floating powder magazine off the shore of New Jersey was, during a violent thunderstorm on August 12th, struck by lightning. It was owned by Messrs. von Lengerke and Detmold, of New York, and was under the charge of Captain Jansen, who, with his wife, was on board at the time. The cabin was set on fire and completely gutted before Captain Jansen could get the mastery of the flames. In a few minutes, however, there was further cause for anxiety, for the contents of the hold were also ignited by the same flash, and those contents comprised fifty cases of nitro-powder—American E.C. Smokeless—each containing ten five-pound tins, in addition to a quantity of black powder. Fortunately, only the nitro-powder was affected, and though the whole of it was more or less damaged, there was no explosion, the powder burning away comparatively harmlessly. To show the nature of the damage, in one particular case not a single tin was left whole, the solder melting away, the sides falling apart, and the contents burning away to the last particle. Fortunately, the boxes containing black powder were only slightly damaged, though the labels on the tin cases had been stripped and deposited in charred fragments at the bottom of the boxes. Had this black powder ignited, there can be no doubt that the effects of the fire would have been far different from what happily occurred, and to this extent the smokeless powder appears to have emerged triumphantly, to a certain degree, from a crisis that could hardly have been met with equal success by the older compound.

Weapons and Wounds.—So much has been written at various times on the subject of the effect that the improvements introduced into modern firearms would produce in rendering wars more destructive to human life, if not actually self-prohibitive, that it is well to consider the facts of the matter as exemplified in the present war in South Africa. Admittedly, it is impossible at the present juncture to obtain complete returns of the British casualties with their permanent consequences. There are injuries, the nature of which cannot be gauged accurately within a short space of time. Already there are instances in which a "case" abandoned as hopeless, has achieved a marvellous and complete recovery. In other instances, a casualty that has apparently presented no very serious features has resulted in a permanent loss of

some faculty essential to a proper enjoyment of life. With these examples in view, it is difficult to do more than arrive at a rough and ready approximation of the ultimate effects of wounds inflicted by modern arms of precision. As regards the more immediate results of the development of greater efficiency in the weapons of combatants, however, it is permissible to judge with some degree of accuracy. So far from war being rendered "impossible" by latter-day improvements, the exact contrary seems to be indicated. Obviously, it would be difficult, in view of the desultory and scattered nature of some of the actions fought in South Africa, to calculate the percentage of casualties to the number of men engaged, but from such data as are available a reasonable inference may be drawn that the killing of one man in a war of 1900 involves well nigh the same expenditure of lead as was calculated to produce a similar effect in Peninsular days. The explanation of this levelling of the modern small-bore rifle down to the efficiency of the historic Brown Bess, lies in the difference of range at which they respectively came into use, this being a factor overlooked by the people who incline to the view that war is now being rendered impossible. With respect to the number of men wounded in South Africa, it is found that the proportion borne to the total muster of combatants seems to show a marked similarity with the statistics collected from former wars, while the severity of the wounds has been considerably reduced. Thanks to the clean wounds inflicted by the small-bore, high velocity, nickel-coated bullets of modern rifles, and the great advance of surgical skill during the last few decades, the percentage of recoveries from injuries has now reached a figure far beyond all previous records. It would appear, therefore, that science, so far from rendering war impossible, has merely made it more humane, by reducing its butchers' bill in the item of ultimate consequences.

United States Ordnance.—Work at the gun factory at the Washington Navy Yard appears to be progressing with as much activity as was shown in the height of the Spanish war, and the task of installing new gun machinery is being undertaken with so fierce a vigour that there seems some ground for the anticipation that shortly the ordnance factory will have no superior in the world as regards its capacity for the manufacture of guns and their mountings. At the present time considerable interest is shown in a new 7.5-in. quick-firing gun which is under construction, and which is intended to prove the natural successor to the standard 6-in. gun now in use. Considerable difference of opinion is expressed as to whether the calibre adopted for the new gun, and its projected weight of shot and muzzle velocity, constitute the ideal to be aimed at, but the general weight of expert evidence is on the side of the 7.5-in. calibre, which is thought to be sufficient to meet the latest conditions of the service, and the present development of armour production. In any case, the result of the tests to be made of the new gun will be awaited with great interest.

The Boer Artillery.—The capture of two Creuzot 75-mm. guns at Crocodile River accounts for some portion of the most formidable field-pieces which have been brought into action against us in South Africa, but even now it is not known with any certainty exactly how many of these Schneider-Canet guns have been in use. According to the Intelligence Depart-

ment of the War Office, one battery was in the possession of the Boers before the outbreak of war, and it is believed that a further consignment was got through in some fashion or another during the progress of the campaign. Judging by the singularly ineffective results of Boer artillery fire throughout the war, however, it would appear as though no great number of guns had been available. The Boer tactics were diametrically opposed to those of European artillery, and consisted in treating each gun as a single unit. As a consequence there was never any attempt at the convergence of fire which is a standing practice in Europe, and which alone can produce the most deadly effect. In fact, the Boers seem to have sacrificed efficiency to mobility of action, constantly shifting the position of the guns to avoid being located, and always taking care to place them only in positions whence a rapid retreat could be ensured. To secure this extreme mobility, towards the close of the war, teams of mules were substituted for the horses originally employed, both for the gun limbers and the ammunition wagons, and the teams were driven from the limber seat. Had the Boer field artillery been served with the same dash and concentration of purpose as our own, it would have achieved more than to create merely a feeling of discomfort and produce an open formation. Their heavier guns produced results quite disproportionate to their large calibre and superior range and weight of metal, merely through being worked on a better system of tactics.

THE DANGERS OF PICRIC ACID.

It is possible that the conclusions arrived at by Captain J. H. Thomson, H.M. Chief Inspector of Explosives, after a careful examination of the circumstances attending the explosion of picric acid at the factory of Messrs. Read, Holliday & Sons, Ltd., at Huddersfield, on May 30th last, will lead to the formulation of stricter rules concerning the manufacture and handling of this explosive. Strangely enough, it is only within the last quarter-century or so that the explosive qualities of the acid have been recognised, though it has been in use as a dyeing material since its discovery by Hausmann in 1788. It was never considered commercially as an explosive until, in 1885, M. Turpin patented its use in shells. Three years later, when that inventor offered his discovery to the British Government, it was introduced into the Service under the name of Lyddite. Prior to that, however (in 1873), Dr. Sprengel, in a paper read before the Chemical Society, remarked incidentally that picric acid by itself contains a sufficiency of oxygen to render it, without the aid of foreign oxidisers, a powerful explosive when fired by a detonator. At the time this seems to have been regarded as a matter possessing only theoretical value, and it was not until 12 years later that M. Turpin's researches caused picric acid to become known as a more powerful explosive than dynamite. This conclusion was materially confirmed by the occurrence of a disastrous explosion at Cornbrook, near Manchester, in June, 1887.

As a result of the Cornbrook disaster, an Order in Council was made which brought the acid within the provisions of the Explosives Act when manufactured for any purpose, unless it is wholly in solution, or is manufactured in a building exclusively appropriated to the purpose, and is prevented from coming into contact with any basic metallic oxide or any sub-

stance with which it can form an explosive mixture. The conditions as set down were capable of being complied with so readily that no application was made for a licence to manufacture picric acid purely for non-explosive purposes. In 1889, however, a licence for a factory at Reddish, near Manchester, was applied for and granted, in order to meet the demands of the War Office. The usual terms applicable to other explosives were not imposed in this licence, the only important restriction being that the picric acid should be prevented from coming into contact with metallic oxide. War Office contracts at that time did not prove very extensive, and the factory found little employment; and since the use of picric acid as a dyeing material was now becoming superseded by other chemicals, the manufacture of the acid for any purpose was small in extent for some years. In 1898 the issue of tenders by the War Office for considerable quantities of the explosive led to the establishment of several new factories, so that at the present time seven licences are in force. For the most part they are on the same lines as the one first issued, it still being assumed that picric acid by itself, in whatever quantity, will burn without explosion. Arguing by analogy from the disastrous explosion of chlorate of potash, which hitherto had been regarded in the same light, at St. Helens, doubts were entertained as to whether this assumption would hold good if the quantity of picric acid were considerable. As a consequence of the misgivings engendered by this accident, it was subsequently decided to limit the amount of picric acid in any one building, and this limitation has been imposed in recent licences. As a matter of fact, the licence granted to Messrs. Read, Holliday & Sons, Ltd., was too far advanced at the time to come under the new decision, but it may be noted that the total amount of explosive which was present in the building at the time of the accident already referred to was well within the limitations imposed subsequent to the granting of the licence.

It will be instructive here to give details of the features attending the fire and explosion which formed the text of Captain Thomson's remarks. The accident, which, fortunately, was attended by no loss of life, and indeed no personal injury worthy of mention, occurred in that compartment of a building specially devoted to drying picric acid, and containing at the time 2,700 lbs. of the acid, a second compartment being utilised as a packing-room, and containing 4,500 lbs., while beyond that was a smaller compartment used for wringing the picric acid crystals by means of a centrifugal or hydro-extractor, and having in it 2,800 lbs. of the explosive, this lot being more or less moist. At the time of the accident a mechanic and his labourer were engaged in repairing a leaky flange in a steam-pipe which ran across the end of the passage separating the drying stove from the packing room. The mechanic was working in the passage, whilst his labourer was assisting from inside the stove by prising the pipe back with the aid of a wrench. The former, wishing to raise the pipe, placed a cold chisel beneath it and tapped it with a hammer. Immediately, a flash was seen to pass along the pipe and to follow it through an opening, about six inches in diameter, into the stove, which contained at the time, as has already been mentioned, picric acid to the amount of about 2,700 lbs. This at once took fire, and an attempt to extinguish it proved unsuccessful. According to eye-witnesses, the fire burned with great intensity for about eight minutes, when the roof of the entire building fell in. At this moment, a man

standing in an elevated position was able to look right into the compartment, and states that the drying stove had nearly burnt out, but that the packing-room "looked like a furnace." Half a minute later, a violent explosion occurred, which completely demolished the whole building, scattering the débris in all directions. The explosion developed an immense cloud of black smoke, whereas the fire which preceded it was described as having been almost smokeless. A subsequent examination of the site showed conclusively that the explosion was confined to the packing and centrifugal compartments, and that, as stated by the man already referred to, the contents of the stove had so far burnt out as not to contribute to the effects.

As to the cause of the first outbreak of fire, Captain Thomson entertains no doubt whatever. It was seen to start at the exact moment when the mechanic forced the chisel under the steam-pipe, and was evidently due to picrate of iron, formed on the pipe, being ignited by the glancing blow between the two metal surfaces. This picrate, though not a violent explosive, is very liable to become ignited by percussion and friction, and when so ignited at any point, the flame readily spreads, being probably in this particular case sustained by picric acid dust. The tendency is more marked in picrate of iron than in any other picrate.

With regard to the subsequent explosion, according to a list of recorded accidents with picric acid by fire or explosion, details of which Captain Thomson has collated in an appendix, there is no clear case in which an explosion has occurred with the acid by itself. On the other hand, there are several cases on record in which the picric acid burned away without explosion, though in none of the cases was so great a quantity involved as in the accident under consideration, *i.e.*, about 7,200 lbs. The evidence of previous accidents is not sufficient, therefore, to prove that in this instance the explosion was not due simply to the large amount of acid involved in the conflagration. As against this argument, however, there is the fact that lime was undoubtedly present in the form of mortar, actually in contact with the acid from the moment that the roof fell in, and Captain Thomson is of opinion that the action of the molten acid on the lime was sufficiently rapid to allow of the formation of picrate in a quantity capable of producing the observed explosion, especially as the lime would probably be disintegrated and perhaps reduced to dust by the heat and fall of the roof. Experiments made by Dr. Dupré, the chemical adviser to H.M. Inspectors, failed to record a direct detonation of picric acid by picrate of lime formed in the molten acid; but despite this failure, Dr. Dupré shares in the opinion held by Captain Thomson as just stated.

In brief, after an exhaustive review of the subject, Captain Thomson is now convinced that the present methods of treating the explosive are insufficient to ensure the public safety, and that the comparative immunity from serious accidents which has so far been enjoyed, is due mainly to the small scale on which, hitherto, the material has been manufactured. The logical conclusion undoubtedly is to treat picric acid in precisely the same manner as any other explosive, and in future licences it will be a matter of serious consideration whether this should not be done. As regards existing factories, a formal requisition has now been issued to all occupiers, requiring them to observe the general rules for dealing with explosives, as laid down in the Order in Council, and to supply a fire-extinguishing apparatus, which shall

satisfy a Government Inspector, in every building in which dry picric acid is present or liable so to be. It is thought unnecessary at present to make a further Order in Council, and the more so since picric acid is now manufactured very little except for purely explosive purposes, for which purposes it is covered by the foregoing conditions.

INCIDENTAL JOTTINGS.

"STRIKE WHILE THE IRON'S HOT."

Whatever question may be at issue at the parliamentary elections, it is quite certain that the important one relating to the strength of our armaments will be well to the fore, and it will doubtless be one over which each party will agree. "If you want peace prepare for war," is a good adage, though if proper preparation is carried out, it will cost in money very little less than actual warfare, and will require a strong man at the head to insist upon efficient up-to-date reorganisation. This may sound contradictory to the notes I have penned on previous occasions, where I have maintained that our arms are as good as those of other nations, but I qualify that statement now by limiting such in quantity. What is desired is that all our defences shall be equally strongly fortified, and that our latest patterns shall be provided for our navy, army and auxiliary forces and garrisons, that the Thames ports shall not be the only ones with modern weapons when other vulnerable positions round the coast have to manage with ancient muzzle loaders. It is a big order, but if we have to rely upon our defences, then let us be quite sure that they are such that will inspire confidence, and that our second line of defence has not second-class munitions.

The passage of arms between the Hero of "IF AND BUT." Ladysmith and the Financial Secretary for War is amusing and instructive. I am afraid that in their heated and hasty letters to the papers, much exaggeration is indulged in on both sides. Captain Lambton shows that he has not yet learnt his range tables, and Mr. Powell-Williams ought to tell him where he is mistaken, and not over-balance pessimism with optimism. A man can often unconsciously delude himself into the belief that the public will accept him at his own estimate, like the homely tombstone maker, who generally calls himself a "monumental sculptor" or mason. So it will be, I fear, with Capt. Lambton; the public will smile and only think it bad taste at election time, but it won't affect the Ordnance Committee, nor the Admiralty opinion of this erring officer, though it may gain him a few votes at the election. If Capt. Lambton is elected, I hope he will follow the matter up, and though he is wrong at his first effort, he may later on find a weak spot which he can substantiate and get remedied. Practical men are badly wanted in the House of Commons, but rash statements will soon ruin a reputation, however valiantly won.

A CALL TO ARMS!

The Boer war has certainly emphasised in an unmistakeable manner the continental feeling towards England. No longer can we afford to laugh it off and attribute it to malignant journals, which do not correctly indicate the respective national feeling in their violently worded columns.

You have only to visit France, Russia, Belgium, Holland or Spain, and to a less degree every other nation, to ascertain that "hatred" is the only term which can be applied to their feelings toward us. The small section of society in each country who know England, and do not share the opinions of the masses, is in too small a minority to outclass our enemies, and the sooner we appreciate this fact, the better for us. No amount of self-condemnation or righteous resolutions will ever restore to us popular feeling abroad. At present it is not a question of ethics, but arms, and first we should prove our capability of defence, then we can do the sackcloth and ashes and accept the scourgings of our Courtneys, Steads and others, whom we irreverently dub "Little Englanders," and thus give our continental neighbours an alternative method of overcoming their prejudice against us.

COAST DEFENCE.

I often wonder, in questions relating to Coast defence, whether the various commissions and committees have ever had the project before them of a series of coast railways all round the Kingdom, and gun mountings being made to run on rails in a similar manner to the proof carriages used some years ago at Woolwich. If these railways were well connected with inland towns, and there would be no weak spot open to an enemy to land, any amount of force could be concentrated at any given spot, and be so mobile that we should not need so much to rely on our navy, whose energies might be better employed, convoying our food supplies and guarding our ports, instead of locking them up on "sentry go" where they might never be wanted. In times of peace these railways would be remunerative, supplying a much-felt want, but the great expense would be in providing well-equipped trains with guns, stores, &c., and depôts inland, at various central points from which they could respond to a call much in the same manner as our fire-engines in our towns. Many of the existing lines could be utilised, and the railway companies would doubtless be glad to construct extensions, &c., in any approved manner, if there was a Government subsidy behind it.

THE OFFICIAL CENTRAL BLOCK.

Anyone who is in the habit of visiting the Royal Arsenal, at Woolwich, will miss the much respected principal civil assistant to the Chief Superintendent of Ordnance Factories, who has retired with a well-earned pension. Mr. Tapp was a bright and polished gentleman, ever courteous and charming in his manner—he never leaked out official secrets, though I fear he was apt to pour cold water on any innovation which did not conform with the official ideas at first sight. The "blue ribbon" of this office has fallen on Mr. Le Brooy, who was Mr. Tapp's assistant, and whom I trust will not confuse it with the "red tape." Hitherto the rank and file of this department have, in their zealous efforts to please their chief, mistaken "obstruction" for "centralisation." Every department of the Ordnance Factories has to pass all its official matter through this Chief Office sieve, and up to now the mesh has been of the wrong size, and holds a lot of "bogies" that ought to pass instead of being "referred back" for technical instruction from the manufacturing departments. The evolution of this department is greatly in the hands of the principal civil assistant, and its automatic

working can only be attained by not interfering too much in manufacturing details. In other words—"If you keep a dog, don't bark yourself!" Mr. Le Brooy will doubtlessly effect many improvements, being gifted with abundant resolution and capacity.

ARMS AND THE MAN.

Many journals and individuals are advocating the respective merits of new rifles as compared with the present Lee-Enfield, but I fear that at present their hopes are doomed to disappointment, for there does not appear to be the slightest official desire for a change. Many improvements to the present rifle can be effected by a careful study of manufacturing details. Both the Mauser and Mannlicher rifles are examples of ingenuity of mechanical design due to superior knowledge in the use of machine tools. The whole of the English gun-making trade might learn a useful lesson from German and American methods, and put less faith in the fitter and more in the unerring machine. There is a superstition with regard to the superiority of "hand-made" articles which is difficult to overcome. It is lamentable to see costly special machines being used as "roughing" tools, always leaving the fitter to put the finishing cut with the file. To start off with—in such work as small arms, the machinist should be paid higher wages than the fitter, and thus encourage more brain in this direction. Every part should be machine-finished to the $\frac{1}{1000}$ of an inch where possible, and file marks, instead of being evidence of "high-class hand-made," should be a mark of reproach due to unscientific machining. This would not apply so much to small makers who do not standardise their manufactures, and to whom interchangeability of components is of no great value.

The present rifle is under a great disadvantage in being a single loader, and it "HASTE AND MORE SPEED" is with much satisfaction we hear that the worthy expert manager at Enfield Lock is tackling the matter. May one suggest to him that in his efforts to find a suitable metal clip—no other is any use—he need not fear to alter the magazine, which is capable of improvement yet. It is the only part of the rifle which encourages the use of expressions generally used by those learned in the noble game of golf, and which should not defile the innocent lips of a marksman or soldier. When this is done and adjustable sights substituted, the bolt simplified, no one will be ashamed of the rifle which is now considered unworthy. The cartridge with its increased charge and velocity, the return to the first type of the metal envelope at the nose of the bullet, should add greatly to the efficiency of the rifle. The new powder we hear so much about may also contribute an additional improvement, though, personally, I am not over-sanguine that anyone but Tommy Atkins, who may have less work to do in cleaning his rifle, is going to score much over the ballistic results of cordite.

Seeing that it is determined to greatly enlarge the Ordnance Factories at Woolwich, "WHOLESALE ENLARGEMENT." surely this would be a seasonable time for the re-organisation of that moss-backed anachronism known as the "Works Department." No one would question for a moment the wisdom of having a military man at the head of departments manufacturing war muni-

tions; but bricks and mortar forsooth—this is a civilian's post, surely! There is nothing in the training of a soldier which gives him the experience necessary for such a post, and, although it has been held by a military man for years, there is nothing to warrant the fact that it is advisable to continue it. No architect would for a moment tolerate the erection of that Jumbo-like main entrance to the Arsenal, which the poor inhabitants are obliged to have as an ornament to the town (*sic*); but they grin and bear it—with a particularly accentuated grin. A suitable man would soon prove that ugliness is not necessarily cheapness, and the patchy and small enlargements, which have been the rule for many years, are expensive and undesirable. A War Department architect is what is wanted, and he would wash his hands of the "Jack of all trades" tendencies of this department, and confine his attention to building works, design and erection, and be practically capable of assessing cost, from personal knowledge of the details of the building trade.

CYCLOPS.

CONCESSIONS IN THE TRANSVAAL.

ACCORDING to the conditions laid down in a recent proclamation issued by Sir Alfred Milner, every concession granted by the late South African Republic will be considered on its merits. Her Majesty's Government, however, reserves the right to modify or to decline to recognise any concession which it was not within the power of the Republic to grant, as, for instance, having regard to any convention or agreement between Her Majesty and the Republic, or granted without proper legal authority or contrary to law, or on conditions not complied with or prejudicial to the interests of the public. The commissioners appointed to conduct the inquiry give notice that they will first consider any concession which gives the sole right to manufacture, to import, or to deal in any commodity; any contract under Volksraad Resolution No. 1871, of January, 1896; any concession to any bank; and any railway, tramway, water or lighting concession. The first sitting of the commission will be held to-day, October 1st, and communications are to be addressed to the Secretary, Transvaal Concessions Commission, Library Buildings, Cape Town.

In reference to the proclamation above referred to, Mr. Max A. Philipp has sent the following letter to *The Times*, which has some bearing on the situation:—

"Sir,—In your article on the monopolies which have been granted by the South African Republic you refer specially to the so-called dynamite monopoly, and state that the law officers of the Crown have held it to be contrary to the Conventions between Great Britain and the South African Republic. As chairman of the Transvaal Dynamite Company (*De Zuid Afrikaansche Fabrieken voor Ontploffbare Stoffen Beperkt*), which entered into an agreement with the South African Republic for the working of the monopoly, I beg to request you to kindly publish the following facts:—

"The monopoly for explosives established by the Transvaal Government in 1889 was attacked by those interested in some of the English, German, and French explosives factories, with the support of their Governments, until that monopoly, which had not been carried out in a legal manner, was cancelled. In its stead another monopoly law was passed in September, 1893. The European manufacturers in question

continued their struggle against this new monopoly. After some time, however, the German Government intimated semi-officially to the German manufacturers that there was no prospect of the opposition proving successful, and advised them to come to an understanding with the South African Republic and with the owners of the agreement which had been entered into for the working of the monopoly. As a reason for this it was pointed out that the new monopoly was promulgated in legal form, that as regards the working of it regulations had been issued which could not be attacked on legal grounds, and that no legal exception could be taken to it on the ground of existing commercial treaties with the Republic.

"The French Government seems to have expressed itself in a similar manner to the French manufacturers interested in the matter.

"Under these circumstances, and that not without the knowledge of the British Government, those interested in some of the British, German, and French explosives companies entered into negotiations with the Government of the South African Republic and with their agents. At considerable sacrifice they made an agreement for the carrying out of the monopoly, and as a consequence the *De Zuid Afrikaansche Fabrieken voor Ontploffbare Stoffen Beperkt* was formed. That company has, at a cost of £362,000, erected factories near Johannesburg, which are capable of producing about five to six hundred thousand cases of explosives per annum. At present the stocks there amount to 150,000 cases of explosives ready for the use of the mines.

"The company has carried out its obligations with the utmost punctiliousness, and, having regard to these facts, any attempt to withdraw from the present shareholders, who have invested their money in this undertaking, any of their rights would be a gross injustice."

CAPTAIN ORDE BROWNE, LATE R.A.—During the month just gone, we regret to find, the death has been announced of Captain Charles Orde Browne, late of the Royal Artillery, and a well-known writer on ordnance. The deceased officer was 62 years of age, and was the second son of Colonel B. C. Browne, formerly of the 9th Lancers, of Stout's Hill, Gloucestershire. Captain Orde Browne obtained his commission in 1854, passing from the Royal Military Academy at Woolwich, was promoted to be Captain in 1862, and retired from the service in 1871. He served in the Crimea, in the siege train of the night attack on Sevastopol, and was mentioned in despatches for gallant conduct in the advanced trenches, besides receiving the Crimean and Turkish medals, also the Sardinian order of St. Lazarus for valour. He served for four years in the Royal Horse Artillery, and was Captain Instructor, Royal Laboratory, at the date of his retirement. Subsequently, Captain Orde Browne was military editor of *The Engineer*, and took charge from the start of the section of *Brassey's Naval Annual* dealing with Armour and Ordnance. In 1874, he rendered valuable assistance to science as head of the Transit of Venus Expedition which was sent out to Egypt. He was appointed by the Government as Judge on Ordnance and Warlike Stores at the Chicago World's Fair in 1893, and held the post of lecturer on armour at the Ordnance College, Woolwich. As a writer on technical subjects he was also not unknown. Captain Orde Browne died at Peer's Court, Gloucestershire, the residence of his brother, Colonel Browne.

NOTES.

NEW YORK
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LENOX AND
TILDEN FOUNDATIONS

SALE AND STORAGE OF EXPLOSIVES.—The Clerk of the Peace for Devonshire has received from the Axminster magistrates a representation in favour of a change in the law regulating the sale and storage of explosives, and he has undertaken to lay the matter before the Court of Quarter Sessions, as suggested, with a view to the Home Secretary being memorialised on the subject. This communication points out that no provision has been made in the Act of Parliament whereby a penalty or any punishment may be imposed if persons fail to register the premises on which explosives are kept. The only penalties provided for in the Act refer to non-compliance with the proper mode of keeping explosives, and the memorialists ask that steps be taken to get this defect remedied. They point out that in a recent case in the Axminster Division against a shopkeeper, in which the facts were quite clear, and indeed were admitted, the Bench could not impose a penalty because none was provided for. If the Court of Quarter Sessions is unable to deal with the matter, it is to be referred to the General Purposes Committee of the Devonshire County Council.

EXPLOSION AT A FUSE WORKS.—Major A. Cooper-Key, H.M. Inspector of Explosives, has issued his report on the circumstances attending a fire which occurred at the fuse works of Messrs. William Bennett, Sons and Company, at Camborne, on July 2nd. The fire took place in one of the machines used for the spinning of fuses, and spread throughout the entire building, but was fortunately unattended with loss of life owing to the good facilities existing for the exit of persons employed in that department. Praise is also bestowed on the system instituted by the Messrs. Bennett in separating the hoppers supplying powder to the spinning machines from the workpeople engaged at the machines, by the means of a substantial flooring, an arrangement which undoubtedly contributed materially to the absence of casualties. As regards the cause of the outbreak, Major Cooper-Key finds some considerable difficulty in arriving at a definite decision, despite the fact that every assistance was given him in his inquiry, and the evidence put forward was exceptionally clear. He is inclined to attribute the fire to the introduction amongst the powder as fed to the fuse of some foreign substance, either a broken part of the machine or something contained in the powder before leaving the feed hopper, all other contingencies brought forward appearing to possess inherent improbabilities.

CURIOUS EXPLOSION AT LONGTON.—On the 11th ult. a somewhat mysterious explosion occurred on the premises of Mr. Henry Yates, ironmonger, at Longton, in Staffordshire. Mr. Yates' premises are licensed under the Explosives Act, and Captain Lloyd, H.M. Inspector, had in the previous week made his periodical examination of the place without detecting any irregularity. The accident occurred while a painter was engaged in burning the paint off an upper storey window with one of the usual benzoline lamps, and he was severely injured. The whole building was wrecked by the force of the explosion, but the curious feature of the case was that a most careful examination failed

to reveal any trace of cartridges or gunpowder having exploded. In fact, the explosives stored by Mr. Yates, though scattered over a considerable space inside and outside the building, appear to have remained intact so far as their explosive capacities are concerned. Pending the Government inquiry, it is, of course, impossible to locate the cause of the accident, but unless further facts come to light the casualty would seem to be due to some other cause rather than to the presence of a licensed store of explosives, which, according to present knowledge, remained unignited during the occurrence.

MANNLICHER RIFLES AND PISTOLS.—We have received for notice a finely got-up book, containing illustrations and descriptive matter concerning the series of small-arms associated with the name of Ferdinand Ritter von Mannlicher. This large folio is written by Konrad Edler von Kromar, K. U. K. Obrerst, D.R., and is published in Vienna. It contains thirty-seven beautifully clear plates illustrative of the details of successive Mannlicher arms, from the first repeater designed by the well-known inventor in 1880 up to the latest pattern of Mannlicher-Schönauer magazine rifle, brought out in the present year, which was described in last month's issue of this journal. To the student of military weapons it is distinctly interesting to be able to trace in this compact form the gradual developments and evolution of a type of rifle which is world-famous, and the exploitation of which, as a commercial article, ought to form a useful object-lesson to other manufacturers in the same line of business.

NEW AUSTRO-HUNGARIAN FIELD GUN.—It is stated that the Austro-Hungarian technical committee has decided against the use of steel-bronze in the building of the new field-gun, and in favour of the substitution of cast steel. The calibre of the new gun will be 70 mm., or 2.75 inches, and the ammunition is to be in two parts, charge and projectile, as the committee is decidedly opposed to the "united" form of cartridge.

EXPLOSION AT THE BLACKBECK GUNPOWDER FACTORY.—After a careful investigation into the circumstances attending the explosion which took place on May 26th last, in the press house at the gunpowder factory of Messrs. F. C. Dickson and Co., at Blackbeck, Haverthwaite, Lancashire, whereby two men were killed, Captain M. B. Lloyd, H.M. Inspector of Explosives, attributes the disaster to one of three causes:—(a) Failure of one of the columns of the press, and consequent tilting of the charge on the ram, due to over-pressure; (b) the inclusion of some foreign substance in the charge; or (c) the fall of one of the copper-press plates on its edge on a film of powder. He inclines more particularly, however, to the first-named cause, and in that connection suggests several lessons to be learnt from the fatality. For example, he suggests that in place of malleable iron of whatever description, such as was employed, mild steel should be used for the columns of the press, and the scantling should be such as to afford a large margin of safety in the event of the whole thrust being borne by any two columns only. Moreover, the attachment of the columns to the press head and base plate should be through spherical washers or nuts, and the columns should not be gripped where they pass through their bearings. As regards the pumps, he contends that the press should not be worked directly off the pump,

but through an accumulator, and that the connection between the pumps and the engine should be frictional, and not positive. In respect to other details, not necessarily cognate to the case in point, he suggests the advisability of using roof-timbering only of such strength as to support the roof, and not designed for use in lifting heavy pieces of machinery, for which purpose a portable appliance is more satisfactory. He also advises that some method of sifting "dust charges" might be introduced, and that it is desirable to employ some lighter substance than copper for the press-plates. The result of the injury is, that no blame whatever for this unfortunate occurrence can be attached either to Messrs. F. C. Dickson and Co. or to any of their employés.

REFITTING OF THE BELLEISLE.—It is reported that the hulk *Belleisle*, which recently underwent severe damage in experimental firing trials, is to be fitted out again for the same purpose. On one side she is to be armoured for a length of 20 feet with 6 in. Krupp armour, and on the other side for a similar length with 4 in. Krupp armour. On completion, she is to be subjected to firing from varying ranges in order to ascertain the resistance of these two classes of armour under actual service conditions. The preparation of the hulk for the experiments will probably occupy some months.

NATIONAL EXPLOSIVES CO., LD.—The directors of this company have declared an interim dividend at the rate of 5 per cent. per annum on the ordinary shares, and of 6 per cent. per annum on the preference shares, for the half year ended June 30th last, less income tax.

AMERICAN E. C. AND SCHULTZE GUNPOWDER CO., LD.—The directors of this Company, in presenting their third annual report with the statement of accounts for the year ending December 31st, 1899, announce a considerable increase in the amount of both "E. C." and "Schultze" powder sold during the year, as compared with the twelve months of 1898. Competition in the powder trade in America has, however, been exceedingly keen during the past year, resulting in a decrease in the selling price obtained for powder, and necessitating increased expenditure in advertising, travelling, etc., in order to maintain the position of these particular products in the market. There has also been an increase in wages and in the price of materials, and consequently in the cost of manufacture. These causes, combined with loss owing to a fire at the Company's factory, have together tended to reduce the profits, which amount for the year to £3,576. An agreement has been made for the Company to act as agents in the U.S.A. for the sale of the products of the Smokeless Powder and Ammunition Co., Ltd., of London. Included in this arrangement is the erection, at joint expense, of a plant for the manufacture of these rifle powders at Oakland. This extension is now rapidly approaching completion, and is to be placed under the control of Mr. Wilcox, who has been assistant chemist at the Smokeless Powder and Ammunition Co.'s factory at Barwick for the last four years. This new development is made in consequence of the opinion of the directors that there is a great opening in America for rifle and military powders. Turning to the accounts, the additions to the Company's property during the year amount to £1,788, all of which has been paid out of revenue, and office furniture and laboratory apparatus show

a further increase of £103. No allowance for depreciation appears to be made in these respects, but, on the other hand, £6,267 is written off for depreciation of stocks of guncotton and finished powder, and £133 is written off for preliminary expenses. The balance at credit of profit and loss for the year amounts to £5,224, of which £1,648 was carried forward from 1898. Under the circumstances, the directors were unable to recommend the payment of a dividend, and the balance is accordingly carried forward.

GERMAN MILITARY RIFLES.—According to the *Cologne Gazette*, no great haste is being shown in respect to re-arming the German infantry with the new rifle, pattern 1898, which is an improved design on that brought out in 1888. The existing type has been in use for about ten years, having been manufactured from 1889 to 1892 in the Government workshops at Spandau, Danzig, Erfurt, and Amberg, Bavaria, and by Messrs. Ludwig Löwe & Co., by Herr Mauser, in Obendorf, and by the gun factory at Steyr. Apparently the more complicated modern weapons have less durability than their forerunners. The Mauser of 1871 lasted for 15 years, while the 1888 pattern is showing distinct signs of giving out, and is being replaced as occasion requires by the 1898 improved type. However, the regular output of the Government and other workshops is quite sufficient to meet all demands for renewals without any occasion to resort to overwork or undue haste in the manufacture of the arms.

REARMAMENT OF INDIAN TROOPS.—Ten thousand new Lee-Enfield rifles from England have been distributed during last month to the British troops in the Punjab and Bengal, releasing a similar number for distribution among the native regiments in the field army. This plan will be steadily followed during the current year as new rifles arrive from week to week. A considerable supply of cordite ammunition and other war material is also in preparation for shipment to India. Some of these supplies will be required for the native corps when they are rearmed in the manner indicated, and meanwhile the stocks of Martini cartridges will undergo gradual reduction. With a view to this change of arms, the machinery of the factories is being reconstituted so as to admit of the manufacture of '303 ammunition on a large scale, and it is expected that the new Wellington factory, now under construction, will serve to render India henceforth practically self-supporting as regards the supply of cordite.

A CENTRIFUGAL MACHINE GUN.—The correspondent of *The Times* in Newcastle-on-Tyne sends to his paper information respecting a machine gun of a novel character, the invention of Mr. James Judge, of that city. Mr. Judge himself describes the gun in the following terms:—"The gun is a patent centrifugal quick-firing machine gun; it is 5 ft. high, and weighs about 5 cwt. It is intended for a battleship, earthworks, and garrison purposes. The motive power is electricity, transmitted to a motor attached to the side of the gun. The motor causes a disc to revolve at a very high rate of speed. The bullets, which are introduced into the interior of the disc at the axle, travel along curves in the interior to the circumference, and are there impelled through a barrel. It is claimed that this disc will rotate, under the influence of the motor, at the rate of 12,000 revolutions a minute, and will eject shots from the muzzle of the gun with an initial

velocity of 2,000 ft. per second. One of the chief characteristics of the gun is that it will maintain a continuous fire. If necessary, a shot may be discharged at every half revolution, but in practice one shot every fourth revolution will be found sufficient. The bullets are spherical, and measure $\frac{1}{8}$ in. in diameter. The following are the results of the tests already made with the gun:—18,000 rounds of shot at the rate of 3,000 a minute have been discharged from the gun. These shots consisted of nickel steel, some of brass (as used in France), lead, and chilled metal. It was tested seven times privately; no motor was used, nor is one yet attached to the gun, although the gun is constructed for an electric motor. The tests were made by means of a belt driven by a steam engine. Under these conditions the velocity required, and which it is maintained an electric motor will produce, was not, of course, attained, but the practical working of the gun was fully demonstrated. A long range could not be had, because of the necessity of secrecy, and the testing was done in a covered shed at Blyth Dry Docks. A steel target, $\frac{3}{8}$ in. thick, was shattered, the disc of the gun revolving at a speed of 2,500 revolutions per minute. From the penetration of the target it is calculated that at a distance of 400 yards a penetration of a similar character will be effected of a plate $\frac{1}{8}$ in. thick under the influence of an electric motor. There is no heating of the barrel of the gun because of the continuous stream of cold air which is impelled through it by the turning of the disc. The disc itself is also free from heating, on account of the special bearings on which it is constructed. These bearings are a highly complicated mechanical contrivance, and are similar to those used in Parsons's turbines, which can revolve at the rate of 22,000 revolutions a minute, and Levall's motor, which revolves at the rate of 30,000 revolutions a minute. To test the gun thoroughly it will be necessary to affix a motor, which will be a five horse-power motor coupled direct on to the shaft."

EXPLOSION ON H.M.S. DIADEM.—An explosion, unfortunately attended by two fatalities, took place on H.M.S. *Diadem*, on the 11th ult., at Berehaven. Several men were at work in the after torpedo-flat, testing the electric primers of 6 in. quick-firer cartridges. The cartridges each contain 29 lbs. of cordite, and it appears that the men had not withdrawn the primers from the cartridges, and were not using a testing battery of the authorised pattern. However that may be, it seems that one of the cartridges exploded and caused two others to explode almost simultaneously, with the result that two acting leading torpedo men were killed, and several other men slightly injured. Apparently the accident was due to a want of observance of suitable precautions on the part of the men concerned.

FRIBERG AUTOMATIC RIFLE.—Experiments have recently been carried out at Rosersberg, in Sweden, with a new automatic rifle, invented by Lieutenant Friberg, which is said by qualified experts to possess all the qualities that could be desired, especially with regard to practical use and simplicity of construction. In general appearance the new rifle resembles the Mauser, and it has also the same calibre, and is adapted to take the same cartridge. The action of Lieutenant Friberg's weapon is that, when the magazine is filled, each round is passed automatically into the firing chamber after each preceding shot has been fired, without the necessity of

any working at the breech on the part of the firer. In fact, when the magazine is once charged, the soldier has nothing to do but to aim and fire until the last round is gone. The recoil is said to be less than in other rifles, because the greater part of the gas which causes it is in this arm utilised in reloading the gun automatically.

NEW GUNS FOR NEW SOUTH WALES.—As was mentioned in our last month's issue, the N.S.W. Government has ordered four 4.7 guns for the defence of Port Jackson and the adjacent fore-shores, together with a number of Vickers-Maxim quick-firing guns, and also a field battery of 15-pounders, which are intended to replace the guns of the A Battery of artillery, now in South Africa. These latter are already on their way. In addition, the military authorities have ordered from 3,000 to 4,000 Lee-Metford rifles, and they have furnished the Premier with a detailed report on the question of establishing a small-arms factory in the colony, and the cost of such an undertaking. It is possible, however, that, in view of the cost of such an installation and the near approach of federation, nothing further will be heard of this latter proposition.

CORRECTION.—Referring to the illustrated notice of a Mannlicher rifle, which appeared on pages 136 and 137 of our September issue, Messrs. Schriever request us to point out that the rifle should really be described as the Mannlicher-Schönauer Rifle. Herr Schönauer, a director of the Austrian Small-Arms Co., at Steyr, has greatly assisted Herr von Mannlicher in the invention of this rifle, especially with regard to the revolving magazine. It will be more correct, therefore, to state that the Mannlicher-Schönauer rifle referred to is the joint production of Herr Ritter von Mannlicher and of Herr Schönauer, director of the Austrian Small-Arms Co., at Steyr. Needless to say, we have great pleasure in making this acknowledgment of the valuable assistance rendered by the latter gentleman in producing the new magazine-arm.

EXPLOSIVES REPORT FOR VICTORIA, 1899.

IN furnishing his annual report of the working of the Explosives Act of 1890, in the Colony of Victoria, Mr. C. Napier Hake, the Chief Inspector of Explosives for the Colony, states that no accidents have occurred during the last completed twelvemonths in the manufacture, transport, or storage of explosives, which seems to imply a sufficiently satisfactory condition of affairs. On the other hand, two attempted outrages occurred during 1899, the perpetrators of one being discovered and severely punished. In one case sextuple detonators were exploded on the windowsills of a house, by means of a safety-fuse, but with no more serious results than a slight damage to wood work. In the second case, a $\frac{1}{4}$ -inch gas pipe, filled with gunpowder, was placed on the tram-line, in the centre of the city of Melbourne, but though a tram passed over it, no explosion resulted, the burning fuse attached failing to act. These outrages were brought before the Chief Inspector by the Police Authorities, whose valuable assistance and support in enforcing the provisions of the Explosives Act is the subject of warm acknowledgment.

IMPORTATION.

Altogether 149 licences to import explosives were issued during the year, and the following table shows the quantities

of the various explosives imported into the colony during 1899, as compared with the corresponding figures of the previous year:—

EXPLOSIVE.	1899. lbs.	1898. lbs.	Increase per cent.	Decrease per cent.	Value for 1898 £
Dynamite	4,900	28,851	—	83	193
Gelatine Dynamite	968,730	767,410	26	—	71,320
Blasting Gelatine ..	90,350	129,850	—	30	8,647
Blasting Powder ..	236,435	334,000	—	29	3,741
Sporting Powder ..	90,115	72,366	25	—	4,111
Total ..	1,390,530	1,332,477			88,012

Besides the above-mentioned, other explosives, including caps, cartridges, detonators, safety-fuses, etc., were imported during 1899, to the value of £12,153, as compared with £5,607 in the previous year. These figures are exclusive of all explosives which are the property of the Government. It will be noted that the importations of dynamite and gelatine dynamite show still more strongly than last year the tendency to decrease and increase in marked correspondence.

As compared with the foregoing figures, it may be interesting to note the corresponding details for the other Australian colonies, which are supplied in an appendix to the report, and which during 1899 were as follows for New South Wales, Queensland, South Australia, and West Australia respectively.

EXPLOSIVE	New South Wales.	Queens- land.	South Australia.	West Aus- tralia.
Dynamite	375,332	159,280	192,000	58,800
Gelatine Dynamite ..	246,450	437,710	266,000	938,250
Blasting Gelatine ..	99,850	—*	110,000	60,000
Blasting Powder ..	1,641,876	109,431	256,150	127,475
Sporting Powder ..	52,763	—*	10,561	4,597

* No returns.

In consequence of a somewhat serious accident with percussion caps, which happened at one of the London docks, a new Order in Council has during the year been put into force by the Victorian Government. This enacts that no explosives except safety cartridges, safety fuse for blasting, railway fog signals, and percussion caps belonging to Division I of Class 6 (Ammunition), shall be brought into any ports in Victoria except in virtue of an importation licence granted under the Explosives Act, "and the unloading and delivery, or the transshipping of any explosive constitutes importation for the purpose of this provision. Provided that if the explosive brought into Victoria is forthwith transhipped to places outside Victoria, the fee paid for the importation licence in respect of such explosive may be refunded." Furthermore, a circular has been issued to the trade in reference to percussion caps, whereby it is laid down that, for the future, the distinction between percussion caps when not fitted in cartridge cases and detonators shall, in absence of proof to the contrary, be held to be (a) all caps containing anvils will be regarded as detonators; (b), all caps, the composition of which is not protected either by tinfoil or other suitable material, will be regarded as detonators; and (c), caps containing charges not exceeding '5 grains of composition, or '6 grains of composition, in which the quantity of fulminate of mercury does not exceed one-fourth of such composition; when such composition is protected by tinfoil or other suitable material, will be regarded as percussion caps; caps containing charges exceeding the above amounts, although the composition may be similarly protected, will be regarded as detonators.

TESTING.

During the year, 1965 samples of explosives or ingredients thereof were examined in the laboratory, besides 750 samples

of kerosine (for the flashing point), and 68 samples of miscellaneous articles for the Customs Department. The principal explosives under examination were blasting gelatine, of which 212 samples were passed and 133 rejected; safety fuse, 63 samples of which all passed the test; gelignite, of which 1,035 samples were passed, and 121 were rejected; gelatine dynamite, of which 150 samples were passed, and 115 were rejected; and percussion caps and primers, 67 samples of which were submitted and passed. The whole of the blasting gelatine imported from Europe was of satisfactory quality so far as its purity was concerned, as indicated by the "heat test." The 133 samples referred to were rejected on account of the exudation of nitro-glycerine. These samples represented a total of 8,250 lbs., of which 5,000 lbs. were destroyed, 450 lbs. were treated at the local factory, and eventually passed into consumption, and 2,800 were allowed to be stored under suitable conditions, pending their removal from the Colony. A further quantity of 9,650 lbs. were allowed to be imported from the colonies of New South Wales, Queensland, South Australia and Western Australia, for treatment at the local factory, the only defects being non-sensibility to detonation and dark colour. The 121 samples of gelignite were also rejected for the same reason, exudation of nitro-glycerine, and they represented 46,600 lbs., of which 33,450 lbs. were allowed to pass into immediate consumption, and 13,150 lbs. were allowed to be stored pending removal from the Colony. Also, 38,200 lbs. were allowed to be imported from the other Australian colonies for treatment at the local factory. Exudation of nitro-glycerine was equally responsible for the rejection of the 115 samples of gelatine dynamite, which represented a total of 5,000 lbs., of which 1,500 lbs. passed for immediate consumption, while the remainder was stored pending removal. The other colonies imported 12,000 lbs. for treatment. The whole of the collodion cotton imported during the year was in good condition. No amorces were imported during the year, this explosive being now manufactured in the Colony. Importations of safety-fuse show a marked improvement as compared with the previous year, while the laboratory tests showed this explosive to comply with the legal definition of the safety-fuse in a satisfactory manner.

MANUFACTURE.

Including two small firework factories, the total number of factories under licence in the colony is eight, the same figure as in 1898. The system of licensing is similar to that initiated by the Explosives Department in Great Britain, and consequently ensures a thorough investigation of all technical details when the draft licence is under consideration, and equally affords protection to the local interests concerned. During the year only 27 "Rack-a-rock" manufacturing licences were issued, and no application was received in respect to the authorisation of new explosives. The use of sulphur in admixture with potassium chlorate or other chlorates in the manufacture of fireworks has been prohibited by an Order in Council, except under special conditions approved by a Government Inspector.

STORAGE.

The number of magazines under licence has shown a remarkable increase from 89 in 1898 to 116 in the year under review, this total being exclusive of 21 Government magazines, which are utilized chiefly for the storage of commercial explosives. A great convenience to the trade has ensued from the practice adopted, both on the private and Government sites, of erecting annexes for the storage of detonators. As regards inspection, all the chief centres were visited at least four times in the twelve months, and the stocks of explosives were carefully sampled and examined, with the result that no signs of deterioration were revealed. Two persons were proceeded against and fined for storing explosives without possessing licences to do so, and one person was brought up for storing dynamite and detonators together.

LICENSED PREMISES.

Here again the figures show a substantial increase over those of 1898, in the proportion of 2,251 as against 1,579. With only one inspector at his disposal, the Chief Inspector of course found it physically impossible to inspect the whole

of these licensed premises, but Melbourne and its suburbs, and the other chief towns in the Colony, were visited once during the year. As a result, no breaches of the Act were discovered in Melbourne itself, and only four cases in the suburbs. In county towns 52 persons were proceeded against for various breaches, and 71 were warned for first offences.

CONVEYANCE.

No accidents connected with the conveyance of explosives came under the Chief Inspector's notice during the year, and no irregularities in respect to the packing or marking of this class of goods required investigation.

ACCIDENTS.

The Chief Inspector is able to state that no accidents with explosives outside the jurisdiction of the Act have occurred. In an appendix, however, he gives details of eight accidents, involving the death of three men and injury to nine others, caused by fire or explosion, which were brought under the notice of his department by the Secretary for Mines. In those Australian colonies the returns for which are available, there were in all, during 1899, 45 accidents, causing 12 deaths and 38 cases of injury.

This report is handled in the usual masterly manner, and conveys an abundance of information in a concise form. The appendices are not quite so full as usual, but still form a useful adjunct to the general body of the report.

UNITED STATES ORDNANCE REPORT—III.

Appendix 7 deals with a series of tests made with the Winchester rifle, model 1895, .30 calibre, to determine its suitability for military service. The rifle in question was selected at random from those in hand, and was tried with ammunition having at 53 ft. a velocity of 1965 ft. per second. Tests undergone comprised five preliminary rounds to test the safety and working order of the mechanism, which were followed by a trial of the time required to dismount and assemble the bolt mechanism. The two operations of dismounting and assembling each occupied five minutes. A test of firing, to combine rapidity with accuracy, was made at a target measuring 6 ft. by 2 ft. at a distance of 100 ft. Used as a single loader, 36 tests were fired, registering 36 hits, in two minutes. Subsequently, two batches of 25 shots each were fired, using the magazine, with a total of 48 hits, two minutes being required in each case for the firing of the 25 shots and the loading of five cartridges into the magazine. Tested for rapidity at will, firing from the hip without aim, as a single loader, 24 shots were fired in one minute. Used as a magazine arm, but starting with the magazine empty, 20 shots were fired in one minute, and also one additional cartridge inserted in the magazine. A test of endurance was made, which consisted of the firing of ten different lots, each consisting of 500 rounds, using the magazine. The time taken in firing the 500 rounds varied between 50 minutes and 63 minutes, and the actual number of rounds fired, including those of the preceding tests, amounted to 5,135. At the conclusion of the test the weapon was found to be in good condition except as regards the following particulars:—The bore was in good condition, except the rear end, which was badly scored in the grooves for about one inch in length. The safety notch on the hammer was found broken off. The threads on the sear-spring screw and in the sear-spring were stripped. The hand guard was destroyed, the fore stock badly charred, and the temper of the rear sight base spring was entirely drawn by the heat developed in firing. All parts were then thoroughly cleaned

and assembled dry and free from oil, a new hammer, sear spring and sear-spring screw were inserted. Following this came a sand blast test as regards the mechanism, and a rust test, the latter of which was not considered to yield favourable comparison with the U.S. service arms. Trials with defective cartridges and excessive charges were borne with satisfaction. A tenth test comprised an examination of all the component parts before the beginning and at the conclusion of the foregoing programme of tests, noting all changes that had taken place, the total number of components, and the number and kind of springs employed. The report on this particular test was as follows:—Barrel, no change except the scoring, which was normal; forestock, badly charred; hand guard, destroyed; rear-sight base spring, all temper drawn; breech bolt, face indented around firing-pin hole; locking bolt, cams on upper end showed signs of wearing; hammer, safety notch broken off; second hammer, no change; sear spring, thread stripped, replaced; sear spring screw, thread stripped, replaced; ejector bent; extractor slightly bent and weak. The rifle proper, exclusive of the bayonet, cleaning cord, and sling strap, weighs 9.219 pounds, and is composed of 106 component parts, of which six are flat and three are spiral springs, 16 are assembling pins, exclusive of those of those in the magazine box, and 20 are screws.

As regards the question of component parts, the conclusions of the committee were that on account of the large number of assembling pins and screws in this gun, and of the large number of components composing the bolt mechanism, the time and skill required to dismount or to assemble the mechanism are abnormal. A few parts, like the extractor, firing-pin lock, trigger, and finger lever lock, can be dismounted by removing their pins and without dismounting other parts. Special tools are required to dismount the gun for making repairs and for thorough cleansing, and the dismounting can be properly done only by specially instructed men.

The series of tests showed that the Winchester rifle, used as a single loader, cannot be fired as rapidly as the U.S. magazine rifle, and that when used as a magazine arm its rapidity of fire is markedly inferior. Part of this inferiority in rapidity of fire is due to the manipulation of the lever, which requires more time than does that of the regular bolt. When using single-loader fire the cartridges must be placed horizontally on the carrier cradle in order that the bullet cannot enter the space between the front end of the cradle and the front end of the magazine box, which will produce a jam. When using magazine fire each cartridge has to be carefully inserted in the magazine, or the cartridge guide tips (springs) will not hold it in the magazine. These facts account for the marked low rate of fire obtainable from this arm.

Further tests showed that the velocity of this arm is about 23 feet less than that of the U.S. magazine rifle, and that the Winchester rifle is also less accurate than the present service arm; in fact, markedly so. In conclusion, the committee finds that the manipulation of a lever gun when firing prone on the ground or behind breastworks is awkward, and in the first case necessitates turning the piece on its side for loading. The use of this arm by troops lying down and under fire would expose them more than would be the case with a regular bolt gun.

(To be continued).

A correspondent wishes to know where he can obtain the following outfit:—A large hunt or life-line carrying gun, the bore to be not less than 20 in. long by 2½ in. diameter, and weighing about 108 lbs., manufacturer's affidavit to accompany the same; three projectiles for the gun, weighing not less than 18 lbs. each; three charges of powder weighing not less than 8 oz. each; three rocket lines, not less than 500 yards long by ¼ in. diameter, made of light three-strand rope or braided cotton of similar thickness; and ten fire boxes. Will some of our readers kindly oblige with the required information?

ROUND THE TRADE.

Mr. A. J. Rudd, of Norwich, has recently issued his new season catalogue of guns, rifles, and shooting requisites.

We understand that Mr. F. W. Watkins has transferred his business at 75, High Street, Banbury, to Mr. G. W. Naseby, who will carry on the business as Watkins & Co.

Mr. C. Heasman, who for some years has been with Messrs. J. Purdey & Son, has opened a gunsmith's business in the village of Thame, Oxfordshire.

Messrs. Müller & Co. have received the highest award offered for smokeless powders, the Gold Medal of the Paris Exhibition, on account of their exhibit of Müllerite Smokeless Powder.

The Normal Powder and Ammunition Co., Ltd., inform us that they have been successful in receiving the Gold and Silver Medal at the Paris Exhibition for their exhibits of Smokeless Powder, Gun-cotton and Torpedo charges.

Mr. T. Kither, gunmaker, of Sevenoaks, has, we are informed, retired from business. Sportsmen in that district will now be catered for by Messrs. G. J. Humphrey & Co., High Street, Sevenoaks.

We are at liberty to state that Messrs. Vickers, Sons and Maxim, Ltd., have acquired a considerable interest in the Chilworth Gunpowder Co., Ltd., this being the conjunction of interests alluded to recently by our correspondent, "Cyclops." Mr. Albert Vickers and Lieutenant T. A. Dawson, late R.N., have joined the board of directors of the Chilworth Gunpowder Co., Ltd.

Mr. T. R. R. Ashton, the patentee of the vertical magazine for rifles, applies in a recent Official Journal to amend his patent No. 8,408, of 1896, his reason being "that some of the claiming clauses may be objected to as claiming matters which were not novel at the date of said patent." Several words and lines are struck out.

The registration of a device consisting of three circles of letters cut by lines has been applied for during the past month by Messrs. F. B. Thackray, of Huntingdon, and G. Hardy, of Long Eaton. The device is to be applied to gun carriages and mountings. The first and second circles of letters are I's and the third or outer circle consists of O's.

Mr. Herbert Oliver has recently returned from Australia, where he has occupied for a period of eleven years the position of manager of the gun, rifle, and explosives department in the well-known and up-to-date firm of Messrs. Lassetter & Co., Sydney, New South Wales. It is now his wish to take up a similar class of employment in England.

APPLICATIONS FOR PATENTS.

AUGUST 20—SEPTEMBER 15, 1900.

- 14,920.* Automatic Gun. J. M. Browning.
- 14,921.* Automatic Gun. J. M. Browning.
- 14,955. Magazine Rifles. J. C. Baxter.
- 14,989. Discharging of Ship Guns. L. Obry.
- 14,990. Discharging of Ship Guns. L. Obry.
- 15,057.* Sheds for the Manufacture and Storing of Explosives. G. A. Nahnsen.
- 15,065.* Clips for Cartridge Belts. F. M. Garland.
- 15,085. Rifle Bullets. A. L. Wratil and C. Alphonsus.
- 15,143. Sighting Apparatus. J. L. Crawford.
- 15,218. Small-arms. T. Perkes.
- 15,247. Gun-carriages. Sir G. S. Clarke.
- 15,253. Rifling Cleaner. A. Potten and H. Biggs.
- 15,273. Sighting of Ordnance. W. Youlten.
- 15,277.* Projectiles. C. M. Brown.
- 15,288. Projectiles. R. A. Hadfield.
- 15,308. Targets. D. Edwards.

- 15,330. Rammers for Ordnance. W. L. Wise (Agent for *The Skodawerke Actien Gesellschaft*).
- 15,331.* Rammers for Ordnance. W. L. Wise (Agent for *The Skodawerke Actien Gesellschaft*).
- 15,492. Rifle-carrying Clips. A. Haskins.
- 15,534. Projectiles. A. Primet.
- 15,578.* The Propulsion of Gun Carriages. W. Francis.
- 15,684. Manufacture of Cartridges. W. Glass.
- 15,716.* Quick-firing Field-gun Carriages. K. Haussner.
- 15,750. Small-arms. O. Jones.
- 15,751. Small-arms. O. Jones.
- 15,802. Air Guns. M. Pulvermann (Agent for *F. Langenham*).
- 15,846. Manufacture of Explosives. J. T. Hewett.
- 16,002. Paper for Cartridge Cases. L. and W. H. Hacking and J. Youle.
- 16,003. Percussion firing Gear for Ordnance. A. T. Dawson and G. T. Buckham.
- 16,106. Shot Holes for Quarries. T. Rasmussen.
- 16,235. Torpedo Steering Apparatus. A. J. B. Body.
- 16,275. Ranges and Targets. T. B. Ralstone.
- 16,277.* Explosives. J. Führer.
- 16,284. Rifle Magazines. H. Harris.
- 16,287. Rammers for Ordnance. A. Reichwald (Agent for *Fried. Krupp*).
- 16,320. Manufacture of Guncotton. J. C. Ody and C. R. Cadogan.
- 16,348.* Magazines for Small-arms. C. R. Wagner.
- 16,349.* Clip for carrying Cartridges. C. R. Wagner.
- 16,361. Breech Mechanism of Ordnance. W. Poulson.
- 16,443. Sighting of Ordnance. A. Reichwald (Agent for *Fried. Krupp*).

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

SEPTEMBER 1—SEPTEMBER 22, 1900.

- 16,302 (1899). **Gun carriages.** W. Rothschild, G. D. Ward, and J. A. Wilding, London. At each end of the axle of the gun carriage a pair of coiled springs is fixed, and the axle carrying the gun is capable of a vertical movement, playing in two slots formed on two brackets fixed to the carriage. When it is desired to fire the gun the movement of the springs is eliminated by means of a lever, the turning of which forces two wedges into the slots, so rigidly connecting the axle with the wheels. Accepted August 10, 1900.
- 16,461 (1899). **Projectiles.** J. A. Rowe and F. J. Trewent, London. A compound projectile, designed for use either in ordnance or small-arms, which is composed of an outer shell, in appearance the same as an ordinary shell, and an inner projectile of much smaller diameter than the outer case. The outer case is closed at its rear end and the inner projectile is inserted from the front. By this arrangement it is claimed that as compared with ordinary projectiles, for a given energy the penetration is increased, the outer projectile being left behind after the shot strikes a hard surface, the inner portion alone penetrating the armour. Accepted August 14, 1900.
- 16,558* (1899). **The Smallman trigger mechanism.** J. W. Smallman, Nuneaton.
- 17,863 (1899). **Powder charges.** P. du Buit, France. A method of rendering the combustion of powder in guns progressive. The powder charge is made up of a number of prism-shaped elements with triangular or trapezoidal bases. These prisms are inserted with their apices towards the denotor, and by means of experiments the necessary thickness of the prism may be determined for different guns. Accepted August 11, 1900.
- 18,569 (1899). **Illuminating projectiles.** T. Toccaceli, Italy. Inside a shell is inserted a canister containing a number of illuminating devices composed of a mixture of magnesium, barium nitrate, and sulphur, and to the top of each is fixed a parachute. The nose of the projectile is provided with a time fuse which ignites a charge of powder in the base of the shell. This ignites the illuminating device and breaks the walls of the shell, scattering the illuminators, and so lighting the object to which the shell was directed. Accepted August 18, 1900.

- 20,258 (1899). **Miniature ammunition tubes for Ordnance.** J. Ramsey, and T. E. Riddle, Erith. Mechanism for mounting practice barrels; using reduced ammunition in the powder chamber of guns of the obturating type when the chamber is larger in diameter than the breech-opening of the gun. The mechanism is arranged so that when adjusted for any particular class of gun it needs no further adjustment to allow it to be again mounted. The barrel is self-adjusting longitudinally, the closing of the breech pushing it forward against a strong spring, thus obtaining good contact between the obturator and the end of the barrel. Accepted August 18, 1900.
- 23,300 (1899). **Telescopic sights.** A. A. Common, Ealing. A method of obtaining exact collimation in telescopes used in gun-sighting. The object-glass is mounted in a cell having an external perimeter eccentric to the optical axis of the lens, and this cell is mounted in a ring which is internally eccentric. The outer ring is fitted in the telescope in the usual way, and by turning the rings one upon the other the optical centre of the object glass may be moved so that collimation is easily obtained. Accepted August 18, 1900.
- 8,018 (1900). **Clip for carrying rifles.** D. J. M. Rose, Haddington. A pocket made of leather shaped to take the butt of a rifle is fixed by means of straps in the angle formed by the two tubes of a bicycle meeting over the bottom bracket. The butt of the rifle is supported by a leather flap which is fastened by means of a stud, and the barrel is supported by the handle bar. Accepted August 11, 1900.
- 12,442 (1900) **Explosive charge for guns.** J. H. Brown, U.S.A. An explosive charge for propelling projectiles composed of gunpowder, into which a body of water, or water chemically combined with other materials, is inserted in a separate vessel. By means of this water the pressure is materially increased and the heat decreased. The vessel into which the water is placed is adapted to melt or break up upon combustion of the powder, the heat of the gases converting the water into steam, thereby increasing the volume of gaseous matter, and therefore the pressure, in the barrel. A great deal of the heat absorbed by the gun-barrel in the ordinary way is used up in so converting the water. Accepted August 11, 1900.

* This Specification is more fully described under "Selected Patent"

SELECTED PATENT.

THE SMALLMAN TRIGGER MECHANISM.

16,558 (1899). J. W. Smallman, Nuneaton. This patent relates to several modifications in the trigger mechanism patented in Specification No. 11,348, of 1898, which was fully described in our issue of August, 1899. The arrangement of the triggers is such that the special advantage of single-trigger guns in not having to shift the grasp on the stock is also secured in this mechanism. As will be seen from the illustrations, the two triggers are placed very close together, that of the right-hand barrel being in advance of the other by about the distance of its draught when pulled to release the sear. When the finger is removed from the trigger it flies into a forward position, leaving plenty of room for the insertion of the finger between the two triggers for pulling off the second. When it is desired to fire the left first, the right trigger has to be pushed out of the way by the finger. After firing, the triggers re arrange themselves during the cocking of the gun.

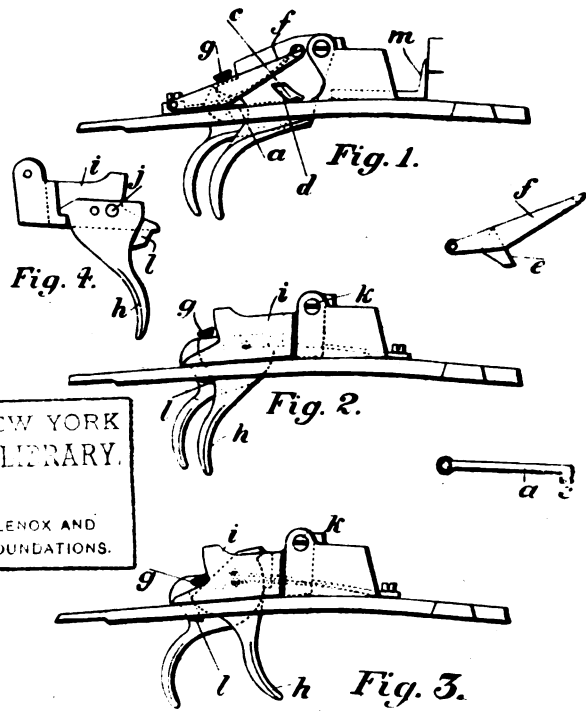
The present patent deals with a number of minor modifications in connection with this mechanism which principally refer to safeguarding against accidental discharge through the constant pressing forward and releasing of the right-hand trigger. In a gun in which the sear-nose and the bent are in proper order this could happen any number of times without accident, but in cases where the sear-nose or the bent has become worn about nine or ten of the taps on the sear tail, caused by the backward motion of the right-hand trigger, have been found to gradually release the hammer, and so bring about an accidental discharge.

In Fig. 1 one method of absorbing the backward movement of the trigger before it can touch the sear is illustrated. A strong guard-

spring *a* (shown in detail), which beds along the trigger plate, is fixed beneath the split trigger spring, and a lateral projection *c* on its end works in the slot *d* in the trigger (Fig. 1). When the trigger is pressed forward, and is allowed to fly back, the bottom of the slot comes into engagement with the spring, and any further backward movement of the trigger is prevented.

Another arrangement to protect the sear tail is the projection *e* on the trigger-actuating lever *f* (shown in detail). It is through this lever, upon which the released sear *g* exerts a downward pressure, that the trigger is pressed forward after the discharge of the right-hand barrel. The projection *e* extends downwards into the right-hand slot in the trigger plate, and the right-hand trigger is stopped by this before it can reach the sear in its backward travel. In guns in which an intercepting, or safety, sear is used, this sear is adapted to protect the ordinary sear.

In Figs. 2 and 3 a more complete arrangement is shown for overcoming this same difficulty. The trigger-actuating lever is dis-



posed with altogether, and the right-hand trigger is formed in two separate parts *h* and *l*, which are pivoted together at *j*. This compound trigger is in its turn pivoted in the ordinary way at the point *h*, and it will be seen that to raise the sear the whole arrangement is lifted. In its normal state the trigger *h* lies just a little below the sear, which it cannot reach without the second portion of the trigger being raised. Thus, when the trigger *h* is pushed forward, and is allowed to fly back, the projection *l*, through which the top portion of the trigger is raised, stops the upward movement of the trigger before it reaches the sear. The downward pressure of the sear *g* causes the trigger *h* to assume its forward position after the discharge of the right-hand barrel.

Referring again to Fig. 1, the stop *m* here shown is provided to supplement the trigger spring in returning the right-hand trigger to its cocked position. Should the mechanism become clogged by rust or by other means, the trigger spring would probably not be strong enough to return the trigger. The stop, which is pushed backward during the cocking of the hammer, exerts sufficient force to overcome resistance from any such causes. This device is not, however, so effective when applied to a hammer gun. Accepted August 15, 1900.

SMITH & WESSON, REVOLVERS.

Manufactured by SMITH & WESSON, Springfield, Mass, U.S.A.

Revolvers of Smith and Wesson manufacture are constructed on one or other of two systems. The Automatic Shell extractors consist of a jointed frame, so arranged that when the action is opened the empty cases are automatically withdrawn from the chamber and fall away free from the revolver. In the hand-ejecting revolvers the frame is solid, and has no joint. The cylinder is released by a simple catch, and may then be swung sideways clear of the breech. With the cylinder in this position a slight pressure on the end of the extractor rod suffices to free the empty cases from the cylinder, so that they fall clear of the revolver.

The following are the leading types of SMITH & WESSON Revolvers and Pistols, which may be obtained either Blue or Nickel Plated:—

.32 HAMMERLESS SAFETY. Five-shot; 3-inch barrel; 88-grain bullet; Automatic Shell Extractor, with Rebounding Lock and Patent Safety Attachment.

.38 HAMMERLESS SAFETY. Five-shot; $3\frac{1}{2}$ -inch barrel; 146-grain bullet; Automatic Shell Extractor, with Rebounding Lock and Patent Safety Attachment.

.32 DOUBLE ACTION. Five-shot; 3-inch barrel; 88-grain bullet; Automatic Shell Extractor.

.38 DOUBLE ACTION. Five-shot; $3\frac{1}{2}$ -inch barrel; 146-grain bullet; also light gallery charge; Automatic Shell Extractor; Target Sights and Target Stocks extra. The above revolvers are the most popular and reliable for pocket use and for house protection.

.44 DOUBLE ACTION. RUSSIAN MODEL. Six-shot; $6\frac{1}{2}$ -inch barrel; Automatic shell Extractor. This Revolver is also supplied to take the .450 English Revolver Ammunition.

.44 DOUBLE ACTION. FRONTIER MODEL. Six-shot; 4-inch barrel; Automatic Shell Extractor; Black Rubber or Checked Wood Stocks. Target Sights extra.

.32 BICYCLE REVOLVER. Five-shot; 2-inch barrel;

88-grain bullet; Automatic Shell Extractor; Rebounding Lock, and Patent Safety Attachment

.32 HAND EJECTOR MODEL 1896. Six-shot; $3\frac{1}{2}$ -inch barrel; 98-grain bullet also light gallery charge; Rebounding Lock. Target Sights and Black Rubber Target Stocks extra.

.38 MILITARY. MODEL 1899. Six-shot Hand Ejector; a strictly Military arm bullet to stand hard service; 4-inch barrel, 1 lb. $13\frac{1}{2}$ oz.; 5-inch barrel, 1 lb. 14 oz.; $6\frac{1}{2}$ -inch barrel, 1 lb. $15\frac{1}{2}$ oz.; Shoots .38 Smith and Wesson Cartridge with 158-grain bullet, .38 United States Service Cartridge with 150-grain bullet, and .32 Winchester with 115-grain bullet; Double Action.

SINGLE SHOT TARGET PISTOL. .22 Calibre, Automatic Shell Extractor; Rebounding Locks and Adjustable Target Sights. This pistol is strongly recommended to persons wishing to practice with a high-class arm. It is extremely accurate, and the ammunition is inexpensive. It is supplied with either a 6-inch, 8-inch or 10-inch barrel, and may be had nickel-plated or blued. The greatest accuracy can be obtained with the .22 R. F. Long Rifle U.M.C. Cartridge.

SMITH & WESSON'S beautifully illustrated book dealing with the different types of "S. & W." Revolvers, etc. may be obtained, together with the best wholesale prices from the Sole Wholesale Agents, CHARLES OSBORNE & Co. Ltd., Whittall Street, Birmingham, and 2 Great Scotland Yard, London, S.W.

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Arms & Explosives

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CURRENT TOPICS.

The Rearming of Native Troops.—Apparently, the example set by Pall Mall in respect to supplying the native regiments in India with arms of a modern character is about to be followed by other countries. France has decided that all the troops in the colonies are henceforth to be armed with weapons similar to those of the home army. Of course this new order does not affect Algeria, which has always been treated as on the same level with the troops in France itself in matters of equipment. Experience seems to indicate that the mere possession of modern arms constitutes a small danger, since the risk of revolt is well-nigh negligible where troops are carefully selected, well-trained, and treated according to the ordinary principles of humanity.

Guns that are to Disappear.—In consequence of a test made at Sandy Hook on October 1st, the U.S. Army Fortification Board has pronounced that guns mounted on disappearing carriages are virtually useless. This decision is considered to be one of the most important ever given in military circles, as it is thought to be the death-blow of a system that has for many years been in evidence among the leading military nations. It is scarcely to be imagined, however, that this pronouncement, directed against the particular type of carriage invented by General Buffington, chief of the U.S. Army Ordnance Bureau, will necessarily imply the abandonment of

the different systems favoured by European Powers. The British system of disappearing gun-mounting, invented by Colonel Moncrieff, and the designs originating at Creusot, and from the brains of Herr Krupp and Herr Gruson and others, do not of necessity stand or fall by the results of a single test of another type of mounting. It would be interesting to know exactly on what grounds General Miles and other U.S. officers have decided that the European types of disappearing guns are impracticable. So much depends on the system and what is expected of it.

The French 75 mm. Field Gun.—After making a point of absolute secrecy for a couple of years or more, the French authorities seem to have come to the conclusion that they can no longer maintain the air of mystery surrounding the construction of the new 75 mm. (2.95 in.) gun. At the manœuvres two years ago, gendarmes were specially detailed to keep all strangers at a distance from the batteries, but this year there was a total absence of such precautions, and the foreign military attachés were enabled to see the working of the guns quite plainly. An explanation of this change of attitude is doubtless to be found in the fact that several batteries equipped with the new gun are under orders for service in China, where they can scarcely be maintained under absolute conditions of secrecy. In any case, it is always extremely doubtful whether the air of mystery adopted by all Governments with respect to inventions of a presumably exclusive character deceives anyone but the authorities themselves. We can remember the disturbance caused by the theft of a

Lebel rifle some years ago, when everyone who had an interest in knowing its constructive details was already in possession of the required information. Possibly there are few rare instances of warlike appliances being kept "up the sleeve" of different Powers. The Brennan Torpedo is supposed to be a case in point. But as regards *matériel* that comes into daily use and is distributed through a branch of the service, the intelligent inquirer can generally learn all he wants to know in one way or another.

Artillery in the French Manœuvres.—As a result of the recent grand manœuvres of the French army, in which the 75 mm. guns received such praise from all who were witness to their working, one of the generals has expressed his opinion that the rapidity and precision of firing in the new gun has increased the value of the French artillery three-fold. Prior to the introduction of this gun, the coefficients of power of the French and German armies had been computed to the following values:—French army, infantry 8, artillery 4, cavalry $\frac{1}{2}$, auxiliary services 2, command 5—total 19 $\frac{1}{2}$; German army, infantry 6, artillery 4, cavalry 1, auxiliary services 2, command 7—total 20. By the process of trebling the coefficient of the French artillery, the totals undergo modifications to, French army, 27 $\frac{1}{2}$; German army, 20. Assuming that this arbitrary apportionment of efficiency possesses any basis of value in actual fact, it is evident that a levelling up of the German artillery to the point reached by their neighbours across the Eastern frontier would speedily restore the old conditions, and there is little doubt that this process will come about shortly.

A Prophet in his own Country.—Mr. Chandler, ex-Secretary for War to the United States, has been indulging in prophecy. In an article appearing in *The Cosmopolitan*, he foretells that, fifty years hence, ships will have discarded their armour in the same manner as did the knights of several centuries ago. It has, he writes, been realised already that armour-plating has been overdone. The fighting ship of the future will therefore be narrowed down more or less to one type, with light armour, if any. It will be swift, nimble of movement, and possessing a tremendous destructive power. It will also, apparently, show a corresponding increase in casualties. Steam, we learn, will be replaced by a more efficient propelling agent, and the radius of action will be increased to such an extent as to enable a vessel to cover 18,000 miles without entering a port. The armament will consist of guns of moderate calibre, all of the rapid-fire type, discharging shells carrying high explosives. Of course, the vessels will be rendered incombustible. For the tactics of defence will be substituted a policy of aggression, and a sea fight will be a contest to determine who shall get in the death-blow first. This strikes one as being a particularly daring effort of prophecy, since the change of tactics thus indicated is, of course, at total variance with present traditions. It is difficult to imagine that even fifty years of training would effect so complete a revolution of ideas as to lead one vessel or squadron to attack another, and the thought of two opposing vessels each striving to get in the death-blow first is absolutely improbable, so opposed is it to all past experience. Continuing, Mr. Chandler thinks that the use of the torpedo will be greatly developed during the next fifty years, and larger torpedo boats will carry a fair battery and be able to put up some sort

of fight. They will evidently become independent units, for we learn that ships will carry submarine boats for torpedo service. Finally, we may mention that the pneumatic gun will go out of use. As a humourist, Mr. Chandler can scarcely yet take rank with Mark Twain. His flights of unconscious humour should place him on a pedestal quite apart from the author of "A Tramp Abroad."

Rifle Thieving on the Indian Frontier.—The theft of rifles from military stations on the Indian frontier still continues, though it is not at present so frequent or serious as at an earlier date, and does not consequently come into the same prominence of publicity. With the approaching rearmament of the native regiments with the small-bore magazine rifle, however, it is only to be expected that a considerable increase will take place in the frequency and number of thefts along the north-west frontier, the market price of a magazine rifle across the border being sufficiently high to attract to the centres of "conveyance" the most expert professional thieves, in view of the approaching increase in the quantity of arms available for theft and subsequent passing across the border. In the past the military authorities have attempted in many ways to defeat the schemes of the rifle thief, but with only partial success, the wily Pathan being only too often able to make good his enterprise. This can be the more easily understood when it is realised that the value of a single rifle is so much to these thieves that a man will be content to wait his chance for six months, provided it comes at the close of the period. Against such persistence the most strict vigilance must fail at times. At Quetta the plan is now adopted of substituting iron cages for the arm-racks usually employed, and if this system should prove to answer the required purpose, it will probably come into general use. Another step in the same direction, which has just been taken by the Indian Government, consists in compelling all natives within the limits of military cantonments to be provided with passes. With these two measures in force, the pilfering Pathan should find considerable difficulties in the way of his favourite pursuit.

Field-Firing Trials at Aldershot.—An interesting trial was made at Aldershot on the 22nd ult. as to the efficiency of long range field-firing. A set of 18 screens covered with khaki-coloured canvas, each 30 yards long and 5 ft. 6 in. high, and placed one behind the other, at a distance of 25 yards, to represent a brigade of infantry in column, were fixed up on Eelmoor Hill West, in the Long Valley. Opposed to these, on Ball Hill, were 40 men of the 2nd Battn. Highland Light Infantry, supplied with 50 rounds of ball cartridge per man under the command of Major Carey. Only the first four of the screens could be seen from this position, and owing to a prevalent haze these could barely be distinguished with the naked eye. Firing was opened with the sighting ordered to 1,900 yards, but as the bullets seemed to fall short, the sights were corrected to 2,200 yards. Independent fire was permitted until the men had used up about half their ammunition, when "cease fire" was ordered to allow the rifle to cool, and a report to be made of the effects of the trial. It was found that the men had got well on the target. Three volleys were then fired, and of the last volley 15 bullets hit the screens. Finally, independent fire was allowed until all the ammunition was expended. A visit to the targets showed the

experiment to have been successful beyond all reasonable expectation. In all there were 348 direct hits, or over 17 per cent., and hundreds of shots had fallen in between or underneath the screens. Practically, the first four screens received the brunt of the bullets, some of those to the rear not being touched at all. Considering the long range, the practical invisibility of the targets, and the atmospheric conditions, a percentage of 17 is most highly satisfactory. The experiment was witnessed by General Sir William Butler and a large gathering of staff and regimental officers. At the conclusion of the shooting, Major Carey took his men across to show them the result of their shooting, and he said that it was quite apparent that their rifles were good, their range was good, and their firing was excellent. Further experiments are to be conducted very shortly.

Dr. Nobel's Bequest.—It may be remembered that on his death, Dr. Nobel left a large sum in trust, the interest on which was to be devoted to the provision of annual prizes given to those who, in the previous year, should have conferred the greatest service on mankind. The amount thus available was to be divided into five equal parts, assigned as follows:—(1) To the most important discovery or invention in the domain of the physical sciences; (2), to the most important discovery or improvement in chemistry; (3), to the most important discovery in physiology or medicine; (4), to the most remarkable literary work (*l'ouvrage littéraire le plus remarquable dans le sens de l'idéalisme*); and (5), to the person who should have rendered the greatest service in the cause of international brotherhood, in the suppression or reduction of standing armies, or in the establishment or furtherance of peace congresses. The competitions were to be open to the entire world. In order to embody the testator's wishes in the most accurate form, it has been found necessary to draft a rather lengthy code of statutes and regulations covering the various conditions. An official translation has now been made from the original French of the statutes, and has been forwarded through the Foreign Office to the Board of Education, who are circulating copies to a number of the chief libraries in England and Wales, to the universities and university colleges, to the principal learned societies, and to the Press. It is intended that the competitions under the Nobel Bequest shall be held for the first time in 1901.

INFRINGEMENT OF THE EXPLOSIVES ACT.—Mr. Thomas Richardson, of Penarth Road, Cardiff, was summoned to the Cardiff Police Court on a charge of keeping at his registered premises a quantity of explosives in excess of that permitted by the Act. From the evidence it appeared that the local Inspector visited the defendant's premises on September 20th, and found 448 lbs. of explosives in store, this being an excess of the amount named in the Act to the extent of 248 lbs. There were, according to the Inspector, sufficient explosives on the premises to have blown Cardiff up *en bloc*. For the defence it was shown that Mr. Richardson only took up the fireworks business early in the present year. The overstock was due, it was further explained, to the fact that the extraordinary rejoicings on *Mafeking Day* caused a great demand for fireworks. Mr. Richardson's stock soon gave out, and in the belief that there would be similar rejoicings later on, he ordered a large quantity of fireworks from the manufacturers, without being aware of their exact weight. The Bench imposed a fine of £3 2s., or at a rate of 3d. per pound for every pound in excess of the quantity prescribed by the Act.

PRESSURE TESTING IN SHOT GUNS.

A RECENT correspondence in the *Field* shows that experts refuse to agree on a point that has been definitely settled for years. On April 14th last our contemporary described an apparatus which it had constructed for the purpose of exactly determining the pressure that corresponded with each stage of the compression of the lead cylinders or crushers that are commonly in use in the trade. Subsequently the same apparatus was used to build up a similar table of equivalents applying to a certain form of copper crusher. In the interim between these two articles, Mr. J. C. Irvine, of Messrs. Eley Bros., had evidently considered the question very carefully, with the result that he promptly responded to the second article with a letter objecting to any unjustifiable interference with the Eley table of equivalents that has been in use so long and has given such general satisfaction. Mr. Irvine was wise enough to secure the support at the outset of all who have studied the scientific experts of the problem by indicating that the Eley table, and for that matter any other table dealing with lead crushers, must fail to give absolute pressure equivalents for given crushings, since lead with equal pressures gives different crushings for variable times of action of such pressure.

The system of calibration adopted by the *Field* provided accurate enough readings for charges having the same time of action as that used in the apparatus, but as crushings in guns are effected in variable times, according to the powder and loading in use, our contemporary's claim to have achieved absolute values falls to the ground. Mr. Irvine put this point very clearly, and our contemporary must have purposely burked the main question when, in replying, it ran off into a discussion of mercury column methods of calibrating crushers. A second letter from Mr. Irvine failed to bring our contemporary on to the right track, and we are, therefore, forced to the assumption that it does not, as in the days of Mr. Toms, ensure at least a plausible theoretical foundation for its conclusions before launching them upon the world. All that we have been told is that the time of action of the *Field* apparatus is the shortest ever used, and, therefore, according to its reasoning, the readings are the most accurate available. We suppose that in these days of nervous hurry no one is supposed to have time to master the underlying laws of crusher measurement of pressure as expounded by such experts as Vieille. At any rate, when we find Mr. Irvine summarising their conclusions in a thoughtful and practical spirit, he is treated as an unreasonable mortal, who must be more or less politely snubbed editorially.

For our own part we find great merit in the apparatus devised by our contemporary. It provides a means of measuring the absolute value of the maximum pressure developed in a gun. The apparatus should, therefore, be capable of throwing the most interesting light on the behaviour of lead crushers under various combinations of pressure and time. Such an apparatus would seem to be very well suited for the study of the variable crushings that would be registered when charges having different times of action are fired under conditions that ensure identical readings of maximum pressure. Unfortunately the craze for something by way of definite results has

diverted attention from this line of enquiry, at least so we judge from the fact that no record of such experiments has appeared. Without any reference to the numerous tests that can be applied to determine the accuracy or otherwise of a pressure table we must assume that such have not been conducted. Without them the new table cannot be accepted, because the whole of our knowledge as to the behaviour of lead tells us that a lead table would not survive such tests of its accuracy in the case of powders having diverse times of combustion. In the hope of making the theoretical aspects of pressure testing more clear, we have decided to treat this subject in our next series of Lectures to Young Gunmakers. We hope to make a start in our next issue, and we have no hesitation in assuring our readers in advance that no efforts will be spared to make our treatment of the subject comprehensive, and at the same time free from bias of any kind.

INCIDENTAL JOTTINGS.

**VOLUN-
SCRIPTION.** It is with a sigh of relief that we return to our work, having patriotically greeted our citizen warriors on their return from the war. We felt somehow that beside the honest welcome, that we were shouting acclamation for the War Office changes that are undoubtedly to come in the reconstruction of the Volunteer Army. We, the public, were having our pulse felt, and now await with interest the diagnosis, and prescription we are recommended. One of the means to provide the remedy seems inevitable. We shall be well "bled!" But we don't mind that so long as we have plenty of confidence in the physician who will work the cure. The volunteer may, however, congratulate himself that he is no longer regarded as a sort of "Lord Mayor's Show" man, but an intelligent being, capable of learning in as few months as much as an ordinary "Tommy" learns in as many years. This revelation now proves that the officers commanding should be gifted with similar or greater intelligence than the rank and file of our citizen soldiers—and that the necessary cash should not be the only qualification for a commission.

**THE WRITING
ON THE WALL.** A "Gunmaker" points out that when dealing with the question of machine-made guns, it should be borne in mind that the structural workshop environments of this ancient craft should be taken into consideration. To employ machinery would mean steam power, and consequent enlargement of their premises, often unobtainable, the erection of shafting on ceilings and roofs, incapable of bearing the strain, and a large amount of work to pay for capital outlay! Whereas they may be fully equipped with hand-working machine tools, from which the modern degree of accuracy cannot be obtained—hence the hand finish. Of course this is a bad state of things, which they show little or no inclination to cope with. I recommend electric power, which may be taken from street mains—gas or oil engines, at a not extravagant price, and "Gunmaker" can adapt his hand machines to power, which shall be the foundation to his fortune. Where there's a will there's a way, provided it is

paved with a chance of remunerative orders. It seems a pity that the small master gunmakers do not realise that should they not move with the times, the great incubus of small traders, the capitalist, will come along and acquire the business for the few, to the exclusion of the many.

**"GREAT
MINDS THINK
ALIKE."** I AM much obliged to "Lient.-Col." "Sapper Chatham," and my New York correspondent for their communications regarding my note on coast defence of last month. I had no idea that the suggestion was so ancient, or that Major Girouard had written a pamphlet on the subject. I shall, however, read it with interest. All this goes to prove that it is no wild scheme, but a really practicable suggestion, which the authorities ought to deal with. Some months back there was, I believe, a commission enquiring into the fortification of the coast, and visits were made to various estuaries, harbours, towns, and points of vantage. Can any of our military readers say if this was only to report on existing forts or to suggest better methods? I do not remember to have seen the mandate from Whitehall in print, though I remember the officers were paragraphed at the various towns they visited.

**THE TRADE IN
EXPLOSIVES.** STILL they come. New explosive works are constantly being built in England, and others enlarged, whilst, on the other hand, many older established concerns manufacturing specialties puzzle the commercial world how they ever exist at all. This sets one thinking as to the outlets for these articles of commerce, and it really is quite astonishing where all the explosives get to, particularly the newer sorts. I dare say many have noticed when in Scotland or Yorkshire, etc., when asking sportsmen what powder they use, 75 per cent. will mention one or two old-established nitro powders, but the gamekeepers invariably favour their particular "ite." For mining purposes a great variety is used, and in fairly large quantities, so that the concession or monopoly of some particular mining district is often sufficient inducement to start a factory on a small scale, with the hope of enlargement. The question, however, whether it would not be best in such cases to make the explosive in the vicinity of such district, is one which does not seem to carry as much favour as it might do, although in other trades the centralisation of allied industries seems greatly on the increase.

**EXPLOSIVE
SPECIALTIES.** It is questionable whether better explosives might not be utilised for military and naval operations outside gunnery. At present torpedoes, submarine mines, boat mines, etc., employ guncotton entirely where other explosives might be used with advantage, either for reasons of occupying less space or greater violence of explosions. For sappers and miners and the gentlemen engaged in blowing up farm-houses of South African oath-breakers, quite a special article might be devised for the purpose, and for destroying ordnance special cartridges might be devised, which would ensure most satisfactory results. For years and years gunpowder was the universal agent, but now we have lived long enough to have specialties devised for such operations. The "ready-made" business has no rival in military work.

CYCLOPS.

TELESCOPIC SIGHT FOR THE UNITED STATES MAGAZINE RIFLE.

THE United States Ordnance Board has recently made a test of a new telescopic rifle sight manufactured by the Cataract Tool and Optical Co., of Buffalo, N.Y. The test was made at the U.S. Armoury, Springfield, Mass., on the service magazine rifle equipped with a Sharpshooters' Telescopic Sight.

As the result of the tests, the Board made the following report:—

"The Board met pursuant to order at 10 o'clock a.m. Present, all the members. H. L. De Zeng, jnr., representing the Cataract Tool and Optical Co., was also present, and explained the working of the telescopic sight submitted by his company for trial. This sight consists of a telescope, which is attached by means of brackets to the left side of the rifle. The front bracket is secured to the lower band by two screws, and the ring through which the telescope passes has a horizontal motion to provide for drift and windage. A ball and socket joint in this ring allows the telescope to be moved in any direction, and it may be pushed forward or backward through this ring to bring it to the proper distance from the eye of the firer. The rear bracket is screwed to the side plate of the receiver, and the ring which holds the telescope has a vertical movement for changes of elevation. This ring is provided with a clamp screw for securing the telescope at the desired distance from the eye.

"The manufacturers make the following claims for this sight:—The points of superiority in our telescope are—their apparent universal focus, their perfect achromatic and spherical corrections, their exceptionally large and flat field of vision, their remarkable illumination, their non-breakable cross hairs, their qualities as a night as well as day glass, their very large lenses, and their proof against water and dirt.

"Telescopes of three different powers were submitted for trial; namely, 8 diameters, 12 diameters, and 20 diameters. The medium power (12 diameters) gave the best results. The telescope is of practically universal focus; that is, it does not require readjustment for different marksmen or for different ranges. The eye can be placed close to the eye-piece or several inches away without any apparent difference in the focus. Danger of being struck in the eye when the piece recoils can therefore be avoided. The lenses are large, and are held in place by having the metal of the tubes in which they are mounted spun over their outer edges. The telescope is light, but at the same time strong. The brackets for attaching the telescope to the rifle are strong and durable, and there appears to be no tendency to jar loose.

"The sight was tested by actual firings up to a range of 2,000 yards, each member of the board participating in the firings. As a result of this test, the board is of opinion that the use of this telescopic sight appears to be of especial value in hazy or foggy weather, and at long ranges. In either case, the target can be seen with remarkable clearness, and the marksman can be absolutely sure that he is aiming at the proper object. This would be of especial importance to sharpshooters acting independently.

"The firing conducted at the target range showed that better targets were secured with the telescopic sight than with the regular sight, but the board is of opinion that this does not indicate the full value of the telescopic sight. The ordinary sight is useful for accurate firing at a regular target up to about 2,000 yards, but it is impossible to see a man or even a small body of men clearly at that range, unless projected against the sky or under other very favourable conditions. It is for this reason that volley firing is so largely resorted to at long ranges. With the telescopic sight a man could be distinguished easily at 2,000 yards, even with an unfavourable background.

"The board is of the opinion that this sight is suitable for use in the United States service, and recommends that a number of them be purchased for trial by troops in the field. If found to be satisfactory, a sufficient number should be purchased to supply such a number of the sharpshooters of each organization as experience in the field shall indicate to be desirable."

A NEW EXPLOSIVES ORDER IN COUNCIL.

A CIRCULAR, dated October 6th, 1900, together with a new Order relating to the use of explosives in coal mines, has been issued by the Home Office to mine-owners, to the following effect:—

SIR,—I am directed by the Secretary of State to transmit to you a copy of an Order which he has made under section 6 of the Coal Mines Regulation Act, 1896, with regard to the use of explosives in mines. This Order repeals the Order of July 24, 1899, and the amending Order of April 7 last; and re-enacts those Orders with certain modifications and additions.

The body of the Order remains unchanged with the exception of two slight alterations in sections 3 and 5: in section 3 the words "under the conditions prescribed in section 2 of this Order," are inserted after the words "permitted explosive is used;" and the exemption in section 5 is restricted to the provisions in sections 1, 2 and 3, so that the regulations as to detonators in section 4 will apply to all mines coming under the Coal Mines Regulation Acts.

The chief purpose of the Order is to embody the results of the Special Test for explosives which was established in October of last year. It will be remembered that in the memorandum of October 18, 1899, announcing the establishment of this "test," it was stated that the Secretary of State found from the reports of the Mines Inspectors that a desire existed among mineowners for further assistance in the selection of explosives for use in dangerous mines than was given by the existing "permitted list;" that list containing merely the name of all explosives that had passed the Woolwich test without in any way distinguishing for the guidance of mineowners between those which had barely passed the test and those which could be fired safely under much more severe conditions. In order to give the mineowners greater assistance in the matter, the Secretary of State decided to establish the more stringent "Special Test" described in the memorandum, and to place on a separate list, to be called the "Special List of Permitted Explosives," those explosives which succeeded in passing it.

The Special Test differs from the ordinary test (1) in the amount of the charges, which is increased by half for the first ten shots, and doubled, with a slight increase of stemming, for the remainder; (2) in the more sensitive character of the gaseous mixture in which the shots are fired; (3) in the fact that, while an explosive might pass the ordinary test with two failures in forty shots, under the Special Test a single failure disqualifies.

Six explosives have now passed the Special Test, and have been placed on the "Special List" which forms the first Schedule to the Order. The list of permitted explosives which have not been placed on the "Special List" forms the Second Schedule.

While the Secretary of State hopes that the Special List thus established will give definite assistance to owners of mines in the selection of explosives for use under dangerous conditions, it should be borne in mind that the responsibility of selecting the safest explosives and the best suited to the requirements of the mine, and especially of taking all reasonable precautions that the explosives are in good condition and properly used, still remains, and must always remain with the owner.

It will be noticed that, in the case of explosives which have been placed on the "Special List," the existing definitions of these explosives, as they appear in the Orders now repealed, have been retained on the ordinary list of permitted explosives. This retention will be temporary only, and is intended to enable manufacturers and owners to use up their existing stock of these explosives.

I am, Sir, your obedient servant,

HENRY CUNYNGHAME.

The permitted explosives which have passed the Special Test as laid down in the Home Office memorandum of October 18th, 1899, and which are now placed on the Special List are:—Ammonite, Amvis, Carbonite, Electronite (second definition), Nobel Ardeer Powder, and Roburite No. 3.

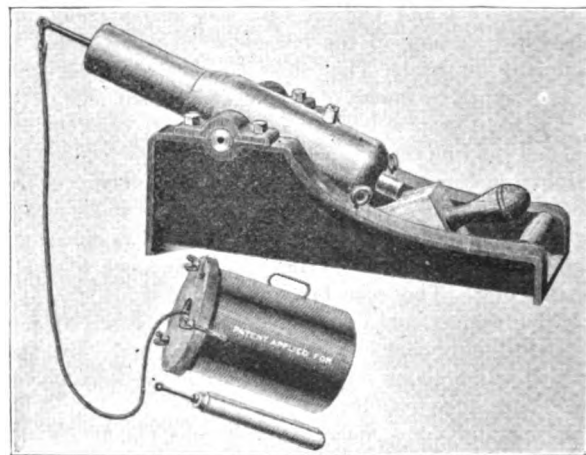
Permitted explosives which are not on the Special List are comprised in the following catalogue:—Ammonite, Amvis, Bellite No. 1, Bellite No. 3, Benedite, British Gelignite, Bull Dog Brand Gunpowder, Carbo-gelatine, Carbonite, Dahmenite A, Earthquake Powder, Electronite (first definition), Elephant Brand Gunpowder, Elephant Brand Gunpowder No. 2, Faversham Powder, Kynite, Kynoch Gelignite, Nahnsen's Gelignite, National Gelignite, Nobel Ardeer Powder, Nobel Carbonite, Nobel Gelignite, Oxalate Blasting Powder, Pembrite, Pit-ite, Rhenish Gelignite, Roburite No. 3, Stowmarket Gelignite, Sun Gelignite, Westfalite No. 1, and Westfalite No. 2.

Mr. John Rigby has a substantial claim to be the first inventor of the system of connecting barrels by a sleeve at either end, as distinguished from the ordinary brazed ribs, as is shown by the following extract from a patent of his taken out in 1855:—"My invention consists, secondly, in uniting two or more barrels of rifles by straps or bands, wedges and screws, instead of by the usual means of soldering or brazing, &c."

Messrs. Vickers, Sons & Maxim, Ltd., have suffered a loss in the death of Mr. John Crossley, at Heatherdean, in Sussex. Mr. Crossley, who was a millionaire at the close of his life, was essentially a self-made man. He first entered the employment of the great Sheffield firm of Messrs. Vickers as a clerk in the office, and subsequently was made a cashier. Finally he was put on the directorate of the company, a position which he occupied for many years, right up to the date of his death.

LINE THROWING GUNS.

THE inquiry we inserted in our last issue respecting the sources of supply of line throwing guns for life-saving and other purposes, has brought us two interesting replies. Thinking that the information we have received may be of interest to others besides our correspondent, we append the following particulars:—The Hunt Life Saving Gun and its equipment, as described, were made and sold by the late firm of the John P. Lovell Arms Co., of Boston, U.S.A., who bought up the original concern of the Hunt Gun Co. At the present time, however, no guns are being made, as the Lovell Arms Co., along with the adjacent Globe Bank, were closed and sold out by the U.S. Bank Commissioners last February. It is still



THE LYLE LINE THROWING GUN.

possible to procure a gun and its equipment except as regards the projectiles. These latter would probably have to be specially manufactured, since the Massachusetts Humane Society bought up all the available stock for use in their life-saving stations along the coast of that state, all of which are supplied with the Hunt Gun. By the way, the gun with a 2½-inch bore, specified by our correspondent, is the calibre generally carried by passenger steamers, the shore guns being of a 3½-inch bore.

Messrs. William Reed and Sons, of 107, Washington Street, Boston, U.S.A., also write to us on the subject, stating that they are headquarters for the article mentioned, and that they sell the facsimile of the U.S. Government Lyle guns, and have furnished them to the Cunard and other noted steamship lines. They have favoured us with a circular giving particulars of their gun, of which they hold a stock ready for immediate despatch. We have reproduced herewith the illustration which appears in their circular, and it seems that the cost of such a gun, complete with fittings, is about £20. The reel contains 1,800 feet of line. A shoulder gun for use in getting a line over high buildings or chimney stacks is also shown. Such a gun is intended for use by fire brigades or for throwing lines from towboats, barges, etc.

The following equipment is supplied with each gun of the type that is illustrated; its bore is 2½ inches, and it is mounted on an iron carriage, its range being from 1,000 to 1,200 feet:—

3 patent reels with lines; 2 rewinding apparatus; 3 projectiles, which can be used over and over again; 1 rammer for gun; 1 cleaning rod and worm; 1 priming wire; 1 lanyard and hook; 6 flannel cartridge bags, or filled with powder if wanted; 25 friction primers.

ROUND THE TRADE.

The Harris Rifle Magazine, Ltd., is the latest of the new companies exploiting a new military weapon.

The *Kynoch Journal* has just completed its first volume, and the most recent issue contains many articles of interest.

The new-elected member of Parliament for Oldham, Mr. A. Stanley Wilson, is chairman of the board of directors of Messrs. H. J. Hussey, Ltd.

Mr. R. C. Courtman, for many years works manager to Messrs. F. Joyce & Co., Ltd., has died after a prolonged illness.

Mr. Walter Winans in one day secured two gold medals for highest possible scores, 15 shots at 16 metres, duelling conditions, at Gastinne Renette's shooting gallery in Paris.

We learn with regret that early last month the well-known sportsman, Mr. J. Bashford ("Sutton"), met with a serious accident while out shooting.

Mr. R. B. Pollitt has just started for Cape Town to take up his appointment at the De Beers explosives factory referred to in the past issues of this paper.

The Midland Gun Co. have acquired the Premier Gun Works, Lancaster Street, Birmingham, which were occupied for many years by Messrs. W. and C. Scott prior to their absorption in the Webley combination.

Mr. J. Brightmore, of Tideswell, Derbyshire, and Mr. F. S. Goodwin, of Blakewell, Darlington, have registered the Winmore Electrical Indicating Target, the word "Winmore" being the word for which exclusive use is claimed.

Messrs. T. Bland & Sons are enquiring for particulars respecting the Delme Radcliffe's patent foresight for rifles. Perhaps some of our readers can supply the requisite information.

A new rifle cleaning preparation, to be known as the "303 Combined Cleaner and Rust Preventer," has been placed upon the market by Messrs. M. F. Findlay & Co., 19, Cadogan Street, Glasgow.

The shooting expert of the Army and Navy Stores was recently injured about the face by the giving way of a Mannlicher rifle when he was testing it at the Nunhead ranges.

Messrs. Kynoch, Ltd., have just issued their price list of smokeless powder, sporting and rifle cartridges and cartridge cases, containing, in addition, particulars of the other articles manufactured at the Company's different factories.

The Sunderland Rifle Club has been started in connection with the patriotic movement to encourage rifle shooting in this country. We are informed that the members are restricted to the use of the Stevens' .22 cal. "Ideal" rifle.

Mr. H. J. Harriss, who formerly carried on business as a gunmaker at Carlton Place, Regent Street, has recently filed his petition. The meeting of creditors took place on the 19th ult., and the statement shows liabilities of £937, against assets of £49.

Mr. Henry Sharpe, sporting writer and shooting journalist, was this day committed for trial at the Clerkwell Sessions for having converted to his own use sundry guns to the value of about £300, which he had borrowed for the purpose of tests to be reported in the course of articles to be written by him.

Loaders of sporting cartridges continue to find the card of loading instructions issued by our contemporary, the *Sporting Goods Review*, of great value. It is kept up to date by the issue of a revised edition at the commencement of each shooting season.

The programme for the winter session at the Gun Club indicates that weekly meetings will take place up to the end of March, 1901. Messrs. Curtis's & Harvey have presented two £20 cups, the one for competition with Amberite on December 1, and the other for a Cannonite competition on January 12, 1901.

Monsieur Martin Gerest, gunmaker, of St. Etienne, France, and conductor of the gun trade organ, *Bulletin Mensuelle de L'Armurerie Francaise*, has just retired from business, his successors being MM. Berthon Frères, who propose to confine their attention exclusively to the manufacture of hammerless guns.



GRAND PRIX, PARIS, 1900

Monsieur F. Courally recently paid a visit to this country with some choice specimens of hammerless shot guns manufactured by Ferd. Courally, sr. d'Aug. Lebeau, of Liège. The firm obtained the Grand Prix at the Paris Exhibition, and they are recognised as the Purvey of the Belgian gunmakers.

The Victorian Government have ordered a large quantity of Martini-Francotte cadet rifles. These weapons shoot the Morris tube cartridge, and, as made by Messrs. Francotte, of Liège, are very popular among buyers of miniature rifles either for gallery purposes or, as in the present case, for the arming of boy brigades.

We regret to learn the death of Mr. J. D. Thomas, which occurred on the 10th ult. Mr. Thomas was right-hand man and manager to Mr. John Darlington, the London agent of Nobels' Explosives Co., Ltd. His knowledge of the intricate regulations concerning the importation and carriage of explosives was encyclopædic.

Mr. Henry A. A. Thorn, trading as Charles Lancaster, recently met with a serious accident while engaged in tests to determine the relative suitability of different metals used for the brazing of gun barrels. Recent enquiries elicit the fact that he is progressing very satisfactorily, and his many friends wish him a speedy recovery.

Mr. H. W. Newton, better known as Harry Newton, the London representative of Messrs. Curtis's & Harvey, will be married on the 7th inst. at St. George's, Hanover Square. His exceptionally wide circle of friends have decided to give him a hearty send off at St. George's, and "afterwards at the Tudor Hotel, Oxford Street," as the invitation puts it.

Mr. W. W. Greener informs us that, owing to the difficulty he experiences in keeping abreast of the great demand for ammunition for the Greener .310 Sharpshooter's Club Rifle, he has made arrangements with Messrs. Eley Bros., Ltd., for that firm to supply the trade direct. The cartridges manufactured by Messrs. Eley Bros., Ltd., are the only ones authorised by Mr. Greener as suitable for use in the .310 rifle.

A statement respecting the unofficial realization of the estate of J. H. & G. M. Emms, trading as G. Jeffries exors., of 8, Orford Hill, Norwich, has been issued by the trustee, Messrs. J. H. Roofe, James Carr, and E. W. Wilkinson being the committee of inspection. Through a difficulty in transferring the freehold premises, the matter cannot yet be closed up, but reference is made to the fact that the premises have been leased to Mr. W. Darlow, gunmaker, of Bedford.

NOTES.

DEMAND FOR FIRE-ARMS IN SIAM.—The U. S. Minister at Bangkok has recently informed the Consular Department at Washington that bids for the construction of a plant to manufacture ammunition in that country were opened to American competition last March, and a bid was asked from the United States for the supply of 20,000 rifles and 10,000,000 cartridges.

TRANSVAAL CONCESSIONS COMMISSION.—The Chamber of Mines put in a long statement before the Concessions Commission on the 3rd ult., at Cape Town, showing that the dynamite monopoly was contrary to the Convention, and that the conditions of the concession had not been fulfilled and were prejudicial to the public interest. Mr. Quinan, of the De Beers factory, said that dynamite could be made in America for £1 per case. Mr. Fitzpatrick also was examined on this matter, and afterwards, on the question of the Netherlands Railway concession, he advocated expropriation. No further evidence will be taken in Cape Town.

BIRMINGHAM SMALL ARMS CO., LD.—The directors of this Company, in their report for the year ending July 31st last, showed a trading profit of £54,777, which, with interest on investments, £3,381, and the amount brought forward from last year, £4,903, makes a total sum at disposal of £63,061. Full allowance has been made for depreciation. Interim dividends at the rate of 10 per cent. per annum on the ordinary shares, free of income tax, and of 5 per cent. per annum on the preference shares, were paid on April 1st. The directors recommended that a further dividend of 15s. per share, free of income tax, be paid on the ordinary shares, and 2s. 6d. per share on the preference shares, payable on October 10th. These payments, amounting together to £50,393, make a total dividend for the twelve months of 20 per cent. on the ordinary shares, and 5 per cent. on the preference shares. The directors further recommended that the sum of

£10,000 be added to the reserve fund, thus raising this fund to £65,000. There remained, to be carried forward, the sum of £2,668. The directors paid a tribute of respect and esteem to their late Chairman, Mr. J. D. Goodman, who, having been appointed to that position at the original formation of the Birmingham Small Arms Company in 1861, had occupied it and superintended the Company's operations without cessation until his death in February of this year. To fill the vacancy, the deputy chairman, Mr. Herbert Chamberlain, has been elected chairman of the Company, and Mr. Thomas F. Walker has been appointed to the office of deputy-chairman. Speaking of the prospects held out by the future, the directors reported that the Company is at present under contract with H.M. Government for large supplies of small-arms, and the Board had reason to hope that the gun factory will be satisfactorily employed for some time to come. It has been found necessary to add to the buildings and plant, and further extensions during the coming year are under consideration.

NEW GUNNERY DEPOT AT DEVONPORT.—At Trevol, near Devonport, the Admiralty have acquired an extensive site, which is destined for use as a naval gunnery depot. Plans have been approved for the erection of barracks having accommodation for 2,000 officers and men, and provision is made for a gun battery capable of affording instruction in the use of all types of breech-loading and quick-firing guns up to the 9.2 in. gun. When completed, the new depot will be one of the largest and most important in the United Kingdom.

SMALL ARMS AND AMMUNITION.—A somewhat belated copy of the *Journal of the Military Service Institution* is to hand, containing an essay on "Small Arms and Ammunition," written by Colonel J. P. Farley, of the Ordnance Department, U.S. Army. The treatise is in part historical and in part purely scientific, but in neither case does it cover a very wide field. A series of tables serve to elucidate the test by placing various properties of the weapons dealt with in diagrammatic form, but it is to be regretted that the writer did not make deeper research into his subject, and thus enhance the interest and value of his essay.

TRAP SHOOTERS AND SPORTSMEN.—The King Powder Co. and Peters' Cartridge Co., of Cincinnati, O., have issued an eleventh edition of this useful little "handy book" for trap shooters and sportsmen, which contains all necessary correction in the Game laws and other enactments to bring it up to date. While obviously a trade catalogue of the firms interested, the little book contains a large variety of information of a kind likely to be useful to sportsmen, including a *précis* of the Game laws of the United States and the British Possessions, and hints on guns and game generally. For trap and live bird shooters, there is also an abundance of timely information as to the formation of a gun club and the rules adopted by the American Shooting Association and other organisations. The whole is presented in a compact and even tasteful form.

ELECTRIC AMMUNITION HOISTS IN THE BRITISH NAVY.—At last a trial is to be made in H.M. Navy of the fitting of electric quick delivery ammunition hoists for quick-firing guns. The innovation will be tried on

H.M.S. *Essex* and her sister ships, new cruisers having a speed of 23 knots, and provision will also be made for the substitution of hand gear should there be any failure of the electric principle. It is calculated that the use of electric gear will enable a very rapid rate of fire to be maintained without undue strain on the *personnel*, and without the hitherto prevailing necessity of keeping large quantities of ammunition in an exposed position on deck within easy reach of the guns' crews. The new cruisers, of which H.M.S. *Essex* is the prototype, carry no heavier guns than the 6-in. quick-firer. As usual, we are somewhat behind other countries in the adoption of electric hoists, notably the United States, in whose navy the system has been in use for some time.

SHELL FACTORY ON FIRE.—Early on the morning of the 6th ult., a fire occurred at the cartridge factory of Messrs. Vickers, Sons, and Maxim, Ltd., at Dartford. The flames spread so rapidly that, before the arrival of the local fire brigades, the shell department was beyond control, and was burned to the ground, together with its contents, which consisted of a large stock of shells prepared ready for shipment and a collection of valuable plant. Fortunately, the outbreak was restricted to this department, and was prevented from reaching the neighbouring powder factory and magazines and the waterworks. A number of residents of Wilmington rendered assistance to the staff and fire brigades. The works are at present almost exclusively engaged on Government work.

SIR W. G. ARMSTRONG, WHITWORTH & CO., LD.—At the annual meeting of shareholders of this Company, held at Newcastle on September 28th, Sir Andrew Noble presided, and in moving the adoption of the report congratulated the shareholders on a satisfactory dividend, equal to that of the previous year. He pointed out that many firms had complained during the past year of a certain degree of slackness of work, but the Elswick firm had suffered less than any he knew of in that respect. They had been able to give to the Government considerable assistance in supplying war material for South Africa, and to meet the calls that had been made upon them, they had initiated large extensions of the works, and were prepared to proceed still further in that direction. Speaking generally, Elswick was full of work, and though the recent great call for war ships had somewhat diminished for the moment, there was no doubt that in that department they would before long be as busy as in the past. Sir Andrew Noble referred to the fact that quick-firing guns of large calibre owed their initiation entirely to Elswick, and were now forming the principal armament of the most recent war ships. He also said how gratifying it was to know that the first gun of this type produced at the works, the 4.7 calibre, had proved so successful in war, and had been the admiration of all who had witnessed its effects.

EXPLOSION ON H.M.S. *DIADEM*.—As the result of the fatal explosion which occurred on board H.M.S. *Diadem*, which was reported briefly in our last issue, a series of court-martials have been held on the different officers concerned. Lieut. F. G. Bird was charged with negligently performing his duty, but the Court found the charge "not proven," though they considered that greater precautions should have been

taken when testing explosives. Torpedo-gunner H. E. Kent pleaded guilty to a similar charge, and handed in a written statement in mitigation. In the end, he was awarded to lose three months' seniority as a gunner, and to be severely reprimanded. Torpedo-Instructor Simeon Griffin, who also pleaded guilty, was sentenced to be disgraced to an able seaman, his torpedo certificate being cancelled, and the understanding being that he was never again to hold a torpedo rating.

WATFORD AND THE EXPLOSIVES ACT.—At Watford Petty Sessions, on the 9th ult., Mr. Kirkworth, local inspector under the Explosives Act, informed the Bench that he had received applications from twenty-six people in the district for registration under the Act, and that he had no ground for objection in any one case.

NEW EXPLOSIVES FACTORY ON CANVEY ISLAND.—An area of about 150 acres of land on Canvey Island has recently been purchased by the International Explosives Company, who intend to utilise the ground for the erection of a new explosives factory to employ some hundreds of workpeople.

IMPORTATION OF ARMS IN THE TIRAH VALLEY.—The Indian Government has discovered that arms and ammunition are again filtering into the hands of the hill tribes round the Tirah Valley. Several seizures have already been made, and officers have been specially detailed to make searches and keep a careful watch on all possible channels of supply. Of the arms so far under notice, the greater proportion are said to be of British manufacture. It will be remembered that we had considerable trouble in the Tirah Valley region a few years ago, and found the natives to possess ample supplies of weapons and ammunition.

HOTCHKISS GUNS FOR BELGIUM.—The Belgian Government has adopted the Hotchkiss system of quick-firing guns for use in the army, and eight weapons of this type have been purchased as a preliminary instalment of the equipment.

COAST DEFENCE AT DOVER.—Following up the delivery of six-inch quick-firing guns which was recently made at Dover Harbour Works, the War Office have supplemented this increase of armament by supplying also three nine-inch wire guns. These guns weigh 27 tons, and use a charge of 150 lbs. of Cordite, the projectile weighing 453 lbs., and containing 30 lbs. of Lyddite. The guns were sent round to Dover in a special War Office vessel, and special traction carriages were employed to convey them to the forts.

GUNNERY DEVELOPMENTS AT WHALE ISLAND.—With a view to the better training of men passing through the Central School of Naval Gunnery at Whale Island, a new system of practice is under process of development. Along the front of the battery, at a distance of about 50 yards from the muzzles of the guns employed for training, a switchback railway is being constructed, on which will be run a little fleet of model ships cut out of solid iron. They will be of dimensions varying from a foot to three feet in length, and will be worked at variable speeds, while the switchback nature of the track will give them the movements of actual vessels in a sea-

way. The practice guns will be fitted with Morris' tubes, and the crews will have every opportunity to learn how to bring their guns to bear on individual vessels of the model fleet at the shortest notice, and under service conditions, the special points aimed at being, of course, rapid sighting and straight shooting. It is hoped that this training will produce a marked improvement in the annual prize-firing in the fleet, and tend to restore the prestige of our seamen as first-rate gunners. In addition to this innovation, extensions are being made at Whale Island which will still further increase its efficiency as a school for naval gunnery.

CHAMBER GAUGES.—The Gunmakers' Association has invited tenders for the manufacture of a set of master gauges for 12-bore chambers, according to the new sizes published elsewhere in this issue.

SAFETY RIFLE RANGES.—We have received from the "inventor" Mr. Ernest Phillips, A.M.I.C.E., of Bedford, an illustrated pamphlet descriptive of the safety rifle range which he has devised. The pamphlet suffers somewhat at the outset from the misplaced enthusiasm of its author, who heads it "No Conscription, or 'Defence, not Defiance,'" and leads off with a number of high-falutin' paragraphs on the importance of rifle shooting, which seem singularly out of place in a document presumably issued with a view to commercial possibilities. Briefly, the system consists in the employment of a fixed firing point for use at all ranges up to, say, 1,000 yards, situated inside a bullet- and splinter-proof tunnel. An arrangement of suitable mantlets within the tunnel allows of the marksman being free to use his rifle as under ordinary service conditions without the risk of an accidentally discharged bullet leaving the tunnel, except through one orifice, 10 feet square. A series of check-butts placed at every 100 yards along the range are so designed as to stop all bullets issuing from the tunnel opening, and to prevent them from ricocheting, and the targets for the various ranges are shown on these check-butts as they may be required. Apart from facilities for firing at fixed targets, the scheme provides for the introduction of other forms of practice in rifle shooting. The main point made by Mr. Phillips, is, of course, that by the adoption of this system it would be possible to construct rifle ranges of any length on comparatively small areas of land, the screening of the tunnel and check-butts dispensing with the necessity for much lateral extent, and requiring no allowance of waste land beyond the extreme butts. As regards the actual novelty of the "invention," there is not much to be said. The idea of employing mantlets to restrain the flight of badly diverging bullets is, of course, far from new, and has been adopted for many years past on existing ranges. The initial feature of the bullet- and splinter-proof tunnel is also no great novelty. As to the system of check-butts along the range, and the rendering of them proof against ricochet action, here again the same remark holds good. Our readers may remember an interesting letter on the subject which appeared in our issue of December, 1895, and also our description of a ricochet mound patented by Mr. Walter Winans, which was detailed in the issue of May, 1896. On the whole, it is somewhat difficult to understand how this can properly be described as an invention, but, on the other hand, due praise must be bestowed on Mr. Phillips for the painstaking manner in which he has plotted out the dimensions of a 1,000 yards range adapted for the '303 service rifle.

THE GUNMAKERS' ASSOCIATION. GENERAL MEETING.

A GENERAL Meeting of the Gunmakers' Association was held at Effingham House on Thursday, October 18th, 1900, and there were present:—Messrs. E. Harrison (in the chair), J. Rigby, T. W. Webley, W. R. Leeson, C. H. Clarke, A. H. Watson, H. J. Blanch, A. H. Gale, H. White, and R. T. Woulfe.

MINUTES.—The minutes of the last general meeting were taken as read, and were duly confirmed, while those of the Annual General Meeting were taken as read and provisionally confirmed.

MESSAGES OF REGRET.—Messages of regret for non-attendance were read from Messrs. H. A. A. Thorn, F. Beesley, John Anderson, J. Tisdall, W. Richards, J. H. Mountstephen, C. E. Greener, and C. Ingram Annan. The Secretary was instructed to convey to Mr. Thorn the regret of those present for the accident which had befallen him and prevented his presence at the meeting, and their sincere wishes that he will be favoured with a rapid recovery.

CANDIDATE FOR MEMBERSHIP.—Mr. Henry Wilkinson Latham, of the Wilkinson Sword Co., Ltd., having been duly proposed and seconded, his election was unanimously agreed to.

12-BORE CHAMBER SIZES.—Mr. Harrison reported to the meeting, on behalf of the Executive, the steps which had been taken to arrive at a series of standard sizes for 12-bore gun chambers. He pointed out that it was mutually agreed at a joint conference between the Executive and the ammunition manufacturers, and a duly appointed representative of the Birmingham and Provincial Gunmakers' Union, that the most satisfactory manner of securing harmony between the cartridge and the gun chamber would be to decide upon standard minimum chamber sizes, and to secure the recognition of these sizes by the ammunition manufacturers. The below-mentioned sizes were unanimously approved at the General Meeting, subject to confirmation of certain points still open, which have since been settled. The following sizes and other particulars are, therefore, fully confirmed:—

MINIMUM CHAMBER SIZES.

A. Size under Rim	·811 inch.
B. Front End of Chamber	·798 inch.
C. Thickness of Rim	·074 inch.
D. Diameter of Rim	·882 inch.

Length of chamber for $2\frac{1}{4}$ inch cartridges to be proportioned to a cartridge case having a maximum length of 2·56 inches.

In the case of $2\frac{1}{2}$ and 3 inch cartridges, the above sizes A, B, C and D equally apply, but the length of chamber shall be proportioned to cartridge cases having a maximum length of 2·75 and 3·00 inches respectively, the extra length affecting only the taper of the walls of the chamber.

In every case the walls of the chamber shall have a straight taper from the rim groove to the front end.

The curve of the rim groove shall be the arc of a circle, the centre of which shall be as shown in the accompanying illustration. Messrs. Kynoch and Eley have undertaken in writing to construct their cartridges to conform with the above standard sizes; the test to be that cartridges, fired in chambers constructed within working limits of such sizes,

tions were carried out. The circumstances were brought to the notice of the London Proof House, who, after carefully enquiring into the facts of the case, and finding it impossible to trace the person responsible for the operations intended to conceal the fact that the action was cracked, decided under these conditions not to prosecute the vendor of the gun, who appeared to be innocent of intention to defraud. The Proof House, however, seized the gun and destroyed it as an unproved weapon, at the same time causing the vendor to refund to the purchaser the amount the latter had paid for the gun. The above circumstances indicate the readiness of the Proof House to take up any case where it seems that irregularities, punishable under the Proof Act, have been committed, and the publicity the case now receives may lead others to aid the Proof House in checking irregularities which affect the safety of users of the gun.

UNITED STATES ORDNANCE REPORT: IV.

Appendix 12 of the report deals with the development and tests of a non-mercuric primer intended for use with smokeless powder small-arms ammunition. Experiments had been made from August, 1897, onwards with two compositions of practically similar constitution as regards sulphur, sulphide of antimony, chlorate of potash and glass, with the addition to one of fulminate of mercury and mealed powder. The one containing the two additional ingredients was that originally experimented with, and a test of 2,000 primers containing this composition gave excellent results. A further trial, however, showed that about two per cent. hung fire. Experiments made with the composition without the fulminate of mercury and mealed powder also gave good results at first, but the primers so charged were found to undergo rapid deterioration in the lapse of time. Sufficient was learned from the tests to suggest the advisability of making further tests of non-mercuric primers, and accordingly a number of primers were made by hand containing sulphur and sulphide of antimony in the same proportions as in the first set of experiments, glass and chlorate of potash, the latter being added in greater proportion to secure complete oxidation of the other ingredients. The composition was mixed dry, instead of being wetted by a solution of gum in water, as is the practice of the shops. On being tested, these hand-made primers were found to be more sensitive than the first-mentioned; they did not deteriorate when exposed to dry air, but deteriorated rapidly in the hygroscope. It was therefore believed that primers containing sulphur, sulphide of antimony and chlorate of potash deteriorate during the process of manufacture when mixed wet, but do not deteriorate further after manufacture if kept dry.

At this time also attention was called to the corrosion of the tinfoil disc and tinned copper cup of service primers and of primers containing the three ingredients above mentioned after exposure in the hygroscope. To determine whether the deterioration of the primers already observed was due to galvanic action set up during the process of manufacture by the presence of the moist composition between the tinned copper of the primer cup and the tinfoil disc used in service manufacture, an experiment was made with four different methods of preparation, and the primers thus differentiated

were packed away separately for the space of several weeks. In No. 1, the wet composition was laid on a piece of bare copper and then covered with bare tinfoil, the foil being bent and fastened around the edges of the copper piece, so as to form a nearly air-tight enclosure to the composition. No. 2 package was formed in a similar manner, save that the copper was slightly tinned so as to resemble the service primer cups. No. 3 package was composed of untinned copper and tinfoil, both being coated with shellac. In No. 4 the copper was tinned, and both it and the tinfoil were coated with shellac. On being examined, some weeks later, these packages showed unmistakably that while the coating of shellac appeared to afford some partial protection to the tinfoil, it had no appreciable effect as regards the copper. The result of the experiment was to show the existence of a decided galvanic action when the primer containing the composition is manufactured after the manner of the present service primer. A further test was made to ascertain whether the ingredients would react on themselves, but after most careful search, no such result could be traced.

Having thus discovered the galvanic action created by the tinfoil and copper when the composition was mixed in a wet condition, the next experiments had for their object the substitution of some other material for the tinfoil. Celluloid, paraffined paper, waxed paper, and paper coated with shellac were severally tried, but the last alone was found practical. Tests of primers so built up proved to be most satisfactory, showing a fine degree of sensitiveness, a regularity of action, and less deterioration in the hygroscope than the service primers. Some considerable space in the report is devoted to a detailed account of the very severe tests to which these new experimental primers were subjected during the winter of 1897. Subsequent to these tests, which were made with a first instalment of 2,000 primers, a number of important improvements in construction have been made. Daily experiments with these primers, mixed wet with a gum as cement, as in service manufacture, showed that the hardening of any gum diminished the sensitiveness of the primer by requiring a harder blow to break up the solidified gum separating the ingredients. By using water alone in mixing, a hard compact pellet is formed after drying, with no foreign ingredient separating the particles of the composition. Again, the lesser force of detonation of the new primer allowed of the thickness of metal in the primer cup being reduced. Further improvements relate to the abandonment of the shoulder used in the service cup, thus permitting of a larger weight of pellet in the primer and the use of an improved foiling-punch; and the careful adjustment and proportioning of the size and form of the completed primer. The advantages now claimed for the new primer as against the service primer are as follow:— Being non-mercuric, it will not induce brittleness in the fired case; its sensitiveness and strength are more regular; it is less susceptible to the effects of moisture; it is cheaper and easier to manufacture; it can be fired after drying only 24 hours (whereas the service primer is considered to require at least three weeks' drying); and it appears to ignite smokeless powder more uniformly, producing greater regularity of velocities and pressure.

A supply of 25,000 of these new primers is now in process of completion, and they will be subjected to further severe tests, after which the substitution of these comparatively inexpensive primers, made of the composition employed in com-

mon friction primers, for the service primers hitherto employed, may be looked for as practicable, provided always that the new primers bear out the opinions already formed as to their efficiency.

Appendix 13 of the report deals with the work of the Chemical Laboratory at the Frankford Arsenal, which is established for the examination of smokeless powder, high explosives, &c. The report covers a period from July 12th, 1898, to July 10th, 1899, and provides a mass of statistics of a most interesting nature, which can, however, scarcely be reproduced in sufficiently condensed form to find a space in our columns. In addition to the carrying out of an elaborate series of tests of various powders, the Laboratory also examined, analysed, and reported upon the metals used in the production of cases, and the alloys used for the slugs of the bullets.

REVIEWS.

Shooting on a Small Income, How to Shoot, and the Management of Small Shootings. By C. E. Walker. Published by Archibald Constable & Co., London, 1900. Price 5s.

THE author of this book is undoubtedly a well-informed enthusiast. While books on shooting are frequently of little interest in that they cover old ground in a more or less uninteresting routine fashion, the present author is able to impart to his writing the interest which he himself takes in the pursuit of a favourite sport. Where he has been so successful is in the avoidance of the technical treatise style, which forbids one to look on a gun except as a tool to be judged by scientific scrutiny, and as an implement for the performance of a series of military drills. In other words, he imparts a live interest to the actual sport of shooting considered from the point of view of a man with country tastes who wishes to take an interest in the side issues, such as the development of a good head of game, and who also wishes to make a good showing when the time for actual sport arrives.

The highly common-sense view taken by the author on all matters connected with the selection and fitting of a gun cannot better be exemplified than by the following extract He says:—

“I would disabuse my reader's mind of the only too common idea that, when a man buys a sixty or seventy guinea gun, he is paying chiefly for the name of the maker, and not for the actual work put into the gun. Whether it is worth while paying more than forty or fifty guineas for a gun is a matter of opinion, but only because it is questionable whether the extra finish is worth the extra money. A sixty guinea gun is practically a sixty guinea gun, no matter from whom you get it. That is to say, the maker who can sell you a sound and reliable gun for £15, will not be able to make you a gun similar in quality and workmanship to those of the maker who turns out nothing under sixty guineas, at less than the latter price.”

Such a lot of nonsense has been written about the relative practical value of a “best” gun, that it is refreshing to hear someone, not in the trade, who talks common-sense on the subject. We have no doubt that a considerable reduction will be effected in the price of best guns if the demand for them were greater. But as the output of them is probably not much over 400 per annum, it follows that the laborious hand

processes that achieve the perfection required cannot be sufficiently organised and aided by modern machinery to produce any real economy.

The author writes equally to the point on all the other subjects that come up for treatment, but unfortunately the scope of our journal prevents our following him in the more sporting chapters of the book. Naturally much of the information respecting the fitting of guns and the faults of alignment that must be corrected by the shooter is common knowledge among experts, but even so it is expressed with an insight and clearness that do much to raise the book from the common run of such publications. The author is a strong advocate of reducing the shot charge for 12-bore guns to one ounce. Quite rightly he points out that careful loading will get rid of the loss of pellets so sustained, while in every other direction there is nothing but good in the change. We fear, however, that he proves his case a little too strongly in the series of comparative patterns obtained with 1 oz. and 1½ oz. of shot respectively. The former series strike us as a little too ideal, and the latter as unduly prone to stringing and clusters. The author is strongly against the modern development of short cartridges, but in our opinion he has not taken sufficient account of the special wadding which has latterly led most of the leading gunmakers to endorse their claims to safety and efficiency to the extent of advertising them for sale. Surely such gunmakers would never sell them were they a tithe as dangerous as the author makes out.

Les Explosifs dans les mines de houille de Belgique, par Victor Watteyne et Lucien Denoel. Saint Etienne, 1900, J. Thomas et Cie. 78 pp.

This is one of three papers presented to the International Congress of Mining and Metallurgy held in Paris during the exhibition. The authors, well known in connection with the use in mines of safety explosives, give in this book very interesting statistics about fire-damp explosions and casualties resulting therefrom, about the varieties of explosives used, their quantities and the nature of workings in which they were fired, and about the mechanical coal-getters employed in fiery places. The book concludes with a very well written summary of the present state of the question of safety explosives, without, however, bringing us much nearer to definite knowledge. Whilst the French fire-damp commission prohibited the use in coal seams of explosives, whose temperature of explosion exceeds 1,500 deg. C., the German testing stations and our memorable one of the North of England Institute, found such explosives as Carbonite and Dahmenite, with 1,845 deg. and 2,064 deg. respectively, to be quite safe with the largest charges tried. Mr. Heise, the former chief of the Schalke testing station, thought, therefore, that besides the temperature the rapidity of explosion was a factor of safety. Messrs. Watteyne and Denoel show that this would lead ultimately to absurd conclusions, and therefore introduce a third factor, the retardation of ignition, discovered by Messrs. Mallard and Le Chatelier; but in the end they have to own that the practical test of finding the maximum quantity which will not explode a certain mixture of explosive gas ought to be resorted to. This is precisely what in this country has always been advocated.

There is a list of all the explosives used in Belgium with their composition, which is well worth studying. Altogether the book is a very well written, lucid, and yet exhaustive summary of the present state of safety explosives in Belgium.

Emploi des explosifs "de sureté" dans les mines de combustibles françaises, par M. Delafond. Saint Etienne, 1900, J. Thomas et Cie. 18 p.p.

This second paper, read at the Paris Congress, gives only the composition of the safety explosives permitted in France, and some statistics about accidents that occurred since regulations were made restricting the use of explosives in fiery mines. The author, like all French writers, claims for French investigators practically all the credit for what has been done to safety explosives, an opinion which is not shared in other countries.

Rapport sur l'établissement des dynamitières, par H. Le Chatelier. Saint Etienne, 1900, J. Thomas et Cie. 43 pp.

This is the third paper on explosives submitted to the Paris Congress. It is a summary of experiments that were carried out according to the ideas of Mr. P. Vieille, to whom the French Government and the explosives industry owe a great debt for his many researches and discoveries. The report was published in extenso in the "Mémorial des poudres et salpêtres." Briefly, it deals with three kinds of magazines (a) underground ones of large capacity; (b) small underground magazines; (c) magazines above ground. In the first case it has been found that a special stopper can be made to prevent communication of the explosion to the workings. This is made partly from cardboard and partly from wooden planks, and moves in a cylindrical gallery made of concrete with a seat built in it. In the ordinary course, access is given to the magazine by means of a door in front of the piston-stopper, which communicates with a rectangular gallery leading to the magazine. The gases of the explosion rush into this gallery, but are retarded by the corners to a sufficient extent to allow the stopper to reach the seat. For small quantities it has been found that if single cases of dynamite are placed in brick recesses three yards apart, and closed by an iron door, and these small magazines are at least 200 yards away from any ventilation door, the explosion of one case is not communicated to the others, and no serious damage is done in the mine. For magazines above ground the best results were obtained when they were covered with sand, earth, or even small rubble. If the stock of explosive (10 cwt.) was enclosed in a cubical building (concentrated), then covering with nine metres of earth prevented projections beyond 25 metres; if the explosive was spread over a gallery of 25 metres length (elongated), then 4½ metres of earth gave satisfactory results.

The experiments were carried out by the Blanzly mines, with the co-operation of the author and Mr. Bijou-Duval, and the favourable results obtained are probably the forerunners of new legislation in France. A similar underground magazine has since been also built in Austria (Mährisch Ostrau) and the stopper arrangement worked equally satisfactorily.

Mario Baratta. Lo scoppio del dinamite di Avigliana e la geofisica. Turin, 1900, Fratelli Bocca. 14 pp.

The great explosion of dynamite at Avigliana on January 16th, 1900, presented a number of interesting points of a naturally unique character, and amongst them the seismic disturbances found an able observer in Mr. Baratta. There exploded practically simultaneously about 12 tons of blasting gelatine. The damage proper was of course done in the factory itself, where scarcely any building escaped injury;

open sheds and chimney stacks, however, were practically untouched. The neighbourhood being hilly, the area of seismic effects would naturally be affected by the surroundings of the centre of explosion, and thus we see that the various zones take more or less elliptic shape. Windows were broken up to six miles distance in large quantities, whilst in a place 37½ miles away, some doors and windows opened; the sound of the explosion was heard in Lugano in Switzerland, 100 miles away! In spite of this violent disturbance of the air, a barograph at the Turin observatory did not show a depression. Amongst the various phenomena produced, which Mr. Baratta ably discusses is the fact that after half-an-hour there fell from a practically bright sky within a radius of about 1½ miles a slight amount of snow, sufficient to cover the ground during a few hours. This, of course, could be expected after the rainfalls that followed other large explosions.

Schuss- und Sprengmittel By Oscar Guttmann, Brunswick, 1899. Friedrich Vieweg und Sohn. 256 pp.

This is a reprint of an article on shooting and blasting explosives, written for Muspratt's Chemistry, and is intended to give the latest information pending a new edition of Mr. Guttmann's large work on "The Manufacture of Explosives." It deals with the various explosives in a concise and thoroughly practical manner, and will therefore be welcome to people interested in explosives in a general way as well as to experts.

APPLICATIONS FOR PATENTS.

SEPTEMBER 24—OCTOBER 20, 1900.

- 17,020. Fire-arms. N. Pieper.
- 17,033. Automatic Target. P. W. Merfield and E. Tozer.
- 17,176. Field-gun Carriages. Sir W. G. Armstrong, Whitworth and Co., Ltd., Sir A. Noble, and R. T. Brankston.
- 17,177. Sights for Ordnance. Sir W. G. Armstrong, Whitworth and Co., Ltd., Sir A. Noble, and R. T. Brankston.
- 17,244. Single-Trigger Double-barrelled Guns. T. Southgate.
- 17,248. Gun Carriage. E. De Freystädter.
- 17,282. Single-trigger Double-barrelled Guns. J. Carter and H. Bruntnell.
- 17,314. Bullets and other Projectiles. A. Eisel, Junior, and H. Schaper.
- 17,359. Breech-loading Fire-arms. H. W. Gabbett-Fairfax.
- 17,372. Automatic Discharge of Fire-arms. W. Ziolecki.
- 17,458. Magazine Rifles. D. A. Lawson.
- 17,501. Cartridge Extractor. P. Bergensen.
- 17,613. Quick-firing Small-arms. E. J. Pennington.
- 17,615. Cartridges. T. Perkes.
- 17,639. Automatic Guns. A. Vickers, and Vickers, Sons and Maxim, Ltd.
- 17,715. Torpedo Steering Apparatus. C. J. Varicas.
- 17,781. Shells. R. Fielder.
- 17,809. Shells. L. Varicas.
- 17,837. Rifle Magazine. H. Harris.
- 18,022. Cartridge Case for Ordnance. A. Reichwald. (Agent for *Fried Krupp*).
- 18,096. Fire-arms. A. Nicholls.
- 18,110. Apparatus for determining position of Shooter when driving or "Walking up." F. H. R. B. Liebenrood.
- 18,185. Game Carrier. S. Downing.
- 18,225. Revolver Small-arms. The Webley and Scott Revolver and Arms Co., Ltd., and W. J. Whiting.
- 18,389. Blasting Explosives. J. W. Weston and J. C. Hamilton.
- 18,396. Deadening Report of Fire-arms. P. A. Savoldelli.
- 18,516. Rifle carrying Attachment for Cycles. A. S. Edwards.
- 18,702. Small-arms. F. Neuber, J. Tambour, and C. Colbert.
- 18,723. Revolvers and Small-arms. G. R. Cawley. (Agent for *A. J. R. Glasford*).

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

SEPTEMBER 29—OCTOBER 20, 1900.

- 17,660 (1899). **Mirror for Attracting Birds.** L. A. Villard, France. A mirror decoy to attract birds, which is operated by the shooter. Through the medium of a foot-plate two pulleys are set into motion, and the motion is communicated to a rod carrying the mirror arrangement. This is thus rapidly revolved first in one direction, and then in the opposite. Accepted August 31, 1900.
- 19,167* (1899). **The Hodges Single-Trigger Mechanism.** E. C. Hodges, Islington.
- 21,249 (1899). **Automatic Pistol.** J. L. Copping and G. D. Trace, London. An arrangement, attachable to an automatic recoil operated pistol, by means of which the magazine carrying the cartridges is automatically released and ejected from the pistol after the cartridge has been delivered into the breech. A ratchet wheel arrangement, actuated by a pawl, is also described. This works inside the pistol, and causes a pointer working over a dial to register automatically the number of cartridges in the magazine. Accepted Sept. 15th, 1900.
- 22,712 (1899). **Ammonia-Salt-petre Explosive.** C. E. Bichel, Germany. The production of an ammonia-salt-petre explosive, consisting in mixing together ammonia-salt-petre, a suitable organic substance such as trinitrotoluol and flour or a similar starch or gluten containing substance, in the presence of heat and water. For blasting purposes, 8 parts of trinitrotoluol are mixed with 86 parts of ammonia-salt-petre, and 6 parts of flour. To this compound about 7 parts of water are added to produce a paste. Accepted Sept. 22, 1900.
- 23,442 (1899). **Blasting Explosive.** J. Ross and W. D. Cairney, Glasgow. An explosive, consisting of a mixture in about the following proportions of chlorate of potash 87 %, charcoal 3 %, wax 7 %, and vaseline 3 %. The charcoal is first mixed with the granulated chlorate of potash. To this mixture the wax is added, and the whole is incorporated until the wax becomes perfectly black. The mixture is then placed in a vessel, and is heated until the melting wax moistens the whole. The proportion of vaseline, previously brought to a liquid state, is then poured over the mass, which is stirred thoroughly. Accepted Sept. 22, 1900.
- 2,778 (1900). **Gun Carriages.** J. F. Meigs, and R. P. Stout, U.S.A. A carriage or mounting for ordnance, which is so constructed that the gun may be adapted to varying conditions, that is, that it may be used as a quick-firing or as a disappearing gun. The details of the invention are described in a bulky specification, and the great points studied throughout the construction of the mounting are those of simplicity and strength, the end in view being to obviate derangement of the parts at any critical time, and to facilitate the ordinary working of the gun. Accepted Sept. 8, 1900.
- 3,529 (1900). **Manufacture of Perforated Explosive.** H. S. Maxim, London. A die for use in the manufacture of perforated explosive, which is so constructed as to obviate one or two of the difficulties experienced with the ordinary die. This is, in the first place, more or less complicated, and secondly, is very liable to injury by the plastic compounds forced through it. The present die is made so that a conical-shaped opening leads up to the smaller outlet of the explosive, and by this method the plastic material is gradually forced to assume the smaller diameter. The die is also constructed so that the fingers or pins through which the explosive passes may easily be removed for the purposes of repair or cleaning. Accepted Sept. 15, 1900.
- 5,457 (1900). **Ordnance and Machine Guns.** F. W. Brooks, U.S.A. In a very long specification, illustrated by numerous drawings, guns of either small or large calibre are described, which are so constructed that they may either be loaded or discharged manually, or may be loaded by power and discharged manually to adapt the gun for armed shots, or may be loaded and fired automatically by power, the sighting in this case alone having to be performed by the gunner. Accepted Sept. 8, 1900.
- 8,393 (1900). **Locking of Barrels in Drop-down Guns.** E. Schlegelmilch, Germany. A method of providing further safety in the locking of the barrels to the breech in drop-down guns, consisting of a projection or nose on the flats of the barrels running the entire width of the barrels. This nose is adapted to engage with a corresponding recess in the flats of the action, and in addition to forming another grip, the shooter is enabled to see exactly in what position the barrels are in relation to the breech by the light which shows between this nose and the recess. Accepted Sept. 22, 1900.
- 8,456 (1900). **Casting of Projectiles.** H. Burrows, Shooter's Hill. The mould, which is formed only of one part, has a coned seating at its top, and the top of the core is correspondingly shaped, so that when inserted into the mould it is held firmly without the necessity of clamping or centring. When the metal is poured into the mould the core is not disturbed, and remains perfectly concentric. Accepted Sept. 15, 1900.
- 8,758 (1900). **Manufacture of Explosives.** T. Jevlev, Russia. In his specification a modified form of an explosive is described, which was patented in specification No. 9,535 of 1897. The explosive consists of a powder with which a liquid is impregnated shortly before use. Methods of rendering the explosive more or less powerful are dealt with in this patent, the powder consisting of varying proportions of potassium chlorate and chalk, potassium chlorate and Portland cement, or potassium chlorate and oxide of copper. The impregnating liquid consists of sulphide of copper, methyl alcohol, and nitro benzole. Accepted Sept. 29, 1900.
- 9,070 (1900). **Automatic Small Arms.** H. H. Luke, London (agent for *J. M. Browning, U.S.A.*). In this specification the numerous details of a new automatic recoil-operated mechanism for magazine guns are described. The magazine is of that type which runs parallel with the barrel, and the rifle is adapted also to be used as a single firer. Accepted Sept. 29, 1900.
- 10,381 (1900). **Igniters for Fuses.** A. Kürten, Germany. In the fuse igniter generally in use a clamp is applied to the match or tape to hold it in its place. This has the disadvantage that it compresses the tape, and tends to prevent the free progress of the fire along the match. The present invention consists of a little pin, which may or may not be kept up to its work by means of a spring, provided with a sharp fork end which just sticks into the match, and holds it against movement. A lateral opening in the casing holding the match is also provided for the insertion of the core and the percussion cap, and this opening is closed by means of a tubular slide. Accepted Sept. 22, 1900.
- 12,003 (1900). **Electrical Mine Exploder.** J. Wetter, London (agent for *L. C. Gomant, France*). A dynamo-electric apparatus for igniting explosive charges, provided with an automatic device for making or breaking the external circuit of the dynamo. The principal object of the invention is to control the connection between the generator and the igniting wires so that the current will enter the external or fuse circuit only after the dynamo has attained its maximum power. Accepted Sept. 29, 1900.
- 12,682 (1900). **Mountings for Ordnance.** P. M. Justice, London (agent for *The Driggs-Seabury Gun and Ammunition Co., U.S.A.*). A modification of the method of mounting guns in masked batteries, in which the gun is raised or lowered by hydraulic pressure or mechanical means. In the present arrangement the gun, when in the raised position, is first swung to a position approximately parallel to the wall of the parapet, and is then lowered. By this means the gun may be placed nearer the parapet, and better protection is afforded against dropping fuse. A more compact combination of battery and masonry is also secured. Accepted Sept. 8, 1900.
- 12,683 (1900). **Mountings for Field Artillery.** P. M. Justice, London (agent for *The Driggs-Seabury Gun and Ammunition Co., U.S.A.*). Several alterations in the mountings of Field Artillery are described in this patent, the first consisting in a method of absorbing the recoil so that there is no substantial backward movement of the carriage. The gun is also arranged so that it may be trained through a small angle without disturbing the trail, and an improved method of braking the wheels of the carriage is also explained. Accepted Sept. 8, 1900.
- 12,684 (1900). **Miniature Ammunition Apparatus for Ordnance.** P. M. Justice, London (agent for *The Driggs-Seabury Gun and Ammunition Co., U.S.A.*). Apparatus for adapting ordnance for miniature ammunition practice, consisting of a smaller calibre barrel, which is fitted inside the larger tube, and is held by means of rings which grip the obturator slope of the powder chamber. The tube is secured against twisting under the influence of the projectile when taking the rifling through the screw threads on the securing rings, which are cut in the

- opposite direction to the rifling. Thus the firing of the projectile tends to tighten the grip of the rings on the bore of the gun. Accepted Sept. 8, 1900.
- 12,685 (1900). **Breech Mechanism of Ordnance.** P. M. Justice, London (agent for *The Driggs-Seabury Gun and Ammunition Co., U.S.A.*). Firing apparatus for breech-loading ordnance, which is self-cocking, and is always in the safe position until the gunner pulls the lanyard. The pulling of the lanyard at once cocks the firing pin and discharges the gun. After passing a certain point in the cocking, the firing pin jumps the cocking toe on the firing lever, and under the influence of a spring, flies forward and strikes the primer. When the breech is open, or the breech block is not quite turned home, a safety comes into play which prevents any accidental discharge. Accepted Sept. 15, 1900.
- 14,122 (1900). **Automatic Pistol Mechanism.** G. Roth, Austria. A self-cocking arrangement attachable to automatic fire-arms, consisting of the four parts composing the self-cocking mechanism used in what are known as single action revolvers, with a fifth part added. Through this fifth part, which is a spring-actuated lever, the hammer, when full cocked upon the recoil of the cylinder, is retained in this position by a notch in the lever. By this means only a light pull is required to discharge the weapon; but the first pull is adapted to cock the hammer. Accepted Sept. 22, 1900.
- 15,331 (1900). **Rammers for Ordnance.** W. L. Wise, London (agent for *The Shodawerke Actien Gesellschaft, Austria*). A rammer for loading ordnance, consisting of a number of telescopic tubes connected together by sliding keys. When the inmost tube, which carries the rammer head is rotated, the other tubes are rotated in their turn by means of stops, and the rammer is thus either inserted into or withdrawn from the gun. Accepted Sept. 29, 1900.

* This Specification is more fully described under "Selected Patent."

SELECTED PATENT.

THE HODGES SINGLE-TRIGGER MECHANISM.

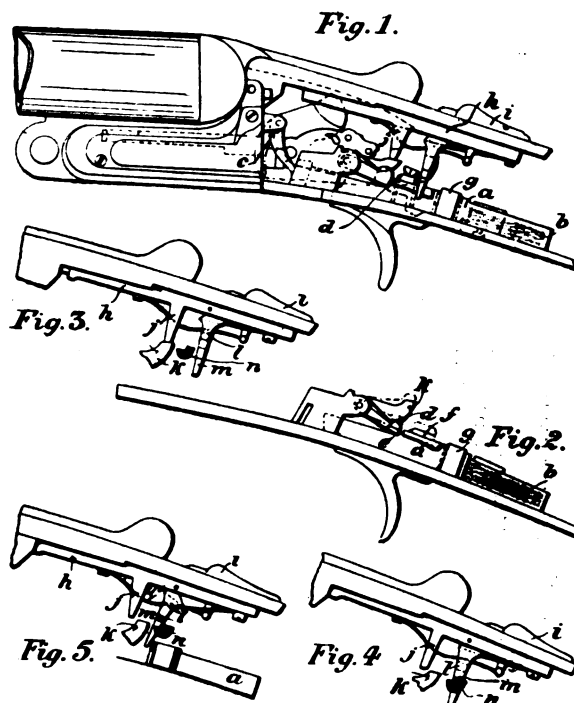
19,167 (1899). E. C. Hodges, London. This patent relates to a single-trigger mechanism in which the safety device is an important feature. This device is so designed that the involuntary pull is absolutely prevented from discharging the second barrel. Until the safety is pushed forward to discharge the first barrel the trigger itself is locked, but when the trigger is released another catch comes into action and locks the left-hand sear until the involuntary pull has occurred. Then the rearrangement of the parts for the second discharge automatically releases the left-hand sear, and the second barrel is free to be fired. This mechanism is of the "two-pull" type, an intermediate pull not being required to arrange the parts for the second discharge. A modified form of the mechanism is, however, described in the patent in which the intermediate pull is a necessary part of the operations.

In Fig. 1 the whole of the mechanism is shown mounted in the gun, but with the left-hand lock plate removed. The trigger mechanism is shown separately and more clearly in Fig. 2, and from this illustration it will be seen that attached behind the trigger, in such a manner that it is free to slide horizontally, is a slide *a*. This limb is actuated by a spring *b*, which always tends to push the slide forward towards the breech. The slide is held in its backward position, to which it is pushed by the lever *c*, during the opening of the gun, by a catch *d* attached to the trigger, which engages with the bent *e* formed on the top of the slide. The slide is provided also on either side with the two vertical slides *f* and *g*, which are situated one in front of the other, the distance between them exactly corresponding with the distance over which the slide *a* is allowed to travel. It is through these vertical slides, which are lifted by the trigger, that the two barrels are discharged.

It will be necessary before explaining the action of the combined parts, briefly to describe the arrangement of the safety slide. This mechanism is shown in Fig. 3, and it will be seen that it

consists mainly of the ordinary arranged rod *h* and thumbpiece *i*. Attached rigidly to the rod *h* is the leg *j* which, when the mechanism is at "safe," engages with an extension *k* of the trigger blade (shown in Figs. 1 and 2). The rocking lever *l* is pivoted also to rod *h*, and this part is capable of a swinging movement. A shoulder *m* is cut upon this lever, and when the safety slide is pushed forward the shoulder is adapted to engage and hold the left-hand sear against any upward movement. The position of the mechanism is shown in Fig. 4.

The action of the various parts in combination will be understood on reference to Fig. 1. Assuming the gun to have been fired, in the breaking down of the breech to extract the spent cartridges, the lever *c* through its end *o* automatically pushes back the slide *a* against the action of the spring *b*. In this backward position it is



held by the engagement of the part *d* with the bent *e*. The opening of the gun also pushes back the safety mechanism in the ordinary known way, causing the leg *j* to lock the trigger. The gun having been loaded and closed, the safety slide is pushed forward, this movement releasing the trigger and at the same time locking the left-hand sear. In this cocked position of the parts, the vertical slide *f* on the right-hand side of the slide *a* is exactly beneath the right-hand sear. Through a pin attached to the trigger the slide *f* is raised upon the pulling of the trigger and the right-hand barrel is discharged. The raising of the trigger also disengages the part *d* from the bent *e*, thus freeing the slide, which under the influence of the spring *b* starts to move forward. It is brought to a stop, however, midway in its travel by a projection on the end of the trigger blade, and not until after the trigger is released is it allowed to complete its forward movement. In the latter stage of its travel the slide comes into contact with the rocking lever *l* attached to the safety rod (see Fig. 5), and disengages this limb from the left-hand sear, which is thus freed. The slide *c*, completing its travel, brings the left-hand vertical slide *g* beneath the left-hand sear, which is raised by the slide when the trigger is again pulled.

Another arrangement of the parts in which the place of the vertical slides is taken by levers pivoted at one end is also described in this specification. The mechanism is, however, of the "three pull" type. Accepted Sept. 22, 1900.

Arms & Explosives

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CURRENT TOPICS.

"Nous sommes Trahis!"—Quite a little storm in a teacup has been aroused by the report that the U.S. Government have obtained possession of the drawings of the latest pattern of field gun in use in the French service. The American Ambassador in Paris and the U.S. Naval Attaché were said to be in the transaction, and every detail that rumour could invent has been called up to give an air of truth to the supposed disclosure. Apparently, the sole reason for this tissue of wild statements is that the U.S. Board of Ordnance is building an experimental field gun, which may or may not bear points of resemblance to the French arm in the principles of working. Seeing, however, that the air of mystery surrounding the gun was stripped from it during the recent manœuvres, there seems to be no ground for accusing anyone of treachery if, after seeing batteries in action at fairly close quarters, an intelligent artillery officer has succeeded in understanding the salient points in the mechanism and working of the famous 75 mm. field-piece.

The Illegal Pawning of Guns.—The prosecution of Henry Sharp, at the instance of various gunmakers whose weapons the prisoner had illegally pawned, ended in a manner somewhat unexpected. Having already spent several weeks in gaol under remand, the prisoner, who pleaded guilty, was recommended to mercy, and was bound to come up if called

upon, since the gunmakers who had been defrauded of their property had no wish to press the case further. They were satisfied with having demonstrated that the process of borrowing guns for suppositious trials, and then promptly pawning them, cannot be carried out without incurring the penalties of the law. The defendant has suffered the loss of reputation inseparable from such an exposure, which unfortunately for him removes at the same time his capacity to earn a livelihood as a shooting journalist. The pawnbrokers who advanced money on the guns have at the same time received a wholesome experience regarding the care that must be exercised in receiving guns for pawn without taking suitable measures to insure that the goods are the property of the person pledging them; for, as stolen property, the guns have been given up without the usual formalities of redemption. Gunmakers so frequently receive and accede to requests for the loan of weapons for the purpose of trials to be recorded in our sporting press, that it has become almost a custom of the trade to loan such weapons without guarantee of any kind. A journalist whose signed articles constantly appear in the columns of a sporting newspaper is at first sight an accredited representative; but the newspaper proprietor would be sorry, and for that matter could not be expected, to hold himself responsible for all the loans that may be contracted by the free lances whose signed material may be accepted from time to time. On the other hand, the responsibility needs definition on both sides. The newspaper which has knowledge that its contributors frequently borrow guns for press reports which

appear in its columns, should exercise a certain amount of supervision over such contributors. Gunmakers, on the other hand, must realize that if they lend guns to such persons it is an entirely private transaction, unless the borrowing is directly authorized or invited by a responsible member of the staff of the paper.

Marine Torches.—Early last month we attended a demonstration of the working of the marine torch which was referred to in our issue of August last. The trial fully demonstrated the capacity of the appliance to burst into flame on striking the water, and to maintain a brilliant light for a number of hours proportionate to the size of the torch, the charge of carbide calcium it contains, and the rate of consumption of gas provided for. The apparatus is fitted with an arrangement that insures the relighting of the torch after submersion, such as might occur in a rough sea. Of course the luminous life-belt has for some time familiarized us with this useful application of acetylene gas. What those interested in the torch profess to have accomplished, is to have obtained control of the most practical modes of applying the principle to naval purposes. It is reported that the torches have been adapted for firing from service guns from board ship, their range being about two miles. While the mechanical details to be overcome in carrying out this idea are no doubt unusual, we are quite prepared to accept as authentic the reports of firing trials made by experts of the United States Navy. From the demonstration already referred to it is clear that such shells, when delivered uninjured into the water, would at once burst into brilliant flame. We fear, however, that it would be premature for us to make use of the electros that have been supplied for the purpose of our report of the proceedings until the matter has advanced further. It is all very well to sketch a hostile port with a circle of battleships and whatnot surrounding it, the blockading port being lit up by a series of marine torches. We should prefer to hear the opinion of experts regarding the wisdom of a blockading fleet approaching to within two miles of land fortifications in order to throw the torches. Another engraving shows a battleship which has surrounded itself with a two-mile ring of torches in order to protect itself from the attacks of the stray torpedo boats. The wall of blackness that would surround this circle of lights might be held to neutralize the possible advantages of the visible area within. Secondly, experts might declare that a ship is safer if it avoids advertising its presence with a ring of torches. Thirdly, we have not been informed how the torches will be anchored so as to remain where thrown. Fourthly—but perhaps it will be better to await the views of practical experts. We, ourselves, are not believers in the principle of settling practical questions in the editorial arm-chair.

The Persian Gulf Seizures.—At the meeting of the Birmingham and Provincial Gunmakers' Association, which was held in Birmingham on the 28th ult., Mr. Hughes, the chairman, was able to congratulate that body on the part it had taken in the litigation respecting the seizures of arms and ammunition consigned to Persian Gulf ports. He was able to report the release of a large quantity of stock which had been seized, not only on the s.s. *Baluchistan*, but also on shore. There still remained other work to be done. The very heavy shipments of rifles seized on the s.s. *Bushire* had not been delivered to the owners, and he had reason to believe that the Govern-

ment had declared that they did not intend to release any of those goods unless they were compelled to do so. This compulsion had been exercised in one or two directions, but at the present time a difficulty arose since the acting British Consul, Col. Meade, was out of the country, and consequently could not be served with notice of action. On the whole, however, the position was satisfactory, but this, Mr. Hughes considered, was largely due to the energy which was put into the executive of the Association.

Hoist on their own Petard.—As a complement to the theft of rifles on the Indian frontier, to which allusion was made last month, the wily native is in the habit of "lifting" powder on all available occasions. Five *badmashes* recently, at one of the inland stations, found opportunity to steal a bag of gunpowder from a store. Previous experience told them, however, that sometimes the storekeeper meets guile with guile, and places a bag of common or garden dust conveniently for the casual raider. Accordingly, the five worthies decided to test the quality of their booty, and on arrival at a suitably retired spot, one took a handful of powder from the bag, and retired a few yards, while the other four *badmashes* stood round the spoil awaiting the report. Unfortunately No. 1 was not sufficiently careful in his methods, and allowed a train of powder to drop from his hands, and when he fired the residue of the handful at what was thought to be a safe distance, the test developed greater completeness of result than was anticipated. The police subsequently discovered the charred remnants of three of the looters, while two somewhat badly injured invalids were able to explain the mystery of the situation in a more or less disjointed fashion.

BIRMINGHAM AND PROVINCIAL GUNMAKERS' ASSOCIATION.

THIS Association has issued its fourth annual report and statement of accounts, which was presented to the members at the meeting held at the Proof-House Hall, Birmingham, on the 28th ult. At the outset we notice that the body has altered its designation during the year from "Union" to "Association," a change which was possibly found necessary in order to avoid confounding the Union of Gunmakers with the Birmingham Gunworkers' Union. On the other hand, the Association now stands in almost equal chance of confusion with the Gunmakers' Association, whose registered offices are in London, and which embraces among its members representatives of the trade throughout the United Kingdom. It would be interesting to learn exactly when the change of title was made. We have before us the List of Members and Rules of the Birmingham and Provincial Gunmakers' Union for 1900, Rule 1 of which states that "the Union shall be called the 'Birmingham and Provincial Gunmakers' Union.'" Rule 10 is to the effect that "if any addition or alteration of these Rules be deemed necessary, the same must be proposed and carried at the General Meeting." Apparently, then, the change of title has been made more or less *ultra vires*, since it was not made at the General Meeting of 1899, and the amendment has been made prior to the recent meeting, at which there was no resolution adopting the new designation.

In the matter of finance the Association must certainly be

congratulated, for it has fulfilled the objects of its formation during the fourteen months, ending October 31st last, on a total net outlay of £8 3s. 6d., while it has received in members' subscriptions £50 18s. 6d., and in interest on the deposit account at the bank £2 6s. 8d. These figures compare with a net expenditure of £10 19s. 5d., and an income of £47 14s. 11d. during the year ending August 31st, 1899. The amount on deposit has, in three years, risen from £41 to £102, while the current account has advanced from £40 to £61.

The report of the Executive Committee refers to the litigation relative to the seizure of ammunition in the Persian Gulf, the Indian Arms Prohibition, and the new Act passed last July with regard to the importation of arms and ammunition into foreign countries generally. With regard to the first-named, our readers will find elsewhere in this issue a report of the appeal brought in respect to the Persian Gulf seizures, which shows that the process of litigation still holds out a promise of further developments. The important action taken by the Gunmakers' Association, in London, in the matter of the adoption of standard minimum chamber sizes for 12, 16, and 20 bore-guns, receives due acknowledgment, and in fact is given considerable prominence in the report now before us. Mr. H. H. Bonehill, of the Birmingham Association, acted as delegate of that body at the meetings which were convened for the purpose of settling the standard sizes. In the matter of technical education, the Executive reports that, under the joint auspices of the Association and the Birmingham Gunworkers' Union, ten youths attended classes at the Birmingham Technical Schools in Suffolk Street. The Association intends to take all possible steps to establish a permanent system of training a class of Birmingham gunworkers in all branches of the trade.

ROUND THE TRADE.

We regret to hear that Mr. W. G. Froome, shooting expert, and director of Messrs. Holland & Holland, Ltd., is ill.

Reports state that passengers on the adjoining railways have lodged complaints respecting the alleged danger from possible stray shots escaping from the Nunhead rifle ranges.

On the 8th ult. the steamer *Emly*, of Chester, with 60 tons of Cordite on board, ran ashore off Ardrossan, on the Ayrshire coast.

A Live Pigeon Shooting Club has just been formed in Hastings, Messrs. Stoakes & Co., having been appointed armourers.

Mr. E. Allen Robinson, well known to gunmakers represented at the Gun Club and Hurlingham, was examined in bankruptcy early last month.

Michael Richards, master of the steamship *Petrel*, was fined upwards of £46 for having smoked and in other ways invited serious accident during the unloading of a quantity of explosives at Thames Haven.

The large number of American visitors was the feature of this year's season at the Gun Clubs. Possibly next year will be a Colonial visitors' season. Anyhow, the first swallow is to be Mr. A. W. Eales, who won the pigeon shooting championship of New South Wales this year.

Messrs. Eley Bros., Ltd., will shortly issue a .303 service cartridge fitted as a pencil case. The turning of the bullet causes a pencil to protrude from a cavity in the nose, the device having been specially adapted for its purpose, and fitted by Messrs. Mordan, the well-known pencil-case makers.

It is announced that Messrs. J. & E. Hall, Ltd., the well-known manufacturers of gunpowder machinery, will shortly come before the public with a capital of £250,000, of which £150,000, in 6 per cent. cumulative preference shares, will be offered for subscription, the balance, £100,000 in ordinary shares, being retained by the vendors.

It gives us great pleasure to announce that Mr. H. A. A. Thorn (Charles Lancaster) has been able to return to business, having so far recovered from the accident we recorded in our last issue as to be able to take up, bit by bit, the threads of his business, which latter he has always administered with painstaking accuracy and attention to detail.

A fatal accident occurred at Messrs. Curtis's & Harvey's works at Trimley, near Felixstowe, where Cannonite is manufactured. The explosion occurred in the mixing house, and instantly killed three workmen, the buildings at the same time being considerably damaged. The sympathy of all will be extended to Messrs. Curtis's & Harvey for the loss and anxiety that this accident will occasion them.

The new Under Secretary of State for War, Lord Raglan, is a past master in the art of taking patterns with the shot gun, report having it that he once accidentally took a pattern at 40 yards on his own body. As a director of the War and Sporting Smokeless Powder Syndicate he learnt a great deal about sporting and rifle powders, but his connection with the trade ceased some years ago, when Messrs. Curtis's and Harvey took over the Cannonite Factory.

The marriage of Mr. H. W. Newton was duly solemnised at St. George's, Hanover Square, on Wednesday, the 7th ult.



Mr. James Ferrier, the Scotch agent of Messrs. Curtis's & Harvey, Ltd., and, therefore, colleague of the bridegroom, performed with considerable tact and humour the duties of master of ceremonies. A number of Mr. Newton's friends in the trade put in an appearance to wish him luck and happiness in his married life. The wedding breakfast at the Tudor Hotel, Oxford Street, was the scene of hearty congratulations to the twain who are now one. The traffic of Oxford Street was for a moment interrupted when the pair took their departure for the honeymoon. People on the busses stood up to obtain a passing glance, and the drivers waved their whips in salute, some of the passers-by receiving 1½ oz. charges of rice not thrown with the close pattern that Amberite sporting powder commonly gives.

ACCIDENT IN MAKING FIREWORKS.—At Bradford, on the 4th ult., a young man named John Fallon, aged 26, was engaged in making fireworks in his bedroom at 203, Mount Street, when he accidentally overturned a lighted candle into a tin of gunpowder. An explosion naturally ensued, which caused Fallon's face to be severely burned, and removed his hair. The walls of the room were shattered, and the window glass broken, but, fortunately, no other occupants of the house were injured.

DANGEROUS FUSES IN WELSH MINES.—The Board of Trade report on the explosion of fire-damp at Crown Pit, Merthyr Tydfil, last May, whereby four men were injured, has been issued. It was drawn up by H.M. Inspector of Explosives and two other nominees of the Home Office, and contains the following words:—"It is impossible to say with certainty whether or no the explosion was due to the use of Bull-dog powder, but it is thought probable that it was due to an imperfect fuse improperly used." The report adds that most of the fuses at present employed in mining are distinctly dangerous, and that steps ought to be taken to test all fuses and other apparatus for firing explosives in mines.

GUN CHAMBER GAUGES. 20709

THE accurate gauging of gun chambers is an essential element in the process of chambering a gun correctly to size. Now that the Gunmakers' Association and the Birmingham Gunmakers' Association have entered into arrangements with the ammunition makers, by which specified standard dimensions are jointly recognised, gunmakers must bestir themselves to give practical effect to what is for the present little more than a matter of figures and arithmetic.

The standard minimum sizes for the chambers of 12, 16 and 20 bore guns are specified in another column of this issue. Gunmakers are required to chamber their guns within working limits of those sizes. What are working limits? Some people would define working limits as the difference that exists between the size of a piece of finished work and the size it was originally intended that it should be. Many guns are constructed on this basis, but we cannot specify exact figures—first, because their value constantly changes; second, because finished work is not always gauged; and third, because we should not care to distress the consciences of our readers by displaying the liberal margins that are commonly allowed under the guise of working limits.

The art and mystery of gun making is so complex that we will define the term "working limits" in connection with a less scientific industry, say that of sewing machine manufacture. Let us suppose that a certain spindle is required, having a diameter of a quarter of an inch ($\cdot250$). Thousands of these spindles are required, and the price of the complete sewing machine does not allow for subsequent tinkering to make each individual spindle accommodate itself to the idiosyncracies of the particular parts in connection with which it does its work. It therefore becomes necessary to determine what allowances plus and minus the theoretical size can be allowed, while maintaining the necessarily good fitting and smooth working of the spindles. The determination of such an important point is not left to the judgment of some irresponsible workman, neither is the margin made so great as to allow the maximum divergence that can occur without destroying the capacity of the particular piece to do the work required of it. Modern machinists recognise that their tools are capable of attaining a certain standard of accuracy. Greater accuracy than that commonly recognised entails heavy additional expense, both in adjustment of tools and in rejection of a considerable proportion of finished work. A less degree of accuracy is liable to impair the efficiency of the work produced, and the slovenly habits engendered among the workmen are bound to cause trouble in the end.

Each up-to-date manufacturer, therefore, constructs a table of allowances for each class of work. It is more difficult to make a hole true to a gauge than it is to make a spindle; therefore, the margin of variation in the first case is greater than in the second. Again, the amount of variation must to some extent be proportioned to the size of work involved. A quarter-inch spindle must be more accurate to its theoretical dimensions than a five-inch shaft of an engine. Obviously this must be so in the sense that the degree of accuracy must be proportionate to the dimensions to be considered. Another point to bear in mind is the nature of the fit to be established between two working parts. Let us return to the quarter-inch spindle, and suppose that a bobbin is to be keyed on

the spindle, and that the ends of the spindle will run in pivot holes. Now the dimensions of the spindle, of the hole in the pulley or bobbin, and the bearing holes in which the spindle must rotate, are all nominally $\cdot250$ in. diameter. But if the spindle is constructed within working limits of $\cdot250$ in. diameter, the hole in the bobbin must be within working limits of another diameter to represent a "keying fit," while the bearing holes must be within working limits of the diameter for a "running fit."

To give effect to the above requirements the manufacturer of sewing machines possesses himself of a series of standard gauges that will enable him to pass or reject the work that is turned out in his shops. Let us, first of all, consider the spindle. The nominal size is $\cdot250$ in.; and if a snap gauge



FIG. 1.

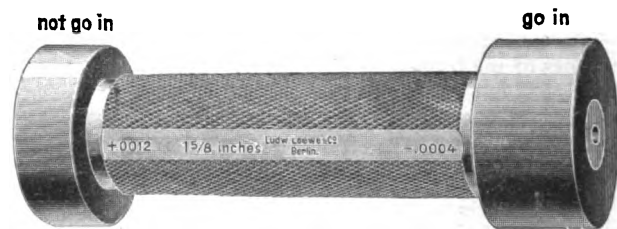


FIG. 2.

(Fig. 1) is constructed with two sets of jaws, respectively $\cdot2497$ in. and $\cdot2503$ in. apart, there is a total margin of difference of six ten-thousandths of an inch ($\cdot0006$) between the two. Such a gauge would serve to determine whether or not spindles were accurate within limits known as plus and minus three ten-thousandths of an inch ($\pm \cdot0003$ in.). The small end of the gauge should refuse to go over the spindle, the large one should go over. The necessary inference is that the diameter of the spindle is something between the two, the precise measurement being immaterial so long as the gauge limits represent the degree of accuracy required. The hole for the bobbin which is keyed on to the spindle must be sufficiently larger than the largest permissible size of spindle, to pass over it when force is used. Supposing that a difference of $\cdot0002$ in. is allowed for this purpose, the smallest permissible hole in the bobbin would have a diameter of $\cdot2505$ in. If a total variation in the bobbin hole of $\cdot0012$ in. were allowed, the largest permissible diameter would be $\cdot2517$ in. A double ended plug of the design illustrated in Fig. 2 would, therefore, be constructed to these dimensions, and the small end must enter all bobbin holes,

and the larger must not. With the limit sizes here adopted it will be noticed that should the smallest size of spindle be combined with a bobbin having the largest permissible size of hole, there would be a total difference between the two of .0020 in. (.2517—.2497). The fact that the variations in such pieces are cut so fine is to provide for those cases where extremes meet. The smallest possible difference between bobbin and spindle is similarly obtained by subtraction (.2505—.2503) and gives the difference already mentioned of .0002 in. This last difference would be too small to secure the required running fit between the spindle and its pivot holes, consequently a more liberal margin is allowed for the pivot holes. It would, we will suppose, be necessary that at least .0010 in. difference should exist between the largest spindle and the smallest permissible hole in which it runs. Assuming the same total variation of .0012 in., the limit size of the bearing holes would be .2513 in. and .2525 in. In this way the difference between the smallest spindle and the largest bearing hole would be .0028 in. (.2525—.2497). This difference amounts to nearly three thousandths of an inch, and to practical men it will be obvious that any considerably greater margin of difference would mean rattling bearings and inferior work.

What has so far been demonstrated, we hope clearly, is that the moment it becomes a question of working to gauges, the measurements of those gauges must be expressed in ten-thousandths of an inch. At first sight it would seem to be an over-refinement of practical work to deal with the fourth place of decimals. But the shake that is so clearly perceptible between two pieces of metal having a difference of two or three ten-thousandths of an inch demonstrates the necessity of dealing with these minute differences when considering gauges that are to test work, itself requiring to be accurate to one or two thousandths of an inch.

When considering the degree of accuracy with which the chamber of a gun should be formed, it is necessary to consider the condition under which it does its work. At first sight it would seem that, as there must necessarily be about .005 in difference between the largest and the smallest cartridge nominally of the same gauge, the need for microscopic accuracy in the gun chamber disappears. But when it is remembered that the two differences are added together when extremes meet in the form of a minimum cartridge in a maximum chamber, it is obvious that the smaller the latitude allowed in the gun chamber the less likely are the elastic qualities of the cartridge to be overtaxed.

The cartridge being a comparatively weak and fragile production, the pressure of the powder gases is ultimately sustained by the walls of the chamber. In other words, the cartridge expands until it comes into contact with the walls of the chamber. The paper tube of a cartridge is parallel; the walls of the chamber are taper; therefore the greatest difference of diameter is at the point where the paper tube adjoins the metal head. Allowing for a cartridge .005 in. smaller in diameter than the front end of the chamber, a little calculation tells us that at the point of maximum difference the paper tube is expanded about .060 of an inch in its circumference. This represents a serious test of the elasticity of the tube, and it is necessary that guns should be chambered so as to prevent unnecessary additions to the amount that the cartridge must expand before becoming seated firmly against the chamber walls. Reliable extraction

of the spent cases, and a number of other points involved in the satisfactory working of a gun, combine to indicate that the closer a gunmaker can chamber his weapons to the accepted minimum standard the better.

In order to deal with concrete instances, we will suppose that a gunmaker decides to allow himself a margin of two thousandths latitude in working to the minimum standard sizes that have just been generally adopted. Possibly in the case of depth of rim recess he would try to work rather closer, but the limit specified is sufficient for our present purpose. The chamber is ordinarily recessed by means of a taper plug, having teeth cut around its outer surface. A common mode of procedure is to make a plug the size of the required chamber, cut the teeth, and then harden it. As this article does not profess to give practical instructions on the manufacture of chamber cutters, it will be sufficient to indicate generally that the process of hardening is bound to deform the cutter. For common work it may suffice to ignore these changes, but for best work it is certain that the cutting edges require finally finishing off after the hardening is complete. The ordinary way is to make the cutter over size before hardening, and to finish off after hardening with an accurately set emery wheel. Even when this is done, it does not follow that the cutter will make a chamber corresponding with its own dimensions. If the cutter has distorted in the hardening process, it follows that some teeth will be ground down more than others, so leaving variations of thickness as between one tooth and another. This, in its turn, affects the form of the chamber, so that the ultimate test of the cutter is the form of the chamber it makes.

The accurate testing of the chamber is, therefore, the obvious check upon the accuracy of the work performed by the chambering tools. In other words, every gunmaker must provide himself with a set of gauges. He would first of all require a plug gauge accurately made to the dimensions of the taper walls of the chamber, as shown in Fig. 3. This gauge would serve to test the chamber. If it enters too far, the chamber is small; if it refuses to go home, the chamber is too large at the place where it binds. In order to get over the difficulty of ascertaining at exactly what part of the chamber the contact occurs, three more gauges, Figs. 4, 5 and 6, would be useful. They serve to test the chamber at the forward, middle and rear end of the taper.

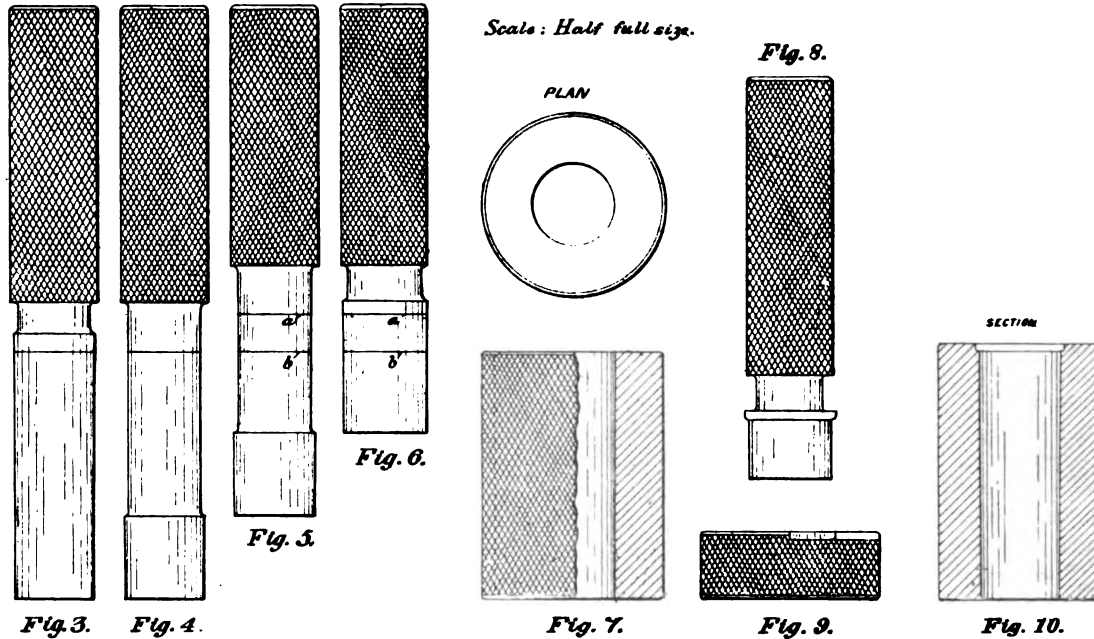
The utility of these short-section gauges would be that two of them would act as maximum gauges as well as minimum gauges. The chamber walls having a straight taper, the diameter of the chamber at any part would be ascertained by the distance that the plug would enter the chamber. To make this clearer, we will take the case of the 12-bore chamber for 2½ inch cases. The total length of the chamber is 2.56 inches. Deducting the depth of rim we obtain a net length of chamber wall of 2.486 inches. The larger end of the chamber is .811 inch diameter, the rear end .788 inch, representing total taper of .013 inch. A simple calculation tells us that the walls of the chamber converge in diameter one thousandth of an inch for every .191 of an inch in the length. This would mean that a chamber .002 inch over the minimum would allow the plug to pass .382 inch further than if the chamber were dead true to the minimum size. The two short plugs (Figs. 4 and 5) should therefore be marked with two lines *a* and *b*, *a* showing the part of the plug that should be level with the end of the chamber wall, in the case of chambers

of maximum dimensions, and *b* another line corresponding with the minimum dimension of chamber. Beyond the chamber the diameter of the bore is reduced so as to merge into that of the barrel. Consequently it will be necessary to add to the list of requisite gauges one exactly similar to Fig. 4 in appearance, except that its diameter would be greater at every place by .002 inch.

In order to round off the set of gauges for the chamber walls it will be necessary to add yet another, viz., that illustrated in Fig. 7, viz., a socket gauge, which will serve as a standard

The catalogue price of the pair of gauges, plug and socket, is £2 14s., subject to certain discounts amounting to less than ten per cent. Mr. Orcutt informs us that the price of gauges manufactured to special dimensions is not much greater than that of stock articles, since the bulk of the price is represented by the hand labour of finishing off after hardening, and this would be the same for each, whether one or five hundred were ordered.

Gauges for the best engineering work are guaranteed accurate to the nearest ten-thousandth of an inch. They are



to ensure that the other gauges remain true to size, and which will be useful for a number of other purposes, including the testing of the chambering tools and of cartridges.

So far the rim recess has not been mentioned. This, in its turn, will require a pair of gauges, male and female, as illustrated in Figs. 8 and 9. The female or socket gauge should preferably be sectioned by the removal of sufficient metal to provide a side view of the rim recess. This would facilitate the proper testing of the rim cutting tools. Having now completed our specification of the series of gauges that would be required for the proper chambering of guns, we may mention yet another that would be of service to the gunmaker, viz., that shown in Fig. 10. It represents the complete gun chamber, including the rim recess. As a test for the cartridge, it is more effective than that illustrated in Fig. 7, since the concentricity of the rim may be tested, while the last-named only tests the walls of the cartridge, though it might easily be applied to the testing of the thickness of the cartridge rim, by simple means that would show how much the rim stands above the top of the gauge.

As regards the cost of gauges, we have consulted Mr. H. F. L. Orcutt, London representative of Messrs. Ludw. Loew & Co., of Berlin. He showed us a specimen gauge which in design is the nearest approach to a cartridge gauge of the kind referred to in this article. We show the gauge in Fig. 11 herewith. It represents the dimensions of a standard form of cone universally used by engineers for the shanks of drills.

finished in the soft somewhat larger than the required size, and the work of finishing after hardening is an expert operation that can only be satisfactorily carried out in connection with a properly organized gauge-making shop, where there is a combination of first-class appliances and a staff of men experienced in the work. Gauges of this sort can be obtained at a low price; but where hardness of material, coupled with accuracy of finish is required, there is no alternative but to pay the highest price.

There are several ways of testing the accuracy of a pair of

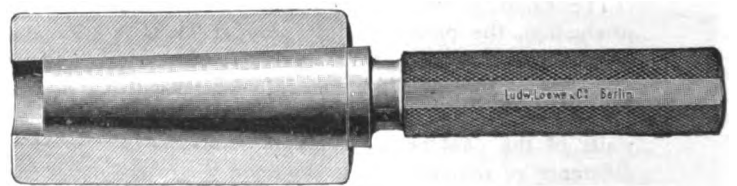


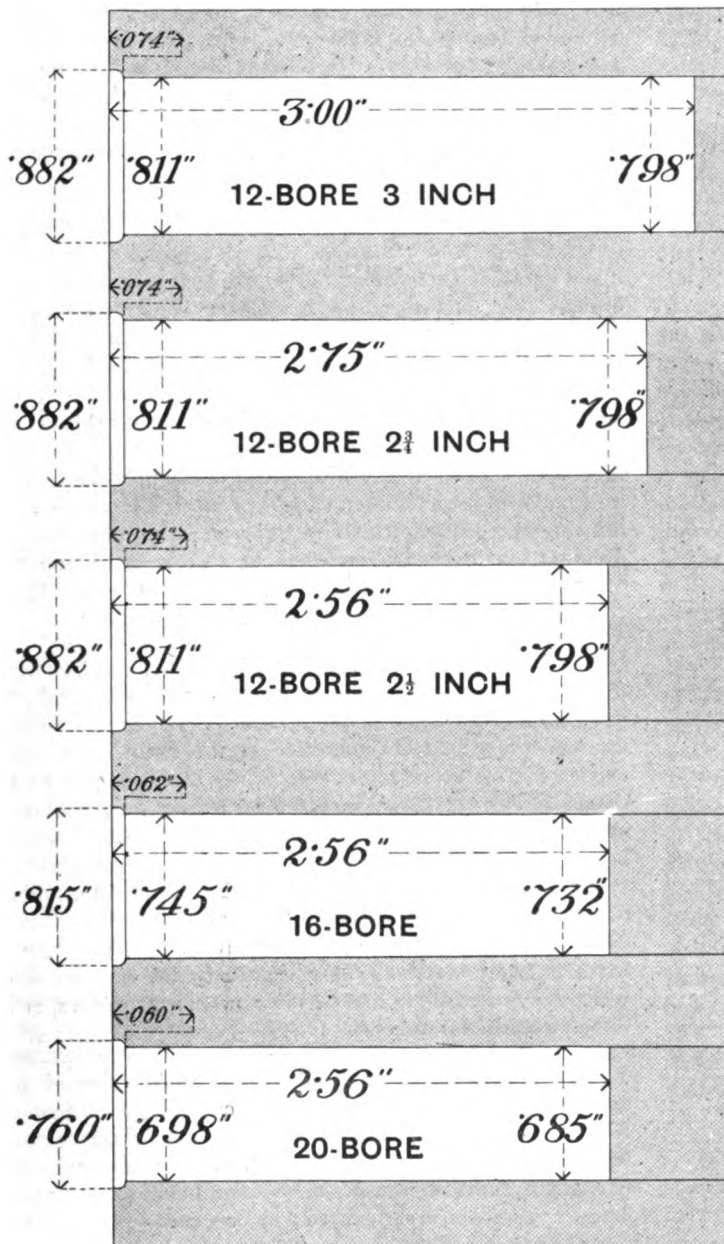
FIG. 11.

gauges of the kind illustrated in Fig. 11. Gently pressing the plug into the socket, it should be possible to turn it with a smoothness of motion and absence of resistance, almost suggestive of a ball bearing spindle. A badly made gauge is easily detected by contrast. There is a rattle and jump in its turning that at once condemns it. It may bind at one part of

the turn, it may pass freely over the next, and then bind again, perhaps so tightly as to require considerable force to recommence the turning. Such gauges have not been properly trued up since the hardening process, and the slight deformation of the male and female cones causes them alternately to lock and jump. There are, of course, other means of ascertaining whether the male plug is in close contact with the female socket at all points.

We believe that the largest gauge makers of prominence in this country are that well-known firm Messrs. Greenwood and Batley, of Leeds. Their gauge shop employs a large number of hands, and they have for many years specialized in gauge making for military rifles, this being one of their numerous specialities.

GUN AND CARTRIDGE SIZES.



THE following are the minimum gun chamber sizes for 12, 16 and 20 bore guns which have been adopted jointly by the Gunmakers' Association, the Birmingham and Provincial Gunmakers' Association, and Messrs. Eley Bros., Ltd., Messrs. F. Joyce & Co., Ltd., and Messrs. Kynoch, Ltd.

MINIMUM GUN CHAMBER SIZES.

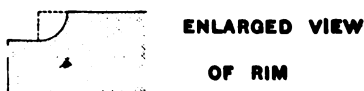
	12-bore.	16-bore.	20-bore.
Size under Rim ...	.811 in.	.745 in.	.698 in.
Front End of Chamber ...	.798 in.	.732 in.	.685 in.
Depth of Rim Recess ...	.074 in.	.062 in.	.060 in.
Diameter of Rim	.882 in.	.815 in.	.760 in.

LENGTHS.

	12-bore.	16-bore.	20-bore.
For 3-in. Cases ...	3.00 in.	3.00 in.	3.00 in.
For 2 1/4-in. Cases	2.75 in.	2.75 in.	2.75 in.
For 2 1/4-in. Cases	2.56 in.	2.56 in.	2.56 in.

The form of the rim recess shall be as shown in the accompanying illustration, viz., the walls of the chamber shall be joined to the walls of the rim recess by the arc of a circle, having a radius in the case of 12-bore of .0355 in., 16-bore .035 in., and 20-bore .031 in., and it shall be struck from a centre an equal distance from the wall of the rim recess and from the end of the chamber wall.

The ammunition manufacturers undertake to construct their 12, 16 and 20-bore cartridges so as to conform with the above standard sizes, the test to be that cartridges fired in chambers constructed within working limits of such minimum standard sizes shall work satisfactorily therein, and that the female standard gauges of the Gunmakers' Association, which are constructed in accordance with the minimum dimensions for 12, 16 and 20-bore chambers, shall be the rejecting gauges for these cartridges.



NOTES.

MESSRS. KYNOCH, LD.—At their last meeting the directors of Kynoch, Ltd., resolved to issue to their ordinary shareholders one new ordinary share for each two ordinary shares now held by them. The price of these shares will be par, and shareholders will be at liberty to pay them up in full at once, or to extend the payments to the 1st April next. The total amount of this issue will be £125,000, and the money is required for the various new businesses in soap, candles, steel castings, nitric and sulphuric acid, and cycle components, that have been added to the original business during the last few years. Circulars announcing the issue will be posted to the shareholders in the course of a week.

THE WILKINSON'S SWORD AND EQUIPMENT CO., LTD.—The prospectus of this Company reaches us at the moment of going to press. The Company has been formed for the purpose of taking over the Wilkinson Sword Co. Ltd., a business that originated about the year 1772, and has been carried on at the premises at Pall Mall for the last 80 years. A private company was formed in the year 1889 to carry on the business, and the present move is to serve the double purpose of providing increased funds for the new works that have been erected at Acton, and for enabling customers and others interested in the business to become shareholders. It is our deliberate opinion that seldom has a prospectus been issued disclosing such a satisfactory bargain for the prospective shareholders. The actual valuations, exclusive of goodwill, show property to the value of £104,441, to be transferred, the purchase price being fixed at £105,000. The share capital consists of £110,000 in £1 shares, and £90,000 in £10 multiples of ¼ per cent. debentures. One-third of the ordinary shares and £10,000 of debentures will be allotted to the vendors as fully paid up in part payment of the purchase money. The remaining two-thirds of the ordinary shares, and £50,000 of the debentures are offered for public subscription, so leaving as a reserve the balance of £30,000 of debentures. It thus appears, assuming the shares now offered will be fully subscribed, that the Company when formed will be in possession of the whole of the property specified in the valuations, in addition to a sum of £60,000, and besides that, the trading profits since June 30th last, the date from which the business is taken over. We regret that the time at which the prospectus reached us has prevented a more extensive notice. We will therefore conclude by quoting the profits for the past three years, viz., £6,774 in 1897-8; £5,894 in 1898-9; and £16,984 in 1899-1900, making an average of £9,870. The current year's business, according to the prospectus, shows signs of equalling, if not exceeding, the records of the previous year.

IMPORTATION OF GOODS TO ORANGE RIVER AND TRANSVAAL COLONIES.—By an Order in Council dated the 12th ult., notice is given that the prohibition on the exportation of goods to the Orange River and Transvaal Colonies, which was made under the Royal Proclamation of December 27th, 1899, is removed as from the first-named date.

EXCESSIVE STORAGE OF EXPLOSIVES.—Mr. William James Martin, newsagent, of Claygate, Surrey, was brought up before the Kingston Bench, on the 1st ult., on the charge of keeping on his premises, which were registered under the Explosives Act of 1875, a greater quantity of explosives than was allowed by the Act and Orders in Council. The county inspector deposed to having visited Mr. Martin's premises for the purpose of asking what fireworks were held in stock. He found in the shop a large tin trunk containing fireworks, and weighing 81 lbs. with its contents. The trunk had no lock. On various shelves were also 20 different boxes, containing the same class of explosives, the total weight, exclusive of the weight of the tin trunk itself, being 153 lbs. The defendant was registered to stock 50 lbs. of fireworks, kept in a suitable manner, but none of the large quantity found in his possession was so kept. He pleaded that he had not received previous warning, and that he could not obtain the fireworks from the manufacturers in smaller quantities. The Bench imposed a fine of £5, with 8s. 6d. costs, and ordered the fireworks to be confiscated.

COAL MINING MACHINERY.—The Jeffrey Manufacturing Co., of New York, U.S.A., have forwarded us a copy of a new catalogue containing fully-illustrated particulars of the electric and compressed-air machinery constructed by the company for coal-mining. This catalogue, which is produced in really first-rate style, sets an example which might be more extensively adopted by British manufacturers, the letterpress being reproduced in English, French, and German throughout. Coal-cutting, boring, drilling, shearing, and conveying machinery all comes within the scope of the firm's specialties, together with a well-chosen variety of electric locomotives for drawing the loaded trucks of mineral. The illustrations of different machines are excellent when it is considered that many show the appliances actually at work under conditions that impose obvious difficulties on the photographer.

SAFETY FUSES IN MINES.—We have received from the Under Secretary of State, Home Office, Whitehall, for publication, the following paragraph:—"In connection with the report of a Special Committee on the Cwm Pit Colliery explosion, the Secretary of State has had brought to his notice the serious danger involved in the use in fiery mines of safety fuses of indifferent quality, and in defective methods of lighting such fuses. The question has arisen whether the time has not come for prohibiting the use in dangerous mines of shot-firing by any method other than electricity. Before coming to any decision on this question, the Secretary of State is ready to receive any representation on the subject which may be made to him by mine owners, by miners, or by the manufacturers of fuses."

NEW AUSTRALIAN EXPLOSIVE.—A series of successful experiments have lately been carried out at Sydney, N.S.W., with a new explosive of local manufacture, which has received the name of Bellenite. In this compound fine blue-green sawdust is said to be substituted for gun-cotton. Two experiments are reported; in one case 9½ lbs. of bellenite were fired in three holes, and dislodged about 250 tons of rock; in the second trial 7½ lbs. of the explosive placed in four holes, succeeded in breaking upwards of 300 tons of rock. Bellenite is reported to emit no fumes, either before or after explosion.

ATTEMPT TO BLOW UP EXPLOSIVES STORE.—What is supposed to have been an attempt to blow up the explosive store at the Hamilton Palace Colliery, Bothwell, has lately been occupying the attention of the local police. It seems that the door of the building had been forced open by means of a pick stolen from a neighbouring quarry, and inside the store was distinct evidence of an attempt having been made to ignite the store of gelatine and gunpowder, which was in sufficient quantity to have wrecked the entire place.

LECTURES TO YOUNG GUN-MAKERS.

VIII. PRESSURES.

WRITTEN WITH THE COLLABORATION OF F. W. JONES.

UNLIKE many ballistic subjects, pressures cannot be judged from mere practical shooting. He would be a daring expert who attempted to fix the pressure per-square-inch from the appearance of a fired case, or even try to determine the relative pressures of two cartridges, except in instances where the pressure of one was abnormal. It is not so with other ballistic subjects, such as velocity, recoil, and ignition. The relative values of these can be ascertained with a fair degree of accuracy by firing tests without the use of instruments. As a matter of fact, we may regard the determination of velocity as an adjunct only to the target practice of rifle cartridges, and in a less degree to the penetration of shot-gun cartridges.

Chronographic results have not yet replaced these practical shooting methods, and similarly recoil and ignition lend themselves to easy appreciation without resource to instruments. Pressure estimation thus occupies a unique position, and this makes it all the more essential that the scientific basis of the methods in use should be well understood and their accuracy determined.

Although there is no ballistic subject of so great importance as the correct estimation of pressures, yet there is hardly any other subject so summarily dismissed by the expert. This apathy is not due to the absence of scientific treatment of the subject, but rather to the prevalence of innumerable theories put forward by independent experts. Pressure taking has thus become, in many cases, a relative measurement, without any attempt to ascertain if these measurements are always proportional to equal variations in the actual pressures, no matter how developed. It is because there is a real scientific basis underlying pressure taking, and that these data are generally ignored, that it is thought that a review of the subject, as it at present stands, would be interesting and useful to the young gunmaker who reads our journal.

The importance of measuring the pressures in fire-arms will appeal to all, and it is not necessary to enumerate these reasons here, but we may say generally that pressure taking is necessary to determine the stresses to which gunbarrels are submitted during proof, and to ascertain how near we approach this proof pressure limit in actual practice and under any and every possible condition of use.

In this opening lecture we propose to describe briefly the two

systems of estimating pressures, and in future lectures to deal at length with the crusher gauge as it is known and used in the explosives world.

THE DYNAMICAL METHOD OF ESTIMATING PRESSURES.

It was shown in Lecture III. that if the velocity of a projectile at various points of a barrel could be ascertained, it was possible to put down the pressures at these points, and thus form a velocity curve representing the velocity at all points of the barrel, and ascertain the corresponding pressure curve. This method of arriving at a knowledge of pressures in fire arms is known scientifically as the *Dynamical Method*.

The measurement of small intervals of time has occupied the attention of quite a number of the best workers in ballistics, and as a result there are several instruments in use for taking small intervals of time in millionths of a second, with,

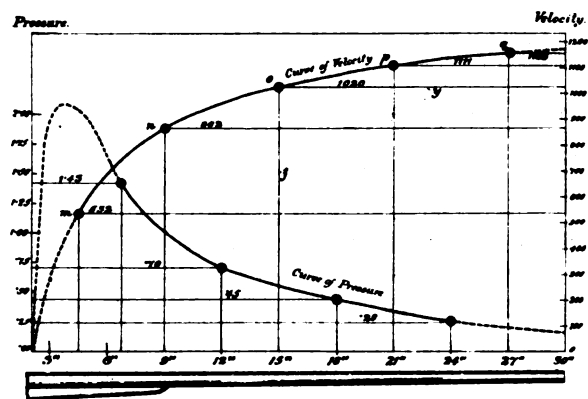


FIG. 1.—PRESSURE CURVE AND VELOCITY CURVE IN THEIR RELATION ONE WITH ANOTHER.

however, varying degrees of accuracy. It will be seen at once how essential for our purpose it is to measure intervals of time with great accuracy, when it is borne in mind that the pressure in a gun rises from zero to a maximum by the time the projectile has moved in the barrel a distance of from one to three calibres.

To enable a proper appreciation of this part of our subject, we here reproduce the diagram (Fig. 1) from Lecture III. page 13. This diagram shows that, in this connection, time measurements, to be of any use, must be correct to at least one hundred-thousandth of a second, and even this, if reliable, would only allow the barrel to be divided into say three-inch sections. An error in measurement of one hundred-thousandth of a second in a three-inch section would cause an error of about 11 ft. per second on the velocity being measured; and if we assume that over a given three-inch section the velocity of 1 oz. of shot fired from a 12-bore rises from 800 to 880 feet per second, the mean effective pressure acting over that distance would work out at .56 of a ton. Allowing an error of 11 ft. on both the above values, we should get a rise of 789 to 891 feet, which worked out show a mean effective pressure of .66 of a ton. It is thus clear that an error of one hundred-thousandth of a second over a three-inch section of the barrel makes the ultimate difference (in this particular case) between .56 and .66 of a ton, or say, 18 per cent.

Seeing now the necessity of correct time measurement, we will examine the available methods.

THE SMITH CHRONOGRAPH is one of the most accurate instruments in general use. Its time record is based on the

wave marks made by a tuning fork, and 10,000 beats to the second is about the available maximum. Thus each wave would require to be divided into ten parts to secure readings of time in hundred-thousandths of a second. Considering the practical difficulties of such a task, we may say that the Smith Chronograph is incapable of such fine work. It must also be remembered that the Smith Chronograph marks the time at which the electric circuits recording the passage of the shot are cut, thus permitting the movement of a needle under the influence of its spring. The spring is made weak to lower the needful strength of the magnets as far as possible. Probably the magnet responds very quickly to the circuit being broken; but when such small times are in question, we must remember that errors must creep in if the record depends on the movement of bodies having weight.

THE NOBLE CHRONOSCOPE, used by Sir Andrew Noble, consists of a train of wheels. The rate of one of the wheels in the train is measured and noted, and by a process of calculation based on the multiplying gear, the speed of the fastest travelling of the train of wheels is known. When a circuit is broken by the projectile an electric spark makes a record on the fast-travelling wheel. The distance between two such marks and the known velocity of the wheel afford the necessary time measurement. The special features about this machine are, first the method of sub-dividing time marks by means of a train of wheels, and second the obtaining of a marking by an electrical means that does not entail movement of bodies having weight. The apparatus is said to measure time in millionths of a second within an error of not more than two to three millionths.

THE POLARIZING CHRONOGRAPH of Crehore and Squier was described in our issue of September, 1895. It will be remembered that it consisted of a device for taking the records on a rapidly revolving photographic plate by means of a shutter opened or closed on the projectile breaking and making an electric circuit. The shutter consists of a chemical substance, which only allowed light to pass through it when the electric current passing round it ceased, and the rate of revolution of the plate was determined from the photographic record of a tuning fork. Like Noble's Chronoscope, the merit of this instrument lies in the fact that the record is registered without the movement of bodies having weight.

THE SIEBERT APPARATUS.—An entirely different means has been used by H. Siebert, a French Colonel. He made use of unusually long shells in large guns. These long shells contain a central axis on which a weight carrying a tuning fork had a sliding movement. The carrier could move freely along this central axis, and in its movement a stylus on the tuning fork left its trace on a smoked surface of the axis. The method of using this appliance is as follows:—The carrier, with its tuning fork, is placed at the fore-end of the projectile, and on the movement of the projectile the carrier, by its inertia, remains stationary, the projectile moving forward. The movement of the projectile sets the tuning fork vibrating, and it describes its trace on the smoked axis during the movement of the projectile over a distance equal to the length of the axis in the shell. This trace of a tuning fork of known rate gives an obvious means for determining the acceleration of the projectile, and thence by calculation the effective pressures producing motion.

A ROUGH AND READY METHOD of obtaining some notion of the amount of velocity added to a shot in the course of its

movement along the barrel is to make a series of experiments with barrels of different lengths. The difference of the average velocity obtained with a barrel of one length compared with the average velocity of a barrel of another length, gives an idea of the velocity added to the shot over the distance represented by the greater length of the longer barrel. Although experiments conducted on these lines have given interesting results, they cannot be regarded as having any very practical bearing on the measurement of gas pressures in guns.

Summing up the bearing of the velocity-method for arriving at the pressures in firearms, we must realise that the difficulties of obtaining a sufficient number of exact values are too great for the determination of initial pressure in any but large artillery of about six-inch calibre and over. This is because the maximum pressure is developed before the projectile reaches at most three calibres, and in small bores this length of barrel does not allow of the determination of a sufficient number of velocities to evaluate the acceleration and the corresponding effective pressures. A reference to our diagram will make this quite clear. It will be seen that the maximum pressure is developed within the first two inches of the shot's movement; and, when it is borne in mind several records have to be taken in this two inches to determine the rising part of the pressure curve, it will be at once recognised that the mechanical difficulties of taking these records, and further the accuracy necessary in the registering instruments, makes an exact determination, in such an instance, quite impossible. It is otherwise with the pressure curve after the point of maximum pressure has been reached. This is capable of easy estimation in nearly all cases, more especially with the most exact of the instruments we have described.

On the other hand, the mathematical relation which exists between pressure and velocity enables us to form a very clear conception of the total amount of energy which is imparted to the shot in its travel along the barrel, the measureable muzzle velocity giving us the total; and in this way we can determine the total effective pressure. By making suitable allowance for frictional and other resistances, we arrive at a general conception of the amount of area to be enclosed by our pressure curve. In this way we are prevented from absurdly over or under-estimating the amount of pressure in the gun.

THE MANOMETRIC SYSTEM OF TAKING PRESSURES.

From what has now been written, it will at once be understood why the velocity system is not a usual method of taking pressures. The estimation of the maximum pressure is the most important for us, and this presents unsurpassable difficulties, except in special and exceptional instances. This explains why the manometric system is the one generally adopted for taking pressures in fire-arms. In general terms, the manometric system of recording pressures consists in supporting a movable part of the walls of a pressure chamber or gun barrel by known resistances. In fire-arms it consists of mechanical means by which the tension of the gases inside the barrel are allowed to act upon a piston, the movement of which is resisted by devices capable of recording the force that has been exerted. The apparatus, a type of which is illustrated in Fig. 2, usually consists of a solid bar of steel, bored out in the manner of a gun barrel, according to the required calibre. A hole is drilled from the

surface to the bore, and in this hole is fitted a smoothly working piston *b*, having a flat head. The standard shot-gun pressure gauge, as used in this country, is fitted with a piston, having a diameter of .225 of an inch, its area being .040 of an inch ($.225^2 \times .7854$). The resisting medium or crusher consists of a lead cylinder *a*, held in close contact with the head of the piston by means of the screw *d*. With such dimensions a gas pressure of one ton per square inch inside

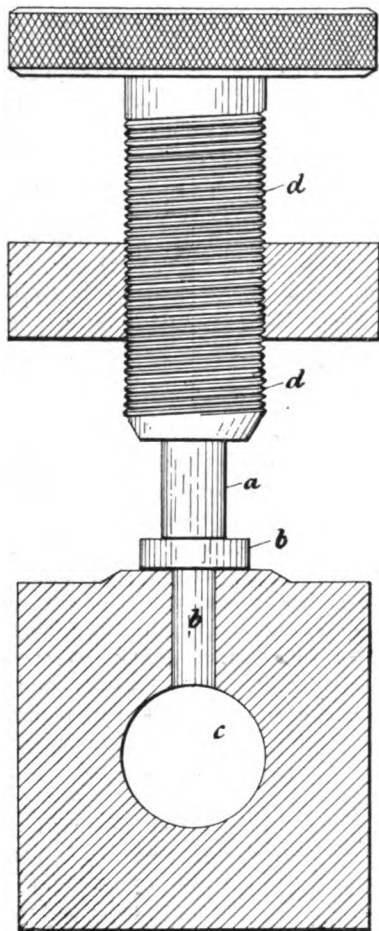


FIG. 2.—PRESSURE GAUGE FOR SHOT GUNS.

the gun would exert on the piston a force of 89.6 lbs. ($.040 \times 2,240$), and in the same proportion for other weights. If we loaded the piston with a resistance having this value, obviously the piston would not move. If, however, the resistance were less than this the piston would move, and if the resistance increases as the piston proceeds, as would be the case with a spring, the movement would go on until the equilibrium were established, and the resistance opposing the piston would be equal to the force acting on the same inside the gun barrel. If, then, we were able to ascertain the amount of resistance brought into play to prevent the piston's motion, we should at once be able to determine the gas pressure in the gun barrel.

With this system of taking pressures there have been many methods designed for registering the final resistance, and the appliances have received the general term pressure gauges. In one method the movement of the piston carries with it

greater and greater dead weights, the largest dead weight balanced being the maximum and final resistance. Another variation of the dead weight pressure gauge consists of a weighted piston, whose motion is determined by taking its trace on a smoked surface. These pressure gauges are not, however, in general use.

The common form of the pressure gauge consists of a combination of piston and spring or cylindrical column of a ductile metal, such as copper, lead, or tin. In the case of the spring the degree of compression, as shown by an index, gives the maximum and final resistance, and in the case of the metal cylinders or crushers, the permanent deformation, as obtained in previous experiments with such crushers in testing machines, provides means of arriving at the maximum and final resistance represented by each degree of shortening sustained by the crusher. The pressure gauge where metal cylinders are used was mainly due to the work of Sir Andrew Noble, and is generally known as the "Noble Crusher Gauge." In the sequel we shall have a good deal to say about this form of pressure gauge, and shall show how and to what degree the maximum and final resistance of the gauge is a measure of the gas pressure.

(To be continued.)

THE SEIZURE OF AMMUNITION IN THE PERSIAN GULF.

JUDGMENT IN THE COURT OF APPEAL.

ON the 1st ult. the hearing of the case of the Sea Insurance Company and Francis Times & Co. v. Carr was resumed in the Court of Appeal before the Lord Chancellor, Sir A. L. Smith (Master of the Rolls), and Lord Justice Collins. This was an appeal of the defendant against the order of Mr. Justice Mathew directing that the action should be tried in the Commercial Court of the Queen's Bench Division. Sir R. B. Finlay, Q.C. (the Attorney-General), and Mr. Acland appeared for the appellant, and Mr. Joseph Walton, Q.C., and Mr. Hollams were for the respondents.

Briefly to recapitulate the circumstances of the case, it may be mentioned that the Sea Insurance Company, of Liverpool, were the insurers of a consignment of ammunition supplied from Birmingham, which was shipped on board the ss. *Baluchistan* for carriage to certain ports in the Persian Gulf, by Messrs. Francis Times & Co., who are Persian merchants. The goods were marked "Muscat, optional," and the *Baluchistan* was making for that port when she was stopped by H.M.S. *Lapwing*. By command of the defendant, Captain Carr, the warship caused the steamer to heave-to, and the latter was boarded by the defendant, who, acting under the terms of a proclamation of the Sultan of Muscat, which had for its object the prevention of landing of arms and ammunition within his dominions, seized and confiscated the goods. The Sea Insurance Company, as insurers of the consignment of ammunition, were held liable to compensate Messrs. Francis Times & Co. in regard to the loss, and paid the claim in full. This action was subsequently brought by the Sea Insurance Company to recover from Captain Carr the amount paid to the shippers. Mr. Justice Mathew made the order as to the trial of the action in the Commercial

Court, and hence arose this appeal of the defendant, who is, practically, the representative of the Crown.

In support of the decision given in the Court below, Mr. Walton said that he had not much to add to the argument put forward when the case was last in court. He contended that this was not a matter in which there should have been any appeal, because the question as to whether or not the case should be heard in the Commercial Court was in the learned judge's discretion.

The Lord Chancellor, however, doubted whether it was a question of discretion. He thought rather that it was a question of fact.

Mr. Walton went on to say that there was no rule about commercial cases at all, nor was there a clear definition of what constituted a commercial cause. It was said that a commercial cause was a matter arising out of transactions between traders and merchants. The present case could not be said to be of that class. No doubt the question raised by the action was one which could be tried equally well in the general Court of Queen's Bench, because justice would be done in either, but he submitted that the Commercial Court would be more convenient for all parties.

The Attorney-General said that he had nothing to add to what he had put forward on the last hearing.

In giving judgment, the Lord Chancellor said that it might fairly be urged that the order of the Court below was not open to review, and that such an order could not be appealed against. It had, however, been contended that an appeal could be properly brought owing to the fact that this was not a commercial cause. He thought that if the application below had been made before himself, probably he would have made a similar order; but they had to consider now whether the case was a commercial cause at all. It was perfectly true that there was no definition of what constituted a commercial cause, but he thought that any commercial man would be able to say whether a case was of a commercial nature or not. The question raised by the action was really a very serious point of international law, and in his opinion there was nothing commercial in the nature of the case, except the fact that the goods had been shipped on board a vessel. The real issue to be tried was, whether the Sultan of Muscat had power to prevent arms and ammunition being brought into his territorial waters. There was also another question involved, viz., whether the Sultan had the power alleged upon which he had decided himself to prohibit the conveyance of such goods by steamer into his territory. The Sultan had, in fact, decided the case for himself, and the question was whether there was the right of appeal against his decision in another country. Therefore, the Court was of opinion that this was not a commercial cause within the meaning of the arrangement which was come to when the Commercial Court, was established. But, in saying this, he did not wish to undervalue the convenience and importance of maintaining the Commercial Court, because it had proved most useful for suitors, and had facilitated the administration of the law in regard to trade and commerce. Yet, he must come to the conclusion that the case should be tried in the General Court of the Queen's Bench Division, and not in the Commercial Court. Therefore, the appeal would be allowed with costs.

The Master of the Rolls and Lord Justice Collins concurred in this finding, and judgment was given accordingly.

EXPLOSIVES REPORT FOR WESTERN AUSTRALIA, 1899.

WE have received a copy of the fourth annual Report of the Chief Inspector of Explosives and Government Analyst for Western Australia, dealing with the year 1899. Mr. E. A. Mann reports that there has been no change in the scope of his duties during the year under review, that there has been no fault to find, or alteration to be suggested in the provisions of the Act, and that he has received no complaint with regard to the bearing of the Act, either upon the development of trade or the preservation of public safety. It has, however, been shown that necessity exists for an extension of the principles of the Act, notably with regard to explosives in mines and on the railway systems of the Colony. Mr. Mann points out that there is a lack of uniformity in the principles of regulation, so many limitations being imposed on his authority, by the establishment of other powers of jurisdiction, that he is in a position of only partial responsibility, with merely advisory powers in many instances.

TESTING.

This large growth in the explosives trade has, as might be supposed, involved a correspondingly large amount of chemical work. In all, 744 samples were tested in the laboratory, of which 16 failed to pass the heat test or to reach the requisite standard of purity, thus giving 2.1 per cent. of failures. These figures bear comparison with 467 tests and 9.79 per cent. of failures in 1898. It may be remarked that the above does not include samples submitted for physical condition only, so that the totals given do not refer to samples condemned for exudation. The list of condemnations during the year is a short one, eight cases only being recorded, involving 186 packages of nitroglycerin compounds containing 9,300 lbs. of explosive, or 65 per cent. of the total quantity of this class of importation.

During the year negotiations were entered into with a view to placing a new explosive, "Fumelessite," on the Authorised List, but the matter did not proceed beyond the preliminary stage. The same result attended an application to place a new brand of fuse igniters on the List.

With regard to the case mentioned in the previous year's report, where there was some suspicion of an attempt to mask the heat test with regard to certain large importations, the Chief Inspector is able to say that, in response to representations made to the agents, the characteristics then complained of have not recurred, and instead of the eccentric and high tests previously obtained, the explosives now show a uniform, though considerably lower, range of tests.

IMPORTATION.

In respect to the importation of explosives, it is reported that the regulations dealing with this matter have on the whole been well observed, though there are several particulars in which improvement is desirable in order to get into line with modern practice. This improvement will in part come about by process of education of those who have the handling and management of explosives outside official control. A slight remodelling of the regulations has been necessary for the purpose of correcting one or two slight technical faults, to

simplify legal procedure, and to define penalties. During the year, the handling of explosives to and from vessels at the chief port of the Colony has been carried on carefully and with safety. The concentration of the explosives trade on the Owen's Anchorage Reserve has removed from Fremantle grave sources of danger which previously existed, but at the same time further and radical improvements are necessary at this Reserve before it can be said that the storage there is accompanied with as much safety as is possible in view of the dictates of modern experience. Referring to the case of the s.s. *Andania*, which was mentioned at length in the previous year's report, the Chief Inspector was, in 1899, called upon to give evidence before a Commission appointed to inquire into the shipping laws of the Colony, and as a consequence of Mr. Mann's report and the evidence given before the Commission, the Thames Conservancy have drawn up specifications for ships' magazines, and have instituted regular inspections to prevent the recurrence of such a danger. Steps are also being taken to introduce similar supervision within the jurisdiction of other harbour authorities in the United Kingdom.

The importation of explosives during the year 1899 constitutes a record, the value showing an increase of £4,000 over any previous year. According to custom, we give herewith details of the importations during the last three years:—

	1897.	1898.	1899.
	£	£	£
Nitroglycerin Compounds ...	65,930	66,829	77,848
Blasting Powder ...	11,096	3,736	1,785
Sporting Powder ...	333	118	461
Fuse ...	6,174	6,992	7,309
Rackarock ...	434	2,282	549
Fireworks ...	386	213	105
Cartridges ...	2,505	2,382	3,254
Detonators ...	3,675	2,083	4,812
N.O.E. ...	1,666	2	—
Totals	92,199	85,452	96,123

As regards the nitroglycerin compounds, the total above given was made up in the following proportions:—Dynamite, £3,347; gelignite, £47,197; gelatine dynamite, £22,929; and blasting gelatine, £4,375. The increase in the importation of nitroglycerin compounds, as compared with 1898, was 16.48 per cent. Sporting powder and detonators showed increases of 29.67 and 71.67 per cent., respectively, while blasting powder marked a decrease of 52.22 per cent. Altogether, the value of the importations, as compared with 1898, showed an increase of 12.48 per cent.

STORAGE.

The number of Magazine Licences applied for during the year was 10, all of which were granted. On the other hand, five of the existing licences were revoked, so that there was a net increase of five, bringing the total up to 40. Most of the magazines are confined to the Government Reserves, and are under full official control. Mr. Mann has continued the series of observations of temperatures attained in magazine buildings, and has obtained results of a very instructive nature, which have been utilised in effecting alterations in some of the constructive details. A series of these temperature readings are given as an appendix. The growth of the Magazine Reserve system continues, and there are now 33 sites held and 29 magazines erected, with a capacity for 441 tons. There are only five magazines on private property, with a

capacity of 15½ tons. Six new Reserves have been declared, comprising 215 acres, and making up a total of 22 Reserves, covering an aggregate acreage of 1,455. Of course, the largest and most important of these is at Fremantle, which forms the central depôt from which the explosives are distributed to the whole Colony. This Reserve is not, however, in a satisfactory condition, owing to encroachments that have been made upon it, and the Chief Inspector has, as the conclusion of various reports, suggested either that the encroachment on the Reserve should be entirely removed, and a high fence erected around the entire area, or that the Explosive Reserve should be removed to another site at Woodman's Point, about three or four miles further down the coast, which is the only alternative site within the vicinity that is practically workable. Mr. Mann expresses himself strongly on the present situation to the following effect: "While I am of opinion that the present site, if used for explosives only, affords sufficient protection to the town of Fremantle, I am obliged to again point out that the existence of the present encroachments cannot but be considered as a source of insecurity, and that until the Reserve is entirely resumed and fenced, or a proper Reserve established elsewhere, those precautions have not been taken which modern experience shows to be necessary." An interesting appendix gives the text of a report presented by Mr. Mann, the Collector of Customs and the Superintendent of Buildings to the Commissioner of Public Works, dealing with this matter. The appendix also refers to the important subject of the condition of the lightning conductors attached to the various buildings on the Reserve, which were until recently very ineffective. This, however, has now been remedied, and all the conductors have been inspected and passed by the Government Electrician, while arrangements will be made for periodic inspection and testing. It has also been arranged that similar inspections shall be made of the Reserves on the Goldfields. Some of the accidents during the year, and observations made during visits to the fields, go to show that one great improvement that should be effected relates to the establishment of systems of electric lighting in connection with underground magazines. It is satisfactory to learn that the question of jurisdiction over Government Departmental Magazines has been settled. The Public Works Departments have agreed to the Chief Inspector having control over their buildings, and all these, with one exception, have now been duly licensed under the Explosives Act.

SALE.

A greater check has been maintained over licensed premises during the year, and the manner in which the regulations have been complied with has greatly improved. There are now 74 store licences in force, 31 new licenses being granted during the twelvemonths, as against 7 of the older ones which were revoked. Four are still under consideration.

CARRIAGE.

Improvements have been effected in the older types of powder vans used on the railways, so as to secure better ventilation. One prosecution was conducted by the Railway Department, for illegal carriage. The carriage of explosives in lighters at the port has been, on the whole, satisfactory. On two occasions the Chief Inspector had to take proceedings against masters of vessels arriving in the port, for not duly observing the warning conveyed by the powder-flag hoisted at the masthead of lighters carrying explosives.

INSPECTION.

Mr. Mann acknowledges with becoming appreciation the valuable assistance he has received from his staff of Sub-Inspectors at the various centres which it has been impossible for him to visit personally. Eight accidents by fire or explosion have come under the notice of the Department during 1899, which are duly scheduled in an appendix. It is feared, however, that the catalogue is far from complete.

The Report concludes with a *résumé* of the work done by Mr. Mann as Government Analyst.

CORRESPONDENCE.

MODERN RIFLE SHOOTING.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—I wish to apologise to your readers for not replying earlier to your points of criticism of my letter. A serious accident to a friend prevented me from attending to my correspondence, and your paper was overlooked and taken to be a circular.

I will take your points:—

1.—You say I take the "same seven" rifles as yourselves in your tables. That is not a fair statement, for I find that you took twelve projectiles out of many, and I took eight. Of these, seven are the same as yours. There are very obvious reasons for the selection of each one of mine, as doubtless of yours.

2.—I know the 236 velocity is usually given at 2550 ft. secs., but none of the cartridges I had would give it, and I put it at what I had strong reason to believe was much nearer the truth.

3.—I took the details of the 500 express from the testimony of a maker, who said they were the commonest.

4.—The velocity was given me by him as a "real" muzzle velocity, not an advertising statement.

5.—The detail of the Spanish Mauser did really come from your table. I did not include this rifle in my table worked out in Easter, 1899. But later on I saw the possible interest it might have, and wrote to a gentleman in a position to know, to ask for the latest exact measurements. His secretary sent them to me. I now find he did take them from your table, and they were inaccurate. I knew they differed from the figures I had; but I had confidence in their source, and did not know whence the secretary had them. But certainly the "toleration" found in many of these rifles is greater than 0.006.

6.—The true detail of the Mannlicher is given in many places, in the official Musketry Book amongst others. They are made close to it, too.

7.—Your criticism on the Snider is justified, though not your sneer. The diameter should have been .587 for my purpose, and I regret the oversight. In a press of work it crept in.

8.—I have not your touching faith in all the statements of makers, who are sometimes honestly mistaken, and sometimes designedly misleading. Your assumption that, like you, I "guessed" is not justified. I formed my conclusion from the more expensive process of actual trial.

There is no assertion on page 262, or any other of my book, such as you say I made. The paragraph is not well written,

but, I think, no fair critic would put such a meaning into it.

In conclusion, I claim that my book is a honest and fair attempt to help men to learn to shoot. It is, doubtless, not always pleasant reading to the trade, but I claim to have followed the wholesome rule:—"Nothing extenuate, nought set down in malice." I welcome all criticism that has the same maxim, and carries it out.—Yours sincerely,

Mistley, Manningtree, Nov. 13, 1900. L. R. TIPPINS.

[While not wishing to prolong this controversy any further, we feel it due to our readers to point out that when we stated the true bore of the Roumanian Mannlicher as .2569 in., we should have made it .2559 in., which is, of course, the equivalent for 6.5 mm. Our own mistake arose from copying the particulars from the *Text Book of Military Small Arms*. Evidently Mr. Tippins found the same mistake repeated in the official musketry book to which he refers in paragraph 6 as the source of his own information, though, personally, we do not know to what publication he refers. Obviously, he cannot mean the *Small Arms Handbook*, because that book contains the information respecting the Spanish Mauser which he obtained from his friend's secretary.—Ed. A. & E.]

APPLICATIONS FOR PATENTS.

OCTOBER 27ND—NOVEMBER 24TH, 1900.

- 18,920* Manufacture of Explosives. E. Gathman.
 18,923* Manufacture of Explosives. E. Gathman.
 18,955 Bandolier or Cartridge Carrier. J. A. Telfer.
 18,961 Fire-Arms and Projectiles. W. S. Evans.
 18,978 Miniature Ammunition Apparatus. H. Andrews.
 19,070 Field-Gun Carriages. S. Cowper-Coles.
 19,130 Projectiles. A. Leven.
 19,131 Artillery Fire. A. Leven.
 19,320 Magazine Rifle and Bayonet. J. A. Swartz and T. A. Fidgebund.
 19,333* Magazine Rifle. O. Imray (Agent for F. J. Carr).
 19,510 Blasting Explosive Regulating Device. M. Bielefeld.
 19,530* Small Arms. R. O. Pickin.
 19,581 Manufacture of Ordnance. A. H. Emery.
 19,601 Repairing of Ordnance. A. H. Emery.
 19,708 Shrapnell Shell. H. D. Rattray and J. S. Kershaw.
 19,773 Manufacture of Gunpowder. C. H. Curtis and G. G. André.
 19,780 Sights for Fire-Arms. W. J. Whiting.
 19,826 Fuses for Blasting. C. E. Tyack and H. T. Robinson.
 19,926* Bandolier or Cartridge Belt. F. G. Hughes.
 19,928 Targets. L. Rienkr. (Agent for A. Riedinger).
 19,944 Sight Fittings for Fire-Arms. A. Perazzi.
 19,961 Small Arms, Ordnance, and Projectiles. C. Davis.
 19,989 Telephone Transmitter of Sounds of Gun Firing. A. J. C. Jackson.
 19,991 Fire-Arms. J. Carter.
 20,037* Apparatus for Bullet Casting. W. and A. Richardson.
 20,103 Sights for Rifles. L. B. Taylor.
 20,118 Cartridge Carriers. W. Lindsey.
 20,133 Priming for Caps. M. Bielefeld.
 20,187 Back Sights for Rifles. A. N. D., and A. Smith.
 20,191 Dummy Bayonet Rifles. G. M. Fox.
 20,265 Sights for Ordnance. Sir W. G. Armstrong, Whitworth & Co., Ltd., and C. H. Murray.
 20,382 Small-arms. J. S. Foley and J. H. Birch.
 20,454 Arms and Ordnance. J. W. and R. Fryer, and W. Dinsdale.
 20,466 Electric Exploder. Evershed and Vignoles, Ltd., and S. Evershed.
 20,524* Ordnance. J. A., F. C. E., and M. E. Normand.
 20,537 Revolving Gun Stand. J. P. Funt.
 20,663 Sights for Rifles. R. C. Woodville.
 20,693 Range Finder. W. A. Burns, F. N. Baker, and J. Lena.
 20,744 Combined Rifle and Wire Cutter. H. Hallows.
 20,780 Cartridge Belts. A. Meyer.
 20,792 Cartridge Loader. N. Ceipek.

- 20,799. Explosives. R. Kändler.
 20,800. Electric Igniter. R. Kändler.
 20,810. Nitrocellulose. H. E. Ede, and E. Ott.
 20,813. Sights for Ordnance. Sir H. Grubb and A. T. Dawson.
 20,814.* Disappearing Gun-mountings W. L. Wise. (Agent for *Skodawerke Actien Gesellschaft*).

*These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

COMPILED BY H. TARRANT.

OCTOBER 27—NOVEMBER 24, 1900.

- 13,505 (1899). **Mounting for Ordnance** H. H. Lake (Agent for *C. Bonagente, Italy*). An arrangement, attached to the wheels of a siege-gun carriage, which enables the gun to travel over uneven or soft roads, at the same time always being in position for firing, so that upon arriving at a fortress, fire may immediately be opened, as is the case with field guns. The arrangement consists of what is called an endless rail. This rail is split up into sections which are hinged to the periphery of the wheel, so that the wheel is, when in motion, travelling constantly over the sections, which arrange themselves one in front of the other, so forming the endless rail. Accepted Sept. 29, 1900.
- 13,887 (1899). **Sighting of Fire-Arms**. J. Formby, Formby. A method of sighting rifled fire-arms, in which the leaf need not be provided with an adjustable cross-bar. The back-sight is divided by means of cross wires into a number of equal divisions horizontally, and also into a number of equal divisions vertically, to correspond with the different ranges. The eye then simply has to train the wire corresponding with the range required with the special open foresight, no adjusting whatever being required. Accepted Oct. 5, 1900.
- 20,535* (1899). **The Brighton Single-Trigger Mechanism**. W. H. Brighton, Wylde Green.
- 23,208 (1899). **Fuses for Projectiles**. J. C. Thompson, Rosherville. An arrangement which may be adapted to any form of distance or time fuse, and more particularly to that described in Patent No. 15,159 of 1898, the object of which is to prevent the rotary dome shifting relatively with the base of the fuse upon discharge. The arrangement consists of one or more steel rods, which are adapted to slide longitudinally within the fuse. These rods are retained in position by rings, but the shock of discharge causes the rings to slide along the dome, and to force the rods into engagement with the base, thus securing it against rotary movement. Accepted Oct. 13, 1900.
- 23,449 (1899). **Apparatus for Pressing Guncotton**. A. Hollings, Chorlton-cum-Hardy. Apparatus for compressing guncotton, preferably prepared in the manner described in Patent No. 19,806 of 1898, into the finished form of charges for shell. It consists of a perforated container, into which the explosive is hydraulically rammed, which is supported by a cradle or holder. A jacket of water under pressure is introduced between the container and the cradle, and this water prevents the guncotton entering the perforation in the container, and allows the compressed mass easily to be removed. Accepted Nov. 3, 1900.
- 24,377 (1899). **High Explosives**. L. Wenghöffer, Germany. A high explosive, consisting of finely-divided aluminium or magnesium, or mixtures or alloys of these metals or their carbides, and some oxygen-carrying material used in high explosive manufacture such as potassium-chlorate or permanganate, picric acid, or any other salt rich in oxygen. Accepted Oct. 6, 1900.
- 24,702 (1899). **Firing Mechanism of Ordnance**. A. T. Dawson and G. T. Buckham, London. A device for preventing the primer from being jerked out by the shock of closing the breech in ordnance. The device consists of a retainer, fixed at the front and free at the rear, which is urged downwards by a spring. It is fitted above the primer, and is adapted to descend after the insertion of the primer, and hold it against being jerked out when the breech is closed. This arrangement is particularly applicable to the breech mechanism described in Patents Nos. 10,606, 26,251 and 26,253 of 1896. Accepted Oct. 13, 1900.
- 25,686 (1899). **Blasting Cartridges**. F. Render, Manchester. A cartridge for explosives, more especially adapted for submarine blasting, in which the joint between the fuse and the
- cartridge is rendered air and watertight. The cartridge case is provided with a nipple or tube, which is covered and protected with a rubber sleeve. The fuse is inserted in this tube, the mouth of which is then firmly bound round with tape, thus not only making a water-tight joint, but securely holding the fuse. Accepted Oct. 20, 1900.
- 808 (1900). **Guns for Throwing High Explosive Charges**. E. M. T. Boddam, London. A gun for throwing high explosive charges, with which is combined a separate explosive chamber. This chamber is opened and closed by an ordinary sort of breech block, and it is provided with a specially-designed and operated valve for admitting into the gun barrel the gas generated from a charge of explosive ignited within the chamber. Accepted Oct. 13, 1900.
- 1,616 (1900). **Armour-Piercing Projectiles**. A. Reichwald (Agent for *Fried. Krupp, Germany*). A method of attaching caps to the points of armour-piercing projectiles, which consists first in turning the cap internally to fit the nose of the projectile, then grinding it upon the nose of the projectile, and finally securing it in place by means of soft solder. This method of attachment obviates two disadvantages, first the impairing of the hardness of the projectile, as is the case when hard solder is used, and second, the weakening of the nose caused by turning a groove for fixing purposes. Accepted Oct. 6, 1900.
- 1,879 (1900). **Armour-Piercing Projectiles**. A. Reichwald (Agent for *Fried. Krupp, Germany*). The ordinary headed projectile generally in use, although possessing superior powers of penetration, has a smaller range, and less final velocity than a non-headed projectile fired under similar conditions. To obviate this disadvantage, the patentees shape the cap externally in such a manner, preferably in the shape of a truncated cone, that a projectile headed with this cap shall possess the same range as an ordinary shell of the same external form when fired under similar conditions. Accepted Oct. 13, 1900.
- 2,053 (1900). **Hydraulic Brakes for Ordnance**. A. Reichwald (Agent for *Fried. Krupp, Germany*). This patent relates to that type of hydraulic brake in which the liquid is forced by a piston connected to the recoiling part of the gun from a recoil cylinder to a return cylinder, for the purpose of storing up sufficient energy to bring back the gun to its original position. In order to obtain uniform resistance with this kind of brake, the liquid is throttled by means of wedge-shaped openings formed in the walls of the return piston, so that the throttling of the liquid is in proportion to the movement of the return cylinder. Accepted Oct. 27, 1900.
- 8,376 (1900). **Shot-Hole Boring**. W. George, Dinas. A drill for boring shot-holes in coal, shale, and such like materials, the cutting surfaces of which considerably reduce the labour of cutting holes as compared with the ordinary method. The drill has spiral cutting threads, which are connected by an intervening thread, and at the front or leading end the bit is forked by the removal of a portion of the web. Accepted Oct. 6, 1900.
- 13,471 (1900). **Miniature Ammunition Apparatus**. A. T. Dawson, London, and J. Ramsey and T. E. Riddle, Erith. The apparatus described in this patent is a modification of that explained in a former patent (No. 20,258, of 1898) by the last two of the above patentees. In the former mechanism the supports for holding the miniature barrel in the bore of the large gun were so arranged that the breech end support could be expanded after insertion, but the muzzle-end support could not be adjusted after insertion, being held by spring power. The present patent deals with a method of independently expanding both supports after insertion in the gun. Accepted Oct. 27, 1900.
- 14,585 (1900). **Built-up Guns**. G. C. Marks (Agent for *G. T. Thompson, U.S.A.*). In built-up guns, that is, those guns composed of a number of tubes shrunk one on to the other, disadvantages exist in that the shrinking process is slow and costly, and a uniform shrinkage of the tubes is impossible. The patentee attempts to get over these and the other disadvantages by doing away with the shrinking process, and in the construction of the gun permitting a relative longitudinal shift or adjustment on the part of the tubes, the force of the explosion being utilised to effect a uniform tightening of the jackets, and a consequent equalisation of the strain. Accepted Oct. 13, 1900.
- 15,065 (1900). **Cartridge Belts for Machine Guns**. F. M. Garland, U.S.A. The clips attached to the machine-gun belt here described consist of two upstanding spring arms, on the inside of which inwardly projecting detents are formed. The cart-

ridge for use with this particular clip is formed with an annular groove about midway down the case, and into this groove the detents inside the clips are adapted to fit. The cartridges are by this means held all in a perfectly straight line, endwise movement, which often causes jamming, being prevented. Accepted Oct. 13, 1900.

15,277 (1900). **Projectiles.** C. M. Brown, U.S.A. In projectiles of that class in which a vane or tail-piece is provided to control the position of the projectile during its flight, and to compel it always to travel point foremost, the vane is provided in the present patent with a disc, which nominally is held tight up against the base of the shell. The heat of discharge, however, releases it, and it is allowed to move a certain distance to the rear, when the action of a chamfered edge of the disc on the air compels the shell to travel in its proper course. Accepted Oct. 20, 1900.

15,330 (1900). **Rammers for Ordnance.** W. L. Wise (Agent for *The Skodawerke Actien-Gesellschaft, Austria*). A rammer for ordnance, consisting of a rotating screw spindle, which engages successively with two or more tubes, each having a nut-like end, which are adapted to slide one within the other, but are prevented from any rotary motion. The rammer works on telescopic principles, the first tube moving out the second, the second moving out the third, and so on. Accepted Oct. 27, 1900.

16,511 (1900). **Cartridge Cases.** W. G. Heys, Manchester. This patent relates to the manufacture of cartridge cases, fuses, or quick-matches, for use in pyrotechny, which in the present case are made from nitrated artificial silk, either in the form of threads or a suitable fabric. This material possesses the property of deflagrating without leaving any residue. Accepted Oct. 20, 1900.

16,628 (1900). **Picric Acid.** A. Gutensohn, London. In order to prevent the waste of acid in the production of picric acid caused through having first to dissolve the carbonic acid in diluted sulphuric acid which stops the violent action accompanying the mixing of carbolic and nitric acids, the present patentee first dissolves the carbonic acid in heated paraffin. Then the nitric is covered with a thick layer of the same oil, and the carbolic acid paraffin solution is gradually added. By this means considerable heat is also generated and artificial heating is rendered unnecessary. Accepted Nov. 3, 1900.

* This Specification is more fully described under "Selected Patent."

SELECTED PATENT.

THE BRIGHTON SINGLE-TRIGGER MECHANISM.

20,535 (1899). W. H. Brighton, Wyld Green. The single-trigger mechanism described in this specification is simple in construction, containing only a few parts, and is of the "two-pull" type, an intermediate pull not being required after the first discharge to arrange the parts ready for the firing of second barrel. A rocking arm pivoted to a vertical extension of the trigger blade is the limb through which the trigger raises the sears, and by means of a peculiar form of slotting in this rocker, and a specially shaped spring, a pin fixed to a post forming part of the trigger plate is caused to detain the parts in a safe position for a sufficient time after the first discharge to allow the involuntary pull to pass off harmlessly.

In Fig. 1 the parts are shown in an uncocked position ready for the opening of the gun to rearrange them for the discharge of the right-hand barrel. Upon the gun being opened, the safety rod *a* is pushed back in the ordinary known way by the turning of the top lever, and in its backward movement the lever *b* is caused to swing the rocker *c* round on its pivot against the action of the spring *d* to the position shown in Fig. 2. Here the rocker is held by the safety sear *e*, which engages with the projection *f*. The swinging back of the rocker automatically releases the part *g*, which is spring-pushed backwards to a position beneath the right-hand sear. Thus the parts are arranged as shown in Fig. 2, and when the trigger is raised to discharge the right-hand barrel the rocker is also lifted by

the extension *h* of the trigger blade. It is through the raising of this rocker that the trigger can only be lifted a certain distance when first pulled, and so can only release the right-hand sears which occupy a position nearer the trigger plate than do the left-hand sears. This is brought about through the bottom of the narrow end of the slot *i* cut in the rocker engaging with the pin *j* projecting from the fixed pillar *k*.

When the right-hand sears have been raised, the projection *f* on the rocker is disengaged, and under the influence of the spring *d* the rocker starts to swing back to the position shown in Fig. 1; but it is stopped midway in its travel by a curiously shaped spring *l*, the top of which comes into sudden contact with the heel *m* of the rocker. This sudden contact has the effect of lifting the rocker and the trigger a sufficient distance for the pin *j* to engage with the central portion of the slot *i*, and thus temporarily to retard the completion of the stroke, and so prevent the involuntary pull discharging the second barrel. The spring *d*, however, again

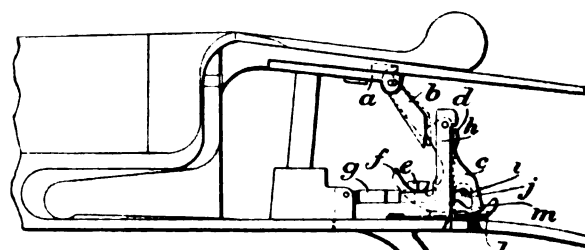


Fig. 1.

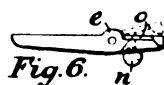


Fig. 6.



Fig. 5.



Fig. 7.

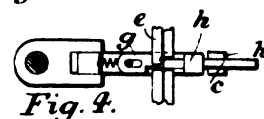


Fig. 4.

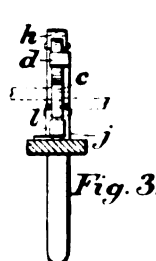


Fig. 3.

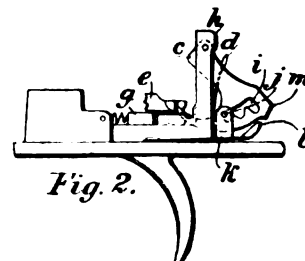


Fig. 2.

impels the rocker forward after the momentary check, and forces the inclined surface of the heel of the rocker up a correspondingly inclined part at the base of the post *k*, thus elevating the trigger until it is brought almost immediately beneath the left-hand sears.

An arrangement for allowing the right-hand barrel to be put out of action, and the left to be first discharged, is shown in Figs. 4 to 7. A sliding pin *n*, having a conically shaped head, is let into the lock plate, and this pin is adapted to engage with the hinged part *o* on the right-hand sears, which holds the rocker *c* in its cocked position. The pin *n* when pushed inwards raises the part *o* against the action of a spring, and so automatically allows the rocker to occupy its forward position, the part *g* being pushed from beneath the right-hand sear during its travel.

A modified form of this mechanism, embodying the same principles of construction, is also described in the specification, but in this last case the rocker is pivoted to the top strap, and not to the trigger blade. Accepted Oct. 6, 1900.

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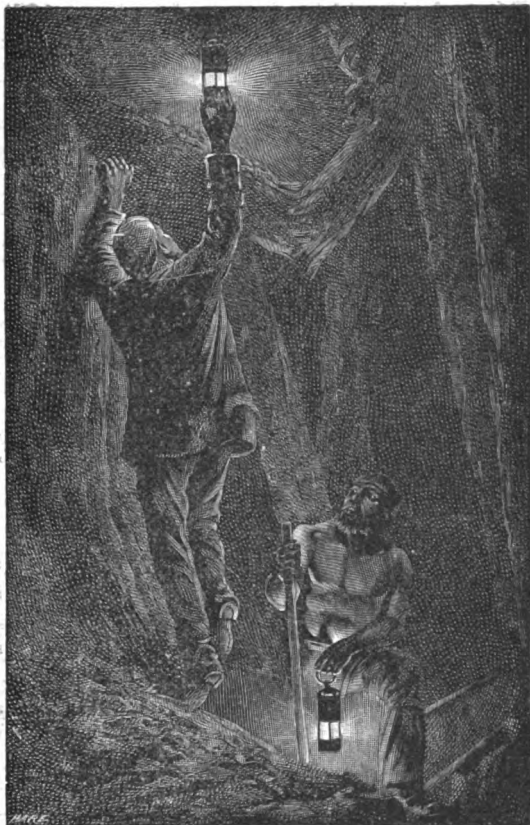
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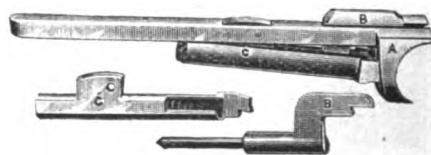
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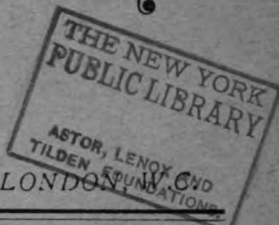
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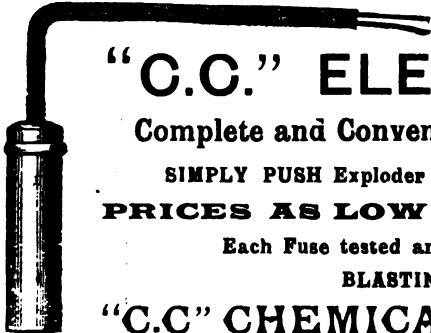
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