Arms & Explosives

A TECHNICAL AND TRADE JOURNAL.

EDITED BY MAX BAKER

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CURRENT TOPICS.

Sir Hiram Maxim.—There are many reasons for feeling gratified that the list of new year honours should contain the name Hiram Stevens Maxim. In the first place Mr. Maxim brought to this country, in his own person, one of the finest types of the American inventor. The mechanical ingenuity of the American, unfettered by old-world ideas, is a justifiable subject for admiration over here. This faculty for invention is at the root of American commercial prosperity. It is as engineers that they have established their national position in the world. For many years past Mr. Maxim has provided us with a sample of the inventive faculty, applied to commercial ends and achieving financial prosperity. A well-known type of inventor is he who borrows the price of the patent fees, at the same time that he promises to remember you when the world has acknowledged his services. It is refreshing to turn from contemplation of such as this to an inventor who is sufficiently commercial and practical to invent on a salary of £5,000 a year, the shareholders of his Company being glad to secure his services and finance his ideas at whatever price he demands. This is the true inventive faculty. An invention is not merely a clever idea, it is an idea that has been worked out with the help of the modern workshop and of unstinted capital. No inventor is so practical as he who labours to produce something which his company can make at a profit. When in the gun business Mr. Maxim's hobby was flying machines, and while this has not been brought to fruition, experts are agreed that Mr. Maxim's motor was a triumph of inventive logic. Now that Sir Hiram has given up much of his active contact with the gun business, his main attention is devoted to motor cars, where his practical methods of evolving the perfect ultimate design, coupled with his fine knowledge of light motors, will no doubt lead to useful results. The old war-horse has a lot of life still in him, and we still regard him as a promising man with a career ahead. Of all things connected with his knighthood perhaps the most pleasing is the fact that his adopted country's recognition of his services will for ever render nugatory the efforts of those, connected to him by ties of blood, who attempt to belittle the fine reputation that is his.

Theoretical Sizes and Actual Gauges.—For the time being a sort of stagnation seems to have affected the gun trade in the matter of giving effect to the new chamber sizes adopted by the two gunmaking associations. The chief question seems to be one of gauges. It is all very well to fix up a set of standard sizes, that is, on paper, but it is quite a different matter to impose those dimensions on so many pieces of hardened steel. It is something quite new in the history of the gun trade to be asked to work to a definite size, and there is a good deal of interesting employment at the disposal of those who observe the manner in which the new sizes are received. While in conversation with a provincial gunmaker, the other day, we were informed that he had no need to make any change in his

present practice. It appeared that his sizes were about two-thousandths of an inch larger all round than the published sizes. He stated that as the adopted sizes were the minimum gauge, and as he worked exactly to his own gauges, there would remain a useful toleration of two-thousandths. This is no doubt the spirit in which the new gauges will be received in a good many quarters, but it is certain that the reform will ultimately be forced upon the most obstinate opposers of innovation. To us it seems a shame that any gunmaker should deliberately make his chambers two-thousandths larger than is necessary, for by so doing he takes that much away from the life of the gun, in so far that, were this metal left in the chambers there would be that much opening for cleaning out the chambers in the future after continuous wear has spoilt their surface or neglect has corroded them. When, however, there is an adequate supply of accurate gauges, things will be materially improved. In the meantime we must expect that sportsmen will insist on the chambers of any new guns they may order being accurate to the recognised sizes.

Gunnery in the Navy.—Since writing on the subject of the prize-firing in the Channel Squadron, in our issue of October last, details are to hand of the remarkable results achieved by H.M.S *Terrible*. Her 9·2-in. guns gave an average of 60 per cent. of hits, which is a satisfactory enough performance; but the most noteworthy practice was gained with the 6-in. guns on the broadside, which yielded an average of 76·8 per cent., consisting of 80 hits out of the 104 rounds fired by the 12 guns in question. This may be compared with the results attained throughout the Navy in 1899, when an aggregate of 2,347 rounds recorded 664 hits, or only 28 per cent. Taking the *Terrible's* performance in detail, four of the guns actually made 100 per cent. of hits, 38 hits to 38 rounds; and the best eight gave an average of 90 per cent. Unfortunately, three guns served to bring the average down considerably below the achievement that might otherwise have resulted. But the record is of special interest when the name of the captain of the vessel is remembered. Captain Percy Scott commanded H.M.S. *Scylla* in 1899 in the Mediterranean, when that vessel broke the record with 80 per cent. of hits. He is now in command of the *Terrible*, which again breaks all existing records. It appears, therefore, that the captain counts for something in gunnery results, and that he exercises considerable influence on the men behind the guns, which bears out our previous remarks on the subject.

Pressures and Imaginations.—We take the somewhat unusual course of calling the special attention of our readers to the papers on pressures which are now appearing in our columns under the heading of "Lectures to Young Gunmakers." So much nonsense is written on pressure testing in connection with fire-arms that it is well, once in a way, to set out the radical principles of these experiments. What we now publish is sufficiently authenticated by the reputation of the author to be above suspicion. Those, therefore, who profess a knowledge of this subject should cease for a time to air their want of appreciation of essentials, and devote the time so set free to a study of the laws underlying the testing of pressures. If they find themselves incapable of grasping the substance of a lecture addressed to young gunmakers, then they should cease to educate the world at large on a subject that is admittedly beyond their comprehension. If, on the other hand, they can appreciate the simple rules laid down, let them cease to use arguments, quote illustrations, and lay down fictitious laws of their own moulding which have nothing to do with pressure testing. As we have before indicated, it is time that pressure testing should cease to be the happy hunting ground of the irresponsible shooting journalist, whose chief equipment is a free supply of involved language, complex technical expressions, and, above all, confidence that the gullibility of his editor and the ignorance of his readers will prevent him from being found out.

Lord Armstrong on Patent Law.—The occurrence of the death of Lord Armstrong, whose notable career is dealt with at length on another page of this issue, serves to recall the very strong position which this distinguished inventor took up with regard to patent law. He viewed the existing legislation on the subject with absolute hostility, and complained without ceasing of its obstructive effect upon the inventor. For example, he was used to quote the case of a man who may conceive an idea which he, quite possibly, will not have skill or knowledge sufficient to develop into a practical success. Yet, if he can put the idea into a concrete form, he may make it the subject of a patent, thereby obtaining a virtual monopoly which will restrain other and more competent men from developing the latent possibilities of the idea. In effect, this is a national, almost more than a personal grievance, and constitutes a survival of the abuses of the system of monopolies inaugurated during the reign of James I. Lord Armstrong was evidently in favour of imposing greater restrictions on the granting of patents, for he was very pronounced as to the impossibility of knowing what could be invented or used, owing to the "perfectly frightful" number of patents already in existence. And moreover, while many of those could not perhaps be enforced in law, yet the wiser course often is, undoubtedly, to accept them as valid rather than incur the expense of proving them to be otherwise. He believed, in fact, that the whole system was unnecessary, and that the only complete remedy for its abuses was to be found in its abolition—which is certainly a drastic method of solving the difficulty. Failing this, he was of opinion that an improvement might be effected by the establishment of special tribunals for the granting of patents and the trial of cases connected with them, by making licenses compulsory, and by withdrawing the right to patent foreign inventions. It is indisputable that the present conditions of legislation are more apt to stifle invention and impede natural progress than to fulfil the obvious purpose of assisting a forward movement.

EXPLOSIVES OF UNREGISTERED PREMISES.—At Aberdare, Mr. Rees Summers, the manager of the Aberdare Workmen's Co-operative Society, was summoned for keeping a quantity of explosives on premises not registered for the purpose. The police officers, who visited the premises, found three boxes of mixed explosives, weighing about 25 lbs. each, in the shop, and three other boxes and some loose black gunpowder in the safe in the warehouse. The manager explained that he was ignorant of the provisions of the Act, and the superintendent pointed out that even with registration only 50 lbs. could kept in the condition under which these explosives were kept. A fine of 20s. and costs were inflicted in this case.

REGISTERING THE GUN TRADE.

THE Gunmakers' Association has given consideration in open meeting to the frequently advocated policy of registering the gun trade. The strictly non-committal resolution which was passed thereon at the General Meeting, of which the minutes are published in this issue, provides an idea of the difficulties attendant upon such a policy. On broad, general grounds the business of a gunmaker is one demanding a high grade of skill and a wide experience, and the existence of a diploma certifying that the holder possesses these attributes would be of value in proportion to the care and discrimination exercised in awarding it. It is all the more necessary that a gunmaker should exercise skill in his profession, since accidents of a more or less serious character are liable to follow from ignorance on the maker's part of the character of the weapons he places in the hands of his customers. It may be argued that the gunmaker, so-called, is frequently a mere retailer of goods supplied by the actual manufacturers of guns, cartridges, and so forth; but even so, it is difficult to find the gunmaker who is not called upon in all manner of ways to act as an expert. Whether it be a matter of repairs, gun fitting, adjustment of sights, recommendation of suitable ammunition, or any other of the thousand and one items that form his daily routine, he is, under all sorts of conditions, consulted as an expert, and his advice is taken by his *clientèle* in recognition of his position as the man who knows. Quite apart from the lesser matters already enumerated, a gunmaker should, of necessity, be a fine judge of workmanship. All sorts of firms offer him their goods, and even the gunmaker who only purchases completely finished arms is at all times called upon to make his selection in a way that will guarantee a good article for the customer who subsequently purchases a weapon. The terrible rubbish that one sees in the shop windows of pawnbrokers and other unskilled vendors of guns is in itself evidence that honest gun vending calls for qualities and knowledge of a special order. What is wanted is that the sportsman should realise that there is a difference between the mere shopkeeper and the man who has devoted a life-time to understanding the gun business.

Admitting what is so clear, viz., that some distinction should be drawn between the skilled gunmaker and the host of miscellaneous retailers who sell guns as part of a general trade in hardware, leather, cutlery, and unredeemed pledges, it becomes necessary to determine what qualifications should be required of those receiving the diplomas, and what authoritative body should apply the test of fitness. The Gunmakers' Company of London was originated some 250 years ago for objects very similar to these, and a suitable revival of the privileges granted to it by Royal Charter would no doubt do much to benefit the conditions of the gun trade in this direction. But the present day representatives of this body are not addicted to violent exertion, and are quite satisfied to see year after year roll by with no more distinguished service rendered than the proving of guns according to the Act. It is, therefore, hopeless to suggest that aid should come from the direction whence, on moral grounds, we have a right to look for it. Hence it is waste of time to consider the Gunmakers' Company as within the region of practical politics. The Gunmakers' Association, on the other hand, is a young body without traditions, statutory power, or wealth, and consequently anything it may attempt must be restricted in accordance with these limitations. Obviously it would be a self-constituted authority, so that any certificate it might issue could not have any very great value to the holder at the outset, though, as years go on, and the care exercised in the allotment of these certificates became wider known, they would ultimately have a value of their own, to be measured by the satisfaction of those who possess them, and the desire of those who don't, to remedy the omission. Whether or not the certificate should be one granted to all members of the Gunmakers' Association has yet to be considered. In our opinion, the duties of the Association are so miscellaneous that many traders would be in sufficient sympathy with its objects to become members, and thereby help it with their subscriptions, who might not, at the period of their election, be of such standing and experience in the trade as to warrant their receiving, for a time at any rate, the certificate of their association.

In fixing the conditions of issuing such a certificate it would be necessary in the first place to bear in mind the class of gunmaker who is most capable of satisfying the needs of his patrons. To our way of thinking, an all-round knowledge of the business is of greater importance than the capacity to earn journeyman's wages at one or other of the branches into which gunmaking is split up. Obviously the man who combines the general knowledge with that of the practical workman is the best; but there are so many efficient supervisors of first-class gun businesses who are not mechanics that we are bound to admit that such general knowledge carries with it the capacity to run a gun business with due regard to the scientific questions that continually come up for treatment. In this same connection it must be remembered that guns are sporting weapons, and that a practical shooting man with years of miscellaneous experience in the field at his back is able to master the problems of gunmaking when actually brought into the trade with a thoroughness equal in many respects to that of the other class of gunmaker who enters the business by the route of the workshop. Examinations, drawing classes, and applied mechanics are, therefore, more suitable for the apprentice and the learner than for the full-blown master of a business. His qualification is of necessity largely a question of what he has picked up, as evidenced by what he has accomplished. A gunmaker's certificate should, therefore, in the present conditions of the trade be granted on elastic principles; but the certificate should itself state the particular reason for which it is granted, so that the practical man should receive full credit for the tuition he underwent in his youth and in his days of early manhood. On the other hand, the clever business man and the competent director of the mechanical operations carried out in his workshop should also secure suitable recognition, based on the records of the business which his energy, and special knowledge acquired over years, have enabled him to build up. Certificates granted on these lines might prove a practical success, but much of their value would depend upon the means taken to ensure, by suitable notices, issued in advance of the granting of the certificate, that no one unworthy of the honour should slide through, and so detract from the value of the mark of honour granted to others who deserve it. The only difficulty that is at all serious is the possibility of splitting the association into two camps—certificate holders and non-holders.

INCIDENTAL JOTTINGS.

SUGGESTIVE SHADOWS. The year 1901 opens under the auspices of the noble "reformer" which is quite orthodox, not to say commendable, and I trust I may not be charged with "cheap cynicism" if I express a wish that these grand New Year's resolutions may not, like a new diary, show a diminishing interest as the novelty wears off, and the volume is relegated to the shelf beholden of all observers by its title only, long after progress has ceased therein. Personally I am no great believer in reform by hybrid committees, which generally ends in a compromise of good and bad suggestions and ideas, and a nebulous summing up, which in its ambiguity and endeavours to spare such departments as are condemned, savours somewhat of the Irishman's defence for having cracked a kettle he borrowed, on the grounds (1) that he never borrowed the kettle, (2) that it was cracked when he had it, (3) that it was all right when he returned it!

SIR GEORGE TO ARMS. In the matter of the new War Office Committee, the *dramatis personæ* shows the cast to be a good one, but special interest will certainly be centred upon Col. Sir George Clarke. This gentleman happens to know where reformation is needed, and all the other members would find it a difficult task to commence before the idiosyncrasies of the present system were explained. This explanation is not to be found in angry letters from small contractors in halfpenny papers, nor in the leaders of such papers inveighing against the War Office upon matters they know little about, for these hang upon the fringe of the greater questions. Nor is it entirely a question of the men who are appointed to administer, though much has to be answered for in the system of their training. "Red tape" is the motto of the Civil Service—advancement automatic, qualifications problematic. One often sees a senior high-salaried official in an important post who is an absolute fool to his junior. The latter does the "deviling,' and, if he does not kill himself with overwork, may possibly succeed to office in his decrepitude.

THE MAGI (NORTH EASTERN). Now what would Mr. George Gibb, the manager of the North Eastern Railway, say if his staff were appointed, trained, and run on the same lines? Would that gentleman ever have left the Great Western Railway for York, or would he ever have had the chance of showing his enormous capacity as a clever manager under Civil Service routine? It is a difficult problem to tackle, as it involves so much hardship for the less capable men who work equally hard with the others. The Civil Service is like an enormous trade union, where the merits of the individuals have to be sacrificed for the community, and years of service and deaths in the senior ranks count more for advancement than capability. But if we are going to reform let's begin at the root of the matter—Civil Service men or outsiders. Do the War Office pay remunerative salaries to secure the very best men? No, emphatically no. Here, then, is a lead, with a special reference to the administrative and technical staff. It may be a little difficult to get at the true facts, and to suggest a genuine remedy, but it wants doing.

POT POURRI. Mr. William Mather ought ably to second Sir George Clarke and Mr. Gibb, being a man of much commercial knowledge and practical ability. But I do not think Messrs. Mather & Platt have had much to do with the War Office, so here again the difficulty of diagnosing will influence the prescription. One of the problems met with in selecting a committee is to be careful that no member is commercially interested in the appointment. This cuts both ways. This particular appointment will, however, satisfy one political party, if not both. As for the remaining members they are neither "Matchless Cleanser" nor "Homocea"; but they are universally well spoken of as men brimful of ideas, many of which are good. Mr. Dawkins is a successful Civil Service man, Sir Charles Welby has spent some nine years as private secretary to ministers of war, and Mr. Beckett is a much respected banker who should render valuable services in several directions, being a long-headed Yorkshireman.

COMPLIMENTS OF THE SEASON. It would not be proper to leave the subject of War Office reform without attacking the one subject which makes our blood boil with indignation, and that is, giving orders for our guns to foreign contractors, and for other articles which we can ourselves manufacture to foreign merchants. There are at least half-a-dozen firms in this country who could have made those guns had they been asked. Was it, do you suppose, from motives of curiosity they were purchased, for if so one or two would have sufficed, and, if good, could have been easily copied in the same way as the Germans buy and copy American machinery? The War Office answer is incomplete—that British firms who might have competed were full of work before they were asked. Some other firms have been choked off in infancy; and the War Office knew it, and were possibly shy of asking favours for fear of being asked to wipe previous moral scores off the slate.

"TERRIBLE" SHOOTING. It is more than gratifying to read of the excellent shooting records made by the gunners on H.M.S. *Terrible* on the China station. Both the *Powerful* and the *Terrible* are fitted with electrically propelled mountings for their 9·2-in. guns, which were built at Woolwich, and finished complete. So little has been said of the innovation of electric power to supersede hydraulics, that one almost felt it was about to die a natural death, due to failure of the mountings, or Conservative prejudice at Whitehall. I am glad, however, to see how it has asserted itself as a worthy successor to the clumsy, antique hydraulic arrangements. The electric mains are perfectly easy to handle and fit up inside a ship, and they can be duplicated cheaply, and well protected from shell fire, etc., much more so than hydraulic pipes. Only see that the motors are good ones, and that there are a few spare ones in the ship in case any get destroyed in action, and Jack can work with far more confidence, knowing that no gun need be put out of action, unless by actual damage to the gun or mounting itself.

IS QUEEN ANNE DEAD? There is a terrible prejudice against anything new in a battleship outside its constructional details. Most of its fittings are made to pattern, sealed and sent to store to guide contractors throughout the coming years. It takes

an accident to get the pattern changed—even the engineers workshops are fitted with lathes made by the score and sent to store—old-fashioned relics which fail to find a market anywhere else. But then they don't pretend to mend anything on board, only to patch till the ship gets home or a new part has been sent out. Fancy an engineers' shop on board with electrically driven (foot power is mostly used now) machinery of modern pattern, a few milling machines, and other labour-saving tools. Portable electric drills, which are indispensable in the dockyards, are strangers on a warship, where there are "sufficient hands to work a ratchet brace"! Fancy Jack sewing his togs with an official sewing machine! This would indeed be going ahead of the times. Electricity and mechanical appliances will one day have a good innings on board all vessels from the first-class line-of-battle ship to the fussiest little torpedo boat, and, at the same time, et us hope that the engineer will be more honorably dealt with in receiving the rank due to his position, which can hardly be said to be the case at present.

ELECTRIC HEROES.

The Electrical Engineers' Volunteer Corps, which was attached to the Royal Engineers in the Transvaal, deserved all the honours of the reception they received upon their return from the Institution of Electrical Engineers at Covent Garden Opera House. This corps is an object-lesson in practical management. The late Dr. Hopkinson conceived the idea, which the War Office approved of, but his sad accident in Switzerland bereft the corps of his services. Mr. Crompton, of Chelmsford, stepped into the breach, and a worthy successor he proved. He impressed on the War Office the fact that their official training was useless, so they gave him *carte blanche*, and the results everyone knows. Within two years of its inception the corps was trained, drilled, fought for ten months in Africa, and came home again, wearing the laurels it so gallantly won. The novelty of a cycle scout at the end of a wire, with a telephone retailing how the enemy were situated, certainly was an innovation of a very daring kind, to say nothing of traction haulage for big guns up kopjes, or tapping the enemies' wires instead of cutting them.

THE ASSETS OF REPUTATION.

Since penning the above, the melancholy news has come to us of the death of Lord Armstrong, to whom the original development of hydraulics, as a source of power in working machinery, is due. It is a pathetic ncident that he should have passed away with the old century, in which he leaves an indelible mark as one of the greatest exponents of mechanical genius. Nor is this all, for he combined the rare gifts of science and commercial ability. His firm stands to-day stronger than ever, when his contemporaries are, most of them, far lower down the scale, and many, including the Maudesleys, Penns, and others, are only memories. It is a sad truism of the engineering world that they believe in the commercial immortality of reputation, and after the master-mind has gone, which probably created a magnificent business, the successors wear the spectacles of past glories, which only fog the vision in the atmosphere of progress. It is pitiful to see some of the old pioneer firms with nothing but the plate on the door and the picture on the wall to indicate the existence of a may-be world-famed reputation, whilst the sons of others, without the hereditary assets of capital or distinction, are able to nullify these valuable auxiliaries by the pursuance of an up-to-date, vigorous advancement, side by side with the trend of time.

CYCLOPS.

THE GUNMAKERS' ASSOCIATION.

GENERAL MEETING.

A GENERAL MEETING of the Gunmakers' Association was held at Effingham House on Thursday, December 20, 1900, and there were present:—Messrs. John Rigby (in the chair), A. H. Gale, W. R. Leeson, H. J. Blanch, C. Boswell, C. Rosson, and R. T. Woulfe.

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

MESSAGES OF REGRET.—Messages of regret for non-attendance were read from Messrs. C. Ingram Annan, J. T. Musgrave, H. W. Holland, C. H. Clarke, J. F. Smythe, A. E. Cole, T. W. Webley, H. A. A. Thorn, C. F. Liversidge, and E. Harrison.

APPLICANT FOR MEMBERSHIP.—Mr. Daniel Fraser, carrying on business as D. Fraser & Co., Edinburgh, having been duly proposed by Mr. John Rigby, and seconded by Mr. E. J. Rigby, his election was unanimously agreed to.

THE STATUS OF THE GUN TRADE.—The meeting then proceeded to deal with the following item on the agenda:—

To consider whether a practical policy could be evolved for the purpose of securing some form of recognition for those gunmakers who, by knowledge and special qualification, may be considered experts in their profession, and, therefore, entitled to some form of registration or certificateship which will tend to raise the stutus of *bona-fide* gunmakers, and securing increased recognition for their productions among those of their patrons who look for expert knowledge from master gunmakers.

The object of putting the above item in the agenda forward in this way is to see whether practical effect can be given to the frequently expressed opinion among gunmakers that something should be done to educate sportsmen to appreciate the difference between the mere vendor of guns and the skilled gunmaker who brings special knowledge and education to bear in the pursuit of his calling.

The matter was considered, and it appeared to be the opinion of the meeting that some form of certificate might be issued to members of the Gunmakers' Association. But it was decided that the question involved considerable difficulty and should be referred to the Executive, with a view to their reporting their suggestions to the next General Meeting.

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

CHANGES IN THE ARMING OF CAVALRY.—As a result of the experience derived from the present long-lasting Boer war, changes are being made in the arming of the 1st and 3rd Dragoon Guards, who are now under orders for South Africa. The lance and carbine are to be discarded, and the men will be armed with the Lee-Enfield rifle and the sword. The substitution of the rifle for the carbine will of course necessitate the adoption of the colonial saddle, with the rifle bucket by the right stirrup.

ROUND THE TRADE.

WE understand that Sir Charles Ross has been awarded a silver medal, as collaborator in the Charles Lancaster Exhibition in respect to the Ross Straight-Pull Rifle.

MESSRS. CLABROUGH & JOHNSTONE have informed us that with the New Year they have removed to more commodious premises at Price Street, St. Mary's, Birmingham.

MR. JAMES WOODWARD, of the firm of Messrs. James Woodward and Sons, who died in July last, has left estate of the gross value of £36,513, which includes personalty of the net value of £28,525.

Mr. H. R. A. THORNE (Charles Lancaster) informs us that the Norwich and London Accident Insurance Association have agreed to make a very satisfactory settlement in connection with his recent accident.

THE two gunmakers' associations have now ready for issue the varnished cards, showing in convenient form the new chamber sizes. They are issued free to members of the two societies, and price 2s. 6d., post free, payable in advance, to non-members.

WE understand that, in consequence of increased business, and in order to ensure prompt delivery of orders for cartridges loaded with their powder, Messrs. Müller & Co. have taken new premises, comprising offices and stores, at Horse Shoe Yard, Mount Street, Grosvenor Square, London, W.

MESSRS. CURTIS'S & HARVEY have favoured us with samples of their handy pocket diaries for the new year. They (the diaries) are bound in fawn leather, and possess the distinction that, while intended for gratis distribution, they are of really practical use, and not overburdened with advertising matter.

MESSRS. ELEY BROS. are to be congratulated on their new show cards, which make a really effective display in the shops of their customers. The originals of the game birds represented were painted by an artist of wide repute, and the three-colour process of printing has reproduced the originals with an artistic effect seldom attained in show cards.

THE Browning Bros. Co., of Ogden, Utah, U.S.A., announce that they have sold their Salt Lake City branch to a new company, which will be known as the Western Arms and Sporting Goods Co. A chief reason for this step is that the Browning Bros. Co. find it easier to deal with their large trade from one central office, and Ogden, with its exceptional railroad facilities, appears to be the most satisfactory location for the purpose.

THE liquidator of the Birmingham Small Arms and Metal Co., Ld., which was wound up on selling the two sections of its business to the Birmingham Metal and Munitions Co., Ld., and Birmingham Small Arms Co., Ld., respectively, issues a notice in the current issue of the *London Gazette* to the effect that a meeting will be held at the Small Arms Factory at Small Heath on February 19th, to receive particulars respecting the winding-up of the Company.

THE Automatic Magazine Rifle, Small Arms and Ordnance Co., Ld., is the title of a newly registered company, with a capital of £185,000, which has been formed to take over an agreement with the Magazine Rifle Syn. Ld., and to carry on the manufacture of rifles and other things. The director's qualification is £100, and remuneration £200 per annum, the chairman receiving an extra £100. The registered office is 120, Bishopsgate Street Within, E.C.

NOTES.

TELESCOPIC SIGHTS FOR RIFLES.—We have received from Mr. L. N. Mogg, of Marcellus, N.Y., U.S.A., an illustrated pamphlet descriptlve of his specialities in rifle telescopes for hunting and target purposes. He pointed out that the making of a rifle telescope involves only two principles: to arrange the lenses to form a correct and clear image, and to have everything so solidly attached that the recoil will not displace any of the parts. Mr. Mogg has three regular sizes of telescopes, built of $\frac{5}{8}$, $\frac{23}{32}$, and $\frac{7}{8}$ in. tubing, and one special make at an enhanced price, the lenses of which are supplied by the leading firms of astronomical instrument makers. There are several varieties of mountings adapted to different purposes, and including one set supplied with open sights over the telescope, so as to be suitable for either running or deliberate shooting. Two dots fitted on the cross wires, for aiming at ranges of 100 and 200 yards respectively without alterating the telescope, also forms a useful arrangement. The pamphlet is well illustrated, and contains valuable information on sighting and shooting generally.

NEW COLT CATALOGUE.—We have received from the Colt's Patent Fire Arms Manufacturing Co. a copy of their new price list for 1901, which contains full particulars and illustrations of all the different lines of pistols and magazine rifles of which this well-known firm makes a speciality. The numerous records made at Bisley and elsewhere in target shooting show the Colt revolvers to have fine qualities of accuracy, while for ordinary everyday work of a rough-and-ready nature they equally show that the excellence of design and workmanship count for something in determining the efficiency of a weapon. Most of the newer patterns include the combination of the jointless solid frame and the simultaneous ejector actuated by the side swing of the chambers, though for those who prefer it one or two types are still built on the "gate" system of loading. The terms offered to the trade, Government agents, and merchants are of a sufficiently liberal nature, and a large stock of London-proved arms is always kept in hand ready for prompt delivery.

SALE OF UNPROVED FIRE-ARMS.—At the Liverpool City Police Court, on the 8th ult., Mr. Joseph Haigh, an optician, of Lord Street, was summoned for having unlawfully kept for sale small-arms which had not been duly proved in accordance with the Gun Barrel Proof Act, 1868. Mr. J. Rowlands, Law Clerk to the Guardians of the Birmingham Proof House, prosecuted, and stated the charge. The rifle in this case bore the Belgian proof-mark, and in addition had a small bone label on the stock bearing the defendant's name, which, it was urged, would give a purchaser the impression that he was buying an article of English manufacture. According to the Proof Act, a gun so marked with a name implying English origin must be proved again either at Birmingham or London. For the defence, it was urged that the label was placed on the stock simply so that anyone purchasing the rifle should know from whom it was brought, in case anything went wrong with it. The defendant was finally ordered to

pay £8 8s. to cover costs in one case, the other summonses being withdrawn, and on the application of counsel it was understood that a case would be stated if required.—At the same Court, Messrs. Langdon and Sons, of Duke Street, were summoned for selling an unproved revolver. Mr. Thomas Turner, the Master of the Birmingham Proof House, said that the revolver in question did not bear any proof-marks at all, though it had been a very good weapon. The defendant could not account for this unproved revolver having escaped their attention, and the Bench, believing that the offence was merely the result of carelessness on the part of someone, imposed a fine of 20s. only.

MESSRS. JOHN RIGBY AND CO. (GUNMAKERS), LD.—This Company was registered on November 29th by Messrs. Wakeford, May and Woulfe, of 37, Bloomsbury Square, W.C., with a capital of £10,000 in £10 shares, the object being to acquire the business carried on at 72, St. James's Street, S.W., by Mr. J. Rigby, and to continue the same as gun, small-arms, and ammunition manufacturers, engineers, metal workers, &c. Qualification for the directorate is £50, and the first four directors are Messrs. J. Rigby, E. J. Rigby, H. M. Rigby, and T. Rigby. The registered offices of the Company are at 72, St. James's Street, London, S.W.

BREACH OF AGREEMENT ACTION.—According to the *British Australasian*, in the actions brought by the Colonial Ammunition Company against the Government of New South Wales, to recover damages for alleged breach of agreement in having obtained supplies of special ammunition from outside firms without giving the plaintiff company six month's notice that such ammunition was required, the full Court has decided that there was no breach of agreement. Judgment was therefore entered for the defendants, with costs.

HORN AS AN EXPLOSIVE.—An explosion of a somewhat novel character, which was followed by a fire, took place on the 14th ult. at the factory of the Aberdeen Comb Works Co., Ld., resulting in serious injury to two of the workmen and considerable damage to property. It appears that a mill which is employed for reducing waste horn and hoof to manure was being fed by a workman, when the dust was by some means ignited, possibly by the presence of a nail or piece of steel. A violent explosion ensued, and the workman was thrown to a considerable distance, while another man, who was attending to a riddle at the time, was burned about the hands and face. The woodwork of the mill was quickly ablaze, but all danger was finally averted by means of the appliances at hand in the works.

CHAMBER OF COMMERCE INQUIRY ON THE BIRMINGHAM GUN TRADE.—The Council of the Birmingham Chamber of Commerce recently appointed a committee to consider the desirability of instituting an enquiry into the causes of the decline of the Birmingham gun trade. This committee reported to the council on October 10th last that, having made preliminary enquiries, they had not received sufficient promises of financial support to justify the Chamber in incurring the expense such an enquiry would entail. They therefore suggested that the matter be held in abeyance for the present. This report was adopted by the Council. Mr. J. B. Goodman, Chairman of the Chamber, points out that, unfortunately, the Chamber has no funds at its command to devote to such an enquiry. The terms of reference were not fixed, and before drawing them up it was intended to invite representative men outside the council to join the committee.

VICKERS' 6 IN. GUN FOR THE BRITISH SERVICE.—Very satisfactory results have been obtained with the new 6 in. quick-firers, built by Messrs. Vickers, Sons and Maxim, Ld., for the British service. A trial of more than 500 rounds was made for the purpose of testing the mechanism and general working of the system, with the consequence that a large number of the guns have now passed into the service. It was found that a rate of fire of eleven rounds per minute could be maintained, and the test showed that the guns developed nearly 100 per cent, more energy than was given by the preceding weapons of the same calibre.

ST. HELEN'S EXPLOSION, 1899.—At the Liverpool Assizes, in the early part of December, the action was heard before Mr. Justice Bucknill and a special jury, in which the St. Helen's Corporation sought to recover from the United Alkali Co., Ltd., the sum of £5,000 damages for injury to the Corporation Gas Works, caused by an explosion of chlorate of potash on the defendant's premises, on the 12th of May, 1899. The hearing of the case extended over four days, and at the close the jury delivered answers to the judge's summing up, which were equivalent to a verdict for the plaintiff. They found that chlorate of potassium was not of itself a dangerous substance; that before the date of the accident it was not known to the defendants that it was an explosive unmixed with other substances, but that the defendants ought to have known that it was explosive; that the defendants in manufacture and storage of potassium chlorate did not take all reasonable care and precaution to prevent accident by fire and explosion; that that want of care contributed to the accident, and that the fire was not one which happened by mere chance without negligence.—Judgment in accordance with these findings was deferred pending a consultation.

MILITARY EXHIBITION, 1901.—At the first meeting of the honorary committee of the Military Exhibition, which is to be held during the coming summer on the well-known space at Earl's Court, M. Paul Crémieu-Javal, chairman of the executive, was able to sketch in the chief details of the scheme. He said that the exhibition will embrace everything possible pertaining to military matters both British and foreign. There will be sections devoted to military engineering, artillery, small-arms, and weapons of all kinds, and to transport and commissariat, and hospital work. It is also intended to show what might be termed a retrospective or historic section, illustrative of the changes that have been evolved in the regimental uniforms and accoutrements of different nations, and in this department would also be included a collection of war pictures. The chairman was able to report that they had received most satisfactory promises of help in collecting the exhibits, and that a great number of things had already been secured, including the whole of the magnificent military exhibit at the recent Paris Exposition, and they had also secured from Paris for the historical section a collection of arms and accoutrements dating back over the last century

at least. Other countries have promised assistance, and it is hoped that the British military authorities will see their way to help the executive in a similarly generous manner. Of course there will be other features of the exhibition, more or less on the lines of previous years' shows. A portion of the proceeds will be set apart for military charities.

EXPORT OF ARMS TO THE DUTCH EAST INDIES. —A semi-official contradiction has been given to the statement recently made that the Governor of the Straits' Settlements has rescinded the order prohibiting the importation of arms and ammunition to the Dutch East Indies. This order has been renewed from time to time since the outbreak of the Achin war, and in consequence of the marked improvement in the internal affairs of that region, a friendly exchange of views has recently taken place between the Dutch and British authorities out there as to the eventual removal of the prohibition. But for the present the prohibition still remains in force, and in Singapore no effort is as yet being made for the resumption of the condition of affairs which existed prior to the order being put into execution.

CAP EXPLOSION IN GRAY'S INN ROAD.—The report issued by Captain J. H. Thomson, H.M. Chief Inspector of Explosives, on the explosion which occurred at the factory of Messrs. Eley Bros., Ld., at Gray's Inn Road, W.C., on September 10th of last year, whereby three men were killed and two were injured, seems to place the lamentable affair on a much simpler basis than was at one time suggested. H.M. Inspector is of opinion that the accident was caused by not more than about 4 oz. of cap composition, which had been left in the 80,000 caps contained in the two boxes after washing out, and which, after being wetted and becoming dry again would be more sensitive to explosion from shock or percussion. Some part of this composition would possibly be retained in place during the washing out process by the operation of one cap getting inside one of larger size in the action of sweeping them into the bags used for the purpose, thus producing much the effect of anvilled caps, which are notoriously dangerous. The actual explosion is attributed to the deceased labourer, John Dyke, who was stooping over one of the boxes at the moment, possibly using a tool to open it, when the manager and foreman, who also were killed, were passing. Captain Thomson is careful to say that he attributes no blame either to the Company or to any of their employees in connection with the accident, and he acknowledges the great assistance he received from Messrs. Eley Bros., Ld., in carrying out the enquiry. The report of Major A. Cooper-Key, H.M. Inspector of Explosives, is also before us. It relates to the circumstances attending two explosions which occurred at Messrs. Eley Bros' Ammunition Factory at Edmonton on July 24th, 1900. The first of the explosions took place in a building in what is known as the "danger" area, this building being lightly constructed of wood with a roof of galvanised iron, and being devoted to the storage of finished percussion caps and chlorate of potash. Three women were present at the time, and were injured, but they could not throw much light on the causes of the occurrence. They were, however, unanimous in showing that the explosion was not the result of any action on their part, a fact which is borne out by the comparatively slight nature of the injuries received. About an hour and a-half later, a second explosion took place in an adjacent building, in a compartment in which no work had been carried on for some considerable time, though it had been entered by at least two people subsequent to the earlier accident. One of these placed a tin of "black mix" on a bench, and the other subsequently placed a tin containing two "white mixes" on the same bench. With regard to both explosions, after a careful consideration of the question from every point of view, H.M. Inspector is of opinion that in each case the accident was due to spontaneous ignition of impure cap composition in bulk; but whether the impurity was wilfully added or otherwise, there is no means of ascertaining. In the first building Major Cooper-Key noticed four irregularities of working, which were not, however, responsible for the accident, and he pays high tribute to the high standing of Messrs. Eley Bros, Ld., and to the excellent condition to which H.M. Inspectors have invariably found the factory on the occasions of their periodical inspections. He also thanks Mr. J. C. Irvine and Mr. Lewis for the valuable assistance they rendered in the course of the inquiry.

LECTURES TO YOUNG GUN-MAKERS.

IX.

PRESSURES.

WRITTEN WITH THE COLLABORATION OF F. W. JONES.

IN our opening lecture we drew attention in a general way to the various attempts that have been made to ascertain the pressure in fire-arms, and we gave it as our opinion that for practical purposes the Noble Crusher gauge is the most simple and reliable method that has been invented. This statement is supported by the fact that most gauges in use are of this form, and it is this practical answer to our enquiry into the theory underlying the various methods proposed which goes to form our view.

We have, however, serious objections to several practica forms and methods of using the gauge, more particularly, however, in respect to the relations which are supposed to exist between the forces applied by the powder gases to the piston of the gauge and the resistance set up by such forces as indicated by the tables which translate crushings into terms of pressure.

In the Noble crusher gauge the movement of the piston, brought about by the forces acting on it in the gun barrel, is stopped by the resistance set up in small cylindrical metal columns, called technically "crushers." These crushers are usually made of copper or lead, and a cursory review of the properties of metals will show the reason why these have been adopted in practice. The crushers must be ductile, and if we exclude the noble and rarer metals we shall see at once that copper, lead, tin, zinc and antimony and arsenic are the only metals available for the purpose. Zinc and antimony and arsenic are too crystalline and hardly ductile enough for crushers, while tin offers no advantage over lead, as we shall see further on. Alloys, such as the bronzes, might be thought worthy of consideration, but the details furnished by Professor Thurston in his valuable books on "The Materials of Engineering" do not indicate any possible advantages over copper on the one hand, or lead on the other. We may, therefore, restrict our remarks to those crushers which are

adopted in practice, and we may be safe in believing that what we find illustrated in these two different forms of metal crushers will apply to any other form of metal crusher that may be proposed, the difference being one of degree and not of kind.

In the first instance, we will enquire in the rationale of the crusher gauge. When a copper or lead crusher is used in a gauge fitted to a fire-arm, the pressure in the gun causes a compression of the crusher, and the amount of this compression, as shown by readings of a micrometer gauge before and after firing, gives the measurements for determining the maximum powder gas pressure.

It is assumed that some form of testing machine has been used to ascertain the various degrees of crushing that result from the application of known forces, and in this way we are in a position to translate the amount of crushing into its equivalent pressure, as shown by a table containing a series of such equivalents. For instance, if it is found that a force of 200 lbs. reduces the length of a crusher by ·015 of an inch, and it is found that a similar crusher sustains the same shortening in the pressure gun, then it is assumed that the piston has been acted upon by a maximum force of 200 lbs. This last value becomes gas pressure in tons-per-square-inch when the ratio between the area of the piston and the unit area of one square inch has been ascertained, and the necessary arithmetical processes described in the previous lecture have been carried out. It is granted that the crusher continues to sustain compression until it offers a resistance equal to 200 lbs., and thus the remaining length of the crusher and the compressing forces are supposed to be related in a definite manner. This is the rationale of the crusher gauge, and we shall have to consider when and how this is true; but before doing so we must attempt to analyse the rise of pressure in a gun from two points of view:—First, that of time; second, that of the relation of the forces applied to a crusher, and the consequent compression, when the suddenness and duration of this application is made to vary.

Rise of Pressure in Fire-arms.

To give a clear idea, we will make use of the diagram, Fig. 3, where the horizontal lines are taken to represent time, and the vertical lines pressure. It should be noted that the diagram does not represent the pressure curve of a fire-arm, to which it bears a striking likeness. We are not dealing with the whole barrel, but with the point where the piston of the pressure gauge opens into the barrel, such, for instance, as the one-inch piston of a shot gun proof barrel. We will endeavour to show graphically how quickly the maximum pressure may be applied to such a piston. In the case considered, let us suppose the maximum pressure to be three tons, which we will represent by O α. If this arose from zero to a maximum all at once, O α would represent its "time pressure curve." We know, as a matter of fact, that it cannot rise from zero to a maximum instantaneously, because even with detonated explosive charges the detonation requires time, and, therefore, in our case, where we are dealing with gunpowder of comparatively slow combustion, we know that there must always be an appreciable, although minute, interval of time between the moment when pressure first appears and when it becomes a maximum. This time may be as long as one-thousandth of a second, or shorter than one ten-thousandth of a second.

Let us suppose we are considering some shot gun cartridges giving three tons maximum pressure on the one-inch piston. Then we may assume that either O A H, O C I, and O E J could represent the varying pressure at this point in the barrel, taking O as the origin of the pressure and O B, O D and O F as the various intervals of time between the origin and the arrival of the maximum pressure. We have not given values to the intervals of time, because this is not necessary for our purpose. We would, however, point out that a comprehension of these time pressure curves is essential for a proper appreciation of our further remarks.

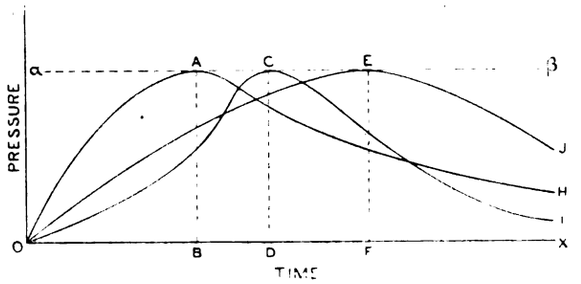


FIG. 3.—CURVE SHOWING VARIOUS RELATIONS OF TIME AND PRESSURE.

Rise of Resistance of Crushers during Compression.

When a rod or column of metal is submitted to a force of compression it shortens in length: it, however, recovers its original length if the force or load applied is not sufficient to compress the column beyond its limit of elasticity. Within this limit of elasticity the amount of compression is proportional to the load applied, such that a load of $2 \times w$ lbs. produces twice the compression of a load of w lbs. If the load applied compresses the column of metal beyond its limit of elasticity, the column takes a permanent deformation or set; and it has been found that the relation of deformation to the load applied varies with most metals. This relation, however, can be ascertained, and our crusher tables indicate what this is for the particular metals used for crushers.

In a later lecture we shall give diagrams showing at a glance the pressure tables for copper and lead crushers. These tables are obtained by two general methods. One method, the *statical*, consists in finding the permanent deformation due to the application of a load or force applied to the crusher through the intermediary of a piston, and in such a way that the moving parts never possess any material velocity or inertia. This method of testing practically amounts to adding the load on the crusher in very small amounts at a time. The other method is known as the *dynamical*, and takes many forms. In this method the load is applied very rapidly, and sometimes with velocity, as is the case with falling weights. The moving parts have considerable velocity, and their inertia, as it is called, has a marked influence on the resulting compression. It should be noted here that all methods of calibrating which deliver the force on the piston with velocity, as in the system of falling weights, deviate in principle from all pressure gauges, because no matter how quickly the powder gas pressure is applied to the piston, the piston never has initial velocity.

It is very difficult to demonstrate the rise of resistance of a crusher as it is compressed without recourse to high mathematics. The spring balance, however, affords an exact

analogy of the crusher, and we propose to use it to make this abstruse part of our subject clear.

The compression of a spring is directly proportional to the load applied, such that if in Fig. 4 O L represents the load applied, and O C the corresponding compression, the relation of load to compression then becomes a straight line such as O A. This same kind of relation exists with the permanent deformation of copper crushers, but is not so simple for lead crushers. However, it will not affect our spring balance analogy.

Every one of our readers must have noticed that when the pan of a spring balance is carelessly loaded the index moves considerably beyond the point of the scale showing the exact weight. As a matter of fact, if, say, a 5 lb. weight be held just touching the pan, and is then suddenly released, the index will move as far as 10 lbs. on the scale; in other words, the spring will be momentarily compressed twice as much as is the case when the weight is finally at rest. The cause of this is that owing to the spring offering very little opposition to the weight in the early part of its motion, the moving parts possess a velocity at the moment when the spring reaches the point of compression equivalent to 5 lbs., and this velocity is not overcome until the spring is compressed to a point equivalent to 10 lbs. Let us suppose the weight is replaced by

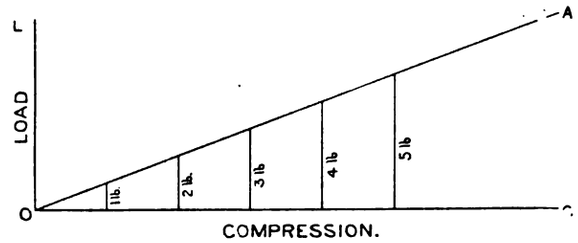


FIG. 4.—LINE O A SHOWING RELATION OF LOAD AND COMPRESSION WITH SPRING.

sand capable of being run on to the pan at any desired rate, then we shall find that if the rate of loading exceeds a certain limit, the index moves beyond the 5 lb. mark on the scale. For very slow rates of delivery the index moves slowly up to 5 lbs., the resistance of the spring balancing the sand during the whole of the spring's compression, so that there is no velocity or inertia. This rate being increased, there will be found a limit above which the index moves more and more beyond the scale of 5 lbs. until it moves up to 10 lbs., when the sand is put on all at once. There is thus a maximum rate of loading which cannot be surpassed without the index moving beyond the point on the scale indicating the exact weight. This maximum rate we shall term *the limit rate of statical loading*. Exactly the same kind of relation exists between the rate of loading and the corresponding compression of crushers, there being a limit rate of statical loading varying with the size and nature of the crusher.

We must again refer to our spring balance, and here let O R and O T of Fig. 5 represent the resistance and time of loading respectively, and let O A represent the limit rate of statical loading. In this case $O t^{I.}$ $O t^{II.}$, $O t^{III.}$, $O t^{IV.}$ and $O t^{V.}$, gives the time at which 1 lb., 2 lb., 3 lb., 4 lb., and 5 lb. respectively of sand are run on to the scale pan. Then for any rate below O A, such as O B, we shall have statical loading, and the index will not move beyond 5 lbs., but for rates such as O C and O R the spring will be compressed beyond 5 lbs. O R represents the load being put on all at once, and is for crusher work the "*maximum dynamical rate of loading*," because in crusher gauges the piston is always brought up to and touches the crusher, and thus acts

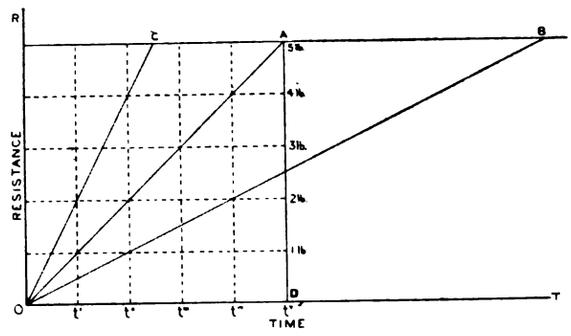


FIG. 5.—SHOWING THE EFFECTS OF DIFFERENT RATES OF LOADING SPRINGS.

without initial velocity. Any intermediate rate of loading, such as is represented by O C, would only possess a degree of dynamical loading.

In our spring balance analogy, and in other cases where the compression is directly proportional to the statical load applied, a dynamical load represented by O C would compress the spring as much more than the load represented by O A, as the area O C A D is greater than the area O A D. In this latter case the one area is just double the other, and is correct, as is shown by suddenly releasing a weight on the pan of a spring balance, when the index moves to a point just double the actual weight applied. Thus all rates of loading less than the maximum statical rate would give statical results, whereas all those above this limit would be dynamical, with varying degrees of inertia, up to the limit of maximum dynamical loading. We have thus two limits, one which gives a compression equal to the load applied, and the other which gives a compression double that of the load applied.

All we have said above, with regard to the compression of a spring, applies equally to the deformation of crushers. Every crusher has a characteristic rate at which it develops its resist-

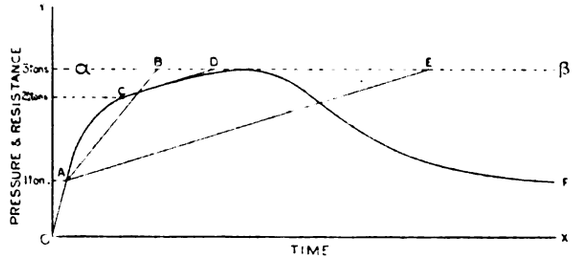


FIG. 6.—CURVES SHOWING THE RELATION OF THE DEVELOPMENT OF PRESSURE IN THE GUN WITH THE DEVELOPMENT OF RESISTANCE IN THE CRUSHER.

ance during compression. In this way, if the powder pressure rises quicker than the crusher can develop its resistance, we have inertia of the moving parts, and the resulting effect on the crusher is such as is obtained by dynamical loading. Unfortunately, we can only imitate the two limit methods of loading, and there are no *a priori* means of arriving at the rate at which pressure is developed in fire-arms. We must, therefore, make

our pressure gauges work at one or other of these two limits if we wish for any degree of accuracy in our pressure taking.

We will make this quite clear by considering a copper crusher and diagram Fig. 6. Let O A C F represent a "time pressure curve" of some particular powder giving three tons pressure, and let A B represent the "time resistance curve" of the copper crusher used. It will be noted that the time pressure curve cuts A B, and part of the former lies above it. Therefore the crusher will be compressed more than by a statical load equivalent to three tons, in proportion to the area of the pressure curve above A B. If, however, we previously compress the crusher to a length equal to 2¼ tons, we get a time resistance curve C D, and as this line lies above the time pressure curve, the further compression of this is statical. If we had taken a crusher which required a long time to develop its resistance, such as A E, the error due to inertia would have been greater, and, moreover, further complicated by the pressure being taken off before the crusher had had time to develop its resistance. This example shows two things clearly, viz., that we should select crushers which develop their resistance rapidly, and also that we should compress our crushers to a point near to the expected pressure, so that the amount of compression while under the powder gases is as small as possible. We shall see later that both these essentials have a practical limit.

Before leaving this example we will consider what the effect would be if the point in the barrel under consideration were some distance from the breech face. Let us assume, for instance, that we are considering a piston six inches up the barrel. Without much fear of contradiction, we can assume that by the time the base of the projectile reaches this piston the pressure has ceased to rise, and, therefore, that the base of the piston receives the full gas pressure all at once, on the principle of our maximum dynamical loading, and O Y thus represents the time pressure curve. For compressions such as these, the evaluation of the pressure is simple, and in the case of a copper crusher the compression is exactly double that due to an equal statical load; therefore, if statical tables are used, the compression observed must be halved to get at the correct pressure.

This is very probably the explanation of *M.* Polain's curious experiments, in which he showed the pressures at the muzzle of a shot gun higher than, or nearly the same as at the breech. Probably he used the same kind of crusher table to interpret the compression at all and every piston of his Proof Barrel.

The same kind of relations can be demonstrated for lead crushers, but these are much more complicated owing to the development of the resistance during compression being comparatively slow, and not directly proportional to the compression. Moreover, as we shall show later, lead flows under comparatively small loads, so further complicating the analysis. The same kind of action, however, goes on, and the rules found for copper crushers are also included in those for lead crushers.

Spring gauges are even worse than lead crushers, the time resistance curve being so slow that the pressure is taken off a long period before the spring has had time to form an equilibrium with the forces acting on the piston; therefore, this form of gauge is the least desirable.

It should now be quite clear that cartridges loaded with different explosives, giving, say, the same pressures, may register very different compressions of lead or copper crushers.

(To be continued.)

LORD ARMSTRONG.

THE death of Lord Armstrong, which took place at his residence, Cragside, Rothbury, Northumberland, on the 27th ult., has removed from the roll of the living yet another of those great personalities whose influence upon the industrial and scientific progress of the nineteenth century can scarcely be measured with accuracy until the lapse of time has provided some interval for the filling in of a suitable perspective. It may safely be said that no man can be duly appraised during his life time, nor the effects of his labour in whatever direction appreciated by the generation of fellow men which saw its accomplishments. In regard to Lord Armstrong, however, there is the less diffidence in attempting to review his life work, since the distinguished veteran had passed well beyond the allotted span of ordinary existence

Born on November 26th, 1810, the son of Mr. William Armstrong, a prominent citizen of Newcastle-on-Tyne, William George Armstrong was educated at Bishop Auckland, and began his career as articled clerk to a firm of solicitors—a somewhat curious opening to a life in which the imaginative faculty must have worked almost *pari passu* with that of painstaking research and investigation. However, he remained in the chosen profession sufficiently long to become a partner in the firm. His inclinations meanwhile were unmistakably tending in the direction of science, and he made his first appearance as an inventor in the year 1840, when he exhibited at the "Polytechnic," in Newcastle, a hydraulic engine of the rotary type, which was employed to drive some of the machines in the same building. At the time some people claimed to see in this water-driven motor a supplanter of the steam engine, but Mr. Armstrong himself recognised that he had not yet hit upon the best method of employing water power. A few years later he produced the first hydraulic crane, substantially the prototype of the thousands of these appliances that are now at work in docks and warehouses throughout the world. Instalments of these cranes were speedily supplied to Liverpool and Grimsby docks. To meet local difficulties where it was well nigh impossible to obtain the requisite head of water to work the crane, he next invented the accumulator, in which a loaded plunger supplies the necessary pressure, and which now-a-days is practically in universal use in hydraulic equipments. It will be noted that by a natural process of development, Mr. Armstrong had departed from his original idea of utilising the power of free water, which was the main feature of his first rotary engine, and in the course of progress initiated the whole of the modern science of hydraulic machinery.

Another of his early inventions, which, however, was never brought into a condition of practical utility, was the hydro-electric machine, which won for him, at the age of 36, election to the fellowship of the Royal Society. This machine, which was evolved from an accidental discovery in the working of a steam boiler, generated electricity by the friction of a jet of steam escaping through a wooden nozzle, and was much used for exhibition purposes, but it never got beyond that stage, as contemporaneous investigators discovered better means of generating the power for commercial employment.

Undoubtedly, the department of science with which the name of Armstrong is most generally connected is that relating to the construction of ordnance. It is not claiming

too much for Mr. Armstrong to say that he was virtually the inventor of modern artillery. Prior to his practical experiments in that line, ordnance was of the crudest type, somewhat akin to the Irishman's definition of a gun as "a long hole with brass poured round it." In 1856, Mr. Armstrong produced the first gun constructed on the built-up principle afterwards associated with his name, and possessing the other vital principles of loading at the breech, possessing a bore with polygroove rifling, and throwing a cylindro-conical projectile of approximately the same pattern as is in use to-day. The satisfactory results obtained from a trial of this gun caused the principle to receive the sanction of the Government, and Mr. Armstrong was appointed Engineer of Rifled Ordnance, was placed in the order of C.B., and received the honour of knighthood. During the period from 1859 to 1863 no fewer than 3,500 guns built on his principle and under his supervision were put into the British service. In reality, what passed into the service as the Armstrong gun was not the product of one mind alone. Anderson and Fraser both contributed their share towards the practical perfection of the weapon, and in many details improvements were effected. The breech mechanism was not too satisfactory, and eventually in 1861 the Government made a retrograde movement back to the muzzle loader, which still retaining the main features of the Armstrong method of building up the piece, and did not revert to the breech-loading principles again until about 1880.

At about the period of this backward movement, Sir W. G. Armstrong resigned his official position, though how far cause and effect operated in the synchronism it is perhaps difficult to judge. Henceforth he laboured consistently in the development of the world-famous Elswick Works, which had originally been established for the manufacture of hydraulic and general machinery, but were destined eventually to become as a household word in connection with warlike appurtenances. The works were founded in 1847, and then gave employment to about 200 men. Ten years later, when the Armstrong gun was a commercial asset, the works had undergone sufficient expansion to employ 4,000 men. From that date onwards, there has been no period of standing still. One invention has given rise to another, and one industry has reacted on the other. With the advent of big guns came an increased demand for machinery to manufacture and to work the ordnance on land and sea. By gradual processes of development the establishment expanded in size and scope, especially in the direction of war *materiel*, until it had the capacity to turn out not only guns and machinery, but completely equipped war vessels of the largest size and most formidable character. Strangely enough—though the fact is scarcely strange to those who know the Admiralty methods—these vast resources have but seldom been employed for the British service, especially of late. But some of the most famous warships of minor foreign Powers have issued from the Elswick Works, more particularly a quite remarkable number of fast heavily-armed cruisers of a type which some experts consider to be far away superior to anything that the British Navy can show, on an equal displacement tonnage. At the present time, the Elswick Works constitute one of the largest establishments of the kind in Europe, occupying more than a mile of frontage on the River Tyne, with an area of 130 acres, and a total staff, in times of full pressure, of about 14,000 men.

As has already been mentioned, Mr. Armstrong was knighted in 1858, and on the occasion of the Queen's Jubilee, in 1887, Sir William Armstrong was created Baron Armstrong. He was the recipient of many other honours at home and abroad. He received the honorary degree of LL.D. from the University of Cambridge in 1862, and D.C.L. from Oxford a few years later, while Dublin conferred on him, in 1892, the honorary degree of "Master of Engineers." In 1863 he acted as President of the British Association, and was President of the Institute of Civil Engineers in 1882. He was also three times elected President of the Institute of Mechanical Engineers, and was President of the Newcastle Literary and Philosophical Society. He made one attempt only to enter political life, in 1886, when he was defeated by Mr. John Morley. In the year 1873 he served as High Sheriff of Northumberland, and he was a Justice of the Peace for that county to the day of his death. He also received a number of foreign distinctions, among them being such honours as the following:—Knight Commander of the Danish Order of the Dannebrog; of the Austrian Order of Francis Joseph; of the Spanish Order of Charles III.; and of the Brazilian Order of the Rose. He was also a Grand Officer of the Italian Order of S. Maurice and Lazarus, and received the 2nd class of the Imperial Order of the Rising Sun of Japan, and Siamese and Chinese titles of almost equal worth.

Lord Armstrong was not a very frequent contributor to the literature of the day, his usual method being to collect anything which he had to say in the form of a paper to be read before one or other of the learned societies with which he had connection. He was essentially a man of deeds rather than of words, and the establishment on the banks of the Tyne will serve to perpetuate his name and to form a fitting monument to the memory of one of the most noteworthy personalities of the last or any century in the world's history.

APPLICATIONS FOR PATENTS.

NOVEMBER 19TH- DECEMBER 15TH, 1900.

20,821. Machine Gun Carriage. W. E. Rowlands.
20,841. Rifle Support for Cycles. H. Lucas and A. C. Davidson.
20,860.* Machine Guns. O. Imray (Agent for *Deutsche Waffen and Munitions Fabriken*).
20,896. Reflecting Device for Sights. W. Youlten.
20,923. Charger for Magazines of Rifles. J. Hodgkinson.
21,065.* Detonators. L. Wohler.
21,068. Explosives. J. Bonnet. (Applied for in France Sept. 22, 1900).
21,120. Cartridges. T. Parker
21,231. Range-finder. C. A. Trotter.
21,244. Projectile Hardening. Sir A. Wilson.
21,245. Mechanical Primers. Sir W. G. Armstrong, Whitworth & Co., Ld., and G. Stuart.
21,453*. Machine Gun. M. H. Bowman and W. O. Hughes.
21,493. Time Fuses. Sir W. G. Armstrong, Whitworth & Co., Ld., Sir A. Noble and G. Stuart.
21,627. Explosives. N. Ceipek.
21,630.* Gun Carriage. O. Imray (Agent for *Deutsche Waffen und Munitions Fabriken*).
21,633 Bandolier. H. R. Hammond.
21,073 Ammunition Hoists for Ordnance. A. T. Dawson and J. Horne.
21,694.* Position Indicator for Shooters when Driving Game. F. R. B. Liebenrood.
21,743. Machine Guns. A. J. Boult (Agent for *G. Perino*).
21,791.* Hydraulic Rams. H. V. Blake.
21,835 Cartridge Cases. S. Cowper-Coles.
28,875. Shot-fiting Apparatus. J. Ashworth.
21,891. Magazines. P. Jenson (Agent for *Krag-Jorgensens Gevær-kompagni*).

21,896. Fire-arms. L. B. Willoughby.
21,918. Small-arms. W. H. Brighton
21,984.* Cartridge Bells. T. C. Orndorff
22,013. Cartridge Clip. G. Roth.
22,045. Projectiles. P. M. Staunton.
22,095. Telescopic Sights. J. B. Lee.
22,127. Sights for Ordnance. Sir H. Grubb, A. T. Dawson and G. T. Buckham.
22,212. Telescopic Sights. A. A. Common.
22,248 Range Finder. J. Waddell.
22,344. Magazine Fire-arms. G. M. C. Brand
22,352.* Shrapnel Shell. H. D. Rattray and J. S. Kershaw.
22,369. Telescope for Ordnance. A. Reichwald (Agent for *Fried. Krupp*).
22,412. Targets. A. F. Dobbs and E. C. Grimley.
22,481. Gun-barrel Cooler. W. H. Fitzgerald.
22,501. Shrapnel Shells. R. Fiedler.
22 548. Sighting of Weapons. R. Slazenger.
22,566. Telescopic Sights for Ordnance. A. A. Common.
22,568. Sporting Guns. R. Darne.
22,616. Sighting Devices. T. G. Russell.
22,651. Fuses and Exploders. A. W. Marshall.
22,689. Bandolier. N. W. Wallace.
22,702. Targets. R. C. Murray.
22,740. Projectiles. J. H. S. Bradley.
22,873. Multi-shot Cartridges. R. W. Scott.
22,922. Detonator Holder. G. Edwards.
22,949. Signalling Detonators. T. Lambert.

*These Applications were accompanied by Complete Specifications.

SPECIFICATIONS PUBLISHED.

COMPILED BY H. TARRANT.

DECEMBER 1—DECEMBER 22, 1900

18,986 (1899). **Submarine Mines.** T. McKenna (Agent for *G. E. Elia, Genoa*). A submarine mine which is discharged from a vessel in a manner similar to a torpedo The mine is guided upon rails, and, as soon as it leaves these rails, an anchor and a lead are automatically released, and drop ahead of the mine. The lead moves away ahead of the anchor until a predetermined length of cable has been unrolled, this length corresponding with the distance beneath the level of the water which it required that the mine shall settle. The lead reaches the bottom, steadies the mine, and allows the anchor to settle the mine in the required position, both as regards depth and locality. Accepted Nov. 21, 1900.

22,001 (1899). **Sighting of Ordnance.** E. Dragoumis, Greece. A rearsight for ordnance, which is automatically controlled by a depression telemeter fixed at any determined distance from the gun or battery. The sight is controlled in such a manner that when a gun is trained towards a certain object, the line passing through the rearsight-hole and the edge of the front sight cuts the corresponding trajectory of the gun at the end of the line measured by the telemeter. Accepted Nov. 3, 1900.

2,776 (1900). **Breech-loading Ordnance.** J. F. Meigs, and S. A. S. Hammer, U.S.A. In a very bulky specification the construction and working of a breech-loading gun are explained. The patentees have paid particular attention to the recoiling arrangements which automatically work the breech, and have endeavoured to turn out a gun in which the principal features are rapidity and accuracy of fire, safety to its operators, and simplicity of construction. Accepted Nov. 10, 1900.

4,253 (1900). **Loading Mechanism for Ordnance.** A. Reichwald (Agent for *Fried. Krupp, Germany*). In ordnance of the class in which the ammunition is supplied by a hoist, and rammed into the gun by a rammer, the rocking action of the cradle, or of the gun, is transmitted to a rock lever working in bearings on the carriage By means of this transmitted action the rammer is brought automatically into the loading position, and the movements of the ammunition tray are correspondingly limited. Accepted Nov. 24, 1900.

8,154 (1900). **Laying of Ordnance.** A. Torricelli, Switzerland. The combination of a pointer at the end of the trail of a field-gun carriage with a forked centreing arrangement, the object of which combination is to insure that after every shot the gun returns to its original position. The forked arrangement consists of two arms attached to the two cheeks of the trail, terminating in a fork, the two prongs of which diverge slightly from one another towards the front. When the gun is brought back to position these prongs embrace a pivot, and correct the gun centrally, while the back end of the trail is brought back exactly to its original position by means of the pointer. Accepted Nov. 17, 1900.

10,115 (1900). **Torpedo Steering** J. T. Armstrong and A. Orling, London. A method of controlling the course of torpedoes after launching, consisting of electro-mechanical means of disengaging the port or starboard propeller from the motor employed for driving purposes according to the course it is desired the torpedo shall take A pendulous weight and a hydrostatic valve govern the operation of the horizontal rudders, and by this means the depth of the torpedo beneath the surface is regulated. Accepted Nov. 10, 1900.

12,042 (1900). **Safety Device for Small-arms** C. Weiser, Bavaria. A safety device which only allows the arm to be fired when the barrel is tilted above the horizontal position. When the weapon is in any other position a lever is forced by its own weight to catch in the trigger slit, and hold the trigger against backward movement The safety is disengaged by means of a lever manipulated by hand. Accepted Nov. 24, 1900

14,920* (1900). **The Browning Automatic Gun** . J. M. Browning, U.S.A.

14,921 (1900) **Automatic Gun**. J. M. Browning, U.S.A. In this specification an automatic gun is described, containing numerous novel parts and arrangements. The gun is adapted to take a belt of cartridges and to maintain a rapid fire by the operation of recoil, as long as cartridges remain in the belt. Accepted Dec. 1, 1900..

15,578 (1900). **Shunting Apparatus for Gun Carriages**. W. Francis, Folkestone. A method of propelling gun carriages by manual labour, by means of a lever, to the end of which is attached a rope loop. The loop is adapted to pass round the axle of the wheel, and is of such a length as to allow a side lug on the lever to come, in certain positions, into contact with the flange of the wheel. When the lever is raised, the lug grips the rim, and revolves the wheel Accepted Nov. 17, 1900.

15,716 (1900). **Quick-firing Field-gun Carriages**. K. Haussner, Germany. A method of preventing the "backing" of the field-gun carriage, designed on the principle of checking the recoil by a spade, by so constructing the trail that it may be extended. When it is desired to fire the gun, the trail is extended, and thus the angle between the trail and the ground is reduced. Accepted Nov. 10, 1900.

16,277 (1900). **Explosives**. J. Führer, Vienna. A method of increasing the expansion of the gases of explosion by adding some ingredient to the explosive which will raise the temperature. Metallic aluminium is the substance to be used, and two parts of this metal added to three of ammonium yield, when ignited, a volume of 2,000 cubic centimeters for a 20-gramme charge. Accepted Nov. 10, 1900.

17,248 (1900). **Carriage and Case for Ordnance**. E. de Freystädler, Hungary. The field piece is placed in a light and flat shaped container, which is adapted to be carried either on a man's or a beast's back. The ammunition and cleaning requisites are also packed into this box, which is also adapted to form the base upon which the gun is fired. Accepted Nov. 10, 1900

18,920 (1900). **Explosive Charges.** E. Gathmann, U.S.A Explosive charges for ordnance, consisting of powder composed of nitrocellulose, or a compound of this substance, In order to obtain uniform ignition of the charge, and to prevent the tendency of the parts of the charge to burst, it is made up of a number of rods, which are multi-perforated, and have alternate V-shaped cuts on their opposite sides, each pair of these cuts reaching the whole of the perforations Accepted Nov. 24, 1900.

18,923 (1900). **Explosive Charges.** E. Gathmann, U.S.A. This patent also relates to methods of forming the high explosive powder charges for ordnance. The charge in one case is composed of rods provided with multi-longitudinal perforations and transverse cuts, each one of which reaches the whole of the perforations. In another case, spiral rods, also perforated, go to compose the charge. Accepted Nov. 24, 1900.

* This Specification is more fully described under "Selected Patents.

SELECTED PATENT.

THE BROWNING AUTOMATIC GUN.

14,920 (1900.). J. M. Browning, U.S.A. In this specification a weapon of the automatic, recoil-operated type is described, in which the parts and their arrangement are ingenious and not complicated. It is similar to other types of its class, inasmuch as the loading and extracting are operated by the impulse of recoil. The weapon will fire continuously until the magazine is exhausted, so long as the trigger is held back; but, of course, deliberate aim may be taken by releasing the trigger after every discharge. A novel catch arrangement is attached which automatically holds the breech bolt in its open position after the discharge of the last cartridge from the magazine, so that the gun is immediately ready for reloading.

Fig. 1

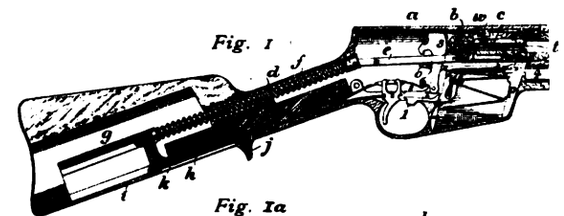


Fig. 1a

Fig 2

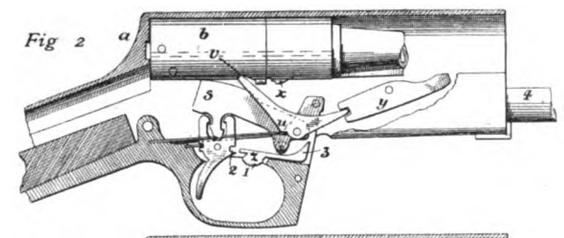
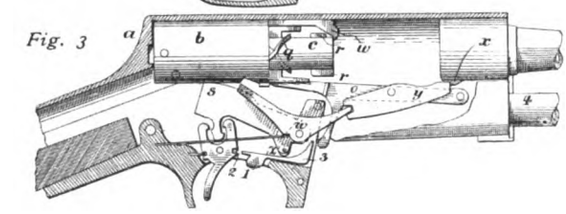


Fig. 3



Referring to Fig. 1 in the drawings above, it will be seen that the receiver *a* contains the breech mechanism, consisting principally of the breech-bolt carrier *b* and the breech-bolt *c*, which are adapted to slide, one within the other, horizontally within the receiver. The carrier *b* is connected with the rod *d*, sliding through the centre of the stock by means of the link *e*. The rod *d* is surrounded by the spiral spring *f*, which has bearings at its rear end against the end of the slide way *g*, and against the head of the rod at its forward end. This spring is adapted through the rod *d* and the link *e* to tend always to urge the breech bolt and its carrier towards the breech end of the barrel. Attached to the rod *d* at its rear end is the slide *h*, guided in the slide way *i*. On the end of the slide is a finger-piece *j* projecting through a slot *k* in the slide way *g*. It will be understood that when this slide *h* is pulled back by means of the projection *j*, the breech-bolt and the parts attached thereto will also be pulled back and forced to assume their rearmost position within the receiver.

Fig. 1a illustrates the barrel. This also is capable of a longitudinal movement within its casing *l*. The thrust of the spring *m* tends always to force the barrel to a forward position, the shoulder *n* serving as a stop.

When it is desired to load the gun, the bolt is first drawn back by hand, and in its backward position the bolt is retained by the lever *o*, which catches in front of the bolt carrier *b*. This lever *o*, it must be understood, comes only into engagement when the magazine is empty, since it is by means of the magazine slide *p* that the lever is held up. When the slide *p* is removed by the loading operation, the support of the lever is taken away, and it thus drops down out of action. When the carrier *b* is drawn backwards by hand, the breech-bolt is partly rotated within the rigid carrier *b* by means of the spiral wings *q*, which engage with corresponding spiral grooves on the inside surface of the carrier. This effects the unlocking of the bolt from the barrel, and the bolt *c* is retained in its extended position (Fig. 3) by an ingenious rock lever arrangement, one end of which enters a recess in the carrier *b*, while the other catches behind and holds the bolt from rotating back into its carrier.

Supposing now the weapon be loaded the bolt and carrier will start to move forward towards the breech end. The bolt presents the projections *r* in a line with the recesses in the end of the barrel, which enter therein. At this point the little rock lever which retains the bolt in its extended position, is put out of action by the inclined end of the recess in the bolt carrier, and the bolt carrier itself is then allowed to move forward over the bolt *c*. Thus the bolt is rotated by means of its spiral wings *q* and the projections *r* are turned into the barrel recesses, locking the two securely together.

In this position of the parts the gun is ready for firing, and if the trigger be pulled the hammer *s* is released, and the cartridge is exploded by the firing pin *t*. The recoil following the explosion forces back both the barrel and the breech mechanism, which it will be remembered, are locked together, until the rearmost position is attained. A spring-actuated catch *u* then comes into play, and retains the breech-bolt carrier against forward movement by catching into the slot *v*. The barrel, however, is impelled forward again by its spring *m*. Its forward movement drags the breech-bolt out of the carrier *b*, and during its forward movement the bolt is caused to rotate in the way described, and the connection between barrel and bolt is again broken. The barrel continues its forward movement alone, and by the time it has reached the end of its travel the spent cartridge, which is pulled from the barrel by the extractor *w*, has been ejected through an opening in the side of the receiver *a* by a little spring ejector on the face of the breech bolt. A fresh cartridge is pushed up from the magazine to take its place ready for the return of the breech-bolt to push it into the barrel. The bolt is only released when the barrel has reached the end of its return travel. Then the release is accomplished by the little projection *x* on the underside of the barrel end. This projection comes into contact at the point shown in Fig. 3 with the rack lever *y*, the rear end of which is in engagement with one arm of the catch *u*. The forward end of the lever *y* is thus depressed, and the rear end is consequently raised. This motion raises the forward arm of the lever *u*, and thus releases its other arm from engagement with the bolt carrier. The bolt and its carrier are then free to return to the forward position under the impulse of the spring *f*, taking the fresh cartridge into the barrel, and making the locking contact with the barrel in the way described. The weapon is then again ready for discharge.

The lever *z*, which is worked by the thumb-piece *t* is the safety device. It doubly locks the mechanism when pushed back towards the butt holding the trigger by the slot *2*, and the hammer through the projection *3* catching under its heel.

The forepart is bored to receive the sleeve *4*. A bolt *5* screws into the front of this sleeve, and serves to hold the parts together. When the bolt is removed, the forepart and barrel are released from the stock. Accepted December 1, 1900.

Arms & Explosives

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CONTENTS.

A NATIONAL MOURNING.

Even a journal devoted almost solely to technical matters must needs set apart some space in order to pay a tribute of respect to the memory of the noble lady who for upwards of sixty-three years held the proud position of Queen of Great Britain and Ireland, and who at the date of her lamented decease was ruler of the largest, the most powerful, and the most united Empire the world has ever seen. As woman and as monarch, Queen Victoria's influence on the diverse nationalities over which she held sway was always for good. Essentially making for peace, she never hampered the actions of her Ministers when war was just and inevitable, however her gentle heart may have sorrowed as she watched the suffering and misery entailed by this final arbitrament between nations. But there can be no doubt that, even under the limitations of the British Constituton, she at all periods exerted a strong pressure in staving off the evils of war, and succeeded in averting those evils in not a few instances. At the same time, she delighted to honour those who upheld the Throne and Empire by force of arms, and throughout her long reign was always interested to an unusual degree in the welfare of her Navy and Army at home and abroad. In the years of her wifehood especially, she took a conspicuous interest in military affairs, visiting the various stations and the temporary camps at Chobham and elsewhere, and setting the seal of her approval on the movement inaugurated by the N.R.A. at Wimbledon by firing the first shot on that historic but now discarded ground. Her interest in sport could scarcely be so great, but the manly outdoor pursuits undoubtedly had her sympathy, and it is no secret that her Highland home was chosen originally almost with entire regard for its possibilites as a shooting centre for the Prince Consort.

Though the reign now brought to a close was distinguished by many wars in various quarters of the globe, its most abiding characteristic was certainly shown in peace and the prosperity that follows. It is not saying too much to assert that the history of the world affords no such instance of a nation's advancement in the gentler arts of peace as is to be gleaned from a retrospect of the past sixty-three years. The record of scientific progress and industrial development is almost exactly coëval with the reign of our late gracious Queen, and it would be the merest folly to attempt to deny that the rapid upward movement was directly consequent on the feeling of security engendered by the beneficent sway of this noblest of monarchs. In the first moments of grief and with the sense of personal loss still poignantly borne in upon us, it is difficult to realise all that one woman, even though a Queen, can effect in the building-up of a nation and an Empire. This is no place to speak of the influence exerted by this one personality on the life of her beloved subjects. Enough that in the words of a dead master, "Her Court was pure; her life serene;" "She wrought her people lasting good." One cannot but realise the enduring fitness of the late Laureate's appreciation of his revered Queen. Hers was no absolute monarchy dependent on an iron hand, but a loving rule "broad-based upon her people's will."

CURRENT TOPICS.

Merchandise Marks Prosecution.—The Gunmakers' Association made an important seizure of fraudulently marked weapons at the premises of Messrs. J. G. Styles & Co., gun dealers, of 62, Branston Street, Birmingham. Eleven guns were seized, nine bearing fictitious names followed by the address "London," while two others were seized, out of a very large stock similarly marked, bearing the name of the firm with the added address "London." The firm has no London address, and, therefore, according to the Act, is not entitled to use that address. Mr. J. G. Styles stated that the firm did have an office in London until the year 1894, but he could not remember where that address was, and admitted that he had regularly marked guns with the word "London" following the name of his firm since that time. The case is due for hearing on the 5th inst. at Birmingham, and the summonses to be heard relate to three guns, previously purchased by the Gunmakers' Association, which bear the following fictitions and fraudulent markings:—"Cox & Co., London," "Halton & Co., London," and "Allday & Co., London." Onr next issue will contain a full report of the proceedings.

Small Arms and Explosives Committees.—The general press is at the present moment occupied with discussing the results of the deliberations of the Small Arms Committee. Vague, and at the same time sensational, are the anticipations of the new type of service rifle which it is expected will be forthcoming. At one time we hear that certain minor alterations will be made in the Lee-Enfield rifle. At another time we are told that an entirely new rifle having the most extraordinary combination of wonderful properties has been adopted to the exclusion of all other types. All this is very interesting, but it is not worth serious consideration in the complete absence of definite information of any kind whatsoever. Rifles naturally appeal more strongly to the public mind than explosives can be expected to do, so that while we hear so much about the new rifle, the Explosives Committee is allowed to conduct its experiments in peace without the aid of the irresponsible journalist, and yet it is not at all certain but that the Explosives Committee are preparing for us a much more striking surprise than the other Committee can possible put forward. Among the trade one cannot help hearing of peculiar little incidents connected with the trial of new explosives. In fact when all these trials appear to be based upon a single type of explosive substance we are entitled to suppose that the substance in question is receiving very serious attention with considerable certainty of its ultimate adoption. The explosive we refer to is a well-known German powder. The small arms pattern of this explosive which seems to be most in favour is of the cordite shape, while that for the bigger guns is in the form of hollow tubes. In other words we shall have vermicelli for our small arms, and macaroni for our ordnance. As regards the composition of the new powder, we believe that nitro-glycerine will entire disappear, or at any rate it will only be present in small quantities not likely to make much difference to the resulting decomposition. A very important little side issue, which emphasised our belief that something is likely to be done in the way of adopting this new explosive, is afforded by a recent amalgamation which did not, perhaps, receive the attention it deserved. The English agents for the powder referred to were absorbed by one of the largest and most influential firms of ordnance manufacturers in the country. Such a firm would obviously be in a better position that a simple powder company to conduct the necessary experiments and demonstrations of the new powder in connection with all classes of ordnance. Their experimental facilities and their close touch with the Government are important factors in satisfying the Committee as to the all-round excellence of the new production. The cost of such experiments and the necessity for well-equipped factories to supply the guns require a command of capital in proportion to the valuable stake involved.

THE GUNMAKERS' COMPANY.

WE print in another column an interesting correspondence between Mr. H. A. Thorn, trading as Charles Lancaster, and the Clerk of the Gunmakers' Company. We do not suggest that the correspondence itself supplies any very novel information, but, on the other hand, it throws an interesting side light on the attitude adopted by a public body having responsible duties to fulfil. The charter of the Gunmakers' Company shows that it was formed by gunmakers for the purpose of enabling London gunmakers as a whole to take suitable measures, controlled by Government supervision, for the protection of the trade against loss of reputation due to the bad work turned out by divers inexpert persons. Obviously the whole spirit of the charter, was such as to indicate that gunmakers as a body were to be the active agents in regulating the testing and proving of weapons. Some 250 years later, viz., at the present time, we find that the ruling Court of the Proof House has degenerated into a close corporation in which certain names appear with curious frequency, while others of gunmakers well known for their skill and scientific knowledge are outside the exclusive fold of self-elected and self-propagating officials.

Now, Mr. Thorn is well known throughout the trade as by far the most active in public matters of all present day gunmakers. So marked is this feature of his character that we do not fear that the making of such a bold statement will cause jealousy or ill-feeling on the part of any of his contemporaries. A marvellous memory, an immense capacity for the gripping of intricate subjects, and finally the interest which enables him to find time to do all these things, in addition to looking after a very large business, indicate him as the one man in the trade who, above all others, should be welcomed as a member of the Court of the London Proof House. He has been a Liveryman of that Company for a great many years, and in one case, at least, his precedence in this respect has been ignored by the election over his head of a later recruit. Whatever may be the cause for this peculiar procedure, and we cannot admit a reasonable or just cause of it, Mr. Thorn is at least a Liveryman of the Gunmakers' Company, and, as such, a member of it, with certain well-defined rights common to members of every organization the world over.

Mr. Thorn wrote to the Clerk of the Gunmakers' Company asking for the names of the members of the Court of the Gunmakers' Company. These were supplied in due course, and when Mr. Thorn asked for the date of election to the

Court, of one of the members the request was abruptly refused. Some six months later Mr. Thorn had occasion to write to the Clerk of the Company asking for information similar to that which had been supplied to him on the former occasion. The Clerk of the Company wrote in reply saying that he would not supply the information unless Mr. Thorn could give some good reason for requiring it. This is not a matter which affects the destinies of nations, but at the same time an extraordinary state of affairs is disclosed when we find that the Liverymen of a Company are refused information as to who are the office holders of the Company for the time being. This information is not in any sense of the word private, since all who attended the last Annual Dinner of the Company could see for themselves who were the present holders of office. Furthermore, we believe that this list of names is supplied to the publishers of one of the city directories, and yet in the face of all these facts we find that the Law Clerk of the Company feels competent to refuse such information. We cannot, therefore, accept it in any other light than as an act deliberately intended to defy Mr. Thorn in his efforts to keep in touch with the work of the Company.

A still more important matter is concerned in the request made by Mr. Thorn to inspect the minutes of the meetings of the Court in order to secure certain information he needed. Mr. Thorn's authority for making this request was based upon the report of the Livery Companies Commission. This Commission sat in the year 1880, and it was empowered to secure information on certain specified points from the various City Livery Companies. The Gunmakers' Company was asked by the Commission "whether the resolutions and decisions of the Governing Body are published or are otherwise accessible to any or all, and which of the members of the Company." The reply to this question was as follows:—"The resolutions and decisions of the Governing Body are not published, but are accessible to members of the Company." In the light of this written reply to a written question, as recorded in a Government Blue Book, the Gunmakers' Company thinks fit 20 years later to affirm by inference that its original statement was neither true in substance nor in fact.

It is perfectly clear that matters cannot remain as they now stand. If the Gunmakers' Company were only a social organization we should have little or nothing to say; but it is vested by Act of Parliament with the power to exercise very important functions needing the whole of the available knowledge that could be placed at its disposal. That the Company would find such assistance useful there are many ways of showing, but it will be more appropriate to demonstrate these points at a more suitable time and place. The War Office is vested with very important rights concerning the regulation of proof matters, and if the gun trade is refused all reasonable information, it will be necessary to appeal to the War Office, who will, no doubt, be willing, in the public interest, to insist upon receiving the information and applying the supervision, the exercise of which is refused to gunmakers.

Considerable attention has been directed to Herr Krupp's success in producing a 28-cm. quick-firing gun. It is understood that the 11-in. quick-firer is to be adopted largely in the German Navy, and that not only the new cruisers, but all battleships at present in course of construction are to be armed with the weapon.

ROUND THE TRADE.

The Gunmakers' Company have recently voted a donation of £5 to the Royal London Opthalmic Hospital.

We understand that the affairs of Mr. Charles Golden, gunmaker, of 27, North Street, Bradford, have been placed in bankruptcy.

The Union Metallic Cartridge Company has issued a very pretty wall calendar, with a youthful nimrod as the central figure.

Messrs. Eley Bros. have issued a notice to their customers that the price of felt wadding will be increased twopence per pound in consequence of the increased cost of felt.

It is reported that the War Office is considering a proposal to induce qualified gunmakers to enrol themselves more numerously than at present as volunteers by giving them the rank of armourer sergeant, after a short course of tuition.

This year the winner of the Grand Prix du Casino at Monte Carlo used E.C. powder. The competition was robbed of a great deal of interest owing to the fact that the English contingent, as well as our Australian and American friends, withdrew, as a sign of respect to Her late Majesty, Queen Victoria.

We understand that H.M. Inspectors of Explosives has called the attention of several powder and cartridge manufacturers to the practice of gunmakers and ironmongers in sending out lots of 100 cartridges in the boxes used for packing in outer cases instead of complying with the regulations laid down in the Explosives Act.

Messrs. Moore and Grey have succeeded in astonishing the gun trade by means of a striking double column advertisement in the *Daily Express* offering a rifle, suitable for club shooting, together with accessories, on *The Times* system of payment. The two first payments amount to 5s., and the rifle and accessories become the property of the purchaser when he has completed the payments amounting to one guinea.

Messrs. Wm. Bennett, Sons and Co., of Roskear Fuse Works, Camborne, have forwarded an illustrated pamphlet descriptive of their speciality, Bennett's Patent Blasting Fuse, which is largely used for firing explosive charges in mines, quarries, collieries, and in excavations generally. The makers urge one very strong claim in favour of their "Crown Brand" fuse, that during the whole history of their works not a single fatal accident has occurred when that fuse has been used. Messrs. Bennett have also forwarded us a neat office calendar, handsomely bound in red leather, which is a much appreciated addition to our desk equipment.

At Edinburgh, on December 27th, a new company, under the existing title of Nobel's Explosives Co., Ld., was registered with a capital of £1,000,000 in £10 shares, to acquire and take over the business and undertaking, and the whole of the lands, property, and assets, and goodwill and trademarks of Nobel's Explosives Co., Ld., and to carry on the same. The first directors of the new company are Sir Charles Tennant, Mr. Hugh Beckett, and Mr. Hugh Brown, the qualification being £1,000, and the directorate being limited to the above number as a minimum and seven as a maximum.

A company has been registered in London, with a capital of £185,000 in £1 shares, under the title of the Automatic Magazine Rifle, Small Arms and Ordnance Co., Ld., the object of which is to adopt an agreement with the Magazine Rifle Syndicate, Ld., and to carry on the business of magazine and other rifle manufacturers, makers of machine, automatic, electrical, pneumatic, gas impulse and other guns, torpedoes, pistols, swords, bayonets, and other arms and weapons, gunpowder, explosive, projectile, and bullet manufacturers, engineers, founders, smiths, &c.

An interesting variant of the ordinary advertisement is adopted by Messrs. Leech and Sons, the old established gunmakers of Chelmsford, in advertising in the local *Essex County Chronicle*. Side by side with the up-to-date notice of the firm's

specialities for January 4th, 1901, is a *facsimile* of an advertisement appearing in the same county paper on October 2nd, 1795, to the effect that "Leech, Gunmaker, from London, having taken a Shop in Duke Street, near the White Lion, Chelmsford, respectfully acquaints the Gentlemen, &c., of Chelmsford and its vicinity, and the public in general, that he makes and repairs guns, gun-locks, pistols, &c., &c., in the neatest manner on the most reasonable terms, and at the shortest notice." There are not very many firms in the trade, still in existence, whose business dates back to the eighteenth century.

A case of considerable interest to the trade has recently been heard in Belfast, arising out of an action for damages for breach of warranty. The plaintiff was a working shoemaker, the possessor of a muzzle-loading gun, and the defendants Messrs. Hunter and Son, who sold him a ½-lb. tin of smokeless powder. On firing his second shot with this gun and the smokeless powder, the gun burst and injured the plaintiff's hand. The question at issue was as to whether there was a warranty implied in the sale of the powder, and the evidence of the two parties showed some divergence as to the conditions under which the powder was purchased. The plaintiff said that he was asked whether he wanted smokeless powder, and on replying that he had never used it the salesman showed him how to load his gun with it. Relying on the statements of the salesman, he purchased and used the powder, with the result already stated. For the defendants, it was urged that the plaintiff himself asked for smokeless powder, and was supplied with a tin having on it full printed instructions. It was also said that plaintiff at the same time purchased a quantity of breech-loading wads, the contention being that the powder was sold under the impression that it was to be used in a breech-loader. The defendants applied that the case should be remitted to the Recorder of Belfast. Mr. Justice Johnson made no rule on the motion, which was resisted, and made plaintiff's costs to be costs in the cause.

NOTES.

MESSRS. ELEY BROS., LD.—We have received the report and balance sheet of this Company, which discloses a net profit of £37,733, which, added to the balance brought forward, viz., £16,966, makes a total of £54,699. In addition to the intrim dividend of £12,500 already paid, a further dividend of £25,000 is now declared, making in all 30s. dividend for the year on each £10 share. The report contains a passage recording the regret of the Board concerning the series of accidents which have occurred in the year under review. The sum of £2,458 has been paid as compensation to the relatives of the victims of the accidents, and this sum has been met in part by a withdrawal from the reserve fund, and, as to the remainder, it has been taken from the year's profts.

NEW EXPLOSIVES CO., LD.—The report and balance sheet of this Company has been issued, the profit for the year being £20,736 which, with the amount brought forward, brings the total available for distribution to £27,741. The directors recommend that £7,017 10s. should be devoted to the payment of a 7½ per cent. dividend, the balance to be appropriated as follows:—Depreciation against property purchase account, £8,519; reserve for extensions to property, plant and buildings, £4,000; and carry forward £8,134. The Company has during 1900 spent in repairs and renewals to plant and machinery, &c., £3,243, debited to profit and loss account, against £1,892 in the previous year, and in the new buildings and plant £7,436, as against £2,804 in 1899. The sum of £354 spent in patent purchase and continuing experiments, of which £201 was brought forward from last year as an asset, has been entirely written off. There has been considerable delay, which the directors could not anticipate, in completing the new patent moulding and pressing plant, owing to the special character of the machinery which had to be designed, and the difficulty in the engineering trade of getting delivery. The directors point out that in the interests of the Company it would not be wise to declare a larger dividend, since the various appropriations leave the amount carried forward at a sum which the Board do not consider by any means more than sufficient to meet the requirements of the Company's increasing business.

LARGE ORDER FOR MILITARY RIFLES.—The Birmingham Small Arms Company has received an order from the British Government for 15,000 rifles of the Lee-Enfield pattern, which are to be turned out with the greatest expedition. Last year the B. S. A. Compay produced 40,000 rifles for the Government, and during the running of the contract was turning them out at the rate of 1,500 per week. This supplementary order should be a welcome fill-up to the activity of the Small Heath factory, besides giving an impetus to the military branch of the local gun trade.

NEW GERMAN RIFLE.—The new military rifle, with which the German army is to be equipped as speedily as possible, is said to be the last word in modern science. It is sighted up to 2,050 metres, or about 2,250 yards. The rifle itself is only 4-ft. 1-in. long, but it is fitted with a 26-in. bayonet, giving a total length of 5-ft. 10-ins., which is an 8-in. longer reach than that of the British service arm. The weight of the rifle is just over 9 lbs., and of rifle and bayonet together, 9 lbs. 15½ oz., which constitute it a lighter weapon than the Lee-Enfield.

FINE OF THE MASTER OF A GUNPOWDER VESSEL.—William Tiffin, the master of the ketch *Energy*, was summoned for illegally keeping gunpowder in an unauthorised place at St. Osyth. He put into St. Osyth Creek on December 21st through stress of weather, having on board at the time 15 tons of dynamite and 18 tons of gunpowder. The vessel dragged her anchor, and was at one time within a quarter of a mile of Brighlingsea and a fleet of yachts valued at about £135,000, and within 600 yards of the gasworks. In spite of expert evidence by seafaring men in favour of the defendant, a mitigated penalty of £5 with costs was inflicted, it being the opinion of the Bench that the Creek was not an authorised place within the meaning of the Act. A case was stated for appeal.

NEW SPORTING REGULATIONS IN INDIA.—Considerable discontent is felt in military circles in India by the new regulations just issued in respect to shooting parties and sporting guns and ammunition. Soldiers may only go out in parties of three, and must be accompanied by a native interpreter; they may not enter a village or speak to a native woman, and they must not separate while shooting. Presumably, this regulation refers only to the rank and file. But there is a general rule, No. 16, which provides that "no rifle or carbine shall be used which carries Government ammunition, or is under ·450 bore, or is sighted over 150 yards."

This drastic prohibition will have the effect of rendering illegal a large number of sporting rifles, and will seriously restrict sport throughout the peninsular. It is well known that Tommy Atkins, as a sportsman, is a somewhat indiscriminate shooter, with a special partiality for monkeys and peacocks, but the above-mentioned regulation seems to be unduly severe all the same.

WAR RELICS FOR THE GLASGOW EXHIBITION.—Lord Roberts has informed the Lord Provost of Glasgow that he will send to the forthcoming International Exhibition, to be held in that city, the "Long Tom" which was captured from the Boers at Hector Spruit, together with 240 Mauser rifles and a few others of different patterns.

SUPERINTENDENT OF ROYAL ARMS FACTORY.—The Secretary of State for War has decided to retain the services of Col. H. S. S. Watkin, C.B., as superintendent of the Royal Arms Factory, Enfield Lock, after his retirement on pension. Col. Watkin has devoted so much attention to the improvement of small-arms, more especially in view of the requirements brought to light during the operations in South Africa, that the country at large is to be congratulated on the fact that the authorities will continue to receive the benefit of his advice and experience.

RIFLE *VERSUS* CARBINE.—Referring to the mention made last month of the fact that the recent cavalry reinforcements for South Africa were provided with rifles in place of the customary carbine, it is now understood that, many months ago, Colonel Welby urged this change. He pointed out that the cavalry all through the war had been placed at a disadvantage by the imperfect sighting and short range of their carbines as compared with the rifles used by the Boers, and insisted that they should be re-armed with a weapon of full range and accuracy, even though the change meant carrying the infantry rifle in place of the carbine. It seems that the War Office took six months to consider the advisability of making the experiment proposed by the gallant officer.

BAVARIA AND PRUSSIAN PROGRESS.—The Bavarian Government has refused to adopt the latest repeating-rifle and machine gun introduced into the Prussian Army on the ground that they differ only in minor details from the existing arms used in Bavaria. On the other hand, Prussia is very strong on the question of uniformity throughout the German Army, especially as it involves the matter of ammunition, and has consequently offered credit terms, which, however, the Bavarian Diet still refuses to consider. There is apparently a decided deadlock for the present.

ARMAMENTS FOR THE BOERS.—Remembering Lord Salisbury's now historic complaint that the weapons with which the Boer forces have inflicted such losses on our troops were smuggled through to their destination under the unassuming guise of boilers, locomotives, and pianos, it is somewhat conflicting to learn that during the one year, 1897, no fewer than 147,000 Mauser rifles were openly passed through the Customs *via* Delagoa Bay, that the big Creusôt guns were sent along on open trucks, and that Mauser cartridges were consigned up country forty truck loads at a time. As a matter of fact, it was well known to any persons interested in possessing the information that large orders were in progress both before and after the Jamieson raid at the leading Continental small-arms and ordnance factories, the destination of which could scarcely be concealed, even had there been any intentions of so doing. Probably a search in the musty pigeonholes of the Foreign Office might even now unearth the documents containing these interesting details, which seem never to have come within the purview of the Prime Minister and Secretary of State for Foreign Affairs. It is also well to remember that these 147,000 rifles were supplied to the Transvaal, with a roll of burghers capable of bearing arms of barely 30,000 men, a fact which of itself ought to have awakened some curiosity on the part of the Government as to the intentions of a populace which required five Mausers per head of the able-bodied males.

CONDITION OF ARKLOW HARBOUR.—Owing to the recent strong southerly gales, sand has been silted up on the bar at the entrance to Arklow Harbour to an extent that seriously interferes with the trade of the town, there being at present a depth of no more than eight feet of water. As an instance of the inconvenience caused by this shifting of sand, the business of Messrs. Kynoch's Cordite works has been hampered by the fact that one of their steamers, the *Marie*, laden with nitrate of soda, has been unable to enter the port, and was obliged to discharge her cargo at Wicklow, whence it was conveyed by rail to its destination. The Company's other steamer, the *Anglesea*, was also unable to enter the port until some portion of her cargo had been transhipped into lighters, and other vessels were equally debarred from arriving alongside their discharging berths.

SWEDISH ORDNANCE FACTORY.—According to advices from Stockholm, the well-known Finspang Gun Foundry, which is the largest of its kind in the peninsular, has been bought by an English company. The capital of the new company is about £110,000, and the immediate result of the change of hands is that the plant for casting big guns is being considerably increased. It is noteworthy, in this connection, that the British Government has recently placed large orders for powder, with immediate delivery, in Sweden, the quality of the powder being quite satisfactory.

EXPLOSION IN A TUNNEL.—On the 11th ult. a serious accident occurred in the Holywell-Halkin tunnel, now in course of construction from Bagillt, near the River Dee, to the Milwr Mines, near Halkin. Six men were engaged in placing a charge of gelatine in the face of the rock to be excavated, when the charge suddenly exploded. They were all grouped together at the time, and consequently received frightful injuries, one man in particular incurring a fractured skull in addition to severe damage to his legs and arms.

EXPLOSION AT A COLLIERY.—An explosion of gelatine took place in a cabin on the bank of the Mynydd Bach Colliery, on the 5th ult., whereby two men were very seriously burnt and mutilated, and two others received slight injuries. The former were blown ten yards away through the walls of the cabin, some parts of the building itself being hurled to a distance of sixty yards.

REVIEWS.

Mémorial des Poudres et Saltpêtres. Tome X. Gauthier-Villars, Paris, 1899-1900.

The latest volume of this well-known official publication of the French Government Explosives Monopoly Department is well up to previous issues in regard to the valuable contributions on scientific explosive matters. The opening article is by M. M. Vieille, and is entitled "Etude sur le Role des Discontinuités dans les Phénomènes de Propagation." Another article of M. M. Berthelot dealing with the explosion of Chlorate of Potash, while only covering a few pages, is likely to be found of interest by those making a study of this interesting chemical substance, which has defied the efforts of so many scientists desirous of turning its richness in oxygen to practical account in connection with explosives. The remainder of the volume is occupied by official reports of the sittings of the Explosives Committee, and accounts of various other official matters, which have been dealt with during the period under review.

Kings of the Rod, Rifle and Gun, by "Thormanby." Hutchinson & Co., 2 Vols., 24s. net.

IN these handsome volumes "Thormanby" gives us biographical and critical notices of the lives and labours of some two dozen "Kings" of Rod, Rifle and Gun. As the author of "Kings of the Hunting Field" and "Kings of the Turf," "Thormanby" was well qualified to produce the companion publication entitled as above, and he has done his work well. The volumes are something more than a mere compilation of other publications, for they contain much original matter supplied from the author's personal knowledge, and also independent critical judgments on the life and standing of each "King" thought deserving of a place on the list.

We have read the book with all the more interest from the fact that it contains a carefully written life of Joe Manton, as the "King of Gunmakers," a title which was conferred upon him by his friend and patron the famous Colonel Hawker, one which we suppose no one at this interval is disposed to challenge. In his time there can be no doubt that Manton stood out pre-eminently above all his rivals, charging what he pleased for his guns, without one or more of which no sportsman in the early part of the past century thought himself properly equipped.

We are told that Joe Manton's first patent is dated April, 1792. He was then established at 25, Davies Street, Berkeley Square, where he remained until 1825, when he removed to 11, Hanover Square. At the same time his brother John, whom many good judges considered little if at all inferior to Joseph, carried on business at No. 6, Dover Street, Piccadilly, with success for many years after Joseph's death. Notwithstanding his fame as a maker, Joe Manton failed to make his business pay, and in January, 1826, he was gazetted a bankrupt, a misfortune in those days a much more serious misfortune than it is now. Joe Manton never recovered from this blow. His workmen rallied round him to the last, and after many changes he was established in business at No. 6, Hollis Street at his death on 29 June, 1835. His two sons carried on his business for five years after his death, and it was then purchased by the well-known makers, Charles and Henry Egg.

Various extracts from Colonel Hawker's work are given by "Thormanby," descriptive of the life and times of Joe Manton. Colonel Hawker was an enthusiastic admirer, as we all know of Joe Manton's. He declared that any one who looked with a magnifying glass at the work in every part of Joe Manton's guns would discover as much difference between it and those of most other makers as there is "between one "one of our best new town-built Coaches and that Gothic "vehicle, which among our moderns is *yclept* a Jarvey."

The number of patents taken out by Joe Manton, writes "Thormanby," was very large; and in connection with one or two of them he was very shabbily treated by the War Office of the day, which offered him £500 for one of his inventions that had nearly cost him that sum in testing and perfecting. The War Office apparently has always made a point of treating British inventors of fire-arms at arms length. If not the inventor of double-barrelled shot-guns, Joe Manton claimed, and, we believe, with some foundation, to have been the first to have made double-barrels popular with sportsmen, who, before his day, generally preferred single barrels. "Thormanby hazards the opinion in this connection that we are again coming back to the single-barrel in the magazine shot-gun. In that, however, we think the author goes rather too far in stating that we are coming to a magazine gun of "a rapidity and accuracy of fire far in advance of anything "the annals of shooting have hitherto recorded." So far, the magazine shot-gun of American invention, however, well adapted for sport in the United States, has not found favour with game shooters in this country, either for rapidity or accuracy.

"Thormanby" tells one or two stories of Joe Manton, as well as some of his rivals at the time in the gun trade, that we have not hitherto seen in print. Among others he has a good deal to say about Westley Richard's well-known London manager, "Uncle Bishop," or "The Bishop of Bond Street," as he was often called. The prize ring he tells us was Bishop's pet hobby, and "pugilism had no more liberal and ardent patron than this jovial gunmaker" . . . And he had his reward. For it soon became "an acknowledged fact that "the best man in London to supply a good gun at a few "hours' notice was Bishop, and in this way the guns of West-"ley Richards found their way into the hands of some of the "most aristocratic sportsmen in the West End. I do not know "when Bishop died, but I think he lived to see the ignominious "death of the prize rings, and a change in London life that "that must have saddened his jolly spirit. It was a pecu-"liarity of Bishop that he always wore an apron in his shop, "and was never seen without it on his own premises. . . . "The hat with its sporting cock was the symbol of his inde-"pendence as the apron was of his business. He always "wore both in the shop to let the world know that a trades-"man could be civil without being servile."

EXPLOSION AT BLACKBECK.—The report of Captain A. P. H. Desborough, H.M. Inspector, with regard to the explosion which destroyed the corning house at Messrs. F. C. Dickson and Co.'s gunpowder factory at Blackbeck, Haverthwaite, Lancashire, on the 27th of August last, and fatally injured four men, has just been published. The most probable explanation is that the fatality arose from introduction of grit or other substances into the powder, prior to the process of granulating.

LECTURES TO YOUNG GUNMAKERS.

X.

PRESSURES.

WRITTEN WITH THE COLLABORATION OF F. W. JONES.

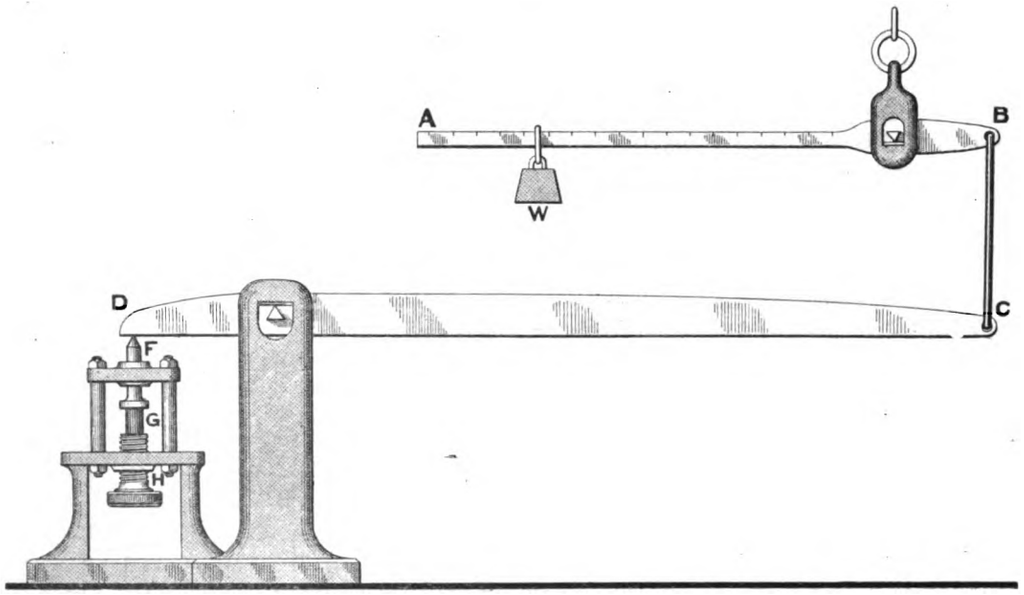


FIG 7.--MACHINE FOR TESTING CRUSHERS

IN the most general way the determination of the deformation of crushers, when submitted to forces of compression, is obtained by some such testing machine as is diagramatically shown in Fig. 7. It consists of one or more levers, so arranged that the actual force imposed on the crusher is much greater than the weight applied, owing to the multiplying arrangement of the levers. The actual construction would hardly ever conform to this diagram in all details since we have disposed the parts to show the principle and mode of action rather than to demonstrate a satisfactory mechanical device. The weight is applied on the lever A B, a kind of steel-yard, and this acts on the other lever C.D., which, in its turn presses the plunger or piston F. In this way the force acting on the piston may be any amount desired. The screwed anvil H is adopted in order to accommodate the machine for any size of crusher, and to adjust the whole arrangement so that the levers are horizontal when the final compression of the crusher is attained.

The weight being properly fixed, and the end A of the top lever temporarily supported, the anvil H is screwed up so that the crusher, piston, and bottom lever are just touching. The machine is then ready, and the weight may be applied. The manner of applying the weight can be indefinitely varied according to the method adopted for removing the support at A. By very gradually lowering the support at A, the weight is allowed to act slowly until the crusher supports the same. It may then be left on for a definite number of seconds This is the usual *statical* dead weight method of arriving at crusher tables. On the other hand, the support at A might be a rod which could be forcibly knocked away or withdrawn, the load or the lever A B thus being allowed to act on the crusher all at once. In this way we should obtain crushing for a live load, in other words the *maximum dynamical* application of the load. Again, the support at A might be connected with a cam on a horizontal shaft, and by the shape of this cam and the rate of revolution of the shaft the load might be applied with any degree of suddenness of application and removal. The compression resulting in such a case would be intermediate between the statical and the dynamical application, depending on the amount of liveliness of the load. This latter method is very popular with experimentalists, because it is believed that by some such method the nature of the application of the pressure in a gun can be obtained. We need hardly point out the futility of this; and, moreover, its practical utility is destroyed because each expert adopts a different rate of application and removal.

It has frequently been proposed, and attempts have often been made, to obtain crusher tables by means of dropping bodies. Weights of various masses are allowed to fall on a piston or plunger from various heights, the impact on the piston compressing a crusher placed on an anvil under the piston. We have pointed out that this is deviating from the conditions of a crusher gauge, where, in no instance, does the piston act with initial velocity, and nothing can be gained by using such a method. Furthermore it must be remembered that, in crusher gauges, the pressure of the powder gases acts with increasing force, the maximum possible rate of applying this force occurring under the theoretical conditions when the whole force is applied instantaneously. In the case of a falling weight a comparatively large force acts at the initial stage, and this is gradually decreased as the compression proceeds. If for any reason the method of applying the load

affects the behaviour of the crusher under compression, then the dropping weight system not only possesses no merits, but its results must be erroneous.

The evaluation of the resistance from the compression of crushers by falling weights is obtained from the principle of work as follows:—

If H and W are the height and weight respectively of the falling body, and if C is the distance that the crusher is shortened or compressed, it follows that;—

The work represented by the fall of the weight = W × (H + C) and the work done in overcoming the resistance of crusher = R × C where R is the average resistance over the total length of compression C.

It will be quite clear why the amount of compression has been added to the height of the fall of the weight, since the weight does not come to rest till it has reached the lowest point represented by the distance to which the upper face of the crusher is compressed. The ordinary expression for energy is weight multipled by height fallen, and the latter element is represented by the fall up to the point of coming into contact with the crusher, added to the subsequent fall allowed by the giving way of the crusher.

Obviously the whole of the energy of the falling weight has been absorbed by the crusher. Ignoring the internal molecular vibrations set up in the crusher as negligible in quantity, we may assume that the amount of shortening is a direct measure of the energy absorbed, provided we can procure the value of the resistance set up during the process of compression. For the sake of simplicity R has been made to represent the average resistance over the total compression. In the same way, therefore, that energy is represented by the fall of mass over distance, so conversely is it absorbed by resistance over distance.

Because the principle of work, *i.e.* foot-lbs., is involved in the dropping weight system, it has been proposed to read pressures in foot-lbs. This is rather absurd, and if the reasoning used were not so seductive we would not trouble our readers to point out the fallacy.

In our expressions above both the terms W × (H + C) and R × C are in foot-lbs., and, moreover, if a crusher in a pressure gauge is compressed an amount C, and R is the average resistance, the amount of work done on the crusher is R × C foot-lbs., and equal to our W × (H + C). Thus it may look as if pressure in firearms might be expressed in foot-lbs. Suppose, however, we previously compress our crusher to near the compression C, and then use it for determining the pressure in our gun, the work done on the crusher would be practically nothing, and our measure of pressure nearly evavescent.

While R is the average resistance over the compression C, the value of R is taken for the compression $\frac{C}{2}$, and this is obviously only correct when the resistance is directly proportional to compression. Assuming this is so, then by varying W and H, corresponding values of R and C are obtained, and from these a table relating compression to resistance is easily obtained.

Under such conditions the whole of the energy represented by the preliminary reducing of the crusher would occur beforehand, and could not, therefore, be taken into account. Replying to the argument that it could be taken into account, we would point out that the compression of a crusher to a point representing a fraction less than the expected pressure in the gun is the equivalent to using a crusher with an initial resistance nearly equal to the pressure of the powder gases, and in such circumstances the energy absorbed is infinitissimal, it follows that the number of foot-lbs. represented by the shortening of the crusher is no measure of the pressure of the powder gases. The reason for this is clear, since the space passed over from the commencement of crushing to the conclusion of the process is dependent on the initial resistance as well as the rate of the increase of resistance. Thus we may safely affirm and if necessary prove, that with every different size of piston and with every crusher of different area of cross section or different time resistance curve, one and the same charge of powder producing identical pressure would give a different measure in foot-lbs.

In a testing machine constructed on the principles shown in the diagram, Fig. 7, at the head of this lecture, we have made tests with Eley's lead crushers issued to the trade during the summer of 1900, and obtained two series of crushings. One was *statical*, the top lever being lowered and allowed to act slowly on the crusher, and left on for 30 seconds,

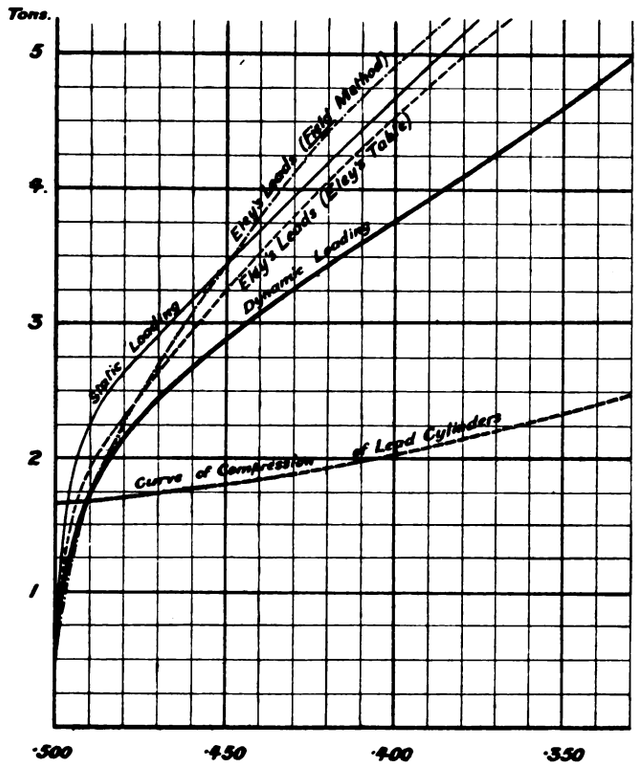


FIG. 8.—CURVES SHOWING REMAINING LENGTHS FOR ELEY'S LEAD CRUSHERS WITH STATIC AND DYNAMIC LOADING, ALSO VALUES GIVEN IN ELEY AND FIELD TABLES FOR SAME.

the whole operation occupying 60 seconds. The compressions were regular, and conformed to an even curve. The second series, were obtained by quickly withdrawing a rod supporting the top lever, the weight having been previously placed in position and the anvil screwed up so that the crusher and its piston were in contact with the bottom lever. By this method we obtained crushings due to a *maximum dynamical loading*, and these were also regular and lay on an even curve. In Fig. 8 these two series of crushings are shown by means of curves.

and in our next lecture we shall refer to the two others plotted out from tables, well known by the trade, with a view to examining the causes of their divergence.

In a similar manner we have obtained the two curves in Fig. 9, representing the two limit loadings for small copper crushers. The compressions of these are much smaller than those of Eley's leads, and we have had to make the scale for compression five times that in Fig. 8. This should be noted.

COPPER CRUSHERS.

If the statical curve for our copper crushers is examined, it will be seen that it is practically a straight line after the first one or two thousandth of decrement. A definite load is required to produce any permanent deformation, and after this point is

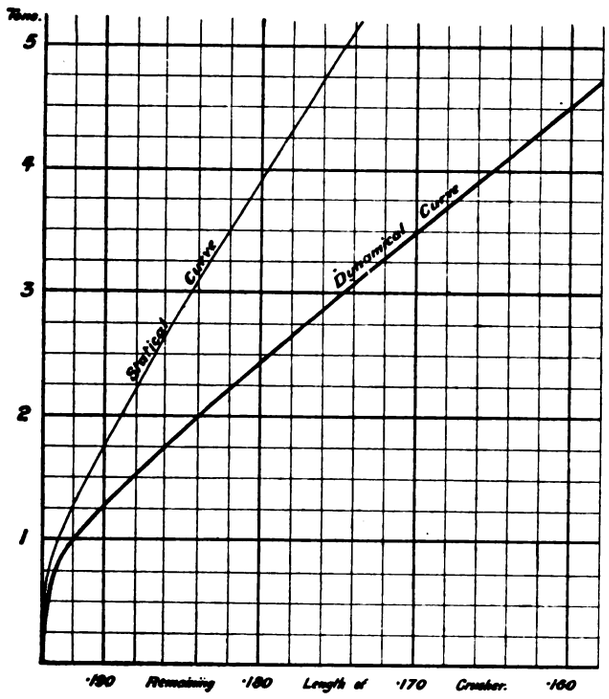


FIG. 9.—CURVES SHOWING REMAINING LENGTHS WITH COPPER CRUSHERS WITH STATIC AND DYNAMIC LOADING.

reached the deformation is directly proportional to the additional load. It is exactly equivalent to fixing the spring of a spring balance so that the index could not move to less than 5 lbs. Then for weights less than and up to 5 lbs. our balance would not indicate, but for weights beyond this limit the index would move in direct proportion to the weight applied. We can express this algebraically as follows:—

Let W equal the load applied to a copper crusher, then

$$W = M + K \times C \qquad (1)$$

Where M is a constant weight and K is the load producing unit decrement.

The principle of this formula is very easily understood. It means that if we put a certain load on a copper crusher, and allow the crusher to complete its compression, the load is represented on the crusher by two factors. First, by the amount of the load that the copper will sustain without deformation, and, second, by the number of times that the weight producing one unit of compression will go into the surplus of the load over and above the amount that does not produce deformation. In other words we multiply the number of thousandths of an inch of compression by the number of pounds that produce one thousandth of shortening. We thus determine what is the effect of the residue of the load, and by adding this residue to the force that produces no compression, we account for the whole load.

For our small crushers we can put this into figures, and our readers can verify the same if they bear in mind that the piston of the gauge considered has an area of ·040 of a square inch. We have then

$$W = \cdot 86 + 16\cdot 4 \times C.$$

W being expressed in lbs. and C in thousandths of an inch.

A load put on all at once gave exactly double the compression of the statical loading, as is shown by the curves, and this is exactly what should follow if our arguments in the previous lecture were correct.

For this reason the curves shown in Fig. 9 merit careful study. It will be noticed that in every part of the two curves the horizontal distance between them is equal to that separating the statical curve from the side of the diagram. These curves are the result of actual experiment, and they consequently demonstrate that in copper at least there is a definite relation between the compressions produced by the two different methods, which is the same for all stages of the process. Fig. 8, on the other hand, shows that if any such relation exists with lead, it is for more complex, and, at any rate, of a kind that would be difficult to apply in practice.

It follows, from what has already been said, the algebraical expression for dynamical loading is:

$$W = M + K \times \frac{C}{2} \qquad 2).$$

That is to say, if the pressure in our proof gun is put on dynamically or all at once, the compression should be divided by two, in order to arrive at the correct pressure from a table of values obtained by the statical method.

Vieille and Sarrau have investigated the compression of copper crushers in a most thorough and exhaustive manner. Their results are recorded in the volumes of the *Mémorial des Poudres et Saltpêtres*, to which all our readers interested are referred. These experimentalists proved by mathematical analysis that when a copper crusher is acted upon by a constant force, such as when a load is applied at once, the time of compression t of the copper is given by the relation:

$$t = \pi \sqrt{\frac{m}{K}} \qquad (3)$$

Where K is the coefficient in our Formula No. (1), m is the mass of the piston acting on the crusher, and π, the well-known relation between the circumference and radius of a circle, = 3·1416. As m is in grains and compression in thousandths of an inch gravity should be taken at 32·2 + 12 × 1000, and the weight of piston divided by 7000.

It should be observed that the time of compression is independent of the load applied, and for our little coppers, with a piston of 165 grains weight, its value is ·00019 of a second.

The resistance of copper increases very rapidly with its compression. This increase consists of two terms, one due to increasing area of the crusher, and the other due to increasing hardness of the metal itself. Copper takes on a hardness termed "hammer hardness" when submitted to forces such as hammering, wire drawing, &c., and it is this quality of copper which becomes evident during compression. The curious part of the matter is that the sum of these two terms is

nearly constant during the compression of copper between wide limits, and it is this property which makes copper the metal *par excellence* for crushers. In the early stages of compression the increasing hardness is the main source of increased resistance, but later the influence of the increasing area is paramount. On account of this play of compensation of these two terms, our coefficient K remains nearly constant

rate at which lead flows, and, unfortunately, this is not constant. Fig. 10 shows the compression of two Eley lead crushers, issued in different years.

An examination of these curves shows that one crusher has a much more rapid flow than the other. The small lower curve shows that a load equivalent to 2·35 tons gives the following compression when duration of application varies.

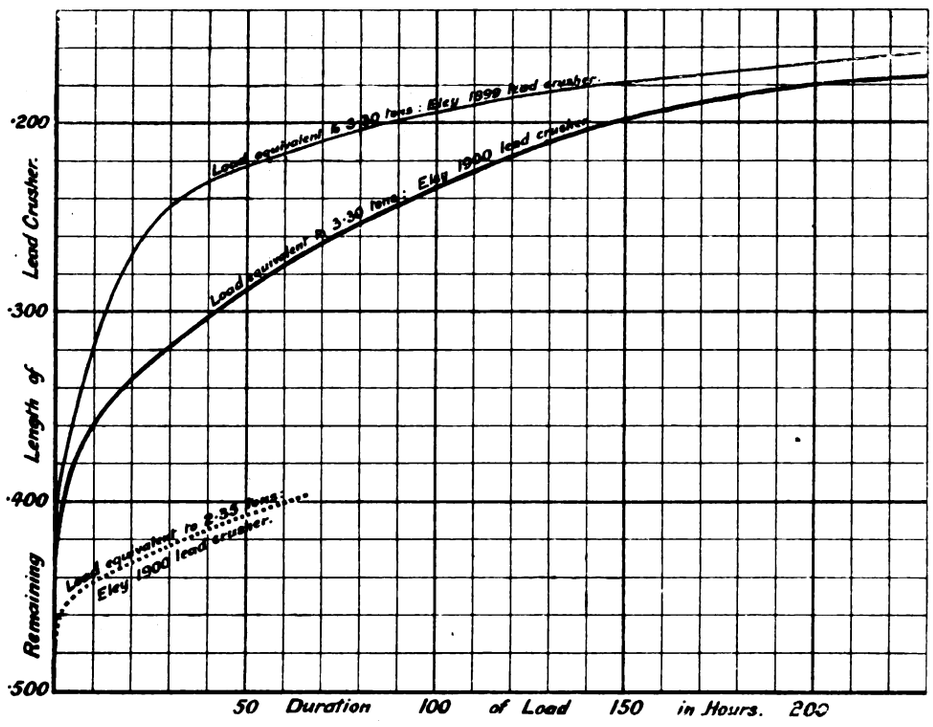


FIG. 10.—ELEY'S LEAD CRUSHERS UNDER LOADS OF LONG DURATION.

from the commencement of compression up to the point where the load applied is equal to the pressure of fluidity of copper, viz.: 22 tons per square inch cross section, a point hardly ever approached in copper crusher tables.

LEAD CRUSHERS.

Lead crushers are not easily dealt with, hence our reason for dealing with copper crushers first. A glance at the statical and dynamical curves of Fig. 8 will show, as has already been remarked, that no simple relation can be expressed between these two limit methods of loading, and this is because in lead we have so many variable elements.

Lead is very much more plastic than copper, and like it has a pressure point at which the metal flows. For copper this is 22 tons per square inch, and for lead about three-quarters of a ton per square inch. Translated into simple terms the presence of fluidity means that in the case of lead, a cylinder of one inch cross-section will support a dead load of three-fourths of a ton; but if a cylinder having a cross section of less than one-inch is loaded with three-quarters of a ton, the cylinder will decrease in height until the area of cross section becomes one square inch. In Fig. 8 we have plotted out a curve to show what this means for Eley's lead crushers, and our experiments show that Eley's 1900 crushers have a pressure of fluidity of one ton per square inch cross section for 12 hours' duration of load, and for longer duration this is even less than three-quarters of a ton. There is also a

Load.	Duration of Load.		Compression. Remaining Length.	Pressure by Eley's Table.
Tons	Hrs	Mins.	Inch.	Tons.
2·35	..	1	·487	2·07
..	..	30	·473	2·56
..	1	..	·457	3·06
..	19	..	·435	3·67
..	26	..	·425	3·92
..	44	..	·415	4·17
..	50	..	·407	4·37
	67	..	·399	4·54

From these data we can separate the elements of the resistance of lead crushers into at least the following terms:—

I. Load up to elastic limit, and not producing permanent deformation.

II. An increase of resistance as compression goes on up to the pressure of fluidity.

III. For loads above the pressure of fluidity there is an element depending on duration. In other words the resulting compression due to all loads over the flowing limit is dependent upon the time that the load remains imposed. A glance at Fig. 8 will show that this element is present for all pressures above 1·65 tons.

It is in consequence of this duration element in the compression of lead crushers that dropped weights do not give

uniform results. Thus a series of compressions given by a 1 lb. weight dropped from various heights do not agree with a 5 lb. weight dropped from one-fifth the same height. This is because the 1 lb. weight would strike at a different velocity to the 5 lb. weight, and as velocity has an influence on the time of compression, the anomaly is explained.

The above objections to lead crushers have caused us to seek for a metal more ductile than copper, and yet not possessing the faults observed in lead. Tin, as may be found on examination of the results given in Prof. Thurston's works, appears the most likely substitute. Our experiments, however, have shown that it possesses no advantages over lead, having an early flowing point, and just as bad a duration element. We must therefore take lead as we find it, and do our best to get intelligent pressure information, and to use copper wherever possible.

There are two other methods of arriving at Pressure tables which we will briefly describe.

CRUSHER TESTING MACHINES.

One recently devised by the *Field*, which consists in using a cartridge itself to determine the load corresponding to the compression produced. In the particular apparatus used by the *Field* a shot gun proof barrel had two pistons piercing the chamber at one inch from the breech face, a horizontal one used for a lead crusher and a vertical one connected with a loaded spring. The arrangement is shown in Fig. 11, the idea being that the load W on the spring S caused a force to act on the piston P equal to the weight of the hopper, and this was undoubtedly correct. Black powder cartridges were then fixed in the gun, and the weight in the pan W was adjusted until the cartridges caused a movement of the piston P equal to one-fortieth of an inch, as registered by the markings of the needle N on the surface of the smoked block B. It was assumed that the force which would produce this movement was practically equal to the downward pressure on the piston, and that the amount of crushing obtained on the lead crusher simultaneously subjected to the same cartridge could be translated into pressure by the known value of the load in the pan. The advantage claimed for this device was that the load was applied and removed identically as powder does it.

A little reflection will show that there is no merit in this appliance over and above any other method in which there is a fixed dynamical method of loading. This is clear, because what might apply to the particular cartridges used would hardly ever hold good for other cartridges, more especially if loaded with different kinds of explosives. In fact there seems to be no just cause for assigning any particular merits to this contrivance, from the point of view of constructing by its help accurate pressure tables. There are, however, two obvious sources of error which nullify the claims of utility for the purpose for which it was devised.

The sources of error which condemn this appliance are:—The compression of the spring is proportional to the load applied, and a small compression is allowed to indicate that the load applied is in equilibrium, the actual pressure of the powder would for this reason be greater than the force exerted by the weight in the pan. A more important error, and of an opposite nature, consists in assuming that a suddenly applied force will not compress a loaded spring unless it exceeds the load on the spring. There is, good reason to suppose that the spring is compressed by a powder pressure much less than the equivalent of the weight in the pan. The errors are of opposite character, the first would be comparatively large for light loads, but might be ignored for heavy loads. We shall for these reasons expect that tables constructed by this method would give too low a pressure for small compression of the lead crusher, and too high a pressure for large compressions. In our next lecture we shall show that as a matter of fact this is so.

The other method of arriving at and testing the accuracy of crusher tables is known as the method of "multiple crusher," and consists in allowing the piston of a pressure gauge to act on two or more crushers, and comparing the resulting compressions with those obtained with one crusher. There are two ways of applying this method. If cartridges are

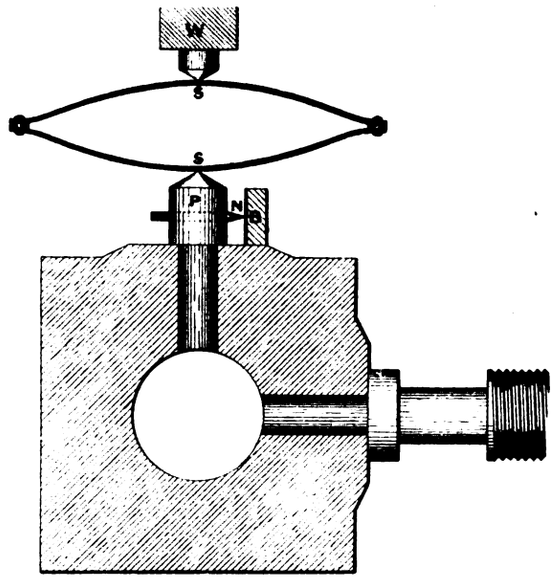


FIG. 11.—APPARATUS FOR CALIBRATING CRUSHERS.

used which give very regular and reliable compressions, it is sufficient to take a series in the ordinary way with one crusher, and afterwards a similar series with two or more crushers, placed side by side on the piston head. If the regularity of the cartridges cannot be relied upon, the piston is mounted with two or more crushers, and on the top a plate. On the plate covering the crushers a single crusher is placed, and the adjusting screw brought home on to this. On firing, we thus obtain by one shot a relation between the compression of one and several crushers by the same definite load as put on by an explosive. In each case the crushers in multiple, being in parallel or side by side, the force acting on the piston is resisted by several crushers, and therefore the sum of these resistances, as shown by the compression, should be equal to the resistance as shown by the use of one crusher. Thus, if the cartridges give an average pressure of 3½-tons, and if the table used is accurate the sum of the individual pressures of the multiple crushers should show the same total. This method gives undeniable proof of the accuracy or conformity of any crusher table, although it cannot be used to make new tables.

We have used this method for testing the various pressure tables proposed, and the results obtained are both interesting and instructive. In our next lecture we shall give some of these results, and analyse their united teachings.

COPIES OF CORRESPONDENCE.

BETWEEN MR. H. A. A. THORN (TRADING AS CHARLES LANCASTER) AND THE CLERK OF THE GUNMAKERS' COMPANY.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.

c/o Charles Lancaster,
Gun and Rifle Manufacturer,
151, New Bond Street,
London, W.
March 5, 1900.

DEAR MR. ASTON,

Will you kindly send me list of names of those now serving on the Court of the Gunmakers' Company.

Hoping you are keeping well, and with kind regards,

Yours truly,
(Signed) HENRY A. A. THORN.

THE CLERK OF THE GUNMAKERS' COMPANY TO MR. THORN.

Fredk. Aston, Solicitor, 61, Gresham House, Old Broad Street, London, E.C.
March 6, 1900.

DEAR SIR,

In reply to yours of the 5th inst., I beg to say the names of those now serving on the Court of the Gunmakers' Company are :— Mr. A. S. Purdey (Master) ; Mr. D. C. Gibbs (Upper Warden) ; Mr. H. S. Barnett (Renter Warden), Mr. E. Barnett, Mr. T. A. Heptinstall, Mr. W. A. Gibbs, Mr. F. W. Bond, Mr. James Purdey, Mr. H. Barnett, Mr. H. Brandon White, Mr. C. O. Purdey, Mr. H. W. Holland, and

Yours faithfully,
(Signed) FREDK. T. ASTON, Clerk.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
March 7, 1900.

DEAR MR. ASTON,

I thank you for your prompt reply to mine of the 5th inst.

Will you kindly tell me the date upon which Mr. . . . . joined the Company, also date of his election to the Court ?

Thanking you in anticipation,

Yours truly,
(Signed) HENRY A. A THORN.

THE CLERK OF THE GUNMAKERS' COMPANY TO MR. THORN.
March 9, 1900.

DEAR SIR,

I have received your further letter of the 7th inst., and you must be aware, as Clerk, I have no authority to give you the information you ask for.

Yours faithfully,
FREDK. T. ASTON, Clerk.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
March 9, 1900.

DEAR SIR,

In reply to yours of this date, when I wrote you on the 7th inst. I never for one moment doubted that you would not be able to give me the information asked.

However, as you have not the authority, kindly, as Clerk to the Court, do me the favour to place it before the Members of same at heir next meeting, and oblige

Yours truly,
Signed) HENRY A. A. THORN.

THE CLERK OF THE GUNMAKERS' COMPANY TO MR. THORN.
March 30, 1900.

DEAR SIR,

As requested in your letter of the 9th inst., I placed your letters before the Court of the Gunmakers' Company yesterday, and I am instructed to refuse the information you ask.

Yours faithfully,
(Signed) FREDK. T. ASTON.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
April 4, 1900.

DEAR SIR,

I am surprised to find from your letter of the 30th ult. that the information asked for by me is refused ; upon what grounds I am at a loss to understand. As I am leaving for Paris on the 9th and shall not return until the 20th, I shall be glad if you will favour me with an appointment after that date, at which I can peruse the resolutions and decisions of the Governing Body for say the last five years.

Yours truly,
(Signed) HENRY A. A. THORN.

THE CLERK OF THE GUNMAKERS' COMPANY TO MR. THORN.
April 20, 1900.

DEAR SIR,

I have not sooner replied to your letter of the 4th inst-, as you intimated therein that you would not be returning to town until to-day.

I regret that I am unable to give you an appointment to peruse the resolutions and decisions of the Governing Body of the Gunmakers' Company for the last five years, as desired by you.

Yours faithfully,
(Signed) FREDK. T. ASTON,

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
April 24, 1900.

DEAR SIR,

In reply to your letter of the 20th do I understand that you personally are unable to give me the appointment, or that the Court have directed you not to do so ?

Yours truly,
(Signed) HENRY A. A. THORN.

THE CLERK OF THE GUNMAKERS' COMPANY TO MR. THORN.
April 26, 1900.

DEAR SIR,

I am in receipt of your letter of the 24th, and in reply would say that there has been no Court since your application of the 4th., but at the next meeting my reply of the 20th will undoubtedly be upheld.

Yours faithfully,
(Signed) FREDK. T. ASTON.

THE CLERK OF THE GUNMAKERS' COMPANY TO MR THORN.
May 11, 1900.

DEAR SIR,

I beg to inform you that the Court of the Gunmakers' Company fully confirm my letter to you of the 20th April.

Yours faithfully,
(Signed) FREDK, T. ASTON.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
May 25, 1900.

DEAR SIR,

In reply to your letter of the 11th inst,, I shall be obliged if you will bring before the Court of the Gunmakers' Company at their next meeting the following reply made by the Company to the City of London Livery Companies Commission :—

Part II A

"The resolutions and decisions of the Governing Body are "not published, but are accessible to the members of the "Company."

I shall be glad to be informed how they reconcile the above extract with the letter you were instructed to write me.

I hope upon further consideration that the Court will instruct you to comply with what seems to me a very reasonable request.

Yours truly,
(Signed) HENRY A. A. THORN,

THE CLERK OF THE GUNMAKERS' COMPANY TO MR. THORN
May 26, 1900.

DEAR SIR,

I am in receipt of your letter of yesterday, and will, as you desire, lay it before the next Court of the Company.

Yours faithfully,
(Signed) FREDK. T. ASTON.

THE CLERK OF THE GUNMAKERS COMPANY TO MR. THORN.
June 29, 1900.

DEAR SIR,

Referring to your letter of the 25th ult., I am directed by the Court of the Gunmakers' Company to inform you that they adhere to their decision already communicated to you.

Yours faithfully,
(Signed) FREDK, T. ASTON.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
July 17, 1900,

DEAR SIR,

Will you kindly let me know what are the fees payable on being elected a member of the Court of Assistants of the Gunmakers' Company.

Thanking you in anticipation,

Yours truly,
(Signed) HENRY A A. THORN.

P. S.—I am glad to see that Mr. Griffiths has joined the Livery. He should be most useful on technical matters and well worthy to occupy any position in the Company.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
July 25, 1900.

DEAR SIR,

Consequent upon the receipt of your letter of the 29th ult., I have laid the correspondence which has passed between us before certain experts in matters appertaining to City Companies, with the result I am advised to present a Petition to the Court of Aldermen to grant me the inspection I require.

This I shall do unless it is voluntarily afforded by the Court of the Company within the next 14 days.

Yours truly,
(Signed) HENRY A. A. THORN.

THE CLERK OF THE GUNMAKERS' COMPANY TO MR. THORN.
July 27, 1900.

DEAR SIR,

I have received your letters of the 17th and 25th inst., which I have laid before the Court of the Gunmakers' Company, and I am directed to inform you that the fees payable on being elected a Member of the Court of Assistants are £27 10s.

The Court note your intention of presenting a Petition to the Court of Aldermen.

Yours faihfully,
(Signed) FREDK. T. ASTON.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
August 1, 1900.

DEAR SIR,

I thank you for your letter of the 27th ult., and I note that the fees of the Gunmakers' Company are about half of those of the Company. I have been asked if I wish to stand for election to their Court of Assistants in September.

Am I to understand your concluding paragraph as a reply to my very plain question as to whether an appointment would be given me to inspect the Court's minutes.

Yours truly,
(Signed) HENRY A. A. THORN.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
October 29, 1900.

DEAR SIR,

Your invitation to dine with the Master, Wardens, and Court Assistants, dated 17th October, was duly received, but I am afraid, owing to a serious accident, that the doctor may not allow me to attend on the 15th prox, but will let you know later on.

My object in acknowledging the invitation at this early date, is to make in writing a similar suggestion that I made verbally at the last Livery Banquet, viz., that the Master or some responsible member of the Court will be prepared to give during the evening a general summary of what has taken place during the past year, as I feel sure yon will admit that such a statement would be very interesting to those who, like myself, are members of the gun trade and Liverymen of the Gunmakers' Company.

Trusting you will lay this letter before those who have the general management of the Toast List, etc.,

I am, dear Sir, yours truly,
(Signed) HENRY A. A. THORN.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
November 23, 1900.

DEAR SIR,

You will, I feel sure, be glad to hear that I am allowed to attend business again for a short time daily, and have had a miraculous escape.

As the Gunmakers' Company do not furnish the members of the Livery with any printed booklet, as many other City Companies do, will you please let me know who has been elected Master-Wardens, etc., and what additions, if any, have been made to the Court, also Livery of the Company, and oblige,

Yours truly,
(Signed) HENRY A. A. THORN.

THE CLERK OF THE GUNMAKERS' COMPANY TO MR. THORN.
December 5, 1900.

DEAR SIR,

Referring to your letter of the 23rd ult., it is not usual to give such information as you ask, but if you can furnish me with any good reason for desiring it, I will lay the matter before our next Court.

Yours faithfully,
(Signed) FREDK. T. ASTON.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.
December 7, 1900.

DEAR SIR,

I am in receipt of your letter of the 5th inst., which was in reply to mine of the 23rd ult., in which you inform me it is not usual to give the information asked for by me, but that if I can furnish you with any good reason for desiring it, you will lay the matter before the next Court.

My request was to be informed of the names of the Master and Wardens for the current year, and to know if there were any additions to the Court of Livery.

It is difficult to understand what possible objection there can be to give me this simple information without asking for a reason. I am a Liveryman, and as such naturally interested in the matter.

I was away ill at the time of the Livery Banquet, and as the information was no doubt readily available to those attending, and as to the officers their names were printed on one or other of the programmes, besides being themselves present and known, I cannot conceive your object in placing obstacles in the way or considering it a matter of so much importance, that before you can answer me you must have furnished to you a "good reason," whereon you will lay the matter before the next Court.

I should have thought it too trivial to trouble the Court with, unless there is something it is thought undesirable I should know, and I cannot believe this.

As a fact, such information is published by the majority of the City Companies, certainly in my experience it has never hitherto been withheld from me.

Yours truly,

(Signed) HENRY A. A. THORN.

THE CLERK OF THE WORSHIPFUL COMPANY OF COACHMAKERS TO MR. THORN.

January 1, 1901.

MY DEAR SIR,

I regret to have to inform you that after making further and more exhaustive enquiry, I have satisfied myself that the proposed Petition will not be entertained by the Court of Aldermen, for the simple reason that as your name is entered upon the City Chamberlain's books as a Coachmaker—which is your Mother Company—no Petition relative to your grievance against the Gunmakers' Company will be entertained.

Yours faithfully,

(Signed) PETER D. L. LONG, Clerk.

MR. THORN TO THE CLERK OF THE GUNMAKERS' COMPANY.

January 31st, 1901.

DEAR SIR,

Not having received any satisfactory reply to my letters to you, it is my intention to publish the whole of the correspondence which has passed between us, and in courtesy to you I think it right to inform you thereof.

Yours truly,

(Signed) HENRY A. A. THORN.

THE CLERK OF THE GUNMAKERS' COMPANY TO MR. THORN.

February 4, 1901.

DEAR SIR,

I beg to acknowledge the receipt of your letter of the 31st ult., acquainting me of your intention to publish the correspondence.

Yours faithfully,

(Signed) FREDK. T. ASTON.

APPLICATIONS FOR PATENTS.

DECEMBER 17TH, 1900—JANUARY 19TH, 1901.

1900.

23,017.* Projectiles. R. T. Phillips.
23,039. Magazine Small-arms. A. Morgenroth.
23,215. Rifle Stand. H. J. Probert.
23,252.* Smokeless Powder. P. M. Justice (Agent for *The International Smokeless Powder and Dynamite Company*).
23,292. Stocks for Small-arms. T. Sheldon.
23,298.* Quick-firing Guns. C. M. White (Agent for *The Rheinische Metallwaaran-und Maschinenfabric*).
23,557. Cartridge Belts for Machine Guns. W. E. Rowlands.
23,558. Explosive Shells. W. E. Rowlands, and W. G. Hay.
23,623. Live Bird Trap. F. Perry.
23,705. Movable Targets. T. B. Ralston.
23,747. Sighting of Ordnance. A. Perazzi.
23,801.* Signalling Detonators. E. F. Lemaire.

1901.

76.* Machine Guns. H. H. Lake (Agent for *E. W. Jeter*).
77.* Spring Air Guns. W. F. Markham.
102.* Mechanism of Fire-arms. R. H. Kjellman, and G. L. Andersson. (Application in Sweden, September 27, 1900).
103.* Automatic Fire-arms. R. H. Kjellman, and G. L. Andersson. (Application in Sweden, September 27, 1900).
196.* Recoil-operated Fire-arms. A. W. Schwarzlose.
198. Cartridge Carrier. W. T. Thorn.
201. Explosives. S. B. Earle.
213.* Magazine Fire-arms and Ordnance. K. K. Bjerkness, and J. Waugh.
218. Rifle Rests. H. B. Smith.
235. Sighting of Ordnance. H. H. Grenfell.
286.* Automatic Fire-arms. G. H. R. Hamilton.
519. Small-arm and Machine Guns. Sir C. H. A. F. L. Ross.
533.* Tangent Scale for Ordnance. H. Korrodi. (Application in Switzerland, June 9, 1900.)
608. Carbine Bucket. T. Frost.
676. Telescopic Sights for Ordnance. A. A. Common.
704. Portable Apparatus for Rifle Shooting. C. E. Luard.
837. Fore-sights for Small-arms. H. C. Sparrow.
849. Machine Guns. A. T. Dawson, and G. T. Buckham.
890. Rifle Clips for Cycles. T. N. Harwood, and T. S. Rose.
914. Cartridge Carriers. E. T. Gibson.
934. Rifle Holder. C. Tucker.
982.* Cartridge Clip. A. H. Russell.
984. Explosives. C. H. Curtis, E. L. W. Smith, D. J. Metcalfe, A. C. Pearcy and A. F. Hargreaves.
1,065. Cartridge Holder. H. H. Lake (Agent for *H. F. Landstad*).
1,112. Targets. J. T. Homle.
1,166. Small-arms. S. W. Daw, and T. R. Evender.
1,174. Sighting of Ordnance. L. K. Scott.
1,211. Expanding Small-arm Bullet. W. B. Wallace.

* These Applications were accompanied by Complete Specifications.

SPECIFICATIONS PUBLISHED.

COMPILED BY H. TARRANT.

DECEMBER 29TH, 1900—JANUARY 19TH, 1901.

25,483 (1899). **Rifle Stocks**. R. H. R. Rimington-Wilson, Boldsterstone. A method of constructing a rifle so that when not in use it may be shortened to enable it to be more easily carried. The method consists in hinging the stock to the fore-end in such a way that the stock may be folded back. A catch holds the stock in its proper position when the rifle is in use. This rifle is designed more particularly for mounted infantry. Accepted December 22, 1900.

681 (1900). **Loading Apparatus for Ordnance.** R. Matthews, Manchester. Improvements in ammunition hoists, described in Specification No. 16,656, 1898. In the apparatus explained in the patent of 1898 a cage containing the ammunition is adapted to be raised from below a gun to the loading position, whatever may be the degree of elevation of the gun. It is liable to derangement, however, by reason of the friction caused by the working of the chain upon the pulleys, and also by reason of the liability of the chain to stretch by undue stresses. In the present apparatus the bearing of the upper pulley is made movable, and is so connected to the gun that the alteration of the position of the cage only affects that portion of the chain adjacent to the pulley instead of its entire length. Accepted December 8, 1900.

743 (1900). **Ammunition Boxes.** W. Rothschild, G. D. Smith, and J. A. Wilding, London. In order to obviate the delay caused by having to withdraw the cartridge belt from the gun to replace it in its box, when it is required to shift the gun, the patentees so construct a box that the lid may be closed immediately after firing has ceased. A spring tongue then catches the band between the two cartridges which happen to be adjacent to the exit from the box, and holds the belt firmly. In this box also further advantages are embodied, inasmuch that the lid is never prevented by a cartridge from closing, and there is no danger of the violent slamming of the lid accidentally discharging a cartridge. Accepted December 8, 1900.

1,995* (1900). **Telescopic Sights.** W. J. Jeffery, London.

2,358 (1900). **Distance Fuses**. G. Klumak, Austria. A modification of the mechanism of that type of distance fuse, in which a spindle is rotated by a vane wheel acted upon by the resistance of the air or water, and which transmits such motion to a train of wheels for releasing the firing pin after a given time. The firing pin in the present apparatus is arranged in continuation of the axis of the vane wheel and in the centre line between the train of wheels. The objects of the arrangement are to allow of the use of a strong spring for propelling the firing pin, to ensure a perfectly uniform motion of the train of wheels, and to reduce to a minimum the action of the initial concussion. Accepted December 22, 1900.

3,007 (1900) **Safety Ranges**. W. T. Blanchett, Slough. A portable safety range constructed of a tube or series of tubes. The rifle is attached to the tube by means of a chain in such a manner that its muzzle cannot be brought outside the tube. At intervals along the interior of the tube flanges are provided to prevent bullets from rebounding to the firing end of the range. Accepted December 22, 1900.

3,487 (1900). **Torpedoes.** J. S Comrie, London. This patent relates to improvements in a device described in a former specification, No. 1,537, 1885 for automatically opening the the flame-holes of torpedo-indicating lights. The flame-hole is initially covered with a piece of thin material, preferably sheet lead, which is capable of being readily ruptured by the pressure of the water. The water thus gains access to the material from which the flame-producing vapour is evolved. Accepted, December 22, 1900.

4,255 (1900). **Sighting of Ordnance** A Reichwald, (Agent for *Fried. Krupp, Germany*). Modifications connected with means for adjusting the elevation of ordnance, which formed the subject of patent No. 8,473, 1899. The gunner is enabled, by means of the present device, to tell when the gun has received the necessary elevation, corresponding to the adjustment of the sighting pointer, without leaving his place. The sighting curve table is composed partly of a material capable of conducting electricity, and partly of a non-conducting substance. The adjustable pointer is provided with a contact so that a circuit is closed when the pointer touches a conducting portion of the table. Accepted December 22, 1900.

9,368* (1900). **Single-trigger Mechanism.** F. E. Jaeger and C. Bittiner, U.S.A.

11,877 (1900). **Hammerless Small-Arms.** W. Thompson, and W. Edwards, Birmingham. In order to dispense with outside hammers in small-arms a striking bolt is provided which is fitted on the side of the body of the gun near the breech. In a double-barrelled gun bolts are fitted on both sides of the weapon. The bolts are cocked by the pushing down of the trigger-guard, which works as an ordinary "under lever." Accepted December 8, 1900.

13,893 (1900). **Brake-blocks for Gun Carriages.** G. Gumpel, Germany. In the ordinary brake-block the metal nails, securing the leather wheel-grip, become warm by friction, and the leather is burnt off at the points of contact. This disadvantage is obviated in the present block, which consists of a solid piece of wood to which is attached any number of strips of leather by means of wood screws. The leather is also cemented, and is subjected to great pressure until the cement becomes stiff. Accepted Dec. 22, 1900.

15,057 (1900). **Explosive Storing Sheds.** G. A. Nahnsen, Germany. In order to minimise the downward blow, when an explosives shed is blown up, and the consequent vibration of the earth, which is the cause of much damage to surrounding buildings, protection cellars are built beneath the shed. These cellars are filled preferably with water, which would not only absorb a great amount of the downward force, but would be flung into the air and extinguish the burning parts which fly about. The size of the cellars and the amount of filling is regulated by the capacity of manufacture of the shed. Accepted December 15, 1900.

17,639 (1900). **Automatic Guns.** A. Vickers, and Vickers, Sons, and Maxim, Ld., London. Several modifications are described in connection with the Maxim automatic gun, which is constructed on the "five motion feed" principle. By means of these improvements it will be possible for the various parts of the lock to be assembled without the aid of tools, and the barrel will be more easily changed than heretofore. A simplified contrivance takes the place of the steam tube and valve for the escape of steam from the water-jacket, and numerous other important changes are made. Accepted December 22, 1900.

19,926 (1900). **Bandolier** F. G. Hughes, Australia. A bandolier constructed to contain a series of clips, each holding the number of cartridges required to fill the magazine. The clips are so arranged on the belt that the cartridges may be pressed directly from the bandolier, when around the shooter's body, into the breech of the rifle. Accepted December 22, 1900.

20,037 (1900). **Apparatus for Casting Bullets.** W. Richardson, and A. Richardson, Nottingham. A number of multiple moulds are mounted upon a revolving table, and into each of the moulds molten metal is poured in succession as the table turns. The metal is cooled by means of a current of air or water, and when cooled the mould reaches another portion of the table where it is automatically unclamped, and the bullets discharged. The mould is then again ready to receive more metal. These operations go on contiuously. Accepted December 22, 1900.

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

SELECTED PATENTS.

TELESCOPIC SIGHT FOR SMALL-ARMS.

1,995 (1900). W. J. Jeffery, London. We referred briefly in our issue of August, 1900, to a sight invented by the above patentee. The patent specification describing the sight being among those published within the last month, we propose to deal more completely with the device. In the ordinary telescopic sight, cross wires arranged within the tube form the sight proper; but in the present sight the well-known device consisting of an inwardly-projecting pointer takes the place of the cross wires. The feature of the arrangement is that the method of mounting the pointer allows it to be diverted from the centre line of the telescope either vertically or laterally, for range and wind purposes.

Fig. 1

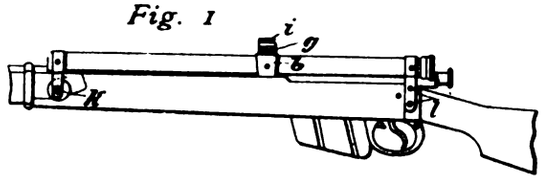


Fig. 2

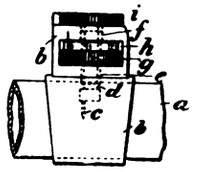


Fig. 4

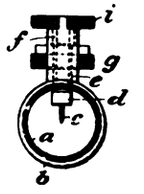


Fig. 6

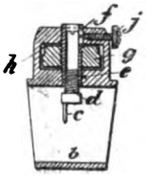


Fig. 3

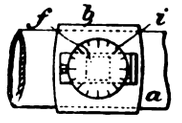
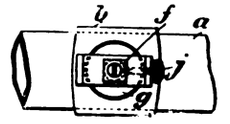


Fig. 5



In the accompanying drawings the telescope is shown in Fig. 1 mounted on a Lee-Enfield rifle. Figs 2, 3, and 4 illustrate the sight proper from various points of view, and in Figs. 5 and 6 a modified form of the fitting is shown.

Referring to Figs 1 to 4, it will be seen that upon the tube *a* of the telescope is mounted the fitting *b*, carrying the finger *c*. The finger is mounted eccentrically on the part *d*, which is externally screw-threaded. The stem *d* turns within the internally screw-threaded sleeve *e*, the top of which is formed with a square head *f*, the head fitting into a corresponding square hole in the frame *b*. The sleeve *e* is also externally screw-threaded, and the milled thumb-piece *g*, arranged within a slot *h* in the fitting *b*, is adapted to turn upon the sleeve, which is itself prevented from turning by its square head *f*. The milled head *i* is attached to the top of the stem *d* carrying the pointer, and by turning this head, which is graduated (Fig. 3) to enable correct adjustment to be obtained, the pointer may be swung to the right or to the left of the centre as may be required. The turning of the thumb-piece *g* causes an alteration in the elevation, the pointer being moved upwards or downwards by this operation.

To prevent the stem *d* being turned within the sleeve *e* when the thumb-piece *g* is turned, the stem may either be made to work stiffly within the sleeve, or a clamping screw *j* (Fig. 6) may be used to keep the stem in position in spite of the upward and downward

movement of the sleeve *c*. In Figs. 5 and 6 the fitting is shown with the milled head *i* removed. This modified form of the sight is applicable more especially to the short-range sporting rifle, with which wind adjustment is not so important or necessary. A turn-screw slot is, however, still provided in the top of the pointer stem to facilitate the exact central adjustment of the pointer tip in relation to the position of sleeve *c*.

When it is required to apply the sight to an existing rifle which has been fitted with an aperture back-sight, and a dial sight, the two sights are removed and one screw hole *k* (Fig. 1) of the dial sight is utilised for the fixing of the front end of the telescope, whilst the two screw holes (*l*) of the back-sight are used for fixing the rear end of the telescope. The sight may be applied to new weapons in any way which may be found most convenient or suitable. Accepted Dec. 15, 1900.

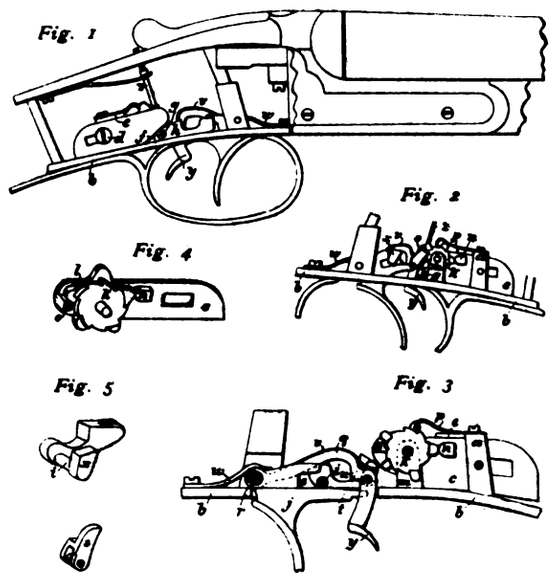
THE JAEGER SINGLE-TRIGGER MECHANISM.

9,368 (1900). F. E. Jaeger and C. Bittiner, U.S.A. In this specification a system of single-trigger mechanism is described in which a limb, called the sear plate, may be set by means of a finger-piece situated behind the trigger, so that either barrel may be discharged first. The order of firing, be it either right and left, or left and right, is maintained until the finger-piece is again operated to switch over the parts. The involuntary pull is guarded against by the arrangement of the mechanism, which is such that every pull of the trigger has entirely to re-arrange the parts in order to bring the sear plate extension beneath the second sear. The duration of the involuntary pull does not permit it to perform this operation. A modified form of the mechanism is also described, which may be applied to triple-barrelled guns.

Referring to the accompanying drawings, it will be seen from Figs. 1, 2, and 3 that upon the extension *a* of the trigger plate *b* is mounted the part *c* (shown in detail in Fig. 4), which is called the sear plate. This sear plate is secured in its vertical position by the flat-headed screw *d*, and it is guided in its backward and forward movement by the flange *e* at the head of the extension *a*. The forward end of the sear plate carries an extension *f* (Fig. 1), which is pivoted at *g* to a dog *h* forming part of the sear tripper, illustrated in detail in Fig. 5. The bar *i* here shown works on the top of the trigger blade *j*, and the dogs *x* and *h* fall on either side of the blade. These dogs, both of which cannot be beneath their respective sears at the same time, are so situated in relation to the sears that the backward and forward movement of the sear plate *c*, to which the dogs are attached, causes either one of the dogs alternately to assume a position beneath its corresponding sear. The manner in which the sear is raised will thus be clearly understood.

We will now describe the means by which the dogs are automatically operated by the pulling of the trigger. In Fig. 3 part of the mechanism is shown in section, and from this illustration it will be seen that two wheels, a ratchet *k* and a star wheel *l* are so mounted between the ears *m* of an upstanding extension as to operate between the two outwardly-projecting tappets *n* and *o* on the sear plate *c*. These two wheels work in unison, and they are adapted to turn in a direction away from the breech face. They are prevented from an opposite motion by the spring *p*, which catches in front of the teeth on the ratchet wheel. The wheels are arranged between the tappets so that their rotation causes one of the teeth on the star wheel to engage with one of the tappets, and to force the sear plate either backwards or forward. The wheels are rotated when the trigger is pulled through the arch-shaped limb *q*, which works on the trigger-blade pivot *r*. This limb carries the pawl *s* (shown in detail), and the limb *q* together with the pawl *s* is raised by the engagement of the trigger-blade extension *t* and the projection *u* on the part *q*. The pawl, which is kept up to its work by the spring *v*, catches beneath a tooth on the ratchet wheel and so forces the wheel round. The upward movement of the pawl is limited to such an extent that the wheel is turned only through a distance sufficient to force the sear plate to its fullest backward or forward position, and to leave one of the teeth of the star wheel in locking engagement with either the rear or forward tappet, according to the position of the sear plate. Thus, when either of the dogs on the sear tripper is beneath its sear, the sear plate is prevented from moving by the locking of the star wheel tooth.

Suppose now the sear plate is in its rearmost position, as shown in Fig. 3, the right-hand dog *h* is situated beneath its corresponding sear. The pulling of the trigger raises the tripper to which the dog *h* is attached, and discharges the right-hand barrel. The involuntary pull which immediately follows does not last long enough to rearrange the mechanism so that the left-hand dog *x* is able to raise the second sear, as may be gathered from the operations which have to occur before the second barrel is discharged. When the



trigger is released the trigger spring *w* forces it down into its norma position, the limb *q* also being pushed down by this spring; and with the second pull of the trigger the blade extension *t* engages with the projection *u* on the part *q*, the part *q* thus being lifted. The limb *q* takes with it the pawl *s*, and through the upward movement of the pawl the wheels are rotated. The rotation of the star wheel causes the tappet *o* to ride over a tooth on the star wheel, and the sear plate is thus forced into its forward position, carrying with it the sear tripper and forcing the left-hand dog *x* beneath the left-hand sear tail. The same series of operations occur when the trigger is again raised to discharge the right-hand barrel after reloading, except that the sear plate is forced backwards. So these operations go on continuously until it is required to change the order of firing. The finger-piece *y* is then forced up, and the consequent raising of the limb *q* switches the parts over to the left-hand barrel, the right-hand barrel then being the second one fired.

The teeth of the star wheel *l* also operate an indicating device. A rod *z* engages with the star wheel teeth, and as the wheel revolves the rod is forced upwards against a spring and is allowed to fall between the teeth, according to the position of the sear plate. The top of the rod appears above the level of the action-shaft when the sear plate is in its backward position, and drops out of sight when the plate is pushed forward. Several supplementary limbs are added to the mechanism described, in order to adapt it to a triple-barrelled gun. Accepted Dec. 31, 1900.

Arms & Explosives

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CONTENTS.

CURRENT TOPICS.

National Rifle Association.—The report of the National Rifle Association has recently been issued, and the winter general meeting followed in due course. It is interesting to know that the rifle club movement has apparently settled down into a state of steady development, and there is good reason for hoping that the Government is sufficiently interested in the work to justify us in looking forward to a time when gun license restrictions will cease to apply to this particular form of shooting. As regard the more general work of the National Rifle Association, there are several problems which it will be worth the while of gunmakers to study with a view to future developments. We refer especially to the increasing recognition of telescopic sights as a natural accompaniment to rifles of precision. The telescope, while doing all that ordinary sights are able to accomplish, at the same time does such a lot more in aiding the alignment of the rifle that it is bound to develop to an extent in no way indicated by its previous reception among rifle shots and sportsmen. The principles involved are of such a character as to require the skilled art of the gunmaker, in addition to the practical application of optical laws. Telescopic sights are, therefore, essentially of a character to require the close co-operation of the gunmaker and the optican. Either member of the partnership is apt to go wrong without the aid of the other. Military rifles will also need the very careful attention of the gunmaker, both in regard to the sighting and the adjusting of match rifles, and the perfecting of sporting patterns of these weapons. Miniature rifles, on the other hand, are still somewhat of an unknown quantity. Whether this type of arm will ultimately settle down into a glorified edition of the cheap American rifle, it is at the present moment difficult to say. Our own hope that some gunmaker would produce a kind of modified rook rifle, characteristic of English workmanship, but at the same sime rifled and chambered for some form of high velocity bullet, approximately ·25 bore, has not yet been realised. Such rifles might well cost ten guineas, and be worth the attentiou of our best firms, but so far the American rifle, with its characteristically clumsy breech action, its cast iron body, and its general unhandiness has not yet found a serious rival in respect to quality on this side of the water. All who are interested in the purely volunteer side of rifle shooting will be very glad to observe that the Council has taken the wise course of abolishing the standing and kneeling positions at the 200 and 500 yards ranges respectively. Practical warfare has shown the inapplicability of these positions, and reduced entries have demonstrated that the keen volunteer, desirous of perfecting himself in rifle shooting, has a horror of positions which introduce sufficient of the chance element to discount pure skill. One of the most satisfactory features of the recent meeting was the election to the Council of the National Rifle Association of Colonel J. D. Hopton. As Chief Inspector of Small Arms, and lately Commandant of the Hythe School of Musketry, his voice in the affairs of the Council will be of great value. Under another name most people remember him as

Inspector of Musketry for the Home Division some six years ago. Throughout his career he has been one of the keenest rifle shots at long ranges in the British Army, and his special knowledge has always turned in the direction of ascertaining what are the best and most practical forms of military rifles. Great hopes are reposed in him in connection with his chairmanship of the Small Arms Committee. Let us trust that he will prove to have had sufficient strength of character to condemn once and for all the very unsatisfactory weapon with which our troops are armed.

A Sporting Syndicate.—Under the heading of the Anglo-American Shot Gun Syndicate, a prospectus has been issued to the public inviting subscriptions to a fund having for its purpose the provision of suitable stakes for an international match between American and British teams with shot guns at clay birds. The proposal is for two teams of ten men each, the Americans to use one barrel only with 1¼ oz. shot, struck measure, 1,106 Dixon's or American Shooting Association measures (Eley standard), and the British to use both barrels, with English rules as to the charge of shot. The stakes proposed are 5,000 dols, or roughly £1,050 aside, but an arrangement fundamental to the scheme is that while, if the American team wins, they take the whole of the stakes, the British team, in the event of proving successful, has to allow 2,500 dols. to their unsuccessful rivals as expenses. Assuming that the chances of the two teams are equal, it will be seen that the division of the stakes is not proportionate, since the British team stand to win only £1,500, as against the Americans' possibility of receiving the full £2,000 of stake money. On the other hand, the proceeds of the "gate" at the meeting, which is to be held in June or July, will go to the British team. It cannot be said that the financial aspect of the proposed Syndicate will appeal to investors very strongly, even when making due note of the suggestion that in the event of the British team winning, "subscribers to the Syndicate would have returned to them the amount of the original subscription, plus a very handsome profit, and we confidently estimate that profit at about 50 per cent." But for all that, quite a number of sportsmen may be inclined to take a £10 share or a £5 half-share, in a purely sporting event having for its object the promotion of a first-class contest between American and British experts, under conditions calculated to show each team at its best advantage in its own particular style of shooting.

Civilian Rifle Clubs and the Gun Licence.—On the initiative of Mr. Ernest C. Tye, Hon. Sec. of the Birmingham Gun Club, a petition has been framed, and is now in process of signature by the members of some two hundred Civilian Rifle Clubs, praying the House of Commons to exempt these Clubs from the restrictions of the Gun Tax. As the petitioners point out, it is very desirable that each member of a Rifle Club should personally own a rifle, and though the existing tax, taken by itself, may seem to be trifling, it forms no inconsiderable addition to the other expenses to be incurred by the enthsuiast in the way of first cost of rifle, ammunition and fares, etc., to and from the range, to say nothing of the sacrifice of time. The tax, in fact, may just constitute the proverbial "last straw," and will quite conceivably act as a deterrent to prevent many comparatively poor men from joining the local rifle club. As has already been pointed out, the exemption of a limited number of club rifles from the tax, a concession which was granted last June, "after considerable negotiation between the War Office and the National Rifle Association," (to quote a recent statement of the Chancellor of the Exchequer), does not meet the case at all. No man has a fair chance to develop into a first-class shot unless he possesses a rifle with the peculiarities of which he is fully conversed, and he will as certainly never be a practical and useful member of a potential volunteer reserve unless he is accustomed to the care and cleaning of his weapon. We fully hope that the agitation now set in motion by the Birmingham Rifle Club may result in achieving the desired end.

THE GENTLE ART OF ENCOURAGING INVENTORS.

BY A CORRESPONDENT.

"THERE is a tide in the affairs of man, which, if taken at the flood, leads on to fortune." If you were to inquire of a hundred men how this could be defined, there is no doubt that at least ninety-nine would tell you that this magnificent achievement could only be consummated by "an invention!" Beyond this, opinion would differ as to the problematic value of a small thing for the benefit of the "million" against a big thing sold to a big corporation—or, better still, a Government. The latter may not be the most lucrative, but it should bring honour and glory, which are not the least pleasurable assets of fortuue. The fascinations of such inventions, linked with the inventor's name, such as the "Armstrong Gun," "Palliser Shot," "Boxer Cartridge," &c., are irresistible. They are national events which assume an historical importance far beyond the dreams of the inventor of a domestic appliance or patent medicine. This is, perhaps, the foremost reason why there is so much ambition in getting the War Office or Admiralty to adopt new ideas instead of taking them to other markets.

There are, of course, other and weighty considerations involved also by those who hope to secure either a good situation, or appointment, with a substantial retaining fee, or salary, and visions of possible superanuation and other hallucinations which generally affect the mind of the inventive sophist. Others less imaginative hope to benefit as sellers, concessionaires, or manufacturers of the patent, as monopolists, even though it bears a nameless reputation, whereas the impecunious or indolent inventor, who does not aspire to financial benefit, looks upon the War Office as an excellent means of getting a patent search at the public expense, if the crafty wight only plays his cards properly.

In dealing with the questions of invention, it is a curious fact that the sources are generally traced to necessity or accident, therefore it becomes impossible to fix upon the class which is most likely to produce an invention of the greatest value. The War Office, for instance, might look first to their own officers and employés, or to contractors performing analagous work, or to information derived from foreign sources, and also to outsiders of mechanical ability, or, finally, to scientific cranks; and with such a range to select from it generally ends in the official vision being unable to distinguish novelty, much in the same way as the individual "who couldn't see the wood for trees."

How does the Government deal with inventors? This question is often asked, and those who have had the misfortune to gain this experience are the best to apply to. There is no regulated method at all. It is an unwritten law that inventors should be discouraged, because it is no man's work to attend to them, and consequently they are a nuisance; but if by chance the invention should be investigated, it filters into the hands of the military section, whose curriculum has never included any practical training in mechanics or commerce, consequently, the ordinary officer fears innovations, where possible want of success in the thing adopted might be laid to his door. Therefore he prefers to let well alone. Why improve manufacture so long as the stores pass inspection! Why cheapen manufacture when some one else pays the bill! Why increase the output when nobody asks for a greater one! There is no dividend to pay! No rent to pay! So let time grind out the automatic evolution of changes whilst the "ordinary officer" gains success by a record of "no failures." "But what about progress?" you ask. Well, that will come to the officer—it is called promotion!

Although the "ordinary officer," as an invention expert does not merit eulogistic tribute, it is only fair to say that he is guided by the highest moral principles, and his convictions, though deplorably simple, are perfectly honest. With him good or bad inventions share alike, they do not command any interest.

But now we come to another type of officer, who takes an ultra-commercial interest in his work—and considers that the dignity of his position is an excuse for a most curious misconception of his moral duty to the Government, as his employers, and to the inventor as an individual. Every invention is carefully scanned and details (not the inventor) even sought for. He will endeavour by every method to take advantage of the invention by any or every method short of robbery—and judging from legal cases during the past years where inventors have sued the Government, the procedure is too well known to need specifying. This is the type of man who has frightened off inventors, consequently the Government have to pay for inventions at a greatly enhanced value, that come from abroad, possibly brought out in their own workshops in the first instance. One infinitely prefers to be told "there is insufficient novelty to justify its adoption" or any other excuse, than to be "diddled" out of the whole thing. All workmen in the Ordnance Factories have to apply for permission to patent anything, but if this sort of officer happens to see the idea *en route* to the authorities, he will doubtless treat the idea as coming from outside. Hence it is not surprising if the workman inventor nominates a friend to patent and communicate his invention outside the factory. Nor can one help feeling some sympathy for the inventor, who, knowing that he has achieved an invention of tangible value, must quit the Government employ and develop it with a firm of appreciative up-to-date contractors, from whom he gets adequate recognition.

But here I only allude to genuine inventors. I do not include those who have violated a position of confidence and trust in order to collect official secrets, which are the *nucleus* of a valuable invention, and with this ill-gotten information resign and join another concern who developes it. Such persons may sell the rights to foreign governments, and by this subtle anticipation defraud the Government of royalties as well as ideas. If these cases are not pure gossip surely some action should be taken under the Official Secrets Act.

In spite, however, of the apathetic and acquisitive officials, there are others who honestly enquire into inventions and recommend their adoption, and now the next stage is the remuneration you will get. It may be adopted as a service article, and you may supply it yourself without fee or reward, and it is possible that other firms will be invited to tender in competition, being informed that the War Department will or will not take responsibility for patent rights. If the Government make the patent articles themselves, and consider the terms for the patent high, they will make a "reasonable" (*sic*) offer, and if you do not accept this valuation you can go without, for the Government can, under certain conditions, compulsorily acquire the invention.

I have purposely refrained from mentioning any specific cases of injustice or incompetent opinion as to the value of inventions, were I to do so the list would be long, for examples abound in great numbers, but generally speaking, your best chance of getting an invention taken up by the Government is to offer it abroad.

Were the narrow official mind lacking in original perspicuity, it is open to an accomplished reputation, and does not mind paying an enhanced value for what might have been acquired for a mere song.

In order to provide a remedy for this state of things, it is quite worth while forming a committee to enquire whether a special department should not be constituted to deal with inventions and inventors. Under the superintendence of a competent official, who is able to appreciate the value of inventions, a new era might dawn in officialdom for the benefit of all. Let it be clearly shown that any officer who fails to adopt any new method which has proved itself capable of improving, cheapening or increasing output of material is *robbing his employer*. Let it be understood that the inventor who accomplishes this is a patriot, and that there is an obligation due to him; and the department should not try and bounce him, as though he were a blackmailer. This would stimulate effort and reward those who interest themselves in the welfare of the country. Every invention should be referred to the Mechanical Engineer, Ordnance Committee, Small Arms Committee or Inspection Department as the case might be. If on the other hand it relates to methods for facilitating, cheapening or improving manufactures, invention should be reported on by the managers of the Department, and if the chief official concerned is not convinced for or against, it should be referred to a third party. Any person employed inside the factories who invents should receive a stated percentage of the saving for one year's production, say 10 per cent., and a fixed royalty on any outside manufactures based on his patent. Inventors should be discreetly encouraged. Payment on result is an absolutely safe basis, and should be resorted to where possible. The chief functionary of the Patent Department should have no fixed salary. Give him 5 per cent. of the saving effected per annum. The Commander-in-Chief would then envy him his princely emoluments.

SIGHTING GUNS FOR THE NAVY.—By a recent order, the Admiralty has decided that all the 7-pr. sighting guns hitherto employed for the turrets and barbettes of battle-ships are to be replaced by a 3-pr. quick-firing gun. The sighting guns, are mounted on the roofs of turrets and barbette shields in such a manner as to be entirely controlled by the training and elevating mechanism of the big guns.

NOTES.

BELGIUM-PROVED SMALL ARMS.—According to a report issued by the Imperial German Consul at Liége, the number of weapons which passed through the State Testing Department of that city during the year 1899 amounted to the very substantial total of 2,238,326. This total was made up in the following manner:—781,338 single gun barrels, 182,533 saloon-rifle barrels, 535,437 double gun barrels, 55,485 saddle pistols, 971 pocket pistols, 547,362 revolvers, 130,720 rifles for war purposes (large calibre), and 4,480 guns for war purposes (small calibre). The figures quoted are sufficiently instructive if compared with, say, those for the corresponding period as regards our own Birmingham Proof House, due particulars of which were given in our issue of April last.

NATIONAL EXPLOSIVES CO., LTD.—The report of the directors of this company shows that the profits for the year 1900 amount to £25,453, which with the balance of £733 brought forward from the previous year, gives a total of £26,186 available for distribution. During the year the factory has been considerably increased, the sum expended on capital account amounting to £31,775, and it was decided to write off £1,775, thus leaving the property account standing at the round sum of £120,000. A further sum of £2,500 is placed to reserve account, which is thus brought up to £15,000. As regards the distribution suggested, the preference shares are entitled to receive a dividend at the rate of 9 per cent. per annum, less 3 per cent. already paid as interim dividend. The ordinary shares are entitled to receive a dividend at the rate of 11 per cent. per annum, less 2½ per cent. already paid as interim dividend, and the deferred shares are entitled to the payment of £4 14s. 9d, per share. These payments will absorb £20,548, leaving a balance of £1,362 to be carried forward. Since this interim dividend was paid, a further amount of £16,138 has been paid up on the preference and ordinary shares, which will rank for final dividend.

HIGH EXPLOSIVES AND COMPENSATION.—On the 18th ult,, at Thorpe (Essex) Sessions, the Bench was applied to, on behalf of the High Explosives Co., Ld., for an amended licence in respect to the Company's works on Bramble Island, near Harwich. Mr. Hugh Jones pointed out, in making the application, that the growth of the Company's business required the erection of new buildings, and he produced plans to show that 14 cartridge huts were authorised, though only eight of these would be erected for the present. There was no notice of opposition, and it only remained for the Bench to satisfy themselves that there was no danger to surrounding properties. The nearest house was a cottage, about a mile distant. Harwich was four miles away, and the nearest public railway was more than three miles off. A member of of the Bench, the Rev. Arnold Page, insisted that the Company should give an undertaking to compensate in the event of life or property being damaged by explosion at the works. To this the Company's solicitor demurred, and suggested that the Bench might rely on his clients' sense of honour, whereupon the Chairman expressed fear that a Company's sense of honour might not be of much value in a crisis. He thought that their hesitation was significant. The solicitor explained that his clients did not wish to be held up as a target for everybody. Unscrupulous people in the neighbourhood might allege that any mortal thing that happened was caused by an explosion on the Company's works. Mr. Donald, the managing chemist, stated that so complete were the Company's precautions that an explosion of 40 tons of dynamite in the magazine ought not to be felt beyond 180 yards, apart from the consequent reverberation. He pointed out that there were probably fewer accidents in connection with the storage of explosives than with any other material. The Company took every possible precaution—if only in their own interests. In the result, the application was adjourned for a fortnight, the Chairman intimating that the Bench were willing to grant the licence, subject to the required undertaking being entered into by the directors of the Company.

A HIP REST FOR SPORTSMEN.—Our interesting American contemporary—*Shooting and Fishing*—has a correspondent who has invented a device which is intended to place the off-hand position in rifle shooting, so far as the weight of the rifle is concerned, on a even footing with the palm-rest position. To effect this purpose, while the sportsman still holds his weapon in the usual manner, the chief weight of the rifle is taken on an adjustable rod terminating in a palm rest-base, this latter being so far extended as to take its bearing on the left hip of the shooter. In this manner it is obvious that the weight of the rifle is transmitted in an almost direct line to the ground below the sportsman's left foot, and his hands are free to be used for giving alignment only. As an example of ingenuity, this device has undoubted claims to notice, but its practical advantages are not as yet fully established. An obvious question that arises is, whether this mechanical appliance would be permitted to rank with the palm rest? For offhand shooting, whether under the condition of competition or in the field, it certainly seems to be barred. One can scarcely imagine a sportsman waiting to adjust the rest to his hip in the interval between seeing and shooting his game. Moreover, under any condition whatever, the use of the hip rest must necessarily be confined to a certain weight of sportsman. These are not a few men, of considerable avoirdupois, who might be puzzled to select a portion of their anatomy on which to find a resting place for the lower part of the device.

IMPROVISED DEFENCES AT MAFEKING. — The recently published despatches of the generals in the Boer War show that Kimberley, with its "Long Cecil," details of the building of which have already been given in these columns, must take a second place in respect to gallant little Mafeking when it is a question of improvising artillery and other methods of offence and defence. General Baden-Powell mentions, under the heading of "Specialities," some of the remarkable makeshifts which were improvised for the discomfiture of the investing Boer forces, which include a Howitzer and ammunition, together with many other ingenious devices. The 6-in. Howitzer was made in "our workshops," under the orders of Major Panzera, by Mr. Conolly. It was built up of a tube of steel, with iron rings shrunk on in two tiers. The breech was a block of cast bronze, and the trunnions and ring were a similar solid casting. Strange to say, this gun could throw an 18-lb. shell to an effective range of about 4,000 yards. Shells and fuzes were also of home

manufacture, the fuzes being invented for the occasion by Lieutenant Daniell, of the British South Africa Police, who employed the butt-end of a Lee-Metford cartridge as the detonator. This type of fuze was in regular use with the locally-made shells. "Our so-called artillery," wrote the General, "should, of course, have been entirely outclassed by the modern high-velocity guns of the enemy, but in practice they managed to hold their own in spite of using powder, shells and fuzes, all made in our own shops." Evidently, the man behind the gun still counts for something, even in these scientific days. In other ways equal resource was shown. Mr. Fodisch, the gun-smith, reloaded Martini-Henry cartridges with home-made powder and bullets, using ordinary gun caps fixed with plaster of Paris as detonators. For trench work also, dynamite bombs were made up in small potted-meat and milk tins by Lieutenant Feltham. These were employed as hand grenades, with slow match fuzes, and Sergeant Page, the champion bait-thrower of Port Elizabeth, was able, with the help of a whip stick and short line, to throw these missiles with accuracy to a distance of 100 yards. Armoured trains, bomb-proof shelters, steel loopholes and shields for sappers also came into the programme, to say nothing of search lights, speaking tubes, electric bells and many other devices. When one considers the ingenuity and pluck shown in evolving all these out of practically nothing, the prolonged and successful defence of the town ceases to be a matter for wonder. Its bulwarks were 1,074 men, every one of them a "brick."

GUN MARKING PROSECUTIONS.

J. G. STYLES & CO., BIRMINGHAM.

ON Tuesday, the 5th ult., the prosecution of J. G. Styles, trading as J. G. Styles and Co., was heard at the Birmingham Police Court, the Gunmakers' Association being represented for the prosecution by Mr. Reginald Woulfe.

A series of summonses had been taken out with regard to the fraudulent marking of the following three guns which had been purchased from the defendant:—One marked "Allday & Co., London." £2 6s. 6d.; a second "Cox & Co., London," £3 6s. 6d.; and finally, one marked "Halton & Co., London," £2 10s. A search warrant was executed on the premises of the defendant on January 29th, and eleven guns were seized, two being marked "J. G. Styles & Co., London"; five "Barratt & James, London": and the remainder as follows;—"Harris & Muir, London"; "McDonald & Co., London"; "Hayes & Co., London; and "Moss & Co., London"; Various books were also seized, showing the extensive character of the business carried on by the defendant in connection with frudulently marked guns. The plaintiffs were represented in Court by Mr. McCardie, instructed by the solicitor of the Gunmakers' Association, and the defendant by Mr. J. J. Parfitt, instructed by Messrs. Reece & Harris.

Prosecuting counsel had only proceeded for a short distance in the opening of his case when a plea of guilty was lodged, on behalf of the defendant, the solicitor at the same time apologising for the offences committed, and urging the Court to take a lenient view, since this was the first occasion in which a similar case had been brought into court in Birmingham.

The magistrates retired to consider thesr verdict, and on their return announced that the defendant would be fined £10 in respect of each gun, a further £21 to be awarded to the plaintiffs for their costs, and finally, that he should pay the Court fees, the total cost to the defendant, excluding Court fees and his own expenses. amounting to £51. In addition to the above it was arranged and decided that the Gunmakers' Association should take possession of nine of the guns seized, the remaining two, those marked "J. G. Styles & Co., London," being returned to the defendant on his undertaking to remove the London address. to which he had no right, at the same time treating in a similar manner the large stock of guns marked in the same way which had been allowed to remain on the premises when the search warrant was executed.

CORRY & CO., CARLISLE.

On Friday, the 22nd ult., the Gunmakers' Association conducted another prosecution at Carlisle against a firm of pawnbrokers trading as Corry & Co. Mr. Reginald Woulfe acted for the plaintiffs, and Mr. Lightfoot for the defendants.

The present summonses referred to a gun marked "J. B. Adams & Co., London," which had been purchased from the defendants for £7. When the proceedings were first instituted the solicitor of the Gunmakers' Association wrote to the defendants, in accordance with Section 2 of the Merchandise Marks Act, inviting them to give an explanation showing the manner in which they had become possessed of the gun. In their reply Messrs. Corry stated that they did not buy guns at all, and that those they had had come into their possession in connection with their trade as pawnbrokers. They stated that the Adams gun had been obtained in exchange for another some three years previously. They further stated that the Gunmakers' Association was being made the instrument of the spite of a local dealer in guns who had repeatedly threatened that he would make it hot for them if they dared to sell the Adams gun. This letter at least established the fact that Messrs. Corry had been warned that it was of suspicious character. The Gunmakers' Association then set to work to try and trace the manner in which this gun had come into Messrs. Corry's hands, and it was ultimately found that Messrs. Styles had suppled it.

The proceedings against Messrs. Corry were thereupon postponed, in order to deal with Messrs. Styles in the manner above recorded. Among the books seized in Birmingham was an order book showing that the defendants Corry had purchased the Adams gun in the ordinary way, and not as stated by them. These points were fully explained by the solicitor of the Gunmakers' Association, who appeared to support a series of five summonses, which dealt with the ordinary offences of incorrect marking, and in addition with the close imitation of the name of Messrs. Adams & Co., who carried on business in London up till a recent date.

The case had not proceeded far when the defendants' solicitor entered a plea of guilty, and was thereupon fined £20, this sum to be paid to the Gunmakers' Association towards the costs of the prosecution.

MESSRS. CHARLES OSBORNE & CO. have issued a circular giving notice of various alterations as regards the prices quoted in the last issue of their catalogue.

ROUND THE TRADE.

THE report of Messrs. Walkers, Parker & Co., Ld., expresses great regret at the unsuccesstul record ot the past year's trading.

MESSRS. G. G. BUSSEY & Co., gun case makers, have closed their West End premises, and will in future carry on this business from the City.

IT has been announced that Royal Warrants, which are affected by the death of Queen Victoria, will remain in force until fresh orders are issued.

THE gun department of the Army and Navy Stores, Howick Street premises, has been removed from the ground floor to the first floor, where a splendid showroom is being fitted up.

ON the 12th ult. Mr. Thomas Pryce was found lying in his workshop in Bath Street, Birmingham, shot through the heart. A rook-rifle was by his side, and it is thought that the death was due to an accident.

The Sturtevant Engineering Co., Ld., advise us that the continued growth of their business has necessitated a change of address to more suitable offices at 147, Queen Victoria Street, London, E.C.

WE have received a programme of the International Pigeon Shooting Contests to be held at Namur this year. The opening event takes place on the 8th of April. Mr. N. Bodson, of Liège, has again been appointed armourer to the meeting.

WE very much regret to hear that Mr. James Irvine, one of the directors of Messrs. Eley Bros., Ld., has recently suffered from a severe attack of illness. The sympathy which will be felt by all who have ever come in contact with Mr. James Irvine, will also be extended to his son, Mr. J. C. Irvine, who is also a director of the same firm, on account of the anxious period through which he is passing.

THE Prix du Grand Championnat Triennal, a competition of equal importance to the Grand Prix du Monte Carlo, was this year won by an Englishman in the person of the Hon. R. Beresford, while the second, third and fourth prizes were divided between another Englishman, an Australian and an American. The winner and one of the trio favoured E.C. powder, while the other two shot with Schultze.

Messrs. Buck and Co. inform us that they have purchased, as from January 31st last, the assets, stock-in-trade, plant and trade-marks of the late firm of McCarthy, Buck and Co. The business will be carried on under the style of Buck and Co., at the address, 11 and 12, St. Andrew's Hill, London, E.C. Mr. McCarthy. late of the above firm, informs us by circular that he has joined Messrs. F. Joyce & Co., Ld., and will be in a position to take orders on their behalf.

A further development of the case of Rosbotham *v.* Hunter and Sons, of which mention was made on page 18 of our January issue, took place in the Court of Appeal, when the defendants appealed against the order of the King's Bench Division refusing to remit the action. It will be remembered that the action was instituted on alleged breach of warranty in the sale of smokeless powder for use in a muzzle-loading gun. After hearing further evidence with regard to the nature and extent of the injuries sustained by the plaintiff owing to the bursting of his gun, the Court held that, having regard to the position in life of the plaintiff, who was a working shoemaker, and to the fact the County Court has ample jurisdiction to award the plaintiff a substantial sum, the case should be remitted. It was ruled that the action depended on one statement only, that the powder was intended to be used in a muzzle-loading gun in the same quantity as though it were black powder. There would have to be proof that the powder was reasonably fit to be used as alleged, and the Court was of opinion that the case before it was equally consistent with the accident being the plaintiff's fault, or that of the defendants. In the end the order of the King's Bench Division was reversed, the costs of the motion to remit in the Court below to be costs in the cause. The plaintiff was to have his costs of this appeal as costs in the cause, and the defendants were to abide their own costs here in any event.

WEBLEY & SCOTT REVOLVER AND ARMS CO., LD.

IN their report, which was issued exceptionally early, on the 8th ult., the directors of this Company were able to present a statement of accounts, which must be distinctly satisfactory to all concerned. In brief, the result of the year's trading, after making provision for repairs, maintenance, and depreciation of plant, machinery, tools and buildings, providing for bad debts, and writing off the balance of preliminary expenses, is a net profit of £27,057; to this has to be added the sum of £302 brought forward from the previous year, making a total of £27,359 available for distribution. Of this amount, however, £8,375 had already been allocated to the payment of the preference dividend for the first half-year, and for an interim dividend on the ordinary shares at the rate of 5 per cent., so that the balance left at the close of the year amounted to only £18,984. The directors proposed the apportionment of this sum in the following way—the payment of the preference dividend for the second half-year, at the rate of 5 per cent. per annum, and the payment of a dividend on the ordinary shares of 10 per cent. for the half-year, making a dividend for the year of 7½ per cent. There would remain a balance of £6,421 to be carried forward to 1901, which shows a substantial improvement as compared with the previous amount brought forward. Looking at individual items in the accounts, it is satisfactory to note that a liberal allowance for depreciation in plant, machinery and tools, buildings, furniture and fittings, is made, no less than £2,384 being written off under those headings. Strangely enough, however, no depreciation seems to be allowed for under the category of patents, goodwill, licences and trade-marks, though it can scarcely be maintained that the first-mentioned of these items remains a fixed quantity from year to year, unless the value of new patents taken up is so arranged as exactly to balance the diminishing value of those already in operation.

The fourth ordinary general meeting of the company was held on the 19th ult. at Winchester House, Old Broad Street, E.C. Lord Ebury, the Chairman of the Company, who presided at the meeting, said in the course of an admirable address:—

It is a great satisfaction to us to be able to lay before you to-day a result from the company's operations for the past year so much better than that which was forthcoming at the close of its two immediate predecessors. The past year has been one of considerable strain upon our revolver-producing resources, and but for the admirable spirit which has throughout prevailed in our revolver-making workshops, under a manager whose services to the company deserve very cordial acknowledgment, it would have been matter of very great difficulty to satisfy the requirements of the Government. Much as we value the privilege of doing Government work, and the mark of confidence involved in placing it with us, it is not work which can, as a rule, be done in the most convenient and remunerative form to the manufacturer. I am not

referring now to the uncertainty as to when you will get contracts or what their proportions will be, but to certain apparently inevitable formalities which attach to Government work, compliance with which is not always dependent upon circumstances within the manufacturer's control. Hence delays are apt to arise which have to be made up by the costly expedient of high pressure, and react prejudicially upon a margin of profit not, from a manufacturer's point of view, by any means too ample to start with. I say this because it seems to me possible that there may be some who will regard the profit realised during the past year as a somewhat inadequate result for a year of unceasing activity; and to those—if there be any—I would further point out that activity has only prevailed in one branch of our business. It is impossible for this country to be engaged in a war entailing the prolonged absence abroad of a great number of troops, without causing serious disturbance to its sporting trade; and this disturbance has been accentuated in this particular war on account of the degree to which the Yeomanry have been, and are being, utilised—a gallant force, which, as we know, is profusely leavened with all that is most distinguished in British sportsmanship.

The ideal condition of affairs for this company would be one in which it was supplying revolvers to one or more Governments at war with one another, while, Great Britain being at peace, her inhabitants would be at leisure to devote themselves to the enjoyment of field sports; and as during the past year no such ideal condition has been forthcoming, the general body of shareholders will probably be fairly satisfied at having earned enough to pay 7½ per cent. upon the ordinary shares, and at the same time to carry forward a fairly substantial amount. The dividend would have been larger but for certain charges against the profits of the year, which I think it is fair to describe as unlikely to recur.

I stated at the last meeting that we were endeavouring to establish relations with the Far East, and that we had dispatched thither an able negotiator to represent our interests, who was keeping himself in touch with us by regular correspondence. In the course of a sojourn in China which lasted the best part of the year, during which he visited all the most important centres of commerce and followed up every available clue, Major Higgs prepared a great deal of ground, which he felt sanguine would in due course produce good fruit, provided we were willing, in some degree, to adjust our methods to Chinese requirements. But, unfortunately, before the matter had time to assume any very definite shape, the outbreak of the Boxer rebellion, the tragic events of the subsequent war, and the quickly succeeding prohibition to import arms into China, drew a sponge over Major Higgs's well filled slate, and compelled his return to this country after a journey during which he had covered about 31,000 miles. The position which China is to occupy amongst nations for the future is too uncertain to afford the basis of a forecast as to the extent to which Major Higgs's footsteps will be traceable when matters settle down. Meanwhile the profits of the year have been debited with £937 as the expense of that which I can by no means admit to have been an unwise, although it may possibly turn out to be an unremunerative venture.

Another charge against the profits of the year which will not recur is one of £800 expended upon the premises of our allies, Messrs. Scott. Everybody knows what a different appearance premises present when they are in full occupation from that which they present when they are dismantled and bare. Messrs. Scott having taken close order with us in Weaman Street, it became necessary to make their premises attractive to possible purchasers and lessors, and these premises being practically freehold, now that they have been made tidy we do not anticipate any difficulty in finding a market for them, very likely before, but certainly when, the sporting trade regains its prosperity.

A third item, and an important one, against the profits of the year, consists in a triple dose of preliminary expenditure, You are aware, I dare say, that it had been contemplated to write these expenses off in five annual sums of equal amount. Two have been written off, and at the close of the past year three remained, about which the auditors expressed the somewhat strong opinion that, having regard to the circumstances, the books ought to be disencumbered. So you will observe that but for the Far Eastern enterprise which was brought to a premature end, and for the expenditure of which our allies were the innocent cause, and that suggestion of the auditors with regard to preliminary expenditure—in which I am bound to say we cordially concurred—there would have been nearer £3,000 than £2,000 more profit as the result of this year of unremitting activity—an extra profit absorbed by items, two of which certainly will not recur, whereas the third, I think, also will not recur to anything like the same extent in any future statement of profit and loss.

Dealing with the accounts, the item under the head of repairs and maintenance of plant, machinery, and tools, on the one hand, and of buildings, on the other, shows a considerable increase under both denominations. The increase under the first denomination I have come across in my remarks with regard to Messrs. Scott's premises. Then, the more business you do, the more repair and maintenance your tools will require: and, resolved as we are to turn out the best work, the maintenance of plant and all connected with it in the highest state of efficiency is a mere corollary of the situation. On the credit side no doubt you will have observed with satisfaction that the gross profit has increased by £19,407. Freehold land and buildings is increased by £2,410—the cost of various structures which will contain our electric installation; and the next item for plant, machinery, and tools has a direct connection with it, because of £2,867, which represents its increase, £2,254 refers to the same installation. Stock in hand has increased by £2,783. Cash and bills in hand show a deficit of £29,901—a circumstance requiring explanation, and finding it in the next item, which is investment in War Loan and Treasury Bills at cost, £44,536. The greater part of this sum is the balance of a fund provided as working capital at the formation of the company. Out of it has been provided a fine range of buildings to accommodate our allies at a cost of £12,400. The barrel-boring business has been purchased at a cost of £1,250; the larger moiety of expenditure upon electric installation has been defrayed; and when all capital expenditure in sight has been met there will remain a balance of at least £30,000, which, although it may not be called so, represents an important and effectual reserve against the item for patents, goodwill, licences, and trade marks.

A shareholder, whilst congratulating the directors on the improvement in the balance-sheet, pointed out that the expenses came to 40 per cent. of the profits. He also thought that it was time something was written off from the very large

amount set down for patents and goodwill, an item of £170,000, and he endeavoured to obtain further information as to the automatic pistol experiments.

Lord Ebury, however, said that the directors did not think it advisable to say anything further on that point at the present moment.

The report was unanimously carried, and Lord Ebury, who was re-elected a director, in responding to a vote of thanks, paid a high tribute to the work of the secretary, and the whole of the Birmingham staff.

NOTES ON THE SO-CALLED HEAT TEST.

Volumes have been written on this subject, and we seem to be no nearer finality than we were 10 years ago. Mr. Wm. Cullen, in a paper recently delivered before the Society of Chemical Industry under the above title, has, however, carried the matter a stage further, and from all that we can learn his proposal is likely to meet with every support from the heads of the different Government apartments, as well as from the principal manufacturers of explosives. Few empirical tests have such effect on processes of manufacture as the "Heat Test," which is employed as the gauge of the chemical stability of the explosive. No one seems to claim that it is perfect; many, indeed, prefer others, but after all, the Home Office test, with slight modification, is used all the world over, and that in spite of numberless attempts to introduce something more satisfactory. It seems, nevertheless, to have fallen somewhat into disrepute, and one of the principal reasons appears to be the difficulty of making successive batches of papers of the same degree of sensitiveness. Tables of results were shown by Mr. Cullen proving that "Test Papers," all apparently made in the same manner, gave widely different results, and it will be sufficient if one example is given. The tests were carried out with cordite, and the papers employed were from six separate sources.

	Series I	Series II.	
Paper A ...	22 ...	19	minutes
„ B ...	27 ...	24	„
„ C ..	40 ...	37	„
„ D ...	21 ...	25	„
„ E ...	50 ...	46	„
„ F ...	37 ...	37	„

Maximum difference in first series 28 minutes.

Maximum difference in second series 27 minutes.

In the face of these results it does not seem surprising that the test has fallen somewhat into disrepute. In investigating the cause of these differences, the author comes to the conclusion that they lay principally in the quality of paper employed, the texture and thickness, both having an important bearing. In a general way these facts were known to manufacturers, and so long as the test was used as a factory test pure and simple, little harm resulted; but as the paper seems to have such an important bearing, it is not unreasonable to suppose that quantities of cordite or, indeed, any other explosive might be rejected on the grounds of chemical instability when the papers were really to blame. Blame is perhaps hardly the correct word to use in this connection, but in any case they might not be quite the same as previous lots. What the author proposed was that manufacturers ought to combine and copy the procedure adopted by the War Office, which procedure seems to work admirably. All the test papers for home and abroad are made at one place by one person, and care is taken that the same paper is always used. If the proposal is given effect, the "central supply" would be in constant touch with the chemical apartments of the Home Office and War Office, no doubt the same explosive would be used by all three for standardising, and there would be every reasonable chance for the papers to be as nearly alike as it is possible to make them. To illustrate his point, the author showed several diagrams exemplifying the methods in use at Woolwich and Waltham Abbey for getting continuity of results. The "central supply" would require to lay in a stock of paper and the necessary chemicals sufficient to last for a number of years. Each batch of papers as they were made would be tested against those of Woolwich and the War Office, and although they could not pretend to emanate officially from these sources, they would be a "fac simile"—which is the same to all interests and purposes. Even in its new form abnormal results would be obtained, but they would not be of such frequent occurrence.

The "Heat Test" does not attempt to measure the relative stability of different explosives. For instance, the mere assembling together of the different ingredients which go to form cordite could not possibly produce an explosive 4 times as stable as the guncotton employed. The physical state of the new body is quite different to that of the original ingredients, and physical sub-division is perhaps, one of the greatest factors in the carrying out of the test. It is known that certain bodies, when assembled together, give a product—say cordite. When this is subdivided, a certain heat is obtained, and general experience shows what may be reasonably expected in general manufacture. If, in a special case, the test does not come up to standard, then there is something abnormal about the explosive itself, or one of the ingredients. This is an instance where the test is lengthened, but in other cases the converse can happen. Such, for instance, the admixture together of nitro-glycerine and guncotton in the preliminary stages of cordite making. Experience has shown therefore that by the assembling together of certain materials a certain "test" is generally obtained, and is to be expected. If it is lower, unstability may be looked for; if higher, then masking, deliberate or accidental.

Undoubtedly the advent of the horny, smokeless powders of modern times has made it a little difficult to give the test the same scope as it had when first introduced; but here, again, it is only a question of adapting it in a common-sense manner to the special circumstances arising. In many cases it would certainly be advantageous to have a verification test, and perhaps that recommended by Mr. Oscar Guttman or Dr. Spica would form a valuable adjunct to the present test, which does perfectly well, however, in 999 cases out of every 1,000. It must be confessed, however, that it is too sensitive, and most experimenters know, or have been led to assume, that bodies other than the products of decomposition frequently affect the papers adversely. At times batches of explosives, made from perfectly stable ingredients, fail to pass the specified test, but, if kept for a time, they gradually improve. What the peculiar bodies, which behave as has just been described, are, no one has as yet found out, but the mere mention of a fact like this goes to show that there is still a field for research in this already much-investigated sphere.

LECTURES TO YOUNG GUNMAKERS.

XI.

PRESSURES.

WRITTEN WITH THE COLLABORATION OF F. W. JONES.

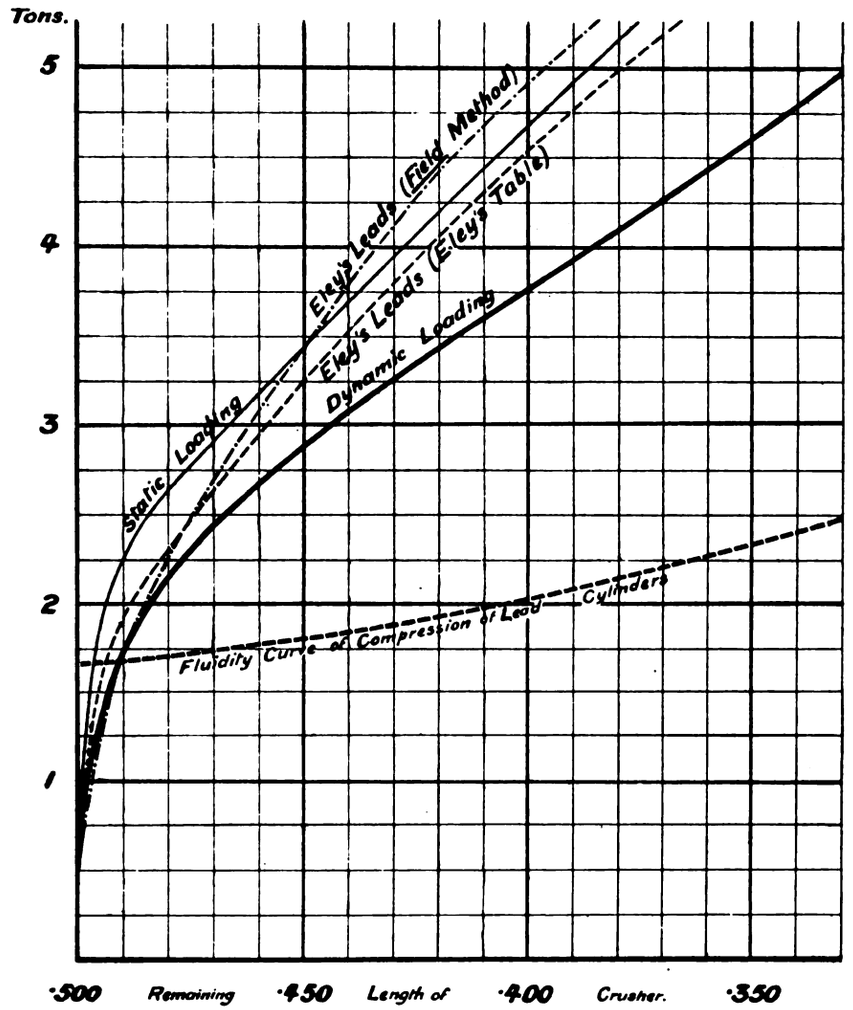


FIG. 12.—CURVES RELATING TO ELEY'S CRUSHERS.

IN this lecture, which summarizes and completes what has already been said on pressures, we propose to restrict our remarks and observations to Pressure Tables, Crushers and the practice of the trade. The series of curves here illustrated appeared as Fig. 8 in the last lecture, and is now reproduced, owing to the necessity of frequently referring to it. It consists of statical and dynamical curves, showing the behaviour of Eley's 1900 issue of lead crushers. To these have been added the corresponding values derived from the Eley table, and also that recently issued by the *Field* to show the results given by the testing apparatus we described and commented upon in the last lecture.

At the risk of re-covering ground already trod, we will point out exactly what the diagram is intended to express. Eley's leads shorten when subjected to pressure. According to the Eley table a given shortening has been produced by so much pressure. The *Field* table says it has been produced by another quite different pressure. Coming back to fact, the static curve shows the value for this same shortening as produced by a weight gradually released so as to exert its pressure very slowly, thus giving the crusher time to shorten before the whole weight is applied. Similarly the Dynamical Curve shows the pressure value of the same shortening under conditions in which the weight is brought into contact with the crusher and then allowed to exert its whole pressure. The vertical lines in the diagram show various amounts of crushing, as measured by the remaining lengths of the crushers after treatment. The values of these crushings are

shown by the figures at the foot of the diagram, from which it will be clear that each vertical line represents a remaining length of ·01 of an inch different from the adjoining lines. The horizontal lines, as is denoted by the scale of tons at the side, show a series of pressures, ranging from zero to five tons, the space between two lines representing ·2 of a ton. These curves have of a necessity been reproduced on a very restricted scale. Consequently it has not been possible to show any great detail, as is evident from the fact that in the original, from which the illustration was prepared, the sheets measured about thirty inches square, Consequently the present illustration can only be considered as giving a general idea of the relative values of the curves reproduced. To make clear the working of the curves we may take a shortening that leaves a remaining length of crusher equal to ·400 of an inch as an example. The Eley table says this would be produced by a gas pressure attaining at its maximum a value of rather more than 4·5 tons per square inch, provided, of course, the experiment be made with a crusher piston of the standard size. The *Field* table says this ought to be rather under five tons; whereas we know that a static load rather under 4¾ tons, and a dynamic load of 3¾ tons actually produce the above shortening.

To test how far these four curves shown are accurate, and conform throughout their length, we arranged for the taking of a series of pressures of some 12-bore cartridges, loaded with various charges of No. 2 black. In one case the piston acted on one crusher and in the other on two placed side by side on the multiple system. The pressures, as shown by the curves of Fig. 12, were read off for the different compressions, and in the case where two crushers were used, these were added together. The following table gives the average results, the figures in brackets showing the difference between the two series :—

Arrangement.	Eley's Curve.	*Field* Curve.	Statical Curve.	Dynamical Curve.
With one crusher..	2·58 (1 11)	2·60 (·55)	2·85 (·00)	2·48 (·13)
With two crushers	2·67	2·05	2·85	2 35
With one crusher..	2 84 (·04)	2·92 (·85)	3·05 (·10)	2·67 (·22)
With two crushers	2·88	2·07	3·15	2 45
With one crusher..	3·24 (·20)	3·40 (·85)	3·37 (·30)	2·90 (·04)
With two crushers	3·44	2·65	3·67	2·86
With one crusher..	3·62 (·09)	3·90 (1·10)	3·70 (·29)	3·15 (·18)
With two crushers	3·53	2·80	3·90	2·97
With one crusher..	3 88 (·12)	4·15 (1·02)	4·00 (·10)	3·32 (·02)
With two crushers	3·76	3·17	4·30	3·30
Agg. Difference ..	(·56)	(4·37)	(·79)	(·59)

This table does not show whether the pressure given by any curve is exact, as will be obvious if one considers that if the whole pressures were divided by some number, the same relation would still exist. The test shows without any doubt whatever whether any particular table is accurate and conforms with itself, *i.e.*, whether any particular pressure of, say, 2·5 tons is exactly double the pressure of 1·25 tons, or half 5·0 tons.

The conformity shown is close in the case of Eley's table, and the results are very much out with the *Field* table. We gave our reasons in lecture X. for regarding the latter apparatus as unsuitable for the purpose intended. The curves elucidate our points very well indeed. For light loads, such as correspond to about 1¼ tons, the error in reading the load, caused by the amount the spring was allowed to compress, makes the load read less than the real one, and consequently the compressions given are too great for light loads. The error due to suddenness of application, being of an opposite character to the above, namely, causing the load to be read higher than the actual value, has a compensating effect from 1¼ to 2 tons, but from 2 tons upwards it becomes more and more evident.

In Eley's curve it will be noticed there is a point of sudden change at just below two tons, and the curve from this point up to 3 tons is not uniform with the remainder of the curve. We think this is due to tabulating the results obtained in the machine testing without taking the precaution of laying out the results on squared paper and drawing the average curve, so as to get rid of the slight variations due to experimental divergencies. Had Messrs. Eley adopted the latter recognised plan their curve would not have presented this anomaly. If Eley's curve lay uniformly under our statical curve, the "multiple crusher" test would have given greater conformity, as is shown by the following table obtained for such a rectified curve :—

"MULTIPLE CRUSHER" RESULTS WITH ELEY'S RECTIFIED PRESSURE CURVE.

Cartridge.	One Crusher.	Two Crushers.	Difference.
A	2·67 tons	2·67 tons	nil
B	2·92 ,,	2·88 ,,	+ ·04 tons
C	3·24 ,,	3·46 ,,	— ·22 ,,
D	3·62 ,,	3·59 ,,	+ ·03 ,,
E	3·88 ,,	3·93 ,,	— ·05 ,,

Messrs. Eley would do well to rectify their table when, in our opinion, it would leave nothing to be desired. It is not suggested that Eley's rectified curve would give an absolute relation between pressure and compression of their lead crushers. We do not think this is possible with lead, as it contains so many elements which it is impossible to fix with any degree of accuracy. We do say, however, that such a rectified curve would give, according to our experience, as reliable a curve for determining pressures with their lead crusher as any others that could be suggested, and, as the trade in all powder-making countries are accustomed to its use, it would be folly to propose a table giving radically different figures for Eley's lead crushers. It is to be regretted that Eley's adopted a semi-dynamical method of loading for arriving at their figures; a statical or maximum dynamical loading would have been more preferable. Usage, however, gives an unanswerable argument for the retention of their figures; and, further, it must be remembered that for lead, unlike copper, there is no definite pressure value for a given crushing, and, therefore, an arbitrary table, provided it is fairly consistent within itself, as judged by the multiple crusher process, is the right thing to use if universally adopted.

In our opinion new crusher tables should be arrived at by a gradual or statical loading, or by a load put in all at once without initial velocity, such as we have termed the maximum dynamical loading. Methods of loading intermediate between

these only complicate the interpretation of the crusher gauge. It is absolutely futile to attempt to imitate the way a crusher is loaded in a crusher gauge, and obviously nothing is gained to assist the interpretation of pressure readings by adding a variable element in the shape of an indefinite semi-dynamical crusher table. Tables constructed as we suggest can be imitated by anyone, and are easily understood, and we have only to consider whether it is possible to make our crusher gauges work at one or other of these two limit methods of loading, so that we may rely absolutely on the pressure readings. If this is not possible in any particular instance then the pressures should be taken in a relative but not proportional sense.

We have seen that with lead crushers the duration of the load above a certain point has a most important effect on the resulting compression, and that this duration element practically destroys all the reliability of lead crushers. Moreover, the time a crusher takes to develop its resistance is an inverse function of the rate it is compressed by increasing loads, and as lead is compressed unit-length by a comparatively small load it follows that it develops its resistance slowly. This comparatively slow time-resistance curve of lead crushers would cause the pressure to be put on mainly dynamically even for pistons in the powder chamber, and moreover the load may be taken off before the crusher reaches a resistance equal to the amount of the powder pressure. Again, owing to the low pressure at which lead commences to flow, see Fig. 8, the comparatively small gas pressure, after the maximum pressure has been passed, which continues until the exit of the shot, may further complicate the results. Thus lead can hardly be regarded as a reliable metal for crusher work, but as it will doubtless continue to be used on account of its general handiness, where absolute values are not required, variable elements should be constantly borne in mind, and the results of lead crushers taken in a restricted comparative sense only.

The elements of copper crushers can, on the other hand, be determined with great accuracy. It is undoubtedly the most reliable metal for crushers. Within the limits of crusher tables the duration of the load has only slight effect, and these are explainable by the vibration or tremors of the testing machine. The relation between dynamical and statical loading is simple, and has an exact mathematical basis, so that one can be derived from the other. Moreover the amount of compression for a given increase of load is small, and, therefore, the time-resistance curve rapid, so that statical curves may be used for most crusher work, except for pistons removed from the powder chamber proper, where dynamical loading by the powder gases must necessarily take place.

Copper crushers should be made in one general way. The copper should be turned to the exact size and then heated to cherry red and tempered by cooling in powdered charcoal. Made in this manner, coppers of various sizes bear an exact relation one with the other, a crusher of twice the area of cross section, and of the same length, requiring double the load to produce a given compression, and a crusher of twice the length and identical area requiring half the load to produce the same decrement. Thus it is easy to derive a table for a given copper crusher of any size from a standard table in existence. For shot gun work we would suggest a copper crusher of one-eighth of an inch diameter and one-quarter of an inch in length, and that the piston of the gauge be ·320 of an inch diameter, representing an area of about ·080 of a square inch. This combination would give a statical decrement of one-thousandth of an inch for a pressure of about ·10 of a ton, and give readings from half a ton upwards. A piston of this size would be quite practicable for 12-bore guns, and the crushers proposed would give reliable results between one ton and four tons. For pressures above this limit two such crushers could be used in parallel, or side by side, on the same piston, the pressure developed being the sum of the two readings giving us a limit of eight tons. By this arrangement the same crushers and proof barrel could be used for fixing proof charges and for testing cartridges of commerce. It is impossible to give a combination of copper crusher and area of piston of wider range than the above without approaching too near the flow of copper.

In the actual practice of taking pressures the pistons occupy two positions, viz., in one case the base of the piston is in the powder chamber proper, as is the case with 1 inch plug of a shot gun proof barrel, and in the other the pistons are fixed at various points up the barrel. Obviously in the latter instance we must nearly always read the compressions of the crusher by a dynamical table, but in the former case the action of the forces of the powder gases may be statical, or more or less dynamical.

For lead crushers we can offer no instructions, and can only wish for a general system. This in effect is what is more or less taking place. Eley's crushers and their table are being used throughout the world, and we plead that as far as lead crushers are concerned theirs be taken for the standard. We would, however, like to see the development of shot gun crusher gauges with copper crushers on the lines we have laid down.

In rifle work copper crushers are invariably used, and the pressure tables are always statical. So far this is good, but in many gauges the powder gas pressure is dynamical, and as one and the same table is always used for given crushers, erroneous results are frequently obtained and published. It will be obvious from our previous remarks that all pistons beyond six inches from the breech will be loaded dynamically by the powder gases, and in these the compressions should be divided by one half to arrive at correct pressures from the values given in statical tables. For pistons in the powder chamber, and those near the end of the cartridge case the action may be partly dynamical, and, therefore, not easy to interpret on an exact basis. We pointed out early in this course that to obtain a correct estimation of pressure we must make our gauges work at one or other of the two limits, and we have now to see to what extent this is possible.

We will just deal with the piston in the powder chamber proper, the base of the piston forming part of the walls of the chamber. In Lecture VIII., it will be remembered, we showed that all powders must have a characteristic time-pressure curve, *i.e.*, that the maximum pressure is developed at a certain rate. We have also seen that for copper crushers the rate at which they develop their resistance when loaded all at once is given by

$$t = \pi \sqrt{\frac{m}{\kappa}}$$

Any other method of loading contains the same terms divided in a certain ratio.

To obtain a statical loading of a given copper crusher, it should be able to develop its resistance just as quickly as the pressure rises, so that at each instant there is an equilibrium between the resistance of the copper and the forces acting on the same through the intermediary of the piston. To attain this end our crusher should develop its resistance rapidly so that t in the above expression should be small. Consequently the piston (m) should be as light as possible, and the crusher as large as possible so that (κ), the load which produces unit rate of decrement, is comparatively large. Moreover, as was shown in Lecture VIII., the more nearly the crusher is compressed before the experiment to the value of the expected pressure, so that the further decrement is small, the more likely are we to avoid dynamical effects, or as it is usually termed, the effects of inertia. Our copper crushers should, therefore, be as large as possible, consistent with giving measurable readings, and the crushers should be compressed up to about 80 per cent. of the pressure expected.

We would then suggest that the crushings obtained from all pistons in the powder chamber and within six calibres from the base of the wads or projectiles should be read statically, and that for all other pistons the compressions should be read dynamically. This may seem rather arbitrary at first sight. In practice rifle proof barrels have pistons at one inch, three inches, and six inches. The one-inch and three-inch pistons would be taken as receiving their loads on the statical principle, the six-inch pistons and others beyond as receiving dynamical loads. In a case where the expected pressure at three inches is twelve tons we should use a crusher that had been previously loaded up to 9½ tons. At the three-inch plug it is more than likely that the powder would not be all consumed, and the pressure would not have reached its maximum. If the piston received a pressure at first under 9½ tons the effect, most likely, would be that of statical working. At six inches, however, the pressure would have passed its maximum, and would, therefore, be put on all at once. On the six-inch piston, therefore, undoubtedly we have a maximum dynamical loading in such instances. The above remarks would apply equally to shot gun proof barrels when copper crushers are used.

Above we have only considered rifle proof barrels with side pistons. For small bore rifles such pistons cannot well exceed an area of one-thirtieth of a square inch, and consequently the diameter of crusher has a very small practical limit. In the base pressure apparatus, such as the Woolwich proof barrel, the cartridge itself is the piston, and has, in the case of the ·303, an area taken at ·1774 of a square inch. Consequently a very much larger crusher can be and is used, with all the advantages as regards quickness of developing resistance, and more likelihood of obtaining exact statical working. For the ·303 Woolwich proof barrel the time resistance curve of its crusher for loading all at once is ·000018 of a second. The use of the base pressure system gives an immense advantage, and, moreover, as all small and large bore rifles can be fitted to the same pressure taking apparatus, the facilities for comparing the results obtained are considerable, and this confers on this system a great superiority as compared with any other method.

In all proof barrel work, velocities should be taken at the same time as pressures, since many details, such as the device used for firing the charge and the methods adopted for preventing escape of gas, have a material influence in increasing or decreasing the velocity; and obviously, if for any reason a cartridge develops more or less power, the pressure will drop or fall in consequence. Therefore it is absolutely essential to observe the velocity simultaneously with taking the pressure in order to ascertain whether in this respect the cartridge is doing the same amount of work on the shot as under normal conditions of shooting.

Our next lecture will summarize all that has been said on the subject of pressure testing, and in it some effort will be made to induce gunmakers (who are "young" in the sense that they are still open to new ideas) and others interested to divest their minds of the tangle of undigested theory with which its consideration is usually hampered, and thereby learn that plain direct pressure testing for commercial purposes can be effectually carried out if certain simple factors are kept prominently in view.

ADDENDA.

In Lecture IX, January issue, page, 10, on the twelfth line of the second column, the following should be added after the words "OCAD is greater than the area OAD":—"And in the same way the maximum dynamical load OR would compress the spring as much more than OA, as the area ORAD is greater than the area OAD."

In Lecture X, February issue, page 22, in the first column, the two paragraphs commencing "In our expressions above" and "While R is the average resistance," respectively, should be transposed so as to precede the paragraph commencing "It will be quite clear."

DYNAMITE PROJECTILES.—Herr Elias Elmelin, an engineer, of Sundsvall, in Sweden, has recently been exhibiting the qualities of dynamite projectiles of his invention, which can be fired from an ordinary gun or rifle loaded with powder, and yet do not explode except on impact with some object. At a series of trials conducted before a body of military and engineering experts, most satisfactory results were attained, the projectile in no case exploding until it struck against a concrete wall at which it was aimed. The damage done by the explosive was considerable. Some part of the experiments were made with an ordinary Remington rifle.

CORRESPONDENCE.

THE BROWNING AUTOMATIC RIFLE.

TO THE EDITOR OF *Arms and Explosives*.

SIR,—In your description of my automatic rifle in the January issue of *Arms and Explosives*, you described the arm as firing automatically so long as the pressure on the trigger is retained. This is a mistake, though a pardonable one, on your part, as the trigger action is not explained in the specification for the rifle on account of its being identical with a previous automatic shot gun patent, but it is so arranged that it can only be fired once with each pressure of the trigger. This is accomplished in an exceedingly simple manner, in fact, without the addition of a part to the simplest locks commonly used, just a hammer, main spring, trigger and trigger spring. I enclose specification of the shot gun patent referred to which describes the action fully.

I am pleased to note the general accuracy of the articles in your most excellent magazine, and beg to remain,

Yours very truly,

Ogden, Utah, U.S.A. J. M. BROWNING.

Feb. 6, 1901.

[The sentence in our description of the Browning automatic rifle referring to the trigger action of this weapon was as follows:—"The weapon will fire continuously until the magazine is exhausted, so long as the trigger is held back; but, of course, deliberate aim may be taken by releasing the trigger after each discharge," which was based upon the following lines (No. 5 to 8, page 1) taken from the English patent No. 14,920, 1900, from which our description was written:—"The gun is of that character which will continue its fire, after the first discharge, as long as there are any cartridges in the magazine, if the trigger be held back, but which may be fired slowly if desired by a proper manipulation of the trigger, the loading being effected by recoil." The American patent, which Mr. Browning has kindly sent us, contains a clear description of the trigger action which makes it evident that the English patent was vague on this point.—*Ed. A. & E.*]

APPLICATIONS FOR PATENTS.

JANUARY 21ST- FEBRUARY 16TH, 1901.

1,322. Projectiles. A. Reichwald (Agent for *Fried. Krupp*).
1,323. Compound Fuses A. Reichwald (Agent for *Fried Krupp*).
1,360. Ordnance Sighting. A. A. Common.
1,381. Ammunition Hoists. A. T. Dawson and J. Horne
1,500. Projectiles. J. A. Wilding.
1,501. Fuse Clamps. J. A. Wilding.
1,579. Projectiles. F. Render.
1,606. Rifle Sights, R. Wake.
1,658. Targets. H. B. Sleeman (Agent for *F. Möller*).
1,677. Telescopic Sights. A. A. Common.
1,727*. Fire-arms. N. Pieper.
1,847. Fire-arm Support for Cycles. A. Ord.
1,857. Cartridge Belts. P. A. Martin.
1,943. Small-arms. J. D. Thompson.
2,014. Explosives, Shells, and Fuses. H. Geary and E. Neal.
2,024*. Shrapnel Shell. C. M. White (Agent for the *Rheinische Metallwaaren und Maschinenfabrik*)
2,093. Breech Mechanism of Guns. C. Holmström
2,113. Magazine Rifles. R. C. Pudney.
2,114. Telescopic Sights for Rifles. N. Mallock.
2,127. Fuse Heads for Blasting. W. A. and S. R. Malson.
2,187. Gun Barrels. E. R. Martin.
2,202. Fire-arms. C. P. Clément.
2,239. Brakes for Gun Carriages. G. V. Allen and J. E. Schumacher.
2,253.* Explosives. J. P. Bernadou.
2,257. Ordnance Practice Apparatus. H. W. Blundell.
2,269*. Sighting Apparatus. C. P. E. Schneider and J. P. G. A. Canet.
2,339*. Nitrocellulose. D. Bachrach.
2,367. Explosives. A. Luck.
2,391. Automatic Magazine Fire-arms. H. W. Holland.
2,432. Rifle Ranges A. E. Ingledew, and A. B. Lennox.
2,577 Obturators for Ordnance. A. T. Dawson, and G. T. Buckham.
2,605*. Magazine Rifles. O. Imray (Agent for *S. Lee*)
2,650*. Explosive Mixing Machines. J. C. Schrader.
2,676. Rifle Sighting A. A. Common.
2,812. Fuses for Projectiles. H. V. Keeson.
2,864. Magazines of Fire arms. T. McKenna (Agent for *R. J. Browne, and F. W. Petley*).
2,865. Magazines of Fire-arms T. McKenna (Agent for *R. J. Browne and F. W. Petley*)
2,897. Oil for Fire-arms. F. T. F. Wilson.
2,905. Torpedoes. G. H. Jones.
2,910. Gun Carriages. J. Van Swilten.
2,924 Apparatus for Testing Straightness of Gun Barrels. F. Stordeur.
2,969. Rifle Carrying Attachment for Cycles. G. D. Petrie.
3,011. Magazines for Fire-arms. P. Jensen (Agent for *Krag-Jörgensens Geværkompagni*).
3,090. Liquid Air Cartridges. L. Callender.
3,155. Shrapnel and other Shells. H. D. Rattray, and J. S. Kershaw.
3,156. Shrapnel and other Shells. H. D. Rattray, and J. S. Kershaw.
3,173. Range finder. A. Barr, and W. Stroud.
3,196. Cartridge Clips. G. V. Fosbery.
3,237*. Cartridge Belts. A. Mills, and T. C. Orndorff.
3,245. Shooting Saddle. P. F. Collier.
3,317. Moving Targets. F. Ward, and E. W. Phillips.

* These applications were accompanied by Complete Specifications.

SPECIFICATIONS PUBLISHED.

COMPILED BY H. TARRANT.

JANUARY 26TH--FEBRUARY 16TH, 1901.

214 (1900). **Manufacture of Explosives.** A. C. Girard, Paris. Explosive compounds in which solidified oil, obtained by dissolving dry soap in a hot state in animal or vegetable oil, is mixed with some such supporter of combustion as chlorate or perchlorate of potassium or ammonia Several proportions are set out in the specification, among which are chlorate of potassium 80 parts, solidified oil 20 parts. Among mixture consists of chlorate of potassium 80 parts, nitronapthaline 6 parts, and solidified oil 14 parts. Accepted Jan. 3rd, 1901.

655 (1900). **Training of Ordnance.** G. E. Vaughan, London. (Agent for *J. A. Vaughan, South Africa*) The electrical apparatus, described in this specification, is intended principally for the manipulation of a ship's rudder from a distance, but is also applicable to the training of guns. The operator, who may be at any distance from the gun, is enabled by electrical means to train the gun,, and a pointer working on a disc keeps him posted as to the exact movements of the gun. Accepted Jan. 11, 1901.

1,674 (1600). **Range Finders.** W. J. and I. G. Harrison, Wirksworth. An instrument, consisting of a mirror, having marked upon it a vertical sight line, which is attached to a rifle in such a manner that the objects reflected on the sight line when aiming the rifle are at right angles with the line of sight of the gun. Two shooters using rifles with this device attached, aim at the same object from different ends of a known base and from the measurements thus obtained a complete right-angled triangle is obtained whereby the necessary range is discovered. Accepted Jan. 26, 1901.

2,002 (1900) **Small-arm Mechanism.** Sir C. H. A. F. L. Ross, Ross-shire. The rifle mechanism described in this patent is chiefly applicable to the recoil-operated arms referred to in a former specification No. 5,683, 1896. The breech mechanism in the present patent is of the hand-operated bolt type, and in a bulky specification the numerous details of the mechanism are fully dealt with. Accepted Jan. 26, 1900.

2,359 (1900). **Fuses for Shell.** A. T. Dawson, G. T. Buckham, and S. V. Dardier, London. The fuse described combines the functions of time and percussion, that is, it may be used either to ignite the charge at a predetermined time, or when the flight of the shell is suddenly arrested. Both methods of ignition are operated by means of pellets, the insertion of one pellet causing it to fly backwards and ignite the time fuse, and the inertia of another pellet causing it to fly forward and strike a needle when the shell is suddenly arrested. Accepted Jan. 5, 1901.

2,650*(1901). **The Baker Single-trigger Mechanism.** W. Baker, Birmingham.

2,766 (1900). **Time Fuses for Projectiles.** H. H. Lake, London (Agent for *R. H. Quisling, Norway*) A time fuse for projectiles so constructed as to be absolutely safe during transport and handling A timing key is used to time the fuse, the key being inserted in a slot in a fixed ring to disengage the moveable safety stopper, and to alter relatively the position of two rings and so indirectly to time the fuse. Accepted Jan. 12, 1901.

2,882 (1900). **Automatic Fire-arm Mechanism**. C. H. R. Clausius, Hamburg. Automatic recoil-operated breech mechanism for pistols, which is constructed especially with a view to simplicity and cheapness. Very few parts go to make up the mechanism, only five being used in the breech recoiling arrangement. Relatively weak springs only are needed, and even weak explosive charges are strong enough to recoil the barrel and breech-bolt for reloading. Accepted Jan. 26, 1901.

3,088*(1900). **The Osborne Single-trigger Mechanism**. C. O. Ellis and E. W. Wilkinson, Birmingham.

3,206 (1901). **Rammers for Ordnance.** Sir W. G. Armstrong, Whitworth & Co., Ld., and C. H. Murray, Newcastle-on-Tyne Chain-actuated rammers for heavy ordnance, in connection with which a method is explained of disposing of the chain when run back and out of the gun. One end of the chain is fixed to a spindle, upon which it is re-coiled when run back. The spindle turns in sliding bearings, which move between guides and raise or lower the spindle as the chain is made to run out or back. Accepted Jan. 12, 1901.

3,207 (1900). **Rammers for Ordnance.** Sir W. G. Armstrong, Whitworth & Co, Ld., and C. H. Murray, Newcastle-on-Tyne. A rammer for heavy ordnance consisting of two or more bars arranged to slide telescopically one within the other. All the bars except the central one are formed trough-shaped, and toothed racks are cut on the tops of the sides of the trough bars and on the top of the central bar. Being all on the same level the bars composing the rammer may be run out by one long pinion, which extends across them, and this may be worked by hand or by power. Accepted Jan. 12, 1901.

3,477*(1900). **Sights for Rifled Arms**. H. Greener, Birmingham.

4,049 (1900). **Breech Mechanism of Ordnance**. Sir W. G. Armstrong, Whitworth & Co., Ld, and Sir A. Noble, Newcastle-on-Tyne. In the breech mechanism of ordnance described, the carrier arm is made in two parts pivoted together, one part being pivoted to the gun, and the other to the breech block. This arrangement allows the breech block to be withdrawn from the breech in an almost straight line, so clearing the obturator from the breech before the block commences to swing rearwards about the carrier arm pivot. Accepted Jan. 26, 1901.

4,593 (1900). **Manufacture of Nitro-explosives.** W. D. Borland, London. In the regulation of the hardness, density, and explosive qualities of nitro-compounds, an emulsion consisting of methylated spirits and small quantities of acetone, camphor, liquid paraffin, benzoline, or refined naptha is used instead of a solution. A method is described also of removing the solvent which usually clings in small quantities in the manufactured explosive. The method consists of treatment by warm air at about a temperature of 150 deg. F., which must be charged with watery vapour. Accepted Jan 19, 1901.

4,593* (1900). **Manufacture of Nitro-Explosives.** W. D. Borland, London.

4,623 (1900) **Training of Ordnance**. A. Reichwald, London (Agent for *Fried. Krupp, Germany*) Modifications of the apparatus for adjusting ordnance, described in Patent No. 8,473, 1899. The gunner is enabled, without leaving his place when sighting the gun, to see the relative positions of the pointer and the sighting curve plate, and is so enabled to control the elevation or depression of the gun. The pointer and pointer-shaft are made hollow for this purpose, and are provided internally with a series of mirrors, through which the image of the end of the pointer and the corresponding part of the curve are transmitted to the sighting telescopes. Accepted Jan. 19, 1901.

4,955 (1900). **Hardening of Projectiles**. C. Micholetzky, and J. Spitzer, Austria. A method of insuring uniform hardening of shells. The projectile to be hardened is immersed in a vessel filled with water, and while there is douched, both internally and externally, with water under pressure by means of two jets or nozzles. The temperature of the water in the vessel and that under pressure may be regulated as the case necessitates. Accepted Jan, 12, 1901.

6,212 (1900). **Pistol Holsters**. G. Martin, London. Instead of the flexible caps which folds over the top of the ordinary pistol holster, a cap is provided which is pivoted by means of buttons to either side of the holster. This arrangement allows of the ready drawing of the pistol, the disadvantage of the ordinary holster being that the cap has first to be unbuttoned before the pistol can be drawn. Accepted Jan, 19, 1901.

11,099 (1900). **Electric Targets**. J. Paterson, London. In connection with the electric targets of the type in which separate rings compose the magpie, outer, inner, and bull parts of the target, a method of obviating the inconvenience experienced through the signalling apparatus getting clogged with the whitewash used for marking, and with other foreign matters. The target is constructed so that it shall, to a certain extent be self-cleaning, and the different parts shall be readily accessible for repairing or readjusting. Accepted Jan, 12, 1901.

13,060 (1900). **Motor Gun Carriages**. H. J. Lawson, London. A three-wheeled motor gun carriage, built with a light frame, composed of tubes, the gun, one of the quick-firing type, being mounted on the steering socket. The whole of the driving apparatus is mounted on the front wheel, and is protected to a certain extent by armour plates. The gun is also protected by means of a plate. Accepted Jan. 12, 1901,

14,123 (1900). **Automatic Fire-arm Mechanism.** G. Roth, and C. Krnka, Austria. Mechanism for locking and unlocking the breech cylinder and barrel of automatic fire-arms, consisting of a locking ring which engages lugs on the cylinder, and automatically parts the barrel and cylinder when driving backward under recoil, and locks them when the cylinder is impelled forward to again join the barrel. Accepted Jan. 12, 1901.

14,342 (1900). **Working of Ordnance**. Sir G S. Clarke, Woolwich. A method of effecting the various operations in the working of ordnance through the utilization of the energy of recoil. An accumulation is employed, consisting either of weights, springs, or springs and weights, and at each recoil pressure is stored, and is utilized under suitable control to perform various operations. The accumulator is located preferably in a position safe from the enemy's fire, but, in some cases, it is fixed on the gun mounting. Accepted Jan. 14, 1901.

16,348 (1900). **Magazines for Cylindrical Breech Rifles.** C. R. Wagner, Germany. A box-shaped magazine for cylindrical breech rifles, in which, as the hinged bottom plate is opened, the lever holding the cartridge feeder is, by a positive mechanical action, turned down upon the bottom plate, and is retained in this position until the magazine is once more closed. Thus the cartridge feeder is folded up into a compact form, whilst the magazine is open. Accepted Jan. 26, 1901.

17,501 (1900). **Cartridge Extractor.** P. Bergensen, U.S.A. An implement for extracting cartridge shells, which may have lost their runs or become broken, consisting of an expansible tubular body, which is inserted in the headless tube from the breech, and the gun closed upon it. The implement is thus forced into the case, which it grips tightly, and the extractor of the gun engages a flange formed on the end of the implement, and withdraws case and implement when the gun is opened. Accepted Jan. 26, 1901.

18,185 (1900). **Game Carrier** S. Downing, Northampton A game carrier, consisting of a piece of stout wire bent into three pieces, parallel with one another. The entrance for the necks of the game between the pieces is slightly contracted by a knob, the wire having to be slightly sprung outwards to admit each neck. The carrier is provided with a strap handle. Accepted Jan. 26, 1901.

19,530 (1900). **Safety Mechanism for Small Arms.** R. O. Piccin, London. A method of holding a gun "safe" until it is actually at the shoulder by means of a rod and catch arrangement. The rod runs through the stock to the butt, and at its forward end engages a catch which holds the trigger. When the rod is pushed forward by the shooter's shoulder, the catch is automatically released. Accepted Jan. 19, 1901.

21,127 (1900). **Detonators for Signalling.** H. E. A. Cousin, and L. J. H. Rochatte, France. A detonator for carrying upon locomotives which, in appearance, is similar to a shot gun cartridge. Between the wad covering the powder charge, which is ignited by an ordinary percussion cap, and the wad beneath the colouring matter, which takes the place of the shot, are several discs, imprinted with the number of the locomotive. When the cartridge is exploded, the discs are left on the permanent way to indicate the number of the locomotive which carried the detonator. Accepted Jan. 5, 1901.

22,013 (1900). **Cartridge Clip**. G. Roth, Austria. A cartridge clip so designed as to bring an even pressure to bear upon each cartridge. The side walls of the clip are bent inwardly, a ledge being formed to engage the sides of the cartridge ends laterally. The ends of the sides of the clip are folded beneath the bases of the cartridges, and two springs are thus formed which press upwards against the bases. The cartridge ends are by this means subjected to pressures both from beneath and from the sides. Accepted Jan. 5, 1901.

22,352 (1900) **Manufacture of Shrapnel Shell** H D. Rattray, and J. S. Kershaw, Rochdale. By means of a punching and cutting machine, described in this specification, the tin cylinders used for containing the shot in the interior of shrapnel shell are manufactured very rapidly. The machine turns out the sheet metal perforated and cut ready to be formed into complete cannisters. Accepted Jan 26, 1901.

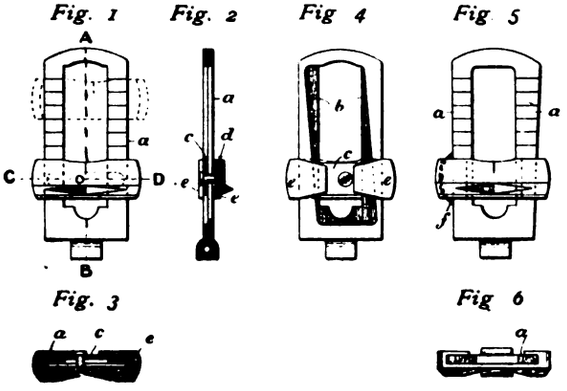
* These Specifications are more fully described under "Selected Patents."

SELECTED PATENTS.

SIGHTS FOR RIFLES.

3,477 (1900). H. Greener, Birmingham. In order automatically to correct the "drift" of a bullet from the line of the axis of the bore caused by the right or left twist of the rifling, the back sight is formed with inclined surfaces so that the sliding bar when raised has a slightly horizontal movement in conjunction with its vertical motion imparted to it.

In the accompanying illustrations, Fig. 1 is a front view of the sight. Fig. 2 is a section through A-B (Fig. 1) and Fig. 2 is another sectional view through C-D (Fig. 1). Fig. 4 is a rear view of the



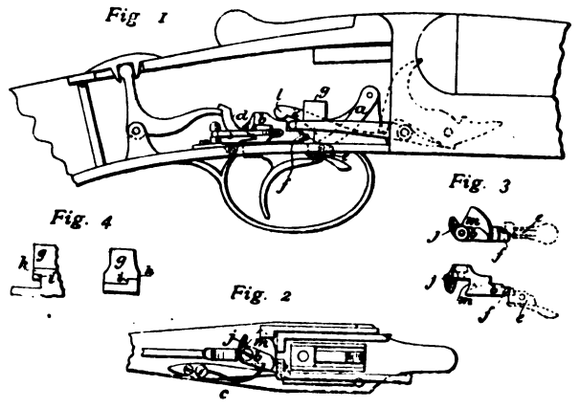
sight, and Figs. 5 and 6 illustrate a modified form of the arrangement.

Upon the back of the ladder *a* the inclined surfaces *b* are cut according as to whether the twist of the rifling is left or right. The piece *e* is made to slide between these surfaces, and is dovetailed at *d* (Fig. 2) to the cross bar *c*. It will be clearly understood that when the slide bar is raised a sideway movement is also imparted to it. A modification is shown in Figs. 5 and 6. The inclined surface *b* is here arranged on the extreme side of the ladder, and the cross bar is held tightly against the surface by the spring *f*. Accepted Jan. 26, 1901.

THE OSBORNE SINGLE-TRIGGER MECHANISM.

3,088 (1900). C. O. Ellis, and E. W. Wilkinson, Birmingham. The single trigger mechanism described in this patent is of the two-pull type. The principal limb is a "switching arm" adapted so to turn on a pivot, as to occupy alternately positions beneath the two sears. The specification deals especially with a method of obviating the danger of the involuntary discharge of the second barrel. Either barrel may be fired first according to the will of the shooter.

The complete mechanism is shown in Fig. 1 in the accompanying drawings, and from this illustration it will be seen that the trigger blade *a* is pivoted at the end of an unusually elevated extension of



the trigger box. A large arc of motion is by this means imparted to the trigger, and an exceptional amount of space is left around the trigger-box for the accommodation of other parts. Pivoted to the top of the trigger-blade *a* is the switching arm *b*, and this part is capable of a swinging movement between the two sears. The spring *c* always tends to impel the arm over from the right to the left, but when the parts are at rest the arm is retained in its right-hand position by the lever *e*, one end of which, as shown in the detailed illustration, Fig. 3, engages the projection *f*. When the trigger is raised to discharge the right-hand barrel, the arm *b* is lifted with the trigger above the lever *e*, and after the lifting of the sear is free to swing over to the left under the influence of the spring *c*. The arm starts to swing when in the raised position, but is arrested by the lower part of the box *g*, upon which are cut the two steps *h* and *i* (see Fig. 4). The pressure of the finger keepin the trigger in a raised position, the spring *c* forces the arm against the first step *h*, and when the pressure is slightly relaxed the arm slides down with the trigger and rests on the second step *i*. Any intermediate increase of the pressure on the trigger only jams the arm the tighter against the step *i*, and not until the trigger is entirely released is the arm free to complete its travel beneath the step *i* over to the left-hand sear. In this way the involuntary pull is intercepted. After the second discharge the arm *b* is automatically turned back to its right-hand position by the engagement of the rock lever *d*, which is connected with the safety slide, with the cam-like surface *j* of the arm *b*.

The parts may be switched over to the left in order to enable the left-hand barrel to be fired first, simply by pressing up the lever *e*.

The arm *b* thus released flies straight over to the left-hand sear. When the left-hand barrel has been discharged, the fallen hammer tail rocks lever *k*, and causes the front end *i* of this lever to strike another cam-like surface *m* on the arm *b*. This action forces the arm back to the right-hand position ready for the second discharge Accepted January 26, 1901.

MANUFACTURE OF NITRO-EXPLOSIVES.

4,593 (1900). W. D. Borland, London. In this specification the patentee describes first a method of regulating the hardness, density, and explosive qualities of nitro-compounds, whether in the form of powder or otherwise, and second, a method of removing the solvent which usually clings to a small but injurious extent in the manufactured nitro-explosive.

It has been usual in the manufacture of granular and other nitro-compound explosives to treat them with solutions of materials having a solvent or other regulating action. The above patentee finds that it is possible greatly to enlarge the scope of such treatments by employing emulsions instead of solutions. These emulsions consist of methylated spirits and small quantities of some such material as acetone, camphor, liquid paraffin and benzoline, or refined naptha. The liquid paraffin is very slightly soluble in all these materials, except benzoline, but it forms with them a good emulsion, and may in the emulsion be introduced into the nitro-cellulose compound without having, as is usual, first to subject the compound to the action of solvents, and then to the process of introducing the oily matter.

The effect, upon the ballistic qualities of the powder, of introducing the oily material in the form of emulsion, is very different to that resulting from its introduction in solution. By this emulsion method a very hard grain may be obtained, which at the same time is porous. The proportion of the following example of an emulsion used per ton of powder would be about 120 gallons :—

1,000 parts by volume of methylated spirits.
10 parts by volume of acetone.
5 parts by weight of camphor.
5 parts by weight of liquid paraffin.
30 parts by volume of benzoline or refined naptha, specific gravity ·700 to ·776.

The above emulsion is suitable for treating a granular nitro-compound, consisting mainly or wholly nitro-cellulose.

As regards the removal of the small quantities of volatile solvents, which are retained in the nitro-cellulose explosive, the presence of such a non-volatile body as liquid paraffin would rather increase the liability to retention of the remaining volatile portions: but the patentee overcomes this difficulty, both as regards compounds treated with this emulsion, and with solution, by treating the nitro-compounds with warm air. The temperature of the air should be about 150 degs. Fahr., and should be charged with watery vapour. One method of so charging the air is to admit a small jet of low pressure steam into the inlet opening of a fan for supplying the warm air. Air so charged speedily removes the remaining volatile constituent parts, and a further benefit is reaped inasmuch as the generation of electricity, which is frequently observed in dealing with hot dry nitro-cellulose explosives, is practically obviated. Accepted Jan. 19, 1901.

THE W. BAKER SINGLE-TRIGGER MECHANISM.

2,650 (1900). W. Baker, Birmingham. In this specification a system of two-pull single-trigger mechanism is described, in which particular attention has been paid to the prevention of the involuntary firing of the second barrel, following from the recoil of the first discharge. A sliding piece attached to the top of the trigger blade is the part through which the sears are lifted, and this limb is prevented from taking up its position beneath the second sear until the trigger has been allowed, by the removal of any finger pressure, to return to its normal position.

In the drawing attached the parts are shown in the different positions they occupy during and between the operations of firing the two barrels. From Fig. 1 it will be seen that, linked by means of the part *a* to the top of the trigger blade, which is pivoted at *b*, is a sliding piece *c*. The spring *d* works upon the top of the slide, and the end of the top arm of this spring engages a set back in the link *a*, and always tends, through the engagement, to force the slide *c* into the forward position illustrated in Fig. 3. The slide is pushed backwards against the pressure of the spring by the bolt *e* in the opening of the gun, and it is caught and held in this position by the right-hand sear *f* which enters the recess *g*. In this position, Fig. 1, the parts are ready to discharge the right-hand barrel first. When the trigger is pulled the right-hand sear *f* is lifted with the raising of the slide *c*. The upward movement of the slide causes the projection *h* on the trigger box to enter the recess *i* in the slide, and the following descent of the trigger leaves the sear tail in its raised position (Fig 3). In spite of the removal of the sear tail the slide is prevented when raised from moving forward by the catch *h*. Only when the pressure on the trigger has entirely relaxed is the slide allowed to move forward, since the trigger must be right down in its normal position before the catch *h* and the recess *i* become disengaged. The involuntary pull occurs before the trigger is relaxed, and so is prevented from raising the second sear. The

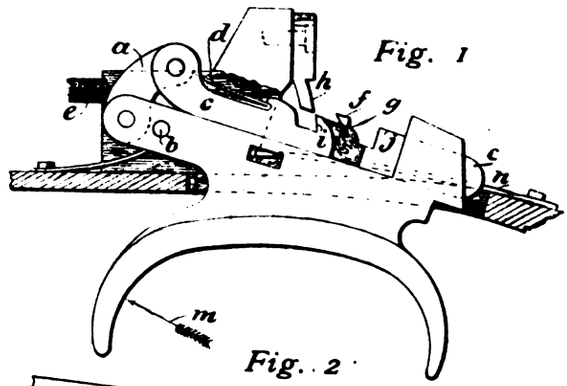


Fig. 1

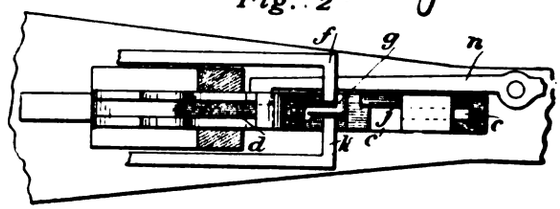


Fig. 2

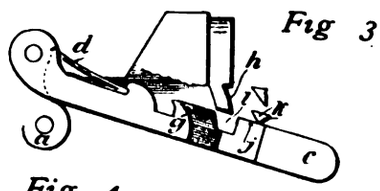


Fig 3

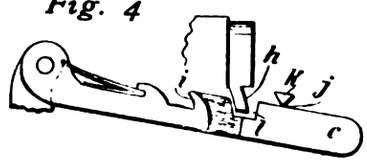


Fig. 4

forward movement of the slide brings the surface *j* beneath the left-hand sear *k* (Fig. 3), and when the trigger is raised again the left-hand barrel is discharged, a slot *l* being cut to allow of the entrance of the projection *h* (Fig 4)

When it is necessary to discharge the left-hand barrel first the trigger is pushed forward in the direction indicated by the arrow *m*. The trigger is thus rotated downwards against the action of the spring *n*, and the sear *f* and recess *g* being by this means disengaged, the spring *d* is allowed to impel the slide to its forward position.

Two modified forms of this mechanism are also illustrated and described. In one, a different catch device performs the function of the catch sear *f*, and the trigger proper is separated from the front switching lever. In the other altered form a piece pivoted to the trigger blade takes the place of the slide *c*. Accepted Jan. 5, 1901.

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CONTENTS.

CURRENT TOPICS.

Politics and Libel.—Mr. Arthur Chamberlain is entitled to the sympathy and congratulations of all who have a stake in the sanctity of one's own personal honour, and of others who are interested in the purity of journalism. To have one's name dragged in the mire, to be accused of every form of villainy, and to be held up to general obloquy, is not what an Englishman should suffer because he is brother to the Colonial Secretary. Every politician has his political enemies, and Mr. Joseph Chamberlain is an example of this rule in every sense of the word. This, however, is no justification for the course adopted by the *Morning Leader*, which at the time of the General Election printed a series of articles in which an attempt was made to establish a connection between the Government contracts received by Messrs. Kynoch and the fact that the brother of the chairman was a member of the Government. Mr. Arthur Chamberlain was informed by counsel for the defendant in the course of libel proceedings that he must not complain of the attacks made upon his own personal honour, because he had been used merely as a means of attacking and injuring his brother. Fortunately the jury did not take this view, and the result was a verdict for £200, and in addition that the defendants should pay the costs of the action. The case was very much mixed up with the facts elicited by the Cordite Commission, and it was made evident that the plaintiff would have had no case if the comments had been restricted to this particular aspect of a subject of public interest; but the fact remains that the comments covered much more than the legitimate ground. Mr. Arthur Chamberlain's personal honour was called into question, and entirely unjustified statements were made, in order to prove the bad case which had been made out by means of journalistic imagination, no doubt stimulated by political malice directed against his brother.

A Co-operative Laboratory.—The Explosives Committee circular contains some interesting details relating to a co-operative laboratory which has been established by a number of German explosive manufacturers. The function of this laboratory, which is well equipped with experimental appliances and funds, is to make tests of materials turned out by the subscribing manufacturers. The highly competent staff which is permanently engaged in experimental work is kept in the closest touch with the demands of the industry with which it is affiliated, and it goes so far as to test and report upon samples of each company's manufacture, so maintaining a high level of quality in the goods manufactured, which aids in maintaining the prosperity of the industry as a whole. The committee recommend that a similar establishment should be inaugurated in this country, but for our own part we see so many vital points of difference in the conditions governing the explosives industry in the two countries, as to render joint action of the kind recommended a virtual impossibilty. A first condition in the success of such an organisation is the combination of the commercial interests by means of a ring, to regulate prices and distribution of orders. Then, again, we must remember that instead of several large factories of almost equal size and importance, as in this country, there is in Germany one very large one and a number of smaller ones of varying status down to a model factory, which, while in full working order, does not pay a dividend on a minute capital. The wealthier of the

explosives factories in this country already have well-equipped research laboratories, and these certainly would not consent to turn their expenditure for experimental research into a general fund to be utilised for the education of their trade rivals in common with themselves. If, however, by any chance it were found possible for the War Office and Admiralty in conjunction to establish a central testing station in co-operation with the Explosives Department of the Home Office, it is quite possible that, with due regard to the requirements of secrecy, certain problems which affect the welfare of the trade at large, without touching competitive points, would receive a degree of support meriting its inauguration; but this is quite a different question, and we do not believe that, unless the Government were very keen on its inception, the Treasury would vote the necessary funds. On the general question of its value to the country, there can, however, be little doubt. What the Hythe School of Musketry is to small arms, the explosives laboratory would in a modified degree be to the explosives industry.

Gunmakers' Liability.—It will be seen from the report published elsewhere in this issue relative to a case tried in Belfast, in which a purchaser of smokeless powder, for use in a muzzle-loading gun for which it was unsuited, tried to saddle the gunmaker who sold the powder with the responsibility of the subsequent accident, that the dispute was settled in favour of the defendant. This is quite in accordance with common sense, equally with common law—two terms which are not necessarily synonymous. It is scarcely to be supposed that the vendor of an article can be held responsible for the uses to which it is put by the purchaser. Except in the case of such admittedly dangerous substances as poisons, there is no *onus* on the vendor to exercise a scrutiny as to the ultimate end for which the purchase is concluded. If the buyer chooses to apply the object purchased to a purpose for which it is obviously unsuitable, that must in all fairness be an affair in which the buyer takes his own risk. One can, in fact, imagine what anxiety would be in store for the gunmaker who retails powder were he to be held responsible for an accident such as the one elsewhere recorded. In the case in question, it was sought to prove that the salesman had given, or implied, a guarantee that the powder he sold was suitable to the gun in which it was subsequently fired, but the evidence showed nothing of that nature to have taken place. Had that been the fact, another aspect might have been taken of the matter, but on the broader grounds of general liability, the defendants deservedly received the complete verdict of the Court.

EXPLOSION ON TRIMLEY MARSH.—The report of Captain M. B. Lloyd, H.M. Inspector of Explosives, into the circumstances attending the explosions at the factory of Messrs. Curtis's and Harvey, Ltd., at Trimley Marsh, Suffolk, on November 28th last, has been published. Captain Lloyd is of opinion that the first explosion in the mixing house, whereby two men were killed, might be due to the fall or rough handling of a weight or scale pan, to the ignition of nitro-cotton on the floor of the house owing to the fact that overshoes were not worn by the foreman, or to a spark from the chimney of the boiler-house. As regards the second explosion of the stove, which killed a third man, this was most probably caused by communication or projected débris from the mixing house, and though this cannot be definitely attributed to the excess of explosives in that house, such excess made the risk to the stove greater than was provided for by the licence.

THE GOVERNMENT SMOKELESS POWDER.

EVENTS have moved somewhat rapidly during the past month with reference to the service explosive. Lieutenant Dawson, of the Vickers Co., delivered a lecture at the Society of Arts, in which he spoke most favourably of the German powder Rottweil, which was of course the powder we referred to in this column a couple of months ago, when we stated that there were many reasons for supposing that the Explosives Committee had in mind the adoption of a non-nitro-glycerin explosive to replace Cordite. It was a little unfortunate that Lieut. Dawson did not explain how strong was his commercial interest in the Chilworth powder, because a correspondence which appeared in *The Times*, following upon the report of his lecture, represented the author of the lecture as having adopted the attitude of an impartial observer, whereas the business relations of Messrs. Vickers, Maxim and the Chilworth Company constituted him an interested party in every sense of the word.

A circular which has been issued by the War Office, above the signature of Sir Henry Brackenbury, has also introduced a large amount of discussion with regard to our service explosive. This circular invites the submittal of smokeless powders for consideration by the Committee, and bearing in mind the scandal which arose with regard to the Cordite Committee, it is interesting to note that this circular guarantees to inventors that their powders will be treated confidentially, and will not, except under special authorization, be submitted to Government experts. It is an extraordinary state of affairs that the British Goverment has sunk so low as to find it necessary to protect outside inventors from piracy by its own officials. Still, what has happened in the past provides strong justification for treating certain grades of officials as suspected persons. Another little comment that is raised by the issue of this circular is concerned with the date of its issue by relation with the commencement of the Committee's duties. We all know that the Committee has been hard at work testing powders for a long time past, and so much have its efforts been concentrated upon the single powder Rottweil that it is regarded as almost certain that their mind is made up in this direction, and that powders now submitted will mainly serve to prove how well the ground has been covered before the final selection was made.

It is entirely a separate question whether or not the approved points of Rottweil powder are such as to require the payment of a price for its use. Patents of smokeless powders are obviously difficult to sustain, and the fact that so many types of this kind of explosive are manufactured in all parts of the country is in itself evidence that the exclusive property in processes and ultimate form is restricted within extremely small limits. All of us remember the result of the attempt made some years ago to uphold a patent relating to the complete gelatinization of nitro-cotton. It was shown that no modern powder is completely gelatinized, and, therefore, that there is a free market in the only efficient type of nitro-collulose powder so far as gelatinization by solvent is concerned. There may be other processes subject to patent rights which are of minor importance, but the general truth remains that the day of patent monoplies in smokeless powder has gone by. It, therefore, appears to us, reading the

signs of the times, that the Committee will adopt a pure nitro-cellulose powder in cords for small-arms and tubes for artillery. Certain of the processes of manufacture will doubtless be subject to small payment for royalty, but it is hardly likely, in the light of our present knowledge and existing freedom of processes, that any large sum will be required for the purchase of patents. What we may expect, however, is that those firms who have aided the Committee by the making of experiments will so far turn their knowledge to account as to erect factories for the manufacture of the new explosive, and they will probably be so favourably placed as to secure orders which will fully recompense them for the trouble they have taken.

FRENCH GUN AND AMMUNITION TRIALS.

A SPECIAL committee of influential French sportsmen has been instituted for the purpose of holding at Paris, in May and June of the present year, a series of exhaustive trials of sporting guns of all makes that may be submitted, with a view to determining some of the problems that require solution by the gunmaker, and with a further end of initiating sportsmen into a more exact knowledge of the capabilities of their weapons. It cannot be said that this series of trials will necessarily cover new ground, at least, so far as the British gun trade is concerned. For the last 20 years there has been a fairly exact knowledge in this country on all the different points which go to make an efficient gun for sporting purposes, and gunmakers are in the habit of making elaborate tests of the shooting qualities of their productions in respect to killing circles, pattern, penetration, and the like matters, under varying conditions of loading. The trials proposed by the French Committee seem, in effect, to break no very new ground, though one can possibly admit that, in order to carry out the extensive programme proposed so as to obtain the fullest scientific value, they will require as efficient an organization as was necessary at either the *Field* or any other historic gun trials of the past. The chief points which the Committee hope to bring out are those determining the strength of the barrels, the amount of the charge desirable with different types of powder, and a consideration of the length of barrel, the exact diameter of the bore, the form of choke, the minimum weight of the gun, &c.

According to the published conditions regulating the trials, the competition is open to all the world, and to weapons on all systems of manufacture, but the chief series of tests naturally refer to ordinary double sporting guns. A preliminary condition is that they comply with a certain maximum limit of weight, as follows:—

	Weight complete.	Barrels only.
12-bore Pigeon Gun	7·7 lbs.	3·5 lbs.
12-bore Sporting Gun	7·0 ,,	3·3 ,,
16-bore ,, ,, ...	6·6 ,,	3·1 ,,
20-bore ,, ,, ...	6·2 ,,	2·6 ,,

Manufacturers are at liberty to submit five guns each, only two of which, however, are to be of the same class. No entrance fee will be charged to the trade. Amateurs and others may also submit guns for trial on payment of a fee of 20 fr. per gun, to the number of three. Guns on the repeating principle, and single-barrelled weapons generally, will come under a special category.

All guns and cartridges submitted for the trial have primarily to pass through a series of tests which are obligatory, and a failure to pass which will disqualify from further participation. These preliminary tests will be made at the Paris proof house. The first will be a proof test of the guns made with a cartridge charged with nitro-powder, specially loaded for the purpose at the Government powder factory, and giving a pressure of 5·4 tons per square inch (850 kilos. per square centimetre). Before the test is made exact measurements will be taken of the bore of the barrels, and of the thickness of metal. Next the cartridges to be employed in the trial will be submitted to tests for velocity and pressure in a crusher gun fitted with a Boulengé chronograph, and must give a velocity of not less than 787 f. s. at a distance of 49·2 feet, and a pressure not exceeding 3·8 tons per square inch for each of the three calibres. A further proof for penetration will be made on a set of boards of poplar, each ·118 inch thick. The first test applies, of course, to guns only, the others to cartridges submitted for the subsequent trials with the guns, in distinction from those supplied by the Committee.

So far as the regulation trials are concerned, all guns must be tested with a special type of cartridge supplied by the Committee. This cartridge will be loaded with T powder, which is the latest in date, and which appears to give the best results in diminution of sound, suppression of smoke, and high velocity with a low pressure. The loading will be as follows:—

	Powder.	Shot.
12-bore Pigeon Gun	38½ grs.	1¼ oz.
12-bore Sporting Gun	37 ,,	1⅛ ,,
16-bore ,, ,, ...	27¾ ,,	1 ,,
20-bore ,, ,, ...	23 ,,	⅞ ,,

The shot will be No. 6 (*numérotage de Paris*).

The competitive trials to which guns and ammunition which pass the preliminary test will be subjected will be three in number, for dispersion, pattern, and regularity. To measure dispersion, the guns will be fired from the shoulder with an elastic support, at a range of 22 yards, on a target measuring 5 feet square and subdivided into 2-inch squares throughout. The competitor will be allowed to select the centre of the group of pellets, and from that centre two circles will be drawn by compass having diameters of 20 inches and 30 inches respectively. Altogether, eight shots per barrel will be fired in this test, apart from a warming shot. The classification of guns undergoing the test will be by a series of coefficients. For example, the greatest number of squares hit within the smaller circle will have a coefficient of 1·50, while those in the outer circle will have a value of 1·0. The greatest number of pellets comprised in the larger circle will also have a coefficient of 1·0. A test for grouping will be made also with the aid of two circles of the diameters already given, at a range of 40 yards, and account will be taken of the number of pellets within the circles severally, and also of the number of squares on which pellets have struck. In this test also eight shots will be fired, and for a general consideration of dispersion and grouping the mean of the best seven shots in each series will count. The third test of regularity will be divided into three heads, weapons shot for dispersion only, those shot for grouping only, and those combining the two qualifications. In arriving at the ultimate judgment of general efficiency, due regard will be taken of the precision of the weapons, but it is to be

noted that there seems to be no scheme of differentiation between choke and cylinder bored guns in the tests.

Prizes will be awarded to guns and ammunition from which the best results have been obtained in accordance with the conditions above mentioned. The value of the awards is not yet announced, as it depends upon the sums placed at the disposal of the Committee. So far the date of the trials is not definitely settled, but entries cannot be received after the 15th inst. The offices of the Committee are at 46, Rue de Bac, Paris.

A note appears in the pamphlet, from which the foregoing particulars have been transcribed, to the effect that while the Committee limit themselves as regards the classification for awards to the tests already enumerated, they reserve to themselves the liberty to make a most rigid examination of the weapons submitted to them, in respect to such details as manufacture and mechanism, etc., and they also intend, with the consent of the owner, to submit such guns as seem desirable for the purpose to special tests for velocity, recoil, penetration, etc., with a view to arriving at various interesting data, and in order to be able to formulate certain conclusions in making their report. If this competition and the supplementary series of trials are carried out with the completeness that is foreshadowed by the draft preliminary announcement, it is possible that the results yielded may be of considerable value, even to the gun trade in this country, which has already for a number of years carried out the process of manufacturing sporting weapons on lines dictated by scientific tests and a very complete system of experimentation.

INCIDENTAL JOTTINGS.

JACK IS AS GOOD AS HIS MASTER.

This last month certainly provides plenty of subject-matter for jottings, were it not that one is almost getting tired of the wealth of intellect we, as a nation, possess in matters military and naval, especially those who have adopted the subject as a pet hobby to fill in their spare time. Every man, from a 'bus driver to a member of Parliament, who reads his daily paper, is dying to impart his views with as great a versatility in dealing with widely varying subjects as Gilbert's "Modern Major-General." In fact, I daily expect to hear that the School Board is including naval and military subjects in its course of studies, with special evening continuation classes, which officers who have passed the Staff College will be invited to join! No text-books would be required, as the demonstrators would doubtless select extracts from the halfpenny daily press as being quite impartial, reliable and up-to-date. This movement will be hailed with acclamation by those who have for some time preached the superiority of continental training, with special regard to technical instruction which shall ripen the artisan budlet, hitherto frost-bitten, with practical demonstration.

CONGRATULATIONS AND EXPECTATIONS

There can be no heartier congratulation than I offer to Colonel Holden, R.A., upon his promotion. This worthy officer is the superintendent of the Royal Gun Factories at Woolwich, and is a practical mechanic and an eminent scientist. He is thoroughly *au fait* with modern engineering, and is one of those rare exceptions in whom the inventors, discussed by a correspondent in last month's issue, might find a friend. It is to be hoped that he will one day have a free hand in sweeping out a lot of the ancient pre-historic methods of that sanctified museum over which he superintends. He is a man to be trusted by the Treasury, for he will not bury his talents in a napkin. A liberal supply of cash, plus Col. Holden, and the old gun factories ought to hold their own against all comers in manufacture and design.

POWDER AND BORES.

One subject which will interest most readers will be the selection of a new powder in the near future. Many of us, doubtless, can hazard an opinion as to which powder stands foremost in the catalogue of the multitudes of eligible competitors; but perhaps it is not well to be too certain, as strong influences sometimes engender strong prejudices. The Committee will indubitably view the matter with an impartial mind, keeping the main fact of what is best for the gun before the question of pounds, shillings and pence. There are plenty of admirable substitutes for Cordite, but few as cheap, and this feature of the business is one which will exercise the minds of the economists in favour of Cordite. It has already been suggested that it would be cheaper to reline the bore of the guns, rather than incur such an expense in preserving them. This argument is all right in the time of peace, but with greater ranges, more rapid firing, and a general augmentation of the present day capabilities of a gun, one can imagine the success of a campaign when the guns needed retubing with frequency. A few odd extra millions spent on the best article will be the cheapest in the end.

BORES AND POWDER.

The memorandum inviting all and sundry of the explosives fraternity to proffer their wares will be received with a certain amount of caution. There are certain makers who would have thrust their powders on to us years and years ago, and will doubtless try again, oblivious of well-known defects, and these will take up a lot of time to no purpose; whilst other powder makers, who come after them, may have productions possessing most excellent and enviable qualities, which will be looked upon with suspicion, as their composition may be almost analogous, but differently worked. This is a very serious matter for the army of "ites" who may be tempted to court fortune before a Committee which may not conceive the subtle distinctions differentiating between a good and bad powder of apparently similar composition. Only a chemist who has spent his life in manufacturing these compounds can adequately demonstrate the value of the relationship. For this reason it is to be hoped that the Committee will afford ample opportunities for the discussion of these niceties of manipulation which form such an integrant value.

TWEEDLEDUM AND TWEEDLEDEE.

It is certainly very kind of the Government in their invitation to promise to be good and keep all the secrets from those wicked people they employ in their Ordnance Factories, but this does not commit them to any terrible extent. One thing is certain, whoever gets their powder adopted will have an exceedingly difficult task to prove a patent. The little manufacturing secrets cannot in most cases be upheld as an original treatment in a court

of law. One powder which has been freely talked about lately is no exception. It is one branch of an immense family tree, whose distinctions, we doubt, are hardly differences in patent law. So that manufacturers will do well to remember Cordite in its infancy, in spite of fair promises. On the other hand, syndicates which hope to get big orders, without even "a hut or shed," will do well to remember Cordite in its prime, and refrain from exploiting capital in the hope of large orders. The only way to get a good chance is for a number of makers of these analogous powders to put their heads together, and not play one against the other on microscopic differences which no lawyer could grasp. All may float in on a big boat—the War Office and Admiralty sea is too rough for individuals in cockle shells.

EXPECTATIONS AND REALIZATIONS.

As forecasted in a previous issue, the Small-Arms Committee have apparently decided to cook up the present rifle instead of striking out a new line. Their decision is one which does not surprise us. First they find, what everyone knew long ago, that Cordite makes the rifles so hot that after firing the men cannot use them for bayoneting or clubbing, as it burns the skin off their hands, so they propose to cover the barrel in from breech to muzzle. This revolution will doubtless run concurrently with the decisions of the Goshenites, who will probably suggest a cool powder, which amongst its various virtues shall not make the rifle too hot to hold after a few rounds. This is locking the stable door after the horse has gone with a vengeance. The shortening of the barrel seems absolute vandalism, as this is the only part of the rifle which has any merit at all. Perhaps the Committee think it is well to bring the ballistics into line with the action, and give experts further cause to jibe at it. If the change is suggested to meet cavalry requirements, why not supply a regular carbine and leave the infantry weapon alone.

CYCLOPS.

ROUND THE TRADE.

Major Woolley Dod, R.A., late Inspector of Laboratory Stores, has retired from the Government service.

We understand that Mr. J. F. Barker has ceased to act as agent for the Clermont Explosives Co., Ld. (Messrs. Muller & Co.).

Monsieur H. V. Taelen, of 92, Beaufort Street, S.W., has been appointed English agent to the Belgian gunmaking firm of Ferd. Courally, successors of August Lebeau.

Messrs. Curtis's and Harvey, Ld., have appointed Mr. J. Mackintosh, late of the British Explosives Syndicate, as works manager for their new Cordite factory on the Thames.

Mr. E. Anderson, originally with the firm of Easton, Anderson and Goolden, has been appointed manager of Messrs. Kynoch's Arklow factory.

Mr. G. F. Whitby, late foreman to Messrs. Lang and Hussey, Ltd., has been appointed by the London Sporting Park in connection with their gun-making department.

Mr. W. C. Sealy, late manager of Kynoch's Arklow factory, has entered into business in Dublin, and his present address is 34, Oakley Road, Ranelagh.

A donation of 100 guineas has been made to the Soldiers' and Sailors' Families Association by the Cotton Powder Co., Ld.

We are informed that Mr. Henry A. A. Thorn (Charles Lancaster), of 151, New Bond Street, W., has been elected a director of the Harris Rifle Magazine, Ld.

At the Thames Police Court last month J. G. Grasivan, master of the s.s. *Vesavis*, was fined £50 for carrying a quantity of explosives up the river contrary to the bye-laws.

We understand that Mr. George Gooch, gunsmith, St. Albans, has filed his petition, and the matter is now in the hands of the Official Receiver.

Several of the well-known manufacturers of ammunition will be represented at the forthcoming Naval and Military Exhibition to be held at Earl's Court.

The London Sporting Park have now secured telephonic connection, about which there has been some difficulty in the past, owing to their isolated situation. Their number is 1569, Paddington.

Major Woolley Dod, R.A., late Inspector of Laboratory Stores, has, we understand, joined Messrs. R. A. Hadfield & Co., Ld., of Sheffield, Messrs. Hadfield thereby earning our congratulations.

The International Explosives Co., whose factory site is on Canvey Island, off the Essex coast, have engaged Mr. Soddy, late of the British Explosives Syndicate, as works manager. Mr. Paisley, late of the High Explosives Syndicate, is general manager.

MESSRS. KYNOCH applied on the 18th ult. for an amending licence to consolidate the various licences governing the Arklow factory. The application came before the Wicklow County Council at Wicklow in due course, and was unanimously granted.

In answer to a question in the House of Commons, Lord Stanley stated that £6,568 had been paid to contractors in connection with the withdrawal of Mark IV. cartridges. About 4½ millions of these bullets have been broken up, and about a quarter of a million are still in hand.

The summer season at the Gun Club opens on Saturday, the 6th inst., and the list of cups which will be offered for competition includes the "Ballistite" Cup and the "Lancaster Pygmie" Cup. The opening meeting of the season at Hurlingham takes place on the 8th inst.

Mr. Percy Newton has been appointed general manager of Messrs. F. Joyce & Co., Ltd., which represents promotion in respect of the position he has previously occupied with the firm. Mr. T. Rosewell is now works manager to Messrs. Joyce, in succession to his former chief, the late Mr. Courtman.

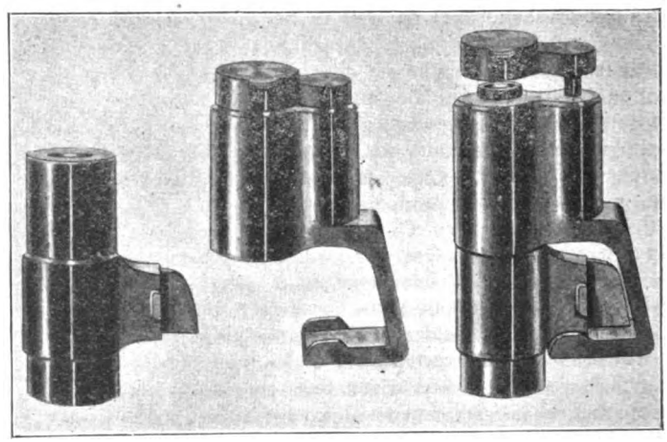
The directors of S. W. Silver & Co., and B. Edgington, Ld., recommend, subject to a final audit, a dividend at the rate of eleven per cent. per annum for the six months to December 31st, making, with interim dividend already paid, eight per cent. for the year 1900, placing £3,000 to reserve, and carrying forward £1,080.

An application was received by the Gloucestershire County Council from Messrs. Crane & Co., of Bristol, for assent to the establishment of a magazine for explosives at Bridgeyate, Wick, and Abson, in accordance with the conditions of a draft licence issued by the Home Secretary. The matter was referred to the Finance Committee.

Mr. Martin Scott, lately connected with the firm of W. and C. Scott & Sons, has recently started business for himself in St. Mary's Row, Birmingham. He is a cousin of the brothers J. C. and William Scott, who are now so closely identified with the Webley Company. It will be remembered that the Webley prospectus stated that Mr. Martin Scott would take service with the Company as manager of a department.

A NEW SIGHT PROTECTOR.

UP to the present time a sight protector has been in use on the Lee-Enfield rifle, more especially when in the hands of volunteers, which has consisted of a solid brass cap completely enclosing the muzzle of the rifle the while that it protected the foresight and block from injury. The main drawback to this somewhat clumsy though fairly efficient contrivance lay in the fact that, when on, it allowed of no examination of the interior of the barrel, and on this or some less obvious account a new protector has been devised, which has disadvantages peculiarly its own. It is made of spring steel, and is held on the muzzle of the rifle by its own elasticity, so that each time it is adjusted or removed it is likely to do some damage to the blueing of the barrel. As a sight-protector it may possibly be successful, but that is all, for it affords no sort of cover to the interior of the barrel, and the volunteer who brings his weapon up to town with him in the morning, and carries it to the drill hall in the evening, will find plenty of dust, and perhaps moisture, to remove before parading for inspection.



Of course, this condition may be remedied by resort to the "pull through" carried in the stock of the rifle, but only if the volunteer is fortunate enough to have half an hour to spare for the operation. The Service sight-protector is, in fact, pretty much the same as the Service rifle and the Service ammunition—a makeshift. This conviction is the more readily brought home to us since we have quite recently had the opportunity to compare the two protectors already referred to with the very ingenious device intended to serve the same purpose on the new Mannlicher-Schonauer rifle recently described and illustrated in these columns. Herewith are given representations showing respectively the muzzle of the rifle with its block and foresight, the sight-protector detached, and the latter fulfilling its function. It will be noticed that the protector consists of a cylindrical piece of steel, which accurately fits the muzzle of the rifle, and having at one side another cylinder and a projecting arm which goes completely over the foresight. Within the cylinder that goes over the muzzle is another ring of steel of smaller diameter, and the top orifice of which is somewhat smaller than the bore of the rifle. This ring is normally pressed down by a spring, and when the protector is first placed on the rifle, with the projecting arm at right angles to the sight, the two claws shown at the bottom of the arm cannot pass the sight block. Pressure applied to the protector bodily, however, allows it to be depressed sufficiently for one of the claws or clips to pass below the sight block, and on releasing the pressure the guard is at once held firmly against the sight block, completely protecting the sight in the manner shown in the third illustration. The fastening is perfectly secure. The third illustration, however, shows something more. There is a dust-tight cap to the protector, shown in its normal position in the second figure, and shown pulled up against the action of a holding spring in the third figure. When thus raised it can be swung round on the pivot shown, clear away from the muzzle of the rifle. This action leaves the orifice of the protector free, down which the cleaning rod can be passed, and the sight protector in this form acts also as a protector to the rifling of the arm, since the orifice is rather smaller than the bore. This feature is one of considerable importance, as it is well known that the accuracy of a rifle is often most seriously impaired by the destruction of the rifling at the muzzle, due to careless use of the steel cleaning rod at that most vital part of the bore. Altogether, this sight-protector is most carefully thought out in all its parts and properties, and affords a useful object-lesson, unhappily too often passed over in this country, of the truth that perfection consists in attention to detail.

TRANSATLANTIC SPORTING JOURNALISM.

A PRETTY little quarrel is waging on the other side of the Atlantic between the Marlin Firearms Co., of New Haven, Conn., U.S.A., and the New York sporting paper *Recreation*. According to the statement of facts entered in court by the plaintiff company under oath, the trouble arose in the following manner:—The Marlin Firearms Co. began to advertise its rifles in *Recreation* towards the close of the year 1894, and continued to do so until January, 1899, at varying rates per page. During the greater part of the period, the editor and manager of the paper bought Marlin rifles to give away as premiums for subscriptions to the paper. Between June, 1898, and November of the same year, however, the plaintiff refused to file the defendant's orders for rifles owing to a difficulty in obtaining payment, and on this account, so it is alleged, the rates of advertising were, on the expiry of the existing contract, raised 100 per cent., whereupon the Marlin Co. refused to advertise any longer in that particular medium.

An interesting side light on the methods adopted in Transatlantic journalism is afforded by a letter written by the editor of the paper to the Marlin Co. some time prior to the cessation of their business connection On July 2nd, 1897, the plaintiff received from the editor of *Recreation* a communication, from which the following is an extract: "I hand you herewith proof of a bear story, which I trust will interest you. I should be glad to state in the blank space in the note that the rifle used was a 30·30 Marlin, or whatever other gun you might prefer to have mentioned. . . . . Now, my proposition to you is to set an ad. of your new rifle in the lower right-hand quarter of this page. . . . . I should, of course, want this to be in addition to the two pages you are

running, and I consider the space and the lugging-in of your gun into the statement of the case, as I have suggested, worth 100.00 dols. This is an opportunity that an advertiser would not get in ten years. You are the first gun house to whom I have made the proposition. I think either Winchester or Savage would jump at it, but frankly and candidly you are my best customers, and I give you the first shy at it." A month later the defendant wrote to the plaintiff company offering that if it would give his "principal staff artist" one of its rifles, the defendant would publish reports of his artist's experiences, in which the plaintiffs' rifles would figure. Neither of these magnanimous offers appears to have met with the expected response.

After the termination of the advertisement contract, several letters were written by the editor of *Recreation* to the Marlin Co. The first of these pointed out the large number of letters still coming in, all speaking in praise of the Marlin rifle, of the same type as had hitherto been freely published in the correspondence columns. "Now that you have withdrawn your ad. from *Recreation* I cannot continue to do this." A few weeks later, a batch of these testimonials was sent by the defendant to the Marlin Co. Other letters followed, all much to the same effect. From the date of the cessation of the advertisement, however, references to the Marlin rifle in the columns of *Recreation* began to change their character, and before many months were past letters were published purporting to come from correspondents in various parts of the United States, speaking of the rifle in terms of the strongest condemnation. The Marlin Co., in its sworn statement, testifies that the defendant knew that these statements were false, and published the same wrongfully and maliciously, and in the execution of a wrongful and illegal scheme or plan to force the plaintiff company to advertise its rifles again in the defendant's journal by publishing such false and unfounded statements. Apparently, the plaintiff company has no adequate remedy at law, but it has taken action to the extent of demanding judgment against the defendant, that he be perpetually enjoined and restrained from publishing articles or statements of the nature indicated, and from pursuing the alleged scheme to force the plaintiff company again to advertise its rifle in his journal.

The result of this action remains to be seen, but in the meantime the incident is not without interest as illustrating some of the amenities of a certain class of journalism which is, happily, not much in evidence on this side of the water.

A QUESTION OF WARRANTY.

THE case of Rosbotham *v.* Hunter, to which allusion has been made in our two last issues, came up for final hearing before the Recorder at Belfast early in last month. The cause arose from the sale by Messrs. Hunter & Son to the plaintiff, who is a working shoemaker, of half a pound of Blue Rival Smokeless Powder. This powder was loaded by the plaintiff into a muzzle-loading gun, and on firing the second barrel the gun burst, part of it being blown away and the plaintiff's hand severely injured. Action was brought for the breach of warranty under a sub-section of Section 14 of the Sale of Goods Act, 1893.

According to the plaintiff, he had clearly stated to Messrs. Hunter's salesman, who was, in fact, Mr. Edward Hunter, the object for which he required the powder, namely, for use in a muzzle-loading gun. The salesman had, so he alleged, produced two tins, one of black and the other of Blue Rival Smokeless Powder, and said that the latter was greater in quantity, cleaner, quicker, and more destructive. He furthermore said that it was to be used in the same way as black powder, and to be rammed tight. Plaintiff was clear that he told the salesman it was for a muzzle-loading gun, and that he did not say it was for cartridges for a breech-loader. He did not buy any caps or wadding. In the course of cross-examination it was elicited that the plaintiff had heard of smokeless powder, but had never used it before. He charged the gun with the thimble of the powder-flask in the usual way, and not with the "heel" of his hand. It was quite possible that he might have charged it twice, but he did not think he had. He had had the flask a long time; the spring catch was a bit loose. When he asked the salesman the second time, the man told him there were full instructions on the tin.

For the defence, Mr. Edward Hunter, the salesman in question, gave evidence that the plaintiff asked for half a pound of smokeless powder, and he also got half a pound of B. C. wadding. Plaintiff said he had not used smokeless powder before, and witness told him that he would find full directions on the tin. He gave no warranty when he sold the powder. It was not true that he put two tins on the counter, one of black, the other of smokeless powder, and said that the latter was the better. He did not tell the plaintiff to ram the powder tight. Plaintiff did not make any remark to him about using a muzzle-loader. In cross-examination, Mr. Hunter said that the powder was not suitable in an ordinary sense for a muzzle-loading gun, and if plaintiff had told him it was for that kind of gun, he would not have sold it to him.

Mr. Thomas Curran, who had been in Messrs. Hunter's shop at the time of the sale, gave evidence confirming that of Mr. Edward Hunter, and Mr. Robert Downey said that he had used Blue Rival powder in a muzzle-loader several times.

Mr. Frank Izzard, as representative of the Blue Rival Smokeless Co., Ld., stated that the powder in question set up less pressure than black powder, to the extent of 1½ tons to the square inch. The advantages of smokeless powder were, greater velocity and increased penetration with less recoil and less smoke. This powder had almost entirely taken the place of black. As regards the gun, he had seen what was left of it, and he would not describe it as first-class, far from it. The original cost of the gun was about 35s., and he had examined it, and found the barrel to be on the "thin side," and it showed signs of wear, though he found no flaw in it.

Defendant's case being closed, his Honour gave judgment. He said that upon the evidence the matter was clear against the plaintiff, if the defendant's witnesses were to be relied upon. Even taking plaintiff's own evidence, it appeared that he would find it very hard to sustain the case he had brought forward. He had stated that he did not read the instructions on the tin in which he bought the powder, and had not produced the portion of the gun broken off by the explosion. The case was accordingly dismissed, a grant for witnesses' costs being made on the application of the defendant's counsel.

NOTES.

NATIONAL EXPLOSIVES CO., LD.—The ordinary general meeting of this company was held on the 7th ult., under the presidency of Mr. Athol Thorne, Chairman of Directors. After reviewing the figures, which were summarised in our last issue, the chairman pointed out that during the past year extensions have been made, and the machinery and plant have been increased in the gun cotton and Cordite departments to such an extent that, together with the smaller extensions made in previous years, the manufacturing capacity of the factory in respect to those materials is now four times as large as it was in 1895. Many of last year's additions only came into operation quite at the latter end of the year, and consequently their full effect is only now being felt. The chairman also alluded to the report of the Select Committee on War Office Contracts, in which the National Explosives Co., Ld., came under most favourable mention.

MOVEMENTS OF PRICES.—We have received from the Philadelphia Commercial Museums, Philadelphia, D. C., U.S.A., a copy of "Movements of Prices, 1840-1899," which is a record of the average and wholesale prices of various commodities both in Great Britain and the United States at each period of three months during the range of years above indicated. The immense volume of statistics is compiled from Sauerback's Tables, the *London Economist*, and Report of the U.S. Senate and of the Department of Labour on Prices. The work itself is derived from the summary of Commerce and Finance for May, 1900, and is issued by the Treasury Department, Bureau of Statistics, of the U.S. Government. Especially interesting is a table of the wholesale prices of rifle powder in the United States for every three months from July, 1845, to July 1899. The period of the war of secession is clearly defined by a conspicuous rise of prices in 1861, which reached its highest point at the beginning of 1865.

COTTON POWDER CO., LD.—The report of the directors of this Company, which was placed before the shareholders on the 14th ult., revealed a most satisfactory condition of affairs. After setting aside the commission payable to the directors under the Articles of Association, on account of dividend recommended, and payment of first and second debenture interest, with a writing off of £5,105 for depreciation, there remained a net profit on the year's trading of £15,819, to which must be added £995 brought forward from the previous year, thus giving a total of £16,814 available for distribution. Out of this total the directors recommended the payment of dividends of 14 per cent. on the A Preference Shares, of 10 per cent. on the B Preference Shares, and of 20 per cent. on the Ordinary Shares. They further proposed to carry to the General Reserve Fund £5,766, raising it to £10,000, and to create a Contingency Reserve Fund of £3,000. This apportionment would leave £1,828 to be carried forward, and the directors asked the authority of the shareholders to devote one hundred guineas of that amount to the fund of the Soldiers' and Sailors' Families Association, in consideration of the fact that a considerable proportion of the Company's profit has accrued from Government contracts connected with the present war in South Africa. The issue of £10,000 of Second Debentures has allowed the Company to increase the works at Faversham and Malling, and thereby to increase their capacity of output, while the existing works have also been kept in thorough repair. Altogether, the Company is to be congratulated on a most satisfactory year.

ROBURITE EXPLOSIVES CO., LD.—According to the balance sheet and statement of accounts presented to the shareholders in this company, the net profits for the year ending December 31st last amounted to £7,917, to which should be added the balance brought forward from 1899 of £1,375, making a total available for distribution amounting to £9,292. Of this total £792, which represents 10 per cent. on the net profits of the year, is set aside to the reserve fund, and is to be invested in Consols, leaving a balance of £8,500. An interim dividend was paid out of this in August, which absorbed £2,458, and the directors propose that of the balance remaining £4,939 should be devoted to the payment of a further dividend on the 10 per cent. preference shares to discharge the arrears of cumulative dividend for the twelve months ending December 31st, 1898. The balance of £1,103 is to be carried forward to the next account. The directors are able to report that the sales of the company continue to increase, and though the prices of the fuel and raw material have ruled unusually high, the net profits for 1900 are £956 in excess of those for the previous year.

VICKERS, SONS, AND MAXIM, LD.—According to the report of the directors, submitted to the shareholders of this company on the 26th ult., the gross profit for 1900 amounts to £526,937, as compared with £404,046 for the previous year. Out of this total, a certain amount has already been allocated to the payment in August last of interim dividends, 2½ per cent. on the preferred 5 per cent. stock and on the 5 per cent. preference shares, and 1s. 6d. per share (equal to 7½ per cent.) on the ordinary shares. In accordance with arrangements entered into with the Furness Railway Co., £60,000 had to be contributed as a half share towards the deepening of the lock sill at Barrow. There remained, therefore, a balance of profit which, in conjunction with the balance of £44,046 brought forward, gave a total of £340,984 available for distribution. The directors recommended the payment of a final dividend of 2½ per cent. on the preferred and preference stock, and a final dividend of 2s. 6d. (making 20 per cent. for the year) on the ordinary shares. This distribution, though only equal to the results of 1899, nevertheless leaves a carry forward of £11,303 more, or £55,359. The directors mentioned that the high price of fuel has had a large share in keeping down profits, the increased cost at Sheffield alone on this account amounting to £40,000. Then the fire at the Dartford Works had caused a direct loss of £26,000, with a further indirect loss of £11,000, all of which had to be borne out of revenue. As regards various rumours, the directors denied the intention of amalgamating with certain American firms, though the company had been in negociation with a view to getting the company's system of ordnance manufactured in America on a scale commensurate with its importance. They were able to announce that they have acquired the sole rights for Europe for the carriage-lighting system of the Consolidated Railway Electric-lighting and Equipment Co., and for the well-known "Holland" submarine boat, of which latter H.M. Government

ordered five at the end of last year.—An extraordinary general meeting was also called to authorise the increase in the company's capital to £370,000, by the issue of 200,000 new ordinary shares of £1 each, which would be offered primarily and *pro rata* to the existing shareholders at £2 10s. per share, the premium to be carried to the reserve fund.

MODERN ARTILLERY.

A LECTURE bearing the above heading was delivered before the Society of Arts on the 6th ult., by Lieutenant A. T. Dawson, late R.N., who is the Ordnance director of the Vickers-Maxim Co. It is obviously impossible to do full justice to what was a most interesting and instructive review of modern armaments of large calibre within the small space here available, so that the task will not be attempted, and we shall content ourselves more particularly with that section of the lecturer's remarks which deals with explosives. After devoting some attention to the lamentable survival of obsolete muzzle-loading ordnance in our warships and land defences, and suggesting the drastic measure of clearing them out once and for all, Lieut. Dawson went on to discuss the principal factors in the evolution of modern artillery, chief among which, of course, must be placed improvements in the powder employed. He pointed out that the introduction of modern explosives has made it possible to more than treble the energies of guns as compared with the days of black powder, thus bringing into the arena of practical warfare long-range fighting by land and sea, this long-range fighting being rendered accurate by the use of telescopic sights, range-finders, and other refinements. The introduction of modern explosives has also rendered an increased rate of fire possible, since, owing to the smokelessness of the powder, the object aimed at is practically visible all the time. Furthermore, the absence of residue left in the gun facilitates a quick rate of fire. The two great advantages resulting from the employment of smokeless powders are higher energies and a quicker rate of fire.

The lecturer then proceeded to discuss smokeless powders in detail, and he stated the case of Cordite *v.* Nitro-Cellulose in a form that may be repeated here in detail, without committing ourselves to agreement with the opinions expressed. Lieut. Dawson said:—"Having laid stress on the importance of smokeless powders in connection with modern ordnance, it may be well to say a few words on the explosive compounds themselves. In the days of black powder the velocities were limited to about 1,600 foot-seconds, owing principally to the quick rate of burning of the powder. The modern propelling powders, such as the various forms of nitro-cellulose and nitro-glycerine, are much slower burning, and thus longer guns can be utilised in which a greater number of expansions of the gas are obtained, thereby increasing the velocity to a very much greater extent, in many cases up to 3,000 foot-seconds. As to the type of powder to be used as a propellant, there is now practically no difference of opinion throughout Europe and America, nitro-cellulose being preferred on all hands. The United States, Russia, and France have adopted the nitro-cellulose form for some time. Germany has been late in its adoption, having used a form of nitro-glycerine powder containing about 25 per cent. of nitro-glycerine, but has now practically, I believe, decided to adopt a nitro-cellulose powder. Other small countries in Europe have not definitely decided on a particular type of explosive, and may be said generally to be carrying out experiements. The fact, however, of nearly all the great countries of the world, excepting our own, having adopted it, is to some extent a reason why our own Government should give it the greatest consideration. At the present time Great Britain is using cordite containing about 57 per cent. of nitro-glycerine. This powder has now been in use for about nine years, and in its day may be said to have been one of the best known explosives at the time of its introduction; it was absolutely necessary for our naval supremacy to introduce a smokeless powder; hence, I would represent that at that time Great Britain acted advisedly.

"Since that period, however, the manufacture of nitro-cellulose powders has very greatly improved, and the powders now being adopted by Russia and Germany are quite as safe in their use as cordite and other known modifications of cordite having various percentages of nitro-glycerine.

"Nitro-cellulose powder has the great advantage of being capable of producing in modern artillery the highest possible ballistics with the least possible amount of wear to the gun; and therefore at the moment its introduction should be treated from a most serious standpoint. It is, I think, well known that the temperature of explosion of cordite is practically double that of nitro-cellulose powders. This great difference in temperature of explosion has a great bearing upon the wear of guns, for with so high a temperature of explosion as cordite, far exceeding the melting point of steel, it is not reasonable to expect a gun to last for many rounds, and especially if large charges are used, developing heavy volumes of gas. Now, in order to obtain high ballistics, it is very necessary to develop very large quantities of gas, with the view of keeping the volumes of expansion of the gas at the higher pressures as long as possible, and continuing these pressures to the muzzle of the gun. If cordite is used, having this very high temperature of explosion, these volumes of gas at the high pressure must of necessity seriously affect the bore of the gun, especially at the commencement of the rifling. The nature of the wear of the bore with cordite is also very serious. In guns of low power using cordite, where only small charges are required, the effect is, of course, much less than in guns using large charges; but I contend that as it is necessary for modern artillery, except that for special purposes, to have the highest possible ballistics, it is of primary importance to use a powder which, as far as possible, gets over the objections I have just mentioned. The effect of using cordite in, say, 6 in. high-powered guns, having velocities of 2,800 ft. to 3,000 ft., is to entail a loss of some 500 to 600 foot-seconds, after about 200 rounds have been fired, representing a loss of energy of about 34 per cent., owing to the development of erosive effects. Furthermore, these velocities vary very materially with the temperature, and in some guns as much as 3 ft. per every degree Fahrenheit.

"The question really comes to this: that if cordite is used, no higher velocity than, say, about 2,500 ft. can be obtained for any reasonable number of rounds, whereas with nitro-cellulose powder, velocities up to and exceeding 3,000 ft. can be easily obtained, without the objections attendant on the use of cordite. I therefore shall continue to urge that a nitro-glycerine powder is not suited to modern artillery, and that any country continuing to use it must of necessity be at a serious disadvantage with a country making use of nitro-cellulose powder,

"As an example of the small erosion in guns when using a nitro-cellulose form of powder, I would refer you to an experiment carried out in a Krupp 6 in. gun, in which—after some 534 rounds, 76 of which were fired with prismatic powder and ballistite—the dimensions of the bore were such that, notwithstanding the damage done by the 76 rounds of powder other than nitro-cellulose, the dimensions of the gun came within the acceptance limits of a new gun.

"The usual objection put forward to the introduction of a nitro-cellulose powder is that it will not keep on foreign stations with variable climates. This, I must state, is erroneous; I have results of nitro-cellulose powders stored in some of the hottest climates, and these have proved in every way satisfactory, both chemically and ballistically, when fired in guns."

The remainder of the lecture was devoted to a consideration of the various details going to make up modern ordnance, and was illustrated by means of lantern slides, showing typical guns and mountings employed for various services.

THE BIRMINGHAM PROOF HOUSE RETURNS.

IT is regrettable to notice that, according to the recently issued Balance Sheet and Statement of Accounts of the Birmingham Proof House for the twelve months ending on December 31st last, there is an adverse balance of £1,080. At the close of the previous year there had been a distinct continuance of the falling off which had been noticeable for several years in succession, but still there had been a profit on the revenue account, small though that profit had become. The profits at the close of 1898 and 1899 had been £744 and £534 respectively, so that even on the bad year immediately preceding 1900, the twelve months under notice show a decline of £1,614. This marked difference was due, not to a falling off in revenue, but to a substantial increase in expenses, the revenue showing, in fact, an improvement of £296. As regards ordinary expenses, the amount due to gunpowder and cartridges showed an increase of £146, and repairs to buildings and furniture provided for an enhanced expenditure of £296, while the items of incidental expenses, tools and implements, stationery and printing, and coals also showed increased aggregations; but the chief factor in determining so substantial a loss on the year's transactions was an item of £1,487, which comes under the heading of extraordinary expenditure. This includes such details as Amendment Bill expenses £1,156, contribution to Superannuation Fund £250, prosecution expenses (net) £55, and law charges in respect to Shooting Range Bye-Laws £26.

Following out the system adopted in previous years, we give below classified lists of the weapons and parts passing through the Proof House in 1900, as compared with the figures of the years preceding. It will be noted that in the aggregate there is no very great improvement, the total number of proofs in 1900 being 390,268 as compared with 375,513 in 1899. In the matter of provisional proofs there is a slight improvement to chronicle on the very low figures of 1899, and the definitive proofs also show an increase on the quite abnormally good total of that year. The detailed figures for several years past are here given for comparison:—

	Provisional.	Definitive.	Total.
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
1900	69,177	321,091	390,268

Taking these totals still more in detail, the accompanying table shows the relative figures for the two last completed years in respect to provisional proofs. We had occasion in our notice a twelvemonth ago to remark on the total cessation of proofs of African barrels under this category, though in 1898 they had contributed a total of 119,834. The year now under review is equally conspicuous in this respect, there being only three classes of barrels submitted to the Proof House, in the following proportions:—

PROVISIONAL PROOFS.

	1899.	1900.	
Twisted Double and Single Birding and Rifle Tubes	48,302	46,595	*decrease* 3½%
Plain Iron and Steel Double and Single Birding and Rifle Tubes	9,906	11,394	*increase* 15%
Plain Iron and Steel Military Tubes	5,043	11,188	*increase* 122%

It will be noted that there are here no proofs which might come under the heading of "unclassified," and which would include such oddments as single pistol barrels and toy cannons. Item for item, however, the three classifications given above fall far below the corresponding figures of years prior to 1899.

The detailed figures as regards definitive proofs show an aggregate well nigh double the average for any of the years immediately preceding 1899, as can be seen at a glance from the first table given. Subjoined are the classified items:—

DEFINITIVE PROOFS.

	1899.	1900.	
Muzzle-loading Twisted Single and Double Birding and Rifle Barrels	24,948	15,196	*decrease* 39%
Do. Plain Iron and Steel Single and Double Birding and Rifle Barrels	9,876	7,919	*decrease* 20%
Do. African Barrels	139,642	124,155	*decrease* 11%
Breech-loading Double and Single Birding and Rifle Barrels ..	62,409	74,794	*increase* 20%
Do. (Foreign)	2,532	6,587	*increase* 160%
Do. (Nitro-proved or proved with nitros). (Supplementary) ..	7,102	6,601	*decrease* 7%
Military Barrels	4,508	5,575	*increase* 24%
Do. (Foreign)	6,935	131	*decrease* 98%
Pistols and Revolvers	54,087	79,376	*increase* 47%
Unclassified in this Abstract	223	757	*increase* 240%

An examination of this table shows a marked decrease in muzzle-loading barrels, and in African barrels, and in the supplementary list of barrels, nitro-proved, or proved with

nitros, while the proof of foreign military barrels has declined to the extent of practical extinction. There is, on the other hand, a satisfactory increase in the number of breech-loading weapons proved, to the extent of 20 per cent. It is noteworthy, however, that proofs of foreign breech-loading barrels have suddenly leaped up 160 per cent. in the same period. The increase in military barrels is also of a substantial nature, thereby recovering some of the ground lost during the previous completed twelve months, though they still do not reach one-half the total of 1898. Proofs of pistols and revolvers have suddenly moved up 47 per cent. as compared with 1899, which was a year of comparative decline in that respect. The unclassified items are of little importance, referring only to toy cannons and a few special barrels.

The revenue derived from provisional proofs amounted to £710, as compared with £638 received during 1899. Definitive proofs yielded another £3,653, as compared with £3,575. Other items in the revenue account included £502, interest on investments £100, in respect to the sale of old cartridge cases, and £240 due by the rifle shooting range. The expenses which are set against these incomings have already been detailed. As regards the assets of the Proof House, not much need be said. The total now stands at £31,638, in place of £32,574, which was the sum in 1899. A chief difference to be noted is that, whereas in 1899 the amounts in the bank and invested were respectively £14,336 and £5,000, these two items are now £2,069 and £15,013. On the other side, the reserve fund is £5,000, and the capital account £24,033, to which must be added £3,293, which is the surplus on the sale of shooting range land transferred. It is to be observed with satisfaction that the Proof House authorities have now fairly committed themselves to the system of placing corresponding figures for the previous year in parallel columns with those of the twelve months forming the subject of their statement of accounts. This system has already been urged strongly in these pages on previous occasions, and it affords a most valuable means of determining the trend of the gun trade from year to year.

LECTURES TO YOUNG GUNMAKERS.

X.

PRESSURES (SUMMARIZED).

WRITTEN WITH THE COLLABORATION OF F. W. JONES.

It would be a task of some difficulty to define the exact class of person to which these lectures are addressed. The young gunmaker has been selected as a representative person who would be interested in an attempt to lay down the scientific and practical groundwork of the problems with which anyone interested in the fire-arms industry is brought into contact. The lectures themselves are no more than our own humble effort to lay down in the manner of an ordinary engineering text-book that information which the gunmaker, desirous of equipping his mind for his calling, should possess. Other expert trades are mostly over-provided with text-books for the beginner, but in some way the science of small-arms has never been practically treated in the manner which we have taken in hand. Many excellent works describe guns from the point of view of their mechanism, but being more particularly addressed to the sportsman, they are weakest in just those directions where the gunmaker would like practical information in order to qualify him for bringing scientific knowledge to bear upon the problems that are daily arising. In military text-books there is a great deal of useful scientific information, but here again the audience addressed is something different from the gunmaker, and the knowledge imparted consequently loses much of its application to the problems of the gunsmith. If, therefore, in our modest efforts to stop what appears to us to be a gap in the bookshelves of the gunmaker we fall into occasional error, we trust that the difficulties of our task will be taken as sufficient excuse. Where the applied rules of a practical subject have never been systematically set forth by a trained scientist, he who first essays the task is bound to meet with difficulties which he may be able to overcome to only a partial extent.

As regards the question of pressures, an enormous amount of fragmentary work has been done, and in those cases where the records of this work are available, signs of incompleteness and want of cohesion are apparent. What, therefore, we have endeavoured to accomplish has been to frame a connected narrative showing the manner in which pressures may be recorded, and how far the results attainable with existing appliances may be accepted as demonstrating true values for the work done in the gun. As far as possible, we have shorn the question of that fringe of supposition and inapplicable theory which tends only to confuse the mind of the enquirer, at the same time failing to exemplify the conditions that enter into the problem. At the risk of repeating what has already gone before, it is proposed in this lecture to summarize the four that have preceded, so giving a general account of up-to-date developments in the work of pressure taking.

The ordinary pressure gun, as used in the trade, consists of a heavy barrel having one or more perforations along its length, into which are fitted accurately-made pistons. The lower faces of these pistons form portions of the walls of the barrel, and thus receive a force commensurate with the pressure exerted by the powder gases within the gun. Pressures in the ordinary way are recorded in values of tons per square inch, fractions of a ton being generally expressed to the second place of decimals. For every ton per square inch of pressure within the barrel the piston is subject to a force as much less than one ton as the area of the piston base is less than one square inch. The commonly adopted area for shot gun pistons is one-twenty-fifth of a square inch (diameter ·225 in.). It therefore follows that for every ton of gas pressure within the barrel the piston receives a force equal to 89·6 lbs. Pressure testing consists in measuring and recording the value of the force to which the piston is subjected. Many difficulties are introduced by the character of the force that is exerted. Were it a constant or stable force it could be allowed to act on a recording instrument, the index of which would come to rest when that amount of movement had occurred necessary to produce equilibrium between the force exerted and the resistance set up by the recording instrument. Any form of spring balance would satisfy the required need were the force of a simple character, such, for instance, as that exerted by the steam within a boiler or the magnetic pull upon an iron body.

The force exerted by the gases within a gun is not constant or stable in value for sufficient time to give ready means for deter-

mining its value. Gas pressure is set up by the production of gaseous products of combustion, and the rate of increase is governed by a number of conditions, which vary from shot to shot and with different powders, so as to render it well nigh hopeless to anticipate the day when curves may be obtained showing the rise and fall of pressure at a given point along the barrel in the same way, for instance, as is done when taking steam diagrams for engines. The gas pressure rises in a gun at a rate which can only be approximately estimated, and it falls away in a similarly indeterminate manner. The force in which we are most interested is the maximum pressure attained by the powder gases at that part of the barrel's length where the piston is situated. Guns which are burst by detonating charges show us that, however short may be the duration of the high pressure, it is long enough to make its effect felt upon the metal of which the barrel is composed. Compressible cylinders of metal are the recognised method of recording the force exerted upon the piston which receives the pressure. A small cylinder can be made which will respond so quickly to the force of the powder gases that, within their period of duration, it will compress sufficiently to establish equilibrium. In other words, a copper cylinder of suitable dimensions will, under the action of powder gases, reduce in length until its increasing diameter and its increasing hardness render it capable of supporting a pressure before which, in its original state, it gave way. Further than this, a suitably proportioned copper cylinder or crusher responds so rapidly to the increase of powder pressure that the various stages of its reduction in length keep pace with the rise of pressure within the gun. This means that if, at any moment during the combustion of a charge of powder, the action were suddenly terminated, the copper crusher would, by the reduction of its length, record the value of pressure that had been reached. In the same way if, instead of these conditions occurring, the pressure were to remain at the maximum instead of rapidly falling away, a copper crusher would not be further compressed owing to the extra duration of the load. In pressure testing with copper we, therefore, evolve the truth that copper crushers of suitable specification keep pace in their record with the development of pressure by the powder, and do not continue to compress under prolonged pressure equal to or less than that to which they have already been subjected. This property of copper has been sufficiently demonstrated in the previous lectures to enable us to pass on to other aspects of the question.

What has so far been said refers to copper crushers in connection with pistons at or near the chamber of the gun. In such situations the piston is subject to a gradually increasing force, developing at a rate with which the copper can keep pace in the various stages of its compression. Beyond the chamber, and therefore at places where a certain value of pressure will suddenly act upon the copper due to the movement of the shot past the face of the piston, other conditions arise. Supposing that the copper crusher will, in its natural state, support an equivalent to half a ton of gas pressure, and that it is in contact with a piston in such a portion of the barrel that a pressure of one ton will be suddenly switched into action by the movement of the shot, it is obvious that the crusher could instantaneously reduce its length so as to offer the equivalent of one ton of resistance. The compression of the copper under these conditions is such that one ton force encounters a half-ton resistance. The surplus of unbalanced force is still applied to the piston, and results in moving the piston at a rate greater than the half-ton force would produce. The result is that when the copper has reduced in length to the amount qualifying it to withstand the one-ton pressure the unexpended energy, in the form of velocity imparted to the piston, comes into play. Its effect is to compress the copper beyond the distance necessary to produce equilibrium of force and resistance, so causing the copper to indicate higher pressure than actually exists. Undoubtedly the above takes place for pistons beyond but near to the powder-chamber; moreover, in the powder-chamber itself the first rise of pressure may be so rapid that with some combinations of crushers and pistons a certain value of pressure will act before any material movement of the piston can take place, causing the same kind of error as detailed above.

The remedy for the above source of error is to be found in the simple procedure of previously subjecting the copper to a dead weight equivalent to one ton of gas pressure. The sudden switching on of one ton of pressure thus has no effect on the copper, which is therefore free to respond to the further development of pressure by the powder gases as the combustion of the charge proceeds. It is impossible to ascertain the exact value of the pressure that will be so switched on, but a few preliminary trials in the case of novel conditions occurring, and experience of a code of instructions under established conditions, will make it a simple matter to select the right value of preliminary crushing for all practical conditions. It is unnecessary as a matter of fact to estimate the value of the pressure first switched on; since the same result would follow from knowing approximately the maximum pressure developed at the point where the piston is placed. The crusher would thus remain quiescent until a force had been developed sufficient to overcome the initial resistance to which the crusher had been subjected. Supposing that several charges had been fired with crushers loaded for three-ton pressures, and that the resulting readings in some cases showed no measureable crushing, and that others showed crushings but slightly over three tons, the obvious inference would be that two or two-and-a-half ton crushers would be more suitable for the range of pressures encountered in that particular series of experiments.

The system of preventing errors due to the imparting of velocity to the piston, only applies to those portions of the barrel to the rear of the point reached by the shot at the moment when the powder gases have attained their maximum pressure. For pistons beyond this and towards the muzzle, the conditions are quite different. A given pressure is suddenly switched on to the piston by the movement of the shot, and the pressure does not increase beyond this value, but subsides as the shot passes onwards to the muzzle. Here we must rely upon the teachings of well-known tests of this metal, which will enable us to make suitable corrections for the over-registration which must necessarily occur. We know that a suddenly applied force will compress a copper crusher to an extent representing exactly double the force that would produce the same result if gradually applied. The rule, therefore, for using copper crushers is to load them previously to within a certain margin of the expected maximum pressure for all pistons up to the point of maximum pressure, and to halve the readings of the unloaded crushers used beyond that point.

What has so far been said applies solely to pressure-taking by means of copper crushers. The few words still remaining to be said apply both to lead and copper crushers. Lead crushers in their shortening are subject to a number of influences other than pressure, which preclude us from considering them as a scientifically exact means of determining the behaviour of the powder gases within the barrel. It is, however, a handy means of affording a general insight into what takes place, so handy, in fact, that it will doubtless retain its popularity for many years to come in connection with the every-day tests at powder and cartridge factories, when the very obvious sources of error in the use of lead crushers are generally admitted, it will be clear how necessary it is that a uniform system of testing should be everywhere adopted. In this way the readings obtained will have a definite and generally accepted meaning in relation to what is and what is not a safe charge to use in a given gun. The powder maker and cartridge loader will thus be able to work in close relation with the requirements of the gunmaker, and the gunmaker in his turn will learn by experience what margin of safety to allow in working out the thickness of metal necessary to withstand a certain nominal value of pressure. Were it a question of steam boilers, where absolute values are ascertainable, and may be checked, it is quite unimportant what form of gauge is used. With gun pressures, however, there is no direct means of obtaining exact values. Copper crushers are theoretically more exact than lead crushers, but even here the difficulties are such as to render it highly desirable that a standard copper test should be established. This might be reserved for important experiments where accuracy of results is of greater moment than cost, and the services of highly skilled experimentalists. In a single word commercial pressure testing is not the highly technical subject that many suppose it to be, provided that the tests are carried out on a uniform and carefully worked-out basis.

It is a matter of the greatest satis action to us to record the fact that Mr. James Irvine, senior, has made the most satisfactory recovery from his recent illness, having been regularly at the office for some time past.

FIREARMS IN SPAIN.—The *London Gazette* of the 19th ult. contained the following notice issued by the Foreign Office:—"With a view to obviating the inconvenience caused to British travellers entering Spain by ignorance of the regulations governing the introduction of firearms into that country, his Majesty's Ambassador at Madrid has forwarded the following information on the subject to his Majesty's Secretary of State for Foreign Affairs:—Travellers entering Spain with firearms must in all cases obtain a permit from the Governor of the province of the place of entry. These permits are obtainable on application through one of his Majesty's Consular officers. On receipt of the permit the duties, as stated under numbers 69, 70 and 71 of the Custom House tariff, have to be paid. As, however, under Royal Orders of June 23, 1900, and January 26, 1901, exception is made in favour of guns temporarily imported by sportsmen, travellers in possession of permits whose stay in Spain does not exceed six months can obtain passes at the Custom Houses, which hold good for that time, by registering the full description of their weapons.

THE SEIZURE OF AMMUNITION IN THE PERSIAN GULF.

On the 25th ult., an action was brought in the Commercial Court, by Messrs. Fracis, Times and Co., merchants and exporters, against Colonel Meade, who was in 1897 and 1898 H.M. Political Resident and Consul-General on the Persian Gulf. The action was brought for the purpose of recovering damages for the alleged wrongful seizure of arms and ammunition at Bushire and Bahrein, and the main particulars of the case have already been detailed in our notice of former actions brought in this or other Courts by the plaintiff firm against officials concernded in the seizure in question. As regards this particular case, at the time of the seizure of goods in the port of Muscat by a British warship, under circumstances previously referred to, the plaintiffs had, in their go-down at Bushire, arms and ammunition of the value of about £30.000, on which duty had been paid. On December 7th, 1897, Mr. Gaskin, the Vice-Consul, accompanied by Persian officials, visited the plaintiffs' office, demanded their keys, and sealed up the go-down in which the arms were stored. Within ten days the whole of the arms and ammunition were removed by the defendant and his agents to Teheran, and had been totally lost to the plaintiffs. The Foreign Office view of the matter was that the plaintiffs could expect nothing less than seizure because they had been violating the law of Persia for the last thirteen years in respect to the importation of arms. It was also contended that the confiscation was the act of the Persian authorities.

There was another similar incident which took place at Bahrein. This differed from the Bushire case to the extent that Bahrein is under the sovereignty of a Sheikh, who is himself under the protection of the Indian Government. In 1895 the Sheikh granted a concession, which in 1896 became the property of the plaintiffs, conferring on them the sole right to import arms and ammunition into his territory, subject to the condition that the goods were not to be sold to certain of his neighbours. The concession had been obtained by a Persian, named Saffar. At the end of 1897 the plaintiffs had about £17,000 worth of arms and ammunition in their go-down at Bahrein, and a month or two later Saffar, who had lodged a claim for a large amount against the plaintiffs, procured an additional padlock from the Sheikh to secure the go-down contending that he was thereby merely exercising his right to obtain a foreign attachment as security for the money owing to him. Subsequently the defendant arrived at Bahrein on H.M.S. *Lawrence*, and demanded that the plaintiffs' arms should be given up. Part were so given up, and the remainder detained under lock and key until June, 1900, when they were released, it was alleged, in a very damaged condition. On that account it was sought to recover damages for the loss incurred. In this case also the defence was that the seizure and detention were carried out at the instance of the local authorities, in accordance with Persian law.

Evidence was called for the plaintiffs to show that the prohibition of arms, which was originally issued in 1881, was in reality a theoretical or nominal embargo which substituted an arbitrary impost for a fixed duty. A member of the firm said that in Persia the customs were farmed out to the highest bidder, who subsequently fixed the amount of duty, and whether it should be paid in money or in kind. He stated

that the Persian Government were pleased with the development of the trade, as they were able to make larger payments to the Shah. It was sought to prove that the seizures were not made at the instance of the Persian authorities, but by the defendant and his agents.

For the defence, on the other hand, it was contended that the seizures were made in accordance with the law of Persia. In that country, the law was the will of the Shah. In 1881 he had issued a prohibition against the importation of arms, and traffic subsequently carried on was only due to a systematic bribery of the local officials. As regards the seizure at Bahrein, the defendant was not present when it occurred, and was not responsible for it. It arose out of a dispute between the plaintiffs and Saffar, and was in no way the act of the defendant. Even if he had been concerned in it, the will of the Sheikh was paramount there. Similarly, the seizure at Bushire was carried out in direct obedience to the Shah's orders, and not by the defendant's.

After the case had come up for three days in sucession, further hearing was adjourned until April 29th, and a report of the proceedings will appear in these columns in due course.

CORRESPONDENCE.

"THE GENTLE ART OF ENCOURAGING INVENTORS."

TO THE EDITOR OF *Arms and Explosives*.

DEAR SIR,—I was very much interested in this article in last month's issue, but I do not consider your correspondent's case was put as strongly as it might have been. I compare it with a series of pin-pricks where a healthy stab or two is necessary.

The records of the treatment which the inventor has received from the Government in the past is one of the blackest pages which ever disfigured the annals of a commercial nation.

Lord Wolseley recently stated that in his opinion the army should be managed by soldiers, as civilians were ignorant of the art of war! Conversely; does not the same hold good, applying it to the workshops and management of Ordnance Factories? And yet every available post is greedily absorbed by the military section in the vain imagination that the pay, being less than an efficient civilian would command, is an economy. Never, sir, was there such a fallacy. How can these untrained men give inventors justice? Your correspondent seems to classify them much as a grocer does his eggs, but call them what you will, "ordinary" or "extra-ordinary," progress and invention are stifled for lack of trained commercial and qualified men. There is the whole story in a nutshell. Let it not be forgotten we are a nation of shop-keepers. Our commercial instincts are really much stronger than the affected snobbery and militarism which pervades the youth of this country. The desire to be a "gentleman" is the ambition of every schoolboy, and the poor young fop is encouraged to believe that the expression "an officer and a gentleman" is a synonym, or a virtue of sole monopoly, which does not extend to the humble commercial aspirant, and when he becomes gazetted and appointed he assumes as much arrogant superiority of intelligence over the trained technical man as an average policeman over the judicature. The remedy is obvious.

I am, Sir, yours truly,

JOHN PURGER.

REVIEWS.

L'Artillerie à l'Exposition de 1900, par Le Colonel X. Paris: Vve. Ch. Dunod, Editeur: 49, Quai des Grands-Augustins.

THIS volume only misses becoming a standard work on modern artillery by the fact that it is confined to dealing only with such examples of up-to-date gunnery as were exhibited at the recent Exposition. On this account it is unfortunate that none of the Great Powers was represented, if we except certain exhibits contributed by the Russian Government, and some mountain-guns built for the Mexican Government to their own design by a French firm. As regards firms, also, there was by no means a complete representation. Germany entirely abstained from participation in the Exposition Messrs. Vickers, Sons, and Maxim, Ld., were the sole representatives of Great Britain. The manufacturing resources of Austria were vindicated only by the work of the well-known Usines Skoda. So that the chief burden of the exhibits in war material of this class rested upon four French firms: Creusôt, Châtillon-Commentry et Neuves-Maisons, Saint Chamond and Hotchkiss.

The first section of the work is devoted to a review of the exhibits of the above-mentioned establishments, regarded in respect to their general particulars. This section will probably be of special interest since it contains brief descriptions of the various factories, and some faint discrimination as to the methods employed in different countries. As regards the actual exhibits themselves, however, these are dealt with in absolute detail in a second part of the work, in which they are classified according to their uses and mechanical properties, in a series of eight chapters. For example, Chapter I. deals solely with breech mechanisms, and the various systems in use are carefully explained and illustrated. Four succeeding chapters are devoted to gun carriages, for field and mountain batteries, for siege trains and guns of position, for coast batteries, and for naval guns. It is interesting to note that most of the guns of position shown at the Exposition had carriages of the disappearing type, in contrast to the vehement condemnation of this type by the U.S. Government advisers. Another chapter is devoted to cupolas and their fittings for land defence, and to naval turrets. Finally, two chapters deal respectively with automatic guns and mitrailleuses, and those especially which are operated by the gases of each discharge. The whole of the field covered is explained by upwards of two hundred illustrations, for the most part of excellent character, and this work is undoubtedly, within its limitation, a singularly comprehensive review of the present condition of artillery manufacture and design.

The Art of Revolver Shooting, by Walter Winans. Published by G. P. Putnam's Sons, New York and London. Price £1 1s. net.

For some time past gunmakers and revolver shooters have been looking forward to the publication of this book, and now that it is in our hands the feelings with which it is received are those of satisfaction, since it is fully up to the level of the most favourable anticipations that we were led to form concerning it As a specimen of printers' art, it without question does justice to the best teachings of the late William Morris and others who have laboured to raise the printer's work to the level of an art. The initial letter for every chapter has been specially designed in an artistic manner, which

is not only true to art, but appropriate to the subject-matter of the chapter which it introduces. What is characteristic of the work, as a whole, is the fact that the author has designed these initial letter sketches himself. In addition to the designs referred to, each chapter is concluded with a tail-piece equally artistic. They are more or less in the nature of thumb-nail sketches. In one place we come across the clock tower at Bisley, with blue wreaths of smoke curling round, which tell us that the hour of gun-firing has just arrived. At another place we see a spirited sketch of Mr. Winans driving his pair of trotters into the Bisley ground. We cannot specify in detail any more specimens of those really interesting productions, but it is sufficient to say that they are subject to none of the reproaches which one usually associates with amateur work. The general llustrations throughout the book are exceedingly well carried out, and fully balance the general excellent get-up of the work.

Turning now more particularly to the literary contents of Mr. Winan's book, we find ourselves faced with a range of information which makes anything in the nature of a summary extremely difficult. Having the pleasure of personal acquaintance with the author, we do not need to enter into imaginary pictures of his mode of work, as based upon the particulars in his book. From the very earliest days he has been a keen revolver shot, and while there are many others who have in one or other or several branches of the sport attained equal or greater proficiency, the honours of holding the records rests with the author. Having reached the top of the tree, he has retired an unbeaten champion, and he now proceeds to tell us the manner in which his victories were accomplished. The sneering say that he purchased his prizes. In one sense he certainly did; but in our opinion any such statement is grossly unfair to Mr. Winans. To put it in another way, there are plenty of persons who could well afford to spend all that Mr. Winans has spent on revolver shooting, and there are also many revolver shots who could afford to spend such an amount to place them in an equally favoured position with the present author. The fact, however, remains that no one has possessed the interest in the subject, or has exercised the same dogged perseverance to attain perfection. Mr. Winans has made a careful and systematic study of every class of revolver on the market. He has judged the several merits of different forms of sighting, and he has regulated his weapons so that each one in a large armoury may represent special applicability to a given class of work. No gunmaker could have afforded to spend all that Mr. Winans has lavished in order to bring the revolver to its highest state of shooting perfection, and certainly no gunmaker, or in fact any other enthusiast, would be inclined to undertake the long course of experimentation necessary for the making proper use of the capital which Mr. Winans has employed to such good purpose.

That Mr. Winans does not take a selfish view of the question is now plainly shown by the issue of the present book, which conveys to all interested the results of years of experimentation, which will probably never be repeated by any individual for generations to come. In other words, the whole of what Mr. Winans has learnt is now dedicated to the world at large, and it is presented to the world in a form leaving nothing to be desired. Practically all that could be said of revolver shooting has been stated by the author. No doubt many of his conclusions will be contested by other exponents of the art, but we regard the plan adopted by the author as the best under the circumstances. Knowing so much himself, and having passed through the drudgery of obtaining his information at first hand, he has confined himself to the stating of his own conclusions, and has systematically avoided repeating, contesting, or editing the opinions of others. Naturally it follows that this mode of treatment has in places somewhat limited the scope of the book from the point of view of an exhaustive handbook, especially so far as regards the actual weapons on the market.

Mr. Winans's chief experience with modern revolvers is largely based upon the performance of the Smith and Wesson. He gives excellent reasons for his belief that weapons of this make may be regarded as standards, and he, therefore, speaks more frequently of Smith and Wesson revolvers than of any other type. Through the greater part of his shooting career he has made use of one or other of the various forms of Smith and Wesson revolvers and pistols. His book must not, however, be read in the sense that he believes no other revolver to be its equal. He has selected this particular one for his own use, and his remarks concerning it no doubt equally apply in the majority of cases to other revolvers having the same characteristics. As he points out in the earlier chapters of his work, the effort to deal exhaustively with all patterns of revolvers would reduce him to a task as uncongenial as the compiling of a gunmaker's catalogue. What he wished to write about was revolver shooting, and he has mentioned revolvers solely as the implements of the sport, irrespective of their relative modes of action, except, of course, where he is dealing with special types of arm for the purpose of showing their adaptability or otherwise for any given kind of shooting.

Gunmakers will find this book essential for reference purposes in connection with their business. Revolver shots of all classes will also find it equally useful, according to their several needs. The book represents very good value for the guinea that is asked for it, and our advice to all and sundry is to purchase it without delay, since it is bound to become a classic in the shooting library, and as such will in years to come fetch premium prices. This is the history of all first-class shooting books that have been published up to date, and there is certainly no work within our knowledge upon which more care and elaboration have been lavished. With these words we close the book, having read it from cover to cover, only regretting that there was not another volume to engage our further attention.

APPLICATIONS FOR PATENTS.

FEBRUARY 18TH—MARCH 16TH, 1901.

3,500.* Safety Device for Small-Arms. T. Krompecher.
3,514. Single-Trigger Mechanism. T. Southgate.
3,534. Telescopic Sights. W. G. Steel and F. C. Rogers.
3,634. Lock Mechanism of Sporting Guns. O. Hoxton.
5,651. Rifle Sights. T. Cuthbert.
3,725. Guncotton Presses. A. Hollings.
3,789. Trigger Mechanism for Small-Arms. H. A. Vachell.
5,897. Bullets. L. B. Taylor.
3,901. Fire-Arms. D. Fraser.
3,961. Explosive Shells. J. E. Bott, and W. K. Webster.
4,052. Testing of Shot-Firing Cable. J. T. Stobbs.
4,071. Search-Light Projectiles. J. E. Bott, and W. K. Webster.
4,118. Sighting of Ordnance. A. A. Common.
4,151. Recoil Apparatus for Ordnance. Sir G. S Clarke.
4,171. Small-Arms and Punt Guns. H. W. Holland, and T. Woodward.

4,300* Recoil Apparatus for Ordnance. C. P. E. Schneider, and J. B. G. A. Canet.
4,415. Magazine Small-Arms. O H. Edwards.
4,433* Repeating Rifles S. H. Bang.
4,453. Method of Securing Cartridges in Bandolier. Ellen J. Pennefather.
4,465. Apparatus for Musketry Instruction. P. F. G. Christie.
4,474. Brakes for Gun Carriages. A. Reichwald (Agent for *Fried. Krupp*).
4,493. Cleaners for Ordnance. Sir W. G. Armstrong, Whitworth and Co., Ld., and S. M. Murray.
4,513.* Cartridges for Fire-Arms. J. J. Mangon.
4,520. Ordnance. W. S. Simpson.
4,526. Explosives. R. and H. Hawkins.
4,555. Back Sight for Small-Arms. W. R. Clark.
4,574. Automatic Fire-Arms. H. W. Gabbett-Fairfax.
4,596. Fire-Arms. H. W. Gabbett-Fairfax.
4,698. Cartridge Holder. C. F. Greenfield.
4,703.* Gun Carriages. K. Haussner.
4,733. Targets. G. H. Hopwood.
4,770. Cartridges for Ordnance A. Reichwald (Agent for *Fried. Krupp*).
4,783. Sighting Apparatus for Practice Purposes. Sir W. G. Armstrong, Whitworth & Co., Ld , and E. W. Lloyd.
4,795. Small-Arms. F. W. Green.
4,802. Dummy Magazine for use with Miniature Ammunition. E. Romer.
4,877.* Machine Guns and Cartridge Carriers. F. M. Garland.
4,924. Revolvers. W. J. Whiting.
4,992. Mountain Gun Carrying Apparatus. H. R. Newburgh-Stewart.
5,030. Priming Ribbons. K. Tietze.
5,169.* Magazine Small-Arms. F. R. von Mannlicher.
5,212. Cartridges. H. W. Gabbett-Fairfax.
5,231.* Explosives. J. V. Skoglund.
5,264.* Explosive Charges for Guns. R. W. Scott.
5,267. Range Finders. G. Forbes.
5,297* Single-Trigger Mechanism. C. I. Annan.
5,331. Stocks of Rifles. H. W. Gabbett-Fairfax.
5,354.* Cartridge Clip. G. Roth.
5,417. Automatic Fire-Arms. H. W. Holland and T. Woodward.
5,418. Gun Mountings. A. Welin.
5,439* Quick-Firing Rifles T. A. Fidjeland, and J. A. Schwartz.
5,603 Protectors for Projectile Points. R. A. Hadfield.

* These applications were accompanied by Complete Specifications.

SPECIFICATIONS PUBLISHED.

COMPILED BY H. TARRANT.

FEBRUARY 23RD—MARCH 16TH, 1901.

1,888 (1900). **Explosives Factories.** G. Beneke, Kingsbury. A portable or mobile factory for the manufacture of explosives for military and mining purposes, the external form of which is that of a wheeled vehicle. Special apparatus is provided for use within the vehicle, by means of which all the mixing operations and the subsequent manipulating of the ingredients to form the finished explosive may be carried out in the same receptacle. The danger attending the moving of the explosive mixture from one vessel to another is thus avoided. Accepted Jan. 30, 1901.

2,498 (1900). **Back-sight for Rifles.** J. B. Carslake, Birmingham. The leaf of the back-sight is provided with a guide, which acts upon the sight-bar as an adjuster. During the raising or lowering of the sight-bar the guide causes it to travel laterally across the leaf, so automatically adjusting the sights at the different ranges, as to compensate for the natural drift in the flight of the bullet. The pitch of the guide is, of course, coincident with, and determined by, the amount of and path of the drift, which is ascertained by experiment. Accepted Feb. 1, 1901.

4,097* (1900). **Rifle Mechanism.** E. Harrison, London.

4,341 (1900). **Hand Thrower for Inanimate Birds.** J. F. and C. W. Pike, Birmingham. Hand apparatus for throwing inanimate birds for shooting practice. The apparatus consists of a holder formed of a piece of wire bent to correspond with the shape of the clay bird. This holder is fixed into a handle which is gripped by the thrower. The pressure of the wire is sufficient to hold the bird within the holder against an india-rubber collar. A throwing action of the arm ejects the bird from the holder in any desired direction. Accepted Feb. 1, 1901.

5,454 (1900). **Rifle Carrying Attachment for Cycles.** G. T. Spier, London. Two attachments are used in connection with safety bicycles for carrying a rifle. These attachments consist of two hook-shaped spring clips, one of which is fixed at the point where the head and top bar meet, and the other at the back end of the top bar. The rifle is thus carried in a horizontal position. Accepted Feb. 3, 1901.

5,508 (1900). **Ammunition Carrier.** N. W. Wallace, London. In order to enable a soldier to carry a reserve supply of ammunition into action, a valise or satchel arrangement is provided, which consists of a canvas backing on which are fixed a number of pockets capable of containing from 100 to 150 cartridges. The backing folds down upon itself, so forming a compact package, and is carried on the back in a similar position to a knapsack. When the cartridges are required the arrangement is opened, and by means of straps also provided, is fixed to the chest (in the open position) when the cartridges are readily accessible. Accepted Feb. 23, 1900.

5,873 (1900). **Breech Mechanism of Quick-firing Guns.** A. T. Dawson, and L. Silverman, London. In Hotchkiss quick-firing guns or guns of a similar type, in which the energy of recoil is utilized to return the gun to its firing position, apparatus is provided for the automatic or semi-automatic working of the breech mechanism. Through the engagement of a finger attached to the block-operating axle, with a hinged arm carried by a stationary part of the gun mounting, the axle is caused to turn during the recoil, and thus to open the breech block. On the return movement the block is locked, when the finger is automatically tripped by a spring which is compressed by the axle in turning during the opening. Accepted Feb. 23, 1901,

6,647 (1900). **Firing Mechanism of Automatic Guns.** A. T. Dawson, and L. Silverman, London. In order to insure that only single shots are fired in automatic guns, with every pull of the trigger, one arm of a little double-armed lever pivotted to the sear controlling lever, is adapted to engage with a shoulder of the trigger bar. By means of the stop, working in conjunction with the other arm of the lever, the trigger bar shoulder slides beneath the first arm immediately after the discharge, and the bar is then at once returned to its original position by a spring. Accepted Feb. 23, 1901.

6,960 (1900). **Rifle-carrying Attachment for Cycles.** A. Haskins, Moseley. The combination of attachments for carrying a rifle on a cycle consists of a shoe clipped on to the down tube, in which the butt of the rifle is tightly strapped. The barrel, or forward part of the rifle, is secured in a bracket arrangement, which is clipped to the head of the machine. Thus the rifle is carried conveniently, in no way interfering with the pedalling. Accepted Feb. 11, 1901.

7,472* (1900). **Bolt Lock Rifle Mechanism.** S. Lee, and R. C. Pudney, London.

7,473 (1900). **Cartridge Carrier.** S. Lee and R. C. Pudney, London. In order to avoid having to arrange rifle cartridges all one way for insertion into the magazine as is necessary when served out in ordinary packages of tens, the patentees pack them in paper cases in fives with all heads one way. The package thus formed is shaped like a truncated pyramid, and these packages are arranged in specially designed pockets fixed to a belt so shaped as to be out of the way of the soldier's knapsack. Accepted Feb. 23, 1901.

7,968 (1900). **Hydraulic Brakes for Ordnance.** A. Reichwald, London (Agent for *Fried. Krupp, Germany*). A hydraulic brake containing a filling-up pump, which is used for adding liquid to replace leakage, occupying little space, and protected from flying fragments. The filling up pump is built into a reservoir, which holds the brake liquid for replenishing the brake cylinder, formed by either the cylinder cover of the running out cylinder, or of the brake cylinder. Accepted Feb. 16, 1901.

7,969 (1900). **Envelopes for Ordnance Charges.** A. Reichwald, London (Agent for *Fried. Krupp, Germany*). A bag for containing the explosive charge in ordnance, which is designed to combine the advantages of a bag made of some such woven fabric as silk, and the complete combustibility of a bag made of a film of smokeless powder. In the manufacture of this bag a fabric is employed consisting of threads of smokeless powder. This patent relates also to a construction of envelope described in Specification No. 9,481, 1899. Accepted Feb. 16, 1901.

7,970 (1900). **Ammunition Hoists**. A. Reichwald, London (Agent for *Fried. Krupp, Germany*). The spring catches ordinarily employed in ammunition hoists are generally maintained in an operative position, either by their own weight, or by spring power or weights. The non-operation of these catches might be the cause of an accident, and in order to ensure their operation, the present patent deals with a method of automatically locking the catch in an operative position by the action of the working pressure. Accepted Feb. 16, 1901.

8,462 (1900). **Time Fuses**. A. Reichwald, London. (Agent for *Fried. Krupp, Germany*). In time fuses which contain an easily rotatable composition ring, a method of preventing premature bursting by accidental movement of the ring, by causing the spindle carrying the ring to become jammed through the sudden forward movement at the moment of firing, The spindle is for this purpose hollowed out, and the part of the closing nut screwed on to the spindle bearing against the composition ring is formed in the shape of an annular lip. Accepted Feb. 16, 1901.

8,716 (1900). **Sighting of High Angle Firing Guns** A. Reichwald, London (Agent for *Fried. Krupp, Germany*). It is generally necessary to make use of calculated tables to obtain the weight and charge corresponding to the given range and required angle of descent desired for the projectile, and also to obtain the amount of elevation, before a high angle firing gun can be trained through its spirit level. In the present patent a spirit level quadrant is described having a number of ranged scales arranged upon a drum, the rotary movement of which effect an angular displacement of the spirit level. The index marks indicated by the adjustment of the spirit level point out the various distances in metres at which the projectiles would fall when the gun is loaded with corresponding weights of charge, and is trained to an angle corresponding to the angle of elevation shown by the spirit level. Accepted Feb. 16, 1901.

8,898 (1900). **Rifle carrying Attachment for Cycles**. M. Pedersen, Dursley. Two levers are pivoted to the frame of a bicycle, and these levers carry two catch or seat arrangements for holding the rifle. The transmission of the bumping of the cycle to the rifle is prevented by springs, which are affixed to the levers. The carrier may be used on other vehicles besides bicycles. Accepted Feb. 23, 1901.

12,645 (1900). **Rifle-carrying Attachment for Cycles**. F. W. Read, Doncaster. Two clips are attached to the cycle frame by means of draw pins suspended by chains. One clip, which takes the stock, is attached to the back stays, and the fore-end clip is fastened to the head of the machine. The clips are made in a slightly modified form to carry a sporting gun. The weapon may be instantly withdrawn from the clips. Accepted Feb. 23, 1900.

20,865 (1900). **Machine Guns**. O. Imray, London (Agent for *Deutsche Waffen & Munitions Fabriken, Germany*). The training pivots of machine guns are usually cast upon the gun metal cover. In order to make these pivots stronger and firmer, the cover is made of hard material such as steel, and the hardened steel pivots are fixed thereto by inserting them in holes in the cover, and securing them to a ring lying within the tube. Accepted Feb. 1, 1901.

21,065 (1900). **Detonators** Dr. L. Wohler, Germany). A method of rendering detonators less expensive and more efficient by substituting for part of the fulminate of mercury a quantity of trinitrotoluol. Trinitrotoluol is not so expensive as the fulminate of mercury, and not so much of the former substance has to be used as the latter. An example of the material for insertion in the detonator tube is as follows:—Trinitrotoluol, 0·1 to 1·3 grains, according to desired effect so first inserted, and above that 0·1 to 0·3 grains of mercury is distributed. Accepted Feb. 16, 1901.

21,630 (1900). **Gun Carriages**. O. Imray, London (Agent for *Deutsche Waffen & Munitions Fabriken, Germany*). A method of so adapting a portable machine gun carriage that it may either be carried by two men or drawn along by one man alone. The water jacket is ordinarily left off for fear with this on the load should be too heavy for one man. The present carriage is constructed as a sledge, the front part being provided with a pair of adjustable handles. Through these the complete gun may either be carried by two men or drawn along by one. Accepted Feb. 9, 1901.

23,252 (1901). **Manufacture of Smokeless Powder**. P. M. Justice, London (Agent for *The International Smokeless Powder and Dynamite Company, U.S.A.*) A powder which is manufactured with a view to securing greater ballistic power by means of a greater nitrogen content, while also increasing the percentage of soluble nitrocellulose. More progressive burning and a tougher article is so obtained. The powder is composed of a colloided nitrocellulose having a mean content of 13·10 per cent. of nitrogen, and a mean solubility in ether and alcohol of 95 per cent. Accepted Feb. 9, 1901.

23,801 (1900). **Detonators for Railways**. E. F. Lemaire, Paris. A detonator for railways in which the fulminate consists of a mixture of about 50 per cent. chlorate of potash, and about 50 per cent. of sulpho-cyanide (preferably sulpho-cyanide of lead. This mixture causes a loud explosion, but does not shatter the wheels of the locomotive or the rails. Accepted Feb. 9, 1901.

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

SELECTED PATENTS.

RIFLE MECHANISM.

4,097 (1900). E. Harrison, London The rifle mechanism described in this patent is of the bolt type. The bolt head and other parts of the lock are mounted within a breech block, which is capable of a sliding movement backwards and forwards, along a pair of rails attached to a shoe secured to the breech end of the barrel. The locking between the bolt head and the barrel is effected by means of an interrupted screw attachment.

In the appended drawings Fig. 1 is a plan view of the rifle, Fig. 2 is a longitudinal section, and Fig. 3 is a view of the breech block and mechanism as seen from beneath. Fig. 4 illustrates a part section of the mechanism, showing the ejector device.

Attached to the barrel *a*, by means of an interrupted screw, is the shoe *b*. The shoe is secured to the barrel by making a quarter-turn, and the two are firmly locked together by the screw *c*. A pair of rails *d* are fixed to the shoe *b*, and the breech block *e* is so mounted upon the rails as to be capable of a sliding movement backwards and forwards, when actuated by hand, through the medium of the bolt handle *f*. The bolt handle is attached to the bolt head *g*, which, together with other parts of the lock, are contained within the breech block *e*. On the end of the bolt head *g* another interrupted screw is formed, and this is adapted to enter the shoe and engage the flange thereon. A quarter-turn locks the bolt, and thus, all the breech mechanism, securely to the barrel. The spring-actuated firing pin *h* runs through the centre of the breech block. The point of the pin is retracted from the cap of the spent cartridge when the bolt is drawn back, by the inclined plane *i*, which, turning with the bolt head in opening, engages a collar on the striker, and so forces it back into the block against the action of its spring. The striker is automatically cocked when the bolt is returned, through the engagement of the point of the spring-actuated sear with a notch cut in the end of the striker. A transverse pin *j*, which lies in a peripheral groove cut in the bolt head, forms the locking attachment between the bolt head and the breech block. To prevent any turning of the bolt head when the breech is open, a tumbler *k* (Figs. 3 and 4 is provided, which is caused, by engagement with one of the rails, to enter a recess in the bolt. When the bolt is pushed home the tumbler falls out of action into another recess cut in the end of the rail. The bolt head is then free to be turned to effect the locking between barrel and breech.

The ejector mechanism is illustrated in Figs. 3 and 4. It consists of a slide *l*, which is caused to actuate the rod *m*. When the bolt is pulled back the extractor *n* withdraws the spent cartridge from the barrel. After having travelled backwards a certain distance the slide *l* is brought in contact with a projection on the top of the sear *o*, and the continued backward movement of the bolt forces forward the rod *m*, which is attached to the slide *l* through the upright *p*. The end of the rod is thus caused to deal the cartridge base a sharp kick, and the case is thus thrown out sideways.

The safety consists of a spindle *q*, which passes through the

breech block, and is adapted to enter the notch *r* in the striker. A notch *s* is formed also on the spindle. When this spindle notch is turned upwards the striker is allowed to pass; but when the spindle is given a half turn through the lever *v*, the rounded side of the spindle enters the striker notch, and locks it. The pin is made

Fig. 1

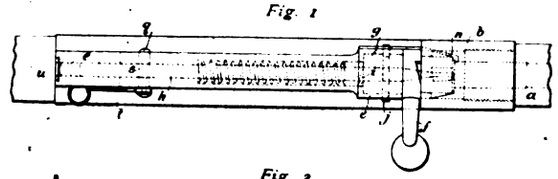


Fig. 2

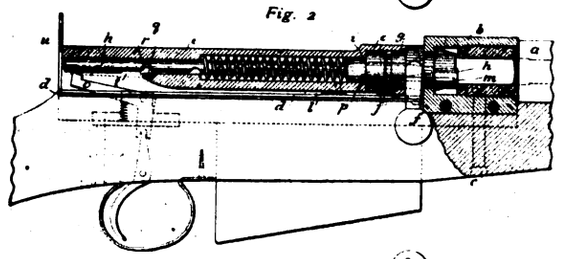


Fig. 3

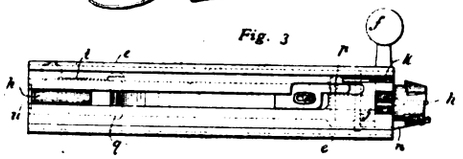
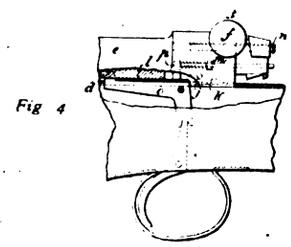


Fig 4



slightly eccentric, so that when turned to engage the striker notch, the striker is forced back a little, and is so lifted off the sear.

The rear sight *u* may be cut to any desired shape. It is adapted to work in a dove-tail groove cut in the rear end of the breech block. Accepted Feb. 9, 1901.

BOLT LOCK RIFLE MECHANISM.

7,472 (1900). S. Lee, and R. C. Pudney, London. This patent relates to rifles having a sliding bolt breech action, in which the bolt is partly turned to unlock it from the barrel. A description of certain safety appliances, the object of which is to prevent inadvertent opening or firing of the rifle, a magazine cut-off, a bolt stop and a device for releasing the striker, so that it may be taken out of the breech block, occupies the body of the specification.

In the annexed drawings, Fig. 1 illustrates a part longitudinal section of the mechanism, Fig. 2 shows a part side view, and Fig. 3 is a sectional view of the bolt handle. Fig. 4 is a transverse section on the line 1—1 (Fig. 1), and Fig. 5 is another transverse section on the line 2—2 (Fig. 2).

The arrangement of the parts illustrated in Fig. 3 is designed to prevent the bolt *a* from being accidentally turned when the rifle is closed. The spring-actuated plunger *b* is fitted into the bolt handle knob *c*, and this plunger is connected by a pair of levers *d* to a stud *e* fitted at the base of the handle. This stud *e* projects into a hole drilled in the breech casing, so that until the plunger *b* is pushed in the bolt cannot be turned to unlock it from the barrel.

On the screw head *f*, which holds the firing pin and its spring within the bolt, projections *g* are formed The cocking head *g* is so designed that it may be made to engage these projections (Fig 4) by withdrawing it a little and turning it partly round, as shown in dotted line in Fig. 3. The cocking head is by this means converted into a wrench, and the screw head *f* may be turned out to release the striker. The necessity for a separate tool to perform this operation is thus obviated.

In order to prevent the bolt being entirely withdrawn, and at the same time to do away with the spring stop generally used for this purpose, the trigger blade is provided with an arm *i*, which is adapted to raise the part *l*. The top of the limb *j* engages the stop *k* when the bolt is pulled back, and so stops any further backward movement. The trigger is simply pulled back when it is desired to take the bolt off completely. This action draws down the limb *j*, the obstruction being thus removed.

To cut off the supply of cartridges from the down-feed magazine *l*, the device *m* is attached to the weapon. Pivoted to the part *m* are a couple of pins *n*, which project upwards through holes in the bottom of the magazine. The part *m* is constructed so that through the medium of the thumb, when applied to the roughened surface *o*, it may be moved backwards or forwards. When the device *m* is moved forward its front end pushes up the two pins *n*, and in this position they obstruct the passage of cartridges from the magazine (Fig. 5). The part *m* is also adapted to act in the capacity of a safety. When pushed forward the stud *p*, which it carries, slides

Fig. 1

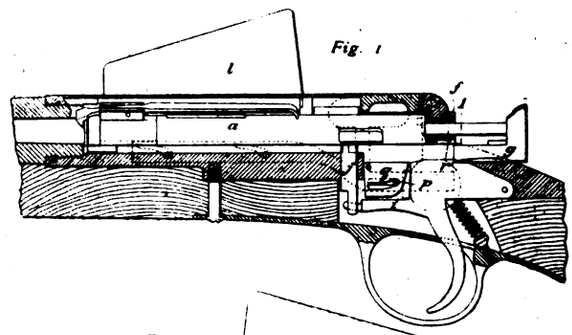


Fig 2

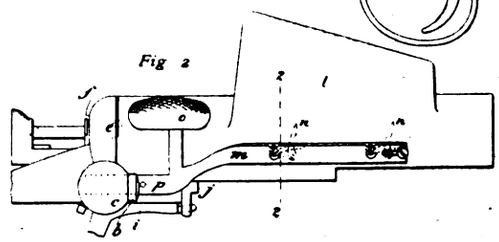


Fig. 3

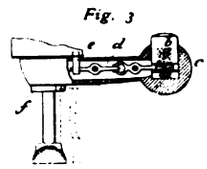


Fig. 4

Fig 5

through the inclined slot cut in the pivoted plate *q*. This motion raises the plate *q* into the path of the cocking head *g*. If the trigger were then accidentally pulled the projection *r* on the cocking head would come into contact with the plate, and the striker would thus be prevented from completing its stroke. The device *m* could be divided into two parts if it were found necessary that the two operations performed by the one part should be carried out independently of one another. Accepted Feb. 23, 1901.

Arms & Explosives

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CONTENTS.

TO OUR READERS.

It will be noticed that there is a change in the name which appears at the head of our front page, denoting that the individual hitherto responsible for the editing of these pages has made way for someone else. The change of editorship involves no change of policy. The retiring editor will continue to act in an advisory capacity, while the present editor will simply be carrying on, in his own name, work for which, as a matter of fact, he has been mainly responsible during the past eighteen months.

CURRENT TOPICS.

An Anglo-American Match—The trials and tribulations of those who have busied themselves with the organization of the proposed Anglo-American match between teams of inanimate bird shooters have at last resulted in the attainment of a state of fruition. Such a match is bound to create enthusiasm of a wide-spread character, reaching beyond the circumscribed limits of the present followers of the sport. American genius in this class of shooting has for years past been a bye-word in this country. Certainly the American papers have at times been known to record misses, but this is lost sight of when we call to mind the doughty deeds of Buffalo Bill in the arena at Earl's Court, and Dr. Carver, who performed more foot-pounds of work in an hour, by way of raising his gun and taking its recoil, than the most energetic horse-power steam engine ever known. For better or for worse, we have decided to take up the gauntlet that has been thrown down. What we think is that shooters, as such, are only human, and that a selected ten from the four quarters of Great Britain, who have devoted a life-time to the acquisition of skill in shooting, are as good, man for man, as any ten who hail from the States. Across the water they have a more varied scope for selection, but surely the limitations imposed by the necessity to travel across the Atlantic will bring things to about a level. Even if we cannot guarantee victory, we can, at least, promise our visitors a sportsmanlike reception and a truly British cordiality of welcome.

The Explosives Committee.—A committee that is dumb, bar, of course, the Patent Office announcements of the explosives it has "arrived at" during the course of its enquiries, is bound to be the subject of much rumour of a more or less contradictory character. Our own policy in these matters is to strike a general average of the frame of mind of those who may be expected to know a certain amount of what is going on behind the closed doors. In this way we gain a general conception of the trend of the committee's work, which is certainly borne out by the odd signs that are never entirely absent. At the present time the pure nitrocellulose powder seems to be on the wane. It has at last begun to be realised that a committee, however eminent, does not necessarily understand the principles of commercial powder making. No Government is efficiently served with smokeless powder unless the explosive ingredients are such as can be made under contract on the same lines as soap and harness. If a sealed sample represents a standard of perfection that can only be repeated when the gods are willing, it is pretty certain that

schedule dates of delivery cannot be observed. The whole question resolves itself into the two ways of making explosives. The one may be termed the jam-pot system, the other the factory system. Nitrocellulose powders can be made very nicely on the jam-pot scale, but it does not necessarily follow that the best explosive so made will also be the best judged by the average quality of factory-produced material. Nitroglycerin is a much abused component, but it has the extraordinary property, when used in even small quantities, of averaging or regulating the action of the nitrocellulose, whether or not the physical condition of the latter, or something else, may have been affected by the state of the barometer or the weathercock.

The Gunmakers' Gathering.—Another year has passed, and another annual report of the Gunmakers' Association has been issued. As usual, it contains a record of a year's earnest work tending to benefit the trade, and to maintain its members in a state of co-operation for mutual benefit, in which trade rivalry has no place. As usual, we might almost say, the year's finances show a small deficit, and surely those of the trade who have abstained from becoming members must, if they have a conscience, feel that their own want of public spiritedness has been responsible in part for the modest fiver that represents the difference between the income and expenditure sides of the account. At the risk of giving offence, we intend to call attention to the fact that nearly 200 gunmakers were happy to recognise the Gunmakers' Association when the invitation of the Kynoch Company some two years ago offered, under its auspices, a free trip and an enjoyable gathering. Surely the work that is done by the Association merits more support than is accorded by the pious expression of hope that the organization may prosper and continue the good work to which it has set its hand. It is the guineas that make the earnest endeavours of the Executive effective, and yet those in distant places, who cannot conveniently aid in the work of the Association by attending the meetings, fail to do that which is well within their power, be they in a small way or a big way. Those who are acquainted with the gun trade must realise that there are more than 76 substantial firms entitled to call themselves *bonâ fide* gunmakers, and who are thus eligible for membership. Unfortunately, this is the total number of members, and the firms represented are somewhat fewer, as in several cases firms are represented by more than one member. Surely the paucity of support which the Gunmakers' Association receives should be taken to heart by a large number of members of the trade, whose chief mode of affording encouragement is the economical one of shouting "Excelsior," and doing nothing.

Treason or Trade Secrets.—French military secrets seem to be particularly easy of penetration, or the employees at French factories must be especially open to bribery. At least one or other of these would appear to be the conclusion capable of being drawn from the periodical reports of the divulgence of the secrets of design or manufacture of French munitions of war. There is, of course, another explanation, that these constantly recurring scares are genuine mare's nests, and that the so-called "secrets" are by no means exclusive and vitally important. As regards that view of the case, the excitability of our neighbours across the Channel undoubtedly tends to magnifying somewhat unduly such trifling incidents as would pass unnoticed in a country more phlegmatically constituted. The latest trouble in the alleged betrayal of military secrets is more of the nature of a mere trade matter, always assuming that it possesses any importance whatever. An Austrian is charged with obtaining details of the processes employed by the Compagnie des Forges de Châtillon-Commentry et des Neuves Maisons, in the manufacture of ferro-chrome, through the collusion of various workmen in that factory, and with selling the secret to the firm of Krupp and Co. and to manufacturers in other countries. There are rumours also as to the divulgence of the mechanism of the new French Army rifle and the new quick-firing gun but these additions doubtless are due to the imagination of the French press. Narrowed down to the first-named charge, the matter simply concerns rival firms of manufacturers, and in that case there is scarcely need to raise the usual cry of "Treason," however reprehensible the offence may be when regarded from the stand-point of commercial morality.

Sale of Revolvers.—With reference to the recently revived proposal to impose greater restrictions upon the sale of revolvers, thereby rendering it less easy for irresponsible or dangerously minded individuals to increase the normal death-rate, a well-known firm of gunmakers have addressed the following letter to a contemporary:—"We quite agree that it is desirable to restrict the sale of revolvers, so that they may not be purchased by the general public unless a licence is produced showing the purchaser to be a fit and proper person to carry a weapon." Unfortunately, the ordinary gun licence scarcely meets the case as here propounded, since it is issued without any very close scrutiny into the condition of the applicant's mind and morals, and, on the other hand, that would seem a somewhat clumsy process of granting licences wherein the proposed user of a gun or pistol was made the subject of a special inquiry before the Commissioners in Lunacy. On the other hand, as time progresses, and King John's aphorism, "How oft the sight of means to do ill deeds makes ill deeds done," is more and more frequently exemplified, the crying need for some method of dealing with the question becomes accentuated. The gun trade generally are quite prepared to give their support to any reasonable measure of legislation calculated to diminish the existing facilities for the committal of crime, to say nothing of the even more frequent fatalities brought about by accident.

AUSTRIAN DYNAMITE.—According to the report of the directors in the Nobel Dynamite Co., of Vienna, for the past year, the position of the company is characterised as being relatively favourable in view of the severe competition now prevailing, the increase in the price of raw materials, the recent coal strike, and the fact that the Pressburg factories are no longer exempt from taxation. Since 1896, when increased endeavours were made to obtain dynamite at reduced prices, and competition was also started by the fiscal works the net profits from the factories at Pressburg, Zamky St. Lambrecht, and Saubersdorf have declined about 60 per cent. It is proposed to declare a dividend at the rate of 20 per cent. for the past year, as compared with 22½ per cent. in 1899.

THE CORDITE OF TO-DAY.

FROM A CORRESPONDENT.

At the present time, when the merits of this new powder and of that are freely canvassed by the world at large, would it not be well to reflect carefully before committing ourselves to a final expression of opinion as to the merits and demerits of such as are already in use? Our old friend Cordite, since 1889, has done us good service. Possibly it is not the best form or composition of a nitro-glycerin powder, but even as it is, up to this time no other has ever come up to it, much less beaten it. It behoves us, therefore, not to cast Cordite aside till we have something which has actually proved itself to be superior, at any rate, in the essential points which make for all-round efficiency.

In the first place, Cordite is cheap compared with nitro-cellulose powders. It is not only less in price, but a smaller load is required. It is exceedingly regular in its results; its pressures are low; its velocities high; its bulk small; and it will maintain its ballistics for years after loading. It is comparatively easy to make, and the manufacturer finds no difficulty in guaranteeing that one batch will be the duplicate of another. It ignites easily, and is unaffected by moisture within reasonable limits. It is safe to handle and easy to load—in fact, it is hardly an explosive at all until confined—and as a fire risk the danger is a very small one. It appears to stand extremes of temperature, and even after being frozen, or after being baked in a tropical heat, will regain its condition.

These by no means exhaust its virtues; but we will now consider its disadvantages, which many do not consider are entirely the fault of Cordite. The conditions under which it is fired, stored, and manufactured, all have an important bearing upon the matter. We all remember, for instance, that the old Black Gunpowder required to be kept dry and warm. Therefore the magazines were so placed on board ship that they could get heat. This placed Cordite at a disadvantage, because the temperature which suited gunpowder was excessive when Cordite was in question. The stories of decomposition and exudation, which at one time created so great a sensation, arose, therefore, from the barbarous treatment to which Cordite was subjected by those who did no understand its requirements in the matter of temperature. At the same time the Q.F. cases were plugged with absorbent wads, which, in consequence of this exudation, absorbed the nitro-glycerin, and thus became powerful detonating explosives—a result which certainly was never intended, and which further brought Cordite into disrepute.

Ignition was at one time a difficulty, because no one apparently knew anything except how to fire Black Powder, and they all tried the same methods with the new explosive, until the sporting nitro-cellulose makers experimented successfully with new fulminate compositions with their small-arm powders, and awoke the Government to the possibility of an improved method. The larger calibres of guns, with their larger charges, could get a good ignition with a copious supply of Black Powder; but the form of the cords was never altered, although Sir Hiram Maxim showed many ingenious methods of hollow and perforated cords which overcame the difficulty, and at the same time reduced the effects of its excessive temperature of combustion. This is a line it would have been worthy to follow, but no, the Government had not ears for Maxim or Nobel, who knew exactly what was wanted, and how to do it, for fear probably that they might invent or patent something for which the Government would have to pay—notwithstanding the enhanced value the Cordite might attain in the process. The same remarks apply to the excess of nitro-glycerin in Cordite, which was harmful and caused no end of trouble. The nitration of the cotton was also a fixed prescription, and, rightly or wrongly, the Government authorities decided to stick to it rather than fall within the ingenious limits which the law laid down for Nobel's and Maxim's patents. This determination of the authorities has cost the nation fabulous sums, and now it almost looks like losing our Cordite through it. The erosion of the guns is not altogether due to Cordite. It can be prevented by the exercise of some mechanical ingenuity and chemical skill.

The form of Cordite for the smaller calibre is not yet perfection, especially as regards the S.A. Blank and Webley pistol ammunition; but these details are too small to occupy great minds, no doubt, though there is yet scope for considerable improvement. It is extraordinary what a very slight alteration may effect, though personally I have failed to see why it is absolutely necessary to stick to Cordite for pistol and blank ammunition, it being much cheaper to roll the mixture out, and cut it into flakes, which process apparently gives better results.

The foregoing is a brief résumé of the advantages and disadvantages under which Cordite labours, and it may safely be said that this form of explosive, as it now exists, is capable of improvement, possibly to a degree sufficient to overcome all its disadvantages. It will be instructive also to summarise a nitro-cellulose powder without glycerin, which everyone is crying out for. Briefly, its points are the following:—It is more expensive per lb. and requires a larger charge. It is generally regular in its results, but its pressures are higher than Cordite in ratio to its velocity, and its bulk greater. Its keeping qualities are dependent upon very careful manufacturing, but it generally deteriorates slightly with age. Moreover, it is not easy to manufacture, as there is considerable difficulty in making each batch the duplicate of any other, and consequently a great amount of blending is entailed in its production. Its ignition and moisture-resisting properties are about the same as Cordite. If made in the form of cords it is as easy to load as Cordite, while if it is in flakes it is much more difficult to load, and the fire and explosive risk is greater. It will stand cold climates better than Cordite, and hot climates do not affect it so greatly if it is free of all its solvent. It is cooler to fire than Cordite (as at present made), and does not consequently erode the gun so much.

By the way, it may not be inappropriate to mention at this point that, as a general rule, one now never sees small-arms seriously eroded; but at first the erosion was terrible. I have seen the rifling eaten away almost to one-tenth of an inch deep, just in front of the chamber; but a single small glazed board disc (jute wad) stopped all this by obturating the gases until the rifling had formed its grooves into the bullet, and caused the latter to become its own gas check.

There are far more able pens than mine which might take up the brief for Cordite. It is a good and honest, though badly-trained servant. We should remember that it has served us for years, whilst every other nation has been flitting from one powder to another, and in spite of its illegitimate

birth it has won the respect of all who use it, and is genuinely capable of being improved so as to hold its own with all comers.

INCIDENTAL JOTTINGS.

SIGNS OF THE VICTORIAN ERA.

On a recent occasion, when passing down Victoria Street, Westminster, to the Army and Navy Stores, I was struck by the number of posts which erratically project from various buildings on the line of route. At first, one is puzzled to know what these indicate. They have not the blue and red paint of the familiar barber's pole, nor have they a tin fish dangling at the end, with a legend, "Live bait kept within." My Scottish instincts recalled the similar posts in Old Edinboro', wherefrom the family clothes-line depends; but I now learn that the only texture which hangs therefrom is the bunting of each of the various colonies, and the windows from whence these poles project indicate precisely where the Agent-General of each may be found. Reading in some paper recently that Agents-General are desirable people to cultivate, I make no further apology for inserting a practical suggestion as a trade jotting, which was originated by this strange sight.

A FITTING MEMORIAL.

I am thoroughly of opinion that no sculptured pedestal would be a memorial consonant with the times and the life of our late lamented Sovereign. It would not entirely convey the great feeling of admiration for the subject, for, like a notable picture, it would become more an example of a great master in art to hand to posterity, than a symbol which would identify Queen Victoria and our national progress. My suggestion is, therefore, to acquire an important site—say the Royal Aquarium or Montague House in Whitehall, or some similar place—and erect a magnificent Colonial Hall, where all the Agents-General would have offices together. The whole of the beneficial functions of that admitted failure, the Imperial Institute, might be transferred there. Many questions of finance, emigration, produce, and trade requirements might be dealt with by this federated family, in a home of their own, instead of by disintegrated units in miscellaneous lodgings. Here also might be the "Hall of Heroes," so aptly suggested some time ago by a contemporary, especially as we now have so many colonial heroes who deserve a niche in the old country. The central figure would, of course, be the Mother of our Colonies—a fitting reminder of the never-to-be-forgotten Victorian Era.

WAR OFFICE EXPOSITIONS.

"Please don't hold up the white flag, nor expose the designs of our forts and war *matériel*." These are very praiseworthy rules, and it is quite time to enforce them, although I am not quite sure whether I have not added the "War *Matériel*" to the original. The public craving for war news is such that every daily paper reporter is encouraged to become a spy for the British Public. A scouting corps of reporters would be a magnificent idea if they would only guarantee all information correct, and banish all thoughts of a later edition which relies largely upon corrections to keep its columns filled. The War Office itself is very circumspect with regard to its publications. It tells a great deal, but generally publishes its books after the matter has become obsolete or improved upon. But who can prevent foreign nations from publishing details of our *matériel*. They are generally up to date, and the information is reliable. These details don't leak out from officers to their friends. They have a sort of official ring about them. One may be forgiven for wondering whether the intelligence department has an exchange bureau. At any rate, if you want to know what England is doing in war munitions, you have only to get the foreign reports to find out on most subjects.

EDITING PATENTS.

I suppose there is no harm in congratulating the Explosives Committee upon their inventive capabilities. Before the Cordite case, everyone shouted for the vials of wrath to be emptied upon a well-known chemist and another evil-doer, but they were able to prove in a court of law the milk-white innocence of their inventive intentions, which was subsequently proved by the fact that neither of its sponsors have received one penny in royalty in respect to the invention. This heroic and patriotic act has evidently stimulated others to follow their example—for the good of the State—and many papers profess to condemn any adverse criticisms in this case as "Mares' Nests," &c., forgetting the similar case of Cordite—forgetting also that for "the benefit of the State" twice as much was spent in litigation as an adequate remuneration would have cost. In the present case, where we have, as Professor Armstrong states in the *Times* of April 15, "eminent chemists, in their own special fields, ignorant of organic chemistry" (of which the manufacture of explosives is a branch), it is difficult to understand how their judgment can be "proportionate," to use Faraday's expression, on some of the subjects that come before them. It is apparently a well-known fact that neither Sir William Roberts Austin or Sir William Crookes are explosive specialists, and that this is new ground for them. The first-named is a Government official employed at the Royal Mint, and subservient to the Officials' Secrets Act. Why should he patent a Government secret (*sic*)?

WILL YOU WALK INTO MY PARLOUR?

The crux of the whole business is this. The Government has promised the inventor, if he will only come before the Commission, that no officials of the Royal Ordnance Factories shall have information of his patents or processes. This implies that the Government is alive to the appropriation of discoveries communicated or suggested by inventors, by their own experts. Yet they allow members of another body to do this very thing, men who knew nothing of the subject before the Commission was appointed, men whose entire knowledge is derived from what has been picked up from the trade experts in giving their descriptions of inventions and unpatented trade secrets—and then, forsooth, we are told that the reasons for patenting are "that the Committee may not be debarred by some *subsequent* invention from making use of *their own* results." The inventors or experts who have been before the Committee up to now will feel solaced by this. Their brains have been picked by these analytical experts to form patents which shall debar them from reaping any result by the compilation of their methods. Surely this is the time for concerted action among powder

makers, who find that instead of a Committee of open fair-minded men they have a nest of rival inventors. If these be fair inventions that these Committeemen have made, let them be published, together with the evidence of the witnesses bearing on them, so that we get a just decision as to their merits for originality.

A SHOOTING STAR.

A brand new bullet is being paragraphed in the States. It is known as the three-rayed star or cross-bullet—from its sectional form, which is that of an ordinary cupro-nickel mantled bullet with three or four sectors cut out. We are not surprised on hearing that the powder would blow through the sides of the bullet, and render the gun worthless, but we must confess that a "disc of steel placed between the bullet and powder" fills us with wonderment, not so much at the difficulty it will have to check the gases, as to what the marksman's comrade will say when he receives this unemployed errant disc in his eye! Steel discs don't make good projectiles! Will not someone suggest a wad or so, which would break up at the muzzle? Similar bullets, by the way, have been tried over here, but have not proved themselves of any value. There are many better ways of reducing skin friction in bullets, the formation of which do not deter the whole bullet from reaching the target! Next, please.

HODGE SUPPORTS HOME INDUSTRIES!

In passing through a small country village, I happened to see a travelling shooting saloon with enticing rows of empty bottles, targets to fire at. I stopped awhile to observe a returned Imperial Yeoman, who was causing great merriment in a shooting match with the village butcher. The gross result of 16 rounds (one shilling's worth) was five bottles. This gave me an idea of the sense of security the Boers must have in Africa. But, before condemning Tommy Atkins, it occurred to me the guns might be ancient weapons with misleading sights, so I went to examine them. Imagine my surprise to find the latest model Winchester repeating rifles, in splendid condition. I had a few shots with each gun, and accounted for a bottle every time—indeed, it was quite easy to "cut the string," so accurately were they sighted!

THE EXHIBITIONS.

There will be a wealth of exhibitions this year, which should be a good thing for the gun and allied trades. Glasgow, Earl's Court, and the Crystal Palace are inviting military and other gunmakers to show, and their efforts seem to be liberally responded to. We shall look forward with interest not only to our English exhibits but those of France Belgium, Germany, and America, which will all be in evidence. There is one article in great request just now, and that is a miniature equipment for a garden range, with self-registering targets. It is a most fascinating amusement, and only wants encouraging to make it a most popular pastime. Air guns are very well in their way, but are not so accurate or so reliable as these small rook rifles, and are too much trouble to load. A very good outfit should be provided for a five-pound note, and there should be a ready sale, in addition to which there would be a constant demand for ammunition to follow. Surely it is worth someone's while to follow this up.

THE FOLLY OF THE WISE.

In these columns I have sometimes remarked on the Works Department at the Royal Arsenal, Woolwich. I noted the other day, with much amusement, that the new stores have been built so close to the proof butts that the firing of a 9·2-in. or 12-in. gun breaks most of the windows One paper suggests the butts being moved, another proposes the stores. It seems to the casual outsider that it is somebody at the "Works" Department that requires moving. One cannot understand such egregious folly, especially when remembering it is run by military men!

INFORMATION WANTED.

It is to be hoped that very full particulars of the picric acid accident at Frankfürt may be obtainable, as it may indicate the necessity to frame some new regulations to control its manufacture. It is a fast-growing industry, and its immunity from danger is apparently greatly overstated. As gunpowder dies out and new products take its place, the attention of the Home Office Explosive Officers cannot be too often drawn to any fresh developments or idiosyncrasies of new explosives. This should be done in the interest of the community as soon as detected, and not after waiting until an accident happens to others whose observation is not so keen, thus calling for an enquiry too late. There is a disposition, I have observed, to keep these "little matters" private, but it is very unfair to the explosive fraternity. Information may be given to the Home Office with the utmost confidence, for the Inspectors of Explosives have not yet set up a rival inventing department, although, being in possession of all the makers' secrets, it would be very easy to do so for the good of the "State" on the same lines as the wise men of Goshen.

PARLIAMENTARY BLANK CARTRIDGES.

I had intended to comment on Mr. Brodrick's unfair reply some time ago about the purchasing of German guns! With the exception of the two well-known makers, no other "encouragement" has been given to other firms. There are at least a dozen capable and willing firms who could manufacture guns, but it is only fair to them to say that wordy promises, without substantial orders or guarantees, are not "encouragement" with any commercial value attached. The plant for making guns is an expensive one, and it is childish folly to expect a firm to embark in a great capital outlay without any reasonable prospect of a return. The "encouragement" a firm requires is an order or orders of sufficient magnitude, or lasting over a period of time sufficient to repay at least the capital expended. Orders are rarely given out by merit, so that it is a foolish superstition to imagine that by making a first-class article one can control the trade, or even a portion of it. The cheap man generally cuts the others out. The Government is, however, prodigal in its methods. If you do well, it "encourages" the duffers by giving them the orders, in the hope of improving them, so that it really is a puzzle to know which is the best commercial policy, bad cheap work and plenty of it, or good work with a reward of small orders barely enough to pay interest on plant. It would be interesting for Mr. Brodrick to define "encouragement" as he understands the term.

CYCLOPS.

THE NEW GERMAN MAUSER RIFLE, 98.

AT a time when our own Government is taking the opinions of special Commissions on the subject of an improved Service rifle and more effective ammunition, some interest must naturally attach to the choice exercised by other nations in respect to similar points. The conditions are somewhat dissimilar, as is well-known, for while in this country but the barest encouragement is given at any time to private initiative as regards the design and manufacture of military weapons, on the Continent the exact reverse is the case, with the consequence that whereas in England a design once approved remains the standard for perhaps many years, until it is completely obsolete and has to be replaced by something entirely different, on the Continent a distinct incentive is given to the devising of improvements which have only to be approved to receive early adoption. It follows that foreign armaments stand a much fairer chance of being kept abreast of the most recent developments and requirements than can possibly obtain with the British cast-iron policy.

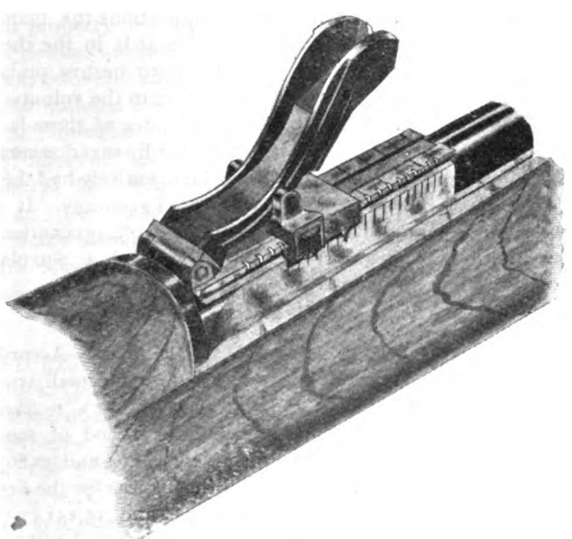
A few months ago we were able to give an illustrated description of the latest pattern of the Mannlicher rifle, the Mannlicher-Schönauer of ·256 calibre with a revolving magazine to hold five cartridges, which represented at that time at least the latest type of construction in that particular type of arm. At present, we believe that the Steyr factory is engaged on the production of a further modification, the chief feature of which will be a reversion to a larger calibre. Following up the record of recent progress, we now show in the accompanying illustrations some of the details of the new Mauser rifle, Model 98, which has been adopted as the standard arm for the German Army. It will be seen at once that in bolt action and magazine attachments this model bears a strong resemblance to the Spanish Mauser introduced about six years ago, which hitherto has been taken to represent the most approved development of the inventive and constructive skill of the Waffenfabrik Mauser, at Oberndorff a/N. In absolute detail, however, the later weapon shows several interesting points of difference from its forerunner, which tend to prove that there can be no finality of design, and that experience is constantly prompting a nearer approach to that ultimate perfection, the attainment of which is so frequently sought without a reasonable measure of success.

One of the most important modifications of pattern, which can be readily seen in the accompanying illustration, showing a side view of the rifle, refers to securing increased facilities for loading. It will be noticed that the side of the receiver, at the rear end, is cut away down flush with the bottom of the bolt recess and therefore level with the top of the magazine. This slight change of design effects a remarkable improvement, for on the insertion of the loading clip into its guides a single downward movement of the flat of the thumb held across the top cartridge suffices to push the five cartridges well into the magazine, without the previously existing necessity to press the last of the batch home with the point of the thumb. The introduction of this gap practically sacrifices nothing of the strength of the shoe, and the disadvantage it might possess of diminishing the guiding surfaces controlling the backward and forward motion of the bolt, is met by forming a rib along the bolt which during this motion engages in a suitable groove in the covering piece of the shoe at the rear end. The bolt itself is of very strong pattern, and is provided with an additional locking lug towards the rear in addition to the two hitherto fitted at the front. The bolt head is enlarged considerably, and constitutes a circular shield to protect the face of the shooter in case of a defective cartridge causing a blow back, while the same contingency is provided for as regards the striker spring by making two holes in the forward end of the bolt to allow of the escape of any gas that might enter round the striker-point. As regards the bolt action generally, it is similar to that of the Spanish Mauser, as described and illustrated by us in January, 1895. The safety has a third intermediate position, to facilitate the dismantling of the bolt mechanism, and in that position the bolt can be withdrawn from the rifle without any risk of accident, as the trigger is inoperative. At the front end of the bolt, the extractor and ejector are of the type adopted in the Spanish pattern, and are exceptionally strong and effective.

Our illustration shows the side of the rifle partially cut away so as to indicate the position and details of the magazine, and this section permits a view of the cartridge carrier with its spring partially compressed. The five cartridges are arranged in zig-zag fashion. As regards other details of the rifle, the half-pistol grip will be noticed. A short wooden handguard encloses the barrel from the sight bed up to the midway

locking ring, as is shown more or less in the second illustration. At the muzzle-end there is a new bayonet attachment of the type introduced, we believe, by Mr. John Rigby. A grooved steel bar extends from the nose-ring nearly to the muzzle of the rifle, close underneath the barrel, and the bayonet is locked to this bar, thereby causing its attachment to be very close to the centre line of the barrel and providing a proportional increase of solidity and strength. This is the more necessary, as the bayonet to be used with the rifle is of the long pattern, and measures 26 inches over all. A feature of this mode of attachment is that the bayonet handle has to be recessed, so that the protruding end of the cleaning rod may fit within it.

The back sight is of the pattern shown in our second illustration, and needs little if any explanation. It starts with 200 metres and advances by fifties from 300 to 2,050 metres, a series of notches along the sight bed being engaged by spring



clutches on either side of the sliding-piece which supports the girder-shaped sight-leaf, the notches on the left side referring to the even hundreds of metres and those on the right to the intermediate fifties. It will be noted that the sight-leaf is of unusual strength, which is the more necessary since it has no capacity to yield before a blow or pressure.

As regards general dimensions, the following particulars of the new rifle may be of interest. Without the bayonet, it weighs 4·100 kilos (9·038 lbs.), and measures in length 1·25 m. (4·1 ft.). In point of calibre it is somewhat of a reversion from the very small bores adopted during recent years, the diameter between the lands being the same as has been hitherto in use in Germany, namely, 7·9 mm. (·311). The system of rifling consists of four grooves, each ·01 mm. (·004 in.) deep, with a right-handed twist which gives three turns in the barrel, or more exactly, one complete turn in 9·45 in. The cartridges supplied for the rifle weigh 27·88 grammes (430·18 grs.), and are 8·25 cm. (3·248 in.) long, and are loaded with 2·67 grammes (41·19 grs.) of Gew. Bl. P., and a hard lead nickel-plated and steel-sheathed bullet measuring 3·13 cm. long (1·232 in.), and weighing 14·70 grammes (226·82 grs.). A clip containing its five cartridges weighs 146·40 grammes (5·16 oz.). At a distance of 50 metres (54·68 yards) from the muzzle, the bullet has an average velocity of 2,023 ft. per second, and its extreme range is about 4,000 metres (4,374 yards). It will pass through 7 mm. (·2756 in.) of iron at a distance of 300 metres, but is stopped at any range by 9·5 mm. of good steel.

NOTES.

EXPORT OF FIRE-ARMS FROM RUSSIA.—According to advices received from St. Petersburg, a prohibition has been placed upon the export of all kinds of fire-arms and ammunition from ports in the Black Sea and Sea of Azoff.

ARMS AND THE TURCO-GREEK FRONTIER.—In view of the troubles in Macedonia and elsewhere in the Turkish dominions, the Hellenic Government has ordered her civil and military officials on the frontier to prosecute all armed persons who try to invade Turkish territory. A party of Moslem Albanians, thirty-six in number, who were proceeding to Macedonia, armed with Gras rifles, were accordingly arrested at Larissa, in Thessaly, but it was then learned that already the Albanians had managed to smuggle across the frontier at least a thousand of these rifles prior to the action of the authorities.

NEW BELGIAN EXPLOSIVES.—As a consequence of the new Ministerial Circular published by the Belgian Government in regard to shot-firing in mines, M. Ghinijonet, a manufacturer of explosives at Ougrée-lez-Liége, has submitted for classification as safety explosives two new substances, denominated respectively "Density D" and "Density E." They are of the following composition:—"Density D"—trinitrotoluol, 85; nitrate of strontium, 10·4; nitrate of ammonia, 81·1; and "Density E"—trinitrotoluol, 5·84; nitrate of strontium, 11·42; nitrate of ammonia, 82·74. In view of the fact that the composition of the substances and the tests to which they have been subjected show them to possess a degree of safety equivalent to the requirements of safety explosives, the Belgian Minister of Industry and Work has decreed that they receive that classification.

GUNMAKERS' COMPANY.—In connection with the correspondence between Mr. H. A. A. Thorn and the Clerk of the Gunmakers' Company, which was recently published in these columns, it may be interesting to give a few details of the present constitution of the company, as they are recorded in the *City of London Directory, 1901.* The present Master, who was elected according to custom on the third Thursday in October last, is Mr. D. Cecil Gibbs; while the Upper Warden is Mr. H. S. Barnett, and the Renter Warden is Mr. C. O. Purdey. The Assistants are Messrs. Edward Barnett, T. A. Heptinstall, F. W. Bond, James Purdey, A. S. Purdey, Herbert Barnett, H. Brandon-White, and H. W. Holland; and the Clerk of the Company is Mr. F. T. Aston. The company's property consists of the Proving House in Commercial Road, Whitechapel, and investments in 2¾ per cent. and Corporation Bonds, which bear an interest of £850, and it possesses also a stock of plate and furniture which is valued at £400. On the average taken for the ten years, 1870-1 to 1879-80,

the company's income from all sources, including the proofs of small-arms, amounts to £3,182 2s. 4d. per annum, while its expenditure naturally includes the cost of carrying on the Proof House. It may be mentioned that the company grants pensions and gratuities to "indigent members" to the extent of nearly £200 per annum.

OLD PROOF ACTS.—Thanks to the energy of Mr. Henry A. A. Thorn, reprints have been made of the Proof Acts passed in the reign of George III., designated respectively Cap. cxv., 10th July, 1813, and Cap. lix., 12th May, 1815. These reprints are both interesting and valuable, and the gun trade is greatly indebted to Mr. Thorn for his enterprise in causing the reproduction of the text of the Acts by the Royal printers. A limited number of copies may be obtained from the office of this journal, on application, at a cost of one shilling for the set of two documents.

NORMAL POWDER.—We have received from the Normal Powder and Ammunition Co., Ld., of Hendon, a handy little card containing a price list of their various specialties in sporting powders and ammunition. Full particulars are given of the "Superior Nimrod" water-proofed case, the "Hendon" half-brass case, brass ejectors—which are now quoted at a reduced price—the "Keeper's Normal," and specially-loaded 2¾ ins. Pigeon cases. Despite the general rise in the cost of all materials, the company have in no case raised their prices. It will be remembered that the Normal Company were awarded Gold and Silver Medals at the Exposition held last year in Paris.

MIAMI POWDER.—The Miami Powder Co., of Xenia, Ohio, U.S.A., have forwarded a tasteful little pamphlet, illustrated in quite the best style to which American enterprise has accustomed us, which contains full particulars of the various explosives manufactured by the firm in question. Among the various specialties referred to in detail are Alarm sporting power, blasting and mining powder, Ætna dynamite, gelatine, and contractors' powder, electrical fuzes and a large variety of general supplies for blasting purposes.

MAUSER RIFLES FOR £3.—It appears that a consignment of relics of the Spanish-American War is now on sale in this country, an advertisement from a half-penny contemporary having been brought to our notice in which the public generally, and rifle clubs in particular, are invited to purchase captured Mauser rifles for £3 apiece, on the instalment principle. They are specified to be 7 mm. Mausers of 1893 model, shooting "a ball small enough for a squirrel, big enough for a bear"; and their advantages are further enumerated as consisting of no recoil, no smoke, but slight report and high power. We are also informed through the same source that this pattern has been adopted as the official rifle of the British Rifle League. Assuming the weapons thus advertised to have borne the stress of the war in Cuba, however, it remains to be seen whether the announcement that their "shooting qualities are perfect," that they give a velocity of 2,400 feet per second, and that they are "surpassingly accurate," will be carried out with even approximate truth. Judging by one's knowledge of the characteristics of Spaniards and their coadjutors in the war, it is open to doubt whether these rifles will be of the least value as weapons of precision, always provided that they have seen service. In any case the price asked for them is likely to undergo a modification at no distant date. There should be quite a quantity in existence, certainly sufficient to supply the curio-mongers who will prove the most ready customers of the firm advertising this bargain.

DYNAMITE EXPLOSION AT ARDEER. — Captain M. B. Lloyd's report to the Home Secretary on the circumstance attending the explosion at Messrs. Nobel's factory at Ardeer, on January 29th, has just come into our hands. The accident occurred in one of the dynamite cartridge huts, and caused the death of one girl, and injury to three others. It was brought about by the improper use of frozen dynamite, which was supplied by a runner to the shed in question in distinct contravention of the stringent rules framed by the Explosive Company. H.M. Inspector apportions the blame for the occurrence to the runner and to the girls in the shed in due measure, and takes the opportunity to bestow praise on the company itself, and to draw attention to the voluntary restrictions that have been imposed in advance of those laid down by the Explosives Act, which undoubtedly saved several lives, and would have prevented the accident entirely had they been carried out by the employés with strict accuracy. It is well known that, thanks to the extraordinary precautions taken, Messrs. Nobel's factories have enjoyed a singular immunity from serious accidents.

EXPORTS OF ARMS AND AMMUNITION.—According to the Board of Trade Returns, the exports of small-arms for the first quarter of the current year show a marked increase on the figures for the corresponding period of 1900, the numbers of weapons being respectively 37,204 and 30,867. Gunpowder shows a distinct decrease, the figures for the first quarter of 1901 and 1900 being 13,236 cwts., and 15,251 cwts. As regards other unclassified arms, ammunition, and military stores generally, the values for the same periods were respectively £529,628 and £432,185, there having been a consistent rise in value of exports for the last three years, at least, to the extent of nearly £100,000 per annum.

SCHULTZE GUNPOWDER CO., LD.—According to the report and balance-sheet submitted to the shareholders in this company for the year ending December 31st last, there has been a serious diminution in profits, which is almost entirely due to the greatly enhanced cost of coal and materials, with a contributory cause due to the disturbance of the labour market by the war in South Africa. The profits for the year amounted to £11,721, to which must be added the amount brought forward from 1899, which gives a total of £17,187. Of this amount, the sum of £5,480 had already been allocated to the payment of dividends on the preference shares, and of the remainder £1,827 was also due to the same account. Further payments of £586 as commission to the superintendent, and of £300 as bonuses to the employés, leave a balance of only £8,994, which the directors recommended to be carried forward to the next account. There is, therefore, no dividend for the ordinary shareholders. At the annual general meeting, which was held on the 12th ult., the chairman, the Hon.

J. Scott Montagu, M.P., reviewed in some detail the history and prospects of the company. He believed that, broadly speaking, the business was in a satisfactory state, and that the position put before the shareholders in the balance-sheet exhibited, if anything, a worse state of affairs than in reality existed. As regards the diminished profits, he pointed out that owing to the causes already mentioned the manufacturing expenses for the year showed an advance of £4,000. Moreover, they had at the present time £5,200 more powder in stock than at the same period of last year. He referred then briefly to the introduction of the new Imperial Schultze Powder, which had so far been favourably received, but the experimentation with which had cost upwards of £800, which had been charged to revenue. With these facts in view, he thought that the financial position could not be considered altogether unsatisfactory, and the more so since the Smokeless Powder and Ammunition Co. was now one of the assets of the company. He thought that with this valuable addition to their property they stood a good chance of having their new rifle powder adopted by the Government in place of cordite. It was generally admitted that cordite could not be maintained as our national powder, and he considered that the products of the Smokeless Powder Company had as good a chance as any other of becoming the new military powder for this country. He then referred to the absence of sportsmen during 1900 owing to the war, and, in conclusion, took a decidedly hopeful view of the situation as regarded the future of the company. After some slight discussion, the report was adopted.

RIFLE *VERSUS* MACHINE GUN.—From trials recently made at Querqueville, near Cherbourg, it has been deduced that one machine gun served by two men will develop as much effective fire action as 200 rifles. Fifty marksmen were chosen from the Colonial Infantry to compete with the Hotchkiss 8-millimetre gun which has lately been adopted for the French Alpine troops. The ranges fired at were 400 and 750 metres. At 750 metres distance (820 yards) the fifty riflemen, firing each five rounds independentiy, obtained 54 hits, or 22·6 per cent. of the number of rounds fired. Thirty-two men were then chosen from among the fifty, and these had to fire each eight rounds in 30 seconds. Under these conditions 34 hits, or 13·3 per cent. of the rounds expended, were recorded. The machine gun was then brought into action, and in 38 seconds fired 211 bullets, making 145 hits. Needless to say, these results are greatly in favour of the machine gun, and further tests led to the conclusion being arrived at as already stated.

HOTCHKISS ORDNANCE CO., LTD.—In spite of wars and rumours of wars, this company has not experienced too successful a financial year. The profits for 1900 show a total of only £22,300 as compared with £34,200 in the previous year, and, as a consequence, there is no possibility of paying a dividend on the ordinary shares. With the carry over from 1899, there is an amount of £29,002 available for distribution, but after the allocation of £6,049 for interest on debentures, and £1,500 for the sinking fund, this is reduced to £21,453. The directors proposed to pay 5 per cent. on the issued preference shares, and to set aside £1,215 for the balance of legal and other charges connected with the re-arrangement of the debenture debts; after placing £5,000 to the reserve, there remains, therefore, only a balance of £4,738, which is carried forward. This would allow of the payment of a dividend, but in view of the fact that during last year £4,482 had been spent on the factory at St. Denis, and that a further £3,000 would be required in the current year, it was thought more prudent to carry over the balance of profit to meet future contingencies. Favourable reports are given of the success of the company as regards the supply of its manufactures to the different Governments, and an interesting feature of future policy is to be found in the announcement that the advisability of erecting works in this country for the production of ordnance is receiving the attention of the directors. It should be noted that, according to the certificate of the auditors, no special provision has been made for the depreciation of the value of patents and goodwill.

GENERAL GRAS.—The death is announced of General Gras, whose name is well-known in connection with the rifle of his invention which was in use in the French army for twelve years, from 1875 to 1886, between the eras of the Chassepôt and the Lebel rifle of more modern design. General Gras was born in 1836, and entered the Polytechnic at the age of eighteen, where he soon attracted notice by his aptitude in solving scientific problems connected with warfare. Entering the artillery, his special talents found ready exercise, and this branch of the French service owes much to the initiative of the future General, who occupied at various times the posts of Inspector of Arsenals, member of the Technical Committee of Arms, and President of the Powder and Saltpetre Committee. As a combatant, he also earned distinction at Magenta, Solferino, and in the war of 1870. General Gras was a Grand Officer of the Legion of Honour.

SAFETY EXPLOSIVES, LD.—A company bearing this title was registered on the 23rd ult., with a capital of £75,000 in £1 shares, the object of which is to acquire the undertaking and assets of Fumelessite, Ld., and to carry on the business of manufacturers of, and dealers in, Fumelessite and other explosives, contractors for rock and blasting, engineers, etc.

NEW FIREWORK MAGAZINE NEAR BRISTOL.—As was briefly recorded in our last issue, the application of Messrs. Crane & Co., Ld., for a licence in regard to a proposed firework magazine at Bridgeyate, near Bristol, was referred by the Gloucester County Council to the Finance Committee, which met to consider the question early in last month. Already, a draft licence had been granted by the Government, subject to the approval of the County Council as the local authority. At the meeting of the Council's Finance Committee, Mr. Phillips reported that he had inspected the site and found it to be in accordance with the requirements of the draft licence granted by the Secretary of State. Mr. Gardom, clerk to the Council, further pointed out that all the requirements of the Explosives Act had been complied with. For the applicants, Mr. J. Crane, the managing director, stated that the magazine would be within a short distance of their present manufactory, and would be a valuable acquisition to their business, especially for the forthcoming Coronation. The magazine would have a storage capacity of 100,000 lbs.

of manufactured fireworks, and would be the largest in England. Sir John Dorington, M.P., the chairman of the Finance Committee, informed Mr. Crane that the licence was granted.

NEW 9·2-IN. NAVAL MOUNTING.—A series of extended trials have been made with a new naval mounting for the 9·2-in. gun, from which very remarkable results have been obtained. The mounting is the production of Messrs. Vickers, Sons and Maxim, Ld., and is intended for special application to five new first-class cruisers now under construction. It is of an entirely new type, and is adapted for hand working as well as hydraulic power, the whole revolving weight of the mounting, including a special steel shield weighing 50 tons, and the gun itself, being 120 tons. The gun can be loaded at all the usual firing positions, from 4 deg. depression to 6 deg. elevation, the maximum ranges of the mounting allowing for 15 deg. of elevation and 7½ deg. of depression. As regards traverse, there is a full movement through 270 deg., and the swing from one extreme of the arc to the other is accomplished in 20 seconds by the use of hydraulic power, or in 70 seconds with four men working the hand-gear. In addition to this new mounting, the gun under trial was fitted with a new breech mechanism, which, in conjunction with the quick-firing mounting, renders possible a noteworthy increase in fire, no fewer than five rounds being fired in 1 minute 26½ seconds. This rate of 3½ rounds per minute compares with the quickest rate of the same type of gun as mounted on the older methods, as, for instance, on H.M.Ss. *Centurion* and *Barfleur*, in which the best results were approximately one round in every 1 minute 30 seconds, the ratio of difference being roughly as five to one.

EXPLOSION AT CHILWORTH.—At the moment of going to press we have received the report of Major H. Cooper-Key on the explosion which occurred in the corning-house of the Chilworth Gunpowder Co., Ld., on February 12th last. It may be remembered that six men were killed, and one was injured, by this accident, which occurred just after the men's breakfast hour on the morning of the day in question. After investigation, H.M. Inspector has arrived at the conclusion that the explosion was most probably due to the fact that two of the deceased men were carrying a barrel of powder dust to the tram outside the building, and that one or other must have struck a spark, either on the tram rail or a flint, with his hob-nailed boots, thus igniting the powder in the barrel, which in turn caused the destruction of the corning-house, and the consequent loss of life. The men who presumably brought about the catastrophe were "pushers," and were outside hands, so that they were not specially shod to prevent the risk of striking sparks. Since the accident, the company have provided against that contingency happening again, but Major Cooper-Key is careful to exonerate the company from any particular blame for the occurrence, which he considers to have been an accident.

A SINGLE-BARREL EJECTOR SHOT-GUN.

IN the subjoined illustration is given a view of what is somewhat of a novelty in this country, in the form of a single-barrel shot-gun having a drop-down breech-action and an ejector. The gun in question is the product of the Harrington and Richardson Arms Co., of Worcester, Mass., U.S.A., and is put upon the British market by Messrs. Charles Osborne & Co., Ld., of Birmingham and London. It has a 30-in. barrel, fully choked, of 12-bore calibre, with a top-lever action, and has the advantage of being of the "take-down" variety, the barrel and fore-end pivoting on a pin, shown in the illustration, which is secured by a very ingenious locking appliance. On withdrawal of this pin by unscrewing, the two

parts of the gun are separated. As can be seen, the stock is of a plain but workmanlike pattern, and is provided with a full pistol grip, and a rubber butt-plate of the type usually in vogue across the Atlantic.

Then gun is of a type which is thoroughly well known in the United States, where single-barrel sporting guns are in general demand, and it is produced at a price which renders it within the reach of a comparatively poor man. Altogether, it represents a class of shot-gun which, while somewhat unfamiliar to British sportsmen, only requires to be tried in order to recommend itself to favour among those who cannot afford to pay a high figure for a first-class double-barrelled gun by a reliable British maker, and who not infrequently, therefore, have at present either to go without their turn of sport altogether, or otherwise to purchase as second-hand a spurious, or at least doubtful, weapon of that type, such as alone could be obtained for the price quoted for this particular single-shot gun. Messrs. Osborne deserve credit for their enterprise in introducing what appears to be a decidedly serviceable and trustworthy weapon at a figure that brings it within the capacity of purchase of quite a modest purse.

French and Belgian made arms and ammunition are finding their way in considerable quantities to the Persian Gulf

ROUND THE TRADE.

It is rumoured that the French Commercial Attaché in Morocco has sold 100,000 rifles to the Shereefian Government.

Messrs. W. J. Jeffery & Co., are, we understand, making arrangements this year to load a certain portion of their own cartridges.

Mr. W. H. Hughes was recently appointed treasurer of the Birmingham Proof House in succession to Mr. William Powell, father of Mr. W. L. Powell, who has resigned that position.

The name of the Fortis Powder and Explosives Co., Ld., figures in the list of liquidators' notices published during last month, and a meeting has been called for the 16th inst., at 80A, Coleman Street, E.C.

We understand that an application has been made to the Committee of the Stock Exchange to appoint a special settling day in, and to grant a quotation for, the shares of the Colt Gun and Cartridge Co., Ltd.

On the conclusion of the hearing of the case of Fracis Times & Co. *v.* Meade, relative to the seizures of arms and ammunition in the Persian Gulf, Mr. Justice Bigham stated that he would deliver judgment before the close of the present sittings.

In the most recent list of donations received by or promised to the Gamekeepers' Kennel Association, are to be found the names of Mr. Charles Lancaster, Messrs. Kynoch & Co., Ld., Messrs. Curtis's & Harvey, Ld., and the Schultze and E.C. Powder Companies.

We understand that the Herodsfoot Powder Mills, near Liskeard, which were purchased by Messrs. Curtis's & Harvey, Ltd., from the East Cornwall Gunpowder Co. in 1898, have now been acquired by the Safety Explosives Co., and will shortly recommence work.

Elswick is currently reported to have offered to supply a gun to the Greek Government for experimental purposes, free of charge. A German firm is stated to have followed suit. Is this a variant or a repetition of the Turkish experience of a few months ago? And is the German firm that of Ehrhardt?

Sporting Ballistite powder, as manufactured by Messrs. Nobel's Explosives Co., Ld., at their works in Scotland, is now officially recognised and classified by the Belgian Government, so that the company is now in a position to accept orders from wholesale and retail dealers in that country.

The present boom in war material is affecting the Government workshops to an abnormal extent, and there are rumours of augmentations in almost every department in order to cope with the requirements of the situation. Private establishments are beginning to benefit from the inadequacy of the Government departments to fit in supply with demand.

Among the visitors at the Sportsmen's Show revolver tournament, given by the Colt's Patent Fire Arms Manufacturing Co. at New York, was Mr. J. M. Browning, who availed himself of this opportunity to meet the expert revolver shooters of the Eastern States. Mr. Browning is the inventor of the automatic pistol bearing his name, which was recently illustrated in these columns.

On Good Friday a friendly football match, under Association Rules, took place at the grounds of the Blagdon Shooting School, the competing teams being mustered respectively from the Small Arms Factory, at Gillingham Street, S.W., and the staff at Blagdon. When it is a question of shooting goals instead of clay birds, the Blagdon people have to yield first place to the manufacturing department, and the result of the match was 4—0, as the home team failed to score. All the same, the opposing forces seem to have had a good day's sport amid pleasant surroundings.

At this year's Glasgow International Exhibition, the gun trade is not very largely represented, the number of firms who occupy spaces in the departments devoted to sports and sporting appliances being only just above a round half-dozen. London gunmakers are represented solely by Mr. Charles Lancaster, but judging from the list of his exhibits, this enterprising Bond Street maker goes far to indicate the claims of the Metropolis as being the centre of the trade, both by the variety and the quality of weapons shown. Otherwise, local gunmakers are alone in evidence. Mr. Charles Ingram has an exhibit in his own name, with others representing the firm of J. D. Dougall & Son, and the Sportsman Emporium, all having their *habitat* in Glasgow. Mr. W. Horton and Mr. Alexander Martin are also well represented. Three powder firms are in evidence. Nobel's Explosives Co., Ld., exhibit dummy models of their leading specialities in different kinds of explosives used in blasting, mining, the military and naval services and sport. Kynoch, Ld., show all kinds of military small-arm and quick-firing ammunition, and sporting ammunition, together with various types of high explosives; and Eley Bros., Ld., make a display of military and sporting ammunition in their usual thorough and effective manner. It must be admitted that there is a distinct disappointment in finding that only four representatives of the gun trade think it worth while to be represented at an exhibition of so extensive and important a nature as the Glasgow International Exhibition, 1901. Perhaps many have reserved themselves for the two London Exhibitions of specially naval and military interest.

TECHNICAL INSTRUCTION FOR BIRMINGHAM GUNWORKERS.

At a small meeting held at the Staniforth Board School on the 4th ult., a resolution was passed:—"That this meeting heartily approves of the efforts being made by Birmingham gunworkers in endeavouring to stimulate a desire among the youths in the trade to secure the glorious benefits of technical education, and thereby conferring a boon, not only among those immediately concerned, but upon the community at large." Mr. F. W. Wakeman, President of the Gunworkers' Union, was in the chair on the occasion in question, the meeting being called for the purpose of distributing prizes to apprentices in the trade who attend the Municipal Technical School. In his speech, Mr. Wakeman said that they wanted to encourage the young men in the gun trade to learn to do things on scientific principles, instead of by the rule of thumb that had been too prevalent in the gun trade in Birmingham. It would be a good thing if they could have less of the sectional system in the trade than they had at present. For instance, they used to turn out a youth a complete action-filer, but now that branch of the trade had been divided and subdivided, and there were very few such workmen in the present day. The result was that for the easier jobs there were more men than were required, and a man often had to work at one job for small wages because he was not able to turn his hand to another. It was not only for the workmen that technical education was wanted. The workman ought to be able more often to look to his employer for instruction and guidance in the more complicated work, instead of being told "I leave it entirely to you." It was said that the workmen in the gun trade were behind the times, but the masters too had much to learn. He thought it a mistake to try and compete with the foreigner in cheapness; it would be much better to try and show that the Birmingham gunmaker, as in the past, was able to challenge the whole world for workmanship.—Mr. Middleton, in proposing the resolution given above, referred to the willingness of the Municipal Technical School Committee to start gunmaking classes, if the trade asked for them.

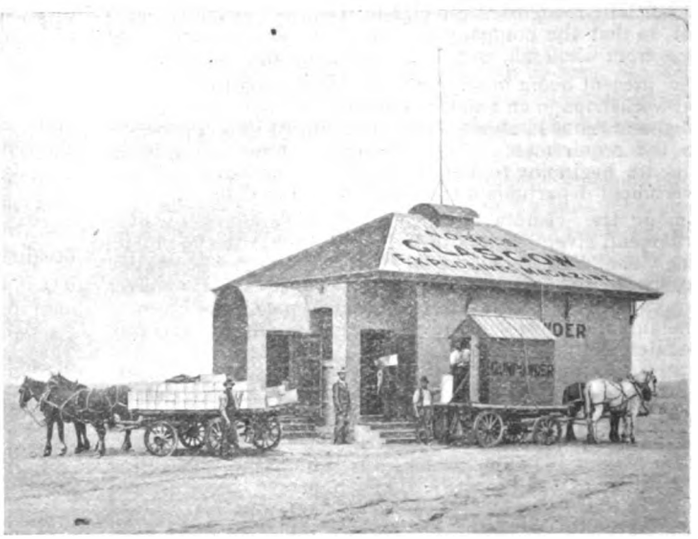
THE BOOK OF HIGH EXPLOSIVES.

BEARING the above-mentioned title, Messrs. Nobel's Explosives Co., Ld., of Glasgow, have issued a most tastefully got-up pamphlet containing particulars of the origin, manufacture and distribution of their world-famous specialities in explosive material. The pamphlet, if it can be so termed, consists of upwards of 150 pages, each measuring 11 inches by 8½ inches, containing a mass of interesting letterpress and a number of illustrations, of which it is no exaggeration to say that they represent the high-water mark of British effort in that direction. Thanks to the courtesy of the directors of the company, we are enabled here to reproduce some specimens of the illustrations in question, more as an indication of the type than of the style of work which is to be found so plentifully displayed in the book. If the reproductions seem to fail in carrying out our encomiums, it must in all fairness be pointed out they were intended for use on a quality of fine-art paper which could not well be employed in the publication of ARMS AND EXPLOSIVES, and any diminution in excellence must therefore be attributed to the relative unsuitability of the paper here used.

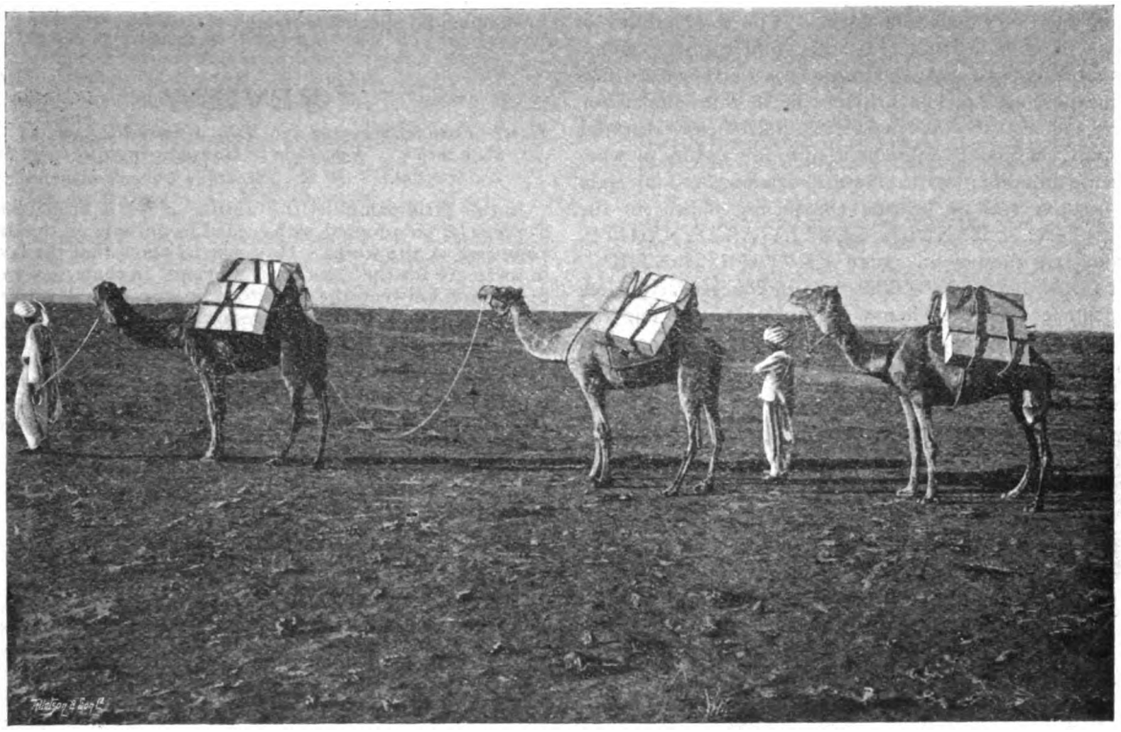
DESPATCHING NOBEL DYNAMITE BY OX WAGON FROM BOMBAY MAGAZINE.

The book opens appropriately enough with a map of the world, painted red so far as the British Empire is concerned, and bearing the legend that all the products of the company are manufactured within the ensanguined regions. Those products are next explained and described in detail, leading off with blasting compounds, detonators and detonator fuses, safety fuses, electric blasting and other items. A very interesting section describes the specialist work of breaking up wrecks, and in this connection there is a well-illustrated account of the work done on the stranded Atlantic liner *Milwaukee* in Cruden Bay some two and a-half years ago. It may be remembered that this huge vessel, of 7,317 tons, was so badly stranded that she could not be got off in her entirety, and the ingenious plan was adopted of cutting her in two parts and towing the stern part, about two-thirds of the whole, back to the Tyne, where the salved portion was duly fitted with a new bow piece which made a new vessel of her. The operation meant the saving of £40,000 out of a total cost of £75,000, and the salvors employed Nobel's dynamite for the purpose of dividing the vessel, 1,700 lbs. of the explosive sufficing to make a good job of the affair. Nobel explosives are also largely used for removing tree stumps on virgin land, and for various other purposes of a more or less singular nature, all of which find due mention in the book under notice.

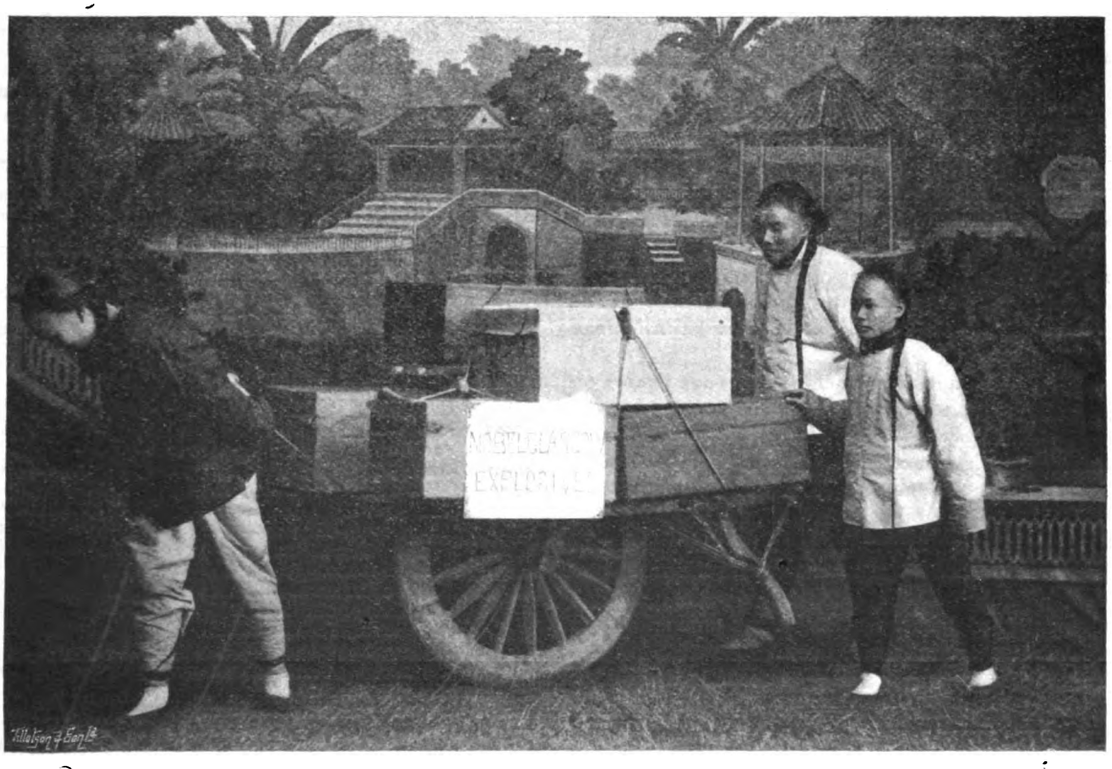
Some excellent descriptions are given of the various Nobel factories, and there are illustrated notices of the late Alfred Nobel, founder of the huge organisation, and of the late Sir Vivian Majendie, K.C.B., who for many years enjoyed a high measure of fame and esteem as H.M. Chief Inspector of Explosives to the Home Office. By no means the least interesting section of the work are accounts of the visits of mere laymen to the factories, and their impressions not only of the ingenious processes employed, but also of the extreme precaution adopted by the management with a view to obviating all risk of accident in the process of producing these powerful explosives. One especially racy article, by Mr. H. J. W. Dam, the author of one of the most amusing musical plays of recent years, recounts his visit to the Ardeer factory in 1897. Another deals with the production of detonators at Westquarter and Redding Moor factories, and in each case the humorous



NOBEL'S MAGAZINE AT BROKEN HILL, N.S.W.



NOBEL EXPLOSIVES ON THE WAY TO THE N.W. FRONTIER.



NOBEL EXPLOSIVES IN CHINA.

writing serves to convey a quantity of interesting information in a very palatable form. The possibilities of dangerous methods of storage, handling and transport of explosives are fully dealt with, and instances are given of the risks run by inexperienced or foolhardy people in this connection, which are sufficient to make one's hair stand on end. Apropos of transport, Sir Vivian Majendie used to tell a story of what happened in London in 1879. Several cases arrived by train from a country station, bearing conspicuous labels to the following effect:—"HANDLE GENTLY AS DYNAMITE. A DROP OF ONE INCH WILL CAUSE CERTAIN DESTRUCTION TO THE CONTENTS." This was undoubtedly true, as the contents consisted of honey in the comb. Among the strange uses to which explosives are put, it may be news to some to know that nitro-glycerine tabloids are a recognised

TRANSPORT OF NOBEL EXPLOSIVES ON LLAMA-BACK IN THE ANDES.—READY TO START.

agent in the British Pharmacopæia in cases of angina pectoris and other heart troubles. In America and India dynamite is another kind of "medicine" in its capacity as a rain producer. Out of respect for our readers we will not reproduce the dog and bear stories, which are also given as illustrations of the strange uses of explosives. One at least is of American origin.

After dealing with explosives generally, the book follows on with a most interesting account of the ammunition department of Messrs. Nobel's. A very large quantity of Cordite for the British Government is manufactured at Ardeer, to the extent of some thousands of tons, in addition to the company's speciality, Ballistite, and other forms of smokeless powder. It is, however, unnecessary to refer to the department in detail, as our readers are fully conversant with the vast capacities of the Nobel factories for turning out well-nigh unlimited supplies of military and sporting ammunition to meet the requirements of the wide world.

Regarding the book here sketchily reviewed as a descriptive catalogue, it serves to mark a welcome epoch in the history of artistic publications, so far as this country is concerned, and credit is due alike to Messrs. Nobel's Explosives Co., Ld., for their initiative and enterprise, and to their willing coadjutors, the Tillotson Press, of Bolton, who, as printers and process-workers, are responsible for the ultimate production of this most splendid specimen of high-class work.

REVIEW.

Bases Fondamentales d'une Loi Universelle sur les Brevets d'Invention. Par Henri Hauser, Ingénieur des Mines et Electricien.

In this little pamphlet the author gives a brief résumé of the legislation adopted with regard to patents in the different countries of the world. He seeks to show that the laws now in force are for the most part injurious, in that they make no distinction between the inventor and the actual worker of a patent, two people not necessarily identical. He draws special attention to the expenditure of time and money exacted from the inventor in acquiring and maintaining his rights, and by a scarcely apt comparison of such rights with the copyright possessed in literary productions, he draws conclusions which, according to his view, represent a point of departure for the framing of a law dealing with patents, which would be more nearly equitable.

CORRESPONDENCE.

LONDON SPORTING PARK.

TO THE EDITOR OF *Arms and Explosives.*

DEAR SIR,—We note in your "Round the Trade" in this month's issue of *Arms and Explosives* that you mention Whitby as being appointed here in connection with our "Gunmaking Department." We do not know how you have obtained this information, but beg to say it is incorrect. He is employed here to carry out some of our gun alterations, as many of our clients wish them carried out during their trial.

We shall be glad if you will contradict your statement in your next issue.

We are much obliged to you for mentioning our telephone.

Your obedient servants,

LONDON SPORTING PARK, LTD.,
T. C. OSBORNE,
Sec. and Asst. Manager.

April 12th, 1901.

APPLICATIONS FOR PATENTS.

MARCH 18TH—APRIL 12TH, 1901

22,651a. Fuses and Exploders. A. W. Marshall. (Date claimed, December 12, 1900).
5,632.* Apparatus for Moulding Projectiles. A. J. Astbury.
5,750. Shafts of Gun Carriages. W. E. Rowlands.
5,765. Breech Mechanism of Ordnance. A. T. Dawson and G. T. Buckham.
5,792.* Discharge-Actuated Guns. S. N. McClean.
5,855. Leaf Sights for Rifles. G. Clapperton.
5,873. Anti-fouling Composition. W. J. Williams.
5,903. Ships' Telegraphs for Gunnery Purposes. S. Evershed and Evershed & Vignoles, Ld.
5,962. Rifle Sights. J. Heinicke.
5,967. Detonators. W. C. Roberts-Austen.
5,991. Telescopic Sights for Ordnance. A. A. Common.
6,039. Manufacture of Nitrocellulose. A. Luck.
6,051. Machine Gun Mountings. J. Formby
6,052. Machine Guns. J. Formby.
6,062. Magazine Mechanism. O. H. Edwards.
6,089. Manufacture of Steel Projectiles. R. A. Hadfield.
6,091. Projectiles. R. A. Hadfield
6,159. Blasting Cartridges. W. Kirsanow.
6,172. Rammers for Ordnance. A. T. Dawson and J. Horne.
6,496. Projectiles for Ordnance. P. M. Staunton.
6,513. Nitro-explosives for Ordnance. Sir W. Crookes.
6,536. Cartridge Clips. H. W. Gabbett-Fairfax.
6,584. Single-Trigger Mechanism. W. L. Powell and A. Dean.
6,602.* Breech Mechanism of Ordnance P. M. Justice (Agent for *The Bethlehem Steel Company*).
6,782. Ammunition Holders. H. G. Turner.

6,729. Ammunition Hoists. A. T. Dawson and J. Horne.
6,872. Drop-down Small Arms. J. Rogers.
6,913.* Bicycle Attachment for Carrying Arms. A. G. Jackson. (Applied for in Queensland, Feb. 1, 1900).
6,923.* Single-trigger Mechanism. H. Hughes.
7,142. Revolving Platforms of Ordnance. A. T. Dawson and J. Horne.
7,148. Detonators for Explosives. M. Bielefeldt.
7,277. A Detonating Band. E. H. Wheeler.
7,278. Detonate Placing Apparatus. E. H. Wheeler.
7,309. Sighting of Ordnance. A. A. Common.
7,323* Projectiles. W. F. Cole.
7,328. Repeating Pistol for Caseless Ammunition. A G. Bloxam, (Agent for *Waffen-und Maschinenfabriks Actiengesellschaft.*)
7,433. Cartridge Belts. P. A. Martin.
7,438. Electrical Targets. W. W. G. Webb.

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

MARCH 23RD—APRIL 20TH, 1901.

COMPILED BY H. TARRANT.

3,614 (1900). **Quick-firing Gun Sights**. A. A. Common, Ealing. A method of laying a quick-firing gun by means of a telescope carried by apparatus, which is mounted on the slide in which the gun works. The apparatus consists of a base, by which it is attached to the gun slide, an arrangement by which a rocking motion may be communicated so as to keep the apparatus vertical, also of a part to prevent the shock of recoil from affecting the telescope, and a means of carrying the telescope so that it may be moved in a vertical plane for the purpose of giving the necessary elevation to the gun. Accepted Feb. 22, 1901.

5,218 (1900). **Rifle Magazines and Mechanism**. J. R. R. Ashton, London. In a very bulky specification, several modifications applicable to the drop-down magazine rifle, dealt with in Patents No. 8,406 and 26,872, both of 1896, are described. The improvements relate principally to the cartridge bed in the breech body, the guide spring, the bolt handle and dust cover, and to the device for the locking of the bolt and cocking head Accepted March 9, 1901.

5,395 (1900). **Quick-firing Gun Mechanism**. J. H. Barry, London, and R. G. Pemberton, Lee. In order to provide for very rapid firing, the gun is furnished with two chambers, which alternately take up their position for firing through an oscillating movement. The two chambers of the breech block are loaded by two slides, which are fitted with hoppers containing the cartridges. The oscillating movement is produced by a lever, which has a rocking action. The lever may also be used for firing. Accepted March 21, 1901.

5,689 (1900). **Wire-cutting Attachment for Fire-arms**. F. V. Dalton, St. Neots. The two blades of a wire-cutting tool are so pivoted at their ends that their centres of revolution are eccentric to one another. A rotary movement of the rifle, to which the tool is attached, revolves a cog wheel and forces the jaws together over the wire. The tool is folded back and held in a convenient position out of the way when not required for use. Accepted March 23, 1901.

6,932 (1900). **Range Finders and Ordnance Sighting**. J. G. Lorrain. (Agent for *C. J. Beauvais, U.S.A.*). A range-finder which is constructed with a view to combining several operations within the one instrument. It is adapted to give the exact distance of any object in miles and fractions of a mile, without any mathematical calculation. It may be used on vessels or in the field, and when used in the field may be quickly and accurately arranged for observation. The speed of ships or any moving objects may be ascertained, and it may be employed for finding the elevation or depression of any place or point. Also by means of this instrument sights of ordnance may be graduated for firing ahead of any moving object, so that the projectile, after a long travel, may be enabled to strike accurately. Accepted March 2, 1901.

8,183* (1900). **The W. Baker Ejector Mechanism.** W. Baker, Birmingham.

8,236 (1900). **Target Construction**, J. G. Glover, London. A target so constructed that all missiles which strike it are collected in a separate compartment, and may be retained as evidence as to what part of the target they struck. Behind each ring a separate compartment is built, and the bullets entering such compartments are guided down an outlet into drawers, which represent the value of the part struck. Accepted March 16, 1901.

8,764. (1900). **Armour-piercing Projectiles**. P. M. Staunton, Howth. A method of increasing the penetration power of projectiles by building over the nose a cap of steel or wrought iron with comparatively thin sides, but with an increased thickness of metal immediately over the point. An unfilled space is left between the point of the shell and the inside casing. The body of the shell is made cone-shaped, so as to maintain the parallel outer lines after the fixing of the cap, and at the same time to increase the substance of the casing. Accepted March 2, 1901.

9,049 (1900). **Means for Preventing Erosion of Guns**. Sir W. G. Armstrong, Whitworth & Co., Ld., and Sir A. Noble, Newcastle-on-Tyne. The patentees have found that the erosion of guns is due mainly to the excessive heat of the gases resulting from the firing of the charge. In order to decrease the temperature without diminishing the ballistic effect, a water case is placed in front of the charge. The expansion of the vaporized water compensates more or less for the loss occasioned by the decreased temperature. Accepted March 23, 1901.

9,051 (1900). **Brakes for Gun Carriages**. W. H. Wright, U S A., Hon. W. Rothschild, and G. D Smith, London. The brake described is designed to rigidly lock the whole carriage, backward, forward, or vertical movements being absolutely prevented. The brake consists of a strip of metal, to the ends of which are fixed two shoes. These shoes bear upon the tyre at opposite ends of an arc of its circumference. The brake may be operated by a lever worked by hand or by foot. Accepted March 30, 1901.

9,765 (1900). **Sighting of Ordnance**. R. W. Smith, Filey. Apparatus whereby a complete chart or record of the zone of fire may be obtained during daylight, so that such chart may be used in conjunction with the indicator to train the gun to any before-observed object during darkness or fog. The indicating apparatus consists of a needle, which follows the movement of the gun when being trained, and is so caused to travel over a stationary convex surface. Accepted March 23, 1901.

10,270 (1900). **Shot-firing Apparatus**. G. Evans, Aberdare. An electric battery for use in shot firing or blasting, the terminals of which are so designed that the operator has to apply the cables thereto by hand, in order electrically to fire the detonator. The terminals are provided simply with flat heads, and present no means of attachment to the cables. With the use of this apparatus accidental discharges may be avoided. Accepted March 30, 1901.

10,334 (1900). **Targets for Rifle Shooting**. W. D. Trick, Swansea A target for rifle shooting, which is hung on rails at top and bottom, and is adapted to travel laterally thereon outwards from a mantlet. The target may be worked in conjunction with another, so that when coupled the act of running one out withdraws the other. In case of shadows falling from the mantlet the target is adapted to be easily transferred to the other side of the mantlet. Accepted March 30, 1901.

11,144 (1900). **Rifle-carrying Attachment for Cycles**. O. Thorn, London. This patent relates to clips for carrying small-arms on cycles. One clip takes the muzzle and is fixed to the head of the machine, and the other is fixed in a position to take that part of the rifle just below the magazine The design of the clip is U-shaped, and the two ends are secured to one another when the rifle is in position by a strap, which is folded over and fastened by a catch similar to a spring glove-fastener. Any well-known "shoe" may be used to support the butt of the rifle. Accepted March 25, 1901.

11,613 (1900). **Electrical indicating Targets.** G. and G. L. McAlpine, Forest Hill. A target constructed so that the value of various hits are communicated by electrical means to the marker. When any part of the target is caused to vibrate, the energy with which the bullet strikes the target causes a ball situated at the back of that portion of the target to roll up a pair of inclines. The ball is thus caused to conduct the current from one incline to the other, and so to complete a circuit. Its own weight causes the ball to roll back again on to the insulated bottom of the incline. Accepted March 23, 1901

20,524 (1900). **Shoulder-trained Ordnance.** J. A., F. E., and M. E. Normand, France. A method of decreasing the effort which the gunner has to exert in training the gun, at the same time permitting him to take a firm bearing on the shoulder-piece whatever the elevation or depression. The patent refers particularly to a modification of the arrangements described in Patent No. 29,161, 1897. The shoulder-piece is formed as part of the mounting, but the handle controlling the elevating of the gun is independent of the shoulder-piece. Thus, with this arrangement, the shoulder follows the movement of the gun when being trained, and once found the line of sight is not lost again. Accepted March 30, 1901.

23,017 (1900). **Illuminating Projectiles.** R. T. Phillips, U.S.A. In illuminating projectiles charged with gas-producing material, such as calcium carbide, what is called a buffer-block is fixed to the end of the projectile so that the burners shall be protected from the exploding charge. The impact of the explosion is received by the buffer, which drops off the projectile when flying through the air. Accepted March 23, 1901.

77 (1901). **Spring Air Guns.** W. F. Markham, U.S.A. In the construction of spring air-guns, a method of providing for the rapid breaking down of stock and barrel for the purpose of packing, and for the easy reassembling of the parts. A slight breaking-down of the stock to provide for easy loading is also permitted by the construction. The spring-barrel consists of an inner tube protected by outer tube, the two being attached by means of a bayonet joint. Accepted March 9, 1901.

2,024 (1901). **Shrapnel Shells.** G. M. White (Agent for *The Rheinische Metallwaaren und Maschinenfabrik, Germany*). A shrapnel shell, the interior surface of which is constructed with longitudinal ribs. Two objects are secured by this design. First, the shell walls are strengthened, and second, rotary displacement of the balls is prevented. The balls themselves are each provided with flats so that they may be packed exactly within the shell, wedging thus being rendered impossible. Accepted March 16, 1901.

2,650 (1901). **Explosives Mixing Machines.** J. C. Schrader, U.S.A. In order to obviate the lengthy and expensive task of mixing by hand the ingredients of explosive gelatin, dynamite or other such compounds, a machine is described which performs the operation thoroughly, avoiding also the danger of transferring the explosive from one receptacle to another. The parts of the machine are so arranged that all bearings or moving parts liable to generate friction are located above the contents of the actual mixing receptacle. Accepted March 9, 1901.

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

SELECTED PATENT.

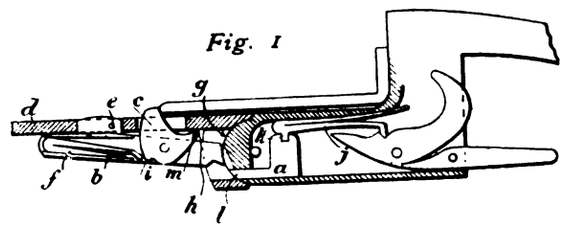
THE W. BAKER EJECTOR MECHANISM.

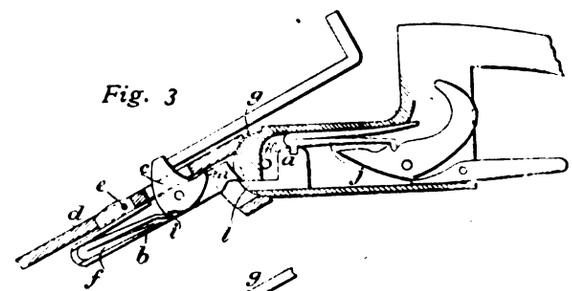
8,183 (1900). W. Baker, Birmingham. In the ejecting mechanism for small-arms, described in this specification, the kicker and its actuating spring are pivoted upon a carrier, which is itself pivoted to the fore-end iron. The carrier is operated by a part which projects beyond the surface of the body joint when the gun is fired. This projecting part is operated by the slight forward movement of the mainspring when the gun is fired, and it is so arranged within the body that less metal has to be cut away for its accommodation than is ordinarily necessary.

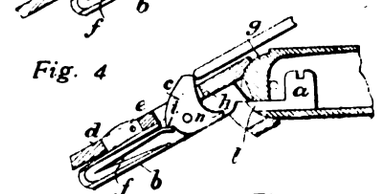
The position of the parts is shown in Fig. 1, when the gun is closed, and is ready for firing. The position of the projecting portion *a*, in relation with the kicker carrier *b*, after firing, is illustrated in Fig. 2. In Figs. 3 and 4 the parts are shown in different positions during the opening of the gun after firing.

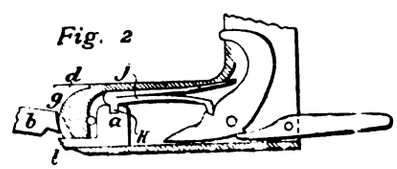
Referring to Fig. 1, it will be seen that the kicker *c* is pivotally carried at *d* upon the part *b*, which part itself is pivoted to the fore-end iron at *e*. The carrier *b* also bears the spring *f*, which actuates the kicker. The carrier is so arranged that its back end lies about the body joint surface *g*. It is shaped so that it may be operated upon by the part *a*, which, when the gun is fired, projects beyond the surface *g*. The kicker has arranged upon its rear-end a point *m*, which bears against the under side of the fore-end iron at *k*. The tail *i* of the kicker is thus forced through this engagement to ride up on to the spring *f*, when the gun is opened after firing.

The projecting slide *a* is worked through the medium of the mainspring *j*. When the gun is fired, the mainspring is pushed slightly forward by the falling hammer. This movement is conveyed to the slide *a* by the engagement of the projection *k* on the spring with









the slide, and the slide is thus pushed forward, its nose appearing beyond the surface *g* of the body joint.

When the gun is opened, after firing, the projecting part *l* of the slide *a* engages the rear-end of the pivoted carrier *b*, and forces this part up towards a position parallel with the fore-end iron (Figs. 3 and 4). During this action the contact of the rear-end *m* of the kicker with the fore-end iron, forces the kicker round on its pivot, and allows the arm of the spring *f* to engage the kicker tail *i*. At this point the gun has been opened sufficiently to allow the cartridge case to pass the top of the breech face, and the engagement of the spring with the kicker tail causes the kicker to be forced round quickly, and to deal the extractor leg a blow strong enough to eject the spent cartridge.

A modification of this mechanism is illustrated also in the specification. In place of the part *a*, a lever is used, which may be pivoted at the hammer pivot, or at any other convenient position. This lever is capable of two movements. First it is forced outwards, as is the part *a*, and second it is turned down on its pivot, this second movement causing its nose just to appear beyond the body-joint surface. Either of these movements may be adapted to operate the kicker carrier. Accepted March 10, 1901.

Arms & Explosives

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CONTENTS.

CURRENT TOPICS.

New Explosive on Trial (?) — A considerable mystery seems to be made in some quarters respecting the experiments which are under progress in the Bermudas. The hulk which was formerly H.M.S. *Scorpion* is apparently being treated much as the hulk *Belleisle* was treated a few months ago, though possibly with some greater elaboration of detail, since we learn that dummies representing the gun crews are dotted about the decks in more or less natural positions, and come in for their due share of the hammering. But the mystery, such as it is, concerns the explosives used for loading the shells of various calibres with which the experimentation is made, which are said to be of a new and secret composition. So far as one can learn by reading between the lines, however, this new explosive is only our old friend lyddite, and it seems to be doing a certain amount of damage to the hulk and its gallant crew of dummies—when it is obliging enough to explode.

Gunmakers' Association Annual Dinner. — The Annual General Meeting of the Gunmakers' Association was held on the 7th ult., and the proceedings are duly reported in another column of this issue. According to custom this meeting was followed on the same evening by a dinner at the Trocadero Restaurant, at which a fair number of gunmakers and their guests sat down, with Mr. Edgar Harrison in the chair. In the course of the after-dinner speeches, the chairman recapitulated the work done by the Association during the past year in the interests of the trade at large, and he entered a strong appeal for a substantial increase in the membership of the Association. Mr. Edwinson Green, of Cheltenham, made one of the hits of the evening in a speech which at once congratulated the Association on past results and spurred them to increased efforts in the future. He deplored the condition of the rifle and revolver trades in this country, and insisted on the necessity of supporting home industries—a point on which other speakers also had something to say. Some of the speakers probably felt some restraint in expressing their opinions on various subjects freely, by the presence of guests who were not in the trade; but, on the other hand, this annual gathering, to which members of the allied trades are invited as guests, undoubtedly tends to a union of interests, and promotes a decided feeling of sympathy and community. On the following day a most enjoyable trip was made by a number of members to the Royal Arsenal at Woolwich, where, by the courtesy of Colonel Bainbridge, the heads of the different departments afforded every facility for a study of the manufacture of small-arms ammunition, the building up of modern wire guns up to 12-inch calibre, and similar processes as conducted at the Government factory. In the evening, Mr. R. W. S. Griffith delivered a most instructive and interesting lecture on "The Recoil of Shot Guns," illustrated by lime-light views, to an appreciative audience in the theatre of the Royal United Service Institute. This lecture is referred to at greater length on another page, under the heading of "Lectures to Young Gunmakers." The general verdict seems to have been that the annual function produced two very pleasant days for such members as were able to attend.

Our Ammunition Reserve.—Something approaching a sensation was caused in the House of Commons and in the daily Press by Mr. Balfour's statement made during the debate on the Army scheme, that at one period early in the progress of the long protracted Boer war the reserve of small-arm ammunition in this country had been reduced to the amount of only 3,300 rounds. Of course, that presupposes that the army in the field and the re-inforcements on the way out were absolutely equipped up to full service requirements; but still, if all that is allowed, the fact remains that the confession reveals a somewhat startling condition of affairs. Without going into the vexed region of politics, it is well known that the last Liberal Government "went out" on the matter of an insufficiency of Cordite and it is therefore somewhat inconsistent to discover that the Government which "came in" on that vital question showed but little greater foresight in providing for the needs of the Services. Mr. Balfour scarcely made the reason for this serious shortage quite clear, nor was his explanation of the condition of affairs following the downfall of the Liberal Ministry altogether convincing. At the time of the change of Government, he said, there were only 92,000,000 rounds, when there should have been 146,000,000 rounds of small-arm ammunition in store. This was raised by the Unionist Government to 197,000,000 rounds, and yet there were only 3,300 rounds in reserve at one period of the war. It is well known that vast quantities of ammunition were wasted during the earlier phases of the struggle, and the attempt to keep pace with this wastage may undoubtedly have caused the despatch of all available resources to the scene of action. An interesting and, at present, missing link in the chain of the narrative might be supplied in the furnishing of details as to exactly the quantity of ammunition that was sent out to South Africa in the first few months of the war. Assuming, as has been calculated, that the capacity of the Government factories and outside firms represents a total of from 10,000,000 to 12,000,000 rounds per week, it is conceivable that even this supply might be drained well-nigh dry by the despatch of every available round. But it was certainly some one's business to see that the ammunition was not all shot away as fast as it was manufactured and sent out. If the storage of reserve ammunition were simply transferred from this country to South Africa, and so caused a quite temporary shortage in the Home reserves, Mr. Balfour's alarmist utterance loses something of its significance.

THE BISLEY PROGRAMME.

THE Bisley Meeting of 1901 has now been definitely arranged in all its details, and the camp and prize meeting will open on the afternoon of Monday, July 8th, with the "Evelyn Wood," "Revolver," and Running Deer and Man Competitions, and will close with the distribution of prizes by Lord Roberts, Commander-in-Chief, on Saturday, July 20th. One important fixture, concerning which some doubt might have been felt, was the historic contest for the Queen's Prize, but Sir Henry Fletcher was able to announce at the spring general meeting of the N.R.A. that King Edward has graciously consented to continue the annual donation of £250, which was given for so many years by the late Queen, and has intimated his wish that for the future it be known as the King's Prize—a change of name which will at first necessitate an effort of memory. At the same time, the Prince of Wales' Prize for N.R.A. medal winners is to be repeated. Among new competitions will be one for a prize consisting of a silver cup, which is presented by the Commander-in-Chief to battalion teams of ten men each, open to all branches of H.M. forces. This will be a very practical test, under conditions as nearly as possible approximating to service conditions. The competing teams are to fire ten shots each from the magazine rifle, each man having a separate target at 150 yards range, consisting of a life-size representation of the head and shoulders of a man in the act of firing. The teams will be extended behind a small breastwork, and must remain in absolute cover except at the precise moment of firing, which is a period limited to four seconds per round, and the moment of which will be indicated by a signal as regards the first, with six seconds' interval between the succeeding shots. There are several other new events.

Among the alterations in the existing fixtures, there are one or two interesting items. In the competition for the St. George's Vase, the use of orthoptics is now permissible, and this concession will produce a feeling of general satisfaction. With regard to the "Winans" Telescopic Sights Competition, the Council of the N.R.A. have laid down a new set of rules governing the design and fitting of the telescopic arrangement which are worth repeating here in detail:—(1) Rifle—(*a*) ·303 Service Rifle, from which the existing aperture and dial long-range sights may be removed if desired. (*b*) The fittings remaining on the rifle when the telescope is removed, must be simple, and not such as to interfere with the individual or the rifle. (2) Attachments—(*a*) Must be arranged primary (*sic.*) for firing in the prone position. (*b*) Must avoid interference with the free working of the breech action. (*c*) Must be strong, compact, and not easily liable to damage; at the same time must admit of the telescope being easily and rapidly attached and detached. (3) Telescopic Sights—(*a*) Maximum length of telescope, 9 inches. (*b*) Maximum weight of sight, including all elevating gear, 1 lb. (*c*) Minimum field of view, 6 degrees. (*d*) Arrangements for obtaining elevation must be simple, and must provide for all distances to 3,000 yards (this may be taken as equivalent to 11 degrees elevation). (*e*) Arrangements for obtaining lateral adjustment may be provided, and must be simple. (*f*) Must be designed to be conveniently carried when detached from the rifle. (4) Target—Of a dull colour, having on it figures or objects not easily distinguishable by the naked eye. (5) Artificial rests provided at the firing point may be used. It will be seen from the foregoing transcript that the conditions of this competition are defined with considerable detail, and provide for a long range of vision in conjunction with considerable powers of illumination. The requirements as to size and detachability of the telescope deserve attention. Another alteration in the regulations for particular competitions concerns the Miniature Rifle and Breech Adapter Competitions, in which the price of the ammunition is raised to 5s. per 100 cartridges, a concession which at once enlarges the opportunities of shooters to obtain reasonably efficient ammunition.

In regard to alterations in the regulations governing the meeting as a whole, by far the most important relates to the position of shooters. This year, at all ranges under 600 yards, the standing, sitting, kneeling or prone positions may be used at will, which of course means that the prone position will be

generally adopted by marksmen. At 600 yards or over, any position may be chosen. As against these concessions, the targets have been modified for the 2nd and 3rd classes to counteract in some degree the improved markmanship which will undoubtedly result from an abolition of the stringent regulations prevalent in last year's meeting. In the revolver class some latitude seems to be indicated by the fact that there is a special "alteration" to the effect that the revolver foresight "must be fixed to the barrel and is capable of lateral adjustment." Last year the regulation read "to be *permanently* fixed to the barrel; and incapable of *vertical or* lateral adjustment." The words italicised will show to what extent the "alteration" affects the question. As regards magazine fire, the competitors' rifles and magazines will undergo examination by the Range Officer or Register Keeper after any competition. No allowance will be made for defective cartridges.

Sir Henry Fletcher drew special attention at the spring meeting of the N.R.A. to the fact that the Council had this year for the first time brought rifle clubs into connection with the Association, regulations having been introduced enabling members of those clubs to compete in most of the events, some indeed being specially introduced for their benefit. He thought the public might be glad to know that they had at the present time 153 rifle clubs affiliated to the N.R.A., and many more in process of joining. It is a healthy sign.

SWISS RIFLE RANGES.

A VERY interesting report upon Swiss rifle ranges has recently been embodied in the form of a Parliamentary paper, which presents in a compact compass an amount of information which may or may not be valuable in assisting the rifle club movement in this country, in direct proportion to the similarity of conditions ruling in the Swiss canton and the English counties. The report is made by Major the Hon. T. F. Fremantle, 1st Bucks V. R. C., and Captain E. C. H. Grant, Argyll and Sutherland Highlanders; but that fact does not of necessity identify either of these competent authorities as agreeing *in toto* with the Swiss system. They are, indeed, scrupulously careful to avoid expressing any decided opinion on the matter, contenting themselves, for the most part, with a simple statement of facts, and leaving their readers to infer to what extent the Swiss system would be capable of adaptation to our own requirements.

In one respect, at all events, the adoption of that system would, at the outset, present difficulties. The various communes are under the obligation of providing rifle ranges, and there are actually in existence 2,735 officially recognised ranges to an aggregate of 3,200 communes, the trifling discrepancy being explained by the fact that adjoining villages sometimes share a range. All game rights are now public property, and are sold every few years by public auction, so that they are subject to any disturbance that may be created by the local range. Moreover, to make difficulties about ranges is to incur the risk of being regarded as a public enemy, and consequently no man dares to interfere with the provision of facilities for the population to exercise freely in the use of weapons which are possibly destined for national defence. To put the matter in brief, public opinion is all in favour of the system, which flourishes accordingly.

The greater proportion of Swiss target shooting is done at ranges of 300 and 400 metres, and of the total above quoted, 118 ranges give facilities up to 300 metres only, 1,683 up to 400 metres, 500 up to 500 metres, and only 434 up to 600 metres or beyond. For the most part, the ranges are not expensively constructed. The report shows that 76 per cent. of the total have no building at either target or firing point. Of the rest, 7 per cent. have a target shelter only, and 4 per cent. a firing point shelter only, while the remaining 13 per cent. have buildings at each end of the range. Proper shelters for the markers are provided at only 90 per cent. of the ranges, and as regards the safety of the public, the compilers of the report are of opinion that only 93 per cent. of the ranges are safe as regards the line of fire beyond the butts, and only 91 per cent. as regards lateral deviation. Except in the case of ranges belonging to large centres of population, the arrangements are of the simplest character possible, as may perhaps be gathered from some of the foregoing statistics. In some places there is no attempt whatever at a fixed plant, possibly even nothing to indicate where the targets or firing points are situated, the targets being portable, and capable of being brought out for use on a hand truck. The marker always wears a scarlet blouse, which constitutes an automatic danger-signal, and his usual screen is a natural mound. There is said to be one village where the marker has no shelter whatever, but sits with his wife and drinks his beer at a table some 20 or 30 yards to one side of the target, within full view of the firing point. This practice is scarcely so risky as it seems, for in Swiss shooting it is not the custom to expect a man to miss the target for several shots consecutively. Anyone firing wildly is at once stopped. The average of marksmanship is so good, that on the 400 metre ranges the 6 ft. targets are placed only 18 inches apart, and in considering the safety or otherwise of a range, no account is taken of the possibilities of accidents from carelessness. This suggests a high order of all-round efficiency such as could only be obtained by catching the marksman or recruit while very young, as indeed is the case.

Targets of various types are in use. For the military ranges double canvas targets in balanced iron frames, similar to those used at Bisley, are employed, fitted to take either square targets or figures. Field-firing is generally practised at disappearing figure targets, placed in telephonic communication with the ground over which the troops pass. As regards the club ranges, there is no approximation to uniformity, some of the wealthier clubs having remarkably complete installations. The compilers of the report describe in considerable detail one particular range at Albisgüth, near Zurich, which seems to be on a most elaborate scale. There are firing-points for 53 targets at 300 metres, and for 15 targets at 400 metres, in addition to 12 revolver targets, the marksmen all being sheltered within a fine two-storied shooting house. At the other end of the scale are the village ranges, to which reference has already been made. The natural conditions of the country are, of course, largely in favour of the easy provision of ranges, and it is but rarely that screened ranges are rendered necessary. There is no modern screened range in Switzerland at all on the same complete lines as that on Wormwood Scrubbs. On the other hand, the extended range of modern rifles is already having its effect, and efforts are now being made to provide an ammunition for the regulation service rifle which should give good practice up to 200 or 300 metres

One device, having this end in view, is to combine a reduced charge with a bullet, the rear end of which is filled with sand to make it lighter.

Altogether, it cannot be said that this report on Swiss rifle ranges, interesting though it undoubtedly is, contributes much information of a nature capable of being of service in the fitting up of ranges in this country, where most of the conditions are totally different. It is but rarely that, in this comparatively flat country, we can secure natural backgrounds of hills behind the targets, and on that and other accounts the severe simplicity of many of the Swiss ranges is altogether beside the mark. Game rights and other property rights, even public opinion, to say nothing of the one vital matter of expense, all tend to complicate the question, and render the provision of rifle ranges a matter of peculiar, though not, we trust, insurmountable difficulty.

INCIDENTAL JOTTINGS.

A NAVAL BEREAVEMENT. If any man ever deserved a eulogistic obituary it is the late Admiral Sir Edmund Commerell. He was one of those delightful, though somewhat rare, combinations of the "Old Salt" with the pioneer of up-to-date improvements, as his connection with the Maxim Company for many years proved. As a social man he was a great favourite, and from the highest in the land to the humble A.B. seaman or workman he was voted a jolly good fellow. His sudden death came as a surprise to many who would have given this hale old warrior many years of vigorous life, judging from his bright interest in and energetic pursuance of all matters within his professional knowledge and social demands.

THE KING'S FIRST BISLEY. If the weather continues as fine as at present, the Bisley meeting should be a great success. It is quite refreshing to find something new on the programme. Lord Roberts evidently read his *Punch's Almanack* this year, for in it was a splendid cartoon of our up-to-date sportsman stalking rabbits from cover. To see Bisley marksmen serpentining under tufts of grass will be a funny sight, which I commend to the Biograph Company. Perhaps the sentries at Bisley could put in a good word for the Volunteer for some of his scouting operations. Returning "under cover" after "lights out" shows a great genius for this kind of thing. The winner of the first King's Prize should be a proud man, and it would be a great incentive to the meeting if his Majesty would present the prizes in person.

YOU PULL THE TRIGGER, YOUR INSTRUCTIONS DO THE REST. In organizing fresh competitions this year, we were bound to find that the war had shown some of the weak spots, and many innovations would naturally be expected. The machine gun is one of the items which have been passed over. The small calibre guns are not "small arms" nor "artillery," therefore they have no place at Bisley or Shoeburyness. What one would like to see would be a time event. Galloping from a certain distance, firing so many rounds at a target, and galloping back, one team against another, and counting the hits without the exact range being known. Another competition that would be interesting would be firing at a target at an unknown range, the target being moved backwards or forwards each round. This could easily be arranged by an electric tram arrangement.

RIFLE CARTRIDGES AND THE GUN TRADE. At a recent gathering of gunmakers one of the speakers, I am told, insinuated that the rifle cartridges used by the trade were, as a rule, Government rejects from which they could hardly expect to gain much satisfaction in any rifle, good or bad. Perhaps the following facts might also interest that speaker, that there is a regular trade in fired cases at the shooting butts and elsewhere. These are washed, recapped, and reloaded, the bullets mostly coming from Belgium or America. Needless to say they are nicely faked-up to look like new, but the ballistic results are exceedingly bad, and the effect of this immoral proceeding is to bring discredit on the original maker of the cartridge whose mark remains on the base. The business is on a level with re-filling empty wine and beer bottles with an inferior liquid, and this warning may perhaps induce the cartridge makers to take action in the matter.

PENNY PLAIN, TWOPENCE COLOURED. It is too bad of Mr. Balfour to play his little jokes on the unsuspecting taxpayer who does not understand that his balance of 3,000 odd cartridges are only a fictitious paper representation. Doubtless at that moment there were millions at hand, but not certified as ready for issue, and millions more certified as issued and still lying in the magazines, but Mr. Balfour said the "whole country." This was obviously a slip on his part, as such a condition of things would be impossible, so that it is a shame of someone to mislead the poor man into making such a statement, as tending to discount future reports.

AN OBJECT-LESSON FOR TRADES UNIONS. Lord George Hamilton did not unduly throw the blame for the loss of railway contracts on to the British workmen, and his precious trade societies, for paralysing and throttling trade. It has long been apparent that a revolution is brewing, and is sadly required in the engineering world to put labour into its proper position, and assign to capital that degree of control which is necessary to hold the markets of the world. The coming depression in that trade will tend to open the eyes of labour sympathisers, and expose the "dog in the manger" principle by which these labour leaders pursue their nefarious business. But Sir Alfred Hickman might also have put in a word for the consulting engineer, whose great delight is to break up stock sizes and productions, and insist upon some outrageous speciality difficult to obtain and of no preponderating value when procured. The consulting engineer should be merely the second opinion of the contractor, except in the case of structures combining civil and mechanical engineering problems; but to purchase machinery through a civil consulting engineer is an anomalous proceeding, and like buying sporting apparatus from the country grocer. It is more a matter of turnover than of practical endeavour to obtain the latest productions, with which the purveyor can hardly be expected to be conversant.

CYCLOPS.

NOTES.

PROPOSED DEVELOPMENTS IN ITALY.—It is stated on fairly trustworthy authority that the French company, Schneider, of Creusôt, and the much talked-of German firm of Ehrhardt, are both engaged in obtaining sites in Italy, at Milan and Spezzia, for the establishment of factories. There seems to be a very keen competition among the continental companies for the securing of the Government orders of the various European powers, and Italy is generally regarded as a happy hunting-ground in the process.

KRUPP GUNS FOR AFGHANISTAN.—The Afghan Agent of the Ameer has recently left Bombay by mail steamer for Germany, his objective being the purchase of six batteries of Krupp guns for Cabul. It is said that an advance has already been made in respect to the purchase-money to the extent of 640,000 rupees, which forms part of the British subsidy. If this be so, surely the British Agent will have something to say with regard to the subject of future purchases of warlike material.

BULLET-PROOF PAPIER-MACHE.—Experiments have lately been made at the rifle range of the Swedish navy, at Karlskrona, with shields made of a new kind of papier-maché, the preparation of which is, so far, kept secret. The experiments were made with the new Mauser rifle and Mauser naval carbine, and the Nagant revolver, in the presence of the chief of the Artillery department and a number of naval and military officers. It was found that a thickness of 72 mm. (2·835 in.) of the material tested resisted penetration by any of the small-arms mentioned. Afterwards, the fire of a Nordenfelt gun was directed at the shield, and the shots pierced the material, leaving jagged edges to the shot-holes, which resembled bullet-holes in thin iron plate.

KYNOCH, LTD.—Subject to final audit, the directors of this company recommend payment of the usual dividend of 10 per cent. on the old ordinary shares, and at the rate of 10 per cent. for one quarter of the year on such of the new ordinary shares as were fully paid on allotment, and, in addition, a bonus of 10 per cent. on the old ordinary shares, and at the rate of 10 per cent. for one quarter of the year on such of the new ordinary shares as were fully paid on allotment. There will be a final dividend at the rate of 5 per cent. on the preference shares.

EXPLOSIVES ACT, 1875.—In the House of Commons, on the 16th ult., Mr. Vaughan-Davies asked the Home Secretary whether his attention had been called to the fact that, under the Explosives Act, 1875, the maximum penalty for any breach or default of the Act was the same, namely, 2s. per lb., for gunpowder and for other explosives which were more dangerous, bulk for bulk. He wished to know whether the official reports showed that, in the case of such explosives as dynamite and nitro-glycerine, the existing penalty was so inadequate as not to be deterrent, and if so, whether the Home Secretary could see his way to amend the law on the matter. In reply, Mr. Ritchie stated that he was advised that the penalty had proved inadequate in respect to high explosives, and he said that if any good opportunity of amending the law in this respect should present itself, he would be very glad to take advantage of it.

ELECTRIC SHOT-FIRING IN COLLIERIES.—Messrs. Hunter and Warren have issued a booklet bearing the above title, which deals with the apparatus for shot-firing, giving illustrations and particulars of their magneto-exploder and their galvanometer for testing cable and L. T. fuzes. The pamplet also contains a variety of useful information on the subject of shot-firing, both as regards the firm's own specialities and generally, and is altogether a serviceable and compact little manual. On application the firm is prepared to supply gratis a companion book containing full particulars of the laws affecting the storage of explosives in registered premises and stores, with plans and specifications of model buildings for that purpose. Judging by the cases that are constantly reported from all over the country, some such digest seems to be a necessity for all persons connected in any degree whatever with the storage of explosives.

KING'S NORTON METAL CO., LD.—The directors of this company present a satisfactory report for the year ended March 31st. During the twelvemonth the sum of £5,539 has been expended on repairs to the works and plant, and has been charged to revenue, and this sum, therefore, is accounted for before reaching the net profit of £30,938, which represents the results of the year's trading. Altogether, with the amount brought forward, there is a total of £31,592 available for distribution, and of this the directors have allocated £3,500 to depreciation, and £3,000 as an addition to reserve. As regards the remainder, the directors recommend the payment of dividends at the rate of 7 per cent. per annum on the preference shares, and of 10 per cent. per annum on the ordinary shares; and, in addition, a bonus of £1 per share on the fully-paid ordinary shares, and 7s. 3d. per share on the ordinary shares having £5 paid up at the close of the financial year. There remains a balance of £539 to carry forward. The report announces with satisfaction that the 6,000 new ordinary shares offered under the resolution passed at the extraordinary general meeting of shareholders in June, 1900, were all taken up. Reference is also made to the new factory now in course of completion at Abbey Wood, the expenditure on which, up-to-date, has been provided for out of revenue.

NEW SERVICE RIFLE.—About the middle of last month, Earl Stanhope asked the Under-Secretary of State for War in the House of Lords whether the War Office would undertake to have the new pattern service rifle ready for trial during the coming Bisley meeting in July, and also whether the present rifle could be altered in conformity with the new pattern without great expense. He thought that it was most important that the new rifle should have a full trial; and, if they put it in the hands of the Volunteers, they would have it tested by their best shots. In reply, Lord Raglan said that it was by no means certain to what extent, beyond the possible shortening of the rifle, a new departure would be necessary. Experiments were now being made, but he did not think they would be concluded in time for the new rifle to be issued for Bisley. It was not, so he alleged, desirable in the public interest to state at present the direction which the experiments were taking, and pending their conclusion it was not possible for the department to estimate the probable cost of the alterations in the rifle. As against this absurd non-committal reply of officialdom, Lord Tweedmouth struck the right note when he hoped that the rifle would not be shortened, as it was ex-

tremely likely that more would be lost in efficiency than would be gained in reducing the weight. He also pointed out that if, as was probable, the new explosive now under consideration was slower than cordite, a long barrel was absolutely necessary for perfect combustion. Another disadvantage in a shortened barrel is the difficulty of giving fine sighting to the weapon.

NOBEL-DYNAMITE TRUST COMPANY, LIMITED.—According to the report and balance-sheet published by the directors of this company, the net profit for the year, ended April 30th, amounts to £229,323, which, together with the amount brought forward, makes a total of £231,900 available for distribution. Out of this, the directors recommend the payment of a dividend of 10 per cent. for the year, thus leaving a balance of £3,360 to be carried forward. They point out that, in consequence of the war, business in South Africa has been almost at a standstill during the past twelve months, and that the company which manufactures there has been unable to pay any dividend. If, therefore, the general result has been equal to that of the previous year, this good result has been due to the development of the business in other markets and in branches other than the blasting explosives trade. In consequence of the extension of the business of Nobel's Explosives Co., Ltd., Glasgow, it was found necessary to widen the powers of that company and to increase the working capital, and the directors therefore authorized its reconstruction under the same style, with new Memorandum and Articles of Association, and with an authorised capital of £1,000,000. The company had accumulated reserves to the extent of £161,090 out of profits, and £265,744 out of premium on shares issued, and of this total £420,000 had been added to the £380,000 of old capital, to constitute the £800,000 capital of the new company, for which fully-paid shares have been issued, thus leaving £200,000 unissued. The balance of the reserves, £6,744, has been written off the assets. This transaction will not affect the capital outlay of the Trust Company, except in so far that a large number of the shares of the Glasgow Company will stand against the amount at book, thereby reducing the average price of the £10 shares to about £12.

PATTERN BOOK OF SPORTING GUNS.—We have received from Messrs. John Blanch & Son a copy of what may, without exaggeration, be described as a thoroughly artistic production in illustrated catalogues. There is certainly little letterpress, such as there is being much to the point, but the illustrations are beautifully reproduced, and on that account there is no need to comment on the fact that what is presumably the catalogue of a firm of gunmakers in 1901, opens with representations of a Spanish snaphaunce or Asnaphan lock of the 17th century, and of a double wheel lock actuated by a single trigger, which is at least 250 years old. As a reminder that Mr. John Blanch started in business in 1809 with the descriptive legend, "From Mr. John Manton's," we are next shown two old flint lock muzzle-loaders, a single-barrel by Ezekiel Baker, and a double-barrel by the famous Joe Manton himself. The percussion system was first patented by Forsyth in 1807, and became general in 1820 or thereabouts, and Mr. John Blanch seems, judging by two illustrations of single and double guns, to have adopted the system in a workmanlike fashion. Following up the history of the gun, further illustrations are shown of a pin-fire breech-loader of 1863, and a central-fire snap action breech-loader of 1872. From the latter it is not so far a cry to the modern breech-loading hammerless ejector guns representing the latest productions of the firm of John Blanch & Son, with box or side locks and single or double triggers. The Blanch single-trigger mechanism is an ingenious arrangement, which was first introduced for public notice and approval rather more than ten years ago. A feature of which the firm makes a speciality is the supply of gun cases and cartridge magazines built up of solid leather on split cane, a light and strong combination of material which is thoroughly appreciated by sportsmen.

GARDNER ELECTRIC ROCK DRILL.—We have received an illustrated pamphlet containing full details of the Gardner Electric Rock Drill, which is adapted to mining all kinds of metal, coal, and salt, and for open rock work, quarrying slate, marble, and similar substances under all circumstances where drilling is required. With the general spread of capacities for the utilisation of electric power, the employment of this form of drill becomes additionally acceptable, and the same supply of power is equally available for lighting the mine or quarry and for firing shots. The Gardner drill is not a very complicated piece of mechanism, as it has only three working parts, and is so simply constructed that any part may readily be taken out, examined, and replaced, by the man in charge. Briefly, it is of the reciprocating type, motion being given to it by a flexible shaft run at a high rate of speed, the drill guide being circular, and the method of operation similar to that of a piston. In use the machine strikes a blow equal to about 200 lbs., delivering the blows at the rate of from 500 to 600 per minute. The pamphlet under notice, besides containing a fully-illustrated description of the machine, has a series of estimates for the supply and fitting-up of installations, and the cost of working, which should prove of great use to intending purchasers.

BIRMINGHAM PROOF-HOUSE.—The report of the guardians was presented at the yearly meeting of the Birmingham Gun Trade, on the 7th ult. So far as the accounts and figures contained in the report are concerned, these have already been dealt with in our issue of April last, and call for no further comment. After referring to the application for an amended Act, the Chairman (Mr. J. W. Ward) said that the reduction that had been made in the cost of proving all classes of barrels would affect the funds of the Proof House to the extent of £300 per annum. He then mentioned the prosecutions which had been instituted against offenders under the Act, and the system adopted of cautioning dealers that the sale of improved guns, revolvers, &c., was illegal, and that the guardians would proceed in every case that came to their knowledge. In reply to various questions, Mr. Ward explained that the workpeople contributed two and a half per cent. of their wages to the superannuation fund, the guardians making a like contribution. The guardians, as Mr. Greener contended, were obliged to reduce the charges for proof when the reserve fund amounted to £10,000, but they were not bound to reduce the charges below the actual cost of proof. Mr. F. Williams was unanimously re-elected auditor on behalf of the trade, and a member of the Registry Board, and Messrs. J. S. Turner, E. W. Wilkinson, and W. H. Hughes, who retired in rotation, were unanimously re-elected guardians. The report was duly approved.—At a special

meeting held subsequently the question of technical education was discussed at length, and a resolution was carried to the effect that provision should be made forthwith for teaching the art of gun-making practically in all its branches, the meeting authorising the guardians to establish classes for that purpose. This movement is only a reply to the school which is already in operation at Liége, apparently with direct results in the direction of stimulating lively competition with the Birmingham trade.

DESTROYING PIKE BY EXPLOSIVES.—The Lochwinnoch Angling Association, Ld., have recently been experimenting with explosives with a view to exterminating the pike which are at present infesting Castlesemple Loch. It is intended to stock the loch with trout, with a view to procuring good fishing, However, before turning these into the loch it is necessary to get rid of the large quantity of pike which are in that water, and since netting accounts for relatively few fish, the association has endeavoured to deal with them in a more wholesale fashion. Accordingly negotiations were entered into with the Northern Explosives Co., Ld., of Glasgow, and after netting various parts of the loch some cartridges of a new explosive, named Erupterite, were fired under water in the netted enclosures. There seem to have been no immediate indications of the results attained by the experiment, as the fish did not come to the surface, but the experiment is deserving of being carried to a definite conclusion.

LECTURES TO YOUNG GUNMAKERS.

XI.—RECOIL.

(Continued from Lecture VII., September, 1900).

AT the termination of our seventh lecture, which was the fourth of the series dealing with recoil, we expressed the hope that practical experiments would be made to determine the values of recoil in a definite manner. In fact we went further than this, stating that experiments had been commenced with the intention of determining the absolute velocity of recoil of a freely suspended gun. Mr. R. W. S. Griffith was the person we had in mind as having undertaken to elucidate the points which could not be cleared up without experiments demanding accurate appliances and the wherewithal for lavishing time and money on the end to be attained. Fortunately for the interests of science, Mr. Griffith took the matter in hand; for by so doing he has placed one more department of enquiry concerning the behaviour of fire-arms on an exact basis.

What is so pleasing to us is the fact that the whole of the experimental results detailed by Mr. Griffith amply confirm the theories and formulæ propounded in our lectures. The records of Mr. Griffith's work were detailed in the course of a lecture delivered before the Gunmakers' Association, and frequently he found cause to quote the formula published in these columns as Mr. Jones's formula, Mr. Jones being our invaluable collaborator, or, more properly speaking, expert guide in the work of preparing the text of our own lectures. The more that Mr. Griffith's readings are compared with the formula, the more certain does it become that the mathematical treatment of recoil, therein appearing, is sound and in complete agreement with practice. We will record in a few words what the formula was. Its various factors were those which govern the amount of recoil met with in shot guns. The weight of the gun, the velocity of the shot, and the remainder of the other determining factors were specified by symbols. Each of these received its proper place in the resulting formula, the answer to which was the total number of foot-pounds of recoil that would be imparted to the gun under the conditions covered by any given series of values applying to the specified factors. In this formula, however there was one factor to which a value could not be given. All other conditions being equal, it was found that two powders might be precisely alike as regards weight of charge and muzzle velocity imparted to the shot, and yet that different recoil would be experienced in their use. This was attributed to the fact that with every powder there is a characteristic velocity of exit from the muzzle after the shot has departed. The character of this efflux could be more closely investigated if it were possible to determine the exact pressure of the powder gases at the moment of the shot's departure from the muzzle, but ordinary pressure-testing is of no avail in such a connection, since its values are only approximate and cannot be definitely set out. It was, therefore, rendered necessary to treat the character of efflux of the gases as an unknown quantity. We knew by calculation the effect of all the other factors, but the formula would have been useless in practice without the means of determining the value of this factor with reference to the different powders met with in the world of sport.

The crux of the whole question was that if we could find the exact value of a gun's recoil under any given set of conditions, we could find out the value of the missing factor by working backwards from the answer, and this value, once obtained, could be used in all future calculations relating to the same powder. It was for this reason that the need arose for a method of recoil-testing which would be sufficiently exact in its methods to ensure that the records could be accepted as mathematical certainties. All the old recoil gauges are of such a character that a world of theory is necessary in order to obtain a precise idea of the correct method of their calibration. Their comparative results may have been sufficiently exact to give useful information; but whether or not the marked scale showed the true recoil of the gun was very difficult to determine. At any rate, published results did not invariably show that relation between shot and recoil energy from round to round which was necessary to inspire confidence.

Now, Capt. Journée's method of freely suspending a gun by two strings at least insured that whatever recoil was produced in the gun would be recorded by its velocity of backward movement. To record this velocity was a comparatively simple process; because, provided the gun were suspended from points of support sufficiently elevated above the gun, its backward movement would be continued an appreciable distance without interference from the effects of gravity, causing the recoil to be transferred into a lifting of the gun on the principle of the pendulum. We know that a gun of ordinary weight has received its whole impulse of recoil after travelling a distance well under an inch, half-an-inch even exceeding the exact value. Now, to measure the velocity of a body travelling, as a rule at a rate less than 20 feet per second,

over, say, a three-inch course, does not involve time-measurements of any greater complexity than is met with in ordinary velocity work. It is true that the muzzle velocity of the shot must be measured at the same time, but this only involves the use of two chronographs of the Boulengé type, or one specially built for simultaneous time-measurements, such as the Jervis-Smith instrument. It is sufficient for our present purpose to state that Mr. Griffith has succeeded in the task he set himself to accomplish. If anything he has said may lead one to suppose that the task was not of a very arduous character, we can only say that by the time a person has overcome the host of mechanical difficulties which beset the path of the experimentalist in physical science, and is so far satisfied with the results as to justify their publication, then at least he has accomplished a task quite onerous enough for the restricted leisure of one with ordinary work going on meanwhile. We must not omit in this connection to add to the roll of honour the names of his laboratory assistants, Mr. Wandsworth and Mr. Shelton, the writer having had personal experience of their untiring efforts in pushing forward the work in hand.

For the present we propose to place on one side those portions of Mr. Griffith's work which are concerned with finding the constant for different powders, and its application to the formula for the purposes of determining recoil under any given set of conditions. What space is now available will be utilised for the demonstration of the manner in which his measurements of recoil and shot velocity may be applied to the building up of curves of recoil.

In tabulated form we give a series of values which enter into the calculation which we propose to demonstrate.

Let M = weight of gun in pounds.
V = observed velocity of recoil in feet per second.
m = weight of shot and wads, and, in addition, half the weight of the powder charge.
v = muzzle velocity of the shot in feet per second.
w = weight of powder charge in pounds.
D = length of gun traversed by shot in feet.

From these six factors governing recoil a great deal can be done in the way of determining the character of the recoil of a gun. The first factor M is the weight of the gun, and its value may be obtained by the simple process of placing it on the scales. The gun used in Mr. Griffith's experiments weighed 7·9 lbs. The observed velocity of recoil is taken by means of the apparatus referred to, and we will select a case where the value recorded was 12·40 feet per second. In the experiments with this powder a shot charge of 1¼ oz. was used, equivalent to 492 grains. The wadding weighed 40 grains, and the powder charge was 42 grains. The weight of the shot, charge, wads, and half the powder gives a total of 553 grains, which is exactly ·079 of a pound, in other words, one hundredth of the weight of the gun. The reason for taking half the weight of the powder charge is fairly obvious. The value of m refers to the products ejected from the gun, and for the purposes of the calculation it is intended that this weight shall be multiplied by the velocity of the ejecta, in order to obtain their momentum. Now, momentum is measured in terms signifying the product of the mass and velocity of a moving body. In the previous lectures it was explained why the mean velocity of the powder gases was half that of the shot, some portions of the total travelling with the shot, others remaining stationary in the chamber. The average of this combination movement is that the products of combustion travel at half the rate of the shot. Now, in momentum mass and velocity are interchangeable terms, in so far that the value of the momentum remains unaltered so long as the product of the m and the v gives the same value. In the same way that any value of foot-lbs. may be obtained by an infinite number of combinations of feet and lbs., so a given momentum is the same, however much the factors m and v are proportionately altered. Wishing, therefore, to obtain the momentum of the products ejected from the gun, we take that of the shot and wads by multiplying their weight by the muzzle velocity. The remaining momentum is that of the powder gases, which may be expressed in terms of their weight multiplied by half the velocity of the shot, or half their weight multiplied by the velocity of the shot. The calculation is very much simplified by taking the sum of shot, wads, and half the powder and multiplying by shot velocity. This explains why the weight of the ejected products is taken in the manner noted for the purpose of subsequently calculating the momentum of the ejecta at the moment when the shot leaves the muzzle.

The remaining factors require no very voluminous explanation. The muzzle velocity of the shot is taken in the ordinary way, observed velocity over a given distance being corrected to mean velocity, or else the mean velocity is taken over a very short distance, which previous experiments have shown to be identical with the muzzle velocity. This apparent anomaly is to be explained by the fact that the outrush of the gases somewhat increases the velocity of the shot after it has left the muzzle, and this increase counterbalances the decrease due to air resistance, which is subsequently encountered over the distance used for the observations. For the present case the value of the muzzle velocity was 1,103 feet per second. The weight of the powder charge, as already stated, was 42 grains, and this now appears in the list of factors by itself, the reason being that in dealing with recoil after the shot has left the muzzle we have to deal with the powder gases alone as the source of the second stage of recoil. The length of gun traversed by the shot for the purposes of the calculation of recoil is the distance over which the shot travels while the powder gases are acting on the base of the wad. The wad will be subject to these conditions from its first movement until it leaves the muzzle, and the value of D may therefore be taken as equal to 2·43 feet, viz. 29·16 of an inch. Since the result must be expressed in feet, it is necessary to go to the second place of decimals, and this accounts for the apparently pedantic use of such a small fraction when the measurement is expressed in inches. This, however, may be taken as a very fair statement of the travel of a charge of shot in a 30-inch barrel.

We will now set out our six factors, together with the values accorded to them, as follows:

M = 7·9 lbs.	v = 1,103 feet per sec.
V = 12·40 feet per sec.	w = $\frac{42}{7000}$.
m = ·079 lb.	D = 2·43 feet (29·16 in.)

What we have stated is that the essential elements of the recoil of a gun may be determined from the six factors which have now been so carefully explained. The first thing to do is to find out how much of the velocity of recoil of 12·40 feet per second is produced while the shot is in the barrel, and how much by the efflux of the gases after the shot has left the barrel. The principles underlying the statement that action and re-action

are equal and opposite, in other words, the equality of M V and *m v*, have already been so fully explained, that we will content ourselves with simple statements of fact based on this truth. The momentum of the gun under recoil at the moment when the shot leaves the muzzle is equal to the momentum of the materials in process of ejection. We cannot measure the momentum of the gun at this stage, but we can that of the ejecta, and the two are equal. The momentum of the ejecta is equal to their weight ·079 lb. multiplied by their velocity 1,103, and the product is 87·137, which is also the momentum of the gun. Dividing by the weight of the gun, viz. 7·9 lbs., we find that the velocity of recoil at the moment when the shot reaches the muzzle is 11·03 feet per second. It will be seen that this is exactly one-hundredth of the velocity of the shot, which was to be expected, since the gun is one hundred times the weight of the ejected materials. This establishes the simple rule that the velocity of recoil at the moment when the shot leaves the muzzle is to the velocity of the gun inversely as the respective weights of the two.

In ordinary calculations the slight variations of weight, due to different smokeless powders and different wadding, may be ignored in favour of adopting the simple ratio of one hundred to one; but where the shot charge or the weight of gun is altered, a fresh ratio must be calculated. The equality of action and re-action provides us with the information that the distance of recoil, up to the moment when the shot leaves the muzzle, is to the length D of the barrel inversely as the weight of the gun is to the weight of the ejecta. This tells us that the gun moves in recoil ·0243 of a foot, or ·2916 of an inch, while the shot is in the barrel, which is one-hundredth of the distance D. This is a very important piece of information as regards the study of recoil, since it is now clear that the gun builds up a recoil velocity of 11·03 feet per second during a distance of recoil equal to ·2916 of an inch. The equivalent of 11·03 feet per second may be expressed in foot-lbs. of energy by use of the ordinary formula.

The next question for treatment is the portion of the recoil due to the efflux of the gases. We know the value of this recoil either in velocity or energy, but it is interesting to gain a general idea of the travel of the gun during the process of its development. The recoil velocity of the gun is increased from 11·03 feet to 12·40 feet, making an increase of 1·37 feet per second. This multiplied by the weight of the gun gives the value of the momentum added to the gun by the efflux of the gases, which is the same as the momentum of the gases themselves. It works out at 10·823. If we divide this momentum by the weight of the powder gases, or, to speak more accurately, the products of combustion, *w*, we deduce the velocity with which they leave the muzzle, viz., 1,804 feet per second. We know, of course, that every particle composing the powder gases would be expelled from the muzzle at a different rate, but in spite of this we have the total momentum of all these particles, and the last arithmetical process tells us that the nett result is as though the whole of the powder left the muzzle at the rate of 1804 feet per second. We took it that the average velocity of the powder gases at the moment when the shot left the muzzle was half the velocity of the shot, viz, 551 feet per second, which would be the velocity with which the centre of gravity of the column of gases was moving forward. If, therefore, we average the velocities 1,804 and 551, we obtain 1,177 feet per second as the average velocity of travel of the gases in their exit from the barrel. Treating the gases as a body situated at a point half way down the length D of the barrel, we find that they occupied in their exit a time equal to half D divided by 1,177, the answer being the decimal value of a second, viz., ·0010323. To find how far the gun recoils during this time it is sufficiently accurate to assume its velocity at the mid-way point between the velocity before and after efflux. The average of 11·03 and 12·40 is 11·715 feet per second. The last arithmetical process is, therefore, to determine the distance the gun will travel during the above fraction of a second, its mean velocity being 11·715 feet per second. Rule of three shows that the answer is to be obtained by multiplying 11·715 by ·0010323, which equals ·0121 of a foot or ·1452 of an inch.

All the above calculations tell us that with the values adopted for our factors, the travel of the gun during the efflux of the gases is ·1452 of an inch, which, added to the travel of ·2916 of an inch during the first stage of recoil, makes a total travel during the acceleration of ·4368 of an inch. This shows that with a gun at rest the whole of the velocity of recoil is imparted during less than half an inch of travel, the remainder of the recoil experienced in practice being due to the inertia of the gun, which causes it to continue a movement when once established until opposing forces have brought it to rest.

Now we propose to give to those of our readers who desire to educate themselves in the application of algebraical formulæ to ordinary work to repeat all these processes of calculation, using the six symbols in place of the actual figure values. Instead of working out the answer at each stage, the formula representing the answer must be treated as the answer, and the next part of the calculation must be expressed by the addition of further symbols. In this way a big, important-looking formula will be built up, and this may be trimmed down by the elimination of letters and figures that cancel one another, until the simplest possible condition of the formula has been attained. This has been done with the following result:—

The movement of the gun during the efflux of the gases

$$= \frac{D}{\left(V - \frac{v}{100}\right) \times \frac{M}{w} + \frac{v}{2}} \times \frac{\frac{v}{100} + V}{2} \text{ feet.}$$

We will now repeat the formula, after having replaced the symbols representing the six factors by their numerica equivalents:

$$\frac{2{\cdot}43}{(12{\cdot}4 - 11{\cdot}03) \times \frac{7{\cdot}9 \times 7{,}000}{42} + \frac{1{,}103}{2}} \times \frac{11{\cdot}03 + 12{\cdot}4}{2} = {\cdot}0121 \text{ ft.}$$

It will be found that by using the formula the arithmetical processes involved are greatly reduced, and further that one does not encounter in the formula the necessity for multiplying out a large number of decimal points, so as to insure a correct answer. The last process of working out the above figures is the first to introduce strings of decimals, but as it is clear that the answer need not proceed beyond the third place, there is no difficulty about knowing when to stop. The further advantage about a formula is that once a system of calculation has been thought out, its processes can be compactly noted for future application, without the need for a fresh thinking-out of the whole subject.

FRENCH GUN AND AMMUNITION TRIALS.

SINCE the publication of the preliminary announcement, which was referred to in our April issue, the Committee of the Concours International d'Armes de Chasse have drafted an amended programme of the proposed trials of sporting guns and ammunition, which contains some important modifications. They have adopted a standard target, on which all the desired results are to be obtained, which consists of ten concentric circles, the largest of which has a diameter of 70 cm. (27.55 in.). The smallest circle has a diameter of 7 cm. (2·76 in.), and the remainder increase by regular gradations of 7 cm. to the maximum. Each circle is divided into segments, the second having six equal divisions, the third ten, the fourth fourteen, and so on by increases of four to the maximum of 38 in the largest circle, all the segments thus delineated being of practically equal area. The relative regularity and dispersion of the charges fired from the guns submitted for trial will be registered on this standard target, and the first terms of comparison as regards different arms will be considered in view of (1) the greatest concentration and the greatest regularity of dispersion at a distance of 35 mètres (38·27 yards); (2) the greatest regularity of pattern at 20 mètres (21·87 yards); and (3) the best pattern at 10 mètres (10·93 yards); the results at the three ranges being taken as a basis for comparison.

In order to subject all the weapons to a common basis, it is decided that, except as regards the shortest range, they shall all be tested with the uniform loading of ammunition prescribed by the committee, and also with cartridges submitted by the competitors as specially suitable for the particular type of gun. There will still be an obligatory and preliminary proof of all the guns with specially loaded cartridges, and tests of the cartridges submitted by competitors as regards pressure and velocity; the pressure not to exceed 3·49 tons per square inch, and the velocity to be at least 787 feet per second at 15 mètres (49·2 feet). The shot will also be required to conform with a standard weight of 1 decigramme (1.54 grains) per pellet, the loading to be as previously specified for the committee's own loading.

The amended list of conditions still contains the proviso that all weapons submitted for competition have to undergo a preliminary proof at the Paris proof-house for strength of barrel or barrels and of breech fastenings, but it is noteworthy that the maximum pressure to be withstood is reduced from 5·4 tons to less than 5·1 tons per square inch. Modified to meet the new conditions specified above, the series of trials remain much the same as was detailed in our previous announcement, the tests being applied to judge of relative dispersion and regularity of pattern as indicated on the target specially devised for the trial.

As the amended circular is dated the 15th ult., and announces that the register of entries for the competitions opened on that date and closes definitely on June 1st, it is evident that this notice of the meeting is somewhat too late to be of service to intending participants. We do not, however, suppose that many British gunmakers would care to avail themselves of the opportunity offered to them by the Concours International d'Armes de Chasse. The trade would have nothing to gain, and possibly something to lose, by entering their products for competition in a set of trials of the nature indicated, under conditions which are not necessarily calculated to prove in a practical manner the relative efficiency of different guns. To put the matter quite briefly, though British manufacturers need fear nothing so far as entering into competition with foreign rivals is concerned, it would obviously be an absurdity, and derogatory to their position in the world's market, to take too seriously a set of trials which, however instructive they may prove to a committee of French sportsmen, would teach our manufacturers nothing they did not know before. So long as an English-made gun is esteemed the world over as representing the highest form of constructive skill, no useful end can be served by placing it on a level with weapons which, howsoever efficient they may be, are admittedly of a different grade, and adapted for other conditions.

THE GUNMAKERS' ASSOCIATION.

ANNUAL GENERAL MEETING.

MAY 7TH, 1901.

THE Annual General Meeting of the Gunmaker's Association was held at Effingham House on Tuesday, the 7th day of May, 1901, at three o'clock in the afternoon, and there were present:—Messrs. E. Harrison (in the Chair), F. Beesley, H. J. Blanch, Alexander Brown, A. G. Cole, A. H. Gale, W. Golden, C. E. Greener, H. W. Holland, and Reginald T. Woulfe (Solicitor).

NOTICE OF MEETING.—The notice convening the meeting was read.

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. Anderson, C. Ingram Annan, L. G. Clough, W. Garden, H. W. Gibbs, C. E. Greener, G. G. Higham, G. Hinton, H. Hodgson, S. R. Jeffery, W. R. Leeson, C. Liversedge, S. H. Mackie, J. MacNaughten, J. E. Martin, W. H. Monk, A. Purdey, J. Purdey, J. Rigby, E. Rigby, J. A. Riley, C. Rosson, J. F. Smythe, H. A. A. Thorn, J. Tisdall, T. H. Turner, J. B. Warrilow, D. H. Watson, and E. Wilson.

ELECTION OF NEW MEMBER.—Mr. John Robertson, proprietor of Boss & Co., 73, St. James Street, S.W., was submitted as a candidate for admission as a member of the Association, his election being proposed by Mr. John Rigby, and seconded by Mr. H. A. A. Thorn. A motion that Mr. Robertson be elected a member of the Association was carried unanimously.

REPORT AND BALANCE SHEET.—The Report and Balance Sheet for the year ended March 31st, 1901, having been circulated among the members previously, was taken as read. The various items in the income and expenditure account were carefully considered, and attention was drawn to the relatively large loss incurred through the Annual Dinner held on May 8th, 1900, in which the expenses exceeded the amount derived from the sale of tickets by upwards of £15. In respect to the item £8 8s. for music, it was decided that the question as to whether or no so great an expense should be incurred in future gatherings should come up for consideration at the general meeting, which will be

held in March, 1902. As regards the comparatively small attendance of members at the Annual General Meeting and Dinner, which is attributable to the date usually fixed clashing with various sporting fixtures, it was further decided that consideration should be given to a proposal that in future the meeting and dinner should be held on a Monday in April, thereby allowing country members to avail themselves of cheap week-end tickets, and also securing that the date will not clash with the opening of the rook-shooting season. In reviewing the report of the year's work submitted to the Association, the chairman drew attention to the several successful prosecutions of persons proceeded against under the Merchandise Marks' Act for the fraudulent marking of guns, and for the sale of the same. These cases were all set forth in detail in the report. Mention was also made of the useful work accomplished by the Executive in advising members on a number of questions submitted to them for expert opinion. The latest developments of the Proof House question were also reported upon, and the chairman referred in detail to the matter of standard sizes for gun chambers and cartridges, which has advanced considerably during the year recently ended. A special tribute was paid to the generous action of the proprietors of *The Field*. in giving a donation of 20 guineas in aid of the Association's work in prosecuting those who engage in the practice of fraudulently marking guns. In conclusion, an earnest desire was expressed that the roll of members of the Association should be largely augmented. It was proposed in due course by Mr. Beesley, and seconded by Mr. Cole, that the report and accounts be passed, which was unanimously agreed to.

ALTERATION OF RULES.—The following alterations in the Rules of the Association, which had already been circulated among the members, were submitted for final approval:—

(1). That Rule 4 be amended to read: "OFFICERS.—There shall be a paid Secretary, and in addition there may be a Honorary Secretary. All other appointments shall be honorary."

(2). New Rule to follow Rule 15. "Any member whose subscription is more than one year in arrear shall be reported to the Executive, who shall direct application to be made for it, and in the event of it continuing one month in arrear after such application, the Executive shall have the power of declaring that the defaulter has ceased to be a member."

Mr. Beesley proposed, and Mr. Blanch seconded, these alterations, which were duly carried.

ELECTION OF OFFICERS.—The following officers were appointed to serve during the Association year, 1901-2.

Executive.—It was proposed by Mr. Beesley, and seconded by Mr. Cole, that the existing Executive be re-elected in a body, leaving one vacancy, and the motion was carried unanimously. The Executive therefore consists of Messrs. C. Ingram Annan, H. J. Blanch, C. Boswell, 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.

Solicitor.—It was unanimously moved that Mr. Reginald T. Woulfe be re-elected as Solicitor to the Association, and the occasion was taken to pay a warm tribute to the very valuable services which he has rendered to the Association, more especially with regard to the several prosecutions of offenders under the Merchandise Marks' Act, which he has conducted with such marked ability and unfailing success.

Hon. Treasurer.—On the proposition of Mr. Beesley, seconded by Mr. Greener, Mr. Holland was asked to undertake again the duties of Hon. Treasurer to the Association.

Hon. Auditor.—Mr. Beesley proposed, and Mr. Gale seconded, that Mr. Herbert White be asked to continue to act as Hon. Auditor to the Association.

Hon. Secretary.—In view of the amended Rule 4, Mr. Holland proposed, and Mr. Blanch seconded, a motion that Mr. Max Baker be elected Hon. Secretary of the Association, which was carried unanimously.

Secretary.—It was proposed by Mr. Greener, seconded by Mr. Holland, that Mr. Geo. Frederick Bird be appointed Secretary to the Association.

The re-election of the Solicitor, Hon. Treasurer, and Hon. Auditor was accompanied by a very hearty and unanimous vote of thanks to the three gentlemen in question for their services to the Association during the last year of office.

GENERAL DISCUSSION.—After the foregoing business the chairman had the pleasure to invite any members present to express in detail their views as to the conduct of the Association's business, with a view to the raising of questions which might tend to the mutual advancement of all the members of the Association, and the interests of the trade at large. In this connection, a letter from Mr. Smythe came up for consideration, in which he suggested that a meeting of the gun trade be arranged in York, at or about the end of June, that gathering being specially intended to induce the meeting together of members in the North and Scotland. It was resolved that Mr. Smythe's suggestion be approved, and that Mr. Smythe, on behalf of the Executive, be asked to co-operate with the Secretary in order to arrange details and make the meeting a success. It was further resolved that the agenda of the proposed meeting be submitted in advance to the Executive, and that it be fully understood that any resolution passed at the meeting should be regarded merely in the light of a recommendation to the Executive for treatment at a subsequent meeting of that body.

Mr. Cole raised the point of expert opinions given by the Executive to members of the Association on various matters that might arise in the ordinary course of business. He thought that the exact scope of the Executive's function in this respect was scarcely defined with sufficient clearness, and that country members generally were not fully aware of the extent to which they might avail themselves of the collective advice of their Executive body. As the result of Mr. Cole's remarks on the subject, it was pointed out that there must necessarily be limitations to the nature and degree of expert opinion afforded, but that it was always open to any member to ask the advice of the Executive on matters that might arise, and that the Executive would, as heretofore, be always happy to give advice and assistance to the best of its ability on general matters which do not fall within the more united scope of "expert opinions," for which special arrangements are made. It was felt, however, in view of the existence of Rule 3 in the Articles of Association, and of the publication from time to time in the Annual Reports of the work done by the Executive in the supply of expert opinion to members, that no further and special announcement in this connection was necessary.

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

ROUND THE TRADE.

A second dividend, amounting to 5s., has been paid by the trustees of Mr. F. T. Baker.

The May issue of the "Sportsman's and Tourist's Guide" has just been published by Messrs. Watson Lyall & Co.

The new factory of the King's Norton Metal Co., Ld., at Abbey Wood, is now rapidly progressing towards completion.

Mr. F. T. Baker, of Glasshouse Street, has now published his price-list of guns, rifles, revolvers and sporting appliances.

Messrs. Nobel's Explosives Co., Ld., have just published their price-list of sporting and rifle cartridges for this season.

We understand that the entries for the forthcoming Darnley meeting show a marked increase over the records of previous years, owing, it is believed, to the abolition of post-fees.

One of the features of the Alexandra Palace, now opened to the public as a park, will be, so it is rumoured, a practical rifle range especially designed for the use of volunteers.

Pit-ite, as manufactured by the New Explosives Co., Ld., at Stowmarket, has passed, after the customary Home Office tests, from the ordinary category of permitted explosives into the "special permitted list."

A subscription which is being raised in aid of the wife and children of "Sam" Manning, for many years a well-known gun attendant at the London clubs, has already reached the substantial sum of £80.

Mr. Adam Seip, late of Messrs. Kynoch, Ld., has been appointed to the charge of Messrs. Curtis's & Harvey's Cordite department at their new factory on the Thames. We understand that manufacturing operations have already been started.

We regret to learn that the accident at Messrs. Kynoch's Worsborough Dale factory has turned out to be more serious than was at first hoped. The two men engaged in the shed have both succumbed to the injuries sustained. The factory in question is under the management of Mr. J. Sealey, son of Mr. W. C. Sealey, of the same firm's Thames works.

We understand that the International Explosives Co., with which Mr. David Paisley was connected, have suspended building operations, and that the intention to erect a factory is now practically abandoned. Mr. Paisley was previously connected with the High Explosives Co., Ld., in the early stages of its career.

Messrs. Kynoch, Ld., have purchased the Drinagh Paper Mills, at Inchicore, Dublin, and have appointed Mr. Alfred Ralston as manager. Mr. Ralston had previously been managing the shell departments at Witton and Stirchley. They intend making the whole of their own paper at Dublin, in addition to supplying the outside trade. The new mills are expected to be at work in about a couple of months' time.

According to information received, Japan is buying large shipments of smokeless powder for Government use from American firms. The powder is for both artillery and small-arms requirements, and it is calculated that by the end of July there will be stores of ammunition of all kinds in the Japanese arsenals to double the amount of any previous period in the country's existence.

The recent explosion at the Chilworth Factory having demonstrated the liability of iron-nailed boots to cause accidents through striking sparks in non-danger areas, the Schultze Co. have arranged to supply the whole of their employés with brass-rivetted boots for use inside the factory gates. In the same way the hinges and fittings of the powder vans used for transferring material from one part of the factory to another have been reconstructed in bronze.

The Yorkshire Dyeware and Chemical Co., Ld. applied last month to the justices at Dewsbury for a licence to erect an explosive factory at Ravensthorpe, in which it is proposed to manufacture picric acid. This application was opposed by the Ravensthorpe District Council and others, but after hearing the evidence fully, it was decided to grant the desired application in accordance with the terms of the licence granted by the Home Office.

Colt's Patent Fire-arms Manufacturing Co. have just issued a new illustrated price-list of their well-known specialties in revolvers, pistols and repeating fire-arms, among which is included the Automatic Colt Pistol (Browning's Patent), which was illustrated and fully described in these columns some few months ago. The Colt's new Service Target Revolver, Model 1901, is a favourite among American shots, and has already made some new records on the other side, at Walnut Hill and the Sportsmen's Show in New York.

Mr. C. G. Mueller has forwarded an illustrated list of the ammunition manufactured by the Rhenish Westphalian Explosives Co., Ld., of which he is sole agent in this country. This list, which is in reality an appendix to the complete price-list, contains a very comprehensive selection of cartridges for target pistols and revolvers, saloon rifles, the different calibres of military rifles, sporting rifles generally, and sporting guns, and is worth a careful study in connection with the price-list itself.

Messrs. Eley Bros., Ld., have issued their new price-list for 1901, containing particulars of all the various classes of ammunition for which they are so deservedly famous throughout the shooting world. As for some time past, the company has devoted great care to the provision of suitable caps for various kinds of smokeless powders, and cases loaded with such powders as "Schultze," "E.C.," "Amberite," "Cannonite," "Ballistite," and "S.S.," are duly fitted with primers calculated to produce the most successful results.

The Home Secretary has allowed the appeal of the High Explosives Co., Ld., from the decision of the Thorpe Bench of Magistrates, which was reported in these columns recently, and has granted the amending licence asked for, free from the conditions which the Bench sought to impose, to the effect that the company should accept all responsibility for injury caused by explosion at the Bramble Island factory. Operations at Great Oakley will, therefore, soon be on the way in accordance with the amended licence.

We hear on the very best authority that a working arrangement has been entered into between the Harris Rifle Magazine, Ld., and the Birmingham Small Arms Co., Ld., by which Lee-Enfield military and sporting rifles fitted with the Harris magazine will shortly be put upon the market. Lists containing full particulars will be issued in due course. The Harris magazine appears to be coming into considerable favour, so that there is likely to be a very great demand for it in the nearly immediate future as a quick and efficient loader for service-pattern weapons and ammunition.

There is a rumour going the rounds to the effect that a certain well-known explosives chemist and engineer, whose present habitat is within 100 miles of Cape Town, has lately been busy with experiments as to the disinfecting qualities of a fluid familiar to the readers of advertisements. The subjects of this scientist's experiments were some unfortunate Kaffirs, who do not appear to have relished the treatment to which they were subjected. On the other hand, the application seems to have had the desired effect of stamping out the plague in the immediate vicinity of the bold investigator.

An application for the confirmation of an amending licence was made by Messrs. Nobel's Explosives Co., Ld., to the West Powder, Truro, Bench of Magistrates on the 25th ult. The amending licence authorises the construction of three factory magazines, with a total capacity for 90,000 lbs. of explosives, and an extension of the danger area, at Perranporth. Considerable opposition was brought to bear on the applica-

tion by landowners and some of the residents in the neighbourhood, but in the result, after a consultation lasting some 20 minutes, the Bench decided to grant the application. The factory now about to be extended was originally started about 11 years ago by the British and Colonial Explosives Co., and was subsequently taken over by Messrs. Nobel's Explosives Co., Ld.

An explosion, attended with fatal results, occurred on the 26th ult. at the gunpowder works of Messrs. Kynoch, Ld., at Worsborough Dale, about three miles from Barnsley. Two men were at work in a shed in the blasting-cartridge department, when an explosion took place which wrecked the building and inflicted such serious injuries on the men, that one died within a few hours of being taken to the hospital, while the other succumbed to shock three days later. The different sheds in the factory are so thoroughly isolated that the damage was entirely confined to the one building.

THE SEIZURE OF AMMUNITION IN THE PERSIAN GULF.

JUDGMENT *RE* FRACIS, TIMES & CO. *V.* MEADE.

As promised on the final hearing of this case, which has already been reported in these columns, Mr. Justice Bigham gave judgment in the Commercial Court of the High Court of Justice on the 22nd ult. He detailed at considerable length the circumstances out of which the action arose, as regards the two acts of conversion said to have been committed by the defendant at the Port of Bushire and at Bahrein.

For a long time, he pointed out, at all events since 1881, there had been in Persia a law prohibiting the importation of arms "without the leave and permission of the Great Government." The existence of this law was evidenced by a proclamation issued by the Shah, and was well-known. Nevertheless, the trade was carried on by many firms, and in later years it was very greatly increased, the value of the importation of arms rising from £3,000 in 1890 to £130,000 in 1897. He then explained the manner in which the trade was conducted by a system of payments to the Governor of Bushire, which, he found, were in reality bribes. It was suggested in the course of the case that they were not bribes, but were payments made for the permission mentioned in the Shah's proclamation. The evidence, however, satisfied him that the permission referred to in the proclamation could only be granted by the Ministers of the Shah at Teheran, and that the so-called permits given by the Governor were illegal. Many firms in Bushire carried on the trade in the way he had described. They broke the law. Many firms also objected to the trade, and refused to share in it. They observed the law. The plaintiff's firm was among those who carried on the trade. It was hazardous and subject to the risk of the law being put in force by the Government at Teheran, but it was no doubt profitable. He was not disposed to blame the plaintiffs, for they were carrying on a trade which they probably regarded as unobjectionable in itself, and they were doing it in the only practicable way.

After reviewing the part which Mr. Meade had taken as British representative in assisting the Persian Government to enforce the above-mentioned law, his Lordship drew the following conclusions of fact with regard to the seizure at Bushire:—(1), That there was a law in Persia forbidding the importation of arms except upon permission of the Ministers of the Shah; (2), that the law had been systematically evaded in Bushire for a long time by importers paying money to the Governor to allow the goods to pass in; (3), that the arms had been introduced in contravention of the law; (4) that the Malek's acts were duly authorised by the Shah and were regular by Persian law; (5), that the acts of the defendant were done exclusively in discharge of his duties under the treaty or to assist the Malek in putting the orders of the Shah into operation. He found nothing that could justify him in holding the defendant liable for any conversion of the plaintiffs' goods, and the letters showed that the plaintiffs regarded the Persian authorities as solely responsible. They had been engaged in a risky trade in a country where the execution of the law was arbitrary, and they could not complain.

With respect to the other matter, of the seizure at Bahrein, which is an independent State governed by a Sheikh, whose will is law, but who is under the protection of our Indian Government, Mr. Justice Bigham also recapitulated the details, which have already appeared in these columns, as to the seizure of the arms by order of the Sheikh, and found that the defendant took no part in, and, indeed, until receipt of a telegram from one of his assistants at Bushire, had no cognisance of this seizure. He landed at Bahrein on February 5th, 1898, about a month after the seizure, and it was upon that day that he was said to have committed or authorised the acts which constituted the conversion now complained of. On his arrival the defendant saw one of the plaintiffs, Mr. Fracis, who was then at Bahrein. Mr. Fracis complained to the defendant of the seizure of the arms by the Sheikh, and alleged that some of them had been stolen. He also insisted that the arms ought not to have been interfered with by the Sheikh, because they had been imported by virtue of concessions. The defendant went to the go-downs with Mr. Fracis, and it was arranged between them that an inventory should be taken by Mr. Fracis and Mr. Hayward, a clerk who went with the defendant to Bahrein. It was alleged by Mr. Fracis that during the operation Mr. Hayward, at the defendant's orders, took possession of the arms. His Lordship found that no such interference took place. In the afternoon the defendant sent word to Mr. Hayward to discontinue the work, and there was no further physical interference with the goods. There was no exercise of dominion over the goods by the defendant. He had declined to give orders for their release; but a refusal to give such orders could not constitute a conversion. After Mr. Meade left, the Sheikh caused the arms to be removed to other stores, where they remained till 1900, when he delivered them to the plaintiffs. The latter, no doubt, suspected that the British Government was really responsible for the seizure; but with that his Lordship had no concern. His duty was to discover whether the plaintiffs had a grievance against Colonel Meade, and he saw no evidence of any: and the letters showed that the plaintiffs at one time were of the same opinion. The defendant throughout this business, both at Bushire and Bahrein, acted with great discretion and ability, and the strictest regard to the law. He never heard of this claim till he returned home in the summer of 1900, when it was started after vain attempts to obtain relief from the British Government, and it was nothing more than another attempt in the same direction.

The result of the finding was judgment for the defendant.

APPLICATIONS FOR PATENTS.

APRIL 15TH—MAY 11TH, 1901.

7,738. Projectiles. J. A. Rowe
7,740. Sights for Small-arms and Artillery. B. B. Hill and W. E. Smith.
7,881. Projectiles for Ordnance. A. J Day.
7,952.* Self-loading Small-arms. J. Schouboe.
8,016.* Sights for Small-arms and Machine Guns. F. J. Choles.
8,063. Nitrocellulose. A. Brown. (Agent for *J. G. B Bonnaud*).
8,094. Magazine Small-arms. J. P. Hunter.
8,101.* Explosives. M. Fiedler.
8,132. Projectiles. W. Munro.
8,161. Hydro-extractors. A. Duchemin.
8,166.* Small-arms. W. H. Watts and H. Everest.
8,304. Cleaning Apparatus for Choked Guns. J. Watson.
8,329. Explosives. C. J. R. Le Mesurier.
8,365.* Explosives. O. Imray. (Agent for *J. L. Norris*).
8,374. Ordnance Mountings. A. T. Dawson, the Hon. S. P. P. Bouverie, and G. T. Buckham.
8,385.* Semi-automatic Ordnance. W. H. Bevan. (Date applied for in U.S.A., December 28, 1900).
8,446. Ammunition Wagons for Field Guns. A. T. Dawson and G. T. Buckham.
8,463. Projectiles. Sir H. S. Maxim.
8,527. Manufacture of Picric Acid. W. H. Akester.
8,559.* Ordnance. F. P. and A. M. Roberge.
8,592. Rifles and Bayonets. H. A. W. Mendham.
8,616. Blasting of Rock. J. G. Lorrain. (Agent for *G. Thompson*).
8,625. Shells. F. Blair.
8,654. Transport of Field Artillery. J. H. Mann, and Mann's Patent Steam Cart and Wagon Co., Ld.
8,662. Explosive Shell. J. T. and J. T. (Junr.) Baharie.
8,707. Bullets. Kynoch, Ld., and R. H. Housman.
8,721. Breech Mechanism of Ordnance. Sir W. G. Armstrong, Whitworth & Co., Ld., and J. Honner.
8,792. Percussion Primers. A. T. Dawson and G. T. Buckham.
8,808. Breech Mechanism of Ordnance. C. Holmström.
8,811.* Sighting of Ordnance. W. L. Wise. (Agent for *The Skodawerke Actiengesellschaft*).
8,821.* Ammonia Explosives. F. Volpert.
8,845. Guiding of Torpedoes. R. Thom and J. Nairn.
8,935. Manufacture of Gunpowder. J. Morris.
9,000.* Brakes for Fire-arms. T. Bergmann.
9,014.* Magazine Small-arms. O. H. Edwards.
9,015. Locks for Guns. F. Havlik.
9,130. Repeating Fire-arms. N. T. Surawongse.
9,167. Rifle-carrying Clips for Cycles. J. Phillips.
9,181. Gun Carriages. A. T. Dawson and G. T. Buckham.
9,182. Disappearing Targets. G. Hawkins.
9,214.* Sighting of Guns. A. Csengery.
9,289. Magazine Small-arms. J. F. Luigi and A. M. Zuccarelli.
9,311. Fuse Head for Electric Blasting. F. Render.
9,348. Sights for Guns. A. L. Winser.
9,398.* Production of Picric Acid. A. Gutensohn.
9,405. Electrical Training of Ordnance. H. E. Wimperis.
9,420. Small-arms. J. N. Zoeller and H. Bauer.
9,441. Sighting Gear of Ordnance. J. W. Claridge
9,488. Aim Indicator for Ordnance. C. J. A. Dick.
9,517. Automatic Guns. Sir W. G Armstrong, Whitworth & Co., Ld., and Sir A. Noble.
9,533. Bandoliers. J. Black.
9,573. Percussion Cap Extractor. W. Souls.
9,582. Explosives. C. Helcké.
9,594. Bolt Rifles. C. and T. H. Ryland.
9,670. Breech Mechanism of Ordnance. C. Holmström, G. A. Köhler, and A. Bremberg.

* These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

APRIL 27TH—MAY 18TH, 1901.

COMPILED BY H. TARRANT.

2,993* (1900). **Back Sight for Rifles.** F. Cavill, Australia.

6,132 (1900). **Cartridge Loading Machine.** L. Chambon, France. A machine for charging cartridges, which is provided with five pairs of tubes charging five cartridges simultaneously. The machine is capable of making ten successive operations without stopping, and thus 50 cartridges may be charged without stopping the machine. The parts of the machine are so arranged that unless every cartridge receives the exact charge of powder the machine is brought automatically to a standstill by an indicating needle, the inclination of which stops a cam, and so the distribution of powder. Accepted April 2, 1901.

7,038 (1900). **Cartridge Bandolier.** M. Podersen, Dursley. A cartridge-belt, the construction of which allows for the carrying of a greater number of cartridges than is usual with the ordinary belt. A double row of clips is so arranged that when the cartridges are inserted therein, they lie bottom to bottom. This arrangement of the cartridges obviates the use of buttoned flaps, as they keep themselves in place. Another method described is to arrange the cartridges bottoms outwards, the bullets of one row between the bullets of the other row. Flaps, however, are necessary in this case. Accepted April 17, 1901.

8,715 (1900). **Rotating Shell for Smooth-bore Guns.** E. M. T. Boddam, London. Round the outside of the main body of the shell, which is made of a little smaller diameter than the bore, a number of spiral grooves are cut. This main body of the shell is covered up to a point near the nose by a steel jacket fitting the bore The gases of combustion are adapted to enter and rush through the grooves between the jacket and the shell through holes in the gas-check at the base, and by this means the shell is caused to rotate. Accepted April 20, 1901.

10,625 (1900). **Miniature Cartridge Adapter.** J. K. Ewart and W. K. Webster, Glasgow. A miniature cartridge-adapter constructed to allow of practice with long-range rifles at short distances. The adapter consists of a cylinder fitting the rifle chamber exactly. A miniature cartridge is inserted in the back end of the cylinder, and is retained by the engagement of its rim with a recess cut in the back end of the cylinder. The adapter is internally cylindrical throughout, and when fired the bullet of the cartridge is conducted into the barrel of the rifle without the possibility of any residue from the charge fouling the chamber and breech. Part of the rim-engaging recess in the adapter, is cut away so that the ordinary extractor fitted to the rifle may be used to extract the small cartridge. Accepted April 6, 1901.

10,456 (1900). **Explosives.** J. de Macar, Belgium. The manufacture of an explosive, the base of which is nitrate of lead mixed in varying proportions according to the desired effects, with (1) derivatives of phthalic acid; with (2) salts of the derivatives of phthlatic acid; with (3) nitro-hydro-carbon; with (4) azo-derivatives; with (5) combinations formed between the nitrous derivatives of the hydro-carbons and the azo-derivatives; or with (6) the nitrocelluloses. Nitrate of lead alone or with the addition of another nitrate is mixed with one or more of the compositions of one or more of these classes. Accepted April 27, 1901.

10,736 (1900). **Rifle Bullets.** J. Luciani The bullet described in this specification is a modification of those set out in Patents Nos. 9,440 and 17,425, 1899. The bullet is reduced in diameter the greater part of its length, so that only part of the top and part of the bottom engage the bore. It is claimed that this construction reduces the friction in the barrel, and greater accuracy is obtained in firing. Accepted April 13, 1901.

11,884 (1900). **Rifle-carrying Attachment for Cycles.** Rudge-Whitworth, Ld., J. V. Pugh, V. A. Holroyd, and W. H. Nelson, Coventry. A rifle-carrying attachment, which consists of a pair of pins or studs fixed to the lower end of one of the front forks and a spring-clip, preferably made in one piece, which is attached to the top part of the fork. The lower studs are adapted to engage the trigger guard of the rifle, whilst the clip above grips the rifle just below the back sight. Accepted April 6, 1901.

12,854 (1900). **Combination Fuses for Projectiles.** A. Reichwald (Agent for *Fried. Krupp, Germany*). In combination fuses the comparatively soft metal of which they are made renders uncertain the proper working of the percussion fuse through distortion on impact. The parts of the percussion fuse are so arranged in the present patent outside the projectile but inside the fuse as to be fully protected on impact. The percussion fuse is enclosed in a pot-shaped case of hard steel, which is inserted in the fuse body from below. Accepted April 27, 1901.

12,988* (1900). **Trigger Mechanism for Small-arms.** F. E. Jaeger and C. Brittiner, U.S.A.

20,814 (1900). **Disappearing Gun-mountings.** W. L. Wise (Agent for *Skodawerke Actien-Gesellschaft, Austria*). The gun-mounting carrying the gun, the elevating and training gear, and the recoil apparatus are all mounted on an inclined truck, upon which they are adapted to run up into the firing position and back under cover. The truck is mounted upon a pair of rails, which are provided with a turn-table, so that no matter what is the position of the gun, or in what direction it is trained, it may be run back under cover and remain in the prepared position until it is necessary to take it back to the firing position. This is then effected by moving the carriage up the inclined truck. Accepted April 27, 1901.

21,984 (1900). **Woven Fabric Cartridge Belt.** T. C. Orndorff, U.S.A. A cartridge belt composed of a multi-ply fabric, which is woven in one piece, with pockets formed to accomodate clip of cartridges. The pockets are formed from the outer ply of the fabric by weaving it at intervals separate from the inner ply, and allowing a fulness sufficiently great to form a pocket open at the top and drawn in at the bottom. In conjunction with the pockets woven straps are used to retain the cartridge clip in position. The straps are fastened to the belt, and fold over and clip by means of fasteners similar to glove clips. Accepted April 20, 1901.

982 (1901). **Cartridge Clip.** A. H. Russell, U.S.A. A cartridge clip for loading magazine arms, which is designed more especially for rifles in which the clip passes through the magazine. The cartridges are retained within the clip by means of two hooks forming part of detents attached to the bottom of the trough of the clip in which the cartridges slide. When the clip is inserted into the cartridge-receptacle of the rifle, one hook comes into contact with a shoulder, which forces the hook aside and releases the cartridges. Accepted April 6, 1901.

2,253 (1901). **Manufacture of Explosives.** J. B. Bernadou, U.S.A. A colloid which may be used after drying as an explosives cementing agent, consisting of insoluble nitrocellulose immersed in ethyl ether. This is exposed to a very low temperate, below that of freezing ethyl alcohol, 95 per cent. absolute by volume, and it goes into solution or forms a jelly resulting in the formation of the colloid. Once in solution the nitrocellulose does not again revert to its original form, but constitutes a body which may be used as a binder in the manufacture of smokeless powders containing other ingredients. Accepted April 20, 1901.

2,269 (1901). **Sighting and Mountings of Ordnance.** C. P. E. Schneider, and J. B. G. A. Canet, France. The different sighting apparatus at present in use on ordnance do not allow the elevation of the gun to be altered without displacing the line of sight. The adjusting of the range is by reason of this often a troublesome job, since it is often necessary to alter the elevation for some purpose or another after the gun is pointed and ready for firing. The apparatus described in this patent renders the line of sight absolutely independent, so that the gun may be directed towards the target while changing the elevation for altering range or angle of firing. Accepted April 13, 1901.

3,237 (1901). **Cartridge Bandoliers.** A. Mills and T. C. Orndorff, U.S.A. A cartridge bandolier to be worn around the shooters' shoulders, which is composed, with pockets included, in one woven piece. The pockets may be made to take either filled clips or cartridges singly. The two sections of the belt are connected by triangular-shaped loops, so that the belt will fit the body of the wearer. A bayonet and scabbard may be suspended from one loop. Accepted April 20, 1901.

3,500 (1901). **Safety Device for Small-Arms.** J. Krompecher, North Hungary. A safety device attached to small-arms, which is designed only to be put out of action when the gun is raised to the shoulder. The butt is provided with a pair of crossed levers, to which are attached blocks projecting beyond the butt plate. When the blocks are pressed inwards by the shoulder of the shooter a long rod running through the stock is caused to release a safety attached to the trigger mechanism. Accepted April 27, 1901.

5,231 (1901). **Manufacture of Explosives.** J. V. Skoglund, U.S.A. The production of an explosive at a reasonable cost, consisting of a mixture of salts containing a high percentage of nitrate of ammonia. Nitrate of soda and sulphate of ammonia are dissolved in water and the solution is caused to crystallise. Sulphate of soda is thus separated. The crystals are removed, and to the clear solution is added an oxide or a salt, preferably a nitrate, the base of which forms an insoluble sulphate. A sulphate is precipitated, and the clear solution consists of nitrates, nearly pure, of ammonia and soda. The water is evaporated and the consequent residue is allowed to dry and is then pulverised before using. Accepted April 13, 1901.

5,264 (1901). **Explosive Charges for Guns.** R. W. Scott, U.S.A. An explosive charge devised to burn slowly when first ignited, thus starting the projectile with comparative gentleness. When the projectile is well under way it burns quickly, the effect being that the pressure in the chamber is reduced and the strain distributed throughout the bore. The explosive charge, which may consist of ordinary strips of cordite, are enveloped in an outer covering of explosive material. This envelope has first to be burned before the interior explosive is ignited. Accepted April 20, 1901.

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

SELECTED PATENTS.

TRIGGER MECHANISM FOR SMALL-ARMS.

12,988 (1900). F. E. Jaeger and E. Bittiner, U.S.A. The trigger mechanism described in this patent is of a novel type. Outwardly the gun appears to be an ordinary double-triggered arm; and, in fact, may be used as such. But the mechanism is arranged also so that besides being able to fire the two barrels in the ordinary way, the shooter may at will, without any shifting of studs or parts, fire the right and left barrels by pulling the right hand or front trigger twice, or the left and right barrels by pulling the back trigger twice, once for each barrel. By a reversed arrangement of the parts the right-hand trigger could be made to fire left first and then right, and the left-hand trigger right first and then left. The parts are illustrated in the drawings appended, as arranged in the box lock gun.

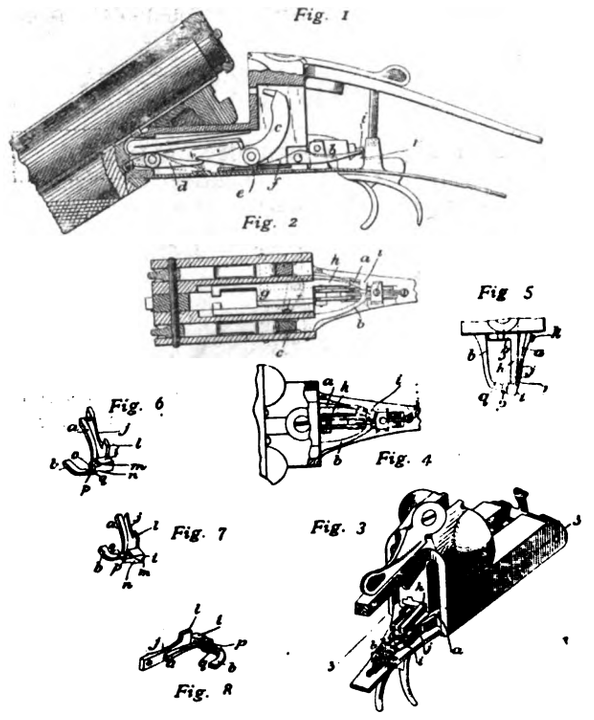
In Fig. 1 the distribution of the mechanism on the trigger plate is illustrated. Fig. 2 is a section of the parts and action body along the line 3, 3 (Fig. 4), and Fig. 3 is a perspective view of the main portion of the gun. In Fig. 4, which is a plan of the parts, the position illustrated is that of the mechanism after the right-hand barrel has been first discharged, and the left-hand sear tail is engaged by a part which is called the tripper block, preparatory to the firing of the left-hand barrel. Figs. 5 to 8 illustrate the different positions of the tripper block in relation to the sears, during the various movements in firing.

Referring to Figs. 1, 2, 3 it will be seen that the sears *a* and *b*, of special shape, work in conjunction with hammers *c*, mainsprings, and cockers *d*, of an ordinary type. The hammers *c* are provided, however, with recesses *e*, so that the noses *f* of the sears *a* and *b* are allowed a supplemental, or additional, downward movement after the fall of the hammers. The barrel-locking bolt *g*, which is worked in the usual manner by the top lever during the opening of the gun, is provided with a backward extension *h*. A cam-like action is imparted by this extension to the spring tripper block *i* (Fig. 5), when it is pushed back in the opening operation. The spring tripper consists of a spring *j*, the back end of which is fixed at *k* to the right-hand sear *a*. The spring is provided at *l* with an upright projection, with which the arm *h* engages in its backward movement. At its rear the spring ends in the tripper block *i*, which is provided with shoulders *m* and *n*, and with a central recess *o* cut in the nose *p*. (Fig. 6). It is in the recess *o* that the tail of the right-hand sear *a* always works (Fig. 8), the sear in this way acting as a support for the tripper block during the transverse movement of which it is capable.

When the gun is broken down to load, the movement of the top lever pushes back the bolt *g*, and thus its extension *h*. This move-

ment brings the end of the arm *h* into contact with the upright part *l* of the spring tripper, and the block *i* is forced sideways. The sideways movement disengages the left-hand sear tail *q* (Figs. 6 to 8) from the tripper block, and when the gun is closed and the arm *h* retracted, the spring tripper is free to force the block *i* back to the old position. The left-hand sear *b* has, however, regained its normal position, and its tail *q* comes into contact with the side of the nose *p* of the block. The tripper block *i* is held by the sear tail *q* in this position, which is called its intermediate or normal position.

The pulling of the forward, or right-hand, trigger lifts the tripper block, and the right-hand sear when the parts are in this norma position. The right-hand barrel is thus discharged; and it is necessary to explain that only an extremely small upward move-



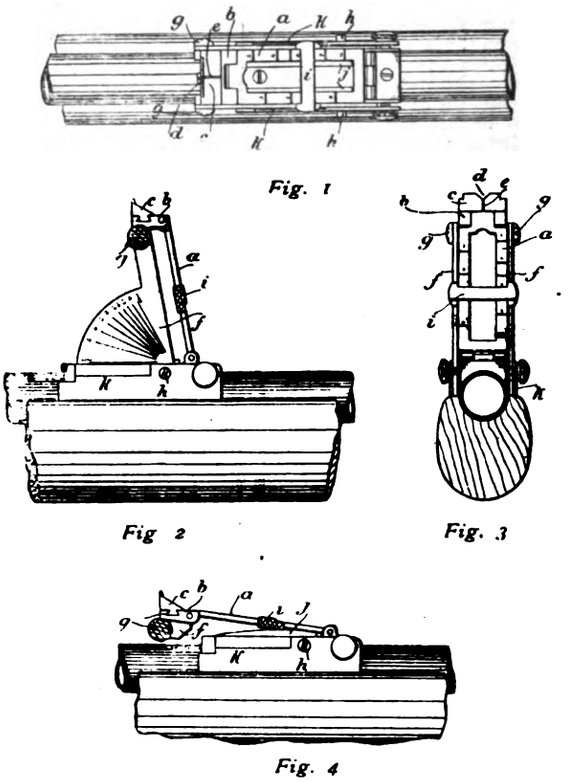
ment of the trigger is wanted to disengage the sear nose and hammer bent. The tripper block is not raised enough to allow it to be forced over on to the top of the left-hand sear tail *q*. The fall of the right-hand hammer allows the right-hand sear nose to rise and enter the recess *l* (Fig. 1) in the bottom of the hammer. A downward movement is thus imparted to the sear tail, which carries the tripper block downwards a distance sufficient to allow it to be forced beneath the sear tail *q* of the left-hand sear, which is kept in one position by the upright projection *r* (Fig. 1) on the left-hand trigger blade. The second raising of the right-hand trigger would again lift the tripper block, and this time the left-hand sear also, and so discharge the left-hand barrel. A pull of the left-hand trigger would, however, perform the same operation.

It will now, perhaps, be clearly understood that the gun may be discharged right first and then left, either by pulling the forward trigger twice, or by pulling the right and left or forward and rear triggers respectively. Two pulls of the rear trigger would discharge the gun left first and right second, or the left and right could be fired by pulling left and right triggers respectively. It will be seen that when the left is pulled twice the first pull releases the sear, and allows it to enter the recess *l* in the left-hand hammer. The tail *q* drops, and the tripper block is forced over on to its top. The second pull lifts the sear tail *q*, tripper block, and right-hand sear, and so discharges the right-hand barrel. Accepted April 20, 1901.

BACK SIGHT FOR RIFLES.

2,993 (1900). F. Cavill, Australia. A back sight for long-range rifles is described in this specification. The sight is so designed that the time required for adjusting it to the various ranges from 100 to 2,000 yards is much less than that which is required to operate the sight of the military type at present in use on the service rifle.

The sight is illustrated in the accompanying drawings, and from Figs. 1, 2, and 3 it will be seen that it consists of a ladder *a* having graduations up to 1,000 yards marked upon its face. Hinged to the top of the ladder is a table *b*, and upon this table a cap *c*, carrying



the sighting V *d*, and line *e* is so mounted as to be capable of a transverse movement for wind-gauging purposes. Two parallel stays *f* are pivoted at *g* to the end of the table *b*. These stays run towards the foot of the ladder, and are again pivoted to the sight-bed at *h*. The table *b* is kept always parallel to the sight-bed by these stays, no matter what is the position of the sight: and thus, for all ranges, a sight is obtainable through the V notch *d*.

Up to 1,000 yards the sight is adjusted by means of the sliding bar *i*. This bar is worked in conjunction with the markings on the ladder, and the elevation of the sight depends upon the position of the bar *i* upon the runners *j* (Fig. 4). From 1,100 to 2,000 yards the sight is adjusted through the medium of the stays or indicator plates *f*. The ranges between 1,100 and 2,000 yards are marked, as illustrated, upon the sides of the plates, which consist of pieces of metal about an inch wide. Supposing it is required to adjust the sight for 1,500 yards, the sight is depressed or raised until the lines representing this distance, which are marked upon the plates, lie along the upper edges of the bar *k*.

The freedom of movement of the sight depends upon the pressure of the walls *k* of the bed upon the plates *f*. This pressure is regulated by tension screws. Accepted April 6, 1901.

Arms & Explosives

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CONTENTS.

CURRENT TOPICS.

Coal Dust Explosions.—We note with satisfaction that Professor Galloway has been appointed by the Home Office to examine into and report upon the causes leading to the recent explosion in the Universal Colliery. It would, indeed, be difficult to suggest an appointment of a more suitable character, since the Professor has made the subject of colliery explosions the principal study of his life, and during the early part of the last decade he carried out, at the instance of the Home Office, some important experiments bearing upon explosions in collieries caused by the accumulation of coal dust, which should be of value in the present case. His conclusions, founded on theory borne out in practice, were that explosions due to this cause could readily be prevented by the use of proper precautions, and though at the time these views were not generally adopted and acted upon, there is now little doubt that Professor Galloway was correct in his theories.

Gunnery of H.M.S. "Terrible."—The captain and gun-crews of H.M.S. *Terrible* are to be congratulated on the success of the recentprize-firing trials. Twelve 6-inch guns were put to work on the target, and fired 128 rounds, out of which 104 were hits, the score thus being 81·25 per cent. of hits. This is a record for guns of this calibre. It will be remembered, however, that when Captain Percy Scott held his previous command on H.M.S. *Scylla*, he broke all records by scoring 86 per cent. of hits from an armament of six 4·7-in. guns and two 6-in. guns. Last year, the best on record with 6-in. guns consisted of 54 shots per minute, and 26 hits, a score of 48 per cent. only. It must be acknowledged that Captain Percy Scott and his gallant crew are excellent exponents of the doctrine that a warship is of value in direct proportion to the capacity of its guns to shoot straight. It also seems to make little difference to these essentially "handy men" whether they are ashore or afloat, judging by their experiences at the Cape and in China, since they could make equally good practice in either condition.

Obsolete Naval Guns.—There is every indication that we are on the eve of a new agitation for increasing the efficiency of the Navy. It is realised, even by the most vehement upholders of the policy of Army reform, that, after all, our chief defence still lies in the maintenance of the sister and senior service at a standard which unfortunately is seldom attempted. At the present time, we are again dropping behind in comparison with other nations, both as regards new tonnage and the efficient up-keep of already existing vessels. It is pointed out by the officials of the Navy League, a most excellent association which has already more than justified its existence, that there are six battleships in the Mediterranean Squadron which are to-day dependent, so far as their chief armament is concerned, on a set of obsolete guns firing black-powder and the blunt-nosed shells of a former generation. That this should be so, as regards what is perhaps the most important of the squadrons into which the commissioned fleets of the British Navy are divided, is a matter for some concern. There are also, either in commission or in the reserve, at least ten vessels possessing a certain degree of value as fighting units, and borne on the Navy List as battleships of the second

or third class, which are for all practical purposes of less than no use, owing to the fact that their main batteries consist of muzzle-loading guns of various calibres from 7-in. to 16-in. The obvious course to adopt in this case is either to refit these vessels with modern weapons, for service as secondary battleships or armoured cruisers, or to get rid of them, lock, stock, and barrel, and so save their present cost of up-keep as dangerous incumbrances, and devote the money thus saved to more modern and pressing requirements.

French Powder Labels.—Our attention has recently been drawn to an example of the painstaking methods adopted by manufacturers in other countries than our own to give the best satisfaction to consumers and customers. The particular example before us is that of a Government department, that responsible for the manufacture of gunpowder in the French Republic, which retains the monopoly in that as in other forms of industry. Two different labels taken from the cases of two smokeless sporting powders have been brought to our notice, and they form interesting reminders of the minute attention to detail which appears to be more common among our continental rivals than with ourselves. In each instance, the labels contain a set of instructions for the use of consumers, giving particulars as to the velocity and pressure to be expected from different weights of powder and shot in 12, 16, and 20-bore guns. Further instructions are given as to the best methods of loading cartridges with the particular powder in question, as to the number, thickness, and disposition of the wads, hardness of compression of loading and type of shot, while due attention is also drawn to the necessity for employing caps of good quality in order to procure uniform results. These various details would enable the purchaser, whether he were a gunmaker or a private sportsman accustomed to the loading of his own ammunition, to understand at once how to deal with any new type of powder so as to secure satisfaction in its use. We are, of course, aware that the same system is adopted to some small extent in this country, but not so generally, or with such attention to detail, as in the case mentioned. Surely this is a matter in respect to which our powder manufacturers might consent to learn something from the methods even of a foreign Government department.

Grandmotherly Legislation.—One of Mr. Arthur Chamberlain's remarks made in his speech at the annual meeting of Messrs. Kynoch, Ld., which is referred to elsewhere, is provided with an apt but somewhat grim comment in a circular letter now being issued from the Manufacturers' Section of the London Chamber of Commerce concerning the Factory and Workshops Amendment Bill. Mr. Chamberlain asserted that manufacturers were inspected to death, and were hampered at every step by restrictive legislation. He endeavoured, therefore, as an antidote, to imagine a golden age when there would be freedom from inspectors of all kinds, and from the interference of Parliament and local boards, which at present tended to place our manufacturing supremacy in jeopardy. That will never be anything save a dream; but at least most will agree that limitations may well be placed on the "mischievous activity" of our legislators in placing further burdens on our industries. On that account we draw attention to the circular already referred to, which affects more or less directly the trades which are represented by this Journal. The various trades enumerated in Schedule 3, Part 3, of the Factory and Workshops Act of 1878 were allowed to make overtime for 48 days in the year under certain conditions, as, for instance, where press of work was experienced at certain recurring seasons of the year, or where a business was liable to sudden press of orders arising from unforeseen events. This limit of 48 days was reduced to 30 by the amending Act of 1895. Now, in the latest Bill, though no specific mention of the question of overtime of this nature is made by the Government in introducing the measure, there are signs that advantage is being taken by certain members of the Standing Committee on Trade, to which it has been referred by the House of Commons, to introduce amendments having that end in view. The circular states that one member proposes to reduce the number of overtime days from 30 to 15, while another would take the drastic course of doing away with the overtime altogether. It seems to us that the time has come when it is necessary to take concerted action in resistance of a form of legislation which bids fair to strangle British manufactures, and we trust that the appeal conveyed by the circular letter of the London Chamber of Commerce, calling on recipients to resist individually and collectively the proposed amendments, will meet with hearty support.

The Anglo-American Clay-Bird Match.—As was anticipated, probably, by the greater number of experts, the match between American and English teams, which opened on the 11th ult., at the grounds of the Middlesex Gun Club, Welsh Harp, resulted in an easy win for the visitors. Some weight undoubtedly attaches to the explanation most generally given as the reason for the failure of the home team, that man for man they were outclassed, and that the Americans were all "expert," practically "professional," shooting men. Certainly, any unprejudiced spectator, after merely watching the two teams at work, would say that the visitors were the more workmanlike, and showed the best style—if style be interpreted as meaning the achievement of the "best" results in the simplest manner. But, after making all due allowance for the personal factor, "the man behind the gun," it can scarcely be disputed that the result of the match depended chiefly upon the relative efficiency of guns and ammunition as employed on either side of the Atlantic. The Americans have specialised in clay-bird shooting. They have adopted a heavy gun and a heavy charge of small, hard shot, driven at a high velocity by a large load of powder, plenty of wad being placed between powder and shot to ensure that the latter is not deformed. This combination means that at a given distance from the muzzle the whole charge of shot forms a close pattern of fast, hard-hitting pellets, all travelling well together, through which no clay target could possibly pass unscathed. With this ammunition, every "bird" that was hit at all was practically pulverised. Under this condition of knowing with certainty that a kill must follow a properly-timed and properly-aimed shot, the Americans were almost at an advantage in being restricted to the use of one barrel. Realising that they had but one chance, they made the best use of it, waiting until the birds had travelled to a distance which experience shows to be the most effective under the given conditions of loading, and the result was a far superior score to that of the English team with ordinary game guns and game charges, and with the prevailing custom "on this side" of getting off the first barrel as

quickly as possible, so that, in the event of a miss, there may be time to score a kill with the second. The net outcome of the two different methods was that in the course of the three days required to decide the match, out of a total of 3,000 birds thrown to each team, the Americans killed 2,587, as against the English total of 2,344, the percentage of kills being respectively 86·23 and 78·13.

MR. ARTHUR CHAMBERLAIN ON REPRESSIVE LEGISLATION.

AT the annual meeting of the shareholders of Messrs. Kynoch, Ld., which was held in Birmingham on the 12th ult., Mr. Arthur Chamberlain, Chairman of the Directors, presided and delivered a very telling speech on the situation, not only as regards the explosives industry, but British trade generally. He began by pointing out the present position of the company, the authorised capital of which was £1,000,000. Of that sum £375,000 was issued in ordinary shares, and only £295,000 in preference. He showed that the profits of the past year being £100,000, and £14,000 only being required for the preference dividend, the profit was sufficient to pay this dividend seven times over. As regards assets, the sums due from the company's debtors were more than sufficient to liquidate the preference shares, while the floating stock, materials and orders in progress were more than sufficient to satisfy their creditors. The assets that come under the heads of property and plant were, he maintained, more valuable than such as usually appeared in companies having their capitalisation. During the past year the company had made many extensions, renewals and repairs of their various properties, their chief concern being in respect to the execution of orders and the organisation of the factories to that end. Organisation, he considered, was to-day the key-note of success, and the main point of all factory organisation was found in the cost office. Their cost office was splendidly organised, so that they not only knew the results of each separate department, but also the result of each individual order as it was completed.

After referring to the provisions made by the company for the welfare of their employees, past, present, and future, Mr. Chamberlain went on to discuss the prospects of trade, which he believed were brighter now than had been the case for a long time past. There was competition, undoubtedly, but he thought that he detected a tendency in that competition to confine itself rather more within lines that were compatible with a living profit. The competition which they might now expect was, he considered, no more than they must always expect in business, and his opinion was that those businesses which were conducted on sound lines might, during the next few years, expect to reap a reward commensurate with the exertions of their managers. The competition of Europe and the United States he regarded largely as the bogey of politicians and newspaper paragraphists, and for him it had few terrors. Individual business, no doubt, waxed and waned, but the manufacturers of this country were never, as a whole, so it appeared to him, more confident, more energetic, more successful, and—perhaps he ought to say this in a whisper—more wealthy.

Mr. Chamberlain said that he would be the last to deny that foreign competition had its dangers, and foreign competitors their advantages, but the restrictive tendency of modern legislation had more terrors for him than all the competition of the foreigner. As a manufacturer he moved among manufacturers, but he could not meet with those manufacturers of whom he read in the newspapers as being depressed and unable to meet the competition of the world. It was true they had burdens, and he would call attention to two burdens from which they suffered in a greater degree than their foreign competitors. The first was the constant interference with methods and management that was now introduced by Parliament and the Local Boards. The cost of all they bought, unless they bought abroad, and the cost of all they made and of all that they sold, whether they sold at home or abroad, was largely increased by harassing legislation. They were inspected to death, and they were hampered at every step. He quoted as an instance of this that electric tramcars and tramlines, and the electric industries generally, had been largely strangled in this country by the interference of the Home Office and the local boards, with the result that they had to go to the United States, where the industry had been allowed to attain its full power, for information as to the best machinery and the best methods in that department of industry. This was due to no deficiency on the part of our manufacturers, but to the interference of Parliament and local bodies. The effect was to destroy initiative, to discourage invention, and to diminish the sense of individual responsibility. There was no amount of education, no amount of book-learning that would make up to the people of this country for the loss of "grit" that was caused by all this outside nursing and interference with them.

After pointing out that the second burden consisted of the great and increasing rates, Mr. Chamberlain compared the cost of manufacture 100 years ago, when the competition of the foreigner was not regarded as of the slightest importance, with the cost of to-day. What economies would be effected if the manufacturer could carry on his business free from local boards and bye-laws, free from sanitary inspectors, free from smoke inspectors, free from chemical inspectors, free from School Board inspectors, free from Home Office inspectors and factory inspectors—free from the whole brood of officials, who, not being producers themselves, lived on the produce of manufacturing industry and strangled it! The irony of the position was that the very politicians and philanthropists who had imposed all these burdens on them were now asking why they could not compete as they used to do with freer nations? Lord George Hamilton said that the explanation was to be found in the deficient education of our manufacturers. It never occurred to him to find it in the mischievous activity of our legislators. At this time of day it was useless to ask that this legislation might be repealed, but they might ask that its progress should be stopped. He claimed that he had pointed out what he considered to be the real dangers threatening our manufacturing supremacy. Surely it was not much to ask that they should be let alone. At the same time, he did not admit that up to now there was anything to give them cause for anxiety, so great were the energy and industry of the English manufacturer, and so superior the people who worked for him. If the loss of British manufacturing prestige should ever occur, it would be due to the comparative freedom enjoyed by the foreigner, and to the continually increasing restrictions that were suffered by manufacturers in this country.

NOTES.

SCHNEIDER AND SIAM.—How often do our manufacturers receive assistance from the Government in the securing of foreign orders? This question naturally enough arises on learning that, on account of information conveyed to him by the French Foreign Office, M. Schneider, of Creusôt, has sent an agent to Bangkok to interview members of the Siamese Government, and probably the King in person, on the subject of providing Creusôt guns for the defences of Bangkok and its environs. The enterprise of our foreign competitors is well known, but when they secure the active co-operation of their Governments in the form of advice as to what requirements are to be supplied in various parts of the world, they are doubly to be feared.

ARMAMENTS IN AFGHANISTAN.—According to the most recent news from Afghanistan, the Ameer is erecting a number of modern forts, equipped with the most modern appliances, along a new road which is under construction towards the Oxus. It is also stated that a large order for heavy Krupp guns is now in progress at Essen, probably as part of the equipment of these forts. Meanwhile, however, the Kabul workshops are fully employed, and one of their latest products is smokeless powder. There is at present only one Englishman in the country, in an official capacity—Mr. Frank A. Martin, brother of the Ameer's British agent, Sir Acquin Martin, now acting as engineer-in-chief to his Highness. Mr. Martin has been in Kabul since 1895.

AMERICAN MACHINERY FOR TURKEY.—It is reported from Constantinople that there is every reason to believe that an American syndicate is likely to secure the contract for the renewal of machinery in the Turkish arsenals. At the present time the existing plant, on which many hundreds of thousands of pounds have been spent, is practically valueless, having been allowed to rust and generally to fall into incurable disrepair. It is, in fact, scarcely worth its price as scrap-iron, with the added cost of removing it. Assuming that the American syndicate does actually receive a substantial order, its members will most probably be the sole beneficiaries. Knowing what we do of the Ottoman character, the assertion may with perfect safety be made that the efficiency of the Turkish arsenals will not be increased by any change of plant alone. What is first required is an alteration in the machinery of the Government.

ORDNANCE FACTORIES.—When the vote for £345,000 for Ordnance Factories came up for consideration before the Committee on Supply in the House of Commons on the 6th ult., Mr. Brodrick was asked to explain how it was that what had originally been a "token" vote of £100 had now become so considerable a sum. He pointed out that the Ordnance factories, like other business undertakings, very properly charged depreciation on machinery and buildings. By a coincidence, the depreciation on buildings and machinery had for some years amounted to precisely the same sum as the new buildings and machinery required. Now, however, it was unfortunately necessary, not only to have regard to depreciation, but also to the services which the country required, and so the amount of the vote was increased to its present figure. Mr. Brodrick incidentally stated that arrangements had already been made for the keeping up of a greater reserve of small-arm ammunition, in accordance with the recommendation of the War Office Committee which was sitting during last year.

THE SERVICE RIFLE AND GOVERNMENT AMMUNITION.—Some little excitement seems to have been caused by the recent publication of an order by the War Office to the effect that no ammunition, either ball, blank, aiming tube or dummy, other than that supplied by the War Department, is to be used in service rifles by any troops, whether of the regular or auxiliary forces. As a matter of fact, this order is not new in substance, since Paragraph 2,035 of the King's Regulations lays down that, as serious damage may be done to rifles by the use of unsuitable ammunition, commanding officers are to forbid the troops under their orders to use any ammunition, whether ball, blank, or dummy, except that provided by the Government.

RE-ARMING OF INDIAN TROOPS.—The re-arming of the Indian troops with modern weapons is rapidly becoming an accomplished fact. At the present time, 41,500 Lee-Enfield rifles and 13,500 carbines are already in India or on the way out, and it is contemplated to despatch as many more during the current year. In the meantime, however, progress is being made with the scheme to render India entirely self-supporting in all war munitions except artillery. The work of the Cordite factory in the Nilgiri Hills is already proceeding rapidly, and the steel shell factory has also proved entirely successful. There is now in contemplation the establishment of a rifle factory, most probably at Ishapur, which is not far from Calcutta, and the plans and estimates for this new venture will be made on the basis of a production of 25,000 rifles per annum.

GUN TRIALS OF H.M.S. *FORMIDABLE*.—During last month H.M.S. *Formidable* carried out her gun trials under the supervision of Captain A. Barrow, of H.M.S. *Excellent*, gunnery school, in most successful fashion. The tests were of especial interest, since this battleship is the first to be fitted with an improved design of hydraulic machinery, designed and supplied by Sir W. G. Armstrong, Whitworth, and Co., Ld., which provides facilities for a considerable increase in the rate of fire of the main armament of 12-in. guns, and incidentally for an increase in the charge of ammunition. In this system there is a special chamber immediately below the gun platform to which the charges are raised independently of the guns, so that one or two charges may be in waiting in close proximity to each gun of the battery, only awaiting a comparatively small final hoist into the loading position. The rate of fire is therefore practically controlled by the efficiency of the crew actually working the gun, and their operations are also aided by a new departure, which allows of the loading being done when the gun is inclined at an angle of only 4½ deg., as compared with the hitherto prevailing inclination of 13½ degs. As this smaller elevation corresponds to a range of about 4,000 yards, it will be seen that in action the tilt of the gun for loading would often be an almost negligible quantity occupying a minimum of time. In the trials, six rounds were fired in salvos of two each, in 144 seconds, so that each gun actually fired two rounds in rather less than a minute.

MINIATURE RIFLES AT BISLEY.—Mr. W. W. Greener calls our attention to a new event on the Bisley programme, which should greatly stimulate those enthusiasts in rifle shooting who lack opportunities to practise with the military arm. The new event is known as the Greener ·310 Rifle Competition, and will consist of an unsquadded competition each day during the course of the meeting, with unlimited entries. It is open to all comers, the only special condition being that all shooters must use rifles of ·310 calibre of Mr. Greener's well-known make. Ten shots will be made at a Martin-Smith target at a distance of 100 yards, from any position, and for the convenience of competitors who do not possess the qualifying weapon, Mr. Greener has arranged to allow the free use of rifles specially kept at the firing point for that purpose, and fitted either with orthoptic or with open sights at the competitor's option. The prizes are presented by Mr. Greener, and will consist severally of one prize of £20, a Greener "Sharpshooter's" No. 2 rifle fitted with orthoptic sights, two prizes of £2 each, and six prizes of £1 each. Scorers of 65 and upwards will be allowed three extra shots. Mr. Greener is to be congratulated on the sportsmanlike nature of his generous offer, and it is to be hoped that the result will be the giving of a distinct impetus to the interest in miniature rifle shooting.

"E.C." POWDER CO., LD.—The report and balance-sheet of this company for the year ending March 31st, shows that after adopting the directors' recommendation of reducing the cost of patents by charging £500 against the year's profits, and £500 against the premium account, and of writing down the book value of the American investment by charging another £500 to revenue account, the net profit for the year is £5,896, which, added to the balance brought forward, makes a total of £8,159 available for distribution. An interim dividend of 2s. per share had already been paid, and it was recommended that a further dividend of 4s. per share be paid, making 10 per cent. per annum. This distribution leaves £3,209 to be carried forward, subject to directors' fees, so that the net result of the year's trading cannot be regarded otherwise than as satisfactory. The sales of the company's powder have increased, and it is evident that this accession of popularity is based on intrinsic merit.

WILKINSON SWORD CO., LD.—This well-known company has just issued a handsomely-got-up list of the various specialities for which it has, in its various phases of existence, been famous for many long years, since 1772, or thereabouts. It would be interesting and instructive to obtain the first price-list sent out by Mr. Henry Nock—provided he issued one 130 years ago—and compare it with the successive productions of his son-in-law and successor, Mr. Henry Wilkinson, who took over the business in 1805; with a further list of Messrs. James Wilkinson & Sons, who first removed from the original premises in Ludgate Hill to the company's present quarters in Pall Mall in 1825; with the specialities of Messrs. Wilkinson & Son, who dated from 1850; and finally to compare all these with the latest catalogue of the Wilkinson Sword Co., Ld., gun, sword and accoutrement makers, whose year of formation was A.D. 1888. Since these facilities for retrospection are not to hand, it may be sufficient to say that the catalogue now before us is fully worthy of the deservedly high reputation enjoyed by the company which now carries on traditions established during a period of 130 years, and higher praise than this it is well-nigh impossible to bestow.

TRIALS OF Q.F. GUNS.—A series of trials of the 6-in. and 7½-in. guns of 50 calibres, mounted on naval quick-firing mountings, was recently made on the gun range at Eskmeals, in Cumberland, by Messrs. Vickers, Sons and Maxim, Ld., before members of the special Naval Spanish Commission. This Commission had previously been making a round of visits to the polygons at Essen, Creusôt, and St. Chamond. It was found that, thanks to the special arrangement of the mounting, in conjunction with the new breech mechanism, five aimed rounds could be fired in 37 seconds from the 7½-in. gun, or at the rate of eight aimed rounds per minute. This rate of fire is similar to that obtained from the latest pattern of Vickers' 6-in. guns, at the official trials. Without exceeding the limits of the working pressure of the guns, the 6-in. gun gave a muzzle-velocity of 2,900 ft. per second, and the 7½-in. gun 2,903 ft. per second. The weight of the projectile for the 7½-in. calibre is 200 lbs., giving a muzzle energy of 11,687 ft. tons.

KYNOCH, LD.—According to the balance-sheet and report presented to the shareholders in this company at the fifth ordinary general meeting, the year's trading shows a most successful result. The net profit for the past twelve months amounts to £100,275, to which must be added the balance of £25,359 brought forward from the previous year, making a total sum available for distribution of £125,634. It must be admitted that this total, which represents nearly 20 per cent. of the present issued capital of £670,000, points to a very satisfactory condition of affairs, and the more so since the capital of the company has been increased in value to the extent of £125,000 during the past year by the issue of new ordinary shares, which were offered to the ordinary shareholders at par, in the proportion of one new share to each two old ones. Of the 12,500 shares thus offered, it is noteworthy that all, except 414½, were taken up, and that this remainder was sold at the substantial premium of £2,798, which was added to the reserve fund, thus bringing that fund up to the fine total of £72,364. The company's property and plant now stand in the books at a total value of £502,271, in which are included two important additions made during the year, apart from the usual extensions and developments of existing properties. One of these new properties consists of a large factory and about 5 acres of freehold land at Stirchley, which was purchased from the Endurance Company at a price of £20,234, including machinery and fixtures. The other addition consisted of an estate of 265 acres, adjoining the Arklow Works, on a portion of which a new nitro-glycerin factory is in course of erection, the remainder being let to tenants. During the year, also, a complete plant has been installed at Arklow for the manufacture of all the sulphuric acid required by the company. As regards the distribution of the profits of the year, the proposal mentioned in these columns in last month's issue is carried out. An interim dividend at the rate of 2½ per cent. had already been paid on the preference shares, and a further payment at the rate of 2½ per cent. is made, bringing the total up to 5 per cent. for the year. The ordinary shares are provided for by a dividend of 10 per cent. for the year, and the new ordinary shares rank for 2½ per cent. in respect to the three months during which they have been issued, or at the rate of 10 per cent. per annum. In addition

the ordinary shares receive a bonus of 10 per cent., and the new ordinary shares *pro rata*. Directors' fees absorb £4,286, and the directors recommended that £27,636 be added to the reserve fund, so as to bring it up to £100,000. These various distributions leave a balance of £23,510, which is carried forward to the next year's account.

INCIDENTAL JOTTINGS.

NEW USE FOR SPENT BULLETS.

Henceforth, the picker-up of unconsidered trifles is warned against groping for the bullets which are embedded in rifle ranges, under pain of being prosecuted. According to a regulation recently issued by the War Office it appears that the present market price of expended cupro-nickel bullets is about £18 per ton, and as a consequence of this discovery of unexpected treasure, it is laid down that no soldier or unauthorised person is to be allowed to search the butts for bullets. They are, on the contrary, to be recovered from the ranges under local contract, and commanding officers are desired to start, where it is possible, a "Metal Fund" in their districts, the proceeds of which will be expended solely for musketry purposes. After all, there is much to be said for the desirability of economy in small things, but what will be the condition of the butts after they have been "groped over" by the contractors? Also, how many bullets go to make up a ton of cupro-nickel, and how many will be recoverable during any twelvemonths? What a host of millionaire contractors will arise in the future from this new regulation!

A SEARCH-LIGHT PISTOL.

The risks which the enterprising burglar runs when a-burgling seem destined to become intensified by the invention of a patent search-light apparatus in close sympathy with the business-end of a pistol. Of course, the idea comes from America. It takes the form of a revolver, which apparently has a second barrel below that usually fitted, this secondary barrel being in reality a tube containing a miniature electric battery, and a small electric lamp. On entering a room in which he has reason to find a burglar, Paterfamilias simply presses a button which brings the search-light into operation, and he then throws the beam of light about until it encounters and illuminates the features, or, at least, some portion of the anatomy of Mr. Sykes. There is no need for further refinement in aiming. The pistol shoots right where the light falls, and the moment that the ray of light is centred on the right spot, a pull on the trigger serves to perforate the discovered intruder. So simple is the idea that one wonders how it was never thought of before. However, it is to be hoped that this ingenious weapon will only be sold to holders of satisfactory testimonials as to character from the parson, doctor, and family butcher, otherwise it might happen that the enterprising burglar started away to do the X-rays business himself.

ADMIRAL SEYMOUR'S CUP.

On relinquishing the command of the China Squadron, Admiral Sir E. Seymour has announced his intention to present a cup, which is to be competed for annually, and to be held from year to year by the ship that makes the best score at the Admiralty prize-firing. A further honour will attach to the temporary owners of the Cup, since it is suggested that the crew of the ship holding the trophy shall, in parades ashore, have precedence of all others, even of the flag-ship itself. In any event, the gift will mark an innovation in the Navy, since hitherto cups have only been given for such contests as boat sailing and rowing, rifle shooting and athletic sports. Admiral Seymour has added another laurel to those accumulated during his command on the China station in thus bringing into importance the necessity for efficient gunnery on ships of war, and in stimulating the crews to friendly rivalry.

KEEP OFF THE GRASS.

Early in last month a case came up before the Divisional Court of King's Bench as an appeal against the justices of Cornwall, who refused to convict a man of an offence under Section 77 of the Explosives Act of 1875. It appears that there was a wreck on the coast not far from Messrs. Nobel's explosive factory at Perranporth, and the defendant, who was a member of the St. John's Ambulance Association, took a short cut across country to reach the scene of the casualty. In so doing he entered and ran across the stores of the explosive company's works. Hence the original appearance before the magistrates, who, however, treated the matter as of less consequence than the prosecutors thought fitting, and dismissed the case. The higher court expressed itself as fully sensible of the importance attaching to an observance of the section of the Act referred to, but, all the same, their verdict was that no interference with the dictum of the magistrate was necessary. Only—the defendant mustn't do it again. And he probably won't after this little experience of the divinity that doth hedge an explosives factory as with a fence of thrice-barbed wire.

A POCKET MAXIM.

That ingenious inventor, Mr. W. S. Simpson, has recently turned his attention to warlike devices of a death-dealing nature. One consists of what has been described as a "bijou Maxim" gun, which is almost capable of being carried in the pocket. At all events, it can be transported by one man, and is worked by him without any assistance. In action, he plants the gun on the ground, with a sort of saddle-frame attached to the hinder end, and assumes a prone position across the saddle, thus holding the gun firmly in position. The elevation and direction of the gun are secured by means of the ordinary elevating and traversing screws. Twenty cartridges are fed into the gun at a time from the right-hand side of the chamber, and it is claimed that 100 rounds can be fired per minute. Apparently, this machine-gun is also capable of of being fired from the shoulder, if necessary, as it weighs only 3 lbs. more than the service small-arm. Another device of Mr. Simpson's provides for fitting an ordinary military rifle with rests, so that a man need only assume the prone position, fix his rests in the ground, and start pumping lead and nickel for all he is worth. These rests can be folded up along the rifle when not in use, and do not interfere in the slightest with the use of the rifle as a shoulder-piece, or with the employment of the bayonet. It looks, at the outset, as if Mr. Simpson had struck on two good ideas; but in the absence of extended trials made under Service conditions, one can scarcely say more than this. Many ingenious inventions fall short under practical tests of a rough-and-ready nature.

VULCAN.

THE DYNAMITE MONOPOLY IN THE TRANSVAAL.

AFTER much careful sifting of evidence and the examination of multitudinous documents, the Transvaal Concessions Commission has prepared its report in the form of a Blue Book, which, though dated April 19th, 1901, was only presented to the Houses of Parliament in June. The commissioners, the Hon. Alfred Lyttleton, K.C., M.P., Mr. A. M. Ashmore, C.M.G., and Mr. R. Kelsey Loveday, together with Mr. Bernard Holland, their secretary, have in reality accomplished a somewhat remarkable feat in carrying the inquiry through to a successful issue in something less than eight months from its original inception, when one considers the vast amount of labour involved in instituting the researches which are embodied, as regards the results only, in the one hundred and sixty-odd pages of the report under notice. At the outset the scope of the commissioners' duties was clearly defined, and will be seen to embrace a fairly comprehensive programme, since the inquiry was to be made into the following matters:—(1) Any concession conferring the sole and exclusive right of manufacture, importing or dealing in any commodity in the Transvaal. (2) Any contract made with the Government of the late South African Republic under the scheme approved by the Volksraad Resolution, No. 1,871, of November, 1896. (3) Any concession to the National Bank or to any other bank or banking institution. (4) Any concession or contract for the construction or working of any railway or public tramway, or the public supply of water or light.

The conduct of the inquiry had naturally to be determined on certain broad principles affecting the peculiar conditions raised by the annexation of the South African Republic to the British Crown. With reservations due to the particular situation, the line adopted was nearly approximate to that taken on the annexation of Hanover by Prussia, in which case the Royal Prussian Patent declared that "We will protect every one in the possession and enjoyment of his duly-acquired rights." Having thus defined the general principle, the object of the commission was to ascertain in each of the concessions brought before its notice, that the rights had, in fact, been duly acquired, and that they remained valid by reason of their conditions having been duly performed subsequently. Going into still further detail, the Commission decided that cancellation of a concession might properly be advised under such circumstances, as that the grant of the concession was not within the legal powers of the late Government, or was in breach of a treaty with the annexing state, or when the person seeking to maintain the concession acquired it unlawfully or by fraud, or he has failed to fulfil its essential conditions without lawful excuse. The Commission even went further, and thought that cancellation, or at least modifications of a concession might be justified where its maintenance was injurious to the public interest. In this latter event, however, the question of compensation might arise under certain circumstances which are duly specified.

As regards procedure, the inquiry took place on the understanding that in each case the onus of proof was upon the concessionaire to establish the validity of his concession and the fact that it was not injurious to the public interest. The Commission had absolute authority to call upon the concessionaires implicated to appear before it, and allowed both concessionaires and objectors to be assisted by legal advisers and counsel. Altogether, the inquiry concerned 25 different concessions, six being in connection with railways and tramways not purely municipal in character; eight referring to manufactures and trading; and 11 being concessions of rights of a municipal nature. Of all these, the one with which we have chief concern deals with the notorious dynamite monopoly.

On May 25th, 1894, a company was registered in the Transvaal under the title of "De Zuid Afrikaansche Fabrieken voor Ontplofbare Stoffen Beperkt"—which may be rendered more simply henceforth as the Transvaal Dynamite Company—as sole agent of the Government of the South African Republic to the exclusion of all other persons, for the manufacture, import, export, trading in and sale of explosive substances of all kinds in the Republic. With a nominal capital of £450,000, there existed in June, 1894, an amount of £192,625 in cash, and assets worth about £41,000, taken over from the French company which was its predecessor. The total capital of the company was subsequently brought up to £423,000 by an issue of debentures. On this comparatively modest capital the company carried on business from June 18th, 1894, with somewhat remarkable results. For example, on September 30th, 1899, to which date the books were made up for the purpose of the Commission, the assets of the company were as follow:—It had purchased and built factories at a cost of £882,000, written down to £779,000. It had accumulated reserves under various names to the value of £320,000, and undivided profits of £506,418; and as against a capital of £423,000, possessed property valued by itself at £1,630,000; so that the company's assets had, in 5¼ years, appreciated almost fourfold. The revenue account of the company for the period in question was almost equally astounding. It had made a gross trading profit of £2,526,033. Of this, £423,460 was absorbed in factory and administration expenses and in directors' fees, while £621,000 had been spent in buying off the precedent French company's opposition, in the extinction of interests connected therewith, and in secret service. The shareholders themselves have, in the short life of the company, received in dividends and savings added to capital, a total of £1,321,000, while the Government, as owner of the monopoly, had as its share royalties to the extent of £264,000.

In the report of the Concessions Commission is to be found a very complete history of the origin, formation and career of the Transvaal Dynamite Company, which we cannot pretend to give in detail here. Put in as brief a form as possible, the salient points to be noted are as given below. In December, 1888, the Government of the South African Republic granted a concession to Mr. E. Lippert for the establishment of a factory with the exclusive right to manufacture explosives in the Republic. Shortly afterwards Mr. Lippert assigned this concession to a company largely consisting of French shareholders, Mr. L. G. Vorstman becoming managing director, and Mr. Lippert sole agent for the sale of the products of the company. This company, however, instead of manufacturing explosives within the Republic, confined itself to the importation of already manufactured material. At this, the British and German Governments entered a protest, and after investigation by a commission, the French concession was cancelled. The act more or less naturally evoked a protest from

the French Government, whereon the Transvaal Government sought to solve the difficulty by declaring the manufacture of explosive a Government monopoly, and surrendering the rights so created to a mixed body of German, French and British manufacturers, on terms that placed the consumers, the mine-owners of the Transvaal, in a position of some difficulty. The next phase in the history was that the Transvaal Government, purporting to be acting in accordance with the regulations passed by the Volksraad, entered into a contract with Mr. Vorstman, on October 25th, 1893, which appointed him sole agent for the carrying out of the monopoly for 15 years, and authorising him to form a company for that purpose. A further contract was made on May 24th, 1894, between the Government and Mr. Vorstman as trustee for the Transvaal Dynamite Company, and on that contract the company's title to the monopoly is founded.

According to the wording of the regulations passed by the Volksraad in September, 1893, on which the latest contract purported to be based, the Raad appear to have contemplated the transfer of the monopoly to private persons on the condition that explosives should be manufactured in the S. A. Republic; that the industry should be under the control of the Governmeut, who might at any time for State reasons withdraw it on terms; and that the exclusive right to import the manufactured commodity should be rigidly limited to a defined period of 2½ years. The contract, on the other hand, went beyond the regulations on several points, and notably in respect to extending the limitation of the right of importation, pending the establishment of suitable manufactories within the Republic. At this point the issues became somewhat involved. As regards the time-limit, the Commission is of opinion that the contractors failed to fulfil a fundamental obligation of their contract prescribed by the Raad, so that unless the Raad itself waived or condoned the breach the contractors from that moment lost their legal rights under it. The question that arises is, therefore, whether the Raad did expressly or implicitly adopt or sanction the undoubted waiver by the Government of the breach of contract. The Commission finds that the Raad did so waive its right to cancel the original contract.

Before proceeding further into a consideration as to how far the company was entitled to rely on this waiver, the report turns to the matter of the effect of the monopoly on public interests. This question turns upon finance of a most remarkable kind. During the period of 63 months from June, 1894, to September, 1899, the Government received in royalties the sum of £264,283 4s. 7d. Mr. Lippert in the same period received in royalties £33,714 16s., and in commission £286,610 5s. 11d. Mr. Lippert, it appears, rendered service in return for these small allowances by acting as agent for sale of explosives for the company, which necessitated having offices at Pretoria and Johannesburg. Messrs. Lewis & Marks, on the other hand, seem to have drawn £60,087 9s. for doing nothing, Mr. Marks candidly avowing that fact. At all events, the average of £10,000 per annum received value only in the form of the withdrawal of an opposition with which Mr. Marks at one time threatened the concession. So far as the company was concerned, £275,000 was carried to reserve, and £45,000 to explosive fund, while £299,958 was written off. Directors' fees and bonuses aborbed £84,542, of which £38,182 17s. 9d. was appropriated by only three persons—Messrs. Vorstman, A. Philipp, and Bourne. Mr. Max Philipp, chairman of the company, drew £3,600 under various items, which included travelling expenses, special services, freight and duty on cigars, wines, and provisions; and in addition Christmas boxes, presents of violins, gold watches, vases wines, and cigars, were made in various quarters. There is a final item of £39,100 expended on secret service in Pretoria during the years 1897-9. The commission finds, after a review of the small benefit accruing to the State in proportion to the vast sums earned and expended, that it was clearly desirable in the public interest that the monopoly in the hands of the company should be ended or modified.

Having got thus far, the Commission reverted to the matter of the waiver of the original resolution of the Raad and the condonation of the breach of contract, which reached a new and pronounced phase by the Act of the Raad in August, 1899, whereby it ratified the monopoly. There is no need to go into the details of this section of the inquiry. We find that the following sums were placed at the disposal of the chairman and Dr. Aufschlager for disbursements "in the interests of the company," namely, £9,100 in 1897, £10,000 in 1898, and £20,000 in 1899, making the total of £39,100 already referred to. The expenditure of these sums, and other transactions, were carefully gone into by the Commission, and the conclusions arrived at could scarcely be otherwise than those stated in the report, which we reproduce here verbatim. The report on the Dynamite Concession ends with the following paragraphs:—

"The evidence satisfied us that Dr. Leyds received from certain directors of the company shares and financial consideration, and that Mr. Wolmarans received money, intended to influence these two members of the Executive Council in favour of the company's objects, and that other sums were paid to Mr. Klimke, the expert adviser of the Government and Council, with a similar intention. We also are satisfied that money to the amount of, at the least, £39,100 was placed by the authority of the European Council at the predisposal of Mr. Max Philipp and Dr. Aufschlager, in the years 1897, 1898, 1899, for use in the interests of the company, and was transmitted to Pretoria by those gentlemen for purposes of corrupt expenditure, and that it was there used in bribery by the local directors—Messrs. Vorstman and Alberto Philipp—and especially in bribery of members of the Raad.

"In the light of these facts many circumstances hitherto unintelligible become clear. We are able now to understand how this company, working under a contract—itself a breach of the regulations of the Raad—broke that contract; how it amassed and consumed in the manner above described vast profits, of which the State obtained in comparison a beggarly share, and yet induced the Government to condone its fault, and the Raad to adopt that condonation. Without the condonation the company has no legal title to the monopoly, and we are convinced that no right or title, giving the company any claim to consideration at the hands of his Majesty's Government, can be founded on Acts of the late Government of the Transvaal and the Raad, which were induced by recent and extensive bribery. We therefore recommend that his Majesty's Government should decline to recognise this concession. The company, in our opinion, should have no advantages in the competition for the manufacture of and trade in explosives in the Transvaal other than those it has secured by the establishment there of its factories, and its first occupation of the field of industry."

ROUND THE TRADE.

Mr. T. Page Wood, junior, has, we are informed, recently opened a gun establishment at 17, Nicholas Street, Bristol.

The directors of the New Explosives Co., Ld., have declared an interim dividend of 2½ per cent. for the current half-year.

We have received a programme of the International Shooting to be held at Namur this year. The meeting opens on the 29th inst. with the Prix Hunyady.

The annual outing of the employees of Messrs. Eley Bros., Ld., takes place on the 6th inst. The company will travel by brakes to the "Talbot Inn," at North Weald, in Essex.

The Webley and Scott Revolver and Arms Co., Ld., has declared an interim dividend for the six months ending June 30th, at the rate of 5 per cent. per annum on the ordinary shares.

We understand that the business of G. Jefferies' executors, of Norwich, will again be put up for sale by public auction, as an offer made by Mr. W. Darlow, of Bedford, for the business has been declined.

Messrs. Curtis's & Harvey offered a cup valued at £25 to be shot for on the opening day of the International Shooting Competitions at both the Gun Club and Hurlingham. The meetings were held from the 24th to the 29th ult.

Lieut. A. T. Dawson, late R.N., has been awarded the Silver Medal of the Society of Arts on account of the paper on "Modern Artillery," which he recently read before the Society, and which was referred to in these columns at the time.

We understand that Mr. Hunter has succeeded to the position hitherto occupied by Mr. Goodman at Messrs. Moore & Grey's establishment in Piccadilly, and that Mr. Bozard has similarly succeeded Mr. Beesley, these changes having taken place during the last month.

The Union Metallic Cartridge Co. have lately, in order to protect the reputation of their factory-loaded shells, adopted different names for empty and loaded shells respectively, of the same quality, while preserving the same distinctive colour for each class of shell as heretofore.

Messrs. Greenwood & Batley, Ld., have arranged to terminate the tenancy of their Greenwich loading works, and to transfer the plant to the new Abbey Wood factory, which has the full Government loading licence under the Explosives Act. The company has secured a long lease of the Abbey Wood premises.

The Gelatine Explosives Co., Ld., was registered on May 25th, with a capital of £100, in £1 shares, to carry on the business of explosives manufacturers, financiers, miners, founders, engineers, merchants, &c., and to adopt an agreement with Mr. D. Paisley. There was no initial public issue.

We learn that Mr. James Watson Rosier, of Clarke Buildings, Bourke Street, Melbourne, who had the honour to supply the ammunition used by H.R.H. the Duke of Cornwall and York and his suite during their stay "down below," has received a letter expressing the satisfaction of His Royal Highness with the cartridges so supplied.

We are pleased to learn that Mr. William Cullen has been appointed works manager of the South African Explosives Company, Ld., Modderfontein Factory, near Johannesburg. This factory is well known to be the largest in the world, and we offer our hearty congratulations to Mr. Cullen on his appointment to this important position.

An order, dated June 11th, has been issued by the Home Secretary, under Section 6 of the Coal Mines Regulation Act, 1896, which adds to the first schedule of the Explosives in Coal Mines Order of September 24th, 1900, the following explosives:—Aphosite, Cambrite, Kynite, Nobel Carbonite, Sasonite, Special Bull-dog, Thunderite, and Virite. The specifications of these explosives are referred to in detail elsewhere.

Messrs. John Brown & Co., Ld., show a net profit for the year, ending March 31st, of £440,393, to which is added a balance of £30,205 brought forward. After providing for depreciation the directors recommend that £100,000 be appropriated to expenditure in expanding the company's business. A dividend of 20 per cent. per annum apportioned to the ordinary shares will leave a balance to carry forward of £71,598.

The word "Albionite" has been registered by Messrs. Nobel's Explosives Co., Ld., for use for explosives included in Class 20. This does not, however, establish any claim to the exclusive use of the word "Albion." For explosives included in the same Class 20, the Carbonite Syndicate, Ld., have registered a device consisting of a star with three forked flashes of lightning on each side, and the word "Thunderite" above it. In this case, no claim is made to the exclusive use of the word "Thunder."

A special session of the Liskeard County Magistrates will be held on the 10th inst., on the application of Mr. de Castro Glubb, to consider an application from the Safety Explosives Company for licences to establish factories for the manufacture of explosives at Herodsford, and Trago, St. Pinnock, where powder mills were formerly at work. Mr. Glubb, in making the application, stated that the Home Secretary had already granted draft licences, which only require confirmation by the local authority.

On the 15th ult., an international rifle match took place at Darnley, near Glasgow, between teams each consisting of 20 members, representing England, Scotland, Ireland and Wales. The scores made at 200 and 300 yards were:—England, 674; Scotland, 641; Wales, 626; and Ireland, 604. At 500 yards, Scotland led with 1,267; England scoring 1,258; Wales, 1,199; and Ireland, 1,198. At 600 yards, England came to the front again with a total of 1,809; Scotland coming second with 1,802; Wales, 1,758; and Ireland, 1,708.

Messrs. Greenwood & Batley, Ld., show a net profit on the twelve months ending March 31st of £35,627, after providing for debenture interest and expenses of management, writing off £7,500 for depreciation, and making due provision for doubtful accounts. The directors have allotted £5,000 towards the cost of completing the installation of electric motors throughout the Albion works, £1,000 as a provision against contingencies, and £10,000 to the reserve fund. Dividends are declared at the rate of 7 per cent. per annum on the preference shares, and 5 per cent. on the ordinary shares, and the balance of £4,474 is carried forward.

Messrs. Boss & Co. held their annual dinner at the "Roebuck Hotel," Hastings, on the 22nd ult. The party left Charing Cross in the morning in ample time for the 1 o'clock dinner, at which the chief toast was "Success to the Trigger." At 5 o'clock the party reassembled for tea, and at 6 o'clock a concert, interspersed with toasts and speeches, was presided over by the genial head of the firm, Mr. John Robertson, with Mr. Embleton in the vice-chair. We understand that the notice at the foot of the programme, "Ambulance and Police—10.30 p.m.," was quite unnecessary, and it is to be hoped also that the additional notice, "Fat Heads, Seidlitz Powders, etc., to follow," was a piece of false prophecy.

The result of the coroner's inquiry into the circumstances attending the death of two men at the recent explosion in the gunpowder factory of Messrs. Kynoch, Ld., at Worsboro' Dale, was that the jury returned the following verdict:—"Accidentally killed whilst following their employment, by an explosion, without any blame attached to anybody; but as to the exact cause of the explosion there is not sufficient evidence to show." Captain Thomson, H.M. Chief Inspector of Explosives, was present, and spoke as to the possibility of the explosion being caused by powder working into a clutch employed in the machinery. He admitted, however, that the same kind of clutch was in use in the Government factories. Mr. J. G. Sealey, the works manager, stated that he had forbidden the men to use the clutch, though there was no doubt, from their own admission, that they had disobeyed his express order to that effect.

THE HARRIS RIFLE MAGAZINE.

CONSIDERABLE interest should attach to the new Harris Rifle Magazine, which forms the subject of one of the "Selected Patents" in this issue, since we learn on very good authority that this device is receiving serious consideration as regards its suitability for use in the new service rifle, concerning which so much has been written recently. As is well known, the difficulties of adopting a rapid system of loading in conjunction with the existing type of service ammunition are considerable. Experiments have been made in the direction of utilising the clip or charger methods of supplying cartridges to the magazine, only to find that the system of shaping the base of the cartridge with a raised rim or beading produces difficulties and complications which are non-existent in the more general type of magazine small-arm ammunition having a groove in place of the raised rim. It would appear, indeed, that loading by clips or chargers, one or other of which systems are common to practically all foreign military arms, could only be adopted to the British Service by making a radical change in the ammunition. Under these circumstances, it almost goes without the saying that either system is definitely barred from our use, and that there is a necessity to devise some other method of loading which is not dependent for its efficiency on the shape of the cartridge rim.

The Harris magazine seems to solve the difficulty to a remarkable degree. It consists, as can be seen from the drawings illustrated on another page, of a box fitted into the woodwork of the rifle immediately below the receiver. This box does not project below the woodwork, and to that extent resembles the magazines of the later patterns of the Mauser and Mannlicher-Schönauer rifles, both of which have been described and illustrated in these columns. Yet despite its relatively shallow depth, the magazine is sufficiently capacious to contain six cartridges disposed in zig-zag fashion on a metal platform of corrugated shape, which thus ensures that one cartridge shall lie partially below the level of another. The platform, with the apparatus for raising and depressing it, forms the principal feature of the whole device. Normally, it is pressed upwards against the cartridges, or if the magazine be empty against a stop, by the action of a coiled spring acting through a bell-crank lever, and in this way it raises each cartridge in turn into position to be pushed forward into the chamber of the rifle by the closing of the bolt action. But as against this normal condition of things, which is the same in essence as that adopted in well-nigh every system of magazine loading, the platform is also capable of being depressed by means of a lever placed conveniently for operation by the left hand in holding the fore-end of the rifle, this lever pulling the bell-crank in direct opposition to the pressure of the coil spring, and thereby causing the platform of the magazine to sink down to its lowest possible limits. An ingenious subsidiary lever fitted to the main lever of the bell crank causes the platform to maintain a horizontal position throughout its travel, this lever being shown in the drawing as pivoted to the bell crank, whereas in the actual example of the magazine which we have examined it had a travel between grooved surfaces on the crank—the final effect being the same in each case.

To those who are used to the slow single-charging method of the present service arm, the working of the Harris magazine is a revelation of simplicity. To charge it, the small thumb lever is pressed, thereby lowering the platform to the bottom of the magazine box. Nothing remains to be done but to tumble half-a-dozen cartridges into the magazine recess through the receiver, the only care being to ensure that they all fall with the bullet towards the front of the magazine, and the base of the cartridge towards the back. Should they show a tendency to jam in dropping into place, a shake of the platform, communicated by means of the thumb lever, speedily jolts them into proper positions, and on releasing the lever altogether, they are found suitably disposed, with the top cartridge ready to be carried forward into the chamber by the return of the bolt. The top edges of the magazine sides are shaped so as to prevent the cartridges from being forced out by the upward pressure of the magazine platform, while at the same time they serve to guide the uppermost cartridge into a central position where it can be in the way of the locking bolt. It should be noted that the use of the Harris magazine in no way affects the employment of the cut-off, so that a rifle so fitted is still capable of being employed as a single-loader, with a magazine of six shots in reserve. If at any time it is desired to empty the magazine without firing, this is done by the simple act of depressing the thumb lever, which actuates the platform. The cartridges at once become loose within the magazine, and on the rifle being turned over they will all fall out into a hand held below the opening of the receiver. It should be evident from the foregoing description, and from a study of the illustration given elsewhere, that the Harris magazine seems to solve in a practical manner some of the inherent difficulties attending the use of ammunition of the particular pattern affected by the British Government authorities.

ERRATUM.—Our attention has been called to a printer's error which quite escaped notice in revising the proofs of the June issue. At the top of page 83, in writing of the new regulations for the revolver competition at Bisley, the rule obtaining at last year's meeting as to the revolver foresight is made to read that the foresight "must be fixed to the barrel and is capable of lateral adjustment." The latter part of this should read, "and incapable of lateral adjustment," a correction which materially alters the meaning of the context, and serves to point the comment as to the slight nature of the alteration from last year's regulation as compared with that for the coming meeting.

EXPLOSIVES REPORT FOR WESTERN AUSTRALIA, 1900.

WE have received a copy of the fifth Annual Report of the Chief Inspector of Explosives and Government Analyst for Western Australia, which deals with the year 1900, as regards the various duties entrusted to that responsible official and the working of the Explosives Act, 1895, within the limits of his supervision. Mr. Mann opens his report by stating that the list of his duties remains precisely the same as in previous years. As regards the general working of the Act, he refers again to the discovery of several weak points which call for remedy, notably in relation to the appointment of sub-inspectors and the subject of inquiry into accidents. On the whole, however, the Act seems to have worked admirably and the report suggests that its provisions appear to be acceptable to the merchants and dealers in explosives, besides, giving reasonable protection to the public. In view of the

lately inaugurated federation of the Australian Colonies, Mr. Mann is in favour of making the supervision of explosives a federal matter, with one Act and a federal inspector-general, thereby securing absolute uniformity of action throughout the different colonies. This is a subject that might well come up for serious consideration, since future developments of the explosives industry, with consequent increase of traffic between the federated colonies, makes a perfect unanimity of legislation highly desirable.

IMPORTATION.

The report has little to say with regard to incidents of an exceptional character. It has been suggested that, as regards cargo steamers lying in Gage Roads, an alteration in the regulations should be made to allow of substituting for the hand-to-hand method of working cases of explosives the system of unloading in slings, as is practised in South Africa. The Chief Inspector, however, after mature consideration, declined to recommend the Minister to alter the regulations, for reasons that seem fairly obvious. As regards the depôt for imported explosives at Fremantle, it is regrettable that from the conflict of contending interests, and on the question of the large expenditure involved, it has been impossible at present to attain the full measure of security, and that absolute perfection of organization which is desirable. The subject is by no means shelved, nevertheless, as is shown in another section of the report under notice.

Though the year 1899 established a record as regards the importation of explosives, it is far and away eclipsed by the figures of 1900, which point to a really marvellous development of the industry. According to custom, we give here in tabulated form the detailed particulars of shipments made during the last three completed years:—

	1898.	1899.	1900.
	£	£	£
Nitro-glycerin Compounds ...	66,829	77,848	131,012
Blasting Powder	3,736	1,785	7,181
Sporting Powder	118	461	668
Fuse	6,922	7,309	9,193
Rackarock	2,282	549	802
Fireworks	213	105	167
Cartridges	2,382	3,254	3,793
Detonators	2,803	4,812	4,494
N. O. E.	2	—	6
Totals	85,357	96,213	157,316

The following details give an analysis of the importation of nitro-glycerin compounds, and show with great clearness the prominent position now occupied by the gelatine explosives, as compared with dynamite No. 1.:—Gelignite, £86,479; gelatine dynamite, £25,798; blasting gelatine, £18,385; and dynamite, £350. Dynamite, therefore, has declined since 1899 to the extent of 89·54 per cent., while the gelatine explosives have increased substantially in the following proportions:—Gelignite, 45·42 per cent.; gelatine dynamite, 11·12 per cent.; and blasting gelatine, 76·20 per cent.; the total increase of nitro-glycerin compounds from the years 1899 to 1900 being 40·57 per cent. The value of the importation of blasting powder has increased 75·14 per cent. for the same period, and of sporting powder 30·98 per cent. It will be noted also that the value of cartridges imported into the colony shows a substantial increase of 17 per cent. Altogether, the increase of the value of the total importations, as compared with 1899, is 63·66 per cent.

LABORATORY DEPARTMENT.

This large expansion of trade, as indicated by the foregoing figures, has naturally involved a considerable increase in the work of the laboratory department, to the extent of 26·62 per cent., as against the record of 1899. No fewer than 1,014 samples were submitted for inspection, and so high is the standard of quality of explosives arriving in the colony, that of this total only three samples of fuses had to be rejected. This total does not, however, include a number of samples that were found to be exuding, or others that were examined for physical deterioration only.

In addition to the testing of explosives, Mr. Mann has, as Government Analyst, to undertake a vast amount of work in connection with the examination of other substances of widely differing characters. Thus, apart from the 1,014 tests of explosives already referred to, 1,229 samples of various kinds were submitted for analysis, no fewer than 46 being in connection with criminal investigations, of which ten were human stomachs and one that of a horse.

STORAGE.

During the year 15 magazine licences were applied for, nine of which were granted, while the remaining six are under consideration. Six existing licences were revoked during the same period, so that at the end of last year there were actually 43 licences in operation. The greater part of the magazines are located on the Government reserves, and are therefore under thorough and constant supervision. These reserves are still in course of extension, there being now 24 with a total acreage of 1,504, as against 22 with an acreage of 1,455 in 1899. There are 34 sites held by merchants, upon which 31 magazines have been erected having a capacity of 496 tons. Outside of the reserves there are 11 magazines having a capacity of only 26½ tons, so that the proportion outside immediate supervision is relatively unimportant, more especially since three of the number are upon Government works and are now under the control of the Chief Inspector in accordance with the agreement mentioned in dealing with the previous year's report. The two new reserves are at Grindalbie and Leonora, with an extent of 50 acres each while the reserve at Coolgardie has been enlarged from 100 to 149 acres.

The difficulties with respect to the reserve at Fremantle still seem to occasion some unusual trouble in settlement, and the Report details with some minuteness the various conditions which prevent a final adjustment. As regards the storage of explosives on mines, Mr. Mann reports that his observations go to show that the regulations which were framed on his recommendation fully meet demands, but that their complete enforcement has not been brought about as yet, especially with regard to constructive details.

SALE.

A total of 46 applications for new store licences was made during the year, in respect to which 42 were issued. The net increase for the year was 26, which is partly accounted for by the wider application of the regulations in connection with the sale of fireworks. There is, however, nothing of an unusual nature to report with regard to the sale of explosives.

INSPECTION.

An important point in law has been raised during the year, which affects the status of the sub-inspectors who assist Mr. Mann in his useful and responsible labours. A prosecution instituted at Kanowna was dismissed by the Court on the

ground that the Act did not recognise any such appointment as that of "sub-inspector," and that therefore such an official had no *locus standi* and no authority to inspect or prosecute. This decision was subsequently confirmed by an opinion of the Crown Law Department, with the result that, as the Act now stands, no one save the Chief Inspector or a police officer has the right of inspection. Mr. Mann enters a recommendation that the Act be amended to the effect that sub-inspectors be recognised, and he also desires to have a new official appointed as Travelling Inspector, who shall visit the more distant portion of the colony under his instructions, and thus bring about a more uniform observance of the Act. Another and important amendment of the Act which he submits for approval refers to the insertion of a clause giving the inspector the same right as is granted in England, to attend and sit upon inquests instituted in the case of accidents with explosives. This is certainly a most desirable amendment.

The report concludes with a warm tribute of praise to the members of the staff, who are ably assisting the Chief Inspector in his many and onerous duties.

NEW EXPLOSIVES IN COAL MINES ORDER.

UNDER date of June 11th, the Home Secretary has issued a new Explosives in Coal Mines Order, which amends the Order of September 24th, 1900. This new Order adds to the Special List of permitted explosives the following, which have passed the special test as laid down in the Home Office memorandum of October 18th, 1899:—

Aphosite, consisting in every 100 parts by weight of the finished explosive of not more than 62 parts and not less than 58 parts of neutral nitrate of ammonium, with not more than 31 parts and not less than 28 parts of nitrate of potassium, with not more than 4½ parts and not less than 3½ parts of charcoal, with not more than 4½ parts and not less than 3½ parts of wood-meal, with not more than 3 parts and not less than 2 parts of pure distilled sulphur, with not more than 1½ parts of moisture, and with no other ingredient.

Provided:—(1) That if the explosive has been compressed into a pellet the density shall not exceed 1·25; (2) that the explosive shall be used only, when in pellet form, in a wrapper of thin paraffined paper; when granulated, in a case of stout paper thoroughly water-proofed with ceresine and paraffin; (3) that the explosive, when in pellet form, shall be used with an electric fuse containing 5 grains of gunpowder, or with other means equally efficient in igniting the explosive, and that, when granulated, the explosive shall be used with the methods of ignition specified above or with a detonator or electric detonator of not less strength than that known as No. 6 (*i.e.*, the detonator or electric detonator 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); (4) that the explosive has been made at the works of the Nitrate Explosives Co., Ld. at Gatebeck, near Kendal, in the county of Westmoreland.

Cambrite, consisting in every 100 parts by weight of the finished explosive of not less than 92 parts of Nobel Carbonite hereinafter defined, and with or without not more than 8 parts of oxalate of ammonium, 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 of not less strength than that known as No. 6 (*i.e.*, the detonator or electric detonator 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 the explosive has been made at the works of Nobel's Explosives Co., Ld., at Ardeer, in the county of Ayr.

Kynite, 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 36 parts and not less than 30 parts of nitrate of barium, with not more than 39 parts and not less than 36 parts of wood-meal, with not more than 5 parts and not less than 4 parts of moisture, and with not more than half a part of chalk, 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 vegetable parchment; (2) that the explosive shall be used only with a detonator or electric detonator of not less strength than that known as No. 6 (*i.e.*, the detonator or electric detonator to be used shall possess an effective detonative strength as great as, or greaer 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 the explosive has been made at the works of Kynoch, Limited, at Kynochtown, near Stanford-le-Hope, in the county of Essex, or at Ferrybank, Arklow, in the county of Wicklow.

Nobel Carbonite, 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 4½ parts and not less than 3½ parts of nitrate of barium, with not more than 32 parts and not less than 28 parts of nitrate of potassium, with not more than 42 parts and not less than 39 parts of wood-meal, provided that the wood-meal contains by weight not more than 20 per cent. and not less than 10 per cent. 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 of not less strength than that known as No. 6 (*i.e.*, the detonator or electric detonator 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 the explosive has been made at the works of Nobel's Explosives Co., Ld., at Ardeer, in the county of Ayr.

Saxonite, consisting in every 100 parts by weight of the finished explosive of not more than 27 parts and not less than 14 parts of oxalate of ammonium, with not more than 86 parts and not less than 73 parts of a mixture consisting in every 100 parts by weight of not more than 62 parts and not less than 58 parts of thoroughly purified nitro-glycerine, with not more than 5¼ parts and not less than 3¼ parts of nitro-cotton, carefully washed and purified, with not more than 30½ parts and not less than 25½ parts of nitrate of potassium, with not more than 8½ parts and not less than 6 parts of wood-meal, provided that such wood-meal shall contain not more than 15 per cent. and not less than 5 per cent. by weight of moisture, and with not more than half a part of chalk, 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 of not less strength than that known as No. 6 (*i.e.*, the detonator or electric denonator to be used shall possess an effective detonator 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 the explosive has been made at the works of Nobel's Explosives Company, Ld., at Ardeer, in the county of Ayr.

Special Bulldog, consisting in every 100 parts by weight of the finished explosive of not more than 86 parts and not less than 84 parts of nitrate of potassium, with not more than 3½ parts and not less than 2½ parts of hydrated carbonate of magnesium, with not more than 13 parts and not less than 12 parts of charcoal, and with not more than 2 parts of moisture, and with no other ingredient, the whole being uniformly incorporated.

Provided:—(1) That the explosive shall be used only when contained in a wrapper of brown paper; (2) that the explosive has been compressed into a pellet of a density not exceeding 1·45; (3) that the explosive shall be used only with an electric fuse, containing 5 grains of gunpowder, or with other means equally efficient in igniting the explosive; (4) that the explosive has been made at the Home, Marsh, or Oare Works of Messrs. Curtis's and Harvey, Ld., at Faversham, in the county of Kent, or at their works at Roslin, in the county of Edinburgh, or at their works at Glyn Neath, in the county of Glamorgan.

Thunderite, consisting in every 100 parts by weight of the finished explosive of not more than 93 parts and not less than 91 parts of neutral nitrate of ammonium, with not more than 5 parts and not less than 3 parts of thoroughly purified tri-nitrotoluene, with not more than 5 parts and not less than 3 parts of flour, and with not more than ½ part of moisture, and with no other ingredient.

Provided:—(1) That the explosive shall be used only when contained in a case of stout paper thoroughly waterproofed with ceresine; (2) that the explosive shall be used only with a detonator or an electric detonator of not less strength than that known as No. 8 (*i.e.*, the detonator or electric detonator to be used shall possess an effective detonative strength as great as, or greater than, that of one containing 30·9 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 the explosive has been made at the works of the Carbonite Syndicate, Ld., at Schlebusch, in Germany.

Virite, consisting in every 100 parts by weight of the finished explosive of not more than 12 parts and not less than 9 parts of oxalate of ammonium, with not more than 40 parts and not less than 35 parts of neutral nitrate of ammonium, with not more than 38 parts and not less than 33 parts of nitrate of potassium, with not more than 5 parts and not less than 4 parts of pure distilled sulphur, with not more than 12·5 parts and not less than 10·5 parts of charcoal, with not more than 2 parts and not less than 1 part of moisture, and with no other ingredient.

Provided:—(1) That the explosive shall be used only in a case of stout paper thoroughly waterproofed with ceresine and paraffin; (2) that the explosive shall be used only with an electric fuse containing 5 grains of gunpowder, or with other means equally efficient in igniting the explosive; (3) that the explosive has been made at the works of the Nitrate Explosives Company, Limited, at Gatebeck, near Kendal, in the county of Westmoreland.

In addition to the special conditions detailed above, it is of course provided in each case that the explosive shall be similar to the sample submitted for test and passed by the Home Office; that each package shall be marked with full particulars as to its contents; and that the explosive, if allowed to get into a frozen condition, shall be thawed in a safe and suitable manner before use.

REVIEWS.

Emploi des Explosifs de Sureté dans les Mines Grisouteuses. Par P. Chalon, Ingénieur Civil.

This pamphlet, dealing with the use of safety explosives in mines subject to fire-damp, comprises the text of a paper presented at the International Congress of Mines and Metallurgy in June of last year. The author is of opinion that a greater number of explosions of fire-damp are due to the match than to the actual firing of the charge, and he sees an obvious remedy for this cause of accidents in the employment of electric igniters. With regard to the charges themselves, he passes in review the leading types of safety explosives now on the market, none of which as at present existing comply apparently with M. Chalon's strict requirements. He claims that they fail to give absolute safety as regards the following points: that very often the firing is incomplete, and that portions of ignited explosive are permitted to remain at the bottom of the shot-hole. This defect he attributes to faults in manufacture, defective tamping or careless fixing of the detonator. A second cause of insecurity is the projection from the hole of burning fragments of the paper cartridge or of incandescent solid matter, the explosion giving a discharge somewhat approximating to that from a gun barrel.

After pointing out the difficulties consequent on an attempt to produce really efficient explosives of a safe character, M. Chalon lays down certain conditions which, in his opinion, are necessary to secure a relatively high degree of safety: (1) By employing very powerful detonators, two grammes for example, so as to obtain without fail as complete ignition as is possible; (2) by removing the paper covering of the cartridge at the moment of its introduction into the shot-hole; (3) by

eliminating from the composition of the explosive any substance capable of producing scoriæ, or of furnishing carbonaceous or solid products by combustion; and (4) by diminishing the proportion of nitrate of ammoniac, and by increasing that of the substance, nitro-glycerine or other, which will have the effect of making the explosive develop greater energy, with greater regularity, and greater convenience of handling. It is true that this would give a higher theoretical temperature of ignition, but the author sees no inconvenience in raising it to 2,000 or even 2,200 degs. Centigrade. As to the danger consequent on a blow-out of the tamping, the author proposes to do away with the ordinary tamping and to substitute for it a wad or tamping of well-worked clay closing the orifice of the mine chamber, in such a way as to make an air space which will serve to cool down the gases. This is a system which he has adopted for 15 years with conspicuously good results.

M. Chalon devotes some considerable attention to the question of testing explosives, as regards the three recognised orders of results, of heat-producing qualities, propulsive or lateral force, and the bruising or crushing effect at the base of the hole, these three factors constituting the potential energy of the explosive when taken in conjunction. He then deals with the various appliances utilised in testing the comparative values of explosives, concerning which he commits himself to the somewhat sweeping statement that "their insufficiency is notorious; they are even capable of furnishing false results." He inclines strongly in favour of Quinan's apparatus as the most trustworthy, but he suggests that it requires modification, so as to suit it to larger charges and to all types of explosives. Throughout, M. Chalon takes a very decided tone in dealing with his subject, and displays considerable acquaintance with the minutiæ of explosives and their treatment.

Los Explosivos Empleados en las Minas. By Enrique Hauser. Bilbao: 1900.

This is a practical little treatise containing details of the most recently invented explosives employed in the mining industry, and an examination into the conditions of their application, by the consulting engineer to the "Union Minera de Espana." It is in reality a reprint of a paper read by the author before the National Congress of the mining industry which was held at Murcia last year, and consists not only of his own researches and studies of the subject, but is admittedly indebted to the collateral investigations of Berthelot, Sanford, Chalon and Tournay, to the dictionaries on explosives by Cundill, Voltelini, Salvati and Wurtz, and to various periodical publications. The recapitulation of the various explosives and their component parts is followed by a series of conclusions deduced by the author from his experience of their action, in which he suggests the class of explosives adapted for different descriptions of mining work. He makes the suggestion also that in order to avoid the confusion that must necessarily arise from the rapidly increasing number of explosives employed for mining purposes, it would be convenient to insist that all manufacturers should place on their cartridge cases a label showing the quantitative composition of the contents. The pamphlet is published at Bilbao, at the offices of the *Revista Bilbao*, a mercantile, mining, industrial and maritime paper, and the organ of the Chamber of Commerce.

APPLICATIONS FOR PATENTS.

MAY 13TH—JUNE 15TH, 1901.

9,893. Gun Mountings. A. T. Dawson and G. T. Buckham.
9,941. Targets. W. Snelgrove.
9,984* Manufacture of High Explosives. J. E. Blomén.
9,991. Temperature Controller for Explosives. D. Hickie.
10,017.* Small-arms. O. Schönauer.
10,168. Carrying Food in Rifles. W. Carter.
10,169. Range-Finder and Sighting Appliance. L. O. Beal.
10,185, Rifle Supporting Device. W. S. Simpson.
10,372. Cartridge Holder. P. Dagnall.
10,385. Rifle Loader. W. Tucker.
10,451. Targets. H. B. Sleeman. (Agent for *F. E. W. Möller.*)
10,589. Guiding of Torpedoes. J Gardner.
10,671. Frames for Targets. J. T. Spencer.
10,701. Sights. G. Foubes.
10,731. Targets. E. F. Bourker.
10,784. Manufacture of Nitroglycerine. C Helcké.
10,855.* Range and Self-indicating Target. W. McNutt.
10,901. Guns. H. T. Tanner.
11,062. Single-trigger Mechanism. L. B. Taylor. (Agent for *A. E. Lard*).
11,065. Explosives. R. Hawkins.
11,087.* Projectiles. M. Weiss.
11,108. Bandoliers. P. A. Martin.
11,125.* Percussion Fuse Igniter. R. W. Barker. (Agent for *C. Gomant*).
11,142.* Time Fuse Setting Apparatus. C. P. E. Schneider and J. B. G. A. Canet.
11,169. Targets. J. A. Stephens.
11,231. Ammunition Pouches. J. C. Robertson.
11,242. Electrical Primers. Sir W. G. Armstrong, Whitworth & Co, Ld., and G. Stuart.
11,243. Bar and Drum Sights. Sir W. G. Armstrong, Whitworth & Co., Ld., and C. H. Murray.
11,259. Sighting of Guns. R. W. Smith.
11,400.* Smokeless Powder. E. Edwards. (Agent for *W. Kent*).
11,416.* Targets. G. Tyrell.
11,425. Brakes for Ordnance. A, Reichwald. (Agent for *Fried. Krupp*).
11,549. Bandolier. T. Norton and F. R. Baker.
11,558. Inanimate Birds. D. Hames and J. F. and C. W. Pike.
11,592. Ordnance. C. Holmstrom.
11,623.* Ordnance. J. W. Kline.
11,656. Cycle Clip for Rifle Carrying. J. J. Kempster.
11,674.* Machine Guns. T. Bergmann.
11,684. Magazine Fire-arms. O. H. Edwards.
11,685. Magazine Fire-arms. O. H. Edwards.
11,711. Explosives. W. Friese-Greene.
11,850*. Field Guns. W. L. Wise. (Agent for *Fahuzengfabrik Eisenach*).
11,962. Miniature Ammunition Apparatus. T. Jones.
11,973. Cartridge Belts. P. A. Martin.
12,172. Shell Percussion Fuse. A. Reichwald. (Agent for *Fried. Krupp*).

*These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

MAY 25TH—JUNE 18TH, 1901.

COMPILED BY H. TARRANT.

3,029 (1900). **Recoil Operated Small-arms.** J. Schouboe, S. C. Jensen and A. and C. H. Christensen (all trading as Dansk Rekylriffel Syndicat) Denmark. A bulky specification accompanied by extensive illustrations, describes a new small-arm mechanism, adapted to work on the automatic principle, in which the energy of recoil is utilised to open the breech and perform the several operations necessary for reloading. The mechanism is only designed for shoulder arms. The cartridges are fed into the breech from a vertical magazine attached to the side of the action, from which the cartridges drop under the influence of gravity. Accepted May 4, 1901.

6,056 (1900). **Recoil Operated Small-arms.** A. W. Schwarzlose, Germany. A method of decreasing the weight and increasing the handiness of automatic pistols, in which the knuckle joint or link system of breech is used. Instead of the links of the joints lying behind one another, they are in this mechanism arranged to lie side by side, or overlap,

when the breech is closed. By this method the length behind the breech end of the barrel, and consequently the weight of the pistol, are decreased. Accepted May 18, 1901.

7,966* (1900). **Apparatus for Testing the Straightness of Barrels.** Florence H. Langworthy and J. Jackson, Leytonstone.

8,274 (1900). **Electrical Fuses for Blasting.** H. J. Haddon, London. (Agent for *F. E. Zünder, Germany*). An electrical fuze, which consists of a flat stick-shaped piece of cardboard, or some material which is a non-conductor of electricity. Both broad sides of the stick are covered with some conducting material, which may consist of metal paper or foil. These coverings are electrically connected at the end of the stick; and are connected so as to form a complete circuit by a globule of congealed priming, which is ignited when the current is switched on. The fuzes are made by a special method in quantities so as to bring their cost down to as small a sum as possible. Accepted May 4, 1901.

8,496 (1900). **Illuminating Projectiles.** A. B. Tubini, London. The combination with an ordinary bullet or shell of an illuminating agent which is adapted to ignite either during the projectile's flight through the air or at the end of its journey. The ignition may be caused either by concussion or by time fuse, and the illuminating agent may consist of magnesium or some such substance. The object of the illuminator is to expose the position of troops or places during the night. Accepted May 4, 1901.

8,620 (1900). **Rifle-carrying Clip for Cycles.** W. Lawson, Dundee. Detachable clips for carrying a rifle upon a cycle. The clips are secured to the cycle by means of flexible leather bands, which are laced around the tube. The butt clip consists of a shoe, which is attached to the tube directly beneath the saddle pillar, and the barrel of the rifle is carried by a U-shaped clip, which is laced to the head of the machine. Accepted May 10, 1901.

9,071 (1900). **Recoil-operated Small-arms.** H. H. Lake, London (Agent for *J. M. Browning, U.S.A.*). This specification describes a number of improvements in automatic recoil-operated small-arms. The main object of the modifications is to simplify the construction of such arms. The recoiling parts in the weapon described are housed, in order that they and the user of the arm shall be protected. The gun is designed so that it shall "take-down," that is, so that the barrel and magazine may be detached from the stocks without the use of tools for the purpose of carrying and packing. Accepted May 16, 1901.

10,239* (1900). **The Harris Magazine Mechanism.** H. Harris, London.

11,941 (1900). **Electrical Gun Training.** W. H. Scott, Norwich. A method of obtaining the full range of speed, from the lowest to the highest, with a single electric motor, for the purposes of gun training. The speed at any point is perfectly under the control of the operator, and the speed for any one position of the controller is approximately constant, although the turning movement required may vary. Accepted May 25, 1901.

12,113 (1900). **Orthoptics.** W. K. Gregory, London. An instrument designed to facilitate the aiming of rifles, consisting of a pair of spectacles in one lens holder, a vulcanite disc in which is mounted so as to rotate. A short tube, with its axis inclined inwards and upwards, is fixed to the bridge side of the disc, and at the outer end of the short tube is a revolving diaphragm, with varying sized apertures, and with corresponding notches in its circumference. A spring detent engages these notches in order to lock the diaphragm in any desired position. The object of the inclination of the diaphragm tube inwards and upwards is to make the optical axis coincident with the angle of aim. Accepted May 4, 1901.

12,326 (1900). **Sights for Ordnance.** Sir W. G. Armstrong, Whitworth & Co., Ld., and R. T. Brankston, Newcastle-on Tyne. A combined telescopic and ordinary sight so arranged that when both sights are in place they may be adjusted simultaneously, but may be used independently of each other. The telescopic sight is carried by a bridge-shaped slide fitting into a groove, and may be readily removed in order that the ordinary backsight may be used in combination with the foresight. The graduations for knots and degrees at the rear of the sight serve equally for both sights. Accepted May 18, 1901.

12,426 (1900). **Blank Firing with Machine Guns.** W. G. Hay, Liverpool. In order to adapt for blank firing the Colt or any other gun, in which the lock mechanism is worked by the lateral escape of gas, an adjustable stop is applied to the muzzle. The passage of the gases is thus throttled more or less, so that for a time the gases are maintained at a pressure sufficiently great to work the mechanism. In order to render the blank cartridges suitable for being fed by the usual mechanism, hollow wooden bullets take the place of the ordinary bullets. These wooden bullets are smashed up into pieces on meeting the stop at the muzzle. Accepted May 11, 1901.

12,443 (1900). **Cross Wires in Telescopic Sights.** A. A. Common, Ealing. A simple method of fixing cross wires in telescopic sights so that they shall be securely held and so that they may be easily replaced if broken. The face of the diaphragm is grooved where it is intended the wires should be. These grooves are so cut that when the wire is laid therein about half of it stands above the surface of the diaphragm. A metal plate fastened to the diaphragm by screws grips the wire and holds it. One end is first fixed in this manner, and the proper tension is obtained by attaching a weight to the free end of the wire to pull it tight whilst that end is being fixed. Accepted May 4, 1901.

13,584 (1900). **Sighting of Ordnance.** A. Reichwald, London (Agent for *Fried. Krupp, Germany*). A sighting device, which may be used equally well for direct sighting and also for indirect sighting. It consists of a telescopic attachment, the telescope of which is so connected laterally and adjustably to the attachment bar, that when the gun is fixed the telescope may be brought to bear upon any target within the field of range. Accepted May 18, 1901.

14,695 (1900). **Safety Device for Repeating Arms.** F. Neuber, J. Tambour, and C. Colbert, Austria. A safety device for use with repeating small-arms, consisting of the lever pivoted in such a position on the stock that not until the firing hand presses it inwards is the hammer unlocked. The lever has two ledges, which, with a revolver, lock the hammer both when cocked by the trigger or by the hand. Accepted May 25, 1901.

19,333 (1900). **Magazine Rifle.** O. Imray, London (Agent for *F. J. Carr, Victoria, Australia*). New mechanism for magazine rifles of the bolt-action type is described, which is so designed that there shall be few working parts, the construction shall be simple, and so the liability of action to get out of order shall be lessened. Special attention has been paid to the prevention of discharge except when the bolt is in its closed and locked position. Accepted May 4, 1901.

102 (1901). **Magazine Mechanism.** R. Kjellman and G. L. Anderson, Sweden. A method of effecting an easy insertion or withdrawal of the cartridge carrier in a rifle magazine, by arranging it to work in conjunction with a spring described in this patent. The spring consists of a broad base, which fits into two notches on either end wall of the magazine box, where it is held up by its own spring power. Two crossing flat springs, which form part of the base, press upwards on to the bottom of the carrier. The spring may easily be removed by the thumb. Accepted May 25, 1901.

103 (1901). **Automatic Small-arm Breech Mechanism.** R. Kjellman and G. L. Anderson, Sweden. A means of insuring the proper guidance of the cartridges into the barrel of recoil-operated firearms. The operations being performed so rapidly, the patentees provide parts which bring the top cartridge from the magazine and hold it in its proper position in front of the chamber. The cartridge, when forced up from the magazine, is taken hold of by yielding lugs actuated by the mechanism casing. These lugs hold the cartridge top, bottom and side, so that it cannot deviate from the straight path into the barrel. Accepted May 25, 1901.

286 (1901). **Recoil-operated Small-arms.** Count G. H. R. Hamilton, Sweden. In automatic pistol mechanism, the recoiling breech bolt has a curvilinear form, and is adapted to move in a correspondingly curved guide, the guide forming the butt of the pistol. Several advantages are claimed for this construction, the principal, perhaps, of which is that the shock of recoil is reduced to a minimum by the curvilinear deviation of the bolt from the longitudinal axis of the bore. Accepted May 11, 1901.

533 (1901). **Sights for Ordnance.** H. Korrodi, Switzerland. A tangent scale for ordnance sighting carrying the level at the scale head, by which, for obtaining a legible graduation of the scale of inclination coinciding with the tangent scale and a fine adjustment of the level, the level carrier is guided in at least one arc-shaped groove of the tangent slide. The carrier forms a toothed arc, the teeth of which engage a geared mounting to revolve in the tangent scale head. By this means the centre of curvature of the arc-shaped groove lies

outside the tangent slide or scale head. Accepted May 4, 1901.

2,202 (1901). **Lock Mechanism of Small-arms.** C. P. Clément, Belgium. The construction of a simple lock mechanism which shall not be liable to get out of order, and which may easily be taken apart and reassembled. The hammer and sear are both attached to the limb which takes the place of the ordinary cocking dog. The opening and closing of the gun turns the cocking lever hammer and sear into the cocked position. The pivot of the hammer is automatically lowered, so that a longer range and consequently greater striking power is imparted to the hammer. Accepted May 4, 1901.

4,300 (1901). **Recoil Apparatus for Ordnance.** C. P. E. Schneider and J. B. G. A. Canet, France. On one or more chambers or hermetic envelopes, closed by flexible partitions and containing some elastic fluid under pressure, are inserted in the liquid recoil chambers of the gun. The piston driven back by the recoil causes the outside liquid to compress still more the fluid within the envelopes. The return of the elastic fluid at the completion of recoil reacts upon the outside liquid, thus causing the piston to return the gun to battery. Accepted May 11, 1901.

4,703 (1901). **Gun Carriages.** K. Haussner, Germany. A light field gun carriage, of tubular construction, designed more particularly for guns having a high angle of fire. The construction of the carriage, combined with the fork-shaped trail, allows of a high elevation and large recoil. In order to allow for a more direct backward recoil, the carriage may be built so that it may be telescopically extended to form a smaller angle with the axis of the gun's recoil. Accepted May 11, 1901.

5,354 (1901). **Cartridge Clip.** G. Roth, Austria. A clip designed to hold the cartridges firmly, in which a spring bent in cross section convex towards the flanges of the clip is, at the centre of its trough-shaped length, attached to the bottom of the clip frame. The sides of the whole length of the spring press the cartridges firmly up against the inner surfaces of the clip flanges. Accepted May 4, 1901.

5,632 (1901). **Apparatus for Moulding Projectiles.** A. J. Astbury, Smethwick. A pattern from which cylindrical projectiles are moulded, having raised bands on their exterior surfaces. The pattern is so constructed that the raised band is caused to recede within the pattern so that the pattern may be withdrawn bodily from the moulding sand, leaving the impression intact. Accepted May 4, 1901.

6,602 (1901). **Breech Mechanism of Ordnance.** P. M. Justice, London. (Agent for *The Bethlehem Steel Company, U.S.A.*). Breech mechanism for ordnance, in which the screw-box and the breech-block are provided with threads, the faces of which threads coincide with involute curves or are composed of a succession of relatively eccentric circular arcs. Thus the threads make contact throughout their entire length when the breech is closed, and the threads on the block are parallel to those on the box when the block is in its unlocked position, and there is, therefore, a uniform and a least possible clearance. Accepted May 18, 1901.

6,923* (1901). **The Hughes Single-trigger Mechanism.** H. Hughes, London.

7,323 (1901). **Projectiles.** W. F. Cole, U.S.A. A method of increasing the velocity, range and accuracy of flight of projectiles, by giving them an elliptical cross section throughout their length. The projectile is twisted to conform to the bore of the gun, and is tapered towards its point, which is constructed with a thin edge having a reverse curve. The rapidity of rotation, it is claimed, is maintained and even increased in flight, whilst the resistance of the air is reduced to a minimum. Accepted May 18, 1901.

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

SELECTED PATENTS.

THE HARRIS MAGAZINE MECHANISM.

10,239 (1900). H. Harris, London. The magazine mechanism described in this specification is applicable to rifles of the bolt type having a magazine of the box description. By means of a lever easily accessible to the thumb of the left hand when that hand is in position on the forepart of the rifle, the platform of the magazine may be drawn down to the bottom of the magazine box, so that the cartridges may be dropped loosely into the open magazine wherein they arrange themselves. The use of a clip or band is by this means obviated.

In the illustrations appended the mechanism controlling the magazine platform *a* is shown on the extension *b* of the trigger-guard *c*. The platform *a* is provided with the lugs *d*, between which the upper end of the lever *e* is pivoted. The lever *e* is again pivoted at its lower end at the point *f*, and the slotted end of this lever engages a pin *g* projecting from the end of the laterally-bent bar *h*. The bar *h*, which is cut square in order to prevent it turning, is screwed on to the bolt *i*, which is operated by the thumb-lever *j*. The spring *k* always tends to urge the bolt *i* in a direction towards the muzzle. The lever *j* is fixed to the horizontal pin *l*, which works in bearings,

Fig. 1

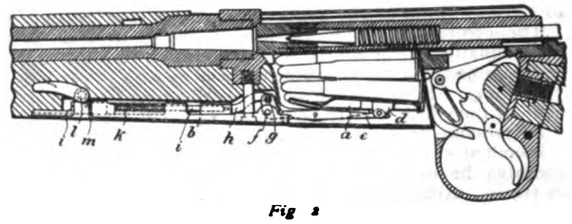


Fig 2

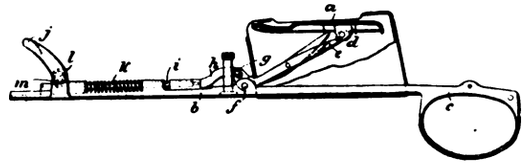
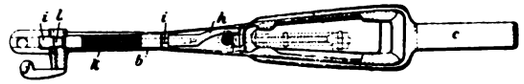


Fig 3



as illustrated, in the projections standing up from the extension *b*. A dog *m*, forming part of the pin *l*, works in a notch in the bolt *i*. It will be easily understood that when the lever *j* is pressed downwards, the bolt *i* is impelled backwards against the pressure of the spring *k*, and the lever *l* is thus turned on its pivot, with the result that its platform end is depressed, and the platform *a* itself is carried down to the bottom of the magazine box. The cartridges may be thrown into the magazine with the platform thus removed, and without any trouble gravity arranges them in their positions. Accepted May 25, 1901.

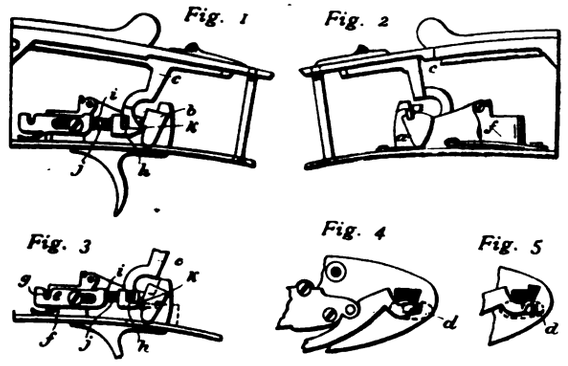
THE HUGHES SINGLE-TRIGGER MECHANISM.

6,923 (1901). H. Hughes, London. A modification of the single-trigger mechanism (patented in Specification No. 9,891, 1899, by G. F. Whitby, London), to which we referred fully in our issue of June, 1900, is described in the present patent. The modification consists in the attachment of new limbs, the objects of which are to convert the prior mechanism into one of the "selective" type. The modified arrangement allows the parts to be turned over from the normal order of firing, *i.e.*, right barrel first and then left, so that the left barrel may be fired first and then the right, by shifting a stud on the right-hand lock-plate.

Referring to the drawings it will be seen that the mechanism principally consists of two harp-shaped cams *a* and *b*, which work on either end of a shaft running through the trigger-blade. These cams are raised alternately during the firing operation, so that either one or the other is beneath its corresponding sear. In the prior mechanism they always had to operate in the right first and then left order, and with the selective mechanism attached the right and left firing operation is practically the same. The right-

hand cam *a* is turned up into the vertical position by the depression of the left-hand cam *b* during the opening of the gun by the leg *c*, which projects downwards from the safety slide. In this position it is held against the pressure of a spring by the safety-sear tail, which engages a notch in the top of the cam. The first pulling of the trigger raises the right-hand sear and fires that barrel. The sear is retained in its raised position by the fallen hammer, and the cam is thus free to be thrown forward to a horizontal position by the spring situated beneath it. This falling of the cam *a* turns the shaft running through the trigger-blade, and brings the left-hand cam *b* into its vertical position beneath the left-hand sear, and the second voluntary pull upon the trigger fires the left-hand barrel.

In order to switch the parts over so that the left barrel is the first discharged, the slide *d* (shown in dotted lines in Figs. 3 and 4) is pushed towards the breech of the gun. This movement raises the safety sear tail and so releases the cam *a*, which is at once depressed by its spring. The left-hand cam *b* is thus brought into position. When the left-hand barrel has been fired the left-hand cam *g* is depressed and the right-hand cam is brought into position by the slide *e* working on a pin attached to the box *f*. The stud *g* working in the vertical slot in the end of the slide is attached to the toe of the left-hand hammer. The falling of this hammer during discharge imparts a backward movement to the slide *e*, and this movement of the slide causes the sear *h* through the spring *i* work-



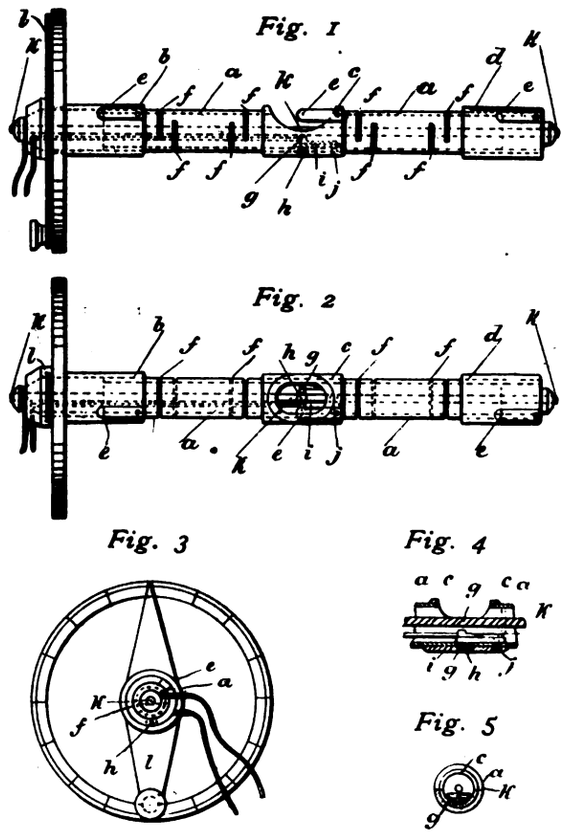
ing on the neck *j* of the slide to engage the bent *k* in the left-hand cam *b*. Not, however, until the pressure upon the trigger has entirely ceased is the spring allowed to exert its influence to depress the cam through the engagement of the sear *h* with the bent. Simultaneous discharge of both barrels is prevented by the subsequent backward movement of the sear to the movement of the slide. The right-hand cam is thus by the operation of the slide turned into its operative position, and is there retained, until discharged, by the safety sear tail. Accepted May 18, 1901.

APPARATUS FOR TESTING THE STRAIGHTNESS OF BARRELS.

7,966 (1900). Florence H. Langworthy and J. Jackson, Leytonstone. The apparatus described in this patent is designed so that the straightness of a gun or rifle barrel may easily be tested. If the barrel being tested is not straight, then it is possible to ascertain by means of the apparatus the extent and position of the bend. Any known method is used in conjunction with this finding-rod, as it is called, to straighten up a barrel.

The drawings appended illustrate the device, which consists of a metal tube *a* adapted to enter the barrel. At each end of the tube, and also in the middle, raised portions *b*, *c*, and *d* are formed. The surfaces of the raised parts are held against the interior surface of the barrel by the springs *e*. Sometimes a flat is cut upon each of the raised parts, so that the edges of the flats shall obtain a steady seating against the barrel. Between the raised parts, the tube *f* is transversely saw-cut as illustrated, so that although connected, the part *b*, *c*, and *d* may act, to a certain extent, independently of each other, the flexibility imparted by the cuts allowing the tube to bend slightly. Within the central-raised part *c*, a piece of metal *g* (Figs. 4 and 5), called the plateau, is transversely fixed, so that its height may be regulated in relation to the diameter line of the tube by the screw *h*. The plateau is insulated and attached to the spring *i* (Fig. 4), which is secured by the screw *j*. It must be understood that the insulation is necessary since it is by electrical contact with another part that the plateau is enabled to record through a bell where the bend occurs within the barrel being tested. The part with which the plateau makes contact is the rod *k*, which runs through the centre of the tube, and is suspended only at each end at the ends of the two raised parts *b* and *d*.

When it is desired to test the straightness of a barrel, the instrument is taken, and the three raised pieces are brought exactly into



line by means of a couple of long straight edges. The plateau *g* is then raised by the screw *h* until it is just off contact with the rod *k*. In this position of the different parts, the instrument is placed within the barrel and is therein revolved. Should the barrel be straight the bell remains silent; but if it is bent then the tube is bent also, and the pressing up of the plateau *g* on to the rod *k* makes contact and causes the electric bell to start chattering. The amount that the barrel is out of straight is ascertained by means of the loose indicating handle *l*. Contact, of course, is made only when the plateau is forced upwards on to the central rod *k*, so that the bell only rings during a portion of the instrument's revolution within the barrel. The moment the bell commences ringing the handle *l* is held still by the operator until the bell again becomes silent. From the distance-measurement shown on the dial, which is the distance the instrument has revolved from the stationary indicator whilst the bell was ringing, the amount of the bend is determined. Accepted April 30, 1901.

VOLUME VIII.

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CONTENTS.

CURRENT TOPICS.

Ammunition at Bisley.—An ingenious correspondent of one of the daily papers has discovered that at the recent Bisley meeting no fewer than 1,028,000 rounds of ammunition were expended, and from this base-fact he obtains a number of comparisons. Assuming the weight of "the average cartridge" as one ounce, the competitors at Bisley shot away the avoirdupois of a dozen ordinary elephants averaging two-and-a-half tons a piece. Turning from weights to measures, we are told that, if stacked, these cartridges would form a solid (?) column 20 ft. high and 5 ft. square, or if they were put end to end they would form "a sort of rod" which would reach from London to Brighton. This correspondent has further calculated that since the cartridges were fired at different ranges, varying from 200 yards to 1,000 yards, the total distance shot over by the 1,028,000 cartridges would exceed the 240,000 miles separating the earth from the moon. We have not had time to verify these interesting calculations, but no doubt they are as accurate as most of the information conveyed in the same form, and it must be obvious to the meanest observation that they are of quite incalculable value.

The Risks of War.—So much has been made in some quarters of the considerable loss of life incurred during the war in South Africa, that it is by no means unpleasant to look at the certainly regrettable "butcher's bill" from another standpoint than that of mere numbers. In the first place, there is an airy fashion of speaking about "casualties" as if that term indicated actual loss of life, which is far from being the truth. Even in the mere figures, there has often been gross exaggeration. Certain M.P.'s were referring to a total of 70,000 casualties at a time when the official figures did not reach 50,000, and implying that this meant the "loss of many tens of thousands of valuable lives." We have not at hand the very latest returns, but at that time the casualty list only reached the smaller total given above, and the actual deaths did not greatly exceed 4,500. Assuming that 260,000 troops were in the field at that period, a simple actuarial calculation shows that of an equal number of civilians living at home, at least 1,700 would have died in the ordinary course within an equal number of months. The risks of the soldier in the field are, in fact, somewhere about in the ratio of 5 to 2 as compared with the probability of death of the average civilian, which, it must be admitted, is not excessive. If we compared the soldier's risks with those of civilians engaged in some of what are known to the insurance companies as dangerous occupations, we should find that the chances were very nearly equal. Of course, that is taking the chances as evenly distributed, but it might so happen that a soldier incurred all his risks within a comparatively short space of time—perhaps in a matter of hours, or even minutes. As regards the number of "casualties," any computation is altogether misleading which does not allow for the fact that the greater proportion of wounded men have since returned to duty. The conclusion that is irresistibly forced upon us is, that war is far more humane now than at any former epoch in the world's history, and that the great developments that have come about in death-dealing weapons have been neutralised by improved systems of tactics, and partly by the great advance that has been made of late years in surgical science,

A New American Gun.—The U.S. correspondent of a provincial paper has sent to his journal the particulars of a new piece of ordnance which is apparently about to be put on its trial. So far as can be judged from the account before us, it is a 4¼-in. quick-firer, using a 55-lb. shell and a charge of 26 lbs. of powder, and is built up of wire. At least, that last item is the interpretation we put upon the statement that "the tube and main foundation of the body of the gun are composed of curled steel sheets, one-seventh of an inch thick, ten miles of which are needed in the manufacture of one rifle. This method (*sic*) will withstand the hitherto unheard-of pressure of 96,000 lbs. to a square inch." We are also told that the shell has a "speed velocity"—whatever the tautology may imply—of nearly 4,000 feet per second, and a striking velocity of 1787 feet, a sufficient force to penetrate 5 inches of hardened steel. Needless to say, this wonderful gun is to have a range nearly twice as great as that of any existing gun, its extreme range being put at 24 miles, with a maximum elevation of 45 degrees, this giving a height of trajectory of ten miles. The time of flight of the projectile will be 1 min. 48 sec. Apparently, the U.S. War Department are about to try a new gun, but how far the journalistic imagination has been fed by official estimates, and how far it has soared unaided, is a problem that remains to be solved.

Gunpowder and Rain.—One by one our most cherished delusions are being swept away. The Weather Bureau of the United States is now committed to a statement that the idea of controlling the weather by artillery discharges is a fallacy. They say:—"The great processes going on in the atmosphere are conducted on too large a scale to warrant any man or nation in attempting to control them. The energy expended by Nature in the production of a hailstorm, a tornado, or a rain storm, exceeds the combined energy of all the steam engines and explosives in the world. It is useless for mankind to combat Nature on this scale." We were not previously aware that mankind had any intention to combat Nature on any scale, but all the same we fail to follow exactly the line of thought which the Weather Bureau is mapping out. There can be no dispute as to the fact that a common or field fly is inferior in muscular power to the average bob-tailed bull, yet it is possible for one small fly to develop a considerable amount of explosive energy in a bovine herd. Probably the Weather Bureau is too busy from day to day in the attempt to reconcile its published forecasts with the actual state of the weather, and in foretelling with approximate accuracy the probability of "unsettled" conditions in the future, to have remembered that "Great events from little causes spring." At all events, the dictum of the Weather Bureau of the United States will probably not discourage those evidently misguided persons in the wine-growing districts of France and Italy who are busy in the installation of specially-designed howitzers wherewith to bombard threatening hail storms. Even weather prophets are not always infallible.

NAVAL ORDNANCE.

ONE of the papers read before the summer meeting of the Institution of Mechanical Engineers, which is being held this year at Barrow-in-Furness, was contributed by Lieutenant A. Trevor-Dawson, on the subject of naval ordnance. The author pointed out that gun-power must always be a dominant factor in naval warfare, and that the especial need of any navy was for quick-firing, high-powered guns, well-protected by armour of the highest resisting quality. He showed that this requirement had not always been prominently brought forward in our own service, and that even in quite late years a considerable number of vessels had been built which were already out-classed owing to the constant and rapid increase in the energy of guns.

As an instance of the truth of this statement, he compared the armaments of H.M.S. *Diadem*, which was launched in 1896, and of H.M.S. *Hogue*, a vessel of practically the same size, but launched four years later. He said:—"The basis of comparison is the most accurate one of the striking energy which the guns develop when utilized to the best advantage in a given time. For this comparison the velocities of the 6 in. gun of the *Diadem* and *Hogue* are assumed to be respectively 2,150 ft. and 2,550 ft. per second, giving energies, at 3,000 yards range, of 1,416 foot-tons and 1,996 foot-tons, and the velocity of the 9 in. gun is 2,720 ft. per second representing an energy of 11,564 foot-tons at 3,000 yards." The author then summed up the efficiency of the two cruisers in the following manner, assuming them to be engaged in a duel at a range of 3,000 yards:—"On first class cruiser *Diadem*, launched in 1896.—Sixteen 6 in. guns with a muzzle velocity of 2,150 f.s., and firing at the rate of seven rounds per minute, will give a total energy—158,592 foot tons. Total energy, 158,592 foot-tons. On armoured cruiser *Hogue*, launched in 1900.—Twelve 6 in. guns with a muzzle velocity of 2,550 f.s., and firing at the rate of nine rounds per minute, will give an energy of 215,568 foot-tons; and two 9·2 in. guns with a muzzle velocity of 2,720 f.s., and firing at the rate of 3½ rounds per minute, will give an energy of 80,948 foot-tons. Total energy, 296,516 foot-tons." Of course, this calculation takes no account of the 12-pounder guns and others of less calibre, which would have little practical effect in determining the issue of an action at long range. Lieut. Dawson proceeded to show that while the above calculation was based upon the assumption of both vessels using Cordite, it would be possible to employ a nitro-cellulose powder in the more modern guns of the *Hogue*, making its energy 351,706 foot-tons, as against the 158,592 foot-tons of the *Diadem*.

In the course of his lecture, Lieut. Dawson touched upon a variety of interesting topics. He reviewed the various types of breech-mechanism, and the influence of different systems in affecting the form of the obturator, which incidentally led him to contrast the metallic case system with that of the plastic pad. With regard to the working of big guns, the author inclined most towards the use of hydraulic power in preference to electricity, compressed air or steam, and he urged that for cruisers having twin quick-firers in barbette mountings fore and aft, the mountings should be separate so as to secure independence of action in loading. He commented with approval on the recent change made by the Admiralty in the armament of the six cruisers of the *Monmouth* class, which are to have 7.5 in. quick-firers for their main armaments in place of the hitherto usual 6 in. calibre of gun. The author raised a certain number of controversial questions on different subjects, more especially in the later sections, which dealt with the ammunition most suitable for modern naval guns, his views on the relative efficiency of various types of explosives being well-known in that connection.

VIBRATIONS OF RIFLE BARRELS.

MR. A. MALLOCK recently prepared a paper on the above subject, which was communicated to the Royal Society by Lord Rayleigh, F.R.S. The greater part of the notes from which the paper was compiled were made some two or three years ago, before the interesting experiments carried out by Messrs. Cranz and Koch of Stuttgart; but the author has since revised his original notes so as to render it possible to compare results to some extent. It may be stated at once that Mr. Mallock's treatise is almost entirely mathematical in its direction, and bristles with formidable-looking formulæ, which there is no intention to transcribe in these pages. On the other hand, it should prove of interest to refer briefly to certain of the points raised in what is evidently a most painstaking and carefully-thought-out monograph.

The late Mr. W. E. Metford is generally accepted as being the first observer of the known deviation in the direction of flight of a rifle bullet from the axial line of the bore, as fixed at the first moment of igniting the charge, who, at the same time, was able to point out the origin of this deviation by means of experimentation. He discovered that the change of direction of the bullet was due to a "flip" or "jump," which had for its main cause the unsymmetrical position which the mass of the rifle stock occupied in relation to the axis of the barrel, and by experiment he found that if the initial direction of the bullet passed below the apparent direction of aim when the rifle was held in the ordinary position, it would be high with the rifle held upside down, and to the right or left if the plane of the stock were horizontal, and the stock itself to the left or right of the barrel. Mr. Metford showed, in fact, that the direction of the bullet on leaving the barrel lay on a cone, having for its axis the barrel at the instant before the ignition of the powder, and in a plane containing the axis of the barrel and the centre of gravity of the rifle. Further, he attributed this deviation to the action on the barrel of a bending couple, which is due to the fact that the direction of the force causing recoil does not pass through the centre of gravity of the rifle.

To put it in Mr. Mallock's own words, the problem of "jump" may be stated in mathematical phraseology thus:—"An elastic tube, to which a mass is unsymmetrically attached, is subjected for a given time to a couple of arbitrary magnitude. Determine the subsequent motion." An initial difficulty presents itself owing to the somewhat complicated "system" of which a rifle consists, and the need to determine what are the natural modes of vibration of such a "system," and their natural periods. These have to be ascertained by experiment, so as to discover more especially the periods and the number and position of the nodes. Of course, these factors would be greatly simplified if the "system" could be represented by a uniform rod, for the solution might then at once be expressed in symbols, since the theory of the transverse vibration of rods and tubes is well known. Moreover, in a rifle, the point of application of the couple is settled by the nature of the connections between the stock and the barrel, and it is a matter of considerable difficulty to make certain how the strains are distributed. For example, the various connections between stock and barrel each exercise their separate influence, and the more so since, though the actual maximum, or chamber pressure, in the barrel is well known for different small-arms and their corresponding ammunition, there is not the same definite knowledge of the curve of pressure in terms of the travel of the bullet along the barrel, and variations in this factor exercise considerable influence in the reduction of the problem to exact figures. In effect, it is found that the direction of the bullet's flight differs from the continuation of the axis of the bore by an amount depending on the ratio of the transverse linear velocity of the muzzle (due to vibration) to the muzzle velocity of the shot. Mr. Mallock found that a series of calculations made with the Lee-Enfield rifle as his example gave results very closely approximating to observed deviations obtained by actual trial, any differences being probably due to the uncertainty of the positions found for the nodes in the neighbourhood of the breech, and the small number of terms completed, as well as to the doubtful approximation of the pressure curve.

If ammunition were of a known and absolute uniformity, the question of "jump" would be of little relative importance, since it would also be uniform and could be allowed for. But even in our Service ammunition there is sufficient variation conveyed in the allowed difference of velocity of + 40 feet per second, to alter materially the factors on which "jump" depends, and in reality, with this particular rifle and ammunition, the variation of jump under these conditions is found to have a compensating and corrective action, as was noticed by Sir Henry Halford.

With regard to the deductions which may be made from the inquiry into the conditions governing the vibrations of rifle barrels and the consequent "jump," Mr. Mallock finds more especially that in the design of a rifle it is most important to consider the relations between the explosion force and the natural periods of the rifle, regarded as an elastic structure. He thinks that the compensating effect mentioned above might be made of more use than is the case at present, and for this purpose he urges that the explosion curves for various classes of ammunition, and the variations to which they are liable, should be accurately determined, while the proportions and length of the barrel, and its mode of attachment to the stock, should be so arranged with regard to the nodes of the "system" as to make the two variable factors of "jump" and initial velocity act in concert to balance, as far as possible, the alteration in trajectory which would otherwise be effected by virtue of the altered initial velocity.

There is another form of "jump" which is experienced with the Lee-Enfield rifle to a somewhat remarkable degree, to which the author of the paper under review alludes in a foot-note. This deviation takes place in a lateral direction, and is due to the pressure of the powder gases acting on an unsymmetrical breech-bolt. It was apparently noticed primarily in the early Gras breech-loader of 1874 or thereabouts, which was rifled with a right-hand turn expressly for the purpose of causing the drift due to the rifling and the divergence due to the unsymmetrical breech-action to counteract one another, and this effect was said to be obtained at a range of 1,000 metres. The existence of this disturbing influence as regards the breech-action of the Lee-Enfield is but one of the many defects of our makeshift, patchwork Service-rifle, which it is to be feared that the Small-arms Committee will fail to remedy by resort to the drastic measure of starting out *de novo* in the design of a weapon worthy of the prestige of our "few but fit" army.

GUNNERY IN THE NAVY.

SINCE the appearance of our last issue, fuller and corrected details are to hand as to the very remarkable scoring which was made at Wei-hai-wei on June 8th in the annual prize-firing of H.M.S. *Terrible*, commanded by Captain Percy Scott. It appears that the earlier reports credited this ship with two more hits from its 6 in. guns than were actually attained, and the percentage is therefore correspondingly reduced, but all the same, the performance establishes quite a noteworthy record, beating the same vessel's record of last year by several points and in more than one particular. Moreover, not only have the gun crews of the secondary armament achieved wonders, but the two big 9·2 in. guns fore and aft have also established records which beat the best achievements of the 6-inch guns on other vessels, and afford a somewhat startling revelation of the grim possibilities that may be brought about in an engagement of the future by the greater attention of one vessel or squadron than another to the important item of gunnery practice. How much the result is due to the initiative of the commanding officer is evident by noticing the particular instance of Captain Percy Scott. In 1899 he commanded H.M.S. *Scylla*, which established a record of 46 per cent. of hits with the 6-inch gun, and 80 per cent. with the 4·7-inch gun. In 1900 he was transferred to H.M.S. *Terrible*, which promptly produced new records of 60 per cent. of hits with the 9·2-inch gun, and 76·8 per cent. with the 6-inch gun. This year, the same "skipper" and the same ship have scored 64 per cent. of hits with the 9·2-inch gun, and 79·7 per cent. with the 6-inch gun.

But there is also a time element which is not without its importance. Battles will be settled in the future, as in the past, not only by the ship or ships whose crews can shoot the straightest, but also by those who can discharge the greatest weight of metal in the shortest space of time. The record of the *Scylla* with its 4·7-inch guns, in 1899, was an average of 4·6 hits per gun per minute. Last year the *Terrible* with its 6-inch guns had an average of 3·33 hits per gun per minute. This was well ahead of any other vessel's record with that calibre of gun, but Captain Scott was still not satisfied. He thought that the loading was too slow, and since then the gun's crews have had an amount of practice in handling their guns and ammunition that has produced most satisfactory improvement. This year's record for the 6-inch guns is an average 4·2 hits per gun per minute, which is nearly four times the average number of hits for guns of this nature in H.M. service. And the 9·2-inch guns were proportionately successful, the average of the two being 1·1 hits per gun per minute, which is the average of the fleet generally with the 6-inch quickfirer. The after 9·2-inch, indeed, gave a most wonderful performance, 12 rounds in 6 minutes, scoring 9 hits, or 1·5 hits per minute. At that rate, how long would the *Terrible* take to sink an opposing cruiser?

Prior to the prize-firing, the gun crews had received daily practice for many weeks with the "dotting" machine and an extemporised loading apparatus, which bids fair to become a necessary fitting on all vessels, judging by its success. The "dotting" machine is fixed to a gun, and is of especial use in training men to keep their sights always on an object, independently of the rolling of the ship, and in conjunction a Morris tube is attached to the gun, and the whole apparatus aimed at an oscillating target, so that the men can actually see the results of their sighting. The loading machine is also a very practical trainer, though it consists of nothing but a breech-block attached suitably to a perforated plate, which represents the breech face, and which has fitted to it a sort of channel or gutter-way to take the place of the gun chamber. This simple appliance is, all the same, an excellent method of training men to handle the ammunition smartly, as the above-recorded results abundantly testify.

The target employed at the prize-firing was of standard Admiralty dimensions, but of an improved pattern devised by Captain Scott, the difference consisting in the fitting of only two masts instead of the regulation three. This change was made in consequence of the frequent shooting away of "sticks" last year, when no fewer than 11 had to be replaced by the *Terrible* alone. Strangely enough the elimination of one mast in this year's target seems to have safeguarded the other two. At all events, they remained intact throughout the firing. The canvas was triced out from each corner, and no spreaders were used. After each run of two minutes duration for the 6-inch, and of six minutes for the 9·2-inch guns, a new canvas was provided, so that each gun made its own separate target. According to the regulations two independent umpires must witness the firing; but this year the *Terrible* invited five, and had, in addition, two of its own officers specially detailed to assist in verifying the times and marking. This increase in the number of witnesses was partly, no doubt, due to the fact that after last year's record there was a quite unfounded doubt expressed in some quarters as to the correctness of the results. Needless to say, the present year's performance amply confirms the figures of 1900.

As regards the performances of individual guns, the 9·2-inch guns in the fore and after barbettes scored 50 and 75 per cent. of hits respectively. Three of the 6-inch guns, Nos. 1, 3, and 7, scored 100 per cent. each. The regulation was that two men at each gun were given a minute each, and ten men each scored 100 per cent. of hits. One man, especially, fired eight rounds and scored eight hits in his 60 seconds, which is a record that will take some beating. The remainder consisted of 2 sixes, 5 fives, 1 four, and 1 three.

Altogether 28 men took part in the trials, two to each of the two 9·2 guns and of the 12 6-inch guns. At the conclusion of the firing congratulatory signals were made by the ships in harbour, and the umpires and Captain Scott himself bestowed a well-earned meed of praise on the gunnery-lieutenant, Lieut. Maurice Woollcombe and his staff for the excellent results achieved. There can be no doubt that H.M.S. *Terrible* bids fair to be this year's holder of the cup offered by Admiral Seymour, to which allusion was made in our last "Incidental Jottings."

To show further what individual effort can accomplish in quickening the efficiency of a crew, a brief mention may be made of the prize-firing of another vessel on the China Station. Captain Sir G. Warrender, of H.M.S. *Barfleur*, is second only to Captain Percy Scott in his desire to promote rapid and accurate shooting, and last year this vessel fired 111 rounds, scoring 44 hits. This year the gunnery-lieutenant is one of the *Scylla* men of 1899, and with his aid the *Barfleur* has crept up to 159 rounds and 114 hits with her ten 4·7-inch guns, and 47 rounds and 23 hits with her four 10-inch barbette guns. The average rate for the 4·7-inch guns was 5·7 hits per gun per minute, as compared with 2·3 last year; and she incident-

ally beats the previous highest record with that calibre of gun made by the *Scylla* in 1899, when she averaged 4·6 hits per gun per minute.

NOTES.

INDIAN ORDERS FOR GERMANY.—The news comes from Berlin that the Indian Government has placed orders with the Ehrhardt and Krupp companies for a number of batteries of machine guns. Some proportion of the guns will be fitted, so we are informed, with a new type of limber and carriage, which will render them suitable for work in mountain campaigns, this being a class of work to which they may be generally liable on active service in India. If this report be true, it seems that the manufacturers of warlike munitions in this country are still unable to deal with current orders, or is there some other reason for giving wholesale orders to foreign firms?

REDUCED PRESSURE AT WOOLWICH.—It appears that the high pressure of work at Woolwich Arsenal, which was occasioned by the requirements of the South African war, is now showing signs of abatement. This is no doubt satisfactory news to the ratepayer, but whether it is equally agreeable to the several hundreds of workmen who are now in process of being dispensed with is another matter. Already there has been a great reduction made in the staff employed during nearly two years, and there is every indication that the establishment may shortly be brought down to its normal peace footing. The shell and small-arms ammunition departments especially have for some time past been working ahead of the war requirements, and have produced an immense amount of material for store, so that with the reduced calls from the front, it should be quite possible to maintain stocks at the present level without keeping up the high pressure that has ruled for the many months of this last "little campaign."

CHANGES IN GERMAN ARTILLERY.—In order to keep abreast of other countries, Germany has now in contemplation a complete reorganisation of its artillery, so far as field guns are concerned. The quick-firing type of gun adopted about four years ago is to be overhauled and supplied with a new recoil brake on the hydro-pneumatic principle, somewhat after the style of the fittings now in use in the French artillery. This refitting of the whole of the field guns will involve a total expenditure amounting to some million of pounds, and will be extended over a period of several years. Meanwhile, the Seventeenth Army Corps will, during the forthcoming manœuvres, which are to be held at Dantzic, make a trial of the new 75-millimetre Krupp and Ehrhardt gun, and will subject it to a series of exhaustive tests under conditions as nearly approaching to those of active service as can be arrived at under the circumstances.

A NEW SWISS MAGAZINE RIFLE.—The Swiss military authorities are said to be now engaged in testing a new type of magazine rifle, the mechanism of which, according to rumour, is to effect a revolution in the rifle-making of the future. This remarkable weapon is the invention of M. Fleury, an engineer living at Aesch, near Basle, who is said to have got hold of the key to the whole question of magazine rifles. Probably this is a somewhat cryptic method of stating that the rifle embodies new features of more or less practical value, but as the Swiss military authorities are still preserving the utmost secrecy with regard to M. Fleury's invention, it is difficult to gather quite the direction in which novelty is shown, or how far it goes towards revolutionising the construction of magazine rifles generally.

NEW AUSTRIAN FIELD GUNS.—According to the *Pester Lloyd*, the trials of the new wrought-bronze field guns, which are to be introduced into the Austrian Army, have proved very satisfactory. During the tests, which were conducted under conditions closely approximating to those of actual service, the trial batteries developed only a few slight faults, which are now in procees of being remedied with a view to further trials being made. At the same time, it is in contemplation to make tests of the Ehrhardt quick-firing gun, first independently, and subsequently side by side with batteries of the bronze guns. The final decision as to which model shall be adopted will be made after the artillery practice at Veszprim, in Hungary, which will take place in the Emperor's presence some time in September.

A ROYAL WARRANT-HOLDER.—Mr. Charles Lancaster, the well-known Bond Street gunmaker, has now received the warrant of appointment to H.M. King Edward, having already had the honour of holding warrants from her late Majesty Queen Victoria and the late Prince Consort, H.R.H. the Prince of Wales, H.I.M. the German Emperor and H.R.H. Prince Christian, and other Royal personages. Mr. Lancaster informs us that he was recently ordered to submit to the King a Lee-Enfield Service rifle, and one of similar pattern, but on Sir Charles Ross's system, with a straight-pull bolt action, both of which were fitted with the Harris Rifle Magazine, of which we gave a notice in our last issue, and he has also submitted the new magazine attachment for the inspection of H.R.H. the Duke of Connaught and Earl Roberts, V.C.

"CHUCKING."—We have received from Messrs. Ludwig Loewe and Co., Ld., a copy of an elegantly bound little pamphlet bearing the above title, which deals with the class of work known by that name in American practice. It is performed on turret machines of either the vertical or horizontal type, which are arranged with a set of tools for finishing cylindrical holes, the work itself being "chucked" or revolved by being held in the face-plate chuck of the machine. Other operations, such as facing hubs, are also possible of accomplishment on the same machine. The great use of this system lies in the production of interchangeable work with absolute certainty and at a comparatively low cost, the outfit consisting of one or more chucking machines with their proper sets of boring tools, and suitable limit gauges for the testing of the output. This little pamphlet describes and illustrates such a typical outfit as would meet the requirements of most engineering equipments, and gives in detail the various processes of a sample operation, showing how by the adoption of a sound system it is easy to attain the *desiderata* of speed, accuracy, and cheapness without any particular training on the part of the machine attendant.

SPORTING ACCESSORIES.—The well-known Browning Brothers Company, of Ogden, Utah, U.S.A., have forwarded to us a most comprehensive catalogue of the various sporting

goods and accessories which they handle. Of course the department specially of interest in this connection deals with shooting and the many appliances used in that branch of sport, and it will be found that the firm stocks all the leading makes of single shot and magazine rifles, shot-guns, and revolvers, not to forget mention of their particular speciality, the Browning or Colt automatic pistol, which was described and illustrated in these columns about a year ago. Naturally, considerable prominence is given to the Winchester make of fire-arms, with the production of which Mr. J. M. Browning has been associated for a number of years, but the Lee straight-pull rifle and the Marlin, Savage, Remington, Stevens and Hopkins and Allen rifles are also stocked by this enterprising house, together with Winchester pump guns and single and double sporting and pigeon guns of various makes, and most of the leading types of revolvers which have a vogue across the Atlantic. Ammunition and accessories are also shown in great variety, and there can be little doubt that in recently concentrating the whole business at what was previously the head branch, this company has suffered no loss of prestige or of capacity for handling what is one of the principal businesses of its kind in the United States or elsewhere.

SUCCESSES AT BISLEY.—Messrs. Daniel Fraser and Co., of Edinburgh, have reason to congratulate themselves on their successes at Bisley. In both the first and second weeks the "Double Sporting Rifle" Competitions, at 500 yards distance, were won with rifles of this firm's manufacture, which in itself was a sufficiently satisfactory result. But better was to follow, for the first King's Prize on record was won by Corporal Ommundsen with a rifle presented by the firm to the 5th V.B.R.S. three years ago. The weapon was, therefore, a private one, though of course of Government pattern and Government viewed in accordance with the N.R.A. regulations, and with it Corporal Ommundsen had already won the St. Georges's, Caledonian Shield, and other important prizes, before attempting the highest feat of all in going for the Blue Riband of the rifle-shooting world. This record incidentally refutes the opinion held by many experts, that a rifle is not in its best condition beyond the duration of one season. It is noteworthy that on three of the four occasions on which the Queen's, or King's, Prize has gone to Edinburgh, the rifles have been supplied by Messrs. D. Fraser and Co. The first time, it was won by Mr. A. Menzies, with a Government Martini-Henry rack rifle. Subsequently, Private D. Dear, Captain J. L. Thomson, and now Corporal Ommundsen, have pulled off the event with Fraser rifles.

SPORTING CARTRIDGES.—We have received from Messrs. Buck and Co., of St. Andrew's Hill, E.C., their catalogue No. 6 for 1901-2, which is a well illustrated list of the firm's various specialities in sporting ammunition for shot guns and rifles. The firm supplies loaded and unloaded cartridges suitable for the leading makes of smokeless powders and for black powder, each with its distinctive colour, in 12 and 16 bore, and also in ·410 calibre, in two qualities and prices, together with all the components to facilitate customer's own loading. These are of the "Shamrock" brand, as also are a leading line in rim-fire ammunition for miniature rifles, pistols, and saloon practice. Messrs. Buck & Co. are sole agents in this country for the products of the Dominion Cartridge Co., Ld., of Montreal, Canada, and stock a large variety of ·22 calibre rim-fire rifle ammunition of this make, and larger calibres of central fire cartridges for revolvers and automatic pistols, and for military rifles. Altogether, this separately classified catalogue contains a wide selection of ammunition intended for the use of sportsmen generally.

NEW NAVAL RIFLE RANGE.—A Provisional Order Bill came finally before the Select Committee of the House of Commons on the 3rd ult., which had for its object the acquiring of four acres of land on the Island of Portland, for the purpose of bringing the existing naval rifle ranges into touch with modern requirements as regards safety. The ranges had been in use from 1871, but the danger limits now in force were those formulated prior to 1897, and since it was proposed, in view of the increasing naval development of Portland, to utilise these ranges for the practice of some 10,000 men, the reconstruction of the danger zone became absolutely necessary. As remodelled, the ranges are intended to be employed for the training of the men in the Channel Squadron and other vessels on the south coast in firing practice on land. Evidence was given to show that the proposed alteration would provide an ample amount of safety to fishermen and visitors to the island, the Admiralty, in fact, having adopted the conditions laid down by the War Office, and it was held that the opposition offered to the promotion of the Order was not of a sufficiently serious nature to justify the Committee in rejecting the Order, which was accordingly confirmed.

EXPLOSION AT WORSBOROUGH DALE.—Captain J. H. Thomson, H.M. Chief Inspector of Explosives, has lately issued his report on the explosion which occurred in the press house at the factory of Messrs. Kynoch, Ld., at Worsborough Dale, near Barnsley, on May 25th last. It will be remembered that two men, who at the time of the accident were engaged in oiling the machinery of the press in preparation for the day's work, lost their lives. Captain Thomson reviews at great length the installation of machinery used in the press, and especially the system of clutch employed for stopping and starting the machine, this clutch being in his opinion the cause of the accident by striking a spark off its iron teeth, which would be communicated by means of grains of powder or dust to the barrels, containing 150 lbs. of powder, that were on the floor of the press awaiting treatment, and to the explosion of which the accident was due. It should be mentioned that the press in question was brought from the Royal Gunpowder Factory at Waltham Abbey, and is of a type for some time in use in Government establishments. Captain Thomson, however, on the occasion of a previous visit, had not been satisfied with the working of the press, and especially the clutch, and had left an instruction that the latter should be used as little as possible. It was to be regretted that this instruction was so far indefinite that the manager had not thought it necessary to issue a clear and precise order on the subject, contenting himself with reducing the speed of the machine and with seeing that the clutch was operated only by an experienced man. H.M. Inspector finds, in conclusion, that no blame can be attributed to the Company for adopting a machine which was known to have been in use for many years at the Royal Gunpowder Factory, nor does any blame attach to the manager or employés in respect of this accident.

INCIDENTAL JOTTINGS.

THE "RUNNING MAN" AT BISLEY.

Once more the curtain has rung down, and Bisley, with all its antiquities and novelties, affords ample points for discussion till the next anniversary. The abnormal heat was not in the marksman's favour—in fact, it was a tropical experience that caused many to wish that the moisture was on the inside and not the outside of their bodies. I fear their thoughts were less disposed towards the pots which were to be won and taken home as the result of scoring a requisite number of bull's-eyes and inners, than on those other pots which common honesty dictated should be left on the table after emptying them of their contents. This gathering is always looked upon as the judge and jury of our small-arms and ammunition. This year the increased charge of Cordite appears to have been productive of a number of minor defects—such as split cases and an escape of gas from the base of the cartridge, this last defect especially heaping coals of fire, or, to be more accurate, putting a gas jet under the shooting victim's nose, as if the sun on the back of his head was not enough.

OFFICIALLY CERTIFIED FOR ISSUE.

It was only recently that the War Office called attention to the fact that no ammunition except that of Service issue should be used in Service military weapons. No one could find fault with this injunction from the War Office point of view, but I don't think such instructions should be unprovisional, and if cartridge manufacturers are competent to supply the Government, they certainly ought to have facilities to retail it, if they wish. Undoubtedly the gunmakers are the proper medium for developing this trade, and I see no reason why they should not be able to purchase "proof"-marked ammunition as well as guns. The Government will inspect and prove rifles for the trade, why not ammunition? Each box containing 1,000 rounds could be sealed with a proof mark, and neither the gunmaker nor the cartridge maker would object to pay for such inspection. It would create work for some of the surplus staff of officers, and save them from the quill-driving fate which awaits them, at the expense of the Civil Service aspirants at the War Office, in accordance with the recommendation of the War Office Reform Committee.

TEUTONIC ARTILLERY, AND A MORAL.

It is not altogether to be regretted that the War Office rushed off to buy field guns in a hurry, as they have now in their leisure time an excellent opportunity for thinking the matter over, which they evidently had not done before. The cost of alteration, adjustment, and adaptation furnish ample arguments in favour of English-made munitions, which will not be forgotten in a day. We are told, in extenuation of their rash action, that they have obtained valuable ideas on entirely new lines to our own. Exactly; but who is responsible for our own patterns? The Government hitherto have not gone to the English makers and said, "We are not altogether sure we have adopted the best pattern; can you suggest any alteration?" Not a bit of it! The contractor is invited to tender for a specific article to a hide-bound design from which he must not depart. Look at our field carriages, for instance!—a coalescence of modern exigencies which grew into the old specification a paragraph at a time. The military ideas are undoubtedly good, but an engineer could embody all these in an up-to-date structure, which could be made more efficient, and at a lower cost.

A "TERRIBLE" EXAMPLE WORTH FOLLOWING.

I shall not tar the whole of our gun carriage design with the same brush. The naval 9·2-in. electric mountings, such as are fitted on H.M.S. *Terrible*, speak volumes in their favour. The shooting records on the recent prize-firing are excellent, and to these successful results the quick and reliable manipulation of the gun on its mounting contributed in no small degree. The 6-inch guns also prove an excellent design of mounting as well as gun, when it is possible to put eight shots on the target in one minute! The war has evidently stimulated Captain Percy Scott in his efforts to teach the value of quick and accurate firing to his gun crews, and the result has been no little success.

"HOMOCEIC" SCIENCE.

It is certainly one of the most intricate problems of the day to determine the difficulty of bringing the scientific man into touch with the practical commercial manufacturer. It is generally agreed that this is "a consummation devoutly to be wished," and not the less so on account of obstacles that appear almost insurmountable. By a scientific man I do not mean the specific consulting trade expert, but more a chemist or physicist with an undetermined range of theory which may qualify him for anything from professional pursuits to a Government commission. Numbers of these scientific men in laboratory experiments discover processes and facts of which they do not recognise the practical value, and if they should they do not always see in what way they can apply their discoveries commercially, so the results are published in the proceedings of some society, whose reports are rarely seen by the practical man, and thus become lost to any useful purpose.

THEORY AND PRACTICE.

The intelligent outsider would at once say that it is easy enough to arrange some means of bringing them together. But the scientist says that his scientific soul is not sufficiently gratified with the glorification of putting the manufacturers on the track of a fortune by cheapening or improving manufacture for a mere fee, so he must hie away to get another fee out of a rival manufacturer for the same thing. The manufacturer, on the other hand, takes unkindly to this procedure, as he does not want to buy the scientist for ever, for, like the "inventor," there is a time when ingenuity and theories reach their limits, and commercial necessities demand a profit-earning policy. There is also a deep-seated prejudice among manufacturers against admitting scientific men into their establishments, which is mainly due to the distrust engendered by the numerous cases of men who have prostituted their laboratory or official position to their own personal ends, and who consider that they may legitimately use their employer's staff upon investigations which may one day bring a practically unearned honour from the substance of these compiled abstractions. The question still remains as to how these differences can be adjusted, and technical knowledge be obtained from a technical brain direct, a process which is

infinitely better than any smattering picked up in a school which, even if properly used, would only be sufficient to teach one to appreciate and apply such talents in others.

RIFLE IN LIEU OF BAYONET.

The Commander-in-Chief has possibly never tried to fire and load a rifle in chasing a retreating enemy—at least, we will say "our rifle"—or he would appreciate what a difficult task it is. It is bad enough to fill the magazine in your own good time, but a man in a hurry, probably under fire, prefers to administer cold steel rather than to tinker with his magazine platform and lose his opportunity. When Tommy gets a new rifle and more practice at disappearing targets he may have a chance. At present I doubt if he can get "home" as many times in a minute at 200 yards as Jack will with a 6-inch gun at two miles.

CYCLOPS.

AN AMERICAN SCHOOL FOR ARMOURERS.

WHILE we are still engaged in discussing the possibilities of technical education as applied to the gun trade in a more or less parochial manner, the Americans are occupied in putting the idea into a concrete form. It appears that Captain John T. Thompson, of the U. S. Armoury, paid a visit to the Liège Technical School for Armourers, when he came over last summer, and the result is that he has the idea to form a similar institution in the States. Apparently he does not want to make it a Government affair, his idea being to interest the leading small-arms manufacturers in the country in his proposal, with the understanding that these small-arms companies shall bear the expense of the school, and that no charge shall be made for the admission or tuition of pupils. He has practically fixed upon Springfield, Mass., as the site of the school, on the ground that the National Armoury, Smith and Wesson, and the Stevens Arms Co. are located there.

The small-arms museum at the Armoury is well known as being an exceptionally fine and complete collection, which should have some educational value. The main idea of the school would be to train up a generation of young men to become expert gun makers in all branches, so that they should be fit, after going through the course, to occupy fully responsible positions. Of course, the principal work which will be in progress at the school will be of a practical nature, the proposal being that it shall take the form of actual work supplied for the purpose by the small-arms companies interested. The man doing the work would be given 25 per cent. of the price of the finished article, and of the remainder, a certain small proportion would be reserved to go towards the running expenses of the school, and the balance to the manufacturer. In addition to this practical course in handicraft, it is proposed to introduce a necessary amount of theoretical instruction to fit the students for all positions they may subsequently be called on to take up.

The leading idea of the scheme undoubtedly is to substitute home-made articles for those at present imported, principally from Liège. The Liège school is a private corporation, and is fitted with the very best and latest machinery, the plant throughout being absolutely modern. As regards its regulations, no boy over the age of 18 is taken as a pupil. The course of study extends over three years; at the end of that time it is expected that the pupils shall have been converted into skilled workmen, not merely proficient in one special line, but all-round men, such as it is difficult to obtain outside of so practical a training establishment. All the elements of the manufacture of steel are taught, among other subjects. Of the course, it may be noted that the first two years are given to general work of an all-round character, while the last twelve months are devoted to any specialist branch or branches for which the pupil shows peculiar aptitude. The instructors are practical men taken from the big manufacturing establishments, and there are, in addition, a certain number of theoretical instructors and others to teach machine drawing and similar departments of the curriculum. It may be premised that all the European Governments have benefited greatly by the work of this famous school, the products of which have gradually spread over a wide area in the Continental gun-making industry.

In this connection it is interesting to note that at the present time a large number of fire-arms are imported into the United States from Liège. About four-fifths of these are machine-made on the interchangeable principle, and the greater part of the machinery used in the processes of manufacture is produced in the United States. One might well ask, therefore, why the country which furnishes the machinery cannot provide the finished article which it is built to manufacture. At least, one-third, however, of the total shipments consists of gun barrel tubes, rough bored and forged, this being a branch of international trade which has sprung from almost zero to a considerable magnitude since the change of tariff in 1897. Prior to that, very few tubes were imported, except those of exceptional value such as high-grade Damascus barrels.

It will be decidedly interesting to follow the career of the proposed Armourers' School at Springfield, should it materialise, and to note whether it tends to bring back to the United States the golden age when American small-arms were in general use all the world over, much as are the Mauser and Mannlicher to-day. At present even the U. S. army is furnished with a foreign weapon having a name, the pronunciation and orthography of which seem to present considerable difficulties. Of course, much of this apparent decadence is due to the illiberal manner in which American inventors are treated at home. Hotchkiss, Hiram Maxim, and other talented men are cases in point of inventors who have transferred their best services to another country owing to the utter want of proper appreciation shown by the Army Board and other authorities in the land of their birth in regard to their natural rights to protection and fair treatment.

Mr. Thomas Perkes, of Windsor, whose name is well known in connection with improvements in fire-arms, and also in reference to protracted litigation over patent rights, has recently brought out a new wad for sporting cartridges. This wad is said to prevent the escape of gas, and to produce very regular patterns. Of course, it has a tendency to produce higher pressures, and as a consequence is specially fitted to do its work with an ounce of shot and a reduced charge of powder, excellent results apparently being given by this modification of existing practice, with less recoil. The inventor claims that a considerable saving will be effected by the adoption of this type of wad.

THE SEIZURE OF AMMUNITION IN THE PERSIAN GULF.

APPEAL IN THE HOUSE OF LORDS.

IN our issue of June, 1900, details were given of the latest phase in the particular case of Fracis Times and Co. *v.* Carr, which is one of the group of actions centering around the seizure of arms in the Persian Gulf by H.M.S. *Lapwing* in 1898. The defendant in this case is a lieutenant in His Majesty's Navy, who, at the time of the seizure complained of, was officer in command of the *Lapwing*, then stationed in the Persian Gulf, while the plaintiffs are a well-known firm of merchants.

There is no need to recapitulate the main features of the seizure out of which this and other actions have arisen, since full details have already been given in our reports from time to time, but a brief mention must perforce be made of the various developments which have now finally led to an appeal brought in the House of Lords.

The seizure was made on January 24th, 1898, by Mr. Carr, within two miles of the shore off Muscat, the ss. *Baluchistan*, on which the ammunition was shipped, being stopped by the war vessel, the commander of which took possession of the ammunition, and landed it at Muscat. On April 15th, a court constituted by the Sultan of Muscat, who is an independent sovereign, inquired into the circumstances of the seizure, and the judges of that court found that the seizure was in every respect legal and in accordance with the permission given by his Highness the Sultan to British men-of-war, at the request of the British and Persian Governments, 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. This judgment was contained in a written document, at the foot of which the Sultan added the following words, with his signature and seal:—"I, Faysal bin Turki, Sultan of Muscat, having carefully considered this decision of my High Court, approve of it and agree with it."

Subsequently, the case was brought into an English court, the plaintiffs seeking to recover damages from the defendant for wrongfully depriving them of 25 cases of cartridges of the alleged value of £596. At the conclusion of the case, the jury found in answer to questions put to them to the effect quoted in our previous report of the case (pp. 96 and 97, vol. viii.), and on June 19th, 1899, Mr. Justice Grantham, who heard the case, gave judgment for the defendant.

The next phase of this long-drawn-out case resulted from the defendant going to the Court of Appeal last year, before Lord Justice A. L. Smith, Lord Justice Vaughan Williams, and Lord Justice Romer. This Court set aside the judgment of Mr. Justice Grantham, and entered judgment for the plaintiffs, the appellants as they were in that Court. This stage of proceedings was reached on May 24th of last year.

Finally, the original defendant, the commander of the war-vessel, appealed from the order of the Court of Appeal which set aside the judgment of Mr. Justice Grantham, and the case came on for hearing in the House of Lords, before the Lord Chancellor, and Lords Macnaghten, Shand, Brampton, and Lindley. The Lord Chancellor moved that the judgment appealed from be reversed. He pointed out that the arguments of the respondents came to this, that the Sultan was not entitled to say what should or should not be a subject of traffic within his own territory. The Sultan's authority was supreme within his own territory, so that the broad proposition was that the Sultan's declaration was an act of State, which could not be impugned in an action in this country. As regards the question as to whether an act done by such authority by a British subject and participated in by the British Government, could be recognised by our courts as lawful, being such an act as could not have been lawful elsewhere, his Lordship quoted a case to show that such an act could not be impugned by our courts. In his opinion no British tribunal was competent to go behind the Sultan's declaration. Then came the other question, which he was somewhat surprised to find raised for the first time in their lordships' House. It did not seem to have been suggested below, and was to the effect that the act was not done within the territorial waters of the Sultan at all. He thought it was inconceivable that our courts should attempt to split up the jurisdiction of the Sultan of Muscat into what belongs to common law, what to Admiralty law, and so on. The answer to the claim was final and complete—that the question had been decided by the Sultan himself.

Lord Macnaghten said that the case came to an extremely short point. The whole question turned upon the issue as to whether the act was justifiable by the law of the place where it was committed. The appellant claimed that the act complained of was done under the authority and by the direction of the Sultan, who adopted it as his act and declared it to be legal. In support of this assertion the appellants relied on two documents—the proclamation of January 13th, 1898, and the report of April 15th, 1898, adopted and confirmed by the Sultan himself. The real question lies in what is the true meaning and effect of these documents. Lord Macnaghten held that the meaning was that the act, if done, was to be done under the Sultan's authority, as his act, and that after inquiry he adopted the act as his own, and declared it to be legal—according to the law of Muscat, which, for anything that is known to the contrary, may be nothing more than the will and pleasure of the despot who rules over that country. If this was the true meaning of the two documents, if the act was legal in Muscat and justifiable there, the noble lord considered this a conclusive answer to the action, and he was of opinion that the appeal must be allowed.

Lord Shand and Lord Brampton concurred with this opinion.

Lord Lindley was of the same mind. He also pointed out that the plaintiffs complained that the finding of the Court of Muscat, that the arms were intended for Persian ports, was wrong. An English jury might probably construe the proclamation more narrowly than a Muscat court or a Muscat lawyer, and an English jury had found that when seized the arms were intended for Muscat. But that finding, even if relevant for any purpose, did not invalidate the declaration of the law of Muscat or show that the authorities who made it misconstrued the Sultan's proclamation, which authorized the seizure, or did what was wrong by the law of Muscat. The counsel for the respondent had contended that the Sultan had no jurisdiction to give anyone leave to search and take arms out of a British ship passing through his territorial waters in time of peace, and that the seizure, although sanctioned by the Governments of Muscat, Persia, and the United Kingdom, was unlawful by the law of nations, and ought to be so treated

by an English court of law. But no English court could hold on general principles of international law only that the Sultan had exceeded his own powers, though, but for its own concurrence in the seizure, it was possible that the British Government might have demanded reparation.

The appeal was accordingly allowed.

THE BISLEY MEETING

THIS year's Bisley Meeting has not been of any exceptional interest to the gun and ammunition trades, in that no new departures of exceptional character have been in evidence. One minor exception must, however, be allowed for in making this somewhat general statement. The exception referred to has relation to the 100 yards' shooting with miniature rifles. Last year the Stevens' was the prime favourite under the conditions which governed the miniature competitions, the limit of price placed upon the cost of the rifles and ammunition barring practically everything except cheap American materials. The slight concession which was this year granted by way of increasing the price of eligible ammunition from three to four shillings per hundred, does not seem to have had any material effect. As before, the American rifles have been chiefly in evidence, and this is not surprising, in that the retail list price must not exceed £3 10s. As is well known, there are at present few British-made rifles sold at this price which would be suitable for target shooting at 100 yards. In the first place, Lyman sights are practically a necessity, so that the rifle itself must be sold retail for little more than 50s. The object of the competition, as explained by the N.R.A., is to encourage the home production of a cheap rifle suitable for target shooting at 100 yards. No doubt in due course this want will be met, and no harm is done by the success of the American rifles, notably the Stevens, since they show our manufacturers the standard of performance to which they must aspire. Certainly, the rough character of these weapons, as judged by the gunmakers' eye, condemns them entirely, but the lesson that has to be learnt is to get good shooting from a weapon entirely unpossessed of those external beauties of fit and finish, which are, to our cost, sometimes considered before fine shooting. There is something so altogether pleasing about the style of an English rifle that one is apt to go into raptures as to its superiority over its rivals. But the expert tries the shooting, and more often than not must confess himself sadly disappointed that he cannot make diagrams with it. Supposing that he has experience with various forms of ammunition, he will soon come to the conclusion that many of the standard cartridges are obsolete, and that something altogether better designed, and, therefore, more fitted for the work, has been put into use abroad. The obvious remedy then comes into view, which is, to purchase a weapon of poorer style altogether, which, however, possesses the saving merit of shooting a well-designed cartridge, the rifling and bore being properly proportioned to the requirements of the ammunition.

We should not have dealt so pessimistically upon the relative merits of English and American ammunition did we not see around us signs of a tendency to set right the omissions of the recent past. English firms show themselves very anxious to develop their goods abreast of the times, and a great deal of experimentation has been conducted for the purpose of producing good rifles and good ammunition to shoot from them. Certainly, one would not reproach the home firms for not having tackled this problem sooner, because this country has not been one favourable to the use of miniature rifles. Many good sportsmen have been known to say that the man who shoots a rook and rabbit rifle in England takes a very grave responsibility upon himself. A very superficial knowledge of the behaviour of rifle bullets tells us that promiscuously-fired bullets are exceedingly dangerous. It is all very well to suggest that a man should pick his shots, but a little practical experience will soon convince one that under certain circumstances many of the shots which are fired at rooks and rabbits might lead to grave accidents were there anybody at the place where the bullets strike the earth, either the first time or after a ricochet. In a thickly-populated country this risk is one that the shooter desirous of a clear conscience does not care unnecessarily to face. Consequently, shooting with the rifle is very much restricted among those who really understand its power and range. Among novices one finds ignorance of a most dangerous character. More often than not, one finds that a statement to the effect that the ordinary rook rifle has a large residual velocity at the end of 400 yards is received with incredulity, and yet the truth of such an assertion may be demonstrated by firing at any expanse of dry ground, such as a ploughed field, the puff of dust thrown up and the comparatively small allowance for the fall of the bullet showing how dangerous are all shots fired at anything less than an angle of 45 degrees with the horizontal. It is no doubt owing to the above circumstances that the shot-gun is *par excellence* the weapon most used and best understood in this country, and it is quite clear why less attention has been devoted to miniature rifles than has been the case abroad. Of course, this leaves aside the production of deer-stalking rifles for the Highlands and hunting rifles for the equipment of shooters going abroad.

The rifle-club movement, which shows some promise of becoming closely identified with this country, has, however, created a new state of affairs, and our manufacturers are beginning to apply the lessons which have been so thoroughly learnt, particularly in America, which is a country where even feathered game is frequently tackled with rifles more advantageously than with the shot-gun. The English patterns of rook rifle represented, till some time ago, our most up to-date types of miniature rifles, but anyone who has used some of the more recently-designed American cartridges will recognise how obsolete these have become. The small ratio of difference between the weight of lead and powder shows that the advantages of high velocity are not yet recognised at their proper value. In America, for instance, we find that the Stevens' Company manufacture a rifle which shoots an 87-grain bullet with 25 grains of powder behind it; and quite a popular cartridge, which is worthy of considerable attention by our home manufacturers, is the ·25-20 Winchester cartridge, carrying 17 grains of powder and an 86-grain bullet; another model, representing a very similar cartridge, carrying 19 grains of powder. These cartridges are lubricated in the cannelures, and in a number of other ways represent something altogether more powerful and handy than the more popular cartridges in this country.

For target shooting at miniature distances something different from our standard English ammunition must be adopted, though probably high velocity will to some extent be

displaced by the advantages incidental to the use of a larger bore bullet requiring less wind allowance, even though the trajectory would become somewhat less flat. When all these facts are considered, it will become apparent that our manufacturers have plenty to occupy their experimental departments in turning out a useful type of target rifle which will possess a reasonable degree of accuracy at 100, 200, and 300 yards ranges. Unless the work of preliminary investigation is systematically conducted, it is possible that disappointments will result. No matter what care is lavished in the production at a cheap price of a neat rifle, its commercial success will be bound to suffer if it turns out in practice that a cheap American rifle, firing a better designed cartridge, will produce better results at the target. Therefore, our advice is that the rifle business should be tackled in a cautious manner, and that facilities should be created for altering at any rate the size of the chamber, so as to adapt the weapon to fire any established brand of cartridge. Among the firms who have devoted special attention to the designing of a special rifle for club purposes are Messrs. Greener, of Birmingham. Their first Sharpshooter rifle was open to much criticism, but, having learnt by experience, they have since produced a weapon which contains many features of exceptional merit. This rifle was in prominent evidence at the Bisley Meeting, the firm having subscribed a large prize fund in order to give competitors substantial encouragement to test the new weapon. The rifle is put on the market at the retail price of four guineas, and it is worth every penny of the money, provided that the firm are willing to adopt every possible precaution for ensuring a supply of the best possible ammunition. While Messrs. Westley Richards have not as yet specially identified themselves with this particular line of business, we understand that they have also been busy on the design for a miniature club rifle. We have examined a sample of the weapon in question, and fully recognise the care and attention which have been lavished in rendering it capable of entering into active competition with such weapons as the Stevens, which latter, in spite of its accurate shooting, possesses many features which the English maker can improve upon, probably without bringing the cost above what the public may be expected to incur.

At the revolver ranges things went on very much the same as in previous years, unless, perhaps, we except the fact that the increase in the cost of the entries has very much curtailed the amount of patronage bestowed. Since the days of Mr. Winans, no other shooter has shown himself willing to shoot with the same pertinacity in order to score possibles in every competition. In any case, the National Rifle Association have found it necessary to consider what they can do to place this section of the meeting on a better paying basis. Naturally, they adopted the obvious remedy of meeting reduced entries with increased prices per entry. But the working out of the ordinary laws of supply and demand has caused the number of entries to become beautifully less in just about the same proportion as the cost of the individual entry became greater. It is quite clear that some much more radical change will need to be effected if the revolver ranges are to be as well patronised in proportion as the ordinary rifle butts. For a number of different reasons, well known to the practical shot, the revolver range is necessarily limited to the small number of shooters who can make possibles almost to order. The man who is an ordinary good shot cannot hope to compete against these with the help of those lucky chances of wind and light which frequently serve to bring the tyro with the rifle higher up on the list than the ex-Queen's prizeman. To a great extent the revolver is a weapon with a very limited application. The officer is, as a rule, prouder of his sword than of his revolver, and if he has any real leaning towards shooting, he is more likely to take to the rifle than to learn the art of scoring possibles with the revolver by means of unlimited entries. Still, the revolver is a weapon which ought to be more generally cultivated than it is, and we trust that the N.R.A. will find an opportunity during the coming year to consider the subject with a view to bringing the Bisley revolver ranges into closer relation with the regimental volunteer officers than they are at present, their chief function being now to cater for a band of experts who have frequently no relation whatever with either branch of the junior Service.

The long-range target shooting has been little more than a repetition of previous experiences. The same shooters, the same rifles, and much about the same scores provide elements of repetition which leave little opening for original comment. The Winans' telescopic sight event provides a somewhat exceptional item, especially as the telescopic sights used were limited to a precise specification, peculiar in several respects. In the first place, the specification may be considered revolutionary in that it barred every telescopic sight previously in existence. To add to the comic opera element of this competition, the National Rifle Association issued this specification such a short time in advance of the Meeting that only one maker, Messrs. Steward, had the enterprise and facilities for roughing out some telescopes within the limits laid down. Messrs. Rigby, of London, and Henry, of Edinburgh, designed mountings for these glasses, which they constructed to the best of their ability according to the lines laid down, which related to compactness and handy adjustment. Curiously enough we were unable to hear of any inspection carried out for the purpose of determining whether or not the mountings in use complied with the military conditions specified, it having apparently been assumed that no one would use a glass which was not everything which the N.R.A. would consider military. Dr. Common, the Ealing astronomer, was the only rival telescope designer whom we met at the firing point. His glass departed from the others, in that it was little more than half-an-inch in diameter. His mounting was different from that of other telescopes in several respects, the most important being that it had a single joint supporting the telescope at one place only, other makers providing a double mounting. Rumour has it that Dr. Common is advising the War Office officially as to the most suitable type of telescopic sight for military purposes, and it is also stated that the National Rifle Association have to some extent been governed by his expert advice. Whether or not this is true is not a matter of very great importance so long as we are assured that the Small-arms Committee is desirous of dealing intelligently with this most important development of military rifle shooting, the need for it having been demonstrated during the Boer war.

Taking the Meeting as a whole, we must regard it as a thorough financial success, but from the point of view of the careful student of fire-arms, it is only here and there that we find evidence of small points worthy of careful consideration by the gun and ammunition trades.

ROUND THE TRADE.

In the list of intended dividends published during July, we notice the name of Mr. G. Gooch, gunsmith, of St. Alban's.

We are pleased to learn that Mr. R. W. S. Griffith has become a member of the Court of the Gunmakers' Company.

A very handsome donation of £2,000 has been received by the Governors of the Technical College, at Glasgow, from Messrs. Nobel's Explosives Co., Ld.

The annual outing of the Gunmakers' Assistants who are employed at the Gun Club, Hurlingham, will take place on the 17th inst., and will take the form of a trip to Hastings.

The directors of Messrs. S. W. Silver & Benjamin Edgington, Ld., have declared an interim dividend of 6d. per share, which is at the rate of 5 per cent. per annum.

At the Suffield Police Court, on the 19th ult., Messrs. Wm. Pickard & Sons, iron merchants, of Handsworth, were summoned for keeping 60 lbs. of blasting powder on unregistered premises. A fine of 40s. was imposed.

The three 16-bore guns built by Messrs. Boss & Co. for the late Marquess of Winchester, were sold by auction at Messrs. Foster's, in Pall Mall, on the 11th ult., and realised the sum of 110 guineas.

Early in last month an injunction was granted in the Chancery of Lancashire to restrain the United Alkali Co., Ld., from exploding dynamite or other substances upon their premises at Seacombe, Cheshire, the injunction to be dissolved at 24 hours' notice if the nuisance complained of ceased.

Mr. H. A. Thiersch has joined the Safety Explosives, Ld., as head chemist. It will be remembered that this company has taken over the factory at Herodstoot, St. Keen's, Cornwall, which was until lately in the occupation of Messrs. Curtis's & Harvey, Ld., and which has now been adapted for the manufacture of Fumelessite.

On the 10th ult., H.M. King Edward gave an audience to Earl Roberts, who introduced Mr. H. A. Oliver, Mayor of Kimberley, from whom the King was graciously pleased to accept a model of "Long Cecil," the gun manufactured in Kimberley by the late Mr. George Labram, which was described in these columns a twelvemonth ago.

We are requested to state that Messrs. Schwarte & Hammer, of 3, East India Avenue, and 6, Lime Street, E.C., have been appointed sole agents for Great Britain and the Colonies of the Austrian Small-Arms Company at Steyr, as regards the sale of the various models of Mannlicher and Mannlicher-Schönauer repeating rifle, etc.

On the 23rd ult. it was officially announced from the headquarters of the Home District that "in consequence of the Child's Hill rifle range having been reported on as unsafe for musketry practice, the Secretary of State has withdrawn his approval of the use of the range, which will be closed accordingly."

After midday gunfire at Bisley Camp on Saturday, the 20th ult., Major Munday, H.A.C., presented Mr. James Goodbody, the well-known representative of Colt's Patent Fire-arms Co., Ld., at Bisley, with a massive gold albert chain, as a mark of appreciation from revolver shots and others, of his skill and courtesy during many years' attendance at the meeting.

Mr. A. de Castro Glubb made application to the Liskeard magistrates on the 10th ult. on behalf of the Safety Explosives, Ld., for the granting of the draft licences for the company's factories at St. Pinnock and Lanreath. No objection was raised, and the licences were endorsed accordingly for final acceptance by the Secretary of State. Mr. J. C. Isaac, of Liskeard, is the local agent of the company concerned.

The first portion of the new works which are being erected by the Nobel's Explosives Co., Ld., at Linlithgow, have now been completed on a prominent site at the east end of the town. These new works have been visited by Sir Charles Tennant, the chairman, and by other directors of the company. Plans for other buildings have also been prepared, and it is expected that employment at these works will mostly be given to young people.

According to an American exchange, a firm of auctioneers in Philadelphia, D.C., recently offered for sale a fine old flintlock, which is said to have been the actual weapon used by Alexander Selkirk during his occupancy of Juan Fernandez. At all events, it was in the possession of a grand-niece of Alexander Selkirk, and experts who are in a position to judge such matters say that its pedigree is much more unclouded than is usually the case with relics of this kind.

A patent has been taken out by a Mr. J. Wheeldon, of Melbourne, for a combination of a wire-cutting device with the hilt of a sword or bayonet. Three forms of this device are shown, two of which necessitate the presence of a somewhat cumbersome lever in connection with the wire-cutter, which would be likely to catch in the clothing and generally to be in the way. The invention shows, in fact, both the defects and the qualities of all combination tools, which must necessarily be in the nature of compromises.

An explosives agent of Dudley, who came up for his public examination in bankruptcy a fortnight ago, attributed his failure solely to his inability to obtain supplies from the manufacturers in consequence of the war. When the war broke out the Birmingham firm with which he dealt had to supply the War Office with service ammunition to the extreme capacity of their output, and his orders could not be attended to. As a consequence, he could not supply his customers, who went elsewhere.

With the creation of "Vickerstown," on Walney Island, Barrow, as a residential district through the enterprise of Messrs. Vickers, Son & Maxim, Ld., a need has arisen for a better means of communication with the mainland. Already upwards of 200 houses are occupied, and 500 more are in a state of erection or completion, and the inhabitants of the new town have petitioned the Corporation to provide a bridge to the mainland, and pending its construction a free ferry service on a more extensive scale than at present.

Recently, an appeal was lodged by the defendants against an interim interdict which had been granted in an action at the instance of Mr. James Learmouth Morgan, house factor, of Cambuslang, against Messrs. James Young, Ld., contractors for the Lanarkshire and Ayrshire Railway. In that action the pursuer wanted judgment against the defenders carrying on blasting operations in the neighbourhood of his house in such a manner as to cause damage to the house, endanger the lives of the occupants, and cause inconvenience and annoyance to the pursuer. An interim interdict had been granted on that action, and on appeal it was adhered to, with the exception of the phrase relating to "inconvenience and annoyance."

We regret to learn of the death of Mr. John M. Marlin, president and treasurer of the Marlin Fire-arms Co., which took place at Newhaven, Conn,, on the 1st ult. Mr. Marlin was 65 years of age, and was born at Rainbow, town of Windsor, Conn. He founded the well-known business that has since borne his name, in 1864, with the manufacture of pistols and revolvers. Then followed the production of the Ballard rifle, which led the way to the Marlin magazine rifle, with its latest development the Marlin magazine shot-gun. As might be expected, Mr. Marlin was a prolific inventor, and his name will always be remembered in connection with the history and development of the fire-arm industry in the United States. His two sons are respectively vice-president and secretary of the Marlin Co.

According to the Board of Trade returns, the number of fire-arms of various descriptions shipped abroad during the first six months of the present year shows a substantial increase over the figures for the corresponding periods of 1900 and 1899, the totals being respectively, 66,629, 43,677, and 60,781. The shipments of gunpowder, on the other hand, show a steady decrease, only 2,753,408 lbs. being exported up to June 30th, this year, as compared with 3,161,200 lbs. exported in the same half of 1900, and 3,968,600 lbs. exported in the first six months of 1899. Under the unclassified heading of "All other kinds," the present year shows a value of £1,256,888, as against £836,834 in 1900, and £680,516 in 1899, which points to a steady and considerable improvement in the trade generally.

THE PNEUMATIC GUN.

IT appears that this country is not the only one to make expensive mistakes. Some years ago the era of the pneumatic gun, which could discharge a large mass of dynamite as its projectile, was announced with a flourish of trumpets, and M. Zalinski, the inventor or adaptor, was looked upon as second only to Armstrong, Maxim, Whitehead, and other giants of warlike renown, if, indeed, he were not regarded as outstripping them in the race to produce the champion death-dealing implement of the age. The United States Government took the matter up with great enthusiasm, and adopted the Zalinski dynamite gun for land and sea service equally. Thus, the U.S. Navy was enriched by the building of the *Vesuvius*, a coast defence vessel having three pneumatic tubes projecting from its forecastle deck, for which it was claimed that this little vessel would be able to sink the biggest armour-clad afloat, and many of them, by a few rounds of dynamite projected through these deadly tubes. This experimental monitor cost about £72,000. For land defence, the Ordnance Board spent about £200,000 in fixing pneumatic guns in positions to command the sea approaches to New York and San Francisco, and weird prophecies were made as to the fate that would attend any hostile approach to the Golden Gate or the Empire City.

The drawback to the system of the dynamite gun was always that of the difficulty in training and aiming. In neither the land nor the sea type was there any question of training the huge tubes, and the different ranges had to be reached by varying the propulsive force at the back of the projectile. On the *Vesuvius*, moreover, the three tubes were absolute fixtures, so that the vessel itself had to be aimed at the object which was to be hit,—a sufficiently awkward arrangement which should have sufficed to show the inherent absurdity of the device. Anyhow, it has been decided that no more dynamite cruisers are to be built, and now the fiat has gone forth that the pneumatic gun is doomed on land also. The existing fortifications at New York and San Francisco are to be dismantled, and so ends the career of an invention which has never had the elements of practical success, and could not possibly have outlived the results of a serious trial under service conditions.

Zalinski's gun seems, indeed, to have shared the fate of many other much-boomed devices for adding new terrors to war. Aerial torpedoes created some little stir a few years ago—on paper, and electricians have boasted of what they could do with their special commodity in the way of blowing up magazines ashore and afloat, and otherwise disturbing the plans of an enemy—also on paper. There is another of these bubbles which may shortly be pricked by the probing-needle of practical common-sense, and that is the submarine boat. It dies nearly as hard as the Zalinski gun, and has been in being for nearly as long a time. Every now and again wonderful tales are told of what has been accomplished in the direction of submarine navigation, and our Admiralty is reproached with neglecting to recognise the importance of foreign progress in this respect. The Admiralty, however, is for once wise in its generation. Nothing so far has been shown save that it is possible to design a vessel which, under certain conditions and with well-defined limitations, is capable of being navigated below the surface of the water. That anything more has been accomplished up to the present date we do not for one moment believe. And it is a long step from that initial possibility to adapting such a vessel to purposes of war—so long a step as to place it outside the realms of probability. Why, then, waste money over profitless experiments when they are being conducted for us elsewhere, and incidentally employing money that might otherwise be devoted to more practical methods of menacing our naval supremacy?

LORD ROBERTS ON RIFLE SHOOTING.

ON the occasion of distributing the prizes to the participants in the various competitions at Bisley, Lord Roberts spoke at some length on the subject of rifle-shooting, and we give below some extracts from his very noteworthy speech. He said that his experiences in South Africa made him more than ever feel that musketry is far and away the most essential part of a soldier's training. The two points, indeed, which the war had brought home to him very forcibly were—the necessity for making our soldiers good shots, and for developing their individual intelligence. He then went on to draw comparison between the old and the new styles of fighting. In former days, when men fought in close formations, and the smooth bore muskets with which they were armed could not be depended upon to hit St. Paul's Cathedral from the bottom of Ludgate Hill, a distance of 450 yards, one can easily understand that it was not by skill in shooting or individual intelligence that battles were won. It was, indeed, impossible to be skilful with "Brown Bess;" and the tendency of military training in those days was rather to stifle individual intelligence and to teach the men to move and act together mechanically.

Lord Roberts pointed out that the introduction of long ranging, accurate shooting weapons has changed all this. He said: "Perhaps I shall make the difference between the conditions of past and present warfare more clear to you if I tell you that, on the morning of the battle of Waterloo, the Duke of Wellington's army, which consisted of 50,000 infantry, 12,400 cavalry, and 156 guns, occupied a front of about three miles, and the greatest distance between his troops and the French was not more than 1,400 yards; in some parts, indeed, they were much closer, the outposts almost touching each other. Such a disposition, as some of you know from experience, would be an absolute impossibility in the present day,

when shrapnel can be used with deadly effect at a distance of at least six miles, and an expert rifle shot, standing in Trafalgar Square, would be able to hit the ball on the top of St. Paul's, a distance of 2,400 yards (if he could see it), nine times out of ten. More than once in South Africa (notably at the passages of the Vet and Zand Rivers, and the battle of Diamond Hill) a force not so large as that which the Duke of Wellington commanded at Waterloo was spread over a front of more than 20 miles, and had to commence its attack at a distance of quite six miles.

"As regards musketry training, certain modifications in the course would seem to be necessary. For instance, volley firing, on which many of us laid great stress as a means for steadying men and preventing waste of ammunition, is scarcely practicable now, except, perhaps, when covering an attack at a very long range or when acting on the defensive in a carefully-intrenched position, the reason being that volley firing entails longer exposure than is compatible with due regard to comparative safety, and gives the enemy too exact a knowledge of the spot at which to fire back with effect. Moreover, as a fact, the men did not waste their ammunition, as it was expected they would do under the excitement of battle, for they soon discovered that their safety depended on the ammunition being carefully husbanded. Then we found that, whilst our present style of shooting is very effective at long and medium ranges, it had no chance with the Boers at distances of 150 yards and less—the extreme length at which it is possible to distinguish the head of a man firing from a trench or behind cover. To be of use at this closer range our men must be taught to fire with rapidity, and to be careful to take cover after each shot, so as not to give the enemy time to aim at them in return. It is with a view to encourage shooting under such conditions that I have given a prize this year. My idea is that the fate of battles in the future will be as often decided by the result of this comparatively close distance firing as it has been by the bayonet charge in the past. Our course of musketry has already been modified to meet the changes proved by the experiences of the war to be necessary; and in the revised edition of the Infantry Drill Book, which will be issued shortly, greater scope will be left to section leaders with a view to developing the individual intelligence of the men."

The conclusion of Lord Roberts' speech was an impassioned appeal for more facilities for perfecting rifle shooting. "Let me say, in conclusion, how much I trust that the whole nation will take the dearly-bought experience of the war in South Africa to heart, and do all that is possible to encourage good shooting in the army. No other qualifications will make up for inferior shooting. There are, I am aware, considerable difficulties in the way of musketry training in this country. It is only in a very few places that suitable ranges can be found near barracks, and still fewer where field firing can be carried on; but a great deal can be done by practising with Morris tubes, and the lately-invented miniature ranges seem likely to prove a great success. But full-size ranges are, of course, of far greater value; and I will appeal to the patriotism of the British public in imploring them to make no unreasonable opposition to the construction of full-sized ranges, and to help by all means in their power to perfect our army in rifle-shooting, for, as I have endeavoured to point out, it is on skilful rifle-shooting that the efficiency of our army absolutely depends."

AMERICAN VIEWS ON THE SOUTH AFRICAN WAR.

THE United States War Department has just made public two reports on the war now waging in South Africa, which are not without interest as showing the views of independent experts on a subject of vital importance to this country. The reports in question were made by Captain Slocum, of the 8th U.S. Cavalry, who was acting as military attaché with the British Army in the field, and by Captain Reichmann, of the 17th U.S. Infantry, who was in a similar capacity with the Boer forces.

Captain Slocum deals first with the tactics of the two opposing bodies, and points out the faults of each system. Of the British, he says, "If ever a people or nation exemplified the phrase, 'Brave to a fault,' it is the British: If they were less brave, there would have been many less faults and more victories in this war." On the other hand, while noting with something akin to admiration the capacity of the Boers to take cover, he points out that their system of defence in trenches rendered it almost impossible to assume the aggressive or to obtain concerted action in counter attack. Of the artillery, he says: "The English artillery had such a tremendous preponderance over the Boers, who, in fact, rarely ever used theirs, that it is impossible to make a fair comparison on their respective efficiency." (This, of course, refers more particularly to horse and field guns). "The Boer smaller Creusot and Krupp guns are, I believe, rapid-firing ones; the English guns are not. The field and horse artillery use shrapnel only, with an extreme effective of over 3,000 yards, but they have no common shell, the wisdom of which I must leave to someone better qualified than I to comment upon. The Lyddite shell has proven one of the distinct disappointments of the war. It has no effect whatever against entrenchments. On exploding, which it almost always does, as far as I could judge, it only makes a small hole about a foot deep and two feet in circumference, and breaks into few fragments. Against the armour of a battleship, for which they are designed mainly, I have no doubt that they would be very effective, and the poisonous gases confined in a narrow and closed space would be destructive, but in the open air they are too quickly dissipated to do any injury. The Vickers-Nordenfelt automatic gun, used by the Boers, has a strangely demoralising effect upon an enemy. It is an effective little weapon, and the British soldier dreads it more than any other gun the Boers have. Its 'pom-pom-pom,' in rapid succession and unknown number, is a great strain on the nerves. It is very accurate."

This critic then goes on to say: "The use of smokeless powder by both belligerents has necessitated, I believe, a greater change in modern battle tactics than even the increased range of the small arm; one can locate the artillery by the flash, but infantry beyond 500 yards can only be heard and felt, not seen. This fact increases the difficulty of the attack far more than the defence, the latter being stationary and carefully hidden, while the former is of necessity continually in motion. The fact that the artillery of its own army can seldom support it so efficiently as formerly, further increases the difficulties of the attacking infantry. The artillery, in fact, labours under precisely the same disadvantages as the infantry, but perhaps to a greater extent on account of

the greater distance at which it is engaged, while it is, in addition, often impossible to tell how close the attack is to the defenders' line."

In a later report, Captain Slocum seems to have altered some of his previous impressions, for he writes: "The artillery has shown itself during the war, in my opinion, to be the best branch of the combatant service. The field and horse artillery guns were not of the most modern type, and were very often outranged by the enemy's; nevertheless, the gunners, both officers and men, have demonstrated that they are as good as the most critical commander could desire. The naval guns, worked by sailors, have been one of the most important factors of the war."

He goes into further detail about small-arms: "In my opinion the bullet is too merciful which permits of a large percentage of those wounded by it to return to the front within a few weeks, as the Mauser ·276 and Lee-Metford ·303 did in the war. A careful study of the war in South Africa by European powers, showing, as it does, the great possibilities of the defensive use of smokeless powder, magazine rifles and increased artillery range, will do more to preserve the peace of Europe than a hundred Hague Conventions. The clip system of the Mauser rifle is, I think, an excellent one. Not only are the cartridges loaded into the magazines much more quickly than without it, but the clip holds the cartridges in the belt and prevents their being lost. The belt worn by the Boers generally had twelve pockets, each with a flap coming down over it and fastened to a stud. The bottom of the pocket or pouch was perforated with five holes. The clip, with five cartridges in it, was put horizontally into the pouch, the ends of the cartridges protruding through the holes at bottom, and the flap flattened down; the cartridges were then secure, and could also be quickly withdrawn from pouch." As regards the arming of officers, Captain Slocum says: "The sword should be abolished. As an infantry officer should now carry a rifle, to prevent his being distinguished at a distance from the men and made a special target of, in addition to his pistol and field glasses, a sword is certainly superfluous. . . . . The Mauser automatic pistol, which can be used either from the hand or shoulder, carried by some of the officers, is a most excellent weapon, and with a larger bullet is better than any form of revolver that I have seen. Telescoping (? telescopic) sights on some of the rifles in each company would be a great advantage."

Captain Carl Reichmann, who accompanied the Boer forces through the earlier phases of the campaign, gives a very detailed account of his experiences in a lengthy report. He speaks in terms of the highest praise of the Boer, as regards his general character, his fighting qualities, and his bravery, but severely criticises his want of soldierly qualities. He writes in one place: "Although still fine shots, the Boers are no longer the excellent marksmen they used to be. Among troops where no discipline was enforced, it is natural that the expenditure and waste of ammunition were great; the burghers travelling on a train would shoot out of the windows at the ant-heaps in the prairie." This scarcely agrees with other accounts of the almost niggardly habit of the Boer never to expend a single cartridge without making sure of a result.

As regards the armament of the Boers, Captain Reichmann says:—"At the beginning of the war the armament of the burghers left little to be desired. In the first place there were enough rifles of all kinds in the Transvaal to arm the burghers three times over. Then the new rifle was the Mauser, which, though at first lacking in popularity, gave splendid results in the war. Most of the Mauser rifles were issued between May and September, 1899, in exchange for Martini Henrys. During the war some eight or nine thousand rifles and carbines were issued, a depôt for that purpose being established at Elandslaagte. So far as the arms came under my observation, they were excellently kept. In the estimation of distances the Boers are very proficient, and it is not infrequent that a father instructs his sons in that particular." "There was no importation of munitions of war after hostilities had broken out, and the Government eventually went to work to establish ammunition factories. Volunteers generally have played a considerable part in this war; they were mostly foreigners, adventurers, amateurs, active, retired, and ex-officers of foreign armies. The Boers are hunters rather than soldiers; they are not much given to holding a position to the last. The foreigners, on the contrary, once posted would hold their ground. Whenever offensive operations were undertaken the foreigners had to bear the brunt of the fighting."

Further on, we learn of the Boer that "his most serious defect was the lack of military discipline. . . . Under fire the Boers were remarkably cool and deliberate. Once started on the attack the British infantry had no cover against the Boer artillery, but as a rule the Boer's lack of offensive capacity prevented him from reaping the fruits of tactical victory. . . . In point of tactics, while some features were brought out in strong relief, the war established no new principles. While the fine defensive position taken up by the Boers, and their superior marksmanship, compensated to some extent for their numerical inferiority, the superior quality of their field-pieces could in no way make up for their paucity. The prolific source of Boer defeats was their lack of a sufficient number of guns. One feature of this war is the superior effective range of the Krupp and Creusot guns of the Boers over the Armstrong gun of the British. The Lyddite shell can hardly be said to be a success in field operations."

APPLICATIONS FOR PATENTS.

JUNE 17TH—JULY 13TH, 1901.

12,336. Lee Straight-Pull Rifle Mechanism E. Punchard and T. R. R. Ashton.
12,390. Cartridge Belts. P. A. Martin.
12,420. Wads for Cartridges. J. Pinfold.
12,467.* Small-arms. O. Imray (Agent for *J. Tambour, T. Neuber, and C. Colbert*).
12,513.* Cartridge Case-making Machine. H. and H. Tirmann.
12,535. Triggers for Fire-arms. W. B. G. Hogg.
12,617.* Explosives. A. A. da Silva (Date applied for in Brazil, Feb 8. 1901).
12,643. Breech Mechanism of Ordnance. J. E. Bousfield (Agent for *P. Nordenfelt and E. Ternström*).
12,662. Small-arms. J. King.
12,695. Process of Denitration of Nitrocellulose. H. Richter.
12,700 Automatic Guns. A. Vickers and Vickers, Sons and Maxim, Ld.
12,721.* Electric Fuses. H. and H. Tirmann.
12,757. Small-arm Carrier. G. B. Gabbitass.
12,784. Turret and Barbette Gun Mountings. A. T. Dawson and J. Horne.
12,839.* Torpedo Discharge under Water. J. Whitehead.
12,847. Semi-Automatic Guns. The Hotchkiss Ordnance Co., Ld., (Agent for *L. V. Benèt*).

13,005. Sights for Small-arms or Ordnance. J. MacNaughton.
13,026. Metallic Cartridges. J. Y. Johnson (Agent for *R. W. Scott*).
13,027. Multi-shot Guns. J. Y Johnson (Agent for *R. W. Scott*).
13,045. Automatic Fire-arms. C. R. S. J. Hallé and M. E. Mibbentrop.
13,079. Bullets. A. C. MacLeod.
13,094. Cartridge Belts. P. A. Martin.
13,114.* Rifle Barrels. H. S. S. Watkin.
13,124. Magazine Fire-arms. O. H. Edwards.
13,213. Double-barrelled Small-arms. M. A. Tighe.
13,216. Lining of Bore-holes. L. Scholvien.
13,235. Cartridge Magazines. H. W. Holland.
13,304. Sights. C. Ciudin.
13,345. Sights for Small-arms. E. H. Parsons and L. B. Taylor.
13,382. Automatic Fire-arms. E. Harrison and J. V. Bonet.
13,393*. Breech Mechanism of Ordnance A. W. Schwarzlose.
13,394. Recoil Loading Apparatus. A. W. Schwarzlose.
13,469. Targets. L. B. Stevens and J. P. Annett.
13,589. Explosives. The Cotton Powder Co., Ld., G. E. Arnold, and A. S. Fox.
13,620.* Smokeless Powder Charges. Hudson Maxim.
13,647. Telescopic Sights. A. A. Common.
13,850. Projectiles for Ordnance. J. Garvee and C. A. McEvoy.
13,878. Ranges and Targets. W. O. Bond.
13,879.* Detonators. E. Beadle.
13,895. Detonating Caps. R. Schultz.
13,960. Cartridge Clips. E. Breuning.
14,000. Gun Cartridges. A. T. Dawson and G. T. Buckham.
14,092. Feed Mechanism for Fire-arms. F. Bacon.
14,162.* Cartridge Clips. H. S. S. Watkin and J. J. Speed.
14,163.* Rifles. H. S. S. Watkin.
14,231. Smokeless Powder. C. O. Lundholm and Nobel's Explosives Co., Ld.
14,268. Explosives and Prejectiles. Sir H. S. Maxim.
14,269 Range Finders. Sir H. Grubb.
14,339.* Sighting Apparatus. C. P. E. Schneider and J. B. G. A. Canet.

*These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

JUNE 22ND—JULY 13TH, 1901.

COMPILED BY H. TARRANT.

10,493 (1900). **Telescopic Sight Mountings**. H. H. Lake. (Agent for *The Cataract Tool and Optical Co., U.S.A.*) The mounting described in this patent is so designed as to allow of an easy adjustment of the telescopic sight within certain limits, and to securely hold the sight against displacement by the shock of firing. The telescope is supported on the gun at its front end by a cup and ball socket joint, which permits the sight to be turned about in any direction without any cramping of the parts. At its rear end the telescope is supported by an adjustable device capable of being raised or lowered. The device consists of a shank, provided at its top with a clamp which grips the telescope. The shank is raised or lowered by a screw in the guide sleeve, which last part is fixed to the gun by a plate. Accepted June 1, 1901.

11,311 (1900). **Balanced Targets**. W. and E. Douglas, Kingswood. This patent refers to devices whereby balanced targets for rifle-shooting practice may be worked so that the raising and lowering of the target carrier is simultaneous with the opposite movement of the dummy. The movement is imparted between the two by a coupling consisting of a chain working under a pulley, its ends connecting the target and the dummy. As the carrier is lowered so the chain is caused to pull the dummy into the raised position, the two working on a spindle common to both. A bolt device is also described, which is adapted to lock the target in either its raised or lowered position. Accepted June 1, 1901.

11,496* (1900). **Magazine Pistol Mechanism**. F. Fortelka and W Leitner, Austria.

12,108 (1900). **Sighting Devices for Guns**. Sir H. Grubb, Dublin. A device for simplifying the sighting of small-arms or ordnance, consisting of tubular holder, inside which is arranged a piece of parallel glass at an angle of 45 degrees to the axis of the tube At right angles to the tube is fixed a second tube, which is closed at its outer end by an opaque diaphragm, in the centre of which is a finely-cut cross. At the inner ends of the second tube is fixed a convex lens, which renders the rays of light passing through the cross slit parallel before they reach the inclined surface of the parallel piece of glass, from which they are reflected to the eye. With this device attached, the gun is shifted about until the object being sighted coincides exactly with the image transmitted through the convex lens. Accepted June 22, 1901.

12,536 (1901). **Powder Charges**. P. du Buit, France. A method of suiting, as nearly as possible, the powder charge to the requirements of the projectile by forming the powder in sheets of suitable thickness, cut so as to resemble a comb with teeth any suitable length and width. The sheets are rolled up into a bundle of suitable dimensions, and the toothed arrangement leaves spaces in the interior of the so-formed charge, which may be made greater or smaller according to the desired rate of combustion. A former Patent, No. 17,863, of 1899, is referred to in the present specification. Accepted June 1, 1901.

13,000 (1900). **Trigger Shield**. Frank Garrett, Stratford-on-Avon. A guard designed to protect the triggers of small-arms, in order to prevent accidental discharge. The shield is so shaped as to be fixable over the bow of the trigger guard, and at the same time to leave sufficient room on one side for the convenient insertion of the trigger finger. The opposite side is covered in entirely, so that stray twigs or such like should not catch the trigger and accidentally pull off the gun. Accepted June 22, 1901.

16,443 (1900). **Sighting of Ordnance**. A. Reichwald, London. (Agent for *Fried. Krupp, Germany*). Heavy terrestrial telescopes are generally used in the telescopic sighting apparatus at present forming part of the field gun equipment. These telescopes are considerably longer than the supporting surface of the attachment head carrying them, and the result is that the optical axis of the practically freely-supported telescope invariably is jarred out of the straight by the continual firing of the gun. The preseutinvention is characterised by the fact that the telescope used is one of the Porro-prism type, and with this telescope the proper optical axis is always preserved, since it lends itself to the rigid support of its whole length. Accepted June 15, 1901.

17,809 (1900). **Explosive Shell**. L. Varicas, Weymouth. A shell consisting of three parts, the cone, the body-piece, and the adjustable conical hop, which may be used as a fuse. The bursting element is liquid gas, and of the three compartments contained within the shell, one holds the gas whilst the other two hold ingredients, the mixing of which with the gas either ignite or expand it, or do both. The gyratory motion of the shell is one means of causing the compartments to liberate their different contents so that they may mix; impact is another; and a third method of expanding the gas is by electrical storage power, which substitntes the other two ingredients. Either impact or time fuse is with the last means the circuit-making medium by which the expansion of the gas within the shell is obtained. Accepted June 1, 1901.

8,811 (1901). **Spring Devices for Ordnance**. W. L. Wise, London. (Agent for the *Skodawerke Actiengesellschaft, Bohemia*). A tangent sight designed so that quickness in adjusting from one range to another is the novel feature. To the sight bar is pivoted a toothed rack, which is pushed away from the bar towards corresponding teeth on the shaft by a strong spring. The pressing in of the toothed rack disengages the teeth and the sight bar is free to be raised or lowered and adjusted with expedition to any particular range. The release of the rack automatically engages the teeth and so locks the sight. Accepted June 1, 1901.

9,014 (1901). **Magazine for Rifles.** O. H. Edwards, Aberdeen. A modification of the magazine platform devices described in Specification No. 4,415, of 1901. The present device is designed to economise space in the arrangements of the magazine parts, and consists briefly of one limb—the platform or cartridge raised with a controlling arm attached, and forming part of it. The arm is pivoted to a forward extension of the trigger guard, and by means of a lever the platform in the magazine is lowered against the pressure of a spring, so that the cartridges may easily be dropped in. Accepted June 1, 1901.

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

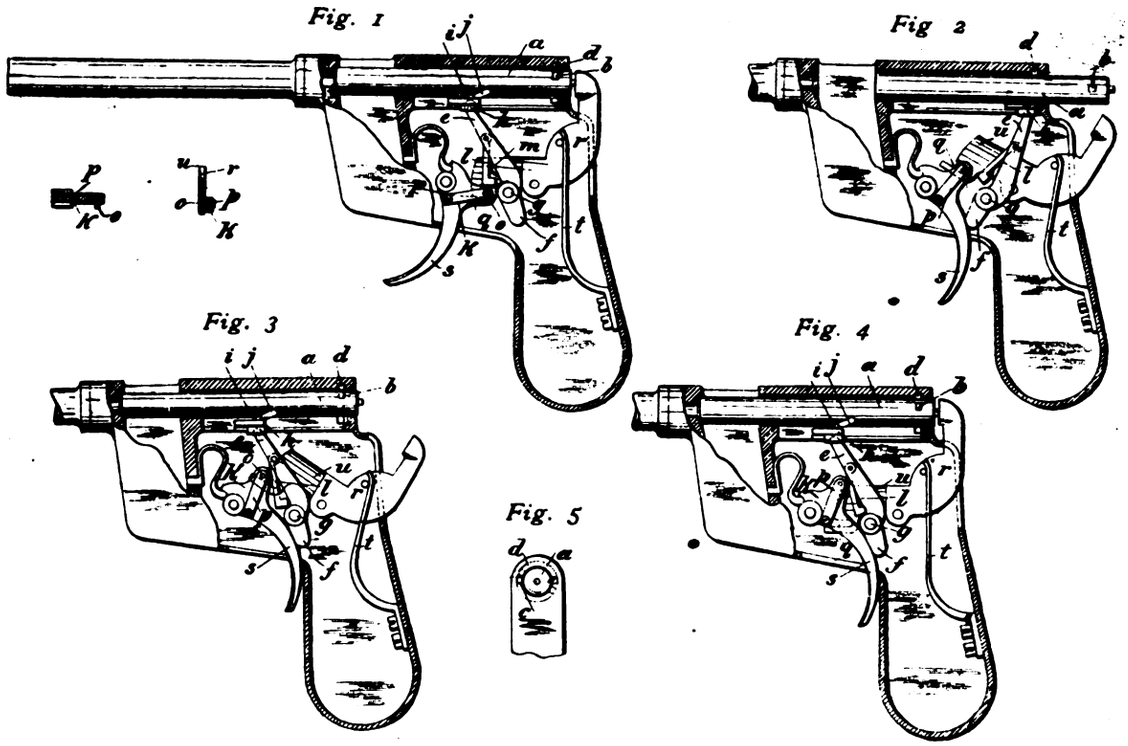
SELECTED PATENT.

MAGAZINE PISTOL MECHANISM.

11,496 (1900). F. Fortelka and W. Leitner, Austria. The mechanism of the magazine pistol described in this patent is of a type similar to that in automatic recoil-operated pistols. It is, however, worked, not by recoil, but by the pulling of the trigger, which action automatically throws back the breech bolt, ejecting the empty case in the process, cocks the hammer, and at the end of the pull releases the hammer and discharges the cartridge, which is taken from the magazine into the chamber by the automatic return of the breech bolt. The action is somewhat similar to that of double-action revolvers, the only difference lying in the construction of the weapons.

In the drawings annexed the parts are illustrated in their different positions during the operation of firing. In Fig. 1 the parts are shown in the closed position, the weapon being ready to fire by the pulling of the trigger. The breech bolt *a* is provided at its rear end with two studs *b*, which are guided in two longitudinal grooves *c* (Fig. 5) cut in the sides of the bolt receiver. At the end of the bolt's forward movement, the bolt is turned slightly, and the studs *b* are caused to enter a transverse groove *d*. This action locks the bolt and prevents any backward movement during discharge. The bolt is actuated in its backward travel by the pulling of trigger through the medium of the two-armed lever *e*, *f*, which is pivoted at *g*. The upper arm *e* of this lever is connected with a part *h*, which slides in a guide cut in the receiver beneath the breech-bolt. The slide *h* is provided with the stud *i*, which is adapted to engage the short helical groove *j* in the under-side of the bolt. The trigger *k* operates upon the upper arm *e* of the lever through the part *l* kept in position by the spring *m* (Fig. 1), which, when the trigger is in its forward position, rests on a shoulder *n* as illustrated. The hammer is cocked by the pulling of the trigger through a little sliding-pin *o*, shown in detail, which is pressed inwards by the spring *p* so that it may engage the slot *q* in the hammer *r*.

The action of the parts is as follows:—Assuming the pistol to be loaded and ready to fire, the position is that shown in Fig. 1. The pulling of the trigger causes the arm *e* to swing backwards through the lifting of the part *l*. The backward motion of the arm *e* carries the slide *h* back, and the stud *i* attached enters the helical groove in the bolt *a*, thus causing the bolt to turn and enabling the studs *b* to become disengaged from the transverse groove *d* and to enter the longitudinal grooves *c*. The continued backward movement of the arm *e* carries the bolt backward also, and the spent cartridge is pulled from the chamber and ejected in an ordinary manner. When the bolt has been taken out to the required extent (Fig. 2), the part *l* slips off the shoulder *n* of the trigger, thus releasing the upper arm *e* and allowing the pressure of the lower part of the trigger *s* upon the lower arm *f* of the lever to force the bolt forward to its closed position. At the end of its forward travel the stud *h* again works through the helical groove *j* and locks the bolt as described.



The continued pulling of the trigger causes the further lifting of the hammer through the pin *o* sliding up the slot *q*. When the hammer has been cocked to the extent shown in Fig. 3, the pin *o* slips out of the slot *q* and, under the influence of the spring *t*, the hammer flies forward and discharges the cartridge taken into the chamber from the magazine by the forward travel of the bolt (Fig. 4). Thus, the whole firing operations are accomplished by the backward motion of the trigger, and with the pressure of the trigger-finger relaxed, the trigger moves forward and allows the stud *o* to slide over the inclined surface *u* formed on the hammer, its spring *p* forcing it once more into the slot *t* ready to accomplish the next cocking operation. The parts are then again at rest in the original position shown in Fig. 1. Accepted June 15, 1901.

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CONTENTS.

CURRENT TOPICS.

The Man Behind the Gun!—A fruitful source of contention hitherto among naval experts has been the attempt to calculate the effective strength of the heterogeneous types of vessel which compose our own and foreign navies. Armaments, armour, speed, coal endurance, these and many other points have all been assigned their different values in estimating the efficiency of various classes, and each expert seems to differ from the rest as to the value that should be given to these items in estimating the whole. One favourite method, having considerable reason on its side, is to compare the fire energy of the vessels' armaments in foot-tons per minute, a method of computation which is susceptible of considerable nicety of adjustment by taking respectively broadside, fore and aft, and all-round arcs of fire. But though this system of calculating the offensive powers of a vessel seems to be more practical than many others, it is totally misleading when considered by itself. We find, in fact, that even in the age of science and machinery, as in the days of Nelson—and perhaps to an even greater degree—the personal factor is, after all, the one which tells. This dominant influence is brought vividly into notice by a glance at the results of the most recent prize-firing trials in the navy. H.M.SS. *Centurion* and *Barfleur* are sister ships, and practically identical in every respect, save the efficiency of their respective gun-crews. Did they belong to different countries, one would be said to neutralise the other in a comparison of relative strength. Yet in a single ship action one would be hopelessly outclassed, judging by the recent trials. Under similar conditions, in a duel lasting for ten minutes, the *Centurion* would have hit her antagonist 14·8 times with her 10 in. guns, and 170 times with her 4·7 in. guns, assuming that all the guns on a broadside could be brought to bear. The *Barfleur*, on the other hand, in the same time and on the same assumption, would have scored 38·4 hits with her 10 in. guns, and 285 hits with her 4·7 in. guns, thus making a disparity that would leave no doubt as to the ultimate issue of the supposititious duel. There is no need to labour the point brought into concrete shape by this method of comparison. It is evident that the most improved specimens of naval artillery may always be handicapped by being handled by indifferent crews.

Chamber Sizes.—We believe that during the course of the coming autumn the Gunmakers' Association propose to standardize the remaining sizes of sporting ammunition which were allowed to stand over when twelves, sixteens, and twenties were dealt with. As to the necessity for this piece of work there can be no doubt whatever, but it must not be forgotten that the more precise are the dimensions of our standard cartridges, the more necessary is it to have gauges defining those standards in a practical form. At the present time there exists no set of standard gauges for the standard sizes which have already been calibrated. It must be remembered that there are three lengths of 12-bore cartridges, three lengths of 16 bore, and the same of 20-bore. This makes nine sizes of chamber for the three bores; and a complete set of gauges in any one size, and of the pattern laid down by the Gunmakers' Association, cannot possibly be produced for less than about £15. Assuming that not less than 20 sporting cartridges will be ultimately standardized, it became clear that a sum of money very little short of £300 must be raised

in order to provide the necessary set of master gauges. That the necessity for these gauges exists we firmly believe, and no practical gunmaker will deny the utility of a standard set of master gauges by which those in daily use by the trade may be checked from time to time. The only method of ensuring accuracy of workmanship is by comparison with a standard set of master gauges, and these the central institution of the gun trade should certainly hold in its possession. Since half a loaf is better than no bread at all, it may happen that means will be found to provide for a start a portion of the complete outfit of gauges, thus involving a reduced though substantial initial outlay. In any case something ought seriously to be done to place the new chamber sizes upon a more practical footing. Further than this the two Proof Houses ought to be invited to recognise the new sizes, since their present method of gauging the chamber sizes is not, we believe, one that marks very fine distinctions.

New Proof Rules.—It has been announced in the columns of a contemporary that the two Proof Houses are busily engaged in organizing a series of experiments to determine the service and proof pressures with a view to the publication of new scales of proof. In connection therewith, a fresh departure has been taken which will be welcomed by all who have the interests of the English gun trade really at heart. It consists in a joint decision by the two Proof Houses that the necessary apparatus shall be purchased for determining the proof and other pressures, and that such expert assistance as may be necessary for properly conducting the experiments shall be employed. This, at any rate, marks a spirit of advance as compared with the previous methods of arriving at proof charges, and it denotes a strange open-mindedness at any rate on the side of the London Proof House. The attacks which have in the past been levelled against that body have been so bitter, and, at the same time, so well founded, that anyone would have been justified in supposing that the London Proof House was incapable of mending its ways. Whatever may have been the moving cause of the new policy we cannot say. Perhaps the effect of the new blood on the Court is beginning to tell. Mr. Henry Holland was the first of the "new chums," but the election of Mr. C. O. Purdey some short time ago seemed to mark a relapse to the family traditions of the Proof House. Since then, however, Mr. R. W. S. Griffith, an outsider in the best sense of the term, has been rushed through the Livery and into the Court in an incredibly short time. Mr. Athol Purdey's unquestionably sincere desire to do his best for the London Proof House has no doubt been encouraged and directed by the new members of the Court, so much so that there seems every reason to believe that the Proof House have at last done something which meets with general approval. Let us hope that the task will be completed in the same spirit, and that we shall in this way have heard the last of the charges of fossilized innocence which have so justly been directed in the past against the manners and methods of the Gunmakers' Company.

The Shooting Season.—With the opening of September the shooting season is well under way, and gunmakers are then able to form some idea of the amount of business that will come along during the next six months. Although the promise of birds for the current season appeared to be excellent all round, reports have already come to hand which indicate that, while the nesting season went off very favourably, there have in some places been unaccountable fatalities since that time, materially reducing the head of game available for sport. In spite of local disturbances of this kind, it is fairly certain that the year's shooting will be well up to the average, probably rather above the average; so that in any case a moderate amount of business is already assured. On the other hand, there is a broad distinction between the amount of custom that results from shooting of a given head of game in a period of trade prosperity as compared with a time when money is tight. While finance is altogether easier this year than last, and many of our absentee sportsmen have come home, at the same time a variety of records go to show that the money available for pleasure purposes is still very much restricted by comparison with ordinary years. Gunmakers must, therefore, be prepared to wait a little longer before there is any real boom in their business. The American, the Chinese, and the South African markets are practically all closed to English goods, and we must, therefore, look to the time when a fresh spurt of colonizing and exploring impulse will come over those who have been to the war, and cause substantial improvement in business which will probably be felt all round. Meanwhile, the time that is available should be spent in carefully considering those details of gun and rifle construction, particularly the latter, which impart an ascendancy to British-made goods in comparison with the work supplied from abroad. In this country we need particularly to set our house in order in the matter of sporting and miniature rifles and ammunition. There is a vast amount to be learnt in these matters, and at the present time things are progressing so rapidly that it behoves everyone to concern himself in the acquisition of fresh knowledge and in applying it. Too long have we been wedded to one or two of our more popular sporting cartridges. Several of our rook rifle cartridges are quite out of date, and yet valuable rifles are chambered for this ammunition in apparent ignorance that better exists. The effect of such a policy is to allow to inferior rifles a command of the market, which they gain not by inherent excellence, but because they happen to be chambered for more effective types of ammunition. In a similar way our gunmakers ought to pay close attention to the quality of the ammunition that is supplied to them for use in the sporting rifles of military type. Several instances have come to our notice where cartridges supplied for high class rifles have been inferior almost to the extent of being dangerous. Unless care is taken to distinguish inferior material of this kind, the risk is again run that some competing rifle of inferior quality will gain the advantage in practical use which comes of firing decent ammunition. If we wrote for a month on this most important subject, we could only give, in an extended form of speech, the following advice —viz., that if you wish to excel as a rifle maker you must study your ammunition on a practical basis.

Several contracts for 12-pr. shells and upwards, for practice purposes on the army range in the South of England, have recently been placed in Glasgow with firms which are on the War Office list.

We learn that a better understanding has been arrived at between the Goverment Service Departments and the firm of Messrs. Sir W. G. Armstrong & Co., Ld., whereby more work will in future be done at Elswick for home armaments. The works are at present undergoing enlargement and a revision of plant, and will probably employ more men in the near future than even at the present time.

THE ACCESSORIES OF EXPLOSIVES.

AT first sight it seems almost inconceivable to how great a degree the growth of factories for the manufacture of explosives, and the constant improvement that is being developed in regard to the best methods of safeguarding employés and the surrounding community from danger in that respect, is responsible for the specialisation of other industries. The modern explosives factory is a remarkable example of all the most recent advances in scientific knowledge embodied into a practical form and applied to a given end, and only those who are connected with the installation of such an establishment can fully appreciate the extensive degree to which the trade is dependent upon other industries for the successful results achieved. There is, in fact, scarcely one single detail in plant, machinery, or the numerous accessories required for various processes, as regards which an explosives factory can proceed on the same lines with other manufacturing establishments, and the trail of the specialist reveals itself at every turn. For example, the buildings must be of a particular character suited to the work done in them; those that are employed for the manufacture, storage, or loading of explosives requiring to be so constructed that an accident will not constitute them active agents in spreading destruction far and near. This special requirement has led to a considerable use of corrugated iron in the erection of explosives buildings, this material, suitably lined and protected, affording almost ideal conditions of safety. The question of lighting these buildings is another matter for expert knowledge. Of course, electricity provides the only possible means of obtaining an artificial light, but even in this the hand of the specialist must be apparent, for there are methods of setting up electric installations which would not commend themselves to adoption under these particular conditions.

The use of iron, steel, and other spark-producing metals is naturally barred in buildings and machinery devoted to explosives manufacture, and hence there is a need for the substitution of specialised metals or alloys which do not afford such risks. Gunmetal is extensively used in this connection, but there is another metal which is now coming to the fore, and which will be probably be more and more employed in the future. In fact, aluminium is already largely supplanting gunmetal and similar alloys for such purposes as the rails for tram lines, with their necessary screws for holding down, and for the trolley wheels, brackets, and other metal parts of the wagons used on these rails. It is also superseding metal or earthenware in the plant used in connection with the nitrating process, and is specially valuable in this use since aluminium is only very slowly acted upon by the acid, and is as clean as and much lighter than earthenware. Many other utensils, such as digesters for explosives mixtures, are also now made in aluminium, together with some parts of machinery and a number of the tools used in different processes of manufacture.

There is, indeed, scarcely any end to the number of specialist industries which centre round and feed the explosives factory. A particular type of sewing machine has to be manufactured for the making and closing of bags used for gunpowder and explosives, and a special make of boot is requisite for those who work in or travel through the danger buildings. These are but trifling instances of the main point urged here, that the explosives industry is one whose ramifications show themselves in well-marked and strictly specialised lines in a number of other industries which, at the first glance, seem to have but little in common, either with it or among themselves.

THE CARE OF RIFLE BARRELS.

THIS is a subject on which expert opinion is still far from having arrived at a final conclusion, and the more so since circumstances undoubtedly alter the condition of individual cases. Everyone is familiar, in these days of smokeless powders more especially, with the results which accrue from quite a temporary neglect of a rifle barrel, and as a consequence those shooters who desire to qualify as experts bestow an amount of pains upon the cleaning of their weapons which to anyone but a real enthusiast would seem almost absurd. And in this connection a question may well arise as to whether it is not possible to spoil the shooting of a rifle by too assiduous cleaning, equally as by neglecting to clean it properly. To many of our rifle-shots such a suggestion will appear to savour of rank heresy. They will at once quote their own experience to show how easily rust marks are formed, especially in rifles of small calibre and using the modern smokeless powders, and they will prove quite definitely that nothing but constant inspection and frequent cleaning and oiling will prevent the formation of these terrible rust spots in a weapon when it is not in use. Assuming that the statement be true, the question remains whether rust is the only evil from which a rifle barrel may suffer, and which will affect its shooting qualities.

In fact, it may be possible so to clean and preserve a rifle that its bore may present the polished surface of a mirror, and yet in the process to have irredeemably spoiled its correctness of shooting. Even without the use of emery powder or any similarly violent agent, constant and unnecessary cleaning must at times and in all circumstances exercise some detrition, no matter how soft or smooth the material may be which is employed to rub the bore. It is an exemplification of the old proverb anent the constant dropping and the consequent wearing away of the stone. Moreover, it is not only the rag or the patch whose effects have to be considered. If a pull-through be employed, the cord must produce attrition, for who is there who even with the exercise of the greatest care can ensure that he pulls the cleaner through without scraping the cord at the muzzle or breech, not perhaps always, but quite often enough for the purpose of causing a marked degree of attrition. If a cleaning rod be used, the case is still more evident. Of course, it is fully recognised that a rifle should always be cleaned from the breech, not from the muzzle. Yet there are several well-known makes of rifle to which the application of this counsel of perfection is impossible, while even in other weapons which give the required facilities, it is not exaggeration to say that fully 50 per cent. of the cleaning is done from the muzzle end. There is scarcely a need to point out in this event how rarely a series of strokes of the cleaning rod avoid including a considerable proportion in which the rod is scraping along one part or another of the muzzle end of the bore, to say nothing of the bashing effect produced when a tight patch or tow-wrapping has been pushed through to the chamber and then suddenly diminishes its resistance, with the result that the handle of the cleaning rod descends violently on to the muzzle of the rifle.

Now, it is common knowledge that erosion and rust show themselves chiefly, almost entirely, within a few inches of the breech chamber, and that imperfections in the bore at that end cause relatively little disturbance in the flight of the bullet. They may affect its velocity, and to that extent alter the trajectory; but if so, the error will become constant, and may be corrected in the sighting. At the muzzle, on the other hand, any deformation of the bore affects the flight of the bullet as it leaves the rifle, giving it a more or less erratic change of direction according to the nature and extent of the deformation. The variations of direction set up in such a case cannot be reduced to a constant factor, and the rifle is at once characterised as shooting wild. It is then no longer a weapon of precision, and is of no practical use to the expert who expects his shots to strike at the place on the target covered by his sights.

The moral intended to be drawn here is fairly obvious, that the efficiency of a rifle may be destroyed as easily by too much as by too little attention in keeping the bore clean. We believe that this is more fully recognised in the United States than over here. The Americans are pre-eminently a nation of rifle shots with all bores, but especially with those smaller calibres which present peculiar difficulties in cleaning. They are intensely practical in this as in all their pursuits, and yet we find that they treat their weapons with what the ordinary British rifle-shot would consider to be carelessness. They clean them and oil them certainly, but not with the frequency and lavishness of attention that is usual with enthusiasts on this side, and they look on a few rust spots in the bore almost with indifference, where some British sportsmen would at once resort to the wire brush or to emery powder. Of course, it may be urged that the comparative dryness of the air in the greater part of the United States is less provocative of mere rust, as distinguished from the erosion produced by the powder gases, than is the case in the more humid atmosphere of this country; but a wet day is wet all the world over, and the American does not differ from his brother sportsman elsewhere to the extent of postponing his expeditions afield in deference to climatic conditions.

INCIDENTAL JOTTINGS.

THE OKEHAMPTON TRAGEDY. That lyddite is somewhat uncertain in its behaviour, seems to be once more shown with startling clearness by the terrible tragedy which occurred on the range at Okehampton. Unfortunately, the only witnesses of what took place in the handling of the shell were the three victims, so that one can simply conjecture as to the events. Apparently, ex-Sergeant Vanstone, late of the Devon Constabulary, found the unexploded shell in a partially buried condition, and informed Sergeant Bleakley, R.F.A. of his discovery, and the two, in company with P.c. Hall, of Okehampton, visited the spot for the purpose of removing the dangerous treasure-trove. It is supposed that in the operation of digging the shell out of the ground it exploded, blowing Sergeant Bleakley completely to pieces, and doing nearly as much to his companions. The custom is to explode all these blind shells on the spot, and this was no doubt the course about to be pursued by the three men when the premature bursting of the shell took the matter out of their hands. It is to be regretted that means cannot be adopted to render the risks attaching to this necessary destruction of blind shells used in artillery practice somewhat less, and the more so, since this is not the first accident that has occurred in the handling of lyddite.

AUTOMATIC RIFLES FOR GERMANY. It will be remembered that we gave, a few months ago, an illustrated description of the new Mauser rifle, 98, which has been adopted for use in the German army, and we understand that the manufacture of this arm is being proceeded with in due course. The German military authorities, however, do not appear to regard this improved magazine rifle as representing finality, for we learn that they are now subjecting various types of automatic rifles to a series of exhaustive tests at Spandau. For the present, while several kinds are being experimented with, no definite decision has been made, so that the re-arming of the troops with the new Mauser will continue pending further developments.

CHINESE ARSENALS. According to Mr. Gerow D. Brill, who was until recently an official in the employ of the Chinese Government, the prohibition placed on the importation of arms into China is likely to be quite futile, since that country possesses the capacity to manufacture its own arms and ammunition, at least, to some considerable extent. Mr. Brill points out that the Chinese have arsenals and smokeless powder factories at Foochow, Hanyang, Nanking, Chengtu, and near Canton. At Hanyang there are factories working at full pressure, night and day, turning out hundreds of magazine rifles, and they have also all the machinery and metal for making large ordnance, quick-firing, and machine guns. There is also a factory there for the production of smokeless powder, and this is now in full work. The same informant expresses it as his opinion that Chang-chi-tung is one of the wisest men in the country, and that he is not making arms and ammunition for nothing, nor reorganising the army without some definite object. He concludes an interview by saying, "No one can tell what is going to happen in China." It seems, judging by this expert opinion, that the Sick Man of the Far East is not so very sick after all.

ARMSTRONG AND ADMIRALTY. It has been a standing disgrace to the Admiralty Department that the great Elswick firm has for years past stood aloof from all Government work, and has been content to turn out its specialist wares for the benefit of foreign countries. The reason for this is well-known to everyone having any interest in acquiring the information, as being due to those short-sighted methods of officialdom which have long rendered it a doubtful honour for a firm to head its letter-paper, "Contractors to the Admiralty." All the same, the apparent reconciliation that has been effected calls for hearty congratulations to whoever was the intermediary, and it is distinctly gratifying to learn that Elswick is now going to place its resources and its profound experience touching naval armaments at the disposal of the Home Government. Already, armour-plates made at Openshaw have emerged most successfully from tests at the proof butts at Whale Island, and the Company is now in receipt of the contract for the supply of armour for H.M.S. *Lancaster*, which is building at Elswick. The construction of this first-class armoured cruiser will constitute a record, inasmuch as

this is the first instance, we believe, in which a vessel of that class has been built for the British Navy, and fully equipped by one private firm. As regards other countries, Elswick has for many years been a sort of universal provider, so that the honour is scarcely overwhelming in its magnitude.

VULCAN.

ROUND THE TRADE.

We are informed that the firm of Lang and Hussey, Ld., will in future be known as Joseph Lang and Son, Ld.

A first and final dividend of 11¾d in the £ was paid in the matter of Mr. George Gooch, gunsmith, of St. Albans.

Messrs. F. Joyce and Co., Ld., inform us that Mr. A. E. McCarthy has ceased to represent them as from the 12th ult.

The directors of the Roburite Explosives Co., Ld., have declared an interim dividend 5 per cent. on the preference shares.

We understand that a new depôt of the Army and Navy Stores will be opened shortly in Calcutta. At the present time there is one branch in India, in Bombay.

We regret to learn that Sir Andrew Noble met with an accident while cycling at his residence near Newcastle, whereby his right leg was somewhat badly injured.

A first and final dividend of 7s. 8¼d. in the £ has just been declared in the matter of Mr. Joseph Price, gun barrel manufacturer, of New Town, Cradley Heath, Staffs.

Owing to increased trade, the Arms and Ammunition Manufacturing Co., Ld., have removed from 143, Queen Victoria Street, E.C., to larger premises at 140 Southwark Street, S.E.

We understand that Mr. James Tolley is retiring from his active participation in the affairs of Messrs. J. and W. Tolley, Ld., and that his place will be taken by Mr. William Tolley.

The National Explosives Co., Ld., has declared an interim dividend at the rate of 6 per cent. per annum on the preference shares, and 5 per cent. per annum on the ordinary shares of the Company for the half-year ending June 30th last.

The British and Colonial Colliery Supply Association, Ld., informs us that the explosives Westfalite No. 1 and Westfalite No. 2, as manufactured in this country, have successfully passed the Home Office tests for admission to the "Special List."

According to the recently exhibited lists of such freemen of the City of London as are liverymen of the City Guilds entitled to the Parliamentary vote, the Gunmakers' Company shows this year an increase of three freemen so qualified as compared with 1900, the figures being 26 and 23 respectively.

The following has been registered as a trademark for explosives included in Class 20, by Messrs. Luck's Explosives, Ld., of 1, Leadenhall Buildings, E.C.:—Device: two circles, one inside the other, with the words "Luck's Explosives, Ld." between them. In the middle of the inner circle is a cross with the word "Henrite" running across it in both directions.

We are in a position to announce that Mr. J. W. Smallman, of Nuneaton, whose new two-trigger mechanism for double-barrel guns is illustrated and described in this issue, is prepared to treat with the trade for the right to adopt this mechanism, on a system of royalties. Mr. Smallman's name is already well known to the gun trade in connection with inventions, notably as regards single-trigger arrangements.

Messrs. Humphreys, Ld., the well-known specialists in the construction and fitting up of iron buildings, are now engaged in the fulfilment of a very extensive order in connection with the new factory of Messrs. Greenwood and Batley, Ld., at Abbey Wood, which bids fair to be one of the most modern and completely equipped establishments in the world for the production of munitions of war and explosives generally.

According to a daily paper, "there is no busier tradesman in London to-day than the sporting gunmaker. He and his staff have been working from morn till very far into the eve to cope with the rush of business which will continue until September 1!" This is satisfactory reading, and we trust that all our friends in the trade have been sharing in the good times referred to, and find this a better season than was experienced a twelvemonth ago.

A new company was registered on the 17th ult., under the style of Messrs. Robert Roper, Son and Co., Ld., with a capital of £3,000, its object being to adopt an agreement between Annie Liversidge and P. Hall, and to carry on the business of manufacturers of and dealers in gunpowder, dynamite, and other explosives, for sporting and blasting purposes, guns, ammunition, drills, picks, and tools of every description for the use of miners, navvies, &c. There was no initial public issue.

The directors of Messrs. Vickers, Sons and Maxim, Ld., have decided to distribute as a bonus amongst the holders of ordinary shares, 1,100,000 unissued ordinary shares of £1 each, fully paid. The following interim dividends have also been declared:—2½ per cent. on the preferred 5 per cent. stock; 2½ per cent. on the 5 per cent. preference shares of £1 each all paid; 1s. per share on the 3,300,000 ordinary shares of £1 each all paid, which includes the bonus shares. These are all free of income tax.

The new branch factory of Messrs. Nobel's Explosives Co., Ld., at Linlithgow, was the scene of a demonstration on the 24th ult., when it was visited by about 300 of the Company's employés from Polmont. They were accompanied by Mr. G. Smith, the genial and capable manager of the Westquarter, Redding Moor, and Regent Factories, and other officials, to say nothing of their own local brass bands, which materially assisted in the subsequent dances and games held on the new factory grounds. The factory is situated at the east end of the town, near to the railway station, on land acquired from the County Council.

According to the Board of Trade Returns, the shipments of arms, ammunition, and military stores to foreign countries during the seven months of the present year continue to show a satisfactory increase. Small fire-arms to the number of 78,635 in all were sent out, as compared with 52,251 in the corresponding period of 1900, and 67,936 in the first seven months of 1899. The shipments of gunpowder are steadily decreasing, the amount in lbs. for the three years being respectively 3,410,512, as compared with 4,126,500 and 4,495 900. On the other hand, the items unclassified and collected under the heading of "all other kinds" have reached a total value this year of £1,413,152, which is a marked improvement on the £1,082,635 of 1900, and the £835,685 of 1899.

Under the style of the Safety Dynamite Syndicate, Ld., a company was registered on the 27th ult., with a capital of £5,000, its object being to carry on the business of manufacturers of tools and other apparatus used in connection with the working of mines, quarries, and the like, manufacturers and dealers in ordnance, all kinds of ammunition, gunpowder, dynamite, or other explosive substances, machine and other guns, colliery, quarry, and mine owners, smelters, metallurgists, iron, brass, and other metal founders and fitters, machine tool makers, engineers and boiler makers, millwrights, &c., and to adopt an agreement with H. C. Hall and W. Parry. There was no initial public issue, and the first directors are H. C. Hall and W. F. H. Hinde.

We have received from the sole wholesale agents, Messrs. Buck and Co., a sample of the new patent cleaning and polishing cloth "Clenveet," which is specially adapted for keeping guns and rifles in order. "Clenveet" is made up into three sizes of cloth, and consists of a soft, smooth material which is apparently thoroughly impregnated with some form of anti-corrosive grease, which cannot, it is claimed, be removed by ordinary washing of the cloth from time to time as may be necessary. The new substance is equally capable of keeping gun and rifle barrels free from rust, and of polishing gun stocks, and certainly is more handy and cleanly than the ordinary oiled rag. It is suggested that gun cases and covers may be rendered practically damp-proof by being lined with this material.

NOTES.

A TELEMETER FOR FIELD SERVICE.—Experiments are about to be conducted with a view to testing the possibilities of an acoustic telemeter, invented by General Giletta, the object of which is to locate the position of artillery in action. It is, in fact, intended to discount many of the advantages derived from the use of modern smokeless powder, as it has claimed for it that it shows not only the direction from which the sound of gun-firing proceeds, but also the distance at which the firing has taken place. The Italian Government has, we understand, ordered the construction of a number of these instruments, which are to be tested at the forthcoming army manœuvres, and it is stated that our own War Office is also experimenting with the appliance with a view to appraising its practical utility.

NEW SECONDARY ARMAMENTS.—The 7·5-in. quick-firing gun, having now passed through its experimental stages, is to be formally adopted for the secondary armament of new battleships and the larger types of cruisers, in place of the 6-in. gun. This should at once effect a most satisfactory increase in the fire-energy of those vessels, some of the productions of late years having been notoriously under-gunned as compared with foreign vessels of similar displacement, the *Diadem* and *Eclipse* classes being special cases in point. In the same way, cruisers which formerly would have been provided with secondary batteries of 4·7-in. guns will henceforth be supplied with 6-in. guns, thereby effecting a most desirable change in the quality of the broadside fire. But not the least important feature of the innovation lies in the improved efficiency of each calibre of gun, a result which is largely brought about by the recent developments in gun-mounting.

THE ROSS-HARRIS RIFLE.—During the last few days of the Parliamentary Session Mr. Henry Norman interested many members of the Lower House by showing to them in the lobby the new combination magazine rifle, which was recently submitted for the inspection of His Majesty and the Commander-in-Chief. This weapon is somewhat shorter, and consequently lighter, than the existing Lee-Enfield arm, and is fitted with Sir Charles Ross's straight-pull bolt-action, and the Harris magazine which was recently described and illustrated in these columns. This combination is undoubtedly a very happy one, and the rifle seems to have won favourable opinions from the various experts to whom it has been shown, containing as it does several important improvements on the Service arm, which seem likely to meet the conditions of modern warfare. We hope shortly to be in a position to give an illustrated description of the Ross-Harris rifle, and shall then be able to deal more fully with its chief points of interest.

WIRELESS TELEGRAPHY AND EXPLOSIVES.—The French Minister of War is reported to have commissioned an investigation into the possibilities of exploding powder magazines by the action of the electric waves employed in wireless telegraphy. It may be remembered that a "scare" was attempted some time ago with regard to the subject, when it was asserted that the magazine of a war ship could easily be blown up by an electric impulse set in motion by an operator on shore. This notion, however, entirely ignored the fact that, in order to transmit the required spark, it would be necessary to have a receiver or coherer on board the hostile vessel acting in sympathy with the transmitting instrument—an assumption sufficiently remote to render the idea entirely unpractical. On the other hand, it is significant to note that the first coherer, on which all M. Marconi's coherers are based in principle, was constructed by M. Edouard Branly for the purpose of conducting experiments on behalf of the French Government as to the effect which electrical disturbances might have on explosives. For this reason, it will be interesting to follow the course of the later inquiry into the same subject, and to see what new facts may be discovered from the proposed investigation.

THE FIELD GUNS MADE IN GERMANY.—On the 12th ult. Major Evans Gordon, M.P. for the Tower Hamlets, Stepney, asked the Financial Secretary to the War Office, in the House of Commons, whether he could say how many of the 108 field guns purchased from the Rheinische Metal Waarenfabrik had been issued, how many remained in store, and how many of those issued had broken down; and, having regard to the fact that such breakdowns had occurred during ordinary field battery drill, when guns and limbers were subjected to no such strain as would be thrown upon them in actual service, whether any conditions and tests as to the quality of the material supplied, such as were invariably imposed on manufacturers at home, were imposed on the German company; and whether guns of identical pattern made by the same firm were in use in the German or any other Continental army. To this string of questions, Lord Stanley replied, that of the 18 batteries bought in Germany, 15 are in the hands of the troops. He averred that no guns have broken down, and such defects as showed themselves in the carriages have been put right. One brigade division has already completed its annual practice at Imaal with perfectly satisfactory results. As regards the question of the quality of material, Lord Stanley stated that the batteries were under inspection during the process of manufacture. Finally, he believed that guns of this pattern are under trial by several European Powers, but none have yet decided to adopt them. We understand that both the German and Austrian military authorities have been most favourably impressed with the Ehrhardt quick-firing field gun of this much abused pattern, as was mentioned in our August issue.

ARMAMENTS IN INDIA.—As was reported in a previous issue, considerable advance is being made in the matter of re-arming the troops in the Indian army with modern weapons, the white troops of all grades receiving the Lee-Enfield and the native troops the Lee-Metford pattern of magazine rifle. The necessity for providing the native forces which act in concert with a backing of European regiments with a weapon rather more efficient than the Snider of former days, has lately been brought into unpleasant prominence by the raids of the Mahsuds, a turbulent race who appear to have obtained a plentiful supply of Martini-Henry rifles, and even some of the magazine service arms, these latter probably being mostly acquired by ones and twos from the light-fingered gentry who prowl about every military station in the country. Altogether, there are some 230,000 men of all arms in the Indian Empire, including the British garrison of about 70,000, so that the process of re-armament as regards the Imperial Service

and native troops naturally takes some time in the accomplishment. When account is taken of wear and tear, wastage and losses on active service, the advisability of establishing a rifle factory in India capable of turning out 25,000 weapons per annum requires no urging, and the more so since, even if this output proved more than sufficient to meet current requirements, there would be no harm in obtaining a reserve. Captain Mahan has suggested the necessity, for an Empire such as ours, of establishing stores of war material over-seas so as to provide against the chance of temporary interruption in the communications with the mother country. India now bids fair to be self-supporting in all war material except perhaps the heavier types of artillery, and she might also be regarded as capable of supplying to some extent the needs of Australia and South Africa when her own requirements are fully met. The Boer war will cause some considerable demand for new arms to supply the place of those worn out in service.

REVIEW.

Torpedoes and Torpedo-Vessels. By Lieut. G. E. Armstrong (late R.N.) 2nd Edition, Revised. London: George Bell and Sons. 1901.

THIS interesting contribution to the series of "Royal Navy Handbooks," in entering on its second edition after an interval of about four-and-a-half years, serves rather to show to what a degree the science of this species of naval armament had already advanced in 1896 than to chronicle any very startling feature of advancement during the intervening period. A comparison of the two editions renders this fact fairly clear, and it is the more noteworthy since the whole science is absolutely modern, dating no further back than the American war of secession at the very earliest. At the same time, though recent developments have effected no revolution of pre-existing methods, that is not to say that there has been no advance. Recent years have seen marked increase in the torpedo flotillas of the world's navies, and especially in the specialised branch of the torpedo-boat destroyers which, while nominally what their designation implies, are equally capable of serving as sea-going torpedo-boats of the largest class compatible with proper efficiency. In the factor of speed especially, there has been a conspicuous increase from the 29·17 knots of H.M.S. *Boxer* to the 33 knots of H.M.S. *Express*, and the 35·6 knots of the ill-fated H.M.S. *Viper*, with its 10,000 h.-p. steam turbines. As regards torpedoes themselves, the adoption of the gyroscope has greatly increased the efficiency of the Whitehead torpedo by rendering it possible to correct any accidental aberrations of the missile after its discharge from the tube, and to that extent has widened its sphere of action by improving its precision and capacity for keeping the required course. The introduction of net-cutters has been more or less neutralised by the improvements wrought in the manufacture and equipment of torpedo-nets, the latest pattern of which is claimed to be practically impenetrable. This, however, is one of those never-ending duels in which, like that between guns and armour, the victory alternately fluctuates from side to side without absolute finality.

Hitherto there has been no opportunity of deciding to any satisfactory degree the comparative efficiency of the torpedo as a factor in naval warfare. It has so far been employed on three occasions—during the Chilian Revolution, the Chino-Japanese and the Spanish-American wars—but any lessons that have been taught by those occurrences have affected details only, not general principles. In apportioning values, so much depends upon the equalisation of opposing factors, and it cannot be allowed that in any of the three instances quoted were both sides on an equality as regards equipment or *personnel*. On the other hand, the experience derived from these wars has assisted largely in settling matters of detail. For example, the action off Santiago, which resulted in the destruction of Admiral Cervera's squadron, has amply demonstrated the dangers and disadvantages following the use of above-water torpedo-tubes in large vessels. But as regards the wider question as to the possibilities of torpedo attacks on single vessels or squadrons, which are in the utmost condition of efficiency and watchfulness, and the moral effect that would be imposed by the impending presence of torpedo-boat flotillas on hostile fleets, it is certain that nothing definite can be learned except in the hard school of a war between two first-class naval powers. The ordinary naval manœuvres are the purest farce so far as a settlement of this question is concerned.

Since the publication of the first edition of this work, some material progress has been made in the designing and construction of submarine or submersible torpedo-boats, and Lieut. Armstrong seems disposed to attach considerable importance to the advances made in this branch of the science. We are pleased to note, however, that he appraises the real "submarine" at what we believe to be its true worth—which is not much. The boat, in fact, which will attempt to approach its enemy by progress below the surface of the water from a distance of several miles is foredoomed to failure under the practical conditions of warfare. As regards the merely submersible boat, however, that is another question. A vessel that approaches a battle-ship with its conning tower above water, and is steered in that manner to within ordinary torpedo range, and then becomes submerged for the last few hundred yards only of its course, has a greater possibility of achieving its purpose, but no boat of that description has so far been evolved which is within a measurable degree of practical perfection. The much-vaunted trials of the French boats have taken place under conditions incapable of attainment in actual war. In any event, it is probable that the submarine or submersible boat will always have a moral rather than a practical value, besides which experience shows that no destructive agent is ever devised and brought into being without speedily meeting with an antidote. On that account there is no need to display a feeling of panic in watching the present progress of evolution in the submarine.

Lieut. Armstrong is to be congratulated on the production of a singularly lucid and complete monograph, which deals with a technical subject in language to be understanded of the people. His descriptions are very clear and simple, and the illustrations have the merit of assisting the understanding of the letterpress, besides being excellent in reproduction. The original frontispiece is again in evidence, a remarkably spirited sketch by the Chevalier Eduardo de Martino, representing "a destroyer at work." This accomplished marine artist's work is too well-known to require further praise here.

THE EXPLOSIVES TESTING STATION AT WOOLWICH.

SUBJOINED we give a somewhat lengthy, but decidedly interesting, extract from the report submitted by Capt. A. P. H. Desborough, H.M. Inspector of Explosives, as to the work carried out at the Home Office Testing Station, Royal Arsenal, Woolwich, of which this capable officer has charge in succession to Captain M. B. Lloyd. The opening of the report deals with certain details of the testing plant, which have undergone modification in accordance with requirements, and the general tendency of the report is to show that Captain Desborough is not only a zealous, but an exceedingly hardworking and painstaking officer in charge. The following is a record of some of the tests conducted during the year 1901, and the extract is derived from Appendix O (3) of the Annual Report of H.M. Inspectors of Explosives, the general contents of which are referred to more particularly elsewhere in this issue.

Captain Desborough writes:—"As mentioned by Captain Lloyd in his report last year, I carried out some experiments with a view of determining the relative charges of explosives. It has been always admitted that the Trauzl lead block gave no real comparison between high and low explosives, and that even for high explosives it was more a test for rapidity of detonation than for strength; no allowances being made when calculating the equivalent strengths for the varying shapes of the crater. In practice, the loss of work through the local shattering of the coal varies directly as the rapidity of detonation. Keeping this in view, I came to the conclusion that a ballistic test would not only give a more accurate comparison from a coal-getter's point of view, but would also give a direct comparison between high and low explosives.

"The apparatus consists of a 5-ton mortar of 13 inches calibre, suspended in an iron framework from an overhead beam. Friction is reduced by the employment of steel roller bearings, made by the Mossberg Roller-Bearing Company, and so much so is this the case, that considerable inconvenience is caused on a windy day by the swinging of the mortar due to the wind.

"To determine the strength of an explosive, one of the guns is loaded with a charge and stemmed with a fixed weight of clay; a small wad of cotton waste is inserted between the clay and the cartridge to prevent the clay finding its way between the sides of the cartridge and the liner. The gun is then run up to a fixed distance from the muzzle of the mortar and fired. The extreme swing of the mortar is then measured to hundredths of an inch by means of a sliding rule, one end of which rests against the mortar, and the other against a fixed block; as the mortar moves forward again the rule falls into a net, and the swing back can then be read by means of a vernier on the rule.

"It was found that charges of nitro-glycerine explosives equal to 4 ozs. of dynamite when fired in the lead-block gave a definite swing, and this has been adopted as the standard.

"As was to be expected, the ammonium-nitrate explosives were found to have been estimated too weak by the lead-block. In the case of low explosives the comparison obtained is 2·3 to 1.

"Quite independently of these experiments, a number of statements by practical miners as to the comparative strengths of high explosives with gunpowder were obtained through H.M. Inspectors of Mines, with the result that the average of 72 estimates above 2 to 1 and below 3 to 1 gave the result of 2·29 to 1, and also showed that ammonium-nitrate explosives were practically found to be stronger than estimated by the lead-block. It must be admitted that the proximity of the two figures is merely a coincidence, but at the same time I do not imagine that the results shown by the pendulum vary much from those practically obtained in coal mines.

"The advantages of this method are:—1. The use of heavier charges (charges of ¼ lb. of dynamite have been fired). 2. The very great regularity of the results. 3. The increased facility for firing a series of shots when necessary. 4. The fact of obtaining a comparison between all grades of explosives, coinciding with that as stated by practical miners. 5. The abolition of an empirical ratio between high and low explosives as necessitated by the Trauzl method.

"One result due to the adoption of this method of determining the strengths of explosives has been that in the Special Test the 10 rounds fired with double charges now always appear to be more severe than those fired with the 1½ charges. Formerly, for low explosives, the latter charge caused more failures, due, I think, to an insufficiency of stemming for the weight of the charge, and thus permitting burning particles of explosive to be projected into the gas gallery. This was confirmed during the experiments with the pendulum, as I was able to see the burning particles projected when fired under the conditions specified above, but did not do so when using double charges and three inches more stemming.

"A series of experiments, based on some private ones carried out in South Wales, was fired. A gun was placed vertically, loaded, stemmed, and coal dust placed on a sheet of asbestos paper over the muzzle. Only one permitted explosive caused an ignition under these conditions, but when the coal dust was placed about six inches above the muzzle no ignition was obtained.

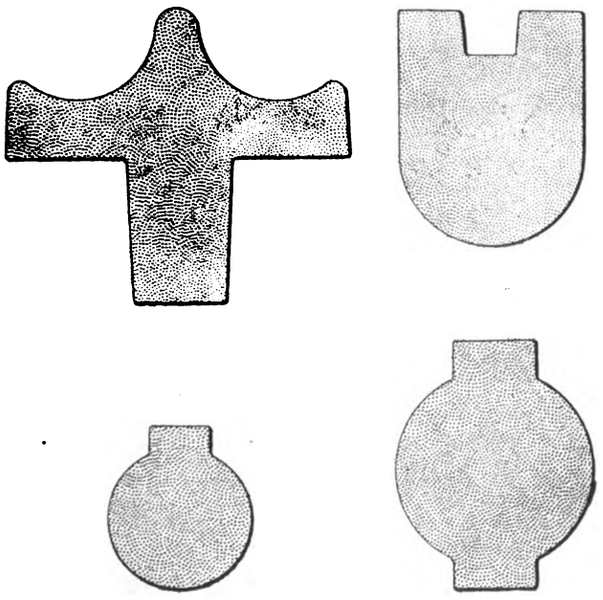
"Other experiments with coal dust have been tried, but in no case have ignitions been caused by explosives on the Special Test, and though this is only negative evidence, I am of opinion that no test of explosives now in use with coal dust and stemmed shots is as sensitive as the Special List Test.

"I carried out a number of experiments with Safety Fuze, by burning a length of 10 ft. in the gas gallery, with the ends of the fuze-lead outside the gallery. The majority of the experiments were carried out with a 10 per cent. mixture, and some were repeated with a 15 per cent. mixture, but this did not appear to make any appreciable difference. In general, the cheaper makes of fuses more frequently caused ignitions, but this was not invariably the case.

"I received from the Roburite Explosives Company an apparatus for testing detonators. The test consists in firing a detonator against a diaphragm of pure lead; the efficiency of the detonator is determined by the appearance of the lead surface. The use of this apparatus has been most instructive, and has drawn my attention to the fact that the pattern of detonator used with safety fuse is more liable to deterioration than electric detonators, the latter, I imagine, being more secure from damage by damp. A detonator affected in this manner is very liable to cause an irregular shot, and it would be interesting to know whether practical men, who have used both methods of firing, can give any corroborative statements."

NEW SECTIONS OF ROLLED STEEL.

MESSRS. JONAS AND COLVER, LD., of the Continental Steel Works, Sheffield, have devoted considerable attention to the production of sections of rolled steel, specially adapted for different classes of customers. We show, in the accompanying illustration, four specimen sections, given in full size, all of which may possibly interest our readers; but of the examples shown, the one to which particular attention may be drawn is that in the top left-hand corner, which is one of the latest sections produced by the firm. We understand that this section presented considerable initial difficulties in the rolling, which were, however, successfully surmounted, and the company now possesses rolls that can turn it out with certainty and celerity. It is more especially designed for the use of the gun trade, and is expected to effect a considerable saving of labour in the formation of the lumps of double-barrel guns and rifles, and possibly also of



the fore-sight blocks of the latter. No doubt, having once triumphed over the difficulties encountered in the production of so complicated a section, Messrs. Jonas and Colver, Ld., will be in a position to modify the dimensions slightly to meet individual requirements, should that be necessary; but we are given to understand that the section here illustrated in full size has received the favourable verdict of members of the trade, and that one well-known London firm of gunmakers has already begun to utilise this steel rolling in the manufacture of its products. The other sections shown are only typical of a great variety which are constantly being turned out at the Continental Steel Works to meet special requirements.

On the 20th ult, a terrible explosion of dynamite occurred at Herkimer, in New York State, U.S.A., on the extension works of the New York Central and Hudson River R.R. The gang of thirteen men engaged on the spot were sleeping in a car in close proximity to the explosives store, and were all killed on the spot, in addition to which three locomotives were entirely destroyed, and every window in the town was broken.

THE SMALLMAN TRIGGER MECHANISM.

IT may be remembered that in our issues of August, 1889, and October, 1900, under the heading of "Selected Patents," we gave illustrated descriptions of the new trigger mechanism for double-barrel guns which was invented by Mr. J. W. Smallman, of Nuneaton. The main idea actuating the inventor of this ingenious device has been that of combining the obvious advantages of the single-trigger mechanism with the simplicity of parts and solidity of construction of the ordinary two-trigger arrangement, and this blending of the best features of the two types has been achieved with a most marked degree of success in the mechanism now under review. At the time when our two previous notices appeared, we were not able to do more than show the working of the parts in diagrammatic form and on a reduced scale, but now, through the courtesy of Mr. Smallman, we have pleasure in showing in Figs. 1 and 2 full-sized side-views of the trigger-plate with all the mechanism in place, and in the other illustrations side-views of a high-grade pigeon-gun fitted with the mechanism and with the triggers clearly shown in the positions occupied before and after firing the right-hand barrel.

Before proceeding to examine the illustrations in detail, it might perhaps be as well to recapitulate in a few sentences the points which were severally aimed at or avoided in the designing of this mechanism. The ordinary double-trigger mechanism may easily be regarded as standing first in order of merit as regards simplicity and solidity of parts. Each barrel has its own separate firing appliances, entirely independent, so that an accident to the parts of one lock will not throw the other barrel out of action—a point of some importance to sportsmen who happen to be at some distance from the confines of civilisation where practical gunsmiths are to be found. But, on the other hand, the double-trigger gun has the defects of its qualities. The hand-grip and length of reach in the stock which suits the firing of one barrel cannot be equally suitable as regards the other, and, as a consequence, assuming that a sportsman is exactly fitted, as is usual, for the discharge of his right-hand barrel, it must be plain that he is under certain disabilities with regard to firing his left-hand barrel, the trigger of which is about an inch nearer to the heel-plate of the gun than is that of the right lock. To get off this second barrel, he has to shift his hand somewhat on the grip, and he also labours under the further disabilities that the second trigger is of slightly different shape from the first, and has also a longer leverage, thereby needing a different degree of pull-off. There is also another feature which appeals to the practical shooter with some force, and that is, that the finger is apt to become severely bruised by the blow dealt by the right-hand trigger during the recoil consequent on firing the second barrel.

As regards single-trigger mechanisms, of course the principal disadvantages of the double-trigger arrangement are obviated. One trigger only being used for the discharge of both barrels, there is, of course, the same length of reach in firing right or left, and generally no appreciable difference in the strength of pull-off. But these results are only attained at the expense of some complication in the mechanism contained on the trigger-plate, especially as in all single-trigger systems of which we have cognisance a timing-device in some form or another is an

absolute necessity, to avoid premature discharge of the second barrel during the second and involuntary pull which always occurs as the result of recoil. Moreover, in practically every type of single-trigger mechanism the arrangement of parts is almost necessarily such that any derangement or accident occurring to the lock mechanism is sufficient to put both barrels out of action, though it must be admitted that the perfection of workmanship attained in most types of single-trigger mechanism which have come under our notice renders this contingency unlikely under ordinary conditions of use. Further complication is introduced where the selective principle is adopted, whereby the sportsman is enabled to fire right-left or left-right at will. It should, however, be clearly understood that in making these points we are not condemning either the principle or the practical application now in existence of the principle of the single-trigger gun. There are now in use a number of arrangements of lock mechanism involving the employment of one trigger only, all of which display great ingenuity in adapting means to an end, while many possess also the further advantage of comparative simplicity and strength of parts. But it must be admitted, in this as in all cases where mechanism is adapted so as to give increased facilities to the operator, that these increased facilities can only be obtained at some expense—which generally takes the direction of an enhanced complication of working parts.

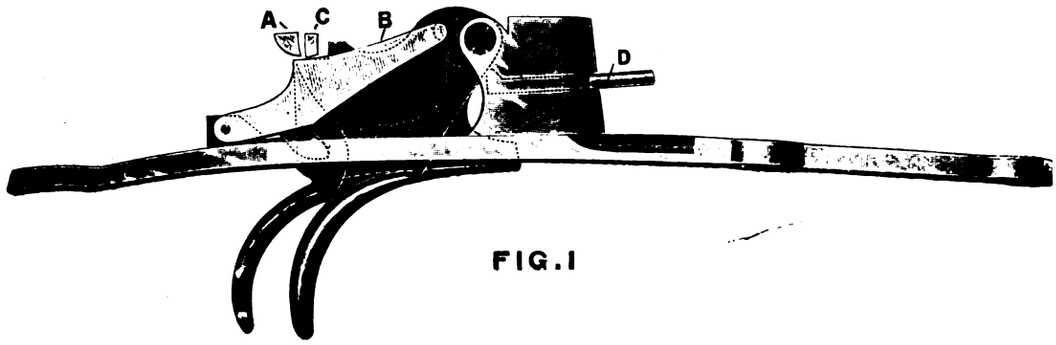


FIG. 1

Mr. Smallman has endeavoured, we think with conspicuous success, to combine the good qualities of the single and the double-trigger mechanism. He has designed a double-lock action having two triggers, which give practically the same length of reach, the same hand-grip, and the same strength of pull-off for each barrel, and with a capacity for firing both barrels as quickly as any single-trigger gun which is provided with an efficient timing-device. At the same time he has adhered closely to the ordinary double-trigger mechanism in retaining the two triggers with full trigger-blades, each of which actuates its own particular sear, and is so arranged that even should any part of his specially-patented action get out of order, the gun would still be capable of being used as an ordinary double-trigger gun, while, even in the remote contingency of one of the lock actions getting out of order, the other could be used independently. An examination of the accompanying illustrations, Figs. 1 and 2, will make the details and operations of the mechanism quite clear. It will be seen that, attached to the trigger-plate, in the ordinary style, are the right and left trigger-blades, which differ only in a slight degree from those ordinarily fitted to a double-trigger gun. For one thing, they are placed rather nearer together than is usual, thereby making the action slightly more compact and causing less movement of the finger in changing from one to the other. A radical difference exists, however, as to their relative positions longitudinally, and it will be noticed at once, from an inspection of Fig. 1, that the right-hand trigger is in advance of its neighbour by little more than the amount of draught requisite to release the sear out of bent. It will also

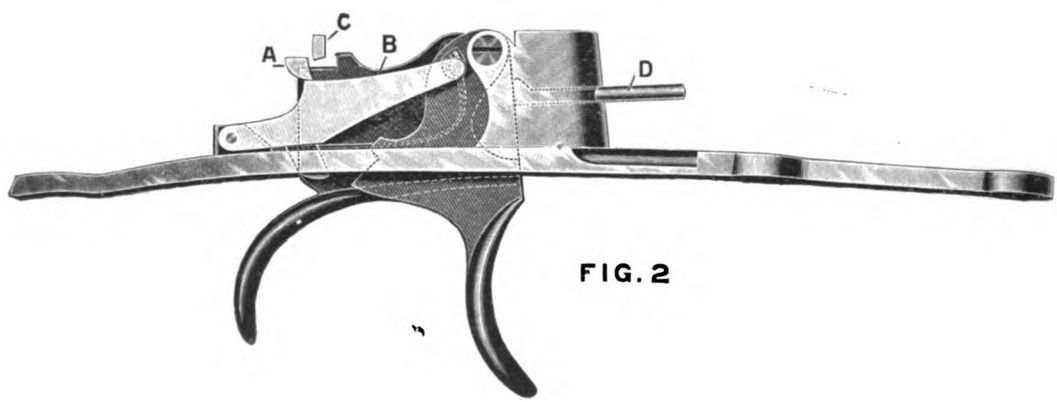
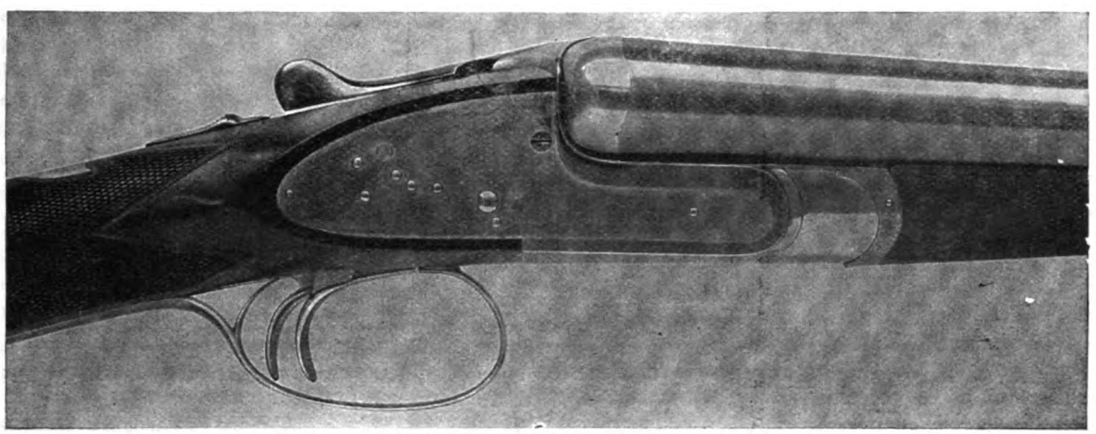


FIG. 2

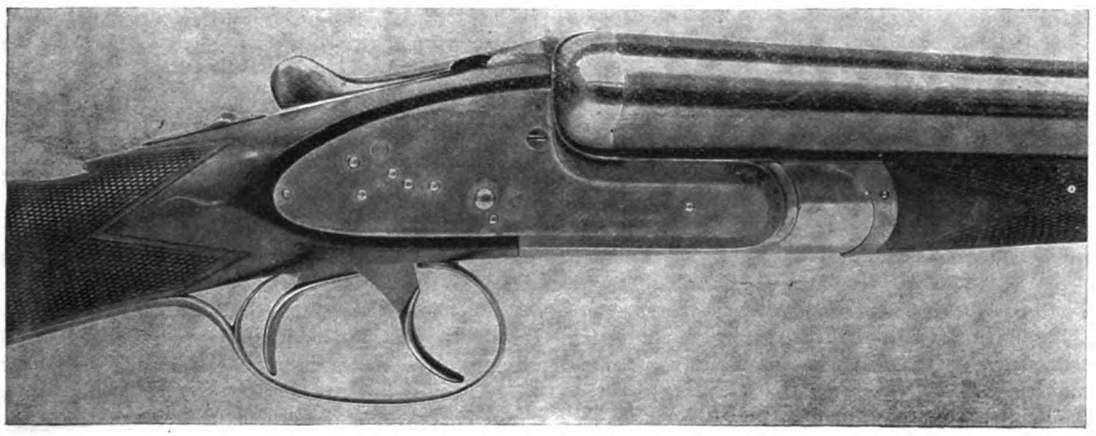
be noticed, from a glance at Fig. 2, that the right trigger-blade has a capacity to swing forward through a slot in the trigger-plate until the tip of the trigger has moved to the extent of at least 1¼-in. from its normal position, and both illustrations also show a lever at the side of the right trigger-blade, lettered B, which is pivoted at one end to the trigger-plate, and at the free end engages, by means of a stud or spur, in a slot in the trigger-blade. Under normal conditions, this right trigger-blade is held in the position shown in Fig. 1 by the action of a light spring, indicated by means of dotted outlines. Fig. 1, in fact, represents the mechanism in the position it occupies prior to the firing of the right-hand barrel, and the mode of operation

is as follows. The forward or right trigger is pulled n the ordinary manner, the blade thereupon raising the sear A and safety-sear C, and releasing them out of bent. During recoil, the finger involuntarily comes away from the trigger sufficiently to allow of subsequent developments.

Turning now to Fig. 2, we see the condition of affairs immediately after the firing of the first barrel. It must be premised that the right lock is false-gaited, so that the right sear-tail



occupies a lower position after the release of the tumbler than when it is in full bent. This is shown in Fig. 2, in which the sear-tail A has pressed downwards upon the lever B, and by so doing has caused the right trigger to swing forward well out of the way of the shooter's finger when it presses the left-hand trigger. The right trigger remains in this position so long as the right tumbler is down, the strength of the sear-spring overmastering the tendency of the lighter trigger-



spring to restore it to the position indicated in Fig. 1. The act of opening the gun, however, raises the tumbler, and places the sear in bent, so that the sear-tail is raised, and thereby takes its pressure off the lever B. This removal of superior pressure allows the relatively light trigger-spring to act and to swing back the right trigger to its normal position, and in this it is assisted by the movements of the sliding rod D, which is actuated by the Purdey under bolt, and which provides an absolutely positive action incapable of being affected by rust or clogged oil.

Even from the foregoing description it should be obvious that the working of this trigger mechanism is of the simplest possible, but no words can adequately express how easily and naturally the firing of the two barrels in rapid succession is accomplished, even by anyone handling a gun fitted on this principle for the first time. We have found that after pulling the right-hand trigger, the finger releases it automatically, and s in its proper position on the left-hand trigger ready to pull off, in a far shorter space of time than is the case in ordinary double-trigger guns, and not appreciably longer than with a single-trigger mechanism. But Mr. Smallman's mechanism also provides for selective discharges in the least complicated manner possible. If it be desired to fire left-right, there is no pressing of a button or slide, as in most single-trigger selective actions. The shooter merely places his finger between the two triggers, thereby pressing the right-hand one forward and getting into position to pull off the left. Since the right trigger is controlled only by a light spring, the recoil causes no bruising of the finger between the two. Yet, immediately on firing the left barrel, the involuntary release of the finger allows the right trigger to spring back into its place ready for the discharge of the right barrel. Using the barrels thus selectively, there is little if any difference between the rates of firing of right-left or left-right.

In conclusion, we cannot but think that Mr. Smallman's mechanism has a clearly marked future before it, and that it

has made its appearance most opportunely. There must be a large number of shooters who are hovering between two opinions, whether to stick to their well-tried double-trigger guns of the ordinary type, or to embark on the, to them, unknown possibilities of the single trigger. Apart from others who will adopt Mr. Smallman's principle on its merits, these waverers should undoubtedly favour a system which so ingeniously and successfully combines the good qualities of the two between which they pause in indecision.

EXPLOSIVES REPORT FOR 1900.

IT must surely be admitted, even by the persons chiefly interested, that the issue of an Annual Report rather more than seven-and-a-half months after the close of the period with which it deals, represents a somewhat regrettable delay. We are far from disposed to attempt to apportion the blame for such a condition of affairs with regard to the twenty-fifth Annual Report of H.M. Inspectors of Explosives, which bears the date, "Home Office, 1st January, 1901," and only reached us on August 18th, and the more so since the publication in question is a bulky Blue Book, consisting of upwards of 200 pages, crammed full of statistical matter, and bearing throughout the evidence of much painstaking. But all the same it is distinctly to be deplored that this useful and instructive publication appears now to be incapable of being issued until the year succeeding that with which it deals, and we trust that in the near future it will be rendered possible to make the compilations necessary for the purposes of the report within a short time of the close of the year dealt with. We call to mind one occasion, that of the annual issue following the death of the late Sir Vivian Majendie, when the report appeared within about three months of the close of the period dealt with.

As regards the introduction to the report, the conditions obtaining in 1900 show a marked similarity to those prevailing in the previous twelvemonths. The only modification of the law made during the past year has been an Order in Council in regard to acetylene gas when in admixture with oxygen or air. The growth of the explosives industry is indicated by an increase in the number of factories, and also by the greater activity exhibited in the leading establishments. Yet it is satisfactory to learn that H.M. Inspectors find that there has been no falling off in the high standard of condition and management in the various factories visited in the ordinary course, and that any irregularities to which attention has had to be drawn have been of a comparatively unimportant nature. This statement might appear to be controverted by the fact that the number of deaths due to accidents by fire or explosion in manufacture is twice that of the average for the decade. But this increase loses much of its alarming significance when it is remembered that the total of deaths so brought about in 1900 was only 9. Moreover, the small number of fatalities of all kinds referred to later on in this notice, in an industry involving undoubted risks, and which finds employment for upwards of 11,000 persons, is a striking testimony to the care exercised in the processes of manufacture, and compares favourably with any other industry, whether specially classified as dangerous or otherwise. The passing of the Explosives Act of 1875 has certainly had the effect of reducing to an almost negligeable quantity the deaths arising from the manufacture of explosives.

MANUFACTURE.—The total number of factories under continuing certificate or licence is 150, exclusive of "small firework" or "toy firework" factories, which come under a separate category. This total shows a decrease of one as compared with the total of the previous year, and four factories of that number are under notice of temporary disuse. The factories under continuing certificate accounts for the slight decrease, there being now only 38, while the number of factories under licence remains stationary at 112. Three new factories have been licensed during the year, while four have become extinct, and there are still 11 licences outstanding, some of which date back from 1899. A return is made of the maximum number of persons employed at one time in the manufacture of explosives, at intervals of five years, the totals of which are here subjoined:—

	In Danger Buildings.	*In Non-danger Buildings.*	*Total.*
1885 ...	2,136 ...	5,348 ...	7,484
1890 ...	3,139 ...	6,681 ...	9,820
1895 ...	3,532 ...	6,491 ...	10,023
1900 ...	4,828 ...	6,270 ...	11,098

These figures do not include persons employed in 12 small firework factories and 15 toy firework factories, each of which gives employment to three or four persons.

During the year 60 amended licences for factories were applied for, and 6 were also outstanding from 1899, and of these 59 were confirmed. It may be mentioned that some of the amending licences were of so complicated and extensive a nature as to constitute practically new licences.

There have been 14 additions to the list of authorised explosives during 1900, and 3 alterations in names, while 6 explosives have been placed on the authorisable list, and 5 alterations in definitions have been made.

As a consequence of 217 visits paid by H.M. Inspectors to the 150 factories now in existence, it was necessary to take proceedings against several firms, more particularly with regard to the increased precautions to be taken in the manufacture of picric acid, which were brought into force after the serious explosion at Huddersfield. There has been no occasion to take proceedings against the occupiers of any small firework factories during the past year. There appears to have been official notice of nine cases of illegal manufacture of explosives, four of which were attended by accidents.

The number of accidents which have occurred during the year in factories for explosives was 77, which caused 9 deaths and 35 cases of injury. These accidents are dealt with in detail in another section of the Report, but it is well to point out that a considerable proportion of the total consisted of mishaps of an unimportant character, such as the fuming off of gun-gotton in the acid centrifugals, while some of the injuries reported as sustained by employés were of a slight nature.

STORAGE.—The number of magazines under continuing certificate and licence at the close of 1900 was 385, a decrease of 7 on the preceding year; but the decrease is nominal only, as the 7 magazines in question were absorbed into a factory. Fourteen magazines have become extinct during the year, as against the confirming of 7 new licences, and at the close of the year there was a further number of 10 under notice of disuse. There are still 4 applications for licences outstanding. Applications were made for 11 amending licences, and of these and 5 outstanding from 1899, 10 were confirmed and 5

withdrawn, leaving 1 still outstanding. It is to be expected that the number of amending licences applied for will diminish from year to year, as the majority of magazines are now licensed for keeping all the authorised explosives of Classes I. to IV. There has been no accident by fire or explosion in connection with a magazine during 1900, and no proceedings were necessary as the result of 429 visits paid by H.M. Inspectors to the magazines in use. In England, Scotland, and Wales there are now 2,462 stores for explosives, and it was not found necessary to take proceedings against the occupiers of any of these. The returns for Ireland are not complete, owing to a change in the administration of the Explosives Act in that country. For the same reason the number of registered premises in Ireland is not stated, but in Great Britain there are altogether 31,579 such places, which yielded three accidents, and four cases in which proceedings were taken against the occupiers for irregularities. There were also 10 cases of illegal storage brought to notice during the year, in which proceedings were taken, besides several instances in which prosecution was withheld on the undertaking of the occupiers to register the premises forthwith.

IMPORTATION.—The number of licences, available for six months only from date of issue, was 121 as compared with 108 in 1899, 114 in 1898, 92 in 1897, 102 in 1896, and 82 in 1895. We give below a comparative table of the importations of nitroglycerin compounds during the last two completed years:—

	1899.	1900.
Blasting gelatine ...	30,000 lbs.	15,900 lbs.
Carbonite	322,000 ,,	292,450 ,,
Dynamite	54,800 ,,	63,000 ,,
Gelatine dynamite ...	508,000 ,,	564,680 ,,
Matagnite gelatine ...	45,000 ,,	62,000 ,,
	959,850 lbs.	998,030 lbs.

There were also importations of blasting explosives, not containing nitroglycerin, in the following proportions:—

	1899.	1900.
Guncotton ...	5,980 lbs.	22,680 lbs.
Thunderite ...	10,502 ,,	20 ,,
Westfalite ...	124,400 ,,	107,050 ,,
	140,882 lbs.	129,750 lbs.

In dealing with the Report for 1899, attention was drawn to the large importations of detonators, notwithstanding the existence of eight factories in this country. It is satisfactory to note that in 1900 the figures show a very substantial reduction to 8,732,500, which is a less amount than in any year since 1895. In the same way, the importation of fireworks shows a material diminution. It should be borne in mind, moreover, that a considerable quantity of imported explosive is not actually for home consumption, but is brought to this country for reshipment abroad. This process of transhipment in British waters necessitates the granting of an importation licence all the same, but no record is kept by H.M. Inspectors as to how much of any shipment remains in the country and how much is consigned abroad.

PACKING AND CONVEYANCE.—There has been no modification of the law relating to the packing of explosives during 1900. Only 16 Special Authorities for packing explosives were issued, as against 26 in 1899, but the decrease is accounted for by the fact that firms having War Office contracts for cordite and picric acid had special authorities issued to them which remain in force during the continuance of the contracts. H.M. Inspectors make a note that they regret the non-existence of means whereby the War Office could take advantage of exemption in Section 97 of the Act, and thus render the issue of these Special Authorities unnecessary. They have made it a practice to grant the authorities only in order to meet some exceptional condition, and have repeatedly refused to make them of a more general character, and they are of opinion that where a permanent alteration of the law with regard to packing is necessary, it should take the form of an Order of Secretary of State, and not of a Special Authority of H.M. Inspectors, such authorities being designed only to meet special cases. Mention is made of the flimsy character of the powder bags in use in several factories, and the suggestion is made that all bags should be capable of undergoing the following tests without allowing any explosive to escape:—A 25 lb. bag, containing the full quantity of gunpowder, and properly choked, dropped on to a wooden floor from the height of a man's waist; a 50 lb. bag, similarly charged, dropped from the height of a man's mid-thigh; and a 100 lb. bag, dropped from the height of a man's knee. It will be noticed that these are only rough-and-ready approximations. In spite of the existence of several irregularities, there were no cases of accident by fire or explosion in conveyance during the year.

CHEMICAL REPORT.—As usual, Dr. A. Dupré, F.R.S, the Chemical Adviser to the Department, has prepared a very interesting report of the work done during the twelve months in his particular line, and it appears that so far as testing was concerned, there was a marked increase in the number of samples submitted for inspection. Samples of licensed explosives, or of the materials used in their manufacture, formed a total of 389, of which 339 passed the tests. With regard to the 50 rejects, these do not constitute so serious an item as might appear at first sight, as in some cases a series of five or more consisted of separate samples taken from one single importation of an explosive, and in some cases the rejection was due to the fixing of a somewhat higher standard of excellence than heretofore, it being frankly admitted that one batch of six samples, rejected on account of a slight deviation from the composition fixed upon, would have been accepted in former years. Dr. Dupré points out a difficulty in respect to some explosives in keeping the proportion of wood meal within the specified limits, owing to deficient allowances for the amount of moisture present. Among the rejects, it is interesting to note, there was not a single star, coloured fire, star composition or star constituent, which is a clear indication that firework makers have got over the difficulty at first experienced after the promulgation of the Order in Council prohibiting the use of sulphur in any chlorate mixture.

Besides the above-mentioned class, Dr. Dupré also examined 39 samples of articles that do not properly come under the first heading. One of these was antimony sulphide, in which was found an appreciable amount of free sulphuric acid, which constituted a dangerous ingredient when the substance is used in connection with chlorate of potassium. Dr. Dupré hopes that the manufacturers of percussion caps, fireworks and fuzes containing antimony and chlorate of potassium, will take notice of the possible danger involved in the use of sulphide of antimony.

As shown in a separate table, 17 samples were examined in connection with the Woolwich Testing Station, which call for no special remark.

A most notable feature with regard to the new explosives examined during the year was the number of chlorate mixtures which were successful in passing the stringent tests required of them. It may be remembered that prior to 1900, only two similar mixtures had been admitted, one of which never really came into practical use, while the other only dates back to 1899. In 1900 Cheddite and Erupterite, both of them chlorate mixtures, passed through the tests, and were favourably reported on, and Librasite, a perchlorate of ammonium mixture, passed through the preliminary tests, but was not, up to the end of the year, submitted to the final examination. There were also three varieties of fuse composition, all chlorate mixtures, which were favourably reported on. For the rest, Fumelessite, which is a mechanical mixture of a variety of substances, but consists chiefly of ammonium nitrate, was favourably reported on, as was also one out of four samples of Gelignite, and two varieties of safety fuse also received favourable mention. Stürcke's Powder, which is a substance somewhat similar to Carbonite, was submitted in two different samples, of slightly varying composition, and was favourably reported on in both instances, subject to their being packed in waterproof cases. Finally, a new colouring matter for dyeing was sanctioned for use in the manufacture of Imperial Schultze Gunpowder.

As a result of accidents which occurred during the year, Dr. Dupré had his attention specially drawn to the following points:—First, that even black sulphide of antimony was liable to contain free sulphur, as well as free sulphuric acid. This point is of interest in relation to the manufacture of percussion caps and other mixtures containing chlorate of potassium and sulphide of antimony, as has already been mentioned. Secondly, Dr. Dupré has observed that moist picric acid forms with iron at first a ferrous picrate, which though by no means violently explosive, shows a remarkable tendency to take fire when struck, the fire spreading rapidly to adjoining portions of the ferrous picrate. Fortunately, however, ferrous picrate soon passes to ferric picrate, particularly in moist air, and this does not show any tendency of that kind, and is a feeble explosive under any conditions.

In addition to the special experiments as to the stability of Carbonite, experiments have been conducted during 1900 to determine the best methods of analysis of explosives containing wood-meal, and an extensive series of experiments have also been made as to the action of picric acid on sundry metals and their oxides. These are embodied in two special reports. Some interesting researches were also instituted as to the action of dilute sulphuric acid on mixtures of chlorate of potassium and sugar. It was found that when the strength of the acid exceeded one per cent., the chlorate mixture frequently exploded after a time, but that when the acid fell below that strength ignition did not take place. These results seem at first sight to be contrary to former experience, and Dr. Dupré advances the following explanation—that when the chlorate is mixed with a small but definite quantity of acid, evenly distributed, and there is nothing else present liable to become acid, a definite quantity only of chlorate can be decomposed, so that, assuming that the heat which can be generated by the liberated chloric acid is insufficient to raise the temperature of the mixture to the exploding point, spontaneous ignition does not take place. If, however, any other material is present capable of yielding acid by oxidation, the small portion of acid is constantly renewed, and ultimately the point of ignition may be reached. This process undoubtedly explains the dangers of such substances as sulphuric acid and antimony-sulphide, despite their originally feeble acid condition.

An interesting experiment was made to disprove the statement of a manufacturer that collodion cotton readily takes fire when in contact with a surface heated to a temperature of 212 degs. Fahrenheit, and also loses nitrogen rapidly. A test showed that under the conditions specified there were no indications of spontaneous combustion, and the loss of but a trifling percentage of nitrogen.

ACCIDENTS.—The number of accidents by fire or explosion of which the Department had cognizance during 1900 was 282, and these involved 59 deaths and 305 cases of injury. These figures are considerably in excess of the average for the ten years 1891-1900, which gives 162·1 accidents, 39·1 deaths, and 161·7 cases of injury. On the other hand, it is satisfactory to note that 242 accidents, causing 49 deaths and 259 cases of injury, occurred in the use of explosives and under miscellaneous conditions to which the controlling provisions of the Act do not apply; but for all that, the balance thus left shows a marked increase on the corresponding figures of the previous year. A noteworthy feature of this "butcher's bill" is that of the 88 accidents occurring in manufacture, keeping, and conveyance, no fewer than 49 were unattended by personal injury, while of the 194 accidents occurring in the use, &c., of explosives, only three were free from personal consequences. In connection with this subject, fresh instructions have been issued during the past year, making it incumbent on H.M. Inspectors of Mines to report all accidents with explosives.

This report shows the usual and commendable care exercised by the Department in the preparation of their annual statements, and it constitutes a most valuable record of the state of the explosives industry from the point of view covered by the operations of the Act of 1875.

APPLICATIONS FOR PATENTS.

JULY 15TH—AUGUST 10TH, 1901.

14,346. Small-arm Sighting Apparatus. H. D. Taylor.
14,370. Cartridges and Projectiles. C. McKay.
14,371. Ammunition Transport Boxes. J. P. Beaumont.
14,415. Targets. J. U. y Motta.
14,450. Automatic Fire-arms. H. W. Gabbett-Fairfax.
14,476. Rammers. A. Reichwald. (Agent for *Fried. Krupp*).
14,480.* Ordnance. E. Gathmann.
14,525.* Explosives. J. W. Mackenzie. (Agent for *The Robin Hood Powder Co.*)
14,622. Small-arms. J. B. Thorneycroft.
14,640. Magazine Mechanism. H. Harris.
14,659. Range Finder. C. A. Trotter.
14,661. Guns. C. A. T. Sjöyren. (Date applied for in Sweden Dec. 20, 1900).
14,676. Explosives. E. Steele, C. J. Bower, and H. E. Poehlman.
14,709. Sighting of Small-arms. J. W. Wedderburn.
14,782. Bandoliers. H. A. Stanley.
14,792. Wheeled Gun Carriages. A. Reichwald (Agent for *Fried. Krupp*).
14,803. Mechanism of Fire-arms. C. Pomilio.
14,805. Firing Mechanism of Ordnance. Sir W. G. Armstrong, Whitworth & Co., Ld., and Sir A. Noble.
14,834. Firing Mechanism of Fire-arms. H. W. Gabbett-Fairfax.
14,871. Targets. J. & W. G. Paterson.
14,887.* Rotary Targets. S. Daniels, and C. S. Armington.
14,898. Telescopic Sights. J. C. L. Campbell.

14,982. Fuses for Projectiles. A. T. Dawson and G. T. Buckham.
15,022. Ammunition. G. Gibson and J. B. Kunkel.
15,067. Automatic Fire-arms. R. Frommer.
15,078. Prevention of Rust in Gun Barrels. A. Beck.
15,123. Gun Carriages. A. Reichwald (Agent for *Fried. Krupp*).
15,128. Torpedoes. H. C. Bull and J. Ramage.
15,141. Smokeless Powder. C. F. Hengst.
15,217. Sighting of Guns. A. A. Common.
15,275.* Capping and Sizing Apparatus. F. J. M. Beglar.
15,364. Ordnance. C. Holmström, G. A Köhler, and A. E. Mascall.
15,365. Sporting Guns. P. Fauriaud.
15,376. Revolver Loader. A G. Pretty and J. Holland.
15,387. Gun Carriages. W. E. Rowlands.
15,453 * Target Apparatus. J. L. McCullough and H. Connett.
15,514. Primers. H. T. Ashton.
15,550. Cartridges. C. Pomilio.
15,590. Sights. A. A. Common.
15,610. Automatic Fire-arms. H. W. Gabbett-Fairfax.
15,661. Small-bore Shot-guns. O. Jaehne.
15,670. Breech Mechanism of Ordnance. A. T. Dawson and G. T. Buckham.
15,672. Breech Mechanism for Ordnance. A. T. Dawson and G. T. Buckham.
15,679. Obturations for Ordnance. A. T. Dawson and G. T. Buckham.
15,738. Verniers. E. J. Witcombe.
15,773. Air Guns. C., J., B., and E. Lane.
15,778. Bandoliers. P. A. Martin.
15,830. Machine Guns. T. J. Keattch.
15,838. Small-arms. A. Frank.
15,983. Manufacture of Nitroglycerine. F. L. Nathan. J. M. Thompson, and W. Rintrul.
16,048. Recoil Brakes for Wheeled Ordnance. A. Reichwald (Agent for *Fried. Krupp.*)
16,068. Torpedo Propulsion. A. H. Valda.
16,111.* Sights. L. Orge and J. Nelson.

*These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

JULY 20TH—AUGUST 17TH, 1901.

COMPILED BY H. TARRANT.

6,940 (1900). **Projectiles**. J. W. Graydon, London. A method of reducing the friction between the projectile and the bore of the gun. The projectile is provided with a number of grooves arranged helically to correspond with the rifling of the gun, and in these grooves a number of balls are arranged. After the balls have done their work of carrying the projectile smoothly over the rifling within the gun, they are useful, with explosive projectiles, to increase the destructive qualities of the shell, since they scatter when the shell breaks. Accepted July 12, 1901.

12,840 (1900). **Small-arm Trigger Mechanism**. J. W. Smallman, Nuneaton. In our issue of October, 1900, we described fully the system of trigger-mechanism set out in Patent No. 11,342, 1898. In the present patent several modifications are described relating to the former arrangement, the principal being a method of providing for the positive return of the front trigger after it has been forced forward, in order to allow of the second discharge. In another part of this issue the mechanism is described and illustrated. Accepted July 17, 1901.

13,101 (1900), **Telescopic Sights.** E. Dönitz, Germany. A telescopic sight for small-arms, so designed that whilst upward straining of the head in aiming is obviated, the field of view is not restricted. The axis of the piece through which the eye is directed lies only just above the barrel, so that the check may be rested comfortably on the stock. The field of view is transmitted by means of prisms, arranged in a vertical attachment to the telescope proper, through the eye-piece to the eye. Accepted June 29, 1901.

13,649 (1900) **Automatic Pistol Mechanism.** C. A. R. Clausius, Germany. In Patent No. 2,882, 1900, automatic pistol mechanism was completely described. The present specification deals only with the modifications on this particular arrangement, and the object of the alterations is to provide parts whereby only a portion of the barrel is allowed to recoil, instead of the whole, as in the former mechanism. Many alterations are necessary to bring about this end, and they are fully described in this patent. Accepted June 29, 1901.

13,797 (1900). **Shot Recorder**. N. W. Mayland, London. Apparatus, automatically worked by the pulling of the trigger, designed to indicate after each shot how many have been fired. The apparatus may be attached either to ordnance or small-arms, and consists of a ratchet wheel, which is operated either by a push or by a rod or string attached to trigger. Each turn of the wheel causes a fresh figure to appear, so that the number of times the trigger has been pulled is recorded. Accepted July 20, 1901.

14,261 (1900). **Breech Mechanism of Ordnance**. A. Reichwald, London. (Agent for *Fried. Krupp, Germany*). A method of utilising the recoil and running out movement of the barrel of large calibre guns relatively with the carriage, for the purpose of opening the breech. To attain this end, a gear wheel, engaging with, and adapted to be turned by, a rack moving with the barrel, is secured to the conveyor screw, which affects the inward and outward movement of the breech block. The rack does not move so fast as the recoiling barrel, and by this method the breech is automatically opened. Accepted June 29, 1901.

14,262 (1900). **Fluid Pressure Brakes for Ordnance**. A. Reichwald, London. (Agent for *Fried. Krupp, Germany*). A method of constructing a fluid pressure brake with a single piston, and without any piston packing, thus doing without the usual running out brake cylinder, to take up the energy of recoil in ordnance. The brake piston is provided with throttling devices opposite the grooves through which the liquid passes from one side of the piston to the other. The throttling devices leave the cross section of the grooves free in one position, and decrease it in the other, so that the ruuning out movement of the gun may be controlled. Accepted June 29, 1901.

14,529 (1900). **Centrifugal Gun.** W. Sharp, Lower Ridge, Barrowford. A gun, by means of which projectiles may be discharged by centrifugal force at any rate between one and twenty-four thousand per minute. The projectiles are fed into the machine on a belt, and are scooped up by two rapidly-revolving serpentine tubes. From the ends of these tubes they are delivered into a race, from which they are ejected by two rod-shaped ejectors through a barrel, which may be directed to any particular point. Accepted July 20, 1901.

14,989 (1900). **Discharge of Ship Guns**. L. Obry, Austria. This patent relates to improvements in the apparatus for discharging ship guns, described in Specification No. 13,496, 1895. The apparatus therein explained is by the present method mounted on an axis parallel with the gun trunnions axis, and may independently be turned to a predetermined angle. It will then remain rigidly fixed with the gun trunnions, so that it will oscillate synchronically with the gun. When the ship rolls, the gun is discharged at the correct elevation by means of this apparatus. Accepted July 13, 1901.

14,990 (1900). **Automatic Firing of Ship Guns.** L. Obry, Austria. Improvements in the apparatus described in Patent No. 13.496, 1895, for automatically firing ship guns the moment the line of sight is horizontal. The present apparatus provides for the discharge of the projectile slightly before the gun reaches the exact horizontal position, in order to counterbalance the motion of the rolling ship, which is still retained by the moving projectile. The time at which the gun is fired all depends upon the amount that the ship is rolling. Accepted July 20, 1901.

15,684 (1900). **Shot Gun Cartridges**. W. Glass, Edzell. In order to temper the power of the gunpowder, to reduce the recoil, and to tighten the cartridge generally, the present patentee replaces the ordinary top wad by a felt one. The cartridge is turned over in the ordinary way, and a supplementary paper wad is jambed tightly down in the cavity over the top wad formed by the turnover. Accepted July 13, 1901.

15,802 (1900). **Air Guns.** M Pulvermann, London. An air gun in which the breech and barrel part in the usual way on a hinge. The characteristic of the invention is a spring catch

which locks the breech and barrel in the closed position. Pressure upon a pin enables the operator to disengage the catch for breaking down the gun. An improved link for depressing the operating spring is also described. Accepted July 13, 1901.

16,349 (1900). **Cartridge Holder.** C. R. Wagner. Germany. A circular frame designed to carry a group of cartridges so arranged as to be easily dropped from the clip into the chambers of a revolver cylinder. The body of the clip is provided with undercut edges which retain a star wheel in position. This star wheel is adapted to revolve to a certain extent. When the cartridges have been inserted in the clip, the movement of the star wheel carries them slightly round so that the rims are taken beneath projecting edges provided on the outside of the clip body. Thus they are retained against unintentional displacement until it is desired to drop them into the cylinder. Accepted July 27, 1901.

18,225* (1900). **Automatic Revolver Mechanism.** The Webley & Scott Revolver and Arms Co., Ld., and W. J. Whiting, Birmingham.

21,891* (1900). **Rifle Magazine Mechanism.** P. Jensen, London. (Agent for *Krag-Jorgensens Geværkompagni, Norway*).

23,039 (1900). **Magazine Small-Arms.** A Morgenroth, Germany. A magazine rifle in which an under lever is used to open and to close the breech bolt and to cock the hammer. Combined with a rifle of this description a magazine is illustrated consisting of a piece of U-shaped sheet metal, the sides of which act as springs. This frame encloses and grips a certain number of cartridges, which are delivered one by one, with the opening movement of the breech, through the inwardly-bent edges at the top of the clip. These edges are always engaged by a groove in the underside of the breech bolt, so that the cartridges shall not be ejected too forcibly from the magazine. With the departure of the last cartridge the bottom of the magazine is automatically opened, and the metal frame falls away. Accepted July 27, 1901.

23,298 (1900). **Loading of Q.-F. Guns.** C. M. White, London. (Agent for *Rheinische Metallwaaren-und Maschinenfabrik, Germany*). A method of loading quick-firing guns rapidly with "separate" ammunition, *i.e.*, with ammunition in which the projectile and cartridge are separate. According to the method here explained the trouble of separately lodging the projectile in the bore before introducing the cartridge is obviated. The cartridge is made of a suitable length, so that the act of introducing it will drive the projectile into the correct position, and there support it. Supposing the cartridge is not long enough a cap is provided, projecting beyond the end of the cartridge. Accepted July 27, 1901.

1,501 (1901). **Fuses for Projectiles.** J. A. Wilding, Old Charlton. Clamping nuts for fixing the time rings in fuses. The cap described is invented to take the place of the simple lock nut, which had to be tightened or slackened with a spanner. By means of an arrangement on the cap, on the washer into which it is screwed, and on the fuse stem, of different screw pitches, the turning of the cap produces a jamming effect, and the dome is thus pressed against the time ring. The advantage of this arrangement is that the locking can be performed by the fingers. Accepted July 27, 1901.

4,877 (1901). **Machine Guns.** F. M. Garland, U.S.A. Improvements in the construction of automatic machine guns. Among these modifications, devices attached to the breech block mechanism for controlling the speed of loading are particularly dealt with. The barrel of the gun is mounted within a case, and is connected with a piston working in a fluid chamber. The flow of the fluid is controlled so that the barrel shall only recoil at a predetermined speed. The breech parts of the gun also are considerably relieved of the force of explosion, so that these parts are constructed of light material, the weight of the gun thus being reduced. Accepted July 27, 1901.

8,101 (1901). **Explosives.** M. Fielder, Russia. The manufacture of an explosive which is called "Donar." The explosive consists of two distinct parts, one a powdery, dry part, and the other a fluid part. Separately the parts are not explosive, but the saturating of 80 parts of the powder with 20 of the liquid forms the complete explosive. The liquid portion is made up of 80 per cent. of nitrobenzol ($C_6H_5NO_2$), and 20 per cent. of turpentine ($C_{10}H_{16}$). The powder is composed of 70 per cent. of potassium chlorate ($K Cl O_3$), and 30 per cent. of potassium permanganate ($KMnO_4$). These proportions form an example only of composition of the explosive. Accepted June 29, 1901.

8,166 (1901). **Small-arm Triggers.** W. H. Watts and H. Everest, London. In order to adapt the length of the stock of a small-arm to shooters with different lengths of arm, the ordinary triggers are mounted on a plate, which is capable of a forward or backward movement on the fixed trigger-plate. A series of notches, each adapted to receive the locking bolt, holds the movable plate and the triggers in any required position. Accepted July 29, 1901.

8,385 (1901). **Semi-Automatic Ordnance.** W. H. Bevens, U.S.A. This patent relates to rather a large number of improvements in semi-automatic ordnance. The modifications described are intended principally to provide simple means for automatically opening and closing the breech, for ejecting the spent cartridge, and for cocking the hammer. The modified arrangements are adapted also to be fixed to certain types of rapid-firing guns working on recoil mounts. Accepted June 29, 1901.

9,398 (1901). **Picric Acid.** A. Gutensohn, London. Improvements in the method of production of picric acid described in Patent No. 16,628, 1900. The method roughly consists in dissolving carbolic acid in heated paraffin oil. To this solution is added a mixture of sulphuric and nitric acids, which mixture has previously been covered with paraffin oil to prevent evaporation and loss of acid through volatilization. Picric acid in a solid form is separated from this liquid after it has stood for a time. After straining it is re-crystallised in boiling water, to which is added a little sulphuric acid. Accepted June 29, 1901.

11,125 (1901). **Fuse Igniter.** R. W. Barker (Agent for *C. Gormant, France*). A fuse igniter discharged by percussion, the feature of which is that no flame is exposed to reach the outer air. The cap is detonated by an anvil through a percussion tool, around which is sufficient air in hollow spaces to support combustion, and at the same time to absorb any excess of flame. Accepted July 6, 1901.

13,144 (1901). **Rifle Barrels.** H. S. S. Watkin. This Specification is a secret document.

16,371 (1901). **Manufacture of Picric Acid.** L. Wenghöffer, Germany. The manufacture of picric acid from some raw material other than phenol, which fluctuates in price, sometimes being very expensive. The raw material taken is aniline, which is converted by any known process into sulphanilic acid. In the presence of nitric acid the amido-group can be exchanged for a hydroxel group passing over the diazo group. Working with this fact as a basis diazo-benzene-sulphonic acid is treated with nitric acid to produce picric acid. Accepted July 13, 1901.

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

SELECTED PATENTS.

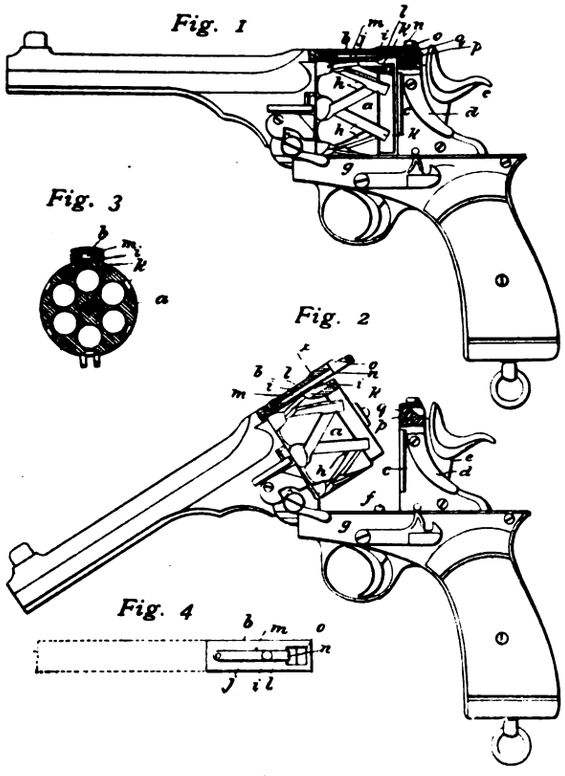
AUTOMATIC REVOLVER MECHANISM.

18,225 (1900). The Webley and Scott Revolver and Arms Co., Ld., and W. J. Whiting, Birmingham. In the accompanying drawings the automatic revolver known as the Webley-Fosbery is illustrated. This patent relates to an attachment only in connection with this weapon, so designed that when the revolver is broken down to reload it shall automatically be put into action to lock the cylinder in such a position as to ensure the correct alignment of any one of the chambers of the cylinder with the barrel when the revolver is closed for firing. The device is released with the closing of the weapon, and the cylinder left free to rotate.

Roughly, the working of the revolver, which, perhaps, is already understood, is as follows:—The cylinder *a*, with its extractor, is mounted in the usual way upon its pivot sleeve. The extension *b* of the top rib is locked to the standing breech *c* by the bridle fastener *d*, in the manner common to this type of revolver. These

parts, viz. the barrel and body, the standing breech, with the cylinder and the hammer parts, are, after each discharge, forced to slide bodily in a rearward direction under the influence of the recoil. This backward movement automatically recocks the hammer *e*, and rotates the cylinder by means of the engagement of the stud *f* fixed to the bed *g* of the arm, with the zigzag race *h* cut in the periphery of the cylinder. The cylinder is rotated at each backward movement only to such an extent as to bring the next loaded chamber into alignment with the barrel. At the resumption of its original forward position, the arm is ready again to discharge.

We will deal only in detail with the parts which form the subject of the present patent; and these are the stud *i*, fixed to the spring *j*, working in combination with recesses *k* cut in the cylinder. These recesses *k*, six in number, are cut at the rear angles formed by each zigzag of the race *h*, and one of them, according to the position of the cylinder *a*, is adapted to engage the stud *i*, projecting from the



free end *l* of the spring *j*. This spring *j* works in a longitudinal groove *m* cut in the underside of the rib extension *b*, and its tip *n* extends into the opening *o*, at the end of the rib *b* (Fig. 4). The tip is so arranged that when the revolver is closed it comes into contact with the point *p* of the notch *q* cut in the face of the standing breech *c* (Fig. 2). This contact forces the spring slightly upwards, so that the projection *i* is lifted from engagement with the recess *k*, and thus, when the revolver is closed and ready for firing, the cylinder is freed, so that it may be rotated during the recoiling of the parts.

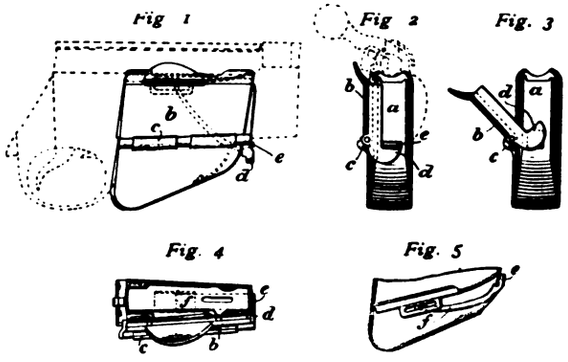
When the revolver is opened by the unfastening of the bridle lever *d*, the free end of the spring *j* is liberated, and drops down, taking its stud *i* into one of the recesses *k* immediately the opening *o* in the extension rib is lifted off the top of the standing breech *c*. At the moment of the re-engagement of the stud and recess, the cylinder is still locked against rotation by the fixed stud *f*, which has not been disengaged from the undermost pocket of the zigzag race *h*. It will be understood, therefore, that any inadvertent rotation of the cylinder during the opening movement, or when the revolver is open, is rendered impossible. Accepted July 6, 1901.

RIFLE MAGAZINE MECHANISM.

21,891 (1900). P. Jensen, London (Agent for the *Krag-Jörgensen Gaværkompagni, Norway*). This patent deals with methods of adapting the Krag-Jörgensen system of magazine, which is fully described in Patents Nos. 18,430, 1889, and 17,082, 1892, to such rifles as the British military weapon. In the Krag-Jörgensen magazine the cartridges are inserted through a gate on the side, and the advantages claimed for this method of charging are—first, that the magazine may be filled at any time without having to retract the bolt to open the breech; and second, that the simple act of opening the gate may, at the same time, be made automatically to depress the cartridge lifter platform ready for the insertion of the cartridges.

In the accompanying drawings one method of adapting the system to such a magazine as that of the Lee-Enfield is illustrated. Fig. 1 is a side elevation of the magazine with the gate attached. Figs. 2 and 3 are end illustrations of the magazine with the gate shown in the closed position and in the open position respectively. Fig. 4 is a plan of the arrangement, and in Fig. 5 the magazine is illustrated in part longitudinal section, showing in detail the cartridge lifter.

On one side of the magazine *a* (in the illustration it is shown on



the right-hand side), an opening is cut a little longer and a little wider than the length and diameter respectively of the cartridges to be inserted. This opening is closed by a gate *b*, having hinges *c* along the lower edge of the opening. When the gate is opened, as in Fig. 3, it forms an inclined surface over which the cartridges are rolled into the magazine. At the bottom of the gate a lug *d* is formed, which is made long enough to engage an extension *e* of the cartridge platform *f*. When the gate is opened, the lug is lifted, and is caused to force the cartridge platform extension *f* upwards, thus drawing the platform *f* against the pressure of its spring down to the bottom of the magazine. In this position the extension *e* is raised so that it is parallel with the end of the magazine (Fig. 5), and the gate is held open by the frictional pressure of the inside of the lug against the extension. The cartridges having been dropped into the magazine, the gate is closed, and the weapon is ready for firing.

In another series of drawings attached to this patent specification a preferred method of construction is illustrated, in which a spring device acts upon the gate and also upon the cartridge lifter. A cam arrangement is also loosely mounted beneath the gate hinge, so that the gate is enabled to swing to a certain extent, towards the closed position without being acted upon either by the gate spring, or by the cartridge lifter. This construction obviates the tendency of the top two or three cartridges to force themselves out through the side opening when the gate is only half closed. Accepted June 29, 1901.

VOLUME

VIII.

OF

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CONTENTS.

CURRENT TOPICS

Across the Sea.—The lamentable tragedy at Buffalo, whereby the United States have been bereft of one of the best of a long and honourable succession of Presidents, serves once again to demonstrate with how little discrimination the hand of the so-called political assassin is directed. Even while it brings home with fearful import a sense of the danger that threatens all who occupy positions of prominence in the councils of the world, we are lost in wonder at the insensate nature of the blow that has for the time brought grief into the hearts of all civilised peoples. Socialism, in its ultimate form of anarchy, knows no distinctions. All forms of government, absolute, limited, or democratic, monarchical or republican, for the people or by the people, alike fall under the ban of that strange creed, whose one idea is to destroy, without any alternative of reconstructive policy. If within the space of a few years two crowned heads, one that of a popular King and the other that of a beloved Empress, have paid tribute to that blind hatred of society as it is; on the other hand, the lapse of little more than a generation's span has seen four rulers of the two great Republics of the age similarly removed from the execution of their sacred duties. In Lincoln, Garfield, and and William M'Kinley the United States of America possessed three exceptional men representing the highest ideals of democratic government, and imbued with a full sense of the grave responsibilities imposed upon them by virtue of their high office. Yet all three equally fell by the hand of the assassin. Time heals all wounds and soothes all sorrows in bringing forgetfulness of details. After the passage of years one is apt to lose remembrance of causes contributing to the consummation of a catastrophe. But in the present instance the grim tragedy stands out without any suggestion of a reason behind it. We have a picture, the canvas of which is bare to the point of absolute primæval simplicity. There is a dangerous homicide, a mere animal with the savage animal's lust for blood. His victim is the most conspicuous man of the community in which this always-potential criminal has found free harbourage. It remains but to fill in the background with a time of public festivity, during which the President is peculiarly accessible of approach, and the deed is accomplished. One can scarcely avoid drawing morals, even while expressing deep sympathy with the great Anglo-Saxon Republic across the Atlantic in its sorrow at the loss of a wise and even a great statesman and ruler. We cannot help remembering that the United States held aloof from the proposals recently made for the better regulation of that dangerous class which every now and again startles humanity by some outrage with dynamite, the pistol or the knife. There is, of course, no real significance in the fact that the very community which declined to treat this constant menace to society seriously, is practically the one to suffer first from the effects of a policy of leniency. The incidence of the blow shows, rather, another indication of the blind venom which is directed against the bosom that, though it does not cherish, at least ignores the hidden peril. We cannot doubt that the foul murder of Mr. M'Kinley will rouse his countrymen to a greater sense of responsibility in this matter. There is, however, another aspect of the tragedy which calls for comment. We can scarcely endorse the suggestion made in one quarter that there should be a universal prohibition of the sale of revolvers. That is a proposal which stands self-convicted of

absurdity, and at the best it would have no retrospective effect. At the same time, no one can read the daily newspapers without coming to the conclusion that it is far too easy for a would-be criminal to obtain the "means to do ill deeds," which now, as in the days spoken of by the great dramatist, so often "makes ill deeds done."

The Late President and his Successor.—There can be no doubt that the name of William M'Kinley will always be associated with the inception of a strong national policy. He first came before the notice of this country as the apostle of a scheme of protection, which took form in the famous M'Kinley Tariff. We trust that there is no appearance of want of respect for the dead statesman in the reminder that, during the operation of that tariff its originator was regarded with little favour by this country, whose commerce suffered as a consequence of the imposition of increased and sometimes well-nigh prohibitive duties on merchandise, which had hitherto competed on fairly even terms with the home products of the United States. There is the less hesitation in alluding to this past history, since it is known that Mr. M'Kinley himself at a later period found a need to modify some of his more extreme theories regarding protection, in face of the new policy of territorial expansion. But throughout his all too brief career Mr. M'Kinley has always received due credit as a strong and straightforward man of marked ability and conspicuous honesty of purpose, representing even while he led the opinions of the people. That he possessed the confidence of the nation to an unusual degree is evident from his re-election to office by so unanimous a verdict. In regard to this country, he always entertained warm feelings of friendship, and doubtless did much to promote the existing condition of good-will which is mutual between the two great English-speaking nations. His untimely death is a loss to the whole civilised world. As to his successor, we know Mr. Roosevelt to be a strong man, somewhat self-willed and impulsive, but permeated with lofty ideals, and absolutely and fearlessly honest in all his actions. He has pledged himself to maintain the traditions so worthily created by Mr. M'Kinley, and we have full confidence that his promises will not fail in the execution so far as human powers of mind and will can ensure their fulfilment.

A New Rifle Range for London.—We record with satisfaction the report that the War Office authorities have acquired some land at Purfleet, in Essex, on which to lay out a rifle range especially intended to provide for the requirements of volunteers in London and its suburbs. It is said that the projected range is to be of a most extensive character, with no fewer than one hundred targets. The general idea is that this range shall be practically self-supporting, since, according to a draft agreement that is going the round of commanding officers, a certain number of targets will be allotted on every Saturday during the shooting season, and on other days if desirable, at a fixed annual rental per company. At present no details are to hand as to what the figures work out at, but it is to be hoped that this scheme will materialise and afford the much-required shooting ground for Metropolitan volunteers. There is only one apparent drawback. It seems somewhat trying to have to waste about three-quarters of an hour on the 16-mile railway journey from Fenchurch Street station down to Purfleet, apart from the initial trouble of getting to the City and a possibly considerable walk at the other end. But, on the other hand, such drawbacks are unavoidable when it is a question of providing full-sized ranges for rifle practice in the neighbourhood of so well populated an area as Greater London. Much of the success or otherwise of the scheme will depend on management. Experience shows that men will readily go down even to more distant places if they could be sure of getting reasonable practice in return for their trouble and outlay.

Standardisation.—In another column of this issue will be found the finally-approved designs and figures for gun chamber and cartridge gauges, designed by the Gunmakers' Association for adoption by the trade generally, as regards the nine different sizes of 12, 16 and 20-bore guns. The same body has now under consideration a similar work of reducing to standard sizes the several similar dimensions applicable to other bores of shot guns, and the official figures will no doubt shortly be available for publication. But while the utility, and indeed the necessity, for arriving at some common basis of agreement between gun chambers and cartridges has long been self-evident, there is another department of the gun-making industry which has even a greater need for the introduction of a system of standardisation. It should, in fact, be indisputable that whatever need may exist for exactness of agreement between sporting guns and the ammunition supplied for use with them, there is a more pressing necessity for obtaining a correspondence of dimensions between sporting rifles and their cartridges. As is well-known, the usual procedure is for the maker of a rifle to bore out the chamber to fit some particular make of cartridge as supplied by a firm of ammunition manufacturers. There are, of course, exceptions to this rule, as when a rifle is designed for a special calibre and chambering, and requires special ammunition to fit it. But in that case the element of standardisation is practically settled. The instances we have in mind are of exactly reverse character—where the rifle must be chambered to suit the cartridge. To produce a satisfactory result, there must be some definite dimensions for the standard cartridge of that type, and for the chamber into which it is inserted. At the present time, so far as we can ascertain, the trade generally is working more or less by rule of thumb in this respect, and would accept with willingness the introduction of the same system of standardisation as is now in course of adoption in regard to guns. The introduction of such a system cannot be brought about too soon. Probably, rifle-shooting has never before had the vogue it now enjoys, and any improvement of detail which makes for increased accuracy and greater uniformity of results cannot fail to produce sufficient return for the time and trouble involved, in rendering the rifle still more popular as a sporting weapon, both in the field and at the butts.

The Doom of the Sword.—There can be no doubt that the lamentably-protracted war still waging in South Africa will be the means of effecting sundry alterations in our systems of fighting. One long-cherished weapon, at all events, can scarcely survive the test of actual service under modern conditions, and the sword seems destined to fall into complete disuse as an instrument either of offence or defence. As is well-known, it has been abandoned in favour of the rifle or carbine for infantry officers, and is not likely to remain in the equipment of the cavalry, now that shock tactics seem no

longer possible in the face of magazine rifles and machine guns. At no time since Waterloo has the "white arm" had much more than a moral effect, and should the necessity for launching a weight of mounted squadrons on an enemy still exist in the future, the weapon to be employed would far preferably be the long sharp-pointed lance rather than the shorter cutting and slashing weapon. A recent order issued by the Commander-in-Chief indicates clearly the approaching doom of the sword, which is now distinctly an out-of-date survival.

CHLORATE EXPLOSIVES.

The "chlorate mixture" has long been the black sheep of the explosives family. Yet, as is frequently the case with its human prototype, it is by no means the least interesting family-member. Moreover, after long years of disgrace it would now seem that chlorate explosives are at last in a fair way of vindicating themselves.

Chlorate of potassium has for obvious reasons always possessed exceptional attraction for inventors of explosives. Its oxygenous and endothermal properties render it *prima facie* eminently suitable for explosive compounds, but unfortunately it has other characteristics which are not only the reverse of favourable, but which, until quite recently, at least, appear to have presented such technical difficulties when used in explosive compounds as to render its application for that purpose practically prohibitive in this country. The excessive sensitiveness of chlorate of potassium, the readiness with which it decomposes, and the great heat evolved in that decomposition, rendered all compounds in which it entered as main ingredient extremely unsafe both to handle and keep.

The number of chlorate compounds proposed during the past 50 years or so might be counted by the score. Save for a few aim and senseless "freaks," the majority of them does not show much variety in the ingredients chosen—sulphur, yellow prussiate of potash, charcoal and sugar being the admixtures preferably adopted. The powders proposed by *Augendre* (1849), *Pohl*, *Hahn* (1865), *Hafenegger* (1868), belong to this type, also *Thorite* (1895), which consisted of chlorate and sugar, and, in fact, was nothing but Hafenegger Redivivus. These compounds were all very sensitive to shock and friction.

A second type was represented by those following the lines of Sprengel's inventions, the chlorate being combined with a liquid nitro-compound (*e.g.*, *Rackarock*), the idea being to discount the question of sensitiveness by mixing the two components on the spot immediately before use.

As a third type may be mentioned that in which a bulky substance such as bran, or specially prepared paper, was chosen with a view to give a large surface and thereby reduce the sensitiveness to shock and friction. The bulkiness of the compound, however, doomed it to failure. *Asphaline* belonged to this class and for a long time enjoyed the distinction of being the only licensed chlorate mixture in this country. It never came into practical use, however, and its manufacture has long since been abandoned.

During the last few years several attempts have been made to tame chlorate explosives by what may be termed lubrication, and, as the list of authorised explosives now witnesses, with a good deal of success. Oils, fats, or other greasy substances, are the "lubricating" substances generally resorted to, and explosives of requisite safety in transport and use have actually been obtained. This method, on the other hand, naturally involves the risk of losing in strength what has been gained in safety, and the problem of combining sufficient stability—chemical and mechanical—with a maximum proportion of chlorate would seem to have been solved with unequal success by the different inventors. According to the last published Government List the following chlorate mixtures are now registered as "licensable" explosives:—

Britainite.	*Erupterite.*
Carlsonite.	*Greffite.*
Cheddite (two varieties).	*Sodalite.*
Cycene.	

Although necessarily classed amongst chlorate mixtures, *Britainite* and *Cycene* cannot be considered as such in the narrower sense of the term, as they only contain 1·3 and 16·6 per cent. of potassium chlorate respectively.

Carlsonite, which is a mixture of ammonium perchlorate and nitro-naphtaline, or optionally dinitro-benzol, passed the Government test after a minimum of 9 per cent. of linseed or castor oil had been added. In spite of the somewhat high percentage of lubricating material this compound still forms an explosive of considerable strength. On detonation, however, the explosive liberates a somewhat high proportion of free hydrochloric acid which, in certain circumstances, may prove a serious inconvenience when used underground. It has recently been proposed to add a sufficient quantity of nitrate of soda (from 30 to 36 per cent.) to ammonium perchlorate mixtures in order to neutralise the fumes, but no samples have as yet been submitted to the English Government tests.

Cheddite, passed the tests with a maximum proportion of 80 per cent. of potassium chlorate—the highest so far attained by any of the authorized chlorate mixtures. As in Carlsonite, nitro-naphtaline is the combustible, and castor oil the lubricating agent, but the manner of incorporating the two substances is different and forms the subject-matter of a patent. The essence of the patent is the increased solubility of nitro- and azo-derivatives in certain oils when heated up to their melting point. The resulting permanent solution, when mixed with the chlorate under heat, is brought to surround each single particle of the salt, whereby the sensitiveness of the whole is materially reduced. Experience has taught that the best results are obtained with a particular fineness of the chlorate. The explosive is claimed to possess the strength of *Gelignite*.

Erupterite contains 75 per cent. of chlorate and 5 per cent. of charcoal, the remainder being fatty hydrocarbons. Higher percentages of chlorate have proved too sensitive, and the strength attainable is thus somewhat limited, probably considerably below that of Dynamite No. 1.

Greffite and *Sodalite* are limited to 60 and 66 per cent. of chlorate respectively, and, therefore, likewise handicapped as regards strength. The lubricating substances are vaseline, soft soap and bees' wax.

In the simple mixtures of chlorate and carbonaceous matter, sulphur, &c., the amount of chlorate required to effect perfect oxidation (into CO_2, SO_2, &c.), is higher than that fixed by the official definition of some of the above-named compounds. Thus, for example, a mixture with carbon would

require 87·2 per cent. of chlorate, viz.: $-2\ (KClO)_3 + 3C = 2\ KCl + 3\ CO_2$. In a mixture with cane sugar 74·2 per cent. of chlorate would be required:—$8\ (KClO_3) + C_{12}\ H_{22}\ O_{11} = 8\ KCl + 12\ CO_2 + 11\ H_2\ O$. With equal parts of sulphur and carbon 82·4 per cent., $22\ (KClO_3) + 9S + 24\ C = 22\ KCl + 24\ CO_2 + 9\ SO_2$,— and so on. The deficiency of chlorate would, therefore, in the case of one or two of the new mixtures result in a somewhat high proportion of CO in the fumes.

The Cheddites with their high proportion of chlorate would appear to have the best chance of developing their full power, the more so, as the manner in which the lubricant is combined with the combustible agent hardly involves any increase of bulk. At the same time, it is clear that the 80 per cent. of chlorate is not quite sufficient completely to convert the contained carbon into carbonic acid; for, assuming that all the available oxygen had been so used, there would still be left 0.2 per cent of hydrogen and 3·67 per cent. of carbon as unoxidised. It is, we think, admitted to be doubtful what really does take place in the case of an explosive not containing sufficient oxygen, but by adhering to the method of calculation generally adopted, the following final products may be taken as fairly correct:—

10	H_2O
18	CO_2
22	CO
1	N
49	KCl
100	

The 22 per cent. of carbon monoxide cannot be considered as excessive, and as the volume of gases produced is about 400 litres per kilo of explosive, and the temperature of explosion = 3437 deg. Cheddite ought to give a good account of itself.

At all events, the chlorate mixture, as a practical explosive, is an accomplished fact, and we shall watch its further development with much interest.

ROUND THE TRADE.

Messrs. Cogswell and Harrison, Ltd., are about to open a new establishment in Paris, at No. 26, Avenue de l'Opéra.

Sir Hiram Stevens Maxim has registered the word "Maximite" for explosives included in Class 20, for military and naval purposes.

The directors of Messrs. Holland & Holland, Ld., have declared an interim dividend on the ordinary shares at the rate of 8 per cent. per annum.

The drop of the Armstrong dividend for the year to 12½ per cent., which is 5 per cent. below that of the previous year, and the increase in the amount carried forward, has led to the circulation of a variety of rumours as to amalgamations and so forth, which, up to the present, lack authority,

Early in last month the Admiralty requested Messrs. Greenwood and Batley, Ld., of Leeds, who are the owners of the British and Colonial patent rights in the de Laval steam turbines, to send one of their most powerful turbines to Devonport Dockyard in order that it might be subjected to a series of experimental tests.

As we go to press we regret to hear of an explosion on the premises of Messrs. Ormrod & Co., of Wigan. Mr. Aspinall, the firm's expert, was engaged at a safe in the basement, where a large stock of explosives was kept, when the explosion took place, and he received such serious injuries that he since died. A portion of the front and rear of the building was blown out by the force of the explosion.

The verdict of the coroner's jury at the inquest held on the bodies of the eight men who were killed in the explosion at Llanbradach Colliery on the 10th ult., was to the effect that the deceased met their deaths through an explosion of coal dust caused by shot-firing, the place where the shot-firing took place being insufficiently watered.

Messrs. John Spencer, Ld., Wednesbury, have forwarded a list of their specialities in iron and steel tubes and fittings for gas, steam, water, and other purposes. The catalogue contains, in addition to a full price list of the Company's specialities, a variety of useful tables of comparative dimensions and weights which are of general application.

In the recent rifle meeting at Sea Girt, New Jersey, U.S.A., the cup which was won by the Ulster team in competition with New Jersey, was presented on the day of the meeting by Mr. A. J. Haskell, of the Laflin and Rand Powder Co. Had it not been for this generous and prompt action on the part of Mr. Haskell, the Ulster men would have had nothing to show for their victory.

Mr. Charles Lancaster has, we are pleased to record, been awarded a diploma for a gold medal by the authorities of the Military Exhibition at Earl's Court on account of his very fine exhibit at that Exhibition, which included, among other items, the Ross straight-pull rifle and the Harris rifle magazine. This adds another to the many honours already received by Mr. Lancaster during a long period of years.

A new company was registered on the 13th ult., under the name of Middlemore (South Africa), Ld., with a capital of £50,000, in £1 shares, its object being to acquire the business now being carried on in King William's Town, S.A., by Hugh J. Reynolds, which includes, among many others, the branch businesses of dealers in hardware, enamels, explosives, guns, pistols, and revolvers, also engineers, patentees, machinists, tool-makers, &c. There was no initial public issue.

At a meeting of directors of the Birmingham Small-Arms Company, held on the 17th ult., it was resolved to recommend to the shareholders the payment of a dividend of 10s. per share, free of income tax, on the ordinary shares, and 2s. 6d. per share on the preference shares, for the six months ending July 31st last. This will make a total cash dividend for the year of 20 per cent. on the ordinary, and 5 per cent. on the preference shares. There is also a proposal to pay to the ordinary shareholders a bonus of one fully-paid £5 share for every two ordinary shares held by them.

The Liskeard District Council seems to be much exercised in mind in regard to the heavy traffic which is now passing over the road from Herodsfoot Powder Mills to Penpoll, St. Veep. This "extraordinary traffic" is apparently due to the large amount of business done by the Safety Explosives Co., Ltd., who are manufacturing "Fumelessite" at the mills in question, as was mentioned in this column recently, and the Council are meditating serving a formal notice on the Company, apparently to keep their business within limits suitable to the condition of the road.

From Vienna comes the news that the negotiations which have been carried on for some time between the Austro-Hungarian War Office authorities and the Nobel Dynamite Co. with reference to the sale of the latter's gunpowder factory at Saubersdorp, have now been definitely broken off, through the failure of both parties to arrive at a satisfactory agreement. The work at the powder factory has meanwhile, we understand, been entirely suspended. and all the workmen dismissed, though the company expresses its readiness to re-open at any time on receipt of sufficient orders from the War Department.

Messrs. Cambridge and Co., of Carrickfergus, have received a letter from Mr. David Simpson, the well-known shipbreaker, to the effect that during the nine weeks in 1899 during which he was occupied on the wreck of the P. and O. steamer *China*, and during the twenty-five weeks of 1900 in which he was similarly engaged on the American Line steamer *Paris*, in which periods nearly five tons of that firm's explosives were used, the number of misfires did not average one per thousand shots fired, even under the very disadvantageous conditions experienced. Mr. Simpson, we believe, always attends to the attachment of the fuse and detonator personally.

NOTES.

THE SERVICE RIFLE ON SERVICE.—A somewhat curious memorandum has been issued by the Commander-in-Chief. It appears that considerable trouble—which is a mild way of putting it—has been caused during the war, more particularly with regard to the Imperial Yeomanry and other volunteer troops, by the loss of breech-bolts from the Lee-Enfield rifle. Those who are well acquainted with the ·303 Service arm are aware that it is by no means perfect, and stories have long been current as to the necessity for securing the breech mechanism from unpremeditated opening by the use of a boot-lace or other contrivance. This tendency, however, is common to practically all bolt-actions, especially when the rubbing surfaces become a little worn, and it does not necessarily affect either the safe handling or the general efficiency of the weapon when in use. But there is a grave difference between this mere shaking open of the breech and the absolute freeing of the bolt from its shoe. In the one case, there will probably be the loss of one cartridge, and some little confusion in bringing the rifle up for firing, caused by the necessity for putting the bolt into position; in the other case, the weapon is entirely useless. From the existence of a necessity to draw attention to this contingency, it is evident that the stop-spring and hook on the bolt head, which are supposed in the Lee-Enfield to prevent the complete retraction of the bolt, do not stand the test of ordinary Service conditions. They are, in fact, not sufficiently strong to do the work required of them. It is no sufficient remedy for this state of affairs that the memorandum in question draws attention to the existence of a safety stud which will lock the bolt in position, and further points out that for the future the cost of replacing lost breech-bolts will fall more or less directly on the men who handle the weapons. It is to be hoped that this detail, among many others, is receiving attention from the experts who are engaged on the not impossible task of improving still further our essentially patchwork Service small-arm.

PENETRATION OF THE SERVICE AMMUNITION.—On the occasion of a vacation visit recently paid by the members and associates of the Society of Engineers to the School of Military Engineering at Chatham, some interesting experiments illustrative of the penetrative powers of the ·303 Service ammunition at short ranges were conducted on the ground set aside for that purpose at the Royal Engineer's Park. It was found that, at a range of 40 yards, a target composed of 24 inches of hard wood was not penetrated, as should have been the case according to the text-book. A similar test made against a target of soft wood, which is supposed to have a maximum penetration of 42 inches, gave actual results of no more than from 27 to 30 inches. Following this came trials against targets of coarse shingle and road metal, with regard to which maximum penetrations of 3 inches and 6 inches respectively are claimed, but in neither case were these results attained in practice. A sand-bag loop-hole and an earth parapet, this latter having a theoretical penetration of 22 inches, equally remained proof against the Service bullet. After these trials had been carried through, an attack was made upon iron and steel plates, and it was found that half-inches of wrought iron successfully resisted all attempts at penetration. In the same way, a plate of $\frac{3}{16}$-inch of hard steel, which should theoretically have been penetrated, remained proof against the small-arm ammunition, but, on the other hand, a similar test made against $\frac{3}{8}$-inch of mild steel resulted in a victory for the bullet. It would appear, as the result of these trials, that the theoretical efficiency of the ·303 Service rifle and ammunition is not fully borne out in practice.

ARMOUR PLATE TESTS.—A test was made early in last month, at Whale Island, of one of the plates intended for the broadside armour of the new battleship, H.M.S. *Bulwark*. The plate was manufactured by Messrs. Cammell & Co., of Sheffield, and measured 14 ft. by 6 ft. 10 in., its nominal thickness being 9 in., by actual measurement 8·8 in., the weight being 360 lbs. per square foot. Three rounds were fired from a 9·2 in. gun with a Holtzer armour-piercing shot weighing 380 lbs., and it was found that in each case the projectile broke up on impact, only one embedding its point in the plate. There were no cracks, and only a slight flaking of the plate where the shots struck, so that the armour is considered to have stood the trial with complete success. The test was conducted under the supervision of Captain A. Barrow, Commander Christian and Lieut. Drury Lowe, of H.M.S. *Excellent*. Mr. W. E. Smith, Chief Constructor, represented the Admiralty, and the makers' interests were watched by Mr. F. Fairholme and Mr. W. A. Hartley.

ARMING OF INDIAN TROOPS.—In connection with the scheme now in operation for the re-arming of the troops in our Indian army, it is interesting to note that those native regiments which have recently been serving in China have received permission to retain the modern rifles issued to them originally for that campaign only. This eminently desirable concession is, however, quite properly accompanied by a new condition to the effect that the loss of either a rifle or a carbine is for the future to be accentuated by the imposition of a very heavy fine. It is well known that there are organised bands of rifle thieves in attendance on every military station in India who do a good trade from year to year by the transfer of rifles from the Government service to the frontier tribes, by whom the weapons are eagerly purchased at almost their weight in gold. The average "Tommy" views the loss of his rifle from the rack with a sufficient degree of equanimity, whereas the native soldier will almost feel sympathy for the astute thief, if he can get another rifle from store to replace the one "conveyed." If, however, the loss of his weapon is visited directly on his own pocket, and not on that of an intangible Government, it is possible that the thieving community will for the future find it less easy, and also less safe, to attempt the supply of up-to-date armaments to customers in the outlying country "back of beyond."

RUSSIA AND THE GARLAND QUICK-FIRER.—Agents of the Russian Government have been in treaty with Mr. Frank M. Garland, of Newhaven, Conn., U.S.A., with regard to his invention of a quick-firing gun, especially designed for use in the fighting tops of war ships, which will fire 1 lb. projectiles at a rate of 208 per minute. The gun is said to be capable of keeping up this rate of fire, presumably with

intervals, for 12 hours at a stretch, and if so, it is certainly a deadly weapon. Two Russian agents appear to have submitted it to searching tests, and to have reported favourably upon it, and they are now awaiting the confirmatory report of a third expert. Should his verdict agree with those already given, we understand that Russia will be prepared to purchase the entire plant, in which case it is probable that Mr. Garland will go to Russia to superintend the processes of manufacture.

THE ITALIAN SERVICE RIFLE.—The *Gazetta di Venezia* has recently published some particulars of the 1891 model service rifle which is in general use throughout the Italian Army and Navy. It appears that this rifle, which is of the Mannlicher-Carcano type, and of ·256-in. calibre, has an extreme range of 3,520 yards, which, according to the journal in question, is exceeded only by the German Mauser, and is equal to that of the Lebel, Lee-Metford, and Speed rifles, and greater than the ranges of the Austrian or Swiss rifles. The same authority gives a comparative table showing the precision of fire of the various rifles, to prove that the Italian model far excels all others. For example, at 330 yards, and at 1,100 yards, the Italian Mannlicher plants its shots within rectangles of 9·45 in. by 10·63 in., and 53·54 in. by 72 in. respectively. As against this, the French service rifle gives rectangles of 26·37 in. by 27·55 in., and 115 in. by 123 in.; the German rifle gives 18·11 in. by 21·26 in., and 63 in. by 117 in.; the Austrian, 22·44 in. by 37 in., and 88·58 in. by 137·79 in.; and the Swiss, 21·65 in. by 39·37 in., and 76 in. by 149 in. for the same two ranges. These figures appear to be the result of a series of practical tests with the various weapons mentioned, but they are neither complete nor particularly convincing. The other details, moreover, do not fully agree with those of our own *Text Book of Military Small Arms and Ammunition*, which is generally regarded as a leading authority on the subject.

ARMS IN THE PERSIAN GULF.—There can no longer be any doubt that of late years the amount of shipments of arms and ammunition to Persian Gulf Ports has increased to a degree scarcely realised. Colonel Kemball, the British resident at Bushire, has recently issued a report in which he personally bears witness to the extraordinary change wrought in the last decade. He points out that whereas, ten years ago, a Martini-Henry rifle was rarely seen in the country around the Persian Gulf littoral, now there is scarcely a man in the villages round about Bushire who does not possess one. At Muscat, he declares that since the seizure of the *Baluchistan* the trade has more than doubled. During the last official year the importation from Europe amounted to 25,000 arms and 2¼ million rounds of ammunition, nearly all of which must have gone into the interior, or have been reshipped for other ports in Persia. The business is mainly in the hands of British traders, and a considerable proportion of the shipments come from Birmingham. Of course, the importation of arms into Persian Gulf ports is illegal, and we learn that since the Customs department of Persia has practically become vested in foreign hands, notably those of Belgium, the orders from Teheran relating to the stopping of the trade have been more rigidly enforced. However, there is still a considerable amount of smuggling in operation which the existing executive machinery seems powerless to stop entirely.

RIFLE SHOOTING IN AMERICA.—The result of the recent rifle meeting at Sea Girt has been to show the American competitors that they have still something to learn in this department of sport, and it is generally admitted that the defeats they sustained may ultimately prove blessings in disguise, by tending to attract attention to the perfecting of the modern small-bore rifle and its accompanying ammunition for long range shooting. It was noteworthy that military rifles and ammunition were conspicuous favourites with the civilian competitors, the winning Ulster team being equipped with the Austrian model Mannlicher, ·256 calibre, and using Austrian Service ammunition. One marksman used the Italian service rifle, elsewhere alluded to in this issue, and though, according to his statement, he shot throughout four days without once cleaning it out, it seemed to give as great an accuracy at the end as at the beginning of the contest. On the whole, the American rifle-shots seem to be as greatly exercised in mind over their failure as were our clay-bird shooters after the Anglo-American Shot-gun Match which was held at Hendon this summer, where they were so completely out-classed by their visitors from across the Atlantic. There can be no doubt that these international contests are of vital importance in respect to the improvements they suggest to the observant manufacturer of arms and ammunition.

A NEW WINCHESTER SHOT GUN.—We notice that the Winchester Arms Co. have brought out a lever-action repeating shot gun which is somewhat of a new departure. It is a 10 bore, and is claimed to be the only repeating gun of that bore on the market, the special purpose for which it is intended being duck and wild-fowl shooting. With that end in view, the weapon is chambered to take 2⅞-in. cartridges, and the 32-in. rolled steel barrel is full choked, so as to produce close and hard shooting. On this account, though pump-guns and the particular bore mentioned are not in great favour in this country, it may still be interesting to notice how the gun would compare with an ordinary 12-bore. A 2⅞-in. cartridge of English loading for a 10-bore would carry a charge of 1¼ oz. of No. 4 shot, with an average total of 260 pellets, as against the usual loading for a 12-bore of 1⅛-oz. of No. 6 shot, with an average of 304 pellets. The gun will, we understand, take any charge of either black or smokeless powder that can be loaded into a 2⅞-in. shell, and it will be evident that it is more especially adapted for fairly long range work at wild game, which might prove difficult to stop with the lighter and more open charge of the 12-bore. In outline the new gun strongly resembles the original Winchester lever action gun, but it has a tighter breech-joint and a more complete support for the base of the cartridge. Provision is made for a positive movement in the retraction of the firing-pin within the breech-block, which is also an innovation of some importance. A further improvement consists in the finger-lever being made separate from the breech-block, and being furnished with a lock which tends to prevent the gun from opening when the action is closed. The design of the gun throughout bears evidence of careful adaptation to a particular purpose, and there can be little doubt that it has been evolved to meet a very definite requirement of the sportsman.

THE NEW U.S. 16-IN. GUN.—More definite details are now to hand concerning the new gun for coast defence, which is being completed at the Watervliet Arsenal, New York. It is the first of a series proposed by the Endicott Board, and

according to the *Journal of the Military Service Institution*, it is the most powerful weapon ever constructed by any Government. The completed gun weighs 130 (short) tons, and is of the built-up type, consisting of a tube, jacket and seven hoops, with breech-block, the forgings having been made by the Bethlehem Steel Company. For annealing the steel, the oil and high-pressure system was applied with success. Over all, the gun measures 49 ft. 2·9 in., and its greatest outside diameter is 60 in., fining down at the chase to 28 in. The calibre is 16 in. exactly, and the powder chamber has a diameter of 18·9 in., extending over a length of 90·7 in., giving a cubic capacity of 26,355 cubic inches, the charge being 1,176 lbs. of black, or 576 lbs. of smokeless powder. The projectile is 64 in. long, and weighs 2,370 lbs., and is calculated to have a muzzle energy of 88,000 foot tons, which is equivalent to the penetration of 42·3 in. of steel. It is estimated that the gun will have an extreme range of about 21 miles. At present the type of mounting is not yet definitely decided upon, and apparently there has been no agreement as to where it is to be placed.

BIRMINGHAM SMALL ARMS.—The annual report of the Birmingham Small Arms Co., Ld., for the year ending July 31st, shows a profit of £85,500, which, together with interest on investments and the amount brought forward, makes a total sum of £90,896 available for distribution. After paying a dividend of 20 per cent. on the ordinary shares, and 5 per cent. on the preference shares, the directors recommended that £36,575 be employed in part payment of an issue of shares, and that the balance of £4,069 be carried forward. The report states that the cycle department promises to continue in a satisfactory condition, and that the large orders in hand for small-arms will provide constant employment to the gun factory for some time to come. When the contract with the Government for small-arms, referred to in the last report, was completed, in March last, the further contract now in hand had been already entered into, so that there was no stoppage of work, and at the present time deliveries are proceeding on account of that order most satisfactorily. This contract, the largest received in the history of the company, was, the directors consider, a gratifying justification of their policy in adding to the buildings and plant in anticipation of orders, so as to place the company always in a position to meet the requirements of the Government. It may be mentioned that the extension to the gun factory during the year in buildings and plant has cost upwards of £50,000, to meet which outlay the company sold out its holding in the Nobel Dynamite Trust Company.

EXPLOSION IN SOUTH AUSTRALIA.—We have received the official report of Mr. W. A. Hargreaves, M.A., F.I.C., Inspector of Explosives, on the circumstances attending an explosion in a small magazine at Yongala, South Australia. At the time of the accident the magazine contained from 300 to 500 detonators, one 25 lb. keg. of blasting powder, from 35 to 45 lbs. of dynamite which had been in stock for about two years, and one stick of phosphorus kept under water in an oil drum with a closed lid. The temperature was high at the time, and circumstances generally suggested only two alternatives as accounting for the explosion, namely spontaneous ignition of the phosphorus, or spontaneous ignition of the dynamite. Mr. Hargreaves arrived at the conclusion that the dynamite, which had been kept for two years in a badly ventilated magazine, had undergone degeneration, had spontaneously ignited in the high temperature, and had thus brought the remainder of the explosives to the exploding point. He suggests, therefore, that persons storing nitro-compound explosives should take steps to have them properly examined from time to time by submitting samples to laboratory inspection.

EXPLOSIVES REPORT FOR VICTORIA, 1900

In furnishing his annual Report of the working of the Explosives Act, 1890, in the Colony of Victoria, Mr. C. Napier Hall, the Chief Inspector of Explosives, has once again the pleasing announcement to make that no accident has occurred during the year in the manufacture, transport, or storage of explosives under conditions regulated by the provisions of the Act. No modification of the law was found to be necessary during the year under review, but a noteworthy change occurred on December 1st, of 1900, when, in consequence of the taking over of the Customs Department by the Commonwealth, the administration of the Act was transferred to a State Department.

Importation.

Two hundred and ten licences to import explosives were issued during 1900, as against one hundred and forty-nine issued during the previous twelve months, but the total quantity of explosives brought into the Colony did not show a proportionate increase, and indeed, on the other hand, declined nearly to the figures of 1898. A comparison of the importation for the last two complete years is given here, for the purpose of reference:—

Explosive.	1900. lbs.	1899. lbs.	Increase. lbs.	Decrease. lbs.	Value for 1900. £
Dynamite ..	2,750	4,900	--	2,150	60
Gelatine Dynamite ..	813,250	968,730	—	155,480	57,998
Blasting Gelatine ..	109,300	90,350	18,950	--	10,040
Blasting Powder	305,200	236,435	68,765	—	5,846
Sporting Powder	107,604	90,115	17,489	—	5,939
Total ..	1,338,104	1,390,530	—	52,426	79,883

It will be seen that there has been a gross decrease in the quantities imported, of 52,426 lbs., while the values give a decrease of £8,129 for the corresponding items. These figures, we may point out, are exclusive of all importations of explosives which were the property of the Government. No particulars are given in this year's Report as to the quantities or values of importations other than those above specified, this being an omission that might easily be repaired in future years. We learn, however, that no amorces were imported during 1900. As regards blasting gelatine, the Chief Inspector has to report that the importations were not of a uniformly satisfactory character, nearly 20 per cent. of the whole being

condemned, partly on account of the low heat tests, and partly owing to exudation of nitroglycerin. One-half of the condemned material was destroyed, and the balance was re-manufactured at the local explosives factory. On the other hand, the gelatine, dynamite, and gelignite imported during the year were quite up to requirements, with the exception of two small consignments, which were subsequently dealt with and re-manufactured at the local factory. The whole of the safety fuse imported during the year complied with the requirements of the Act. A separate table in the Report shows that out of a total of 571 samples of explosives, or materials connected with their manufacture, which were examined during the year, 528 passed the tests successfully, and 43 were rejected. Of these latter, 40 were samples of blasting gelatine, and 3 samples of gelignite.

In accordance with our usual custom, we give here, for purposes of comparison, details of the importations of explosives to the other Australian Colonies during 1900, whereby the relative importance of the various totals, as compared with those already detailed as regards Victoria, may be seen at a glance:—

Explosives.	New South Wales.	Queensland	South Australia.	Western Australia.
Dynamite	99,360	143,750	56,450	5,000
Gelatine Dynamite ..	883,950	652,262	367,900	1,879,700
Blasting Gelatine ..	486,800	—*	257,000	260,500
Blasting Powder ..	808,881	325,870	285,500	484,425
Sporting Powder ..	74,887	63,401	14,350	6,216

* No returns.

New South Wales also imported 3,000 lbs. of Roburite, which is not included in the above table, and Tasmania is now a factor to be reckoned with, since this comparatively small but prosperous Colony had imports to the following extent:—Dynamite, 100 lbs.; gelatine dynamite, 259,650 lbs.; blasting powder, 141,750 lbs.; and sporting powder. 29,625 lbs.

Testing.

Reference is made above to the number of samples of explosives or their components which were examined during 1900. This number, 571, shows a great diminution as compared with the figures for 1899, but, on the other hand, there has been a considerable increase in the number of miscellaneous articles examined on behalf of the Customs Department.

Manufacture.

There is an increase in the total number of factories under licence, one new factory having been opened, making 9 in all. As has been pointed out previously, the system of licensing obtaining in the Colony is similar to that initiated by the Explosives Department of Great Britain, and insures a thorough investigation of all technical details when the draft licence is under consideration, at the same time affording due protection to the local interests. Only 31 "Rackarock" manufacturing licences were issued during the year under review, and two applications were rejected which had for their object the placing of chlorate mixtures on the authorised list of explosives.

Storage.

The increase in number of magazines under licence continues, there being in 1900 no fewer than 124, as against 116 in 1899, and 89 in the previous year. This total does not include the 21 Government magazines, which are used chiefly for the storage of commercial explosives. The new explosives reserve at Truganina, which was begun some three and a-half years ago, was approaching completion at the close of the year, and should by now be in full occupation. It is situated on the western shore of Port Phillip Bay, and comprises an area of over 500 acres enclosed by a galvanised iron fence some 8 feet high. There is a jetty having 12 ft. of water at the end, and two magazines have been erected at the head for the temporary storage of explosives landed from powder boats, prior to their despatch to the magazines or for shipment. Three tram lines connect the jetty with Laverton Station, on the Geelong line of railway, and along these lines 24 magazine sites have been allotted for the erection of private magazines, the magazines already up being well and substantially built of brick, with due regard for climatic conditions. This reserve takes the place of the Maribyrnong magazine, and so relieves a somewhat thickly populated district from the risk that must, despite all precautions, attach to the storage of any large quantity of explosive material. As regards the inspection of these storage magazines, the Chief Inspector points out that it has been physically impossible to visit them all during the year, but the principal centres were visited at least four times, and the stocks of explosives carefully sampled and examined. Except in one instance, no indication of deterioration in the explosives so stored was found.

Licensed Premises.

No details are given with respect to the number of licensed premises in occupation, so that it is impossible to say whether the marked increase which was shown in 1899 is still maintained. We learn, however, that an additional inspector was appointed early in last year, with the consequence of increased supervision. Nearly 600 premises were visited, and although they no doubt form a relatively small proportion of the whole number of licensed premises, they represent in actual fact a large majority of the shops in populous towns where gunpowder or nitro-compounds are stored. Also, apart from the official inspections, a large number of premises in isolated places or small towns were visited by the police, under special instructions, and, notwithstanding this increased supervision, only 11 persons were proceeded against for breaches of the Act, as against 52 in the previous twelvemonths. The chief Inspector is justified, in face of this satisfactory result, taken in conjunction with the generally improved condition of licensed premises, in his belief that storekeepers are more fully realising the importance of making themselves acquainted with their obligations, and of fulfilling them.

Accidents.

As we have already stated, there were, during 1900, no accidents by fire or explosion in the manufacture, transport, or storage of explosives. There were, however, 7 accidents which occurred in the use of explosives, causing 2 deaths and 6 cases of injury. These figures are a decided improvement even on the small casualty list of 1899, but it is regrettable to find that as regards the Australian Colonies, as a whole, there has been a marked increase in the number of accidents and the lists of killed and injured, as compared with the

previous year, the total being 70 accidents, involving 22 deaths and 58 cases of injury. The details of the accidents were brought under the notice of the Department by the Secretary of Mines, and it may be said roughly that most, if not all, of them were due to the non-observance of the most obvious precautions, and were therefore preventable.

The concluding section of the Report deals with prosecutions and offences, and there are in addition four appendices containing interesting tables of statistics in connection with the particulars embodied in the Report. We fancy that the Chief Inspector has not gone quite so fully into details in regard to some sections of his subject as on previous occasions, but this may be due to the fact that he had nothing new to say with regard to those features which appear to have been omitted. In that event, he has no doubt exercised a wise discretion.

SEGMENTAL WIRE-WOUND GUNS.

OUR interesting contemporary, *The Scientific American*, in a recent issue, devotes some considerable space to a description of the new 5-in. gun built for the U.S. Army on the Brown segmental wire-wound system. It says:—

"In the Brown segmental wire-tube gun we have the highest possible development of the wire-wound system. Judged by the ballistic results achieved at the Government proving grounds, it is—weight for weight— by far the most efficient weapon in the world, and there is now under construction a 4½-inch gun, which, if it passes satisfactorily its proving test, will be so far in advance of any existing ordnance as to be positively in a class by itself."

Reference is made to the "experimental" 10-in. gun built on that system some few years ago, and our contemporary says:—"This 10-inch gun was planned in the early days of smokeless powder, and was designed for powder containing 66 2-3 per cent. of nitroglycerin. In its recent Government test, when it was fired with a 35 per cent. nitroglycerin powder, it was found that the chamber was not large enough to contain as much of the new explosive as was necessary to give a muzzle velocity of 2,800 feet per second. The chamber has now been enlarged to the required dimensions, and, judging from the results already achieved, when the gun gave its 575-pound shell a velocity of 2,503 feet per second, it is fully expected that the desired velocity of 2,800 feet per second will be obtained. The piece will then equal in velocity the Navy 10-inch gun; but, as the shell fired from the Brown gun is 75 pounds heavier than the Navy shell, and of the two guns the Brown is 7·4 tons lighter, the resultant muzzle energy and the foot-tons of muzzle energy per ton weight of gun will be considerably greater."

The relative differences are shown in a table here quoted in brief:—"Brown segmental gun: weight, 26 tons; weight of shell, 575 lbs.; muzzle energy, 31,298 foot-tons; or, 1,204 foot-tons of energy per ton weight of gun. Navy gun: weight, 33·4 tons; weight of shell, 500 lbs.; muzzle energy, 27,216 foot-tons; or, 815 foot tons of energy per ton weight of gun." Continuing, we read:—

"The above table tells its own story, and by anyone who has followed the development of modern ordnance and is familiar with the best that has been done, it will be seen that the development of 1,204 foot-tons of energy per ton weight of gun has never been approached, the nearest to it being that of the Krupp 50-calibre 12-inch gun, which develops 946 foot-tons per ton weight of gun.

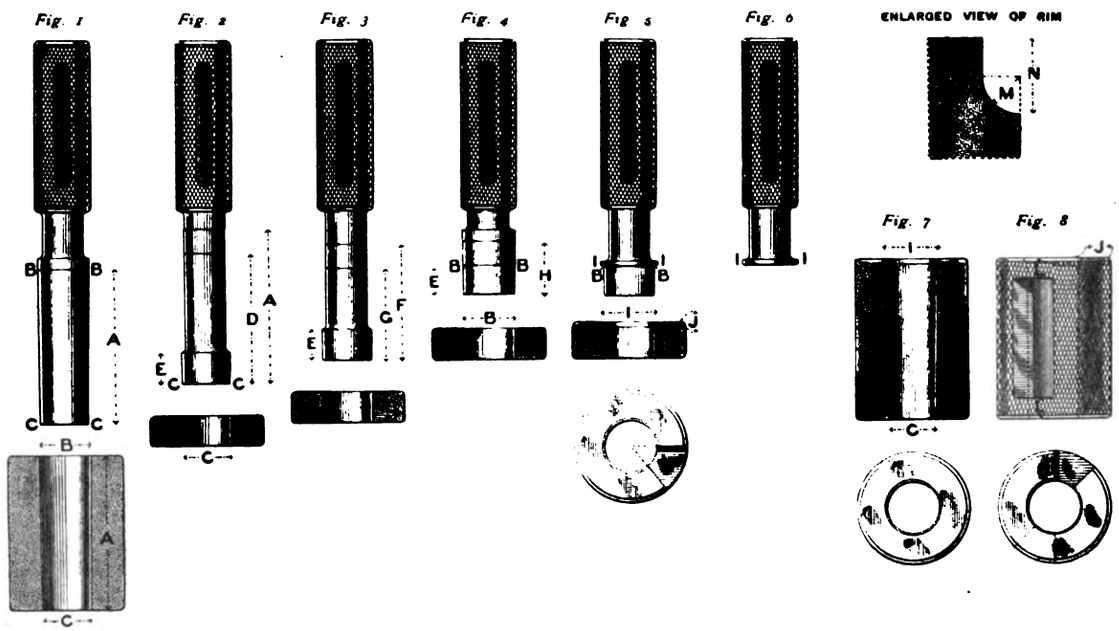
"Since the design of the first 5-inch gun was brought out, Mr. Brown has developed an important improvement by substituting for the straight segments as used in that gun a series of overlaid curved steel plates. The plates are formed from sheet steel, varying in thickness from 1·7 to 0·4-inches, which is cut to the desired taper, and rolled in a special mill to the involute form required. The substitution of these involutes for the longitudinal segments is a logical step along the line of development which is being carried out so successfully in this gun." Then follows a lengthy and illustrated description of the system of construction.

A remarkable example is afforded of the power of resistance offered by this method of gun-construction. "As regards the ultimate strength (the ability of the gun to resist bursting effects due to wave action and other irregularities of the powder), it may be mentioned that the original 5-inch gun of 1893 and 1894 was sent to Sandy Hook to be tested by firing 500 shots with pressure between 40,000 and 50,000 pounds to the square inch, the latter being the maximum pressure to which it was to be subjected. The Ordnance Board, wishing to experiment with a new type of smokeless powder, ran the pressure up as high as 82,850 pounds per square inch, and fired from the gun more shots at pressures of 50,000 pounds and upward than have been endured by all the built-up, hooped guns in the Navy. At the two hundred and ninety-second shot it was found that the repetition of the extravagant charges used in the gun had cracked one of the segments. Nevertheless, although the gun had fired several shots with 50,000 pounds pressure after the cracking of the segment, it was not until the gas had cut its way through the wire that the injury was discovered. This remarkable fact is a conclusive proof of the theory that the segmental system of construction, especially with curved, overlaid plates as now used, will permit a fracture of one of the segments without threatening the integrity of the gun itself.

"As regards the ultimate possibilities of the system, it may be mentioned that a 4½-inch gun is now being constructed which will be capable of firing an extra-long 55-pound projectile, with a muzzle velocity of just under 4,000 feet per second. The ballistic data for this particular gun have been calculated by Lieut.-Colonel James M. Ingalls, U.S.A., and he estimates that when fired at extreme elevation, and with the weight of shell and the muzzle velocity given above, the gun will have an extreme range of 23·9 miles, or just 3 miles more than the range of 20·9 miles estimated by the same authority as the extreme range of the Army 16-inch gun, now nearing completion. This estimate is based upon an assumption of a chamber pressure of 60,000 pounds to the square inch. If the calculations of Colonel Ingalls should prove to be correct—as they undoubtedly will—and the 4½-inch gun prove itself equal to the enormous powder pressures demanded, the United States will be in possession of a weapon so far in advance of existing types as to be distinctly in a class by itself."

We regret to have to record the death of Mr. H. Charles Ballard, at Worcester, Mass., U.S.A. He was the inventor of the well-known Ballard rifle which, was used so largely by the troops in the American Civil War. Mr. Ballard was 79 years of age.

CHAMBER AND CARTRIDGE GAUGES FOR 12, 16, AND 20-BORE GUNS.



Lettering as per Drawing.	12-Bore.			16-Bore.			20-Bore.		
	2½ in.	2¾ in.	3 in.	2½ in.	2¾ in.	3 in.	2½ in.	2¾ in.	3 in.
A	2·4860	2·6760	2·9260	2·4980	2·6880	2·9380	2·5000	2·6900	2·9400
B	·8110	·8110	·8110	·7450	·7450	·7450	·6980	·6980	·6980
C	·7980	·7980	·7980	·7320	·7320	·7320	·6850	·6850	·6850
D	2·1040	2·2940	2·5440	2·1040	2·2940	2·5440	2·1040	2·2940	2·5440
E	·5000	·5500	·6000	·5000	·5500	·6000	·5000	·5500	·6000
F	1·8680	1·9580	2·1080	1·8680	1·9580	2·1080	1·8680	1·958(	2·1080
G	1·4860	1·5760	1·7260	1·4860	1·5760	1·7260	1·4860	1·5760	1·7260
H	·8820	·9320	·9820	·8820	·9320	·9820	·8820	·9320	·9820
I	·8820	·8820	·8820	·8150	·8150	·8150	·7600	·7600	·7600
J	·1000	·1000	·1000	·1000	·1000	·1000	·1000	·1000	·1000
K	2·5600	2·7500	3·0000	2·5600	2·7500	3·0000	2·5600	2·7500	3·0000
L	·3000	·3000	·3000	·3000	·3000	·3000	·3000	·3000	·3000
M	·0355	·0355	·0355	·0350	·0350	·0350	·0310	·0310	·0310
N	·0740	·0740	·0740	·0620	·0620	·0620	·0600	0·600	·0600

Our readers will remember that at various times during the last twelve months or so we have chronicled in these pages the useful work undertaken by the Gunmakers' Association in respect to the standardisation of shot gun chambers and the cartridges designed to be used in them, and we have already given in detail, in our December issue of last year, the dimensions formulated by that body, in conjunction with the Birmingham and Provincial Gunmakers' Association, and Messrs. Eley Bros., Ld., Messrs. Kynoch, Ld., and Messrs. F. Joyce & Co., Ld., and recommended for the general adoption of the trade. The figures there given, on p. 185 of Vol. VIII., referred to three sizes of 12-bore chambers and cartridges, namely, the (nominal) 2½ in., the 2¾ in. and 3 in. cases, and to the 2½ in. cases for the 16 and 20-bore guns. Since then, the Gunmakers' Association, acting in concert with the other associations above mentioned, have also completed the figures applicable to the 2¾ in. and 3 in. cases for 16 and 20-bore, so that the dimensions are now complete as regards three bores of gun and the three lengths of cartridges used in those three bores. It is now in contempla-

tion to pursue the same policy of standardisation with respect to the other sizes of shot gun, as for example the 4, 8, 10, 14, 24, 28 and 32-bores, and ·410 and ·360 calibres, so that within a very short space of time there will be a definite set of dimensions for each size of gun, the adherence to which by gunmakers and ammunition manufacturers should result in mutual benefit owing to the greater satisfaction given to shooters by a strict agreement between gun-chamber and cartridge.

Of course, however, there is not the slightest good likely to accrue from the formulation of standard dimensions unless at the same time means exist whereby to test the agreement of gun chambers and cartridges as made with those standard dimensions. A very slight double error would, indeed, suffice to make the last state of things worse than that already existing before steps were taken to secure an agreement. In that same number of this journal to which reference has been made, we published an article on "Gun Chamber Gauges," which explained in brief form the necessity for and the general principles involved in testing the correctness of workmanship by means of a set of accurate standard gauges, and the article was illustrated by a drawing which showed a set of gauges designed to accomplish that end. Since then, the idea thus promulgated has been subjected to exhaustive consideration by the Gunmakers' Association, which has now definitely recommended for the adoption of the trade a set of master gauges founded on that initial proposition, the possession and use of which would ensure to every maker of guns that all chambers bored out to comply with the tests of the gauges applicable to that particular size would be uniform to within the smallest degree of variation known as "working limits." We show in the accompanying illustration the different gauges which constitute a set for any given size of chamber. It will be seen that there are in all five plug and socket gauges, in which the sockets are the exact complements of the plugs, and that there is one plug gauge in addition, which is a modification of the one immediately preceding it in numerical order. There are also two socket gauges which have no plug gauges apportioned to them.

Without again going into the details of applying these gauges, a few words must necessarily be devoted to describing some of their functions. The plug gauge shown in Fig. 1 is intended to fit the chamber exactly, except at the rim, the length A being the full length of the chamber apart from the rim recess, and the diameters at B and C being equal to the standard diameters requisite immediately below the rim and at the front end respectively. Fig. 2 represents the gauge for testing the front end of the chamber, and it will be noted that the gauging portion, which is of course coned in exact correspondence with the master gauge shown in Fig. 1, has a length E, which is about one-fifth of the total length of the cone A. The stem of the gauge has two fine lines marked upon it, so graduated that if the chamber undergoing test is of standard size, the base *e* exactly fits the front end, and the upper line is level with the interior edge of the rim recess. Should the plug be capable of being entered into the chamber only so far as the lower mark on the stem, however, it would be known that that end of the chamber was ·002 in. below the standard size, the mark being placed so as to give that indication, and less or greater variations from the standard could be judged accordingly. In Fig. 3 the gauging surface E is intended to test the middle portion of the chamber cone, and this plug also has two markings on the stem. But in this case the lower mark indicates the standard size, while if the plug enters to the distance F it indicates that the chamber is, at that place, ·002 in. above the standard. The plug shown in Fig. 4 is for gauging the upper end of the chamber, immediately below the rim recess, and since the line B is made at a point giving the exact diameter of the similar lettering on the master gauge shown in Fig. 1, the plug should be capable of insertion into the chamber until that mark is exactly level with the edge of the rim recess. Should the gauge be capable of being pushed in still further, to the distance H, which is also marked by a fine line, this would indicate that the chamber was ·002 in. above the standard size. Fig 5 shows a plug utilised for testing the concentricity of the rim recess, the gauging surface from B downwards representing the upper end of the chamber, and the raised rim being of a shape and diameter to fit exactly into the rim recess, which latter is shown in an enlarged view in the right-hand top corner of the illustration. It will be noted that the foregoing plug gauges each have their corresponding sockets. These socket gauges fulfil the part of acting as a check on their respective plugs from time to time, and may further be used as master gauges to check the correctness of other plugs if such are found desirable for every-day use in place of, or in conjunction with, the master plugs here indicated. It will also be noticed that the socket-gauge in Fig. 5 has a sector cut out of its upper side to the depth shown at J, so as to afford facilities for checking the fit of the rim gauge in various places. Fig. 6 shows another plug gauge which fits the rim recess only, and is used for the purpose of testing the size of that important detail of the completed gun chamber. It requires no separate socket-gauge, since it can be standardised by the socket-gauge of the preceding example.

The two remaining gauges are designed for the purpose of testing the cartridge rather than the gun. That shown in Fig. 7 is a socket-gauge exactly corresponding to the size of the standard gun chamber, and it should therefore fit in its several dimensions any of the plug gauges shown in the foregoing illustrations. Fig 8 shows the external appearance of a socket-gauge exactly similar in its dimensions, but having a portion at one side cut out so as to show the fit of any object undergoing the gauging test against the interior walls. This sectionised part is so proportioned as to leave plenty of metal above and below to avoid any risk of straining the gauge out of truth. A sector is also cut from the top, after the manner described with regard to the socket-gauge in Fig. 5, to allow of the examination of a cartridge rim.

It will be noticed that all the plug gauges are designed with knurled handles, provided with a flat for the purpose of stamping suitable particulars as to the size or use of the gauge, as for example:—"12-bore, 2¼ in.," "Front," "Middle" or "Rear of Chamber, 12-bore, 2½ in." The socket gauges will be similarly knurled on the outside, and similarly lettered. A general condition of manufacture is that all the gauges shall be hardened, ground and lapped, and shall be guaranteed to be accurate to within one ten-thousandth of an inch.

Subjoined to the illustration will be found the dimensions of various parts adopted with respect to the nine sizes of 12, 16 and 20-bore guns, as recommended by the Gunmakers' Association for adoption by its members and gun trade generally.

A NEW CHRONOGRAPH.

The United States War Department has recently ordered, for use on the Sandy Hook Proving Ground, a set of four new chronographs, made by a Philadelphia firm, Queen and Co., as modifications of the well-known Boulengé chronograph. Following is a description of the new instruments, taken from the *Army and Navy Journal*, of New York. Each apparatus, so we learn, consists of a cylindrical post, on one side of which, near the top, is fastened an electro-magnet. On the opposite side is a magnet clamped by thumb-screws and a slow-motion device, so that it can be raised or lowered as the adjustment of the instrument requires. The armature of the upper magnet is a long rod, called the chronometer rod, which, when released by the magnet, falls freely. The armature of the movable magnet is a shorter rod, called the registrar. When this is released by its magnet it falls, striking a lever, which allows a knife-edge to jump forward. A current of electricity passes through a screen placed in front of the gun in such a manner as to be broken by the passage of a projectile through the screen, and passes through the upper magnet. A second current passes through a second screen 100 feet from the first, and then through the movable electro-magnet. When the first current is broken by the projectile, the chronometer falls; when the second current is broken, the registrar falls, striking the lever, which releases the knife. The knife strikes the recorder on the falling chronometer rod. The height of this record represents the difference in time of the breaking of the two currents, or the time it takes the projectile to pass from one screen to the next. There are several corrections that must be made, however, such as the time it takes to demagnetise the magnets after the current is broken, the time it takes the registrar to fall, and the time it takes the knife to be released and move through the space to the chronometer rod. These errors in time are corrected by taking a disjunctor reading, that is, both currents are broken at exactly the same time. The distance that the chronometer rod then falls is due to the errors in the instrument, which can readily be measured and always be made the same. The new disjunctors, as made by Queen and Co., consist of one steel spring, through which both currents pass. By pressing a button the spring is released, and the currents are broken, and act together without any interval of time between them. In the old form the two currents were broken by two separate springs, which required constant attention to keep them working together.

A rheostat is introduced in each current to regulate its strength. The rheostats furnished by Queen and Co. are a new style made for this particular work, consisting of a flat drum rheostat, having a resistance of about 20 ohms, each drum having about 450 contact points, by which a very close regulation of the current can be secured. Another feature of the rheostat is the large current-carrying capacity, so that they can be used on any form of chronograph. As it is desirable to use as weak a current as possible, the current is cut down by means of the rheostat, so that the magnets will just hold their respective rods. Each chronograph is provided with a velocity scale graduated on a german silver rule reading "feet per second." As soon as a record is made on the recorder it is attached to the velocity scale, and the vernier adjusted until its edge rests in the cut; the reading is then taken from the vernier, giving the actual velocity of the projectile in feet per second.

REVIEW.

Smokeless Powder, Nitrocellulose, and the Theory of the Cellulose Molecule. By Lieut. J. B. Bernadou. Published by John Wiley & Sons. Price 10s. 6d.

This work, as the author states in his preface, consists of a series of papers written by well-known investigators, together with an account of experiments made by himself and certain conclusions at which he has arrived, with regard to the structural formulæ of nitrocellulose.

It is a book of some 200 pages, of which 120, in the form of an appendix, are devoted to extracts from the works of renowned scientists in the field of explosives and the reprint of a lecture by the author himself.

The extracts consist of an article on the Nitration of Cellulose by M. Vielle, also one on the same subject by M. Brulez, both of which have been translated from the *Mémorials des Poudres et Salpêtres*.

There is also the famous contribution on Pyrocollodion and Smokeless Powders by Prof. D. Mendeleef, and lastly the lecture by the author on the Development of Smokeless Powders, which was published in the *U.S. Artillery Journal*.

The interesting experiments of MM. Vielle and Brulez have now become classical. As our readers will perhaps recollect, we reviewed their works at great length some years ago.

The rest of the book is devoted to a fair history of nitrocellulose and smokeless powders (and, in our opinion, it is a matter for regret that this portion is not more expanded), along with an account of the author's experiments on the action of solvents, and his views with regard to the constitution of nitrocellulose. The experiments on the action of solvents are very good. We learn that nitrocellulose, soluble in ether-alcohol, is also soluble in ether or alcohol alone if digested at a sufficiently low temperature. By using liquid air as a refrigerator, the author was able to dissolve ordinary soluble guncotton in either pure ether or absolute alcohol. He also says that ether will dissolve insoluble guncotton when digested at a sufficiently low temperature, but that absolute alcohol will not.

The pages devoted to the solutions of nitrocellulose are interesting, and contain important contributions to our knowledge on the action of solvents on nitrocellulose. We are sorry we cannot say the same with regard to the views expressed on the Theory of the Cellulose Molecule. The author has taken one view of cellulose only, viz., its nitric-ethers; and with a restricted aspect of these compounds—*i.e.*, their action with regard to solvents—he has developed a structural formulæ for cellulose. It is a little unkind to omit all consideration of the other evidence we have on this important point. We think that his conclusions would not fit in with the facts that cellulose forms dextrose on hydrolysis and furfural on condensation. Although his intricate groupings of the cellulose atoms seems to us to possess no merit, yet we think he makes a distinct point when he calls attention to the evidence that solution in different solvents brings to bear on the structural formulæ of nitrocellulose.

We think that this work will find its way into the libraries of most persons interested in smokeless powders, even though its price, considering the new matter, is somewhat prohibitive.

APPLICATIONS FOR PATENTS.

AUGUST 12TH—SEPTEMBER 21ST, 1901.

16,326. Pneumatic Decoy Wood Pigeons. J. Proudlock.
16,402.* Breech Mechanism for Guns. A. W. Schwarzlose.
16,403.* Gun Carriages. A. W. Schwarzlose.
16,514. Ordnance. A. T. Dawson and J. Horne.
16,535. Sights. W. J. Whiting.
16,539. Rifle Clips for Cycles. R. H. Spratley.
16,612. Telescopic Sights. A. König.
16,635. Game Carriers. J. C. Thompson.
16,647. Range Finders. A. H. Marindin.
16,693. Explosives for Armour-piercing Shell. Sir H. S. Maxim.
16,694. Fuses for Armour-piercing Shell. Sir H. S. Maxim.
16,719. Blasting Fuse Apparatus. H. Schulte.
16,774. Air Guns. C., J. B., and E. Lane.
16,843. The Peters Target. J. Peters.
16,913. Targets. C. Mitchell-Innes.
16,939. Single-Trigger Mechanism. C. E. de Long.
16,963.* Single-Trigger Mechanism. C. Bittiner, and F. E. Jaeger.
16,996. Air Guns. W. Field.
17,039. Rifle Range Telephones. C. R. Crosse.
13,907*a*. Torpedoes. R. B. Marston. (Date claimed July 8, 1901).
13,907*b*. Devices for locating Submarine Mines. R. B. Marston. (Date claimed July 8, 1901).
17,167.* Small-arms. H. H. Lake. (Agent for *The Winchester Repeating Arms Co*.)
17,179. Small-arm Cartridge Clips. Sir W. G. Armstrong, Whitworth & Co., Ld., and J. W. G. Simonds.
17,181. Sighting of Guns. A. A. Common.
17,191.* Magazines for Guns. P. Jensen. (Agent for *O. H. J. Krag*).
17,230. Small-arms. E. C. and F. H. Green.
17,336. Ordnance Mountings. Sir W. G. Armstrong, Whitworth & Co., Ld., and R. T. Brankston.
17,341.* Self-loading Rifle. S. H. Bang.
17,384. Range Finders. W. E. Maddock.
17,429. Sighting Apparatus. A. A. Common.
17,492.* Projectiles. A. J. Robertson.
17,626.* Explosives. H. H. Lake. (Agent for *Eastern Powder Co.*)
17,636. Cartridges. R. W. Scott.
17,720. Projectiles and Cartridges. W. Hope.
17,722. Apparatus for Loading Ordnance. Sir G. S. Clarke.
17,723. Sighting Apparatus. Sir W. G. Armstrong, Whitworth & Co., Ld., and F. W. C. Dean.
17,821. Clay Bird Traps. J. L. Dexter.
17,860. Electrical Primers. Sir W. G. Armstrong, Whitworth & Co., Ld., and G. Stuart.
17,870 Small-arm Mechanism. H. Harris.
17,926. Gun Carriages. A. Reichwald (Agent for *Fried. Krupp*).
17,939. Sighting Apparatus A. A. Common.
18,034. Capless Solid Drawn Cartridge. T. H. Harvey.
18,074. Cartridge Belt. T. Hill.
18,086. Projectiles. N. Soliani.
18,161. Explosives. F. W. Jones.
18,259. Small-arms. F. E. Bousfield (Agent for *Sir C. H. A. F. Ross*).
18,294. Charger for Small-arms. The Webley and Scott Revolver and Arms Co., Ld., and W. J. Whiting.
18,339. Magazine Fire-arms. H. Selton-Jones (Agent for *The Actieselskabet Schwartz Fidjelands Gevœrsyndicate*).
18,400. Ammunition Rammers. A. Reichwald (Agent for *Fried. Krupp*).
18,467.* Fork Pivot for Fire-arms. G. T. S. Schoubol.
18,486. Fuses for Projectiles. J. Wattre (Agent for *The Machinenfabrik Oerlikon, and E. Rubin*).
18,523. Target Traps. P. R. J. Willis (Agent for *J. Bouron*).
18,535. Projectiles. A. Smallwood.
18,586. Fire-arms. W. F. Coe.
18,722. Protection for Vessels from Submarine Explosions. W. B. Kemshead and A. E. Collischoun.
18,735.* Howitzers and Mortars. C. P. E. Schneider, and J. B. G. A. Canet.
18,785.* Gun Carriages. F. Müller.
18,829.* Fire-arms. W. & A. McArthur, Ld. (Agents for *J. Marsland and J. Gant*).
18,877. Targets. E. Dolder. (Date of application in Switzerland, Feb. 25, 1901).

*These Applications were accompanied by complete Specifications.

SPECIFICATIONS PUBLISHED.

AUGUST 24TH—SEPTEMBER 24TH, 1901.

COMPILED BY H. TARRANT.

8,170 (1900). **Automatic Guns**. G. Hookham, E. W. Anderson, and Kynoch, Ld., Birmingham. Methods of enabling a quick-firing gun automatically to be operated when firing blank cartridges, as well as when firing loaded ones. The methods consist either in supplying a separate barrel, fixed to the water-jacket, while the moving part fits by contact to the fixed end of the barrel, or by inserting a separate tube within the ordinary recoiling barrel, the tube being fixed to a cooling case. Accepted August 10th, 1901.

13,337 (1900). **Breech Mechanism of Ordnance**. A. J. Dawson and G. T. Buckham, London. In order to obtain a better distribution of firing stresses, and to enable the swinging out of the breech block in ordnance to be effected after only a partial withdrawal of that part, the circumference of the block is symmetrically divided into equal portions, each having the same number of stepped divisions, all equal and threaded, except the extreme division of each portion, which is larger than the threaded divisions. The interior of the breech is correspondingly stepped and threaded. Accepted August 24, 1901.

14,362* (1900). **Single-Trigger Mechanism.** C. E. Goodwin, U.S.A.

14,777 (1900). **Automatic Fire-arms.** H. W. Gabbett-Fairfax, Leamington. In this specification, mechanism, more especially designed for automatic pistols, is described. The breech and barrel are adapted to recoil together against the resistance of springs. At the end of their rearward travel the barrel becomes unlocked from the bolt, and is caused again to assume its forward position. At the end of its forward travel the barrel automatically releases the bolt, which is then forced to travel forward and become relocked to the barrel, taking with it the fresh cartridge, which is drawn from the magazine during the rearward travel of the parts. Accepted August 10, 1901.

15,143 (1900). **Sighting Apparatus.** J. L. Crawford, London. Apparatus for sighting fire-arms by means of which weapons may be aimed whilst their gunners are invisible from the position of the objects aimed at. An angled sighting tube having reflectors arranged at the angles is occupied by one eye of the gunner, whilst his other eye is engaged with a similar tube, which magnifies the object. The arrangement of the tubes is such that the sighter can aim the gun from under cover, and he can use both eyes, one object being superimposed on the other. The object aimed at thus becomes much more distinct. Accepted August 10, 1901.

15,492 (1900). **Rifle-Carrying Clips**. A. Haskins, Moseley. A clip designed more especially for attachment to cycles for rifle-carrying purposes. The clip consists roughly of two side parts, which are capable of exerting a spring pressure in a direction towards one another. A pair of these clips are made according to the shape of the butt and barrel of the rifle, and the pressure of their spring-jaws against these parts hold the rifle securely. Accepted August 3, 1901.

15,534 (1900). **Projectiles.** A. Primat, France. A shell designed to substitute the self-propelling torpedo at present in use in the Navy. The shell is composed of two parts—an inner and an outer shell. The inner shell is held apart from the outer case, in the normal state, by a lead ring and zinc studs, which are smashed by the enertia of the inner case upon discharge. The sudden stopping at the moment of impact creates a forward movement of the inner case, and this movement causes the ignition of a Bickford fuse, through which the shell is exploded. Accepted August 3, 1901.

16,284 (1900). **Rifle Magazine Mechanism**. H. Harris, London. A modification of the Harris magazine mechanism described in our issue of July, 1901. In order to enable the cartridges to be passed smoothly from the magazine to the chamber, and thus to avoid jamming, a supplementary lever is pivoted to the lever which operates the magazine platform. This supplementary lever is so arranged as to enable one arm, working loosely on the underside of the platform, to act in such a manner that the platform is kept perfectly level during its transit from the bottom to the top of the magazine box. Accepted August 17, 1901

16,664 (1900). **Machine Guns**. Cap'ain W. B. Wallace, Enfield Lock. A safety catch for machine guns of the Maxim type. The catch is so arranged that until it is rotated by hand, a bent is always in engagement with the firing lever. The gun may be fired with one hand, the forefinger drawing back the catch, whilst the thumb presses forward the firing lever. A spring returns the catch to the safe position when finger pressure is relapsed. Accepted August 3, 1901.

16,791 (1900). **Telescopic Sights for Ordnance.** A. A. Common, Ealing. Telescopes for the sighting apparatus of quick-firing guns, designed to simplify the focussing and collimation arrangements, and to insure the absolute rigidity of the telescopic parts determining the pointing. A telescope of ordinary terrestrial construction is used, and the object glass, the next three glasses of the eye-piece, and the frame carrying the cross wires, are rigidly mounted in the outer tube. The eye-lens is mounted in a sliding tube. Accepted August 30, 1901.

17,020 (1900). **Bolt-Action Lock Mechanism.** N. Pieper, Belgium. A system of lock mechanism applicable to arms of the bolt-action type. A long pivoted lever, the front end of which is pressed downwards by a spring, has a part arranged at its rear end, which is adapted to be raised when the bolt is opened, and to engage a collar on the firing pin. The striker is retained after the bolt is pushed forward, and is released only when the trigger is pulled, which action draws the upstanding projection on the lever from its path. Accepted August 3, 1901.

17,176 (1900). **Field Gun Carriages.** Sir W. G. Armstrong, Whitworth & Co., Ld., Sir A. Noble, and R. T. Brankston, Newcastle-on-Tyne. In order to prevent field carriages tilting up round the trail end as a pivot when firing, the trail is lengthened and is made in two portions. The lower part of the two is adapted to be folded back on to the top part when travelling. The top part is provided with a spade as well as the lower part, in order to adapt the gun for high angle firing. The recoil springs are arranged telescopically, and the recoil cylinder is fixed to an arm on the underside of the gun. Accepted August 10, 1901.

17,177 (1900). **Sights for Ordnance.** Sir W. G. Armstrong, Whitworth & Co., Ld, Sir A. Noble, and R. T. Brankston. A method of mounting the sights on ordnance so that the gun can be altered without causing any modification in the line of sight. The rear sight is mounted on a bar curved in the form of an arc of a circle, the centre of which is the trunnion centre. The bar slides in guides on the breech of the gun. Below the socket on the gun is a second socket fixed to a standing part of the carriage on which the curved bar may be clamped when desired. The gun can be then raised or lowered without altering the line of sight. Accepted August 10, 1901.

17,781 (1900). **Shells**. R. Fielder, Germany. A method of rendering the bursting of shells visible at long distances, by including in the smokeless powder charge of the shell a cartridge of amorphous phosphorus, which on combustion produces a snowy white dense smoke. The major portion of the charge may be made up of this substance, so that a dense wall of smoke will be produced in front of the enemy, depriving him of a view of the field. Accepted August 10, 1901

17,837 (1900). **Rifle Magazine Mechanism**. H. Harris, London. The magazine mechanism described in Patent No. 10,239, 1900 (fully described in our issue of July, 1901), working in conjunction with a parallel-sided magazine-box, has been discovered to be liable to cause a "piling" of the cartridges. To overcome this difficulty a magazine of an irregular barrel shape in cross section has been adopted. The cartridges follow the shape of the magazine and arrange themselves quickly therein Accepted August 31, 1901.

18,022 (1900). **Cartridge Cases for Ordnance**. A. Reichwald, London (Agent for *Fried. Krupp, Germany*). In order to allow for the easy insertion and ready removal of cartridge cases into and from the breech of ordnance, a certain amount of space is left between the case and the chamber. This patent deals with a method of checking the entrance of the gases of combustion between the two by so forming the mouth of the case that it projects outwards and lies closely around the wall of the chamber. Thus a gas check is created, and the entrance of powder gases with its accompanying evils is prevented. Accepted August 3, 1901.

18,955 (1900). **Bandolier**. J. A. Telfer, London. A bandolier designed to set comfortably around the shoulder of the wearer, and also to have a clearance under the opposite arm in order not to impede the shooter's movements The belt is made in two parts, which lie across the chest and back. These parts are joined by two straps, one lying on the shoulder and the other beneath the arm. Accepted August 31, 1901.

18,978 (1900). **Miniature Ammunition Apparatus**. H. Andrews, Woolwich. An improved device of the kind described in Patent Nos. 14,916, 1887; 7,927, 1889; 5,457, 1890; and 15,282, 1890, which is so designed that miniature cartridges may more readily be united with the apparatus. The cartridge and the block containing the supplementary firing pin are enclosed within a tubular sheath longitudinally slitted to render it circumferentially elastic. The end of the tube grips the cartridge and holds it during discharge. Accepted August 31, 1901.

20,792 (1900). **Cartridge-filling Apparatus.** N. Ceipek, Austria. Apparatus for filling a large number of cartridge cases with powder. The cases are arranged in tubular holders fitted around the periphery of a centrifugal apparatus, from which the powder is delivered in quantities according to the adjustment of the revolution speed of the apparatus. Accepted August 31, 1901.

21,068 (1900). **Explosives.** J. Bonnet, France. The production of an explosive compound especially suited to hot climates. The inventor has discovered that nitro-, picro-, or picro-azoic derivatives are soluble in free fatty acids, or in a mixture of such fatty acids. Consequently he is able to produce an explosive, the melting point of which is higher than that of substances obtained by dissolving, at a high temperature, the same derivatives in oils or fats, in which these fatty acids are combined in the form of an ether of glycerine. An example of a mixture with a free fatty acid alone is:—Stearic acid, 12 parts; Dinitrobenzol, 8 parts; and Chlorate of Potassium, 80 parts Accepted August 24, 1901.

235 (1901). **Sight-Adjusting Gear for Ordnance.** H. G. Grenfell, Alverstoke Gear for adjusting the sights for range in ordnance, so constructed that it operates to turn the gun with respect to the sights instead of turning the sights with regard to the gun as heretofore. By this method the line of sight is not disturbed when making the change for range, and accuracy combined with rapidity of fire is improved. Accepted August 17, 1901.

2,969 (1901). **Rifle Carrier for Cycles.** G. D. Petrie, Stonehaven. Clips designed to be fitted to cycles for rifle-carrying so as to take the weight off the frame of the cycle, and to prevent vibration of the rifle The butt is supported in a spring-suspended leather-lined shoe attached to the axle of the front wheel, and the muzzle is held in a clip attached to the handle bars. The rifle is thus held in an upright position. Accepted August 10, 1901.

4,415 (1901). **Magazine Mechanism.** O. H. Edwards, Aberdeen. Cartridge-raising mechanism consisting of a long flat spring, which terminates at one end in the cartridge-lifting platform. The other end is bent upwardly so as to give to the platform end an approximately horizontal position. The forward end is dovetailed into a recess in the stock of the rifle and is there fixed. A lever, to be operated by finger pressure, is provided to depress the spring, and thus the cartridge platform in order to load the magazine box. Accepted August 3, 1901.

4,433 (1901). **Mechanism for Magazine Rifles.** S. H. Bang, Denmark. Mechanism for magazine rifles consisting of a breech action with a straight pull, in which the turning of the breech bolt during the disconnection from the receiver, its backward and forward movements, and its turning during the closing, are effected by the backward or forward working of a hand-operated cover which catches round the breech bolt, and which slides upon the guides running parallel to the bolt. Accepted August 10, 1901.

5,169 (1901). **Magazines for Rifles.** F. R. von Mannlicher, Austria. In our issue of September, 1900, we described and illustrated fully the drum magazine and breech mechanism which form the subject of this patent. The devices described are the drum magazine arrangement, a device to prevent any delay in filling which would be caused by the bolt should gravity take it forward, and a part to prevent the closing of the breech bolt when the locking head is not in position. Accepted August 10, 1901.

5,297* (1901). **Single-Trigger Mechanism.** C. Ingram Annan, Glasgow.

5,439 (1901). **Quick-firing Rifles.** T. A. J. Fidjeland, and J. A. Schwartze, Norway. To obviate the disadvantage of the rifle becoming hot when firing rapidly, an envelope, perforated with a series of holes, is constructed around the barrel. The envelope is adjusted at such a distance from the surface of the barrel that the heat radiating from the barrel shall shall be carried off by the circulation of air through the perforations. Accepted August 3, 1901.

5,792 (1901). **Discharge Actuated Ordnance.** S. N. McClean, U.S.A. A device is described in this specification which opposes the forward energy of the gases of discharge, against the rearward energy of the recoil. Through this arrangement the recoil is counteracted and controlled, and a portion of the combined energies of gases and recoil is imparted to the breech mechanism to operate it. The device consists of two parts, a cylinder and a piston, one of which is attached to, and moves rearwardly with the gun, while the other is moved forward by the gases. This movement of the two parts brings about a compression of some elastic fluid between them. Accepted August 17, 1901.

8,016 (1901) **Sights.** F. J. Choles, Natal. A mounting for back-sights for rifles or machine guns, by means of which defects in sighting can easily be remedied, and by which, also, the sight can be turned from side to side for wind-gauging purposes. The bed of the sight is pivoted at its forward end to the base of the sight, and at its rear end is provided with teeth which engage a worm on a fixed shaft adapted to be turned by means of a milled head. By means of this engagement, the sight bed may be moved in either direction sideways, so as to counteract any sighting defect, or to allow for wind. Accepted August 31, 1901.

10,169 (1901). **Sight and Range-Finder.** L. O. Beal, New Zealand. A sight and range-finder combined for use with small-arms. The fore-sight is so constructed that the user of the weapon is enabled to judge, from the apparent size of the object in relation to the sight, the approximate distance. The range having thus been discovered, the corresponding aperture in the standing rear-sight is aligned with the fore-sight. Windage is allowed for by sighting from positions between the centre and the side edges of the apertures on the back sight. Accepted August 24, 1901.

11,142 (1901). **Setting of Time Fuses.** C P. E. Schneider and J. B. G. A. Canet, France. Apparatus for mechanically setting time fuses, constructed to facilitate the operation of setting, and at the same time to insure a precise and identical setting of any number of fuses. The apparatus is applied to the fuse head, and two clutch pieces engage recesses in the rings—one in the movable and the other in the stationary ring. One of the clutches is movable, and the angular distance of one clutch in relation to the other during the setting operation may be read off on a scale. Thus the positions of the rings is determined and regulated accordingly. Accepted August 10, 1901.

11,400 (1901). **Smokeless Gunpowder.** E. Edmunds, London (Agent for *W. Kent, U.S.A.*) A smokeless powder consisting of 50 parts of picrate of ammonia, and 50 parts of nitrate of barium. These ingredients are thoroughly ground and mixed together in a wheel mill with a small quantity of water. The resulting pasty mass is then granulated by reducing the pressure of the wheels, and the grains are separated by passing through a sieve. In order to give the powder durability, 15 parts of picric acid are added. Accepted August 3, 1901.

11,623 (1901). **Ordnance.** J. W. Kline, U.S.A. In heavy ordnance an auxiliary and removable jacket is provided, which is applied to the breech end of the gun to support and retain the breech block and its operating mechanism in proper relation to the gun. The bending of the bore of the gun, which sometimes occurs through the great weight of the muzzle end, is also prevented by an adjustable stay or support connected to the end of the gun, and adapted to support the muzzle end and preserve absolute straightness of the bore. Accepted August 3, 1901.

11,850 (1901). **Recoil Apparatus for Ordnance.** W. L. Wise, London (Agent for *Fahrzeugfabrik Eisenach, Germany*). Recoil apparatus for field guns, consisting of a telescopically constructed trail. The outer tube of the trail, which carries the spade, is provided with longitudinal corrugations, designed to render the tube capable, to a certain extent, of resisting projectiles should they strike it. The ridges formed by the corrugations are, at the same time, adapted to engage with, and serve as a guide to, balls inserted between the outer and inner tubes of the trail. Accepted August 31, 1901.

12,467 (1901). **Lock Mechanism for Small-Arms.** O. Imray, London (Agent for *J. Tambour, F. Neuber, and C. Colbert, Austria*). Lock mechanism for small-arms in which the hammer is provided with a bent, engaging the sear nose, which is cut in a rectangular or obtuse angular manner. This bent is adapted to engage a sear nose of greater and more resisting dimensions; and a second sear engages engages the hammer sear at its rear in order to prevent jarring off. This arrangement allows of just as light a pull-off as with ordinary lock mechanism; but accidental firing from jarring is prevented. The gun illustrated in the specification is provided with studs instead of triggers. Accepted August 31, 1901.

13,879 (1901). **Fog Signal Detonators.** E. Beadle, Upper Mitcham. Improvements in detonators of the type described in Patent No. 21,879, of 1891. The improvements provide better means for excluding damp from the explosive material in the interior of the detonator; and for securing the lead clip with which the detonator is fastened to the rails. Accepted August 17, 1901.

14,162 (1901). **Clips for Cartridges.** H. S. S. Watkins and J. J. Speed, Enfield Lock. A clip for charging rifle magazines consisting of a piece of steel bent so as to form two spring sides which are designed to grip the cartridges. The sides are inwardly recessed to a shape similar to the sides and base of the cartridge. A projection is punched at each end of the clip to keep the cartridges in position. Two other projections are also punched on each side to prevent the clip being pushed down with the cartridges into the magazine. Accepted August 17th, 1901.

14,163 (1901). **Rifle and Bayonet Parts.** H. S. S. Watkin, Enfield Lock. A method of constructing the sear and trigger of a rifle in such a way as to give greater facility in aiming; and also a means of fixing the bayonet so as to avoid any strain upon the barrel end. The trigger, in the first arrangement, is balanced on a pivot, and is provided with two shoulders. During the first part of the pull the sear end slides over one of the shoulders. During the last part of the pull the second shoulder is engaged and the discharge effected. A drag pull, believed to facilitate correct aiming, is thus obtained. Accepted August 17, 1901.

14,339 (1901). **Apparatus for Sighting Guns.** C. P. E. Schneider, and J. B. G. A. Canet, France. Sighting apparatus for ordnance which enables the fore-sight to be dispensed with, and at the same time retains the advantages of a line of sight of convenient length. The apparatus forms a small compact arrangement mounted in a socket permanently connected with the telescope, and permits of both the laying of the gun and the making of corrections for drift in a plane of movement of 360 degrees. Accepted August 17, 1901.

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

SELECTED PATENTS.

THE GOODWIN SINGLE-TRIGGER MECHANISM.

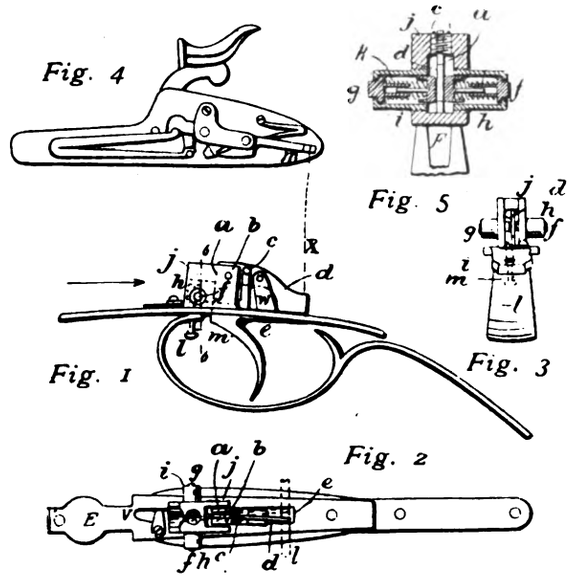
14,362 (1900). C. E. Goodwin, U.S.A. A system of single-trigger mechanism is described in this specification, in which a movable trigger blade is adapted to be switched from one lock to the other, in order alternately to discharge the two barrels. The hammers control the springs which turn the sear-lifting lever over from left to right or right to left, and a pin, dependent from the action strap, is the part through which simultaneous discharge of both barrels is prevented.

In the drawings annexed, the mechanism is shown as adapted to a gun of the bar-lock hammer type; and Fig. 1 illustrates the parts, and the method of distribution on the trigger plate. Fig 2 is a plan; Fig. 3 is an end view looking in the direction of the arrow in Fig. 1; and Fig. 3 illustrates a section of the mechanism along the line 1—1, Fig. 1. Fig. 4 illustrates the lock work in conjunction with which the parts operate.

The upstanding arm *a* of the trigger is pivoted at *b* within the box *j*, and the trigger is held in its normal position by the spring *c*. Loosely pivoted in a slot to the arm *a*, so as to allow both of

vertical and lateral movements, is the lever *d*, the rear end of which lies on the backward extension *e* of the trigger. This lever *d* is adapted to be turned from one lock to the other by the spring-operated pins *f* and *g*, working in the studs *h* and *i*, fixed to the box *j*. One of the two springs *k* operating these pins *f* and *g*, is made stronger than the other, so that in the position when the parts are at rest, the lever *d* is always forced beneath the same sear. The pins are pressed inwards so as to engage with the sides of the lever *d* by the hammer tumblers when in the cocked position. When the hammers have fallen and the tumblers thus turned, the studs are released, so that when one hammer has fallen the lever *d* is forced round to the sear controlling the other hammer by the stud on the side of the cocked lock.

Supposing the gun to be cocked and loaded, the action of the parts is as follows:—The spring of the left-hand stud *g* being the stronger, the lever *d* is caused to occupy the position beneath the left-hand sear as in Fig. 2. The pulling of the trigger raises the lever *d*, and releases the hammer. The falling of the hammer carries the tumbler round, out of engagement with the stud *g*, and the relaxation of the pressure of the inner end of the stud allows the spring-actuated right-hand stud *h* to force the lever *d* round



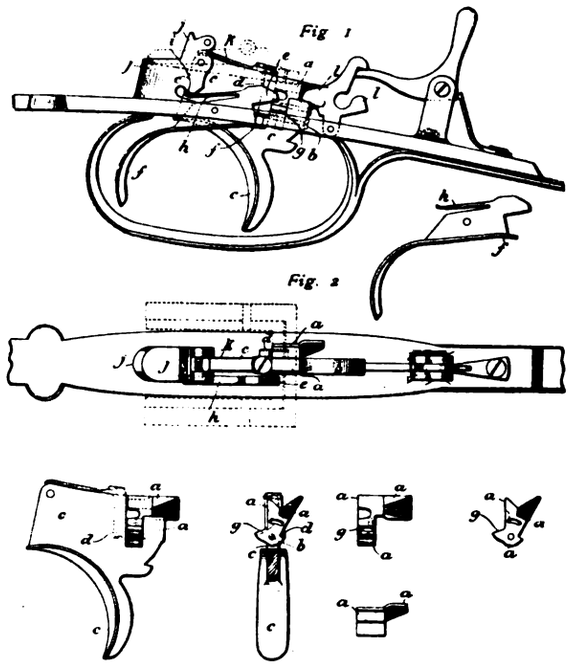
until it is beneath the right-hand sear. The right-hand barrel can then be discharged.

The order of firing is reversed by the push-pin *l*. This pin has an inclined surface formed upon its inner end (Fig. 3), so that when the pin is pressed upwards the point shall slide between the side of the lever *d* and the box *j*, and so force the rear end of the lever over to the right. When the trigger is pulled to discharge the right-hand barrel, the forward part of the lever *d* engages the shoulder *m* on the pin *l*, and forces it down out of the way, so that the path of the lever will be clear after discharge in order to allow the stud *h* again to force the lever round to the left. The weight *n* is attached to the lever *d* to hold it steady, and to prevent jarring by the recoil. A pin projects downwards from the action strap into the path of the traverse of the lever *d*. This pin insures the correct guidance of the lever to either one or the other of the sears, and so makes simultaneous discharge impossible. Accepted August 3, 1901.

THE ANNAN SINGLE-TRIGGER MECHANISM.

5,297 (1901). C. Ingram Annan, Glasgow. The single-trigger mechanism described in this patent consists mainly of about three parts, of which a little rocking arrangement is the most important. The rocker is adapted, under spring pressure, to be tipped over from right to left during discharge operations, and to be returned by the automatic operation of the safety catch during the breaking down of the gun for reloading.

In the drawings appended, it will be seen from Fig. 1, and the detailed illustrations, that the part *a*, called the rocking piece, is pivoted at *b* at the back of the trigger blade *c*. This rocker is operated by the spring *d*, which performs a double function in retaining the rocker in position, and also of rocking it over either to right or left during the firing operations. This it performs by means of its engagement with the wedge-shaped projection on the rocker, the opposite movements occurring when the extreme points of the projection and the spring ride over each other in either direction. The lever is started in its rocking movement by the engagement of the nose *e* of the finger-push lever *f* with the projection *g* on the rocker. The nose *e* is held clear in the normal position of the parts by the spring *h*, one end of which is located beneath the projection *i* on the box *j*.



The action of the parts during the firing operations will easily be understood. Supposing the gun is loaded, and the rocker *a* beneath the right hand sear, the pulling of the trigger raises the rocker and thus the sear, and so discharges the right-hand barrel. During the raising of the trigger, and almost at the instant of discharge, the rocker projection *g* comes into contact with the nose *h* of the lever *f*. This contact turns the rocker over to the left-hand sear, against the end of which it rests. When the trigger is released, its spring *k* carries it down to the ordinary position, and under the influence of the spring *d* the rocker is carried under the left-hand sear tail ready for the second discharge. When the gun is opened to reload, after the firing of the left-hand barrel, the automatic working of the safety-block *l* turns the rocker back again to its former position beneath the right-hand sear tail.

When it is necessary first to discharge the left-hand barrel, the finger lever *f* is operated by pushing it forward so that the rocker is turned over through the depression of the nose *e* of the lever. The safety slide has, however, to be pushed backward and then forward in order again to turn the rocker back for the right hand, and second discharge. Accepted August 3, 1901.

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