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Publisher: Routledge
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Royal United Services Institution. Journal

Publication details, including instructions for authors and subscription information:
<http://www.tandfonline.com/loi/rusi19>

Mont Storm's System of Breech-Loading

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Published online: 11 Sep 2009.

To cite this article: Mr. F. A. Braendlin & Charles Phelps Esq. (1864) Mont Storm's System of Breech-Loading, Royal United Services Institution. Journal, 8:32, 280-291, DOI: [10.1080/03071846409417778](https://doi.org/10.1080/03071846409417778)

To link to this article: <http://dx.doi.org/10.1080/03071846409417778>

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in screws there is a very considerable loss of power: you drive them at a great rate, and there is a great consumption of coal. You get a greater speed no doubt, and under certain circumstances a considerable advantage; but, taking it on the whole, there is a very great disadvantage arising out of the consumption of coal which is necessary, and when you come to head-winds, there is always a great consumption of coal without any corresponding result. I don't think that will occur here while under similar circumstances in smooth water. I think there would be a greater result. This plan has decided advantages over the side paddle-wheel, and it approximates more to the twin-screw. It is of course a question only to be determined by experiment, as to whether it will give greater results than the twin-screw. No doubt you can get a greater surface here, but all paddles have this one disadvantage, this, perhaps, less than any other, that they are immediately affected by the alterations of draught; that is to say, as you consume your coal, you lighten your vessel, and as you lighten the vessel you lessen the dip of your wheels, and the consequence is your engines run away with your wheels, and there is a loss of power. On the other hand, if you so adjust your paddle-wheels that they give the best results when they are very deep, they lose power accordingly as they get lighter, or *vice versa*. If you arrange them so as to have the best effect when the vessel is light, you have to contend with the disadvantage of heavy draught. I think alterations in draught will not make very much difference with this plan. I think they will be nearly as effective with a deep draught as with light draught, which is just what occurs in the screw. It seems in the screw, that the deeper the vessel is, notwithstanding the greater weight, the greater is the effect, because you get it into more solid water,—so you will have here. I quite agree with what Major Phillips says with respect to the water coming up from below. Again I think that experiments with larger vessels will give greater results than those mentioned arising out of this fact, that the larger the vessel is, the greater is the column of water to press the water under the paddles. The more solid the water is, and the deeper the immersion of the wheels arising from the greater column of water, so the effect will be increased.

As we have another paper to read, I will not occupy any more time. Will you allow me to offer your thanks to Major Phillips for his very interesting paper? He has gone into quite a new field, and it does him more credit inasmuch as it is not his profession, and he has not had the advantage which many of us have had.

Major PHILLIPS: I beg to return my best thanks for your kind reception of my paper, and that, not only by all present, but by the members of the naval profession in particular.

MONT STORM'S SYSTEM OF BREECH-LOADING.

Contributed by Mr. F. A. BRAENDLIN, and read by CHARLES PHELPS, Esq.

GENTLEMEN,—At the request of several gentlemen much interested in the recent improvements of small arms, I am induced to come forward on the present occasion to state my views on the subject, which were acquired by theoretical and practical experiments.

All the recent improvements, particularly in breech-loading principles, depend in a great measure on mechanical laws; and I know of one breech-loader, devised and made by a mechanical engineer, which is in my opinion the best, and which will maintain its superiority over all other fire-arms.

Great attention has been given for some time to the study of the different kinds of small arms in use, to the improvements which have been effected lately, to the different projectiles, to the different modes of rifling, and so on, all of which must come into consideration when we speak of military small arms.

I do not think it necessary, and besides it would take up too much time, and perhaps tire the patience of the audience, to go into details regarding muzzle-loading fire-arms; besides, the estimation in which they were held is rapidly declining, and they will soon be one of the things of the past; and I am sure the generation to come will look with the greatest astonishment at a weapon where a stick called a ramrod was necessary to push the charge down into the barrel, when it is so easy to load at the breech. Muzzle-loaders, however, are still used, and every one present is no doubt acquainted with the weapon in use in the English army, I mean the Enfield rifle. Now I have no doubt it will be admitted by all using muzzle-loaders, that loading is a dangerous operation. I, for instance, always feel nervous when pushing the charge down the same road by which it has to come out. The Enfield rifle is an excellent weapon, and at the time of its introduction it was no doubt the best then in existence, but such important improvements have lately been made in fire-arms that it has been decided, I believe to the best of my knowledge, to exchange by degrees the present fire-arm for one more serviceable, and capable of greater execution. To select such an arm it is of importance to consider two things, first, is the new arm to be again a muzzle-loader or a breech-loader.

I am sure every one will agree with me that if we can get a breech-loader that fulfils all the conditions required of a serviceable arm, let it be the one by all means; but to satisfy even the advocates (if there be such) of muzzle-loaders, let us inquire whether there is an arm which is both a perfect muzzle-loader and breech-loader at the same time. If such an arm can be found, decidedly that is the arm which we want, and which will satisfy everybody.

But in the selection of such an arm, it is again important to consider which is the simplest, safest, and cheapest arm of this kind.

The variety of breech-loaders is becoming endless, but all, with the exception of one, fail in the first condition, viz., that there must be no escape of gas, to prevent which almost all require the use of a greased wad, which will never do for a soldier. The reason of this defect is, that in all those breech-loaders, the force of the explosion has a tendency to separate the joint, whilst what is wanted is one in which the force of the explosion *shall close* the joint, and in which the greater the charge, the more effectually shall the joint be closed.

Special ammunition is also very objectionable, for if the special ammunition should be wanting, the arm would be worse than useless. We want a breech-loader which can be loaded with loose powder and ball at the breech if there is no ramrod, or at the muzzle, if there is one, and we choose to do so.

To load with loose powder and ball we must have a solid breech on a solid recoil, and I know only of one which has those desirable pro-

erties. A military arm of this kind must likewise be simple, and must have no delicate parts that require nursing, or it will not do for a soldier. Safety is another great consideration. A breech-loader that cannot be discharged before everything is safe and in its place, and which can be placed without risk in the hands of any raw recruit, is no doubt what is wanted.

Now we come to a very important point, particularly for the country at large, I mean the pockets of the taxpayers. There is no doubt about that, for economy is a very important point.

Now if we can find a breech-loader which is almost as cheap as a muzzle-loader, a great point would be gained; but if we could find a breech-loading principle which could be applied to the existing arms at a nominal cost, that would be best of all. Again, I say there is only one I know of which has all these properties, and I have it here; I am sure it will be interesting to all, for it may be the future arm for warfare, invented and patented by Mr. Mont Storm.

I said before, three points have to be considered, viz.:

First—Simplicity

Second—Safety

Third—Economy.

Let us examine Storm's breech-loading rifle. Is it simple? Most decidedly it is. You have but to open the breech, put the charge in, close it, cap it, and your gun is ready for firing. There are no levers, latches, and all those niceties required to work it, which form an essential part in all other breech-loaders.

In order to give you an idea of its extreme *simplicity*, let us look at its construction. If we take for instance a regular Enfield barrel, cut a piece, say two inches, off the breech end, connect this piece by a hinge with the barrel, so that the breech can be opened and laid on the top of the barrel, fit into this breech-piece a steel tube or valve, which in closing inserts itself into the barrel recessed for the purpose, and which entirely prevents the escape of gas, being in fact the continuation of the barrel, called a valve, gas check, or expanding ring, and of which I shall have occasion to speak more fully presently, and we have a breech-loader of the simplest kind, so simple, in fact, that General Guiod, who made official trials of these guns in France, says in his report to the Emperor:

"That these arms are of a solidity and simplicity, of which no other arms of this kind can give an idea." And again, in another place he says—

"These breech-loaders fulfil all the conditions required of a perfect military arm."

It will be observed that the breech A (Plate XX, Figs. 2, 3) is solid, as solid as that of any muzzle-loader; at the back of it is a little recess B, Fig. 3, for the purpose of locking the breech secure in its place. Of this point I shall have to speak when we come to the second head, namely, safety.

But before doing this, I must ask your attention once more to this very ingenious contrivance, called the valve or expanding ring, C, Figs. 2, 3, and it will be seen that no breech-loader can be perfectly gas-tight

WESTLEY RICHARDS

Fig. 4.

Fig. 5.

Ready to receive charge.

Fig. 6.

BREECH LOADING RIFLES

TERRY'S.

Fig. 7.

Fig. 10.

Fig. 8.

Fig. 9.

MONT STORMS.

Fig. 1.

GREEN'S

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 16.

Fig. 15.

without it. If you look at this little ring you will find that it is at the back tapered down so as to present a surface to the explosive force. Now it is natural that this ring or valve at the discharge will be pressed forward into the barrel, and at the same time expand so as to prevent any escape of gas. So perfect is this contrivance, that at the late meeting at Wimbledon,* such rifles have been fired as many as 400 times in succession, and yet not the slightest escape of gas was perceptible.

It will also be observed as quite natural, that by an increased charge of powder, the ring will, with increased force be pressed against the face of the barrel, in contrast to any other breech-loader in existence. Every one must agree with me that it is the simplest contrivance to get a good and efficient breech-loader.

Speaking of simplicity, I should just like to mention a little circumstance, which was commented upon by many gentlemen, and particularly by some of the Birmingham gun-makers, that is, that the breech fits *so loosely*; and they attribute that no doubt to bad workmanship. Now every gentleman present will know by experience, that all things expand when heated, especially metals. After firing twenty or thirty rounds in rapid succession, breech-loaders that have to fit with mathematical nicety to prevent escape of gas, will stick fast and become useless. Not so with Storm's breech-loader; allowance is made for this circumstance, without depriving the gun of any of the conditions required in a good breech-loader, and therefore the gun can be fired any number of rounds, without any impediment being felt. This is an answer to such futile objections.

The second point, viz., *safety*, is self-evident if we look at the contrivance for locking and securing the breech, B, Fig. 3; it will be seen that the gun cannot possibly be fired without everything being secure in its place, as the hammer could not by any means reach the nipple and explode the cap, and it is altogether impossible to have an accident, and may therefore be given into the hands of raw recruits, as I said before, without the slightest danger.

We now come to the last point, *economy*. Practical men will understand this point better. There is no gun extant, muzzle or breech-loader, that can be turned out so cheap with proper machinery.

Storm's breech-loader can be made cheaper and better than any other gun.

Storm's gun can also be made stronger, and at the same time to look more graceful. Storm's gun can be made to shoot equal to, if not better, than any muzzle-loader. I, for my part, am sure that it will shoot better than any muzzle-loader that can be produced.

Now, if an arm can be made that combines in itself a perfect muzzle-loader, as well as breech-loader in one, that is stronger and more serviceable, and does not require nursing and careful handling; that will shoot equal to, if not better, than any other arm of whatever make or name, that will wear long and stand much use, that is simpler than, and as cheap as any other arm, it is natural that we must call it

* Not the meetings in July, 1864, but in 1863.—Ed.

the most perfect arm of the age. I have said that it is the cheapest arm; I will go a step further, and show that it is an efficient breech-loader, that it is A 1 in every respect; that it is a muzzle-loader at the same time, that it is in fact so good and perfect that no other arm in existence can equal it, can be got that combines two points, simplicity and safety, and can be produced at a small outlay by converting the present Enfield.

I call it economy, as it would save the country millions of money. The present Enfield can be converted or altered into a breech-loader on Mont Storm's principle.

The converted rifle will still be a muzzle-loader, if required; it will be a breech-loader that can be loaded with entire or special ammunition, with the Government ammunition at present in use, or with loose powder and ball at the breech, or at the muzzle of the barrel; in either way it will shoot equally well.

If you consider the terrible execution such an arm is capable of doing, that it can be discharged six or eight times, in case of necessity, in a minute with accuracy; that this arm can be loaded and fired in any position, with entire or breech-loading ammunition, or with loose powder and ball; it must be self-evident that an army with such weapons, is more than three times a match for an army armed with common muzzle-loaders.

Mont Storm's system of breech-loading is applicable to all arms, from the pea rifle, to the largest bore or elephant gun, to the punt gun and field artillery, to 3-pounders and up to 18-pounders.

The jury in the great International Exhibition of 1862 appreciated the merits of these weapons, by awarding it a prize medal, mentioning particularly the merit of its being capable of being applied to the conversion of the Enfield rifle. No one that is at all acquainted with the leading newspapers can have omitted reading in what a spirited manner this subject has been taken up by all and every one, particularly by the *Times*, *Army and Navy Gazette*, *Volunteer Gazette*, &c. Captain Sherard Osborn, an able officer, has shown his appreciation of the principle, by arming the best marksmen belonging to the Anglo-Chinese expedition under his command entirely with this weapon.

A few extracts from some of the leading papers will not be out of place here:—

Times, 13th July, 1861.

During yesterday and the day before, Storm's breech-loading rifle was exhibited on the ground (Wimbledon). A description of this *most perfect of all breech-loaders* has already appeared in our columns, and *its immeasurable superiority* over all other weapons of the same kind is so well known now, that further praise is needless.

Times, 15th July, 1862.

Mr. Storm's American breech-loader, to which we ventured to direct attention, as being *beyond all doubt* the best breech-loading rifle in the building, has met with the cordial approbation of the jury, who have awarded it a prize-medal, &c.

Times, 31st July, 1862.

The American breech-loading rifle is now, since it gained the prize-medal, left out in the Military Court for public examination. The interest which this weapon

is exciting among military visitors, foreigners as well as English, is very great, and seems to be getting greater every day. In the Military Court, the breech apparatus is shown fitted to the Enfield, Whitworth, cavalry, and other rifles, and its *incontestable superiority* over the European inventions of the same kind can be seen the instant the weapons are compared with English, French, or German breech-loaders, &c.

Volunteer Service Gazette, 25th July, 1863.

Just before the conclusion of the meeting a very interesting shooting took place under somewhat novel conditions. The patentees of Mont Storm's rifles had not only a tent on the ground for the display of their invention, but had very wisely given two prizes to be contested for by rifles fitted with their breech—for their invention consists simply in fitting a breech-chamber into any rifle, and thereby converting it from a muzzle-loader into a breech-loader. The principle is an exceedingly simple one; and the patentees have particularly directed their attention to the Enfield rifles, both long and short, so that the Government at a small expense might convert the national weapon at once from a muzzle-loader to a breech-loader. The conditions of the prize were very properly framed, so as to show the great advantage of the breech-loader in quickness of fire, while nothing was sacrificed in precision. Each competitor was accordingly given the use of the butt for two minutes, and he was supplied with a Mont Storm rifle and plenty of ammunition, with which he was at liberty to load and fire as fast as he pleased. There were two prizes to be given to the highest and next highest scores thus obtained. There were upwards of forty competitors, and the first prize was won by Ensign Starkie, of the Queen's (Westminster), who made 34 marks in 11 rounds. The second prize was won by Sergeant Drane, of the London Rifle Brigade, who made 32 marks in 13 rounds. One gentleman fired as many as 15 rounds in the time allotted, while another fired as few as 8. All fired from a sitting or lying down position, and the advantage of loading a breech-loader was seen in a moment, when compared with the intolerably awkward military position of loading a long Enfield muzzle-loader from the knee. The rifleman with the breech-loader need never rise from his lying-down position, and consequently need never expose himself in the least to an enemy's shot—an enormous advantage in skirmishing and outlying or ambuscade work. We are glad to hear that the patentees are organizing a company to bring their invention into general use; and so sure are we that the breech-loader must ere long supersede the muzzle-loader, that we gladly welcome any effort in this direction, and more particularly one that is, as in this case, so closely connected with the national arm. We have watched this rifle with some interest, as it was brought under our notice nearly twelve months ago. We tried it through all the ranges up to 1,000 yards. At that time the inventors had not quite determined on their cartridge, and we used some skin cartridges that were not quite satisfactory. The rifles may now be loaded either with Government ammunition, with an improved skin cartridge, or from the flask, and their shooting at Wimbledon showed the merits of the invention in a very strong light.

No one could have witnessed this contest without contrasting it most favourably with the small-bore shooting of the meeting. The latter, it is true, was carried to the extremest verge of excellence, and bull's-eyes at 1,000 yards were made over and over again: and yet the small-bore has done nothing, literally nothing, in advancing the military defence of the country, and we very much doubt if it ever will advance it. Its very success is, in fact, harking on the leading hounds on a false scent. This Mont Storm contest—almost unobserved, and known but to few who attended the meeting, as it was—on the other hand, is all in the right direction. It showed the military qualities of a rifle in the highest degree—great simplicity, great quickness, great precision; and, man for man, a section of breech-loader riflemen would give an account of a section of small-bore gentlemen before the latter had unpacked their apparatus and got their rifles into working gear.

The following scores were made with

STORM'S BREECH-LOADER.

	Points.	No. of shots.
Ensign Starkie, Queen's (winner)	34	11
J. Drane, London Rifle Brigade	32	13

I will here also subjoin the description of Mont Storm's breech-loading fire-arms in his own words.

Breech-loading arms may be divided into twelve different systems or "species," and there are at least eleven "varieties" of these species. The twelfth species (Mont Storm's "self-sealing chamber system") is of comparatively recent development, and its plan is adapted so as to be universally applicable to every style and class both of military and sporting arms, or the ready conversion of present muzzle-loading arms into breech-loaders. Some of its many points of merit may be enumerated as follows:—

It has a chamber, but no lever, either lateral, vertical, or of any other description, to catch in the accoutrements, dress, or bridle-rein.

It is confined to no special ammunition.

The charge may be varied, but the arm cannot be overloaded.

The explosion takes place within a solid chamber. The recoil is upon a solid breech.

The connection between the stock and barrel is strong, graceful, and "fixed:" thus it is adapted for the use of the bayonet for infantry.

The opening and closing of the chamber is effected with unprecedented ease and rapidity by means of the mere finger and thumb, even when the weapon and the soldier are lying upon the ground, and, in the case of cavalry in action, the left hand remains entirely free to govern the reins. It is a perfect muzzle-loader. The force of the explosion—irrespective of special ammunition—closes the joint, in contrast to its effect in other breech-loading arms; thus there is no escape of gas.

It cannot stick fast or clog by rust or powder dirt.

There is no sliding or abrasion of one surface upon another in opening and closing the breech, so there is no wear by friction.

In the insertion of the cartridge, the ball constitutes the handle or ramrod—an important feature.

It cannot be fired accidentally or purposely till the chamber is locked in place; and the locking device is solid, "self-acting," and infallible in its operation.

It is extremely simple, involves no delicate parts, and cannot easily get out of order.

There are no specialties of lock, stock, barrel, or mountings: thus there are no mysteries in its repair: it is of economical construction, and an approved species of "self-acting primer" may be applied to it.

These arms may be thoroughly and quickly cleaned without the application of water.

Though these arms are only now about to be brought before the public in this country, they have received greater approbation at numerous public trials before Governmental and military authorities in America than any arm hitherto known.

WM. MONT STORM, N.Y.

3, ROOD LANE,

January 1, 1863.

Mr. PHELPS: This is the valve (opening). The explosion taking place in the chamber drives everything before it, and so doing, the lips of the valve are taken against the lips of the barrel preventing the escape there would otherwise be of the gas. It is a solid breech,—it is merely the end of the barrel cut off or another substituted for it. It is solid, just the same as if it was a muzzle-loader, and the recoil is on the solid base of the gun.

The CHAIRMAN: How is it closed at the joint where the hinge is?

Mr. PHELPS: The breech-piece is merely attached by the hinge to the barrel. The gas is prevented escaping by the valve fitting into the end of the barrel.

The CHAIRMAN: Is there a double valve?

Mr. PHELPS: There is only one valve.

The CHAIRMAN: Is there a straight vent into the chamber?

Mr. PHELPS: An angular one.

The CHAIRMAN: There is objection to that angle.

General BOILEAU, R.E., F.R.S.: I wish to make a few remarks on the principle of this rifle. If you will allow me, I will take it into my hands and explain my remarks. It is, Mr. Chairman, a matter of paramount importance that we should consider all the circumstances connected with every invention which is brought forward in this theatre, because I believe that Government look greatly to the discussions which take place here, for opinions which they probably would not receive otherwise; and on that ground I think we ought not to allow the points which have been brought before us this evening to pass without the expression of some opinion as to the quality of gun which is submitted, and also as to its comparison with other breech-loading guns which have been brought under Government notice, and some of which are introduced into the army. Without any wish to refer personally to the inventor of this very beautiful and highly-finished piece, I may say a few words on the principle involved in its construction, because it is on that only I wish to speak. To commence with the principle: I may say that it is acknowledged that curvilinear motion, which is to be resolved into rectilinear motion, is not the principle which you should have where the object is to bring two surfaces into contact the one with the other. It is desirable that the motion should be in a straight line, and therefore I think that all hinge breeches of this description, which turn over for the purpose of loading, and which are obliged to be turned back for the purpose of closing the two surfaces to be brought into contact, is not a correct principle. I have a great objection to the manner in which this gun is loaded. The gentleman who read the paper says he loads by the muzzle always with great fear. I have fired many thousand rounds from muzzle-loading rifles, and I do so with the most perfect certainty that there is no danger at all in the operation. In fact, I feel that I can load a gun from the muzzle with very much more security than I can load this gun from the breech; because in putting the cartridge in, I counter-march the breech before I begin, and then put the powder and bullet in in the reverse order in which they are to go out. That is, I place the bullet towards my own body, instead of towards the proper object to be fired at. Then as to the method in which the breech is closed, I don't think there is a perfect contact between the two surfaces, because from the explosion of the powder, if there is a valve which is supposed to close the breech, it must to a certain extent jamb, and in lifting up the breech in this way, there would be a friction upon the lower part and a scraping upon the upper part, which would in a short time, according to my apprehension, bring about a leakage of gas. Then in respect to the power which this gun is said to possess, of being loaded from any position, supposing it is required to load it with loose powder by the breech, how is this to be done when in such a position as this—kneeling or lying down? It can only be loaded with special cartridges from the breech, or Government, or other similar cartridges from the muzzle. I will now notice several forms of breech-loaders on the principle of direct action, all of which have their advocates, and are deserving of a separate description. Westley Richards's breech-loader (exhibiting one), see Plate XX, figs. 4, 5, 6, has a lift piece which carries a piston; the piston has at its fore end a gun metal or a copper plug, and at the rear end has a sloping shoulder, working against a stud. The cartridge is introduced bullet foremost, as I believe it is the only way it would be introduced by a soldier. The breech-piece is turned down, the piston works against the stud at the end of the chamber, and when the breech-piece is brought down home, the metal plug is pressed firmly into the barrel, and the gun is thus made perfectly gas-tight. Many thousand rounds have been fired out of Westley Richards's breech-loaders, and they have remained to the last as efficient as when first used. I believe a number of them have been introduced into the army, and I am informed they have given great satisfaction.

Another form of breech-loader is that of Calisher and Terry, figs. 7, 8, 9, 10. This (exhibiting the rifle) has also a direct acting piston. There is a side lever which moves on a hinge. This I consider to be its great objection. The side lever is

detached in this way (moving it). The piston is turned round, withdrawn, and the cartridge is put in, bullet foremost. The piston is then returned, the lever carried back, shut, and the piece is ready to fire. This, as far as the principle of action goes, has this objection, that when the plug is forced home, there is no play; it comes in contact with the solid end of the barrel, and, therefore, when the fore portion of the piston wears, the gas escapes, and the side lever is liable to be blown out. That I consider to be an objection to this principle, which has possibly acted to some extent in not securing for it that favour which the other portions of the invention entitle it to.

The last design I would bring to your notice is a form of breech-loader with which I have myself had something to do, and therefore it is a great pet of my own. It is the invention of Mr. Green (figs. 11—16), a gentleman of great mechanical ability, with a fair amount of practical experience, and the result appears to me to do great credit to his inventive talent and mechanical skill. It consists of a piston also, at the end of which a lever is fixed. The lever is raised in this way (working it), and the breech-piece withdrawn. The cartridge is put in bullet foremost, the breech-piece is pushed forward, the lever put down, and the piece is ready for action. Now there is one part of this design which secures the same ends that Mont Storm does, and that is a great advantage in both of these designs, namely, that until you have completed your arrangements for closing the breech, you cannot fire the piece. At the under surface of the piston there is a hole which has to be brought vertically over a pin before the gun can be fired. If you leave the lever in any position where the hole is not over the pin, you cannot fire the piece; but when you put the lever quite down, and the hole is brought over the pin, the piece may then be fired, so that it is perfectly secure. Then this rifle has an advantage which I do not see in other breech-loading small arms, namely, that you can detach your piston altogether, and throw it away, if you like, which under some circumstances is a great advantage. I dare say many of my hearers remember when the gunmakers of London received an order from the Government to take all the locks off the muskets that they had in store, fearful that they would be made use of for improper purposes during riots. So in India, if we had had breech-loading guns from which we could have removed the pistons, we should have taken away a very great amount of the advantage which the mutineers derived from the possession of Government small arms. This breech-loader of Mr. Green's has that advantage. By pushing the trigger forward you can take the breech-piece out, and destroy or throw it away, when, if your enemy gets possession of the rifle, it is useless to him as a fire-arm. These are points in which I consider Mr. Green's breech-loader has great advantages. Such is the description of Mr. Green's patent breech-loader; and without in any way wishing to speak of individuals, I think the advantages are decidedly in favour of this design. Government have, I am told, viewed it favourably, and Mr. Green is fitting his breech-loading apparatus to different descriptions of Government small arms for trial. I have seen one of these guns which fired 1,000 rounds, 700 from the breech, and 300 from the muzzle, almost without a perception of the effect of smoke in the breech chamber. I have myself fired with them when they were in a more imperfect state than they are now, many rounds from the rest, from the shoulder, and from the knee, and I have found their action easy and certain, and the escape of gas imperceptible. There is another point which I consider to be a very great improvement on all other methods of closing the chambers that I have seen. The fore end of the piston consists of a disc fixed on an axis, working on the piston against another disc fixed to the end of the piston or plug, and interposed between the two is a wad of vulcanised india-rubber. There is a slight slot motion for the fore disc axis, so that when the powder explodes it presses backwards upon the vulcanised india-rubber wad between the two discs, and most perfectly and completely prevents the escape of any gas. When the gun is used as a muzzle-loader, a wad of vulcanised india-rubber, rather tight for the barrel, is first passed down, and with that wad several hundred rounds have been fired from the muzzle without more than a discoloration of the surface of the wad. I think if any breech-loading piece is to be generally introduced into our army, and I am not one of those who think breech-loaders will altogether supersede muzzle-loaders, at all events, for some time yet to come, Mr. Green's breech-loader, manufactured by Reilly, ought to command the attention

of Government, as it will, I firmly believe, have the approbation of all men interested in improving the weapons which are placed in our soldiers' hands.

Captain RADCLIFFE, R.N.: I wish to observe that I do not think Mont Storm can claim any novelty in his gun; for four or five years ago, I brought forward the same system. I took it to Mr. Wilkinson, and he told me, "It is a very good thing, but you cannot do anything with it, because the bolt is Leech's Patent." How Mr. Mont Storm has got over that I do not know. I thought it was then of no use my doing anything with it.

The CHAIRMAN: When you say the bolt, you allude to the hinge?

Captain RADCLIFFE: The bolt which secures it in the breech. This other part was invented by Captain Palliser, of the 18th Hussars. I took no more notice of it at the time, and should not have done, till some time since, I saw Mont Storm's gun, and looking at it, I saw it was exactly the same thing except in the valve, which I do not attach so much importance to, because, if you look at this (exhibiting a rifle), you will see, by having a soft metal ring which would expand with the heat when fired, it would stop all escape of gas. If you look at it, you will see it is exactly the same principle as Mont Storm's.

The CHAIRMAN: Do you invert your cartridge?

Captain RADCLIFFE: No. I am not going to bring this subject forward, as I did not anticipate anything would arise. This rifle was made four or five years ago. If you will look at it, you will see it is as similar as possible to Mont Storm's, except that my bolt is at the side. It is the same principle. One great objection is, that if the nipple were worn, the hole would be very large, and it would throw the hammer back, and then the thing would get out of order. Another objection is, that in loading, the powder gets into the bed under the breech, and when you put it down you cannot shut it. This might be obviated by cutting a piece out of the bed to allow the powder to force through. I merely mention it to show that Mr. Mont Storm cannot claim the invention, for I have had this five years.

Mr. BETHEL BURTON: The gentleman who has favoured the meeting by reading the paper has endeavoured to impress upon us the superiority of his system. I have the pleasure of laying before this meeting a breech-loading gun of my invention, and am content to submit it to the judgment of the many gentlemen of known ability I see present, that they may form their own conclusions, first giving an explanation of the arm before them. It is made from an Enfield rifle, adapting the materials at present used for its construction, so that rifles already in use can be altered, according to this system, at a trifling expense. The great difficulty attending breech-loaders is, that they are found, after a little use, to allow an escape of gas at the joints, and every conceivable plan has been resorted to to prevent this evil. It is pretty generally admitted, that if the joint can be effectually closed, and a strong serviceable gun produced, the breech-loader would supersede the present muzzle-loader. I hold in my hand a gun in which no mathematically-fitting joint is required in order to prevent an escape of gas, and, consequently, there is no joint to wear out. The gun is strong and very simple. There is only one screw used for the purpose of keeping the breech-piece together, and it may be withdrawn for the purpose of cleaning, leaving the barrel open from end to end. The means employed to prevent the escape of gas consists of a copper case or cartridge, made without seam, containing the powder and bullet, and in the base, the fulminate, which is ignited by a blow. This cartridge is the most perfect of its kind. It is perfectly air and water-tight, so that the rifle may be fired during heavy rain, or after the cartridge has been immersed in water for hours. It cannot be ignited save by the means now employed, or similar mechanical means; it cannot be ignited by a spark or a flash from the fire of a gun, as is the case with the paper cartridges now used. It is also cheaper than the paper cartridge at first cost, and can be refilled as often as desired. Under the present system, in time of war when extensive guard and picket duty is necessary, the soldiers coming off duty are obliged to discharge their guns, involving the loss of the cartridges, besides the labour of cleaning the guns. With this cartridge, that is entirely obviated, as it may be withdrawn at pleasure by opening the breech, the gun of itself ejecting the cartridge, which is saved for future use. I calculate that this saving alone will pay for the extra cost of the new arm. There is no nipple to clog up or split, and no

cap to put on, which operation is rather difficult to perform in cold weather or on horseback, or in the hurry and excitement of battle. This advantage will enable the soldier to defend himself against superior numbers, as the rifle can be fired twelve times a minute, as readily as the muzzle-loader can fire three shots, and it is not at all affected by rapid firing. In case of necessity, it can be loaded by the muzzle with the ordinary cartridge, or with loose powder and cap, quite as effectually as the Enfield or other weapons. The breech works without fouling, and it may be fired 1,000 rounds or more, as long as the barrel remains clean; and, if the barrel could be kept clean, the breech would fire 10,000 rounds without requiring cleaning. In conclusion, I will say that if Mr. Mont Storm considers the challenge he has thrown out as a *bonâ fide* challenge, I am ready to accept it, and to enter the lists at any stated period, competing with him for rapidity of firing, accuracy, penetration, and freedom from gas escape, and also to shoot the greatest number of rounds. I am anxious to try my rifle against any gun, either in England or America, and will leave it to any disinterested military man to decide which is the better gun for military purposes, such referee to be named by Her Majesty's Secretary of War.

MR. BYRNE: I am acquainted with Mr. Mont Storm, and I should be very sorry to say anything against his gun in his absence. As to the ammunition Mr. Burton has spoken of, they can make these cartridges in the United States for less than a cent a piece,—ball, powder, fulminate, and all at the rate of 300 a minute. That cartridge is made cheaper than the paper cartridges made by Government here. The cartridge can be put in water for twelve hours; you can take it out of the water and it is immediately ready for use; you can throw them against a wall, you may sit upon them, you may throw a bomb shell among a house full of them and they will never explode. They never explode without the proper application of the hammer. Indeed, I may say all breech-loading guns are practically useless without that particular sort of cartridge. That is the cartridge now used in the terrible war now waging in the United States.

THE CHAIRMAN: That cartridge would not do for Mont Storm's rifle.

MR. BYRNE: I think this is well worthy the attention of military men: I have tried all the various breech-loading guns made; in fact, I had folly enough to buy a good many of them, and at last I got one of these guns of Mr. Burton's. I fired 10,000 rounds out of it, and it is now as perfect and as clean as when I began. By making the bullet of lead having a composition of certain other metals, it never leads the barrel; that I think is a great point. There is no residue remaining, and if any one will take one of these guns to a United States officer, he is bound to have that particular sort of shot.

MR. BRAENDLIN: It would take me as long to explain Storm's breech-loader as to explain the other guns. The other breech guns exhibited here this evening look something like gas-pipes, they are not natural looking guns, none of them can be fired with loose powder. If I am out in the colonies and have none of that particular ammunition, if I cannot make up a cartridge, the gun cannot be loaded and is useless. I can load Mont Storm's breech-loader in any way I please. If you were to take Westley Richards or any other breech-loader, and load it from the muzzle, driving the ramrod down you would destroy the gun. You would destroy Mr. Green's in that way.

THE CHAIRMAN: Mr. Green's may be loaded from the muzzle.

MR. BURTON: So does mine.

MR. BRAENDLIN: You can fire only one or two rounds.

General BOILEAU: I have fired seventy or eighty rounds in succession. If any gentleman doubts that Mr. Green's gun can be loaded from the muzzle, I shall be happy to fire 100 rounds in his presence any day.

MR. BRAENDLIN: With Mont Storm's gun I can use the Government ammunition and powder from the flask. Ten thousand rounds might be fired from it, which is more than can be done with any other breech-loader. An observation has been made about the abrasion of the surfaces. If you look carefully at Mont Storm's gun, you will find there is not the slightest friction in any portion of it. The valve re-inserts itself in the barrel, fits perfectly, and the breech is perfectly placed. It is the only rifle where everything is perfectly loose and can be worked without any friction.

I have fired Westley Richards' breech-loader, and have seen attempts made to fire it with loose powder, when on one occasion it burnt a gentleman's eye away. Had I known these other guns were to be introduced, I would have brought several specimens of Mont Storm's gun with me and would have explained them. This gun can be loaded from a powder flask when the soldier is lying down.

General BOILEAU: But you do not give a soldier a powder flask.

Mr. BRAENDLIN: In case of necessity.

General BOILEAU: Never, now.

Mr. BRAENDLIN: If I can load either way, it is certainly better than if I can only load one way: you will admit this. I have shown that I can load from the muzzle, I can load with loose powder, and I can fire with special ammunition. I do not think there is one breech-loader that would do what Mont Storm's did last year at the Wimbledon meeting.

General BOILEAU: I dare say there will be a competition this year.

Mr. BRAENDLIN: Yes, I dare say there will, because Mont Storm will give a very great prize and will see whose breech-loader is the best. This point will be settled. I think all breech-loaders that require special ammunition, or ammunition with fulminate in them are worthless.

Mr. BYRNE: Will you give us the reason why they are worthless?

Mr. BRAENDLIN: Because they are dangerous.

Mr. BYRNE: That is no reason.

Mr. BRAENDLIN: That is a very good reason.

Mr. BYRNE: Boiling water is dangerous.

The CHAIRMAN: We are very much obliged to you for bringing this subject forward, but I think you are a little under misapprehension; you know in all these discussions our object is to find fault, and if we can find fault with a thing best by bringing another into contrast, that is the right way. We are here as censors, and our business is to find the weak points, and it is for the inventor to strengthen those points if he can. I do not think there can be anything really progressive or satisfactory, unless that mode is adopted. There is no doubt Mont Storm's gun has considerable merit over many others; but I think as General Boileau has shown, that the language of depreciation used was rather strong, inasmuch as the assertions were not supported by proofs, but we are much obliged to you for bringing this subject forward, and I am sure these discussions cannot but tend to good. You have heard the comment made upon your rifle, and it will enable you to correct some of its defects.

DESCRIPTION OF BREECH-LOADERS ON PLATE XX.

MONT-STORM'S.

Fig. 1, side elevation of Enfield rifle fitted with Mont Storm's breech-loading chamber.

Fig. 2, breech raised, showing cartridge in chamber.

Fig. 3, side view, partly in section, showing position of breech at the moment of firing.

WESTLEY RICHARDS'.

Fig. 4 represents cartridge inserted and breech closed.

Fig. 5 shows breech open to receive cartridge.

Fig. 6, appearance of rifle, with breech closed.

TERRY'S.

Fig. 7, side elevation of musket, with breech apparatus

Fig. 8, breech apparatus, with cartridge inserted in barrel

Fig. 9, breech apparatus detached, closed up to breech.

Fig. 10, enlarged view of breech apparatus.

GREEN'S.

Fig. 11, side view partly in section, showing breech apparatus.

Fig. 12, piston or bolt, and the cover of the breech chamber.

Fig. 13, transverse section of the cover of the breech chamber and piston, or bolt.

Fig. 14, end view of ditto.

Fig. 15, breech-plug loose in breech plate, which partly turns round in plate.

Fig. 16, side view, with breech closed, and ready for capping.