

**Page 1: (March 1835, Bulletin of the Société d'Encouragement pour l'Industrie Nationale)**

**Bulletin of the Society for the Encouragement of National Industry**

**Arts and Mechanics: Firearms**

**Report made by Mr. Baron Séguier, on behalf of the Committee of Mechanical Arts, on the hunting rifles with breech-loading systems presented by Mr. Lefauchaux, gunsmith, Rue de la Bourse 9, at the corner of the Rue des Colonnes, Paris.**

For a long time, it was known that military rifles, called forced ball rifles, could shoot further than others, and yet little effort was made to apply the same advantages to hunting weapons loaded with small lead shot.

This was difficult; the only way to achieve it was to load them with cartridges in which the lead would be separated from the powder by a diaphragm of a larger diameter than that of the rifle. Such a cartridge could not be introduced and pushed to the bottom of the barrel without great effort; and even in this case, without losing a part of the sought advantages, the intermediate body, placed between the lead and the powder, so compressed at the moment of loading, would eventually align with the diameter of the weapon. Upon explosion, a new bored barrel, molded with superior regularity, was achieved on ordinary bores.

But it could not even be so, since a hunting rifle barrel, to shoot well with lead, must be slightly narrower than its breech. To solve the problem, the cartridge must be placed, as we have just said, in the breech chamber, in a chamber of a diameter a little larger than that of the barrel, and connecting directly to it.

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**Page 2: (Continued)**

Our project, gentlemen, is not, on the occasion of this report, to trace the complete history of the modifications that hunting rifles have already undergone; we will simply tell you that it is to a gunsmith named Pauly that one owes, in our time, the introduction in the trade of such weapons, which, until then, had seemed rather curious than useful.

The rifles we bring to your attention today are presented by a gunsmith long employed in the workshops of Mr. Pauly; this artist seems determined to bring this type of rifle, to which he worked on the principle of perfection, to the highest degree.

Mr. Lefauchaux has exposed before us the designs of various modifications he has made to pass Pauly's invention to the point you see now. The experience has successively provided the indication of practical inconveniences that each of the previous modifications brought with it; it is

today that experience, after quite a long time, sanctions his latest efforts, which we call to appreciate their merit.

The Lefauchaux rifle consists of a fixed barrel, with an articulated hinge in a complete circle, attached to an iron piece that supports its lower end; the barrel is solidly maintained by a notch in this piece that acts as a breech, with the help of an iron pin forming a T, whose head engages between two hooks soldered to the barrel. The piece forming the breech at the same time serves as a piece of stock, and fits into the usual notches in the wood, between the two plates like the extension of the stock piece.

By examining this weapon attentively, you may wonder why the hinge that connects the barrel to the frame has been placed so that the barrel points directly down. This reflection has come to our mind and we must prevent it from acting on you by communicating the motives that led Mr. Lefauchaux to act in this way.

### **Firearms**

Why the hinge connecting the barrel to the mount has been placed so that the barrel points downwards, and why the firing has been done in this axis? This reflection occurred to us and we must communicate the reasons that led Mr. Lefauchaux to act this way: it is to operate the juxtaposition of the barrel against the piece forming the breech; it could not be achieved with side plates; but experience has shown that soon the plates experienced a very remarkable alteration in their appearance.

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### **Page 3: (Continued)**

This phenomenon, observed in rifles with side plates, is curious enough to allow us to entertain you on this point for a moment.

In these kinds of rifles, after a short service, the armor becomes noticeable, corresponding to the point where the barrel ends: this hollowing, which ends up becoming quite deep, operated in the steel or tempered iron becomes even harder, since it does not receive, nor is it the result of a mechanical action of the gas in the firing, or rather it is not the product of a chemical action by the combination of sulfur in the powder with iron. It is, gentlemen, the fact we have been trying to explain. After careful examination, we recognized that the corroded point acquires much greater hardness than all other points of the plate; we have verified that such an alteration is imperceptible, or at least less sensitive, on the copper blade inserted between the barrels to oppose the communication of fire from one to the other. This blade, in the most unfavorable condition, does not last very long when it is in steel, and it is the experience and observation that indicated to Mr. Lefauchaux the substitution of copper for steel.

The good condition of the intermediate blades in copper in the rifles whose side plates were already deeply furrowed did not leave any doubt as to the cause of this deterioration.

Without dismissing the influence of mechanical action, we attribute it mainly to the chemical combination we have just pointed out.

Mr. Lefauchaux could therefore garnish the side plates with copper more abundantly, but he preferred to attack the problem at its root; he sought to completely get rid of the side plates, and it is so, gentlemen, that he was led, to avoid this last inconvenience, to the disposition he submits to you.

This simple disposition, which makes the handling of the rifle easier and more comfortable, seemed to finally completely satisfy the hunters; it turned out differently as the weapon approached its perfection, the requirements grew; they could no longer blame the mechanism, they complained that it did not completely avoid gas leaks.

This leak, following the belief of most, offered the inconvenience of reducing the range and blackening the fingers; we object to you, for our part, to attribute to it this last inconvenience.

Although very slight, this last reproach was founded. Mr. Lefauchaux, desiring to satisfy, in every respect, the numerous hunters who honor him with their confidence, set to work without ever despairing of success; thus, to overcome a last obstacle, he was led to make, for the rifles, the most fortunate application of the principle of closure of hydraulic presses, whose edges apply against the walls of a vessel with as much energy as the liquid it contains is compressed and tends more to escape.

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#### **Page 4: (Continued)**

You understand, gentlemen, that by adopting this principle of closure for rifles, it is not a matter of opposing the leakage of a liquid, but that of an ignited gas, it was necessary to modify the material of the obturator; so it is not a leather cap, but a thin copper bottom that Mr. Lefauchaux covers his cartridges with. The flexible edges of this cap, which has the shape of a large capsule, expand at the moment of explosion, and apply against the walls of the barrel with such accuracy that, from now on, the slightest leak becomes impossible.

This means, as simple as it is ingenious, which an observant spirit has borrowed from hydraulic press closure to make a happy application, deserves your attention: we regard it as one of the most useful improvements made for a long time to hunting weapons loaded by the breech.

In our opinion, it is a real service rendered to the entire field of gunsmithing; by its use, the combinations of closures less precise will be sheltered from gas leaks, and from now on it will not be the exactness, but only the solidity of the closure, which will make the problem of the manufacture of breech-broken weapons difficult to solve.

Mr. Lefauchaux believed it necessary to secure the privilege of using this powerful auxiliary of closure, by a patent of invention and a patent of perfection.

We have just given you the concise description of Mr. Lefauchaux's rifle; we have pointed out and explained its construction in detail, we have informed you how Mr. Lefauchaux had found, in the resources of his inventive spirit, the ingenious means to overcome the obstacles as they presented themselves; we must now talk about the use of his weapon and its results.

Mr. Lefauchaux wanted us to assure ourselves through our own trials of the good effects of his rifle; not shying away from any test, he himself requested comparative experiments; we are going to present the results before your eyes.

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## Page 5: (Experiments and Comparisons)

**Report of comparative experiments between several rifles of different systems, at the request of Mr. Lefauchaux, by Messrs. Olivier and Séguier, Commissioners of the Society for the Encouragement of National Industry, in the presence of Messrs. Lefauchaux, Justin, and others, at the shooting range of Mr. Gosset.**

**Nota:** The tests took place on various papers, half-glued blue paper, unglued grey paper. Each series nevertheless took place, for all rifles, on the same type of paper and under similar circumstances.

### First Test — Pink White Paper.

- **Lefauchaux Rifle.** Powder: 70 grains, shot No. 4, penetration: 57 sheets.
- **Second Shot:** id., id., 49 sheets.
- **Potet Rifle.** Powder: 55 grains, shot No. 4, penetration: 41 sheets.
  - The comparisons could not be made, the charges being unequal, in the following shots, they were reduced to the same weight. To obtain equal amounts of powder, the **Lefauchaux Rifle** used cartridges intended for the **Potet Rifle**. We must observe that these cartridges were more freely inserted in the **Lefauchaux Rifle** than in the **Potet Rifle** for which they had been made.

### Second Test — Blue Paper.

- **Shot No. 4,** one ounce. **Powder,** 55 grains.
- **Lefauchaux.** 25 sheets.
- **Potet.** 31 sheets.

The cartridge was rolled into a strip of paper to fit more snugly into the **Lefauchaux Rifle**.
- **Pink White Paper. Lefauchaux.** 46 sheets.
- **Potet.** 50 sheets.
- **Grey Paper. Lefauchaux.** 71 sheets.
- **Potet.** 74 sheets.
- **Lefauchaux.** 57 sheets.

In this experiment, the paper rolls were turned, and **Lefauchaux** fired on the paper that

had already received the shot from **Potet**. The second shot fired by **Lefauchaux** on fresh paper.

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## Page 6: (Continued Comparisons)

### Third Test — Comparison of Lefauchaux Rifle and Robert Rifle.

- **Grey Paper.** First shot by **Robert Rifle**, charged naked without cartridge, 55 grains of powder, 49 sheets.
- **Second shot with cartridge**, 52 grains of powder, 66 sheets.
- **Lefauchaux Rifle**, charged with powder and lead from **Lefauchaux cartridges**, 52 grains, 75 sheets.
- **\*\*Third shot by Robert Rifle**, fired on paper already struck, 73 sheets.
- **\*\*Second shot, Lefauchaux Rifle**, on freshly reversed paper, 73 sheets.

We believe it necessary to note in our experiments this circumstance of paper that has already been struck, because the need to separate the sheets for counting destroys their juxtaposition, making them more difficult to pierce.

### Fourth Test, intended to determine the best method of ignition, either on the barrel, or from behind.

- These experiments were conducted on two rifles of the **Lefauchaux system**, but with a different arrangement regarding ignition.
- **Grey Paper.** First shot, ignition from behind and inside the barrel, 70 grains of powder, 71 sheets.
- Second ignition on the barrel, powder id., 72 sheets.

From all these experiments, it must be concluded, in general, that it is a serious mistake to think that the distances are as useful as the powder charges are stronger. Note, gentlemen, that we use the word utility in the sense that we do not claim that the distance to which the projectile is launched does not increase with the energy of the spring that imparts its movement. We have said useful, because it is demonstrated for us, and the experiences we have just discussed prove it, that penetration is as useful, if not more so, as the velocity of the shot, up to a certain limit; and, if one reflects that the penetration of a body is all the more difficult the time during which the constituent molecules separate from each other is short, it explains quite naturally the fact, otherwise bizarre, of a bullet fired at short range, flattening on a board, that it completely penetrates when fired from a distance.

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## Page 7: (Detailed Examination of Lefauchaux Rifle)

We have rigorously verified that the **Lefauchaux rifle** no longer presents any gas leak, a condition to which some hunters attach such a high price, which we believe, as for us, is much

less important than is generally assumed. The limits of this report do not allow us to develop, in this regard, our opinion; it is based on a new way of considering the phenomena that accompany the ignition of gunpowder. We think that so far, chemical phenomena such as the production of a gas, mechanical phenomena such as the useful application of a general force, have not been sufficiently distinguished. It will suffice to say that the experiments we have entertained you with, in support of the **Robert** system, that is, one in which there is a significant gas leak, achieved a range equal to those rifles that did not allow gas to escape in any other way than through the barrel itself.

We therefore find it right to acknowledge all the advantages that the **Lefauchaux rifle** presents in its use; we first highlight the solidity of its construction, which has been tested several times by simultaneous explosions of double charges in each barrel; then the ease with which, when fired, the lead comes out entirely after each explosion, preserving the barrel from any fouling; as for the barrel, the lead passes through it at each explosion, cleaning it every time, so much so that after a considerable number of shots, this rifle is as good to use as when it is first handled.

These properties render unimportant the ease of its disassembly and cleaning; however, as **Mr. Lefauchaux** claims again, for the rifle which bears his name, the merit of simplicity of construction, we believe we are showing impartiality in reporting, in support of this report, a comparative table of the number of various parts that make up the rifles of different systems supplied by **Mr. Lefauchaux**, recognizing, as for us, that the smallest number is in favor of the **Lefauchaux** rifles.

**Mr. Lefauchaux's** experience has yielded its fruits, and that justifies the praise we give him; it is the favor of the public that he knows how to win over, the best trophies in terms of industrial excellence. We have before us an album containing a considerable number of certificates of satisfaction given by hunters who make use of these rifles. The inspection of the business books confirms these statements by the importance of the sales.

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## Page 8: (Continued Examination and Endorsements)

We have already long occupied your attention, and yet we have only talked about the improvements brought to hunting rifles. **Mr. Lefauchaux's** inventive spirit is currently directed towards the modifications that our war rifles could usefully undergo, less perfected than those of some of Europe's great powers, such as Sweden, for example; but has **Mr. Lefauchaux** seriously considered the scope and difficulties of the task he is undertaking? He will have to struggle against entrenched habits, then tackle, one by one, the numerous construction faults they harbor, and which defy the judicious criticisms of modest practice, under the auspices of a promising theory. But we leave it to our colleague, **Mr. Olivier**, to discuss **Mr. Lefauchaux's** work in this regard; we only point out, in passing, to support the conclusions we have drawn, the honor of submitting to you, on behalf of the Committee of Mechanical Arts:

We propose to send the name of Mr. Lefauchaux to the Medal Commission, so that he may receive one of the honorable distinctions that the Society reserves for encouraging persevering efforts, rewarding useful works, and crowning successful inventions.

*Approved in session, February 18, 1835.*

*Signed, Baron Séguier, rapporteur.*

#### **Description of the hunting rifle loaded by the breech, by Mr. Lefauchaux.**

- **Fig. 1, Pl. 616, represents the rifle mounted with all its pieces.**
- **Fig. 2, Double rifle with folding barrels ready to receive the cartridges.**
- **Fig. 3, Longitudinal section of the same, drawn to a double scale.**
- **Fig. 4, The key, seen in elevation and in plan.**
- **Fig. 5, The T seen in elevation and in plan.**
- **Fig. 6, Screw of the T in elevation and below.**
- **Fig. 7, Cartridge with its bottom.**
- **Fig. 8, Bottom seen from the front.**

The same letters indicate the same objects in all the figures.

- **a a, Barrel of the rifle.**
- **b b, Hooks adapted under the thunder, between which a kind of lock named T engages.**

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#### **Page 9: (Detailed Rifle Mechanism)**

##### **Arts and Mechanics: Firearms.**

**c, Hook cut into a whistle and used to retain the T. d, Chimney adapted to the barrel and receiving the primer cap. e, Key placed under the breech; it is turned horizontally to the right to release the hooks and lower the barrel; in the square of this key, at the lower end of the T, which is retained by a screw. f, Lock named T, whose part f' is cut in a bevel, to slide against the end of the hook c, cut in an inclined plane; a spring that is not visible in fig. 3, but is indicated in fig. 12, presses against the T and keeps the key open while loading the rifle. g, Screw that fixes the key against the T. h, Ring surrounding the T; it is hollowed out on part of its circumference, to receive a small tab fixed at the bottom of the breech. i, Piece of iron bent at a right angle, named breech; solidly fixed to the rifle, and on the end of which the barrel turns. j, Pin passing through the hinge k of the breech, and serving as the center of movement to the barrel. k, Dog. l, Support. m m, Hammers. n, Visor. o, Cartridge. p, Copper bottom of the cartridge.**

**Handling the Rifle.** One holds the rifle with the right hand; one places the left hand under the barrel, and presses against the key, which turns instantly, and releases the hooks c c. As soon as the barrel is lowered and presents its thunder open. In this position, indicated by fig. 2, the key remains in place and cannot fall, being retained by the spring pressing against the end of

the T. While the rifle is held in the left hand, one inserts the cartridge into the barrel; then one raises the barrel, puts the key back in place, as seen in fig. 1, and the rifle is loaded. All that remains is to cover the chimney with a copper cap containing the fulminate primer, and to arm the dog, which, by striking the cap, breaks it and ignites the fulminate powder, which sets the charge on fire, firing the cartridge. After the shot is fired, one lowers the barrel, removes the cap, and loads as previously described.

The manufacturing price of **Lefauchaux** rifles is from 150 to 350 francs; those made in Paris sell for 550 francs with ribbon barrels, and 650 francs with Damascus barrels.

*Thirty-fourth year. March 1835.*

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## **Page 10: (Continued Firearm Innovations)**

### **Arts and Mechanics.**

#### **Report made by Mr. Th. Olivier, on behalf of the Committee of Mechanical Arts, on a cavalry musket loaded by the breech, presented by Mr. Lefauchaux.**

**Mr. Lefauchaux** presented to the Society of Encouragement a cavalry musket loaded by the breech. You referred this weapon of war to your Committee of Mechanical Arts; it is in his name that I now make the following report.

The advantages enjoyed by the weapons loaded by the breech have been highlighted in several reports; it is therefore unnecessary to recall them anew.

You know that in the army a lot of attention is paid to percussion weapons, but there does not yet seem to be a willingness to accept weapons loaded by the breech. Without discussing here the opinions expressed by officers exclusively concerned with the construction of war weapons, we believe that the use of a percussion rifle, although more advantageous than that of a flintlock, offers serious drawbacks. Thus, the debris of caps, projected by the explosion, often injure men, the chimneys break and are difficult to repair, the primers are separated from the cartridge, etc.; so that if, in constructing a rifle loaded by the breech, the same method of firing is maintained, that is, to carry the fire to the cartridge as employed in percussion rifles, the mentioned inconveniences persist, and one could not help but appeal to the spirit of invention, and demand that they be removed by some new and happy combinations.

It is this combination that I am reporting to you today as being an important improvement of undeniable utility.

Each cartridge bears its primer and its chimney, and this combination has been made possible by the copper bottom that Mr. Séguier talked about in his report on the hunting rifle presented by Mr. Lefauchaux.



A small iron rod, adjusted in the bottom and perpendicular to the length of the cartridge, and carrying, at its lower end, inside the cartridge, a small fulminate cap; this new combination is so simple that one does not conceive how it might fail the latter.

The barrel of the rifle being broken at the thunder, and having turned around its pivots, the cartridge is placed, the small rod lodges in a semi-cylindrical notch made on the right section of the barrel. This vertical notch replaces the former hole which was drilled horizontally.

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### **Page 11: (Further Details and Utility)**

**The barrel being placed back in position, the hammer-dog comes to strike the rod, the cap ignites, and the causes of misfires are obviously rarer with this method than when the cap covers the chimney of a percussion rifle.**

After the shot is fired, the small rod is removed, with the finger and very promptly, the bottom and the burning debris of the paper cartridge.

One can load at night as easily as during the day. The caps do not need to be as large in caliber as those usually employed in percussion rifles because the ignition is immediate, and it does not have to travel the length of a chimney.

The difficulty that one always experiences in changing long-standing habits can only be overcome as long as the improvements do not greatly contradict routine and prejudices.

Thus, we congratulate Mr. Lefauchaux for having, by the simple form of the cartridge, perfected the military carbine without changing the old lock mechanism, and I do not fear to say that now one can finally hope to see breech-loading weapons admitted into the army.

Mr. Lefauchaux's fortunate idea is not new; for a long time, he had imagined a combination producing the same effect, but it was more expensive and presented some inconveniences which have disappeared in the new combination submitted for your examination.

Indeed, for a long time, Mr. Lefauchaux had conducted experiments using fulminating tubes; he replaced the pan with an anvil, the jaw hammer with a hammer, and placed a fulminating tube in the flash hole. This method had been experimented with in England at the same time, it seems; I could not specify the exact period; but, according to the information provided, it was around 1816. Mr. Lefauchaux, having then broken the barrel by thunder, fixed the fulminating tube perpendicularly within the cartridge, and with the flash hole remaining horizontal, he loaded the gun by pushing the cartridge into the barrel and lodging the tube in the horizontal half-flash hole, as he now lodges the iron rod, but in a vertical flash hole; so that, by this method, the cartridge carried its primer.

This simple and ingenious method was nevertheless rejected by Mr. Lefauchaux, because tube primers are much more expensive than caps; because, in the production of these tubes, one

cannot yet be assured that they will all be equally well filled with fulminating material, and misfires are more frequent than with caps; also, because caps, to be properly loaded, require less fulminating material than tubes; finally, because some fragments of the tube were often projected and injured the face of the man using the gun so equipped.

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## Page 12: (Advantages and Endorsements)

### Arts and Mechanics

We must note that the arrangement adopted by Mr. Lefauchaux offers an economy in the choice of woods to be used for the carbine. Indeed, the stock and the body that surrounds it are connected as one piece of iron that the trunnion around which the barrel pivots when loading the weapon is formed.

This arrangement will also allow for greater breaking of the stock, that is, giving it a more suitable curve for shooting. The straight stocks used in military weapons, because of the need not to cut too deeply into the wood grain, make the recoil shock against the shoulder, resulting from the recoil, very painful for the soldier. The apprehension of this shock often makes the soldier, who has only a short period of service time, let his shot go without adjusting.

The arrangement adopted for the carbine, where the barrel is broken at the thunder, so that, when loading, the barrel and the stock are no longer in a straight line, and in this position, it was not possible to use the bayonet if the end of the barrel was armed, this arrangement, I say, defective for a war rifle, offers no inconvenience for the carbine, which is never intended to become a defensive weapon in the hands of the cavalry, but always a throwing weapon.

This carbine can be used to greater advantage in the navy, either on boats, for shooting at various parts of the ship where armed men are placed for throwing weapons at the moment of boarding.

The trials conducted in a situated shooting range on the Champs-Élysées, attended by Viscount **Cavaignac**, lieutenant-general and inspector-general of cavalry; **de Rumigny**, marshal of the camp; and Colonels **d'Houdetot**, aide-de-camp to the King, **Boyer**, aide-de-camp to His Highness the Duke of Nemours; **Naudet**, commanding colonel of the 2nd lancers; **de Courtigis**, captain of the staff. These gentlemen expressed their great satisfaction after having carefully examined the weapon presented by Mr. Lefauchaux and having tried it themselves on several occasions.

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## Page 13: (Final Considerations and Approvals)

### Firearms

Based on these considerations, the Committee of Mechanical Arts proposes, gentlemen, to thank Mr. Lefauchaux for his ingenious and useful communication; 2) to have this report printed and engraved to describe in your Bulletin the carbine and its cartridge; 3) to join this invention to those previously presented by Mr. Lefauchaux, and on which Mr. Séguier made a favorable report, to have it forwarded to your Medal Commission.

*Approved in session, April 15, 1835.*

*Signed Th. Olivier, rapporteur.*

#### **Description of the cavalry carbine loaded by the breech, by Mr. Lefauchaux.**

- **This carbine, represented with all its details in fig. 9 to 17, Pl. 616, is built on the same principles as the hunting rifle; we have indicated by the same letters the pieces that are similar in both weapons.**
- **Fig. 9, The carbine, mounted with all its pieces.**
- **Fig. 10, The same, with its barrel folded down, ready to receive the cartridge.**
- **Fig. 11, Longitudinal section of the same, drawn to a double scale.**
- **Fig. 12, The breech, seen in elevation and in plan.**
- **Fig. 13, Key seen in elevation and in plan.**
- **Fig. 14, Rear part of the barrel, seen in elevation.**
- **Fig. 15, The same, seen from below.**
- **Fig. 16, The barrel open, seen from behind.**
- **Fig. 17, The cartridge bearing its primer cap, seen in elevation.**
- **Fig. 18, Bottom bearing the primer cap, seen in elevation:**
  - a, Barrel; bb, hooks forming a body with the barrel; c, hook cut into a whistle; d, small spring lodged at the bottom of the right-angle piece, and against which the T presses; e, key; e', button to grasp the key forming the latch; f, piece named T; f', upper part of this piece, cut in a bevel, to slide between the hooks bb; g, screw that fastens the key to the T; i, right-angle piece surrounding the lower part of the T; j, pin serving as the center of movement to the barrel; k, dog; l, support; m, latch practiced in the right-angle piece i, and entering into the right-angle notch h, to limit the stroke of the lever; n, hammer that ignites the primer; o o, hinge of the piece i, which receives the pin j, on which the barrel rotates; p, cartridge; r, bottom; s, small rod on which the dog strikes to ignite the primer; t, primer cap containing the primer powder; u, primer cap lodged in the bottom of the cartridge, receiving the impact of the rod s.\*