A. L. O. FAUCHON-VILLEPLEÉ.

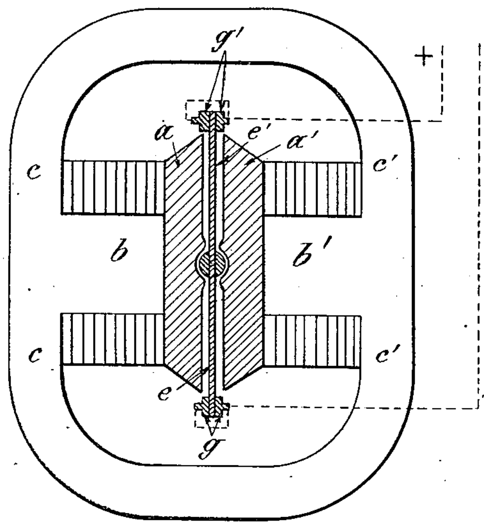
ELECTRIC GUN OR APPARATUS FOR PROPELLING PROJECTILES.

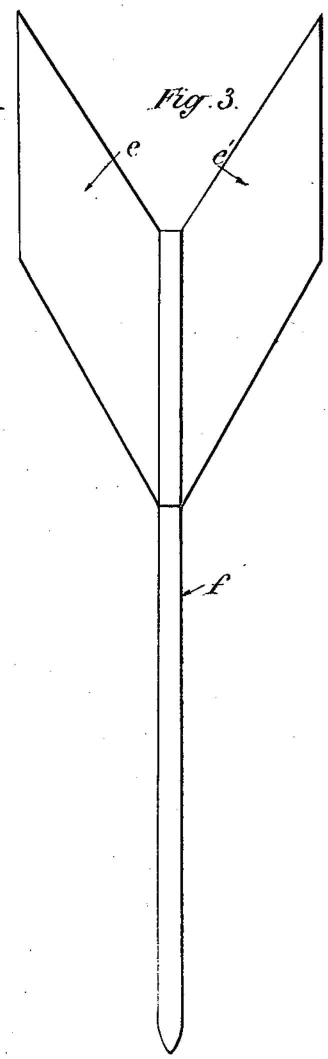
APPLICATION FILED JULY 31, 1917.

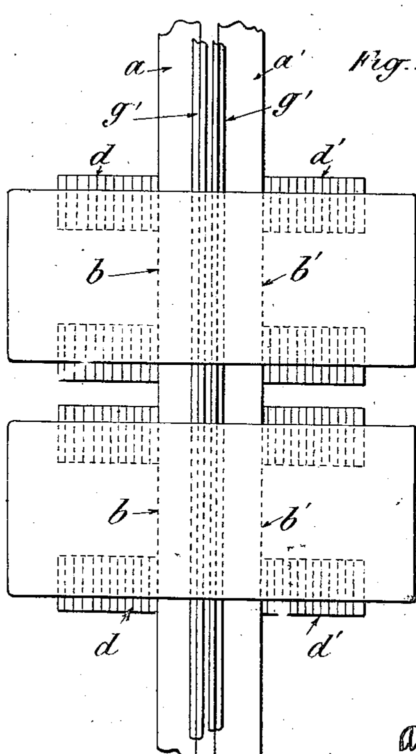
1,370,200. **Patented Mar. 1, 1921.**

12 SHEETS—SHEET 1.

Fig. 1







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12 SHEETS—SHEET 2.

Fig 6

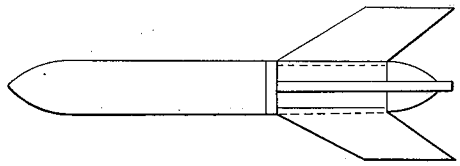


Fig 4

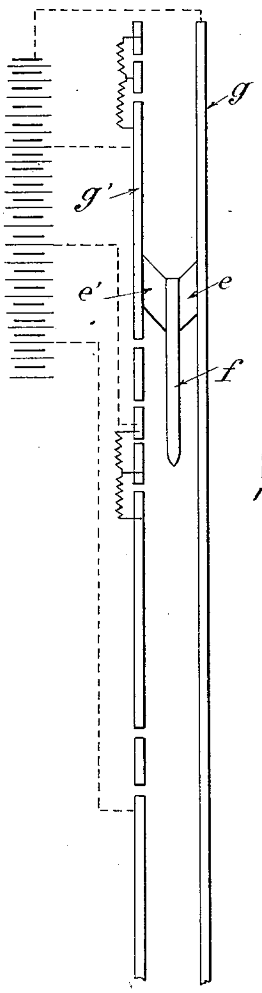
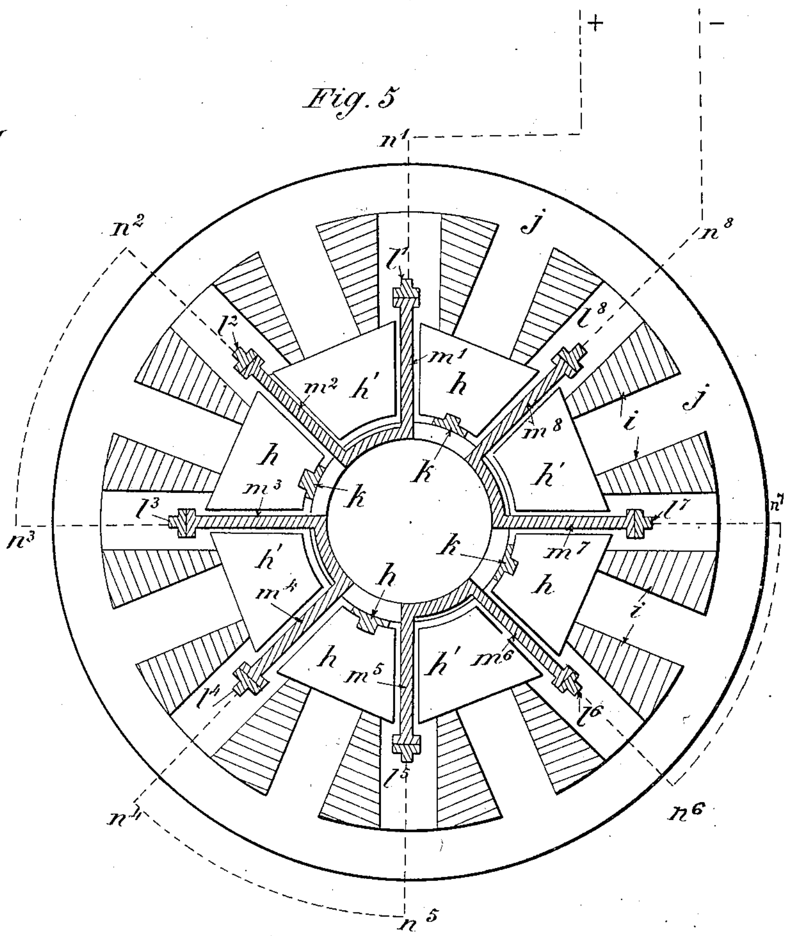


Fig. 5



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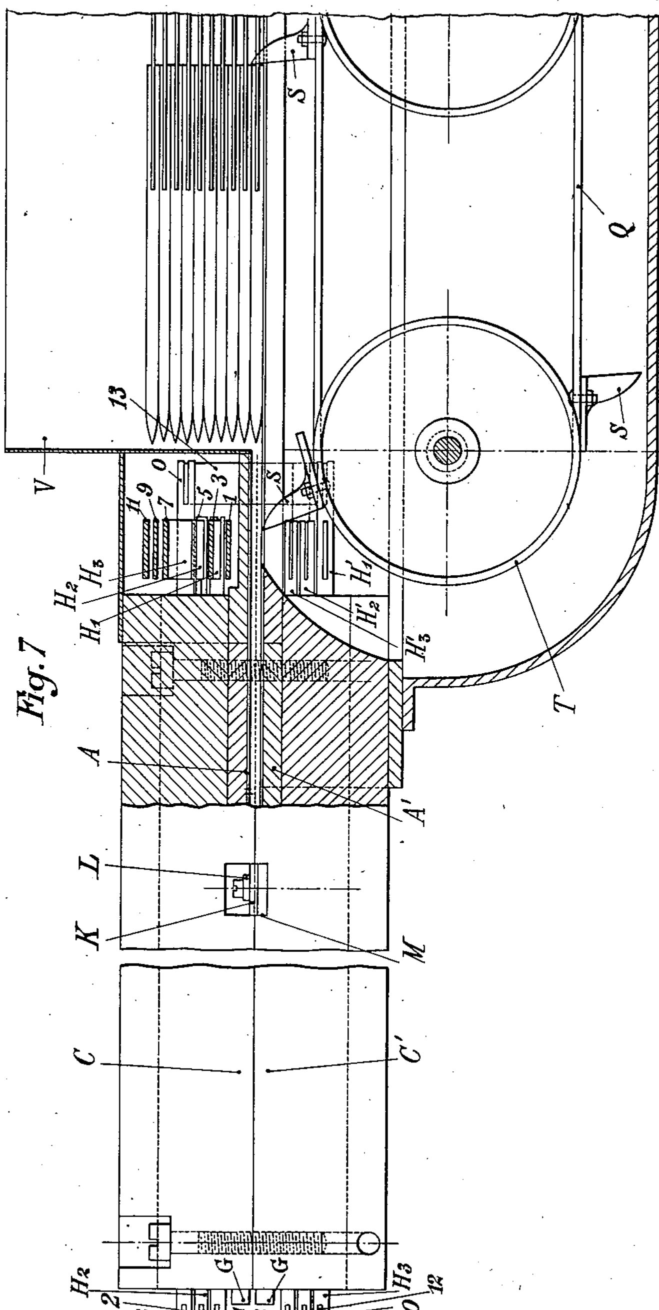

Fig. 7

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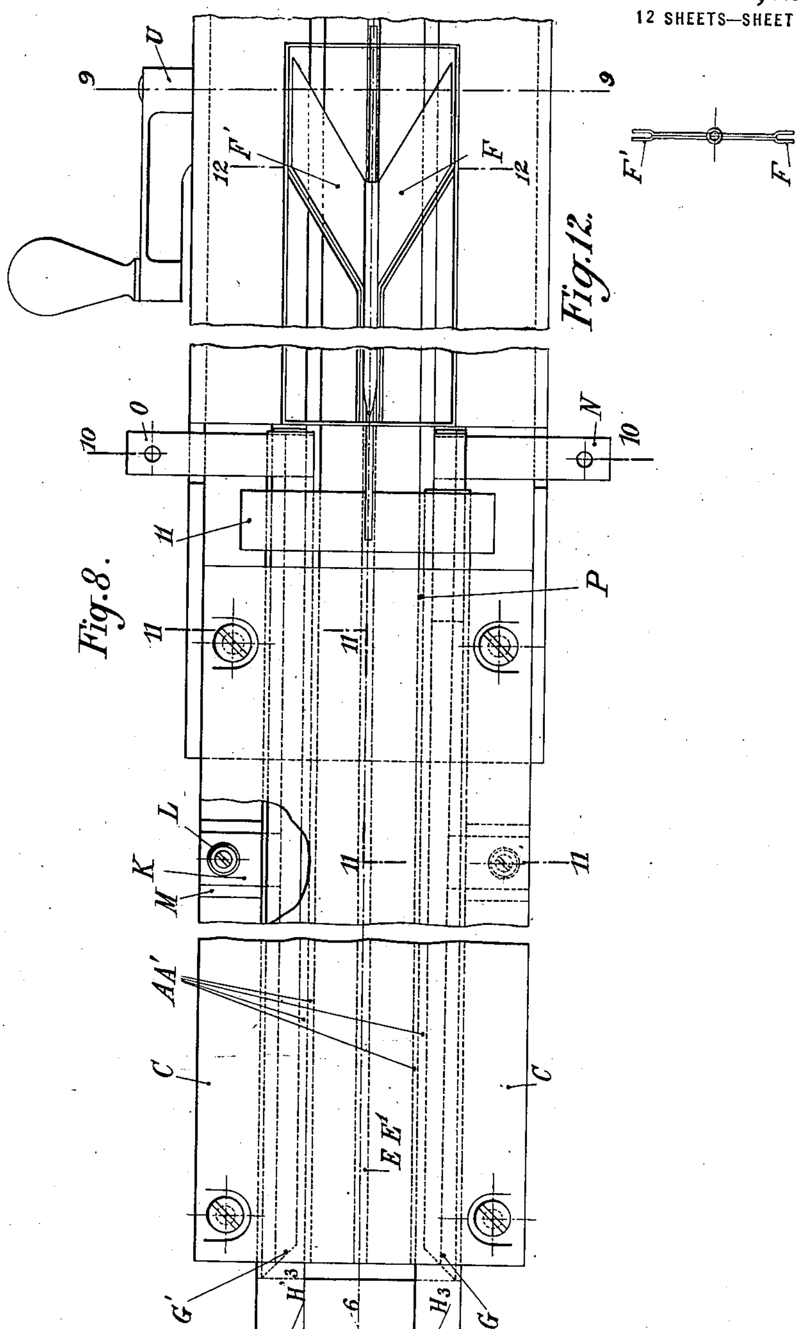

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12 SHEETS—SHEET 5.

Fig. 9.

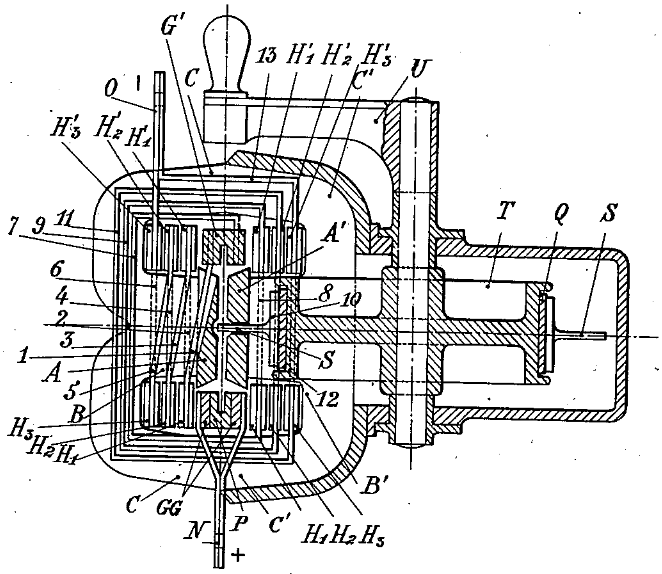


Fig. 10.

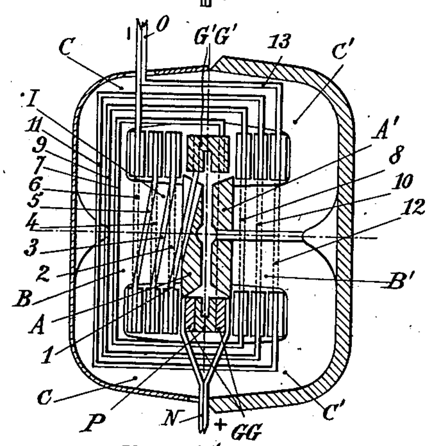
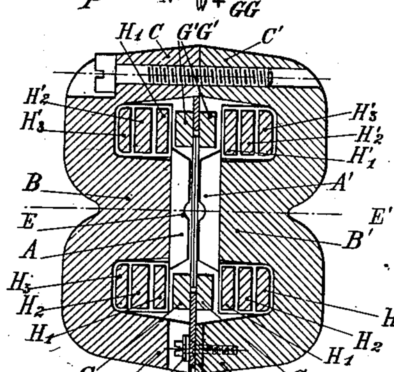


Fig. 11.



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12 SHEETS—SHEET 6.

Fig. 13

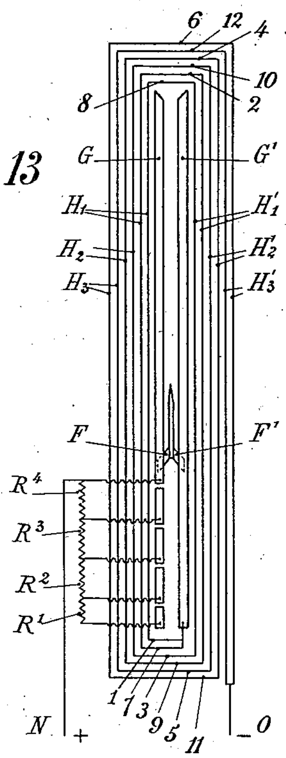

Fig. 14

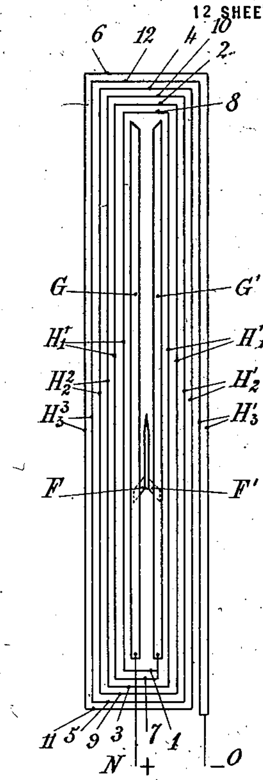

Fig. 15

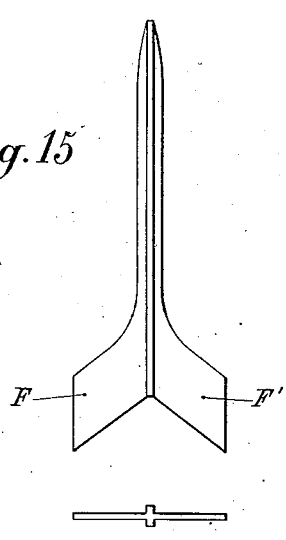

Fig. 16

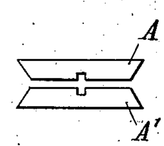

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Fig. 17

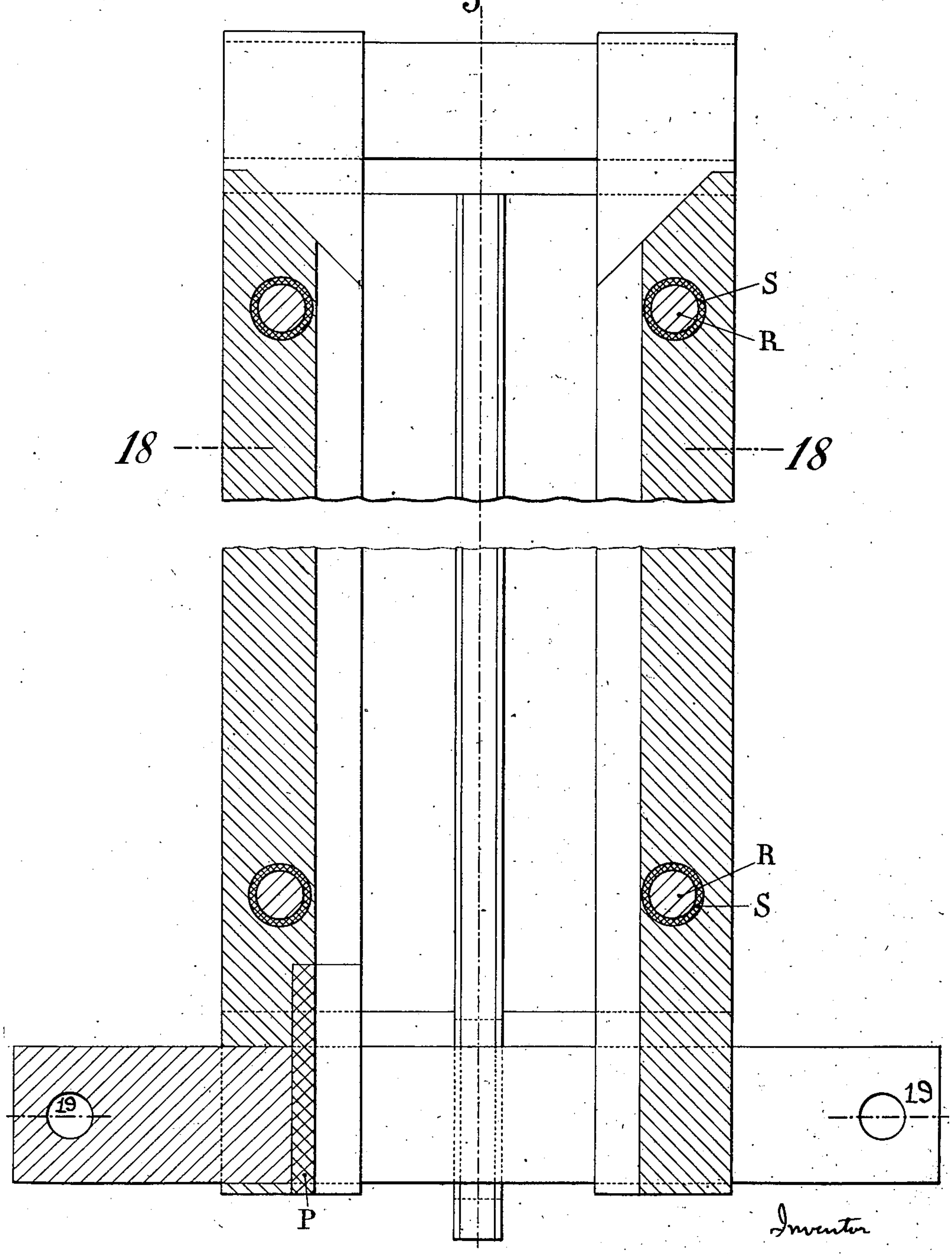

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Fig. 18.

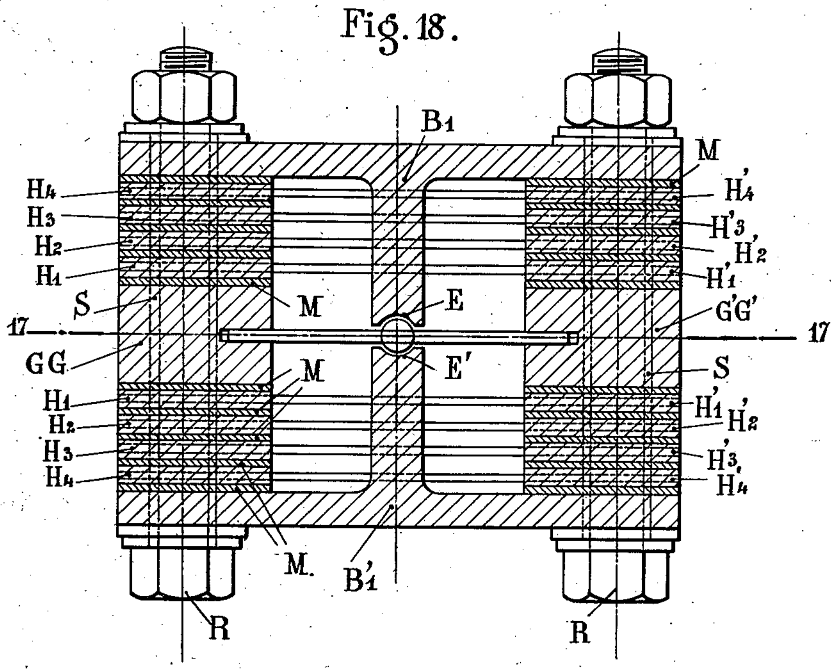

Fig. 19.

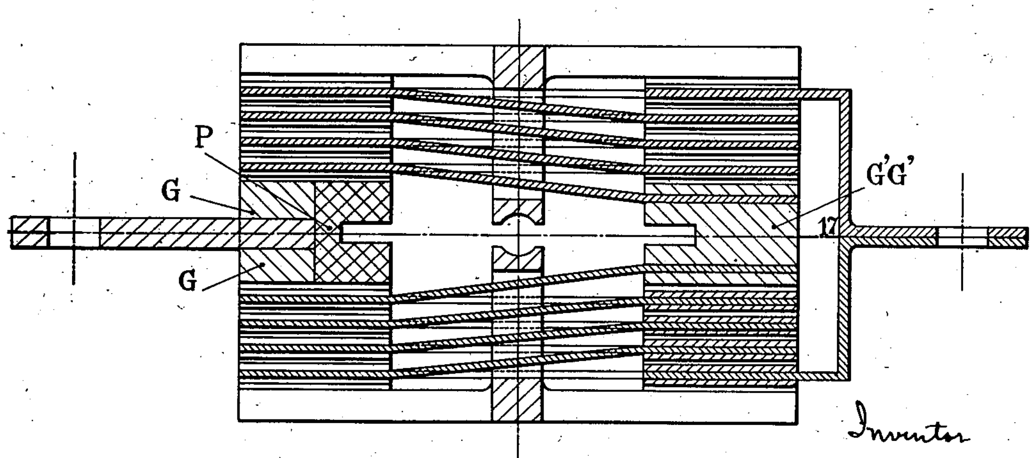

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Fig. 20

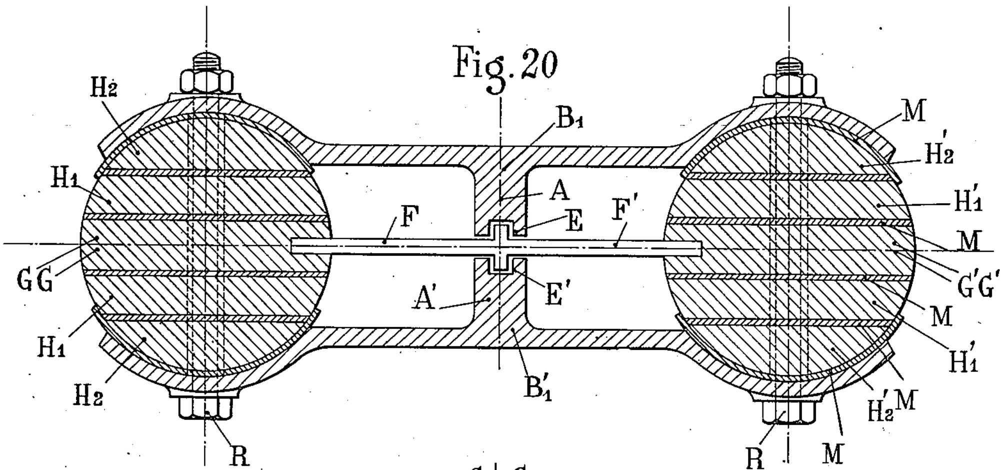

Fig. 21.

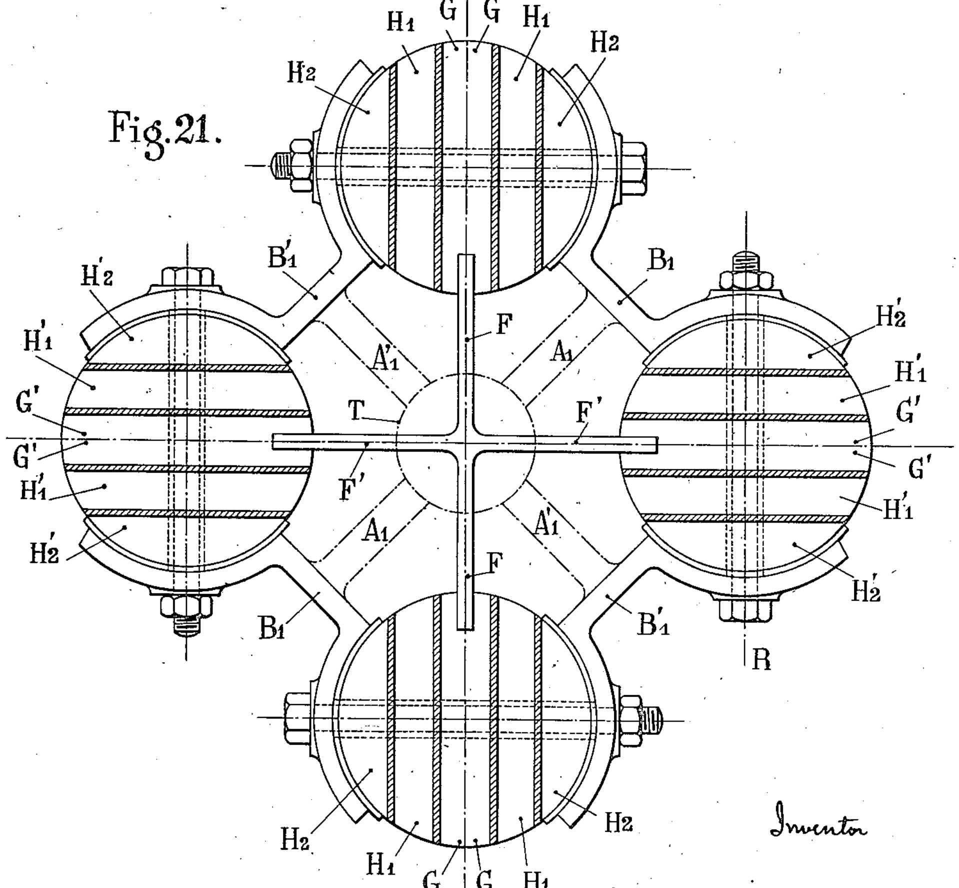

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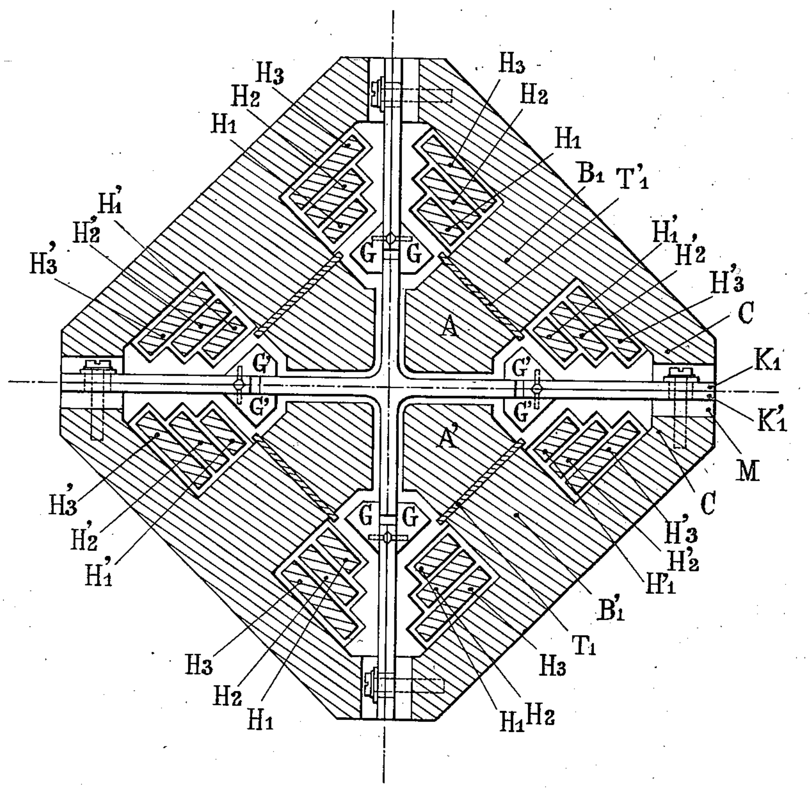
Fig. 22



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1,370,200. **Patented Mar. 1, 1921.**
12 SHEETS—SHEET 11.

Fig. 23

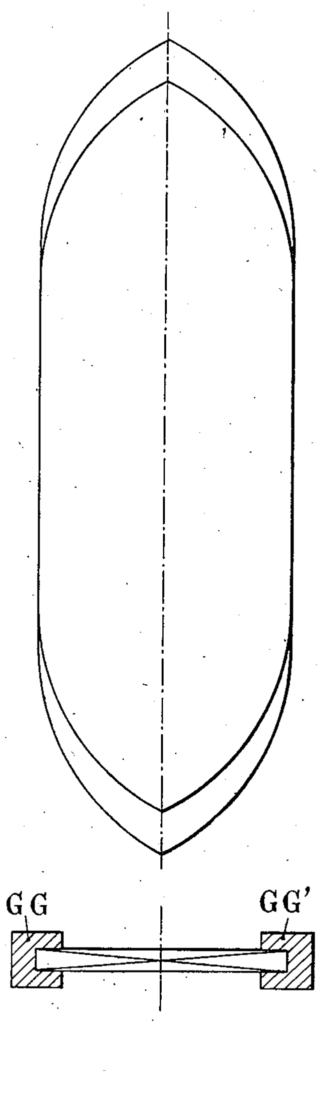
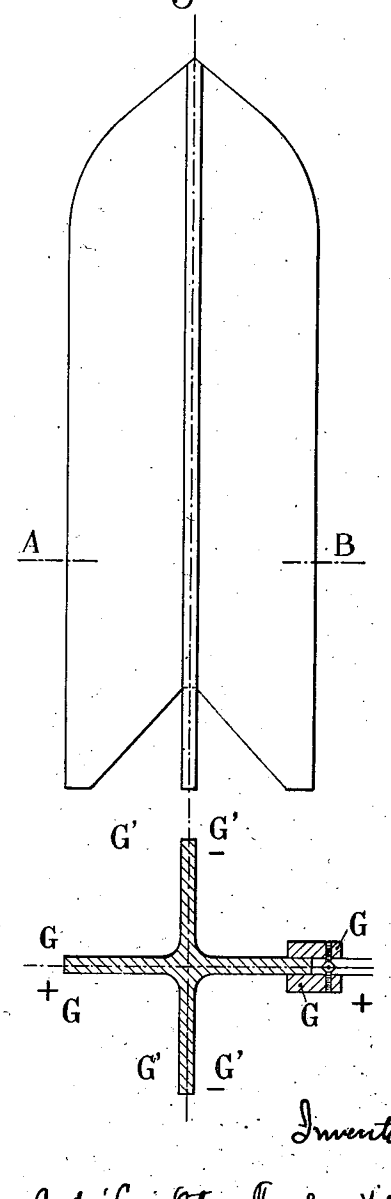


Fig. 24



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1,370,200. **Patented Mar. 1, 1921.**

12 SHEETS—SHEET 12.

Fig. 25

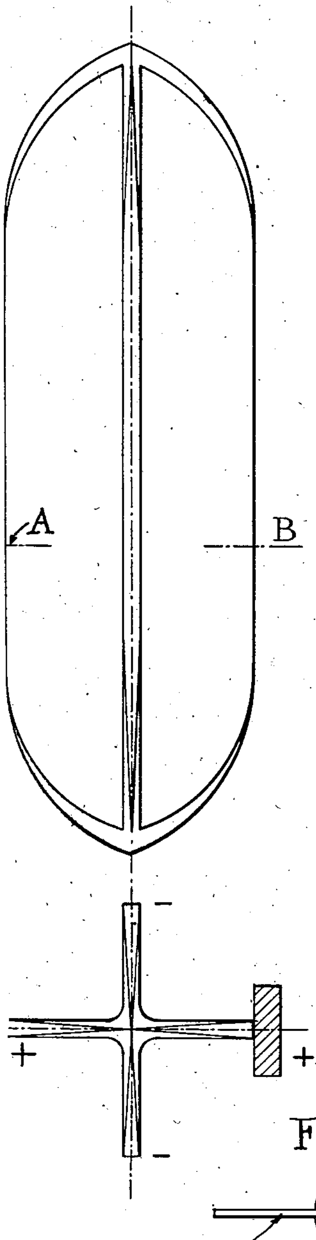


Fig. 26

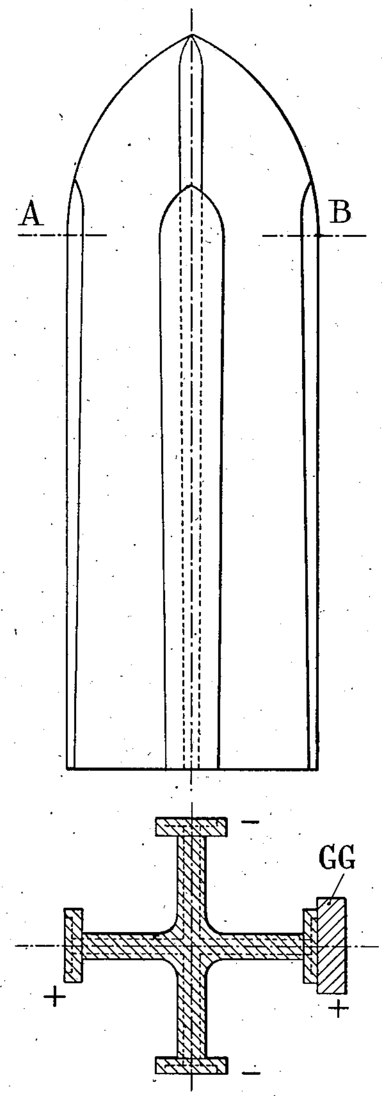


Fig. 27

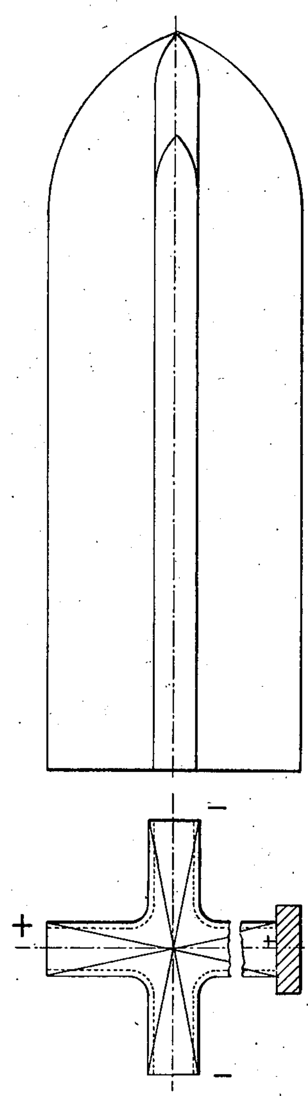
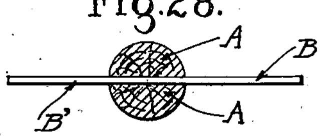


Fig. 28.



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his Attorney

UNITED STATES PATENT OFFICE.

ANDRÉ LOUIS OCTAVE FAUCHON-VILLEPLEÉ, OF PARIS, FRANCE.

ELECTRIC GUN OR APPARATUS FOR PROPELLING PROJECTILES.

1,370,200. Specification of Letters Patent. **Patented Mar. 1, 1921.**

Application filed July 31, 1917. Serial No. 183,796.

To all whom it may concern:

Be it known that I, André Louis Octave Fauchon-Villepleé, citizen of the Republic of France, residing at 2 Rue Meissonier, Paris, in the Republic of France, have invented new and useful Improvements in Electric Guns or Apparatus for Propelling Projectiles, of which the following is a specification.

This invention relates to an improved electric gun or apparatus for propelling projectiles, such as a machine gun, a cannon or other apparatus in which the propelling of the projectiles is effected by means of an electric current passing through wings fixed to these projectiles; these wings slide in the field or polar members excited for the purpose.

This invention allows of obviating the inconveniences arising from the noise and the heating met with in apparatus in which a charge of powder is used as propelling agent and in the case of machine guns it is possible to considerably increase the number of shots fired per minute and the length of use of the machine gun without excessive heat being feared and consequently rapid wear of the article.

In the annexed drawing given by way of example:

Figures 1 and 2 show respectively a transverse section and a partial plan view of a machine gun according to the invention.

Fig. 3 illustrates a projectile with two wings suitable to be projected by this machine gun,

Fig. 4 is a diagram showing on a small scale the arrangement of rails for conveying the current for the wings of the projectile as well as the electric connections of these rails.

Fig. 5 shows in transverse section a large electric gun comprising a projectile with eight wings.

Fig. 6 shows a small shell with four wings for a small gun.

Fig. 7 shows a vertical section of another electric gun taken along the axis of the gun,

Fig. 8 shows a plan view of the same gun,

Figs. 9, 10 and 11 show cross sections taken respectively along the straight lines 9—9, 10—10 and the broken line 11—11 of Fig. 8, these sections being supposed to be overturned to the left.

Fig. 12 shows a cross section of the projectile or arrow, this section being made along the line 12—12, of Fig. 8.

Figs. 13 and 14 indicate two diagrams for electric connections for the gun.

Fig. 15 shows an alternative design of arrow in elevation and cross section.

Fig. 16 is a cross section of polar members adapted for use with this latter form of arrow.

Figs. 17, 18 and 19 show another design of electric gun according to the invention. Fig. 17 is a longitudinal section of the gun taken along the horizontal line 17—17 of Figs. 18 and 19, and Figs. 18 and 19 are cross sections taken respectively along the lines 18—18 and 19—19 of Fig. 17.

Fig. 20 shows a cross section of a gun similar to the preceding but having a different form.

Fig. 21 represents a cross section of a gun similar to the preceding but designed for projectiles having four wings.

Fig. 22 shows a section of an alternative form of a gun employed for projectiles having four wings.

Figs. 23, 24, 25, 26 and 27 represent various types of projectiles.

Fig. 28 is a cross sectional view of a projectile having a body made of non-conducting material.

It can be seen from Figs. 1, 2, 3 and 4 that the machine gun is constituted by a conduit of soft iron formed of two polar members *a* and *a′* having the length of the gun. These polar members are supported at regular distances by cores *b* and *b′* of magnetic circuits *b c*, *b′ c′* excited by means of coils *d* and *d′*. It is easy to understand that if an electric current is caused to pass through the coils *d* and *d′* a magnetic flux will be produced between the polar members *a* and *a′*. The coils *d* and d^1 may be connected in series or in parallel but the direction of the electric current through the same should be such that the magnetic fluxes which are created in the magnetic circuits *a b c c′ b′ a′* have the same direction in all the circuits, whereby for instance in the polar member *a* connecting all of the cores *b* a north pole is created along the whole length of the gun and in the polar member *a′* connecting all of the cores *b′*, a south pole is similarly created along the whole length of said gun.

The projectile (Fig. 3) is constituted by an arrow made of bronze, copper or other suitable metal provided at the rear with two wings *e* and *e′* forming feathering. The rod *f* of the arrow can slide with slight friction in the central passage formed between the pole pieces *a* and *a′* while the two wings extend into the field and between two guides *g* and *g′* which serve at the same time as current conveying rails. These rails are fixed by means of suitable insulators either to the pole pieces or to the magnetic pieces; they are divided and fed with the current in the manner indicated in the diagram of Fig. 4.

The working of the gun is easily understood; if by means of the rails *g* and *g′* a sufficient current is caused to traverse the wings of the arrow, this current cutting the lines of force emanating from the poles *a* and *a′* will cause the arrow to be displaced perpendicularly to these lines of force and this displacement will be quicker in proportion as the voltage is higher. It can be seen from Fig. 4 that the voltage applied between the rails will automatically increase in proportion with the advance of the projectile. This arrangement consequently allows of maintaining in a nearly constant manner through the wings of the arrow, the intensity of current necessary to give this arrow a continuous acceleration sufficient to allow it to reach the muzzle velocity which is desired.

Fig. 5 shows the application of the system of the invention to a cannon of larger dimensions. This cannon is constituted by a conduit of soft iron formed by a series of pole pieces *h* and *h′* having the length of the cannon and capable of being excited by means of the coils *i* mounted in the magnetic circuits *h*, *j h′* as in preceding machine guns for arrows.

The shell is provided with a series of wings connected in pairs and insulated from the body of the shell. It is understood that the number of wings depends on the diameter of the shell. Fig. 5 shows the section of a shell with eight wings while Fig. 6 shows a shell with four wings for a gun of less importance. The shell is guided by means of bronze tenons *k* which can slide in grooves formed in the pole pieces. The wings with which it is provided extend into the field of the pole pieces without touching them; they comprise on their surface a skate which can slide on the current conducting rails l^1 l^2 l^3, etc., fixed on the magnetic circuits by means of suitable insulators.

When the shell is placed in the gun the current from the positive pole passes through the rails l^1, then through the wings m^1 m^2, the rail l^2, the connection n^2 n^3, the rail l^3 the wings m^3 m^4, etc., to pass out through the wings m^8, the rail l^8 and the connection n^8 which connects the rail to the negative pole of the source of electric energy.

All the rails are continuous with the exception of the rail l^8 which is divided in order to be able to vary the difference of voltage between the rail l^1 and the rail l^8 as in the machine gun for arrows. The operation of the apparatus is identical and explains itself.

Having thus defined the principle and the general working of the electric gun, it is proposed to make a somewhat more detailed description of several examples in the way of a practical realization of the present gun and of the projectiles employed therewith.

Referring in the first place to Figs. 7 to 11, it will be observed that the gun can employ a magnetic circuit A, B, C; A′, B′; C′ having the length of the gun.

The two polar members A and A′ carry two grooves E and E′ in which the shell having four wings is adapted to slide. The wings of the arrow pass between two current carrying rails G—G, G′—G′ placed at each side, and these two rails also have the length of the gun. The winding is carried out in this case by the use of the copper bars H1 H1, H2, H2, H3 H3, H′1 H′1, H′2 H′2, H′3 H′3 insulated from each other and connected as shown in Figs. 7, 8, 9, 10, 13 and 14. According to these diagrams the apparatus is mounted in series, that is the current passing in the arrow is the same as the current passing in the winding. Starting with the positive pole N, the current passes first through the double rail G G, then through the wings F F′ and again through the rail G′ G′, and from thence a part of the current passes through the set of bars surrounding the polar member A and the remainder passes around the polar member A′.

In the first series, the current takes the following path; rail G′ G′, back cross connection 1, bar H1, front cross connection 2, bar H′1, back cross connection 3, bar H2, front cross connection 4, bar, H′2, back cross connection 5, bar H3, front cross connection 6, bar H′3, negative pole O.

In the second series, the current takes the following path: rail G′ G′, back connection 7, bar H1, front connection 8, bar H′1, back connection 9, bar H2, front connection 10, bar H′2, back connection 11, bar H3, front connection 12, bar H′3, connection 13, negative pole O. It will be observed that for this second series, the bars of the back connections surround the upper part of the gun, and this is due to the fact that the arrow distributing device placed at the back part of the gun prevents any direct passage at the lower part.

The drawing indicates two circuits H1 H1, H2 H2, etc., for the reason that each of these represents the winding of one of the poles B and B′ of the magnetic circuit, it being here supposed that the two windings are coupled in parallel, but these windings could also be coupled in series if desired.

The method shown in Fig. 13 differs from that of Fig. 14 from the fact that one of the rails G G is made in sections so as to allow of inserting the starting resistances R1 R2 R2, etc., in the circuit as above indicated. The method shown in Fig. 14 gives as good results as the one indicated in Fig. 13. The current carrying rails G G, G′ G′ are supported by means of metal plates K (Figs. 7, 8, and 11) which are attached to the body of the gun and are insulated from it by the use of washers L and mica pieces M. The rails are held apart by means of the plates K and sets of spacing blocks so as to leave a suitable space for the passage of the wings of the arrow with slight friction. The rails G′ G′ have the same disposition.

On the end where the projectile leaves the gun or on the front part, the ends of the rails are cut off on a bevel in order to facilitate the blowing out of the arc which is formed when the projectile leaves the gun. The arrow which is seen in plan view in Figs. 8 and 12 may comprise a hollow or solid rod of copper or any other non-magnetic material which is provided with wings, these being formed by two plates whose edges are extended out so as to make contact in the rail groove. This rod may be filled with an explosive substance and also provided with an exploding device. The front edges of the wings can also be designed as cutting edges.

In the alternative form indicated in Fig. 15, the rod of the arrow has the form of a cross, and in this case the groove in the polar members should be disposed in consequence, as shown in Fig. 16. On the other hand, since the arrow is constructed without expanded edges which act as springs to assure contact with the current carrying rails, such rails must be so designed that their grooves can open slightly so that the wings of the arrow can pass in them with slight friction.

Arrows or shells of magnetic metal can also be employed in which case care should be taken to insulate them magnetically from the polar members by means of non-magnetic metal. They can be protected or preferably spaced from the polar members by the use of guide plates or tenons attached to these polar members.

The operation of the apparatus will be readily understood. Supposing the positive pole N and the negative pole O to be connected to a source of electric supply, it will be observed from the Figs. 13 and 14 that upon inserting the arrow between the two rails, this arrow acts as a connector to close the electric circuit. The current instantly passes in the arrow and in the windings. A magnetic field is immediately formed and under its influence as well as by the effect of the reaction of the currents upon each other, the arrow is propelled forward by the current passing in its wings, and the forward movement is greater the higher the voltage employed.

Again, the greater the width of the wings, the greater will be the number of lines of force cut by them per second, and the current required to propel the projectile will be diminished in like proportion. The same result can be obtained by increasing the number of wings on the arrow, and this will be done in the case of large bore guns, as already indicated.

The use of wings to give passage to the current has a great advantage in allowing variations in the voltage and current which are supplied to the projectile in order to obtain the required speed, for without the use of the wings it would be required to use an excessively high current should the current be sent for instance directly through the projectile.

In order that the electric circuit should not be closed except when the arrow is properly disposed within the gun and can therefore receive the effect of the magnetic field, there is disposed at the forward part of the current rail G G an insulating portion P (Figs. 8 and 10) of fiber, ebonite, porcelain, etc.

At the instant the arrow leaves the gun, the current is broken at the wings and the arc thus formed is blown out automatically.

It is understood that a rotary movement can be easily given to the arrow by designing the magnetic carrier, the rails and the wings in a spiral form. The wings of the arrow can also be cut in bevel in front and at the back in such way as to receive a rotary movement due to the pressure of the air.

The apparatus may be provided with a distributer shown in Figs. 7 and 8 for inserting the arrows in the gun. The distributer comprises a simple endless belt or chain Q carrying the metal projections S and working upon the pair of pulleys T. It will be readily understood that when one of the pulleys is operated by a crank U or a small electric motor, the device will easily take the arrows placed in the magazine V situated below the belt and drive them into the part E E′ of the gun and between the current rails. The speed of firing will depend upon the rate of introduction of the arrows into the gun.

In order to provide a rapid feed for the fixed magazine, the arrows can be placed in charging boxes which allow of emptying a charge of arrows immediately into the magazine.

It is understood that any suitable source of electric supply can be utilized, such as a storage battery or preferably a continuous current generator driven by a gasolene engine or any other suitable type. This generator is preferably of the compound type and independently excited in order to avoid any drop in voltage.

For operating the electric gun there may also be employed an alternator which is wound for instance in the same way as a magneto and in which the current is utilized by suitable means during a portion of the rising current period. The speed of this period will naturally be calculated in such way that the time occupied by the passage of the projectile in the cannon shall be less than a quarter wave length, that is, a quarter cycle of the alternating current.

In the case of large sized guns in which the firing is not done in rapid succession, the electric generator is called upon to furnish energy for only a very short time, and in this case it must be considered as having the nature of a fly wheel or a device for transforming live force, and it furnishes instantly and by electric action all the live force which it previously absorbed during the time when it was gradually brought up to speed in the interval between the firing rounds. It would also be remarked that by reason of the instantaneous utilization of its energy, the electric generator has not time to heat up, and can therefore support an extremely high current as compared with the normal current. It is understood that the above described method of construction is applicable to any system of electric gun employing projectiles with any number of wings, and is especially applicable to the design shown in Fig. 5.

On the other hand the principle of the invention is equally applicable when the current is sent into the projectile itself and when this projectile either with or without wings is placed under the action of a field of electric force of any kind, magnetic or not.

Below will be described several types of apparatus which do not contain a magnetic circuit properly so called. By referring to Figs. 17, 18 and 19, it will be observed that in one design of this kind, the gun may comprise two T-shaped connecting bars B1 and B′1 in magnetic or non-magnetic metal which have the same length as the gun. These bars serve at the same time to guide the projectile by means of a groove E E′ in their vertical portion, and to hold the copper bars which form the current carrying rails G G G′ G′ and the winding H1, H2 H3 H4 H′1 H′2 H′3 H′4. Each of the current carrying rails G G G′ G′ is formed of a copper bar provided with a groove for the passage of the wings of the projectile. The bars G G G′ G′ as well as the bars H1 H2 H3 H4 H′1 H′1 H′2 H′3 H′4 are insulated from each other and from the connecting bars by means of plates of mica or any other insulating material M. The attaching bolts R are insulated from the conductors by means of mica tubes S. The arrow can be insulated by a fiber piece P so that the current will only begin to pass through the wings of the arrow after the latter is placed in the gun. The present form of gun operates in exactly the same way as those previously described. Current which arrives for instance by way of the rail G G passes through the projectile and then through the rail G′ G′ and in the two windings H1 H′1 H2 H′2 H3 H′3 H4 H′4 which in the drawing are shown as connected in parallel. However these windings could be equally well connected in series, and to carry this out it is only required to omit the back connection which couples G′ G′ to the bar H1 of the lower winding, and to connect this latter bar to the back part of the upper bar H′4, it being understood that the outgoing connection which couples this bar H′4 to the negative pole is to be omitted.

In any case, whatever be the method employed, when the current passes in the circuit there are intermediately set up lines of force which pass around the series of bars forming the windings, so as to produce in the portion lying between the rails G G and G′ G′ a field of force which is stronger as the current passing in the bars is greater. The projectile being under the action of the electric current which passes through it and also submitted to this field of force, is thus propelled forward. It is evident that the density of the lines of force for a given number of ampere-turns will be greater in proportion as the length of their path is shortened.

Fig. 20 shows an apparatus designed on this principle. In this apparatus the current carrying rails and the bars of the electric circuit are cut out and mounted so as to form a circular series, and it will be understood that under these conditions the path of the lines of force which surround these series is reduced to a minimum. The construction of this apparatus is analogous to that of the gun shown in Figs. 17, 18 and 19, but the connecting bars are suitably disposed in order to adapt themselves to the shape of the windings. The operation of this gun is exactly the same as that of Figs. 17, 18 and 19. It is understood that the projectiles fired by this apparatus may vary greatly in form. In Fig. 18 is shown a projectile of arrow form which is similar to the one represented in Fig. 12, while Fig. 20 shows a similar projectile to that of Fig. 15. Furthermore, the projectile could be formed of a simple rectangular plate sliding in the grooves of the rails G G′ and the current passes entirely through the projectile (Fig. 23) and the projectile could even be made of a simple disk. Fig. 21 shows a gun employed for a projectile with four wings. The disposition of this gun is similar to the one shown in Fig. 20, and its construction is adapted to the number of wings of the projectile. However as an alternative design, it is supposed that the connecting bars B1 B′1 do not extend for the whole length of the gun and are placed only at intervals so as to merely connect the four series of windings. A projectile is here shown in full lines which has the form of a cross and whose wings extend for the entire length of the projectile. The latter is guided directly by the grooves provided in the current carrying rails G G′.

A projectile could also be used with wings placed in the rear or at the front, but in this case they must be maintained by the guides A1 A′1 having the length of the gun and attached to the connecting bars B1 B′1 as shown in the irregular dotted line in Fig. 21.

As an example the section of a gun similar to the preceding is shown in Fig. 22 but having a magnetic circuit so disposed as to allow of employing a projectile with four wings. The rails G G and G′ G′ are mounted on two springs K K′ attached to the body of the gun from which they are insulated by suitable plates and washers. This disposition allows of pressing the wings of the projectile between each part of the rails G G and G′ G′. The windings are held in place by means of soft iron plates T1 T2 clamped between the polar members A A′ and the cores B B′. The current arrives for instance by the rails G G and passes through the projectile, then leaves by the rails G′ G′ and passes thence in the windings. All the rails G G for the entry of current are connected together and the same holds good for the outlet bars H′3. It is understood that any kind of connection can be employed such as in series or shunt, in compound with independent excitation, etc. This method can be also employed with a greater number of wings on the projectile according to the size of the gun, for the drawings composing Figs. 17, 18, 19, 20, 21, 22 are only furnished by way of example and the invention is not limited to these designs. Any arrangement which will or will not produce a magnetic field can be adopted.

Figs. 23, 24, 25, 26, 27 show a series of designs for projectiles which can be utilized with the electric gun. Fig. 23 shows a projectile which is formed of a simple rectangular plate. Fig. 24 shows a projectile with four wings cut in the rear in arrow shape. Fig. 25 represents the same projectile having its two ends symmetric. Fig. 26 shows a projectile having a side skate acting as current contact. The skates and the body of the projectile itself are so designed as to taper out from front to rear so as to facilitate the penetration of the projectile and to diminish its resistance to air. Fig. 27 shows a projectile which also tapers from front to rear but has a much greater thickness of wing so that the side surface serving as current contact shall be sufficient to allow the current to pass. To sum up, the method allows of employing projectiles having a great diversity of forms, such as bars of rectangular square, circular, elliptical or other section. The number of wings can be increased, and the current can be sent through the projectile or through the wings, which latter are attached over the whole or part of the length of the projectile, and these projectiles can be constructed of magnetic or non-magnetic material, with copper plates attached to them for obtaining a better electric contact; Fig. 28 shows a projectile A made of wood or other insulating material through which a conducting plate B B′ extends. Any of these dispositions can be employed provided the same general principle is maintained, that is the propulsion of the projectile by means of electric current passing either directly through the projectile itself or through the wings which it carries, or again through the wings and the projectile itself, this current being submitted to the action of a field of force either with a magnetic circuit (cast steel) or without any magnetic circuit.

The electric gun affords the following advantages:

1. Supposing the electric current to be supplied by a generator driven by a gasolene engine, it will be readily understood that the weight of gasolene employed to fire a projectile with the electric gun will be much less than the weight of the explosive used to fire a projectile of the same weight at the same speed in an ordinary gun. The heat produced by the combustion of a pound of explosive is in fact much less than that produced by the combustion of a pound of gasolene; therefore the work supplied by the latter is much greater. This is readily seen from the fact that the explosive is obliged to seek its combustible substance in itself, while the gasolene takes it from the air. On the other hand, the yield from an explosive gun is much lower than that of an electric gun, for the whole amount of heat which escapes when the projectile leaves the gun is entirely lost as well as the expansion of the gas. With the present electric gun, there is no such loss, and in consequence the yield or efficiency is infinitely higher, and it follows from this that the weight of gasolene expended at each firing round is much less

than the corresponding weight of explosive. On the other hand the cost of a pound of gasolene is less than that of a pound of explosive, whence it follows that a high degree of economy is realized.

2. The construction of the electric gun according to the present invention is much simpler than for the usual guns, for it does not require the use of special steels of great strength which require the use of long and difficult processes. All that is required is to construct the gun with steel having the highest possible permeability. On the other hand, as the gun is made up by assembling the two series of pieces A B C, A′ B′ C′, the forging work is replaced by milling machine work which is very much easier.

3. There is scarcely any wear to be considered in the electric gun, as it does not undergo the pressures nor the very high temperatures employed in usual guns. It works like an ordinary machine and can even be lubricated.

4. Firing with the electric gun can be as rapid as desired. Its magazine or distributer is much simpler than in the ordinary guns, for the breech does not require any such operation as usual nor any ejection of the used cartridge.

5. A considerable amount of power can be given to the present gun, the only limit being found in the sources of electric supply which are used.

6. The gun produces no smoke and scarcely any noise or light.

7. It also allows of increasing the explosive charge of the shell with reference to the weight. The present gun is especially adapted for mounting on automobiles, railroad cars or boats upon which electric generators can be installed, and it can also be employed for coast defense by taking current from power lines or from electric plants installed for the purpose.

It may be also utilized for attacking airships by means of arrows, or for rockets as well as for torpedo launching, etc.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An electric gun comprising in combination spaced inductor windings adapted to create fields of forces through the space therebetween, means for exciting said windings to cause the flux to flow transversely entirely across said space, means for guiding a projectile in the space between the windings and means for causing an electric current to flow through the projectile in a direction at right angles to said fields.

2. An electric gun comprising in combination: spaced inductor windings adapted to create fields of forces through the space therebetween, means for exciting said windings to cause the flux to flow transversely entirely across said space, means for guiding a projectile having an electrically conductive part in the space between the windings and means for causing an electric current to flow through the electrically conductive part of the projectile in a direction at right angles to said fields.

3. An electric gun comprising in combination: spaced inductor windings adapted to create fields of forces through the space therebetween, means for exciting said windings to cause the flux to flow transversely entirely across said space, means for guiding a projectile having an electrically conductive part in the space between said windings and means for causing an electric current to flow through the electrically conductive part of the projectile, which part is thin and of a substantial area, in a direction at right angles to said fields.

4. An electric gun, containing, in combination, polar members having an air-gap forming lengthwise passages therebetween, means for exciting said polar members, a projectile movable in the air gap of said polar members and having flat conducting wings movable in said passages, and means for bringing current to said projectile, substantially as described and for the purpose set forth.

5. An electric gun, containing, in combination, polar members having an air-gap forming lengthwise passages therebetween, exciting windings for said polar members, a winged projectile forming an electric conductor and having its body movable in the air gap of said polar members and its wings movable in said passages, electrically conductive guide rails for said projectile, and means for supporting and insulating said rails, substantially as described and for the purpose set forth.

6. An electric gun, containing, in combination, a magnetic field piece extending the whole length of the gun, soft iron cores disposed upon said field piece, exciting windings disposed upon said iron cores, pole pieces extending the whole length of the gun and disposed upon said soft iron cores, said pole pieces being separated by an air gap, a winged projectile forming an electric conductor and movable in the air gap of said polar members, electrically conductive guide rails for said projectile, and means for supporting and insulating said rails, substantially as described and for the purpose set forth.

7. An electric gun, containing, in combination, a magnetic field piece, soft iron cores disposed upon said field piece, exciter windings disposed upon said cores, pole pieces disposed upon said soft iron cores, said pole pieces being separated by an air gap, a winged projectile forming an electric conductor and movable in the air gap of said

polar members, electrically conductive guide rails for said projectile cut on a bevel at their front ends, and means for supporting and electrically insulating the projectile upon first introducing it into the gun, substantially as described and for the purpose set forth.

8. An electric gun, containing, in combination, a magnetic field piece extending the whole length of the gun, soft iron cores disposed upon said field piece, conducting bars forming exciting circuits disposed around said cores; polar members extending the whole length of the gun and disposed upon said soft iron cores, said polar members being separated by an air gap, a winged projectile forming an electric conductor and movable in the air gap of said polar members, electrically conductive guide rails for said projectile cut on a bevel at their front ends and insulating pieces disposed between said field piece and the rails, substantially as described and for the purpose set forth.

9. An electric gun comprising in combination: spaced inductor windings adapted to create fields of forces in the space therebetween, means for exciting said windings, means for guiding a projectile having a conductive part through the space between the windings and means for causing an electric current to flow through the conductive part of the projectile in a direction at right angles to said fields, the tension of said electric current increasing gradually as the projectile progresses between the said windings, substantially as described and for the purpose set forth.

10. An electric gun comprising in combination: spaced inductor windings adapted to create fields of forces in the space therebetween, means for guiding a projectile having a conductive part through the space between the windings, and means for causing an electric current to flow in series through the windings and through the conductive part of the projectile, in a direction at right angles to said fields, the flux flowing transversely entirely across the path of the projectile, substantially as described and for the purpose set forth.

11. An electric projector having in combination, a projectile, electro-magnetic poles surrounding said projectile, said poles being arranged to provide a field of flux extending transversely of said projectile, and a conductor on said projectile adapted to carry a current reacting with said field of flux, said reaction imparting translational motion to said projectile.

12. An electric projector having in combination, a field coil arranged to provide a field of flux, a pair of poles operatively associated therewith, and a projectile between said poles and adapted to carry a current, said current reacting with said field of flux, whereby said projectile is given a translational motion.

13. An electric projector having in combination, electromagnetic poles arranged to provide a field of flux of the same direction, and a projectile lying between poles of opposite polarity and adapted to carry a current reacting with said field of flux, whereby said projectile is given a translational motion.

14. An electric projector having in combination, means providing a field of flux, a projectile, and a conductor secured to said projectile and cutting said field at substantially right angles, said conductor being arranged to carry a current to react with said field of flux, whereby said projectile is given a translational motion.

15. A motion transmitting means comprising a movable element, electro-magnetic poles spaced by said element, said poles providing a field of flux extending transversely of said element, said element lying wholly within the space between said poles, and a conductor on said movable element arranged to carry a current reacting with said field of flux whereby translational motion is imparted to said element by said reaction.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDRÉ LOUIS OCTAVE FAUCHON-VILLEPLEÉ.

Witnesses:

LOUIS MOSES,

CHAS. P. PRESSLY.