No. 861,783.

PATENTED JULY 30, 1907.

R. H. WAPPLER & C. F. FAYER.

INTERRUPTER FOR ELECTRIC CIRCUITS.

APPLICATION FILED JAN. 28, 1907.

2 SHEETS—SHEET 1.

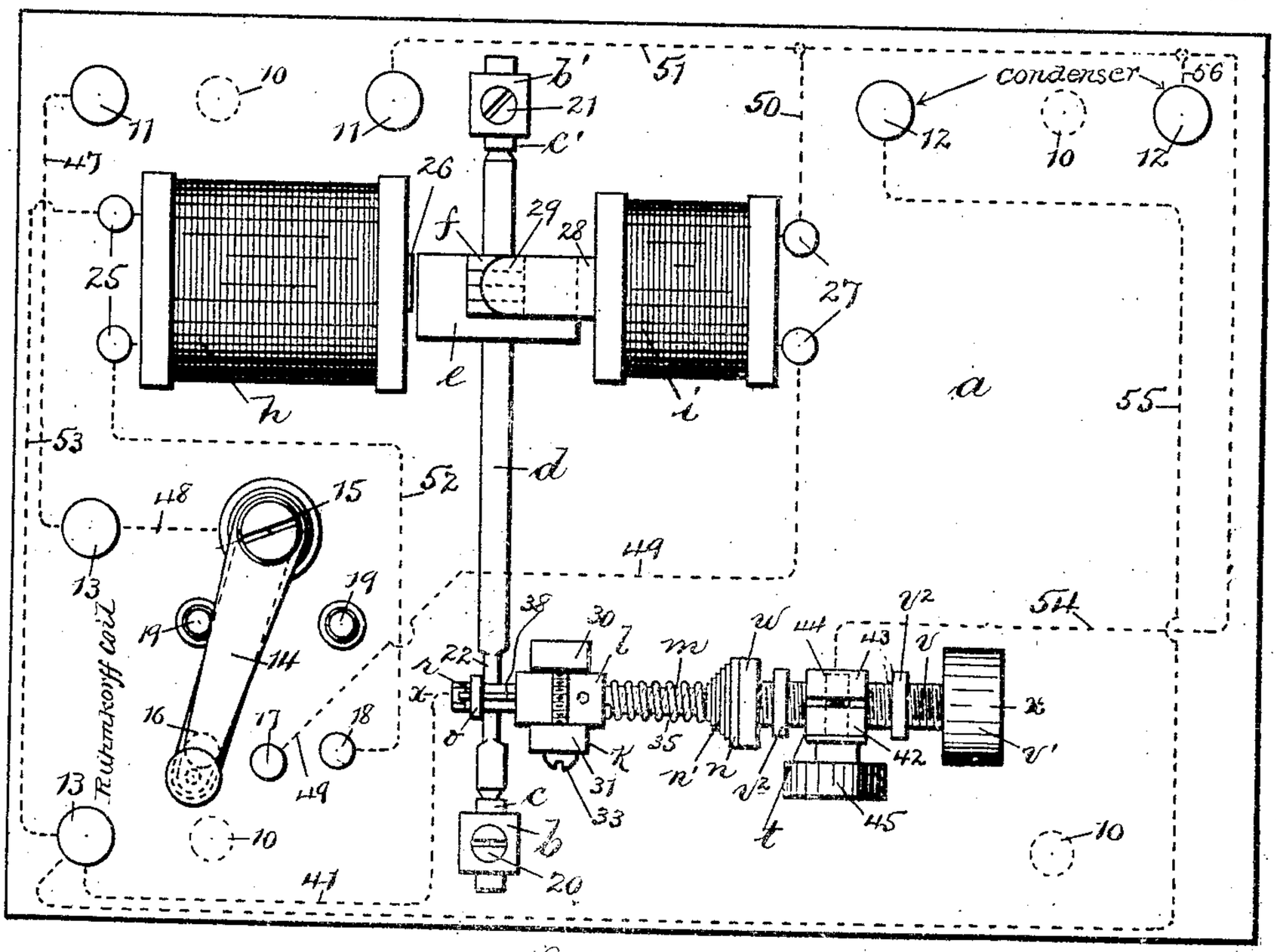
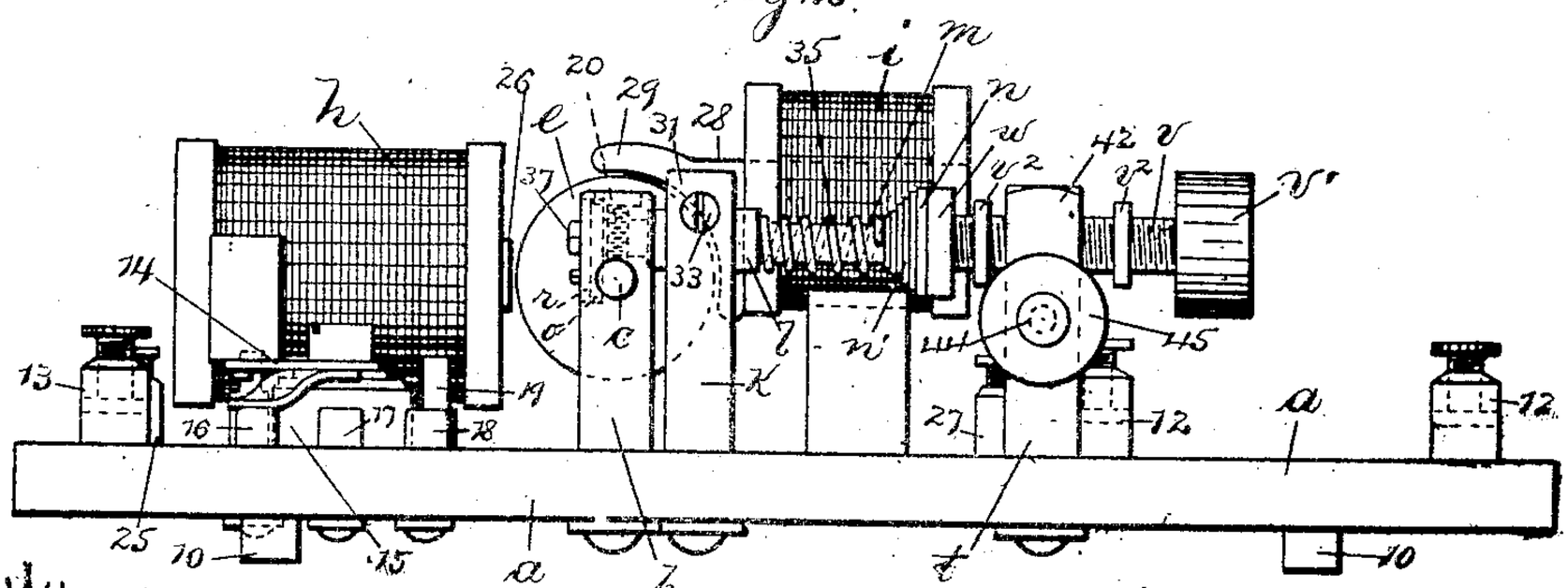


Fig. 1.

Fig. 2.



WITNESSES

A. H. Sewell

Chas. F. Smith

INVENTORS

Reinhold H. Wappler

Charles F. Fayer

PER Harold Sewell

THEIR ATTY

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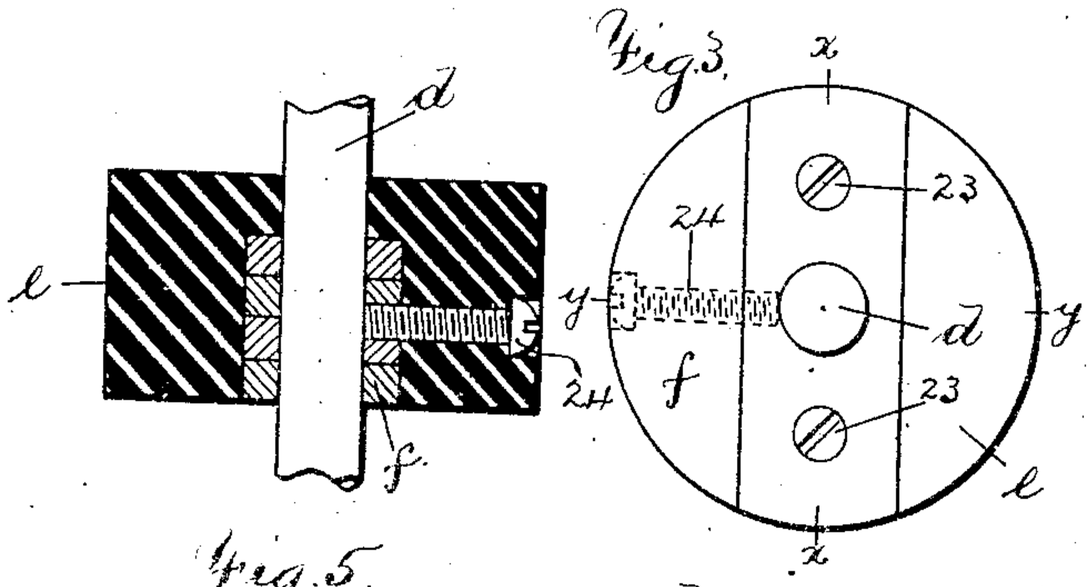

Fig. 3.

Fig. 5.

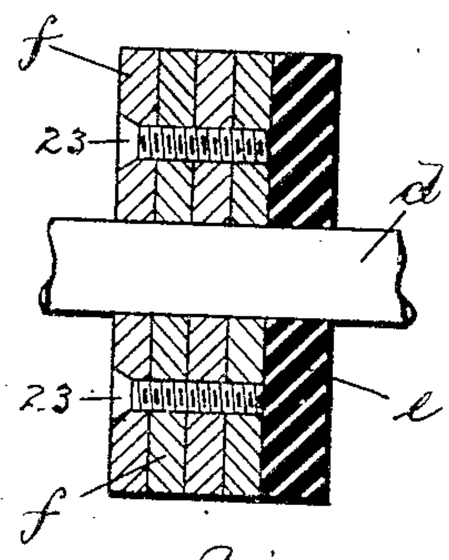

Fig. 4.

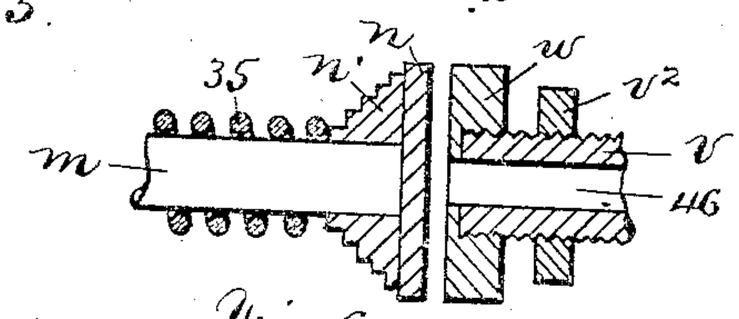

Fig 10.

Fig. 6.

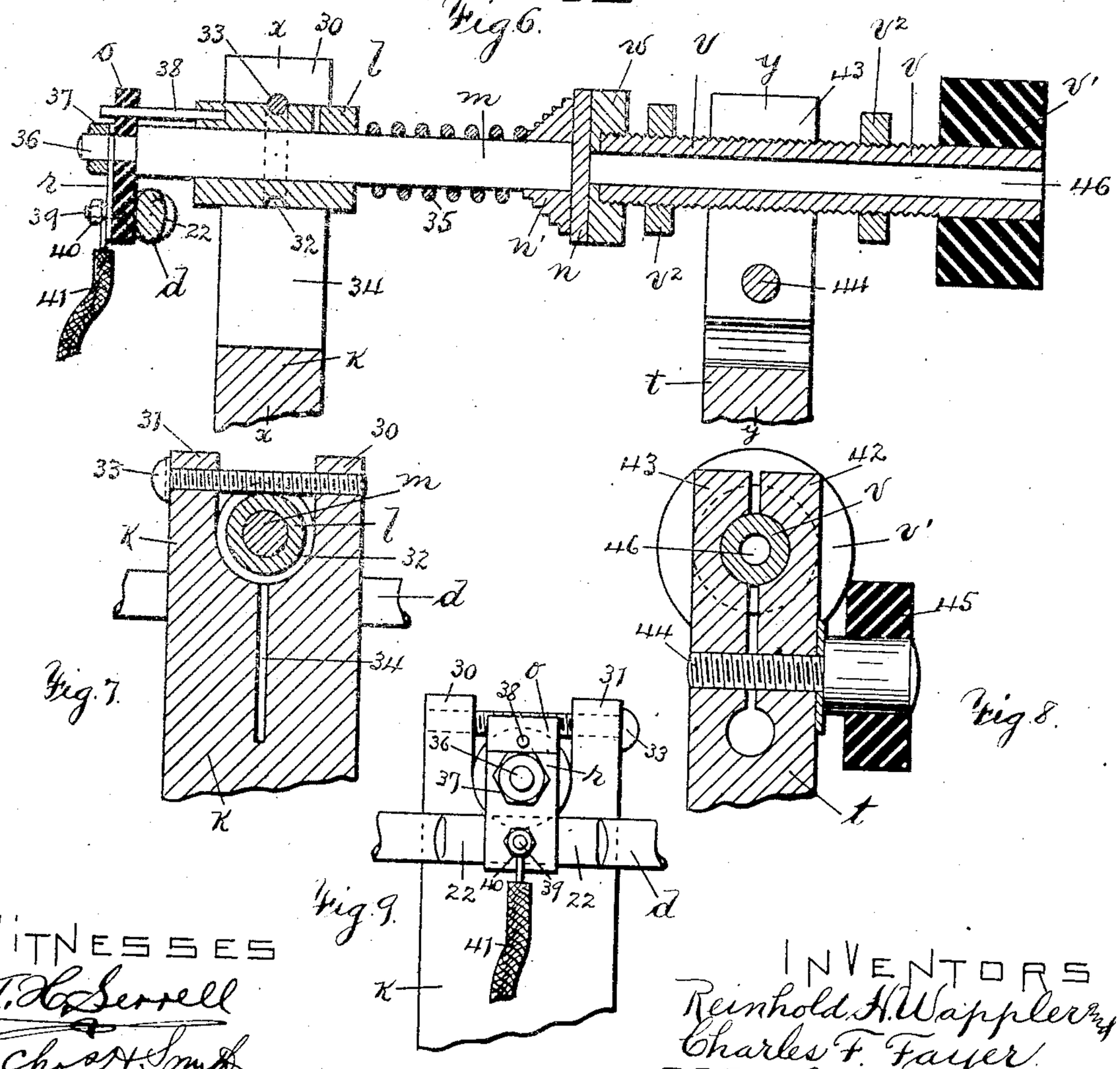

Fig. 7.

Fig. 8.

Fig. 9.

WITNESSES

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UNITED STATES PATENT OFFICE.

REINHOLD H. WAPPLER AND CHARLES F. FAYER, OF NEW YORK, N. Y.

INTERRUPTER FOR ELECTRIC CIRCUITS.

No. 861,783.

Specification of Letters Patent. Patented July 30, 1907.

Application filed January 28, 1907. Serial No. 354,399.

To all whom it may concern:

Be it known that we, REINHOLD H. WAPPLER and CHARLES F. FAYER, both citizens of the United States, and residents of the borough of Manhattan, city, county, and State of New York, have invented an Improvement in Interrupters for Electric Circuits, of which the following is a specification.

Our invention relates to a circuit interrupter and particularly to a mechanical interrupter for electric circuits adapted for use in connection with an X-ray and other similar apparatus.

Heretofore in X-ray and other similar apparatus, an electrolytic interrupter has commonly been employed, due to the rapidity of the required interruptions,—but as discovered by Reinhold H. Wappler aforesaid and as fully set forth and described in an application Serial No. 341296, filed October 30th, 1906, for Letters Patent for an improvement in X-ray apparatus, it is possible and practical by connecting the operating coil and the mechanical interrupter in certain relations in the circuit, to dispense with the use of the electrolytic interrupter and obtain the required rapidity of interruptions by the use of a mechanical interrupter, and the present invention relates to an improved mechanical interrupter with the particular object of effecting a reciprocating movement in the contact parts in place of a rocking movement, which so far as we are aware, has heretofore commonly been employed; in so constructing the operating parts as to reduce the friction and wear to a minimum, and providing means by which the interrupter,—which is magnetically operated,—is self-starting.

In carrying out our invention, we employ a base, a rotating armature, an actuating coil, an auxiliary or starting coil, a movable contact, a stationary contact, means for imparting a reciprocating motion to the said movable contact upon the turning of the armature, means for adjusting the position of the fixed contact relatively to the movable contact, and electrical connections to and from the various parts aforesaid to complete the necessary electric circuits, as will be hereinafter more particularly described.

In the drawing, Figure 1 is a plan of our improved mechanical interrupter for electric circuits. Fig. 2 is a side elevation of the same. Fig. 3 is an elevation of the fly-wheel with the armature embedded therein. Fig. 4 is a section on line x, x, Fig. 3. Fig. 5 is a section on line y, y, Fig. 3. Fig. 6 is a sectional elevation on line x, x, Fig. 1. Fig. 7 is a section on line x, x, Fig. 6, looking towards the left. Fig. 8 is a section on line y, y, Fig. 6, looking towards the right, Fig. 9 is an end elevation of the parts shown in Fig. 6, looking from left to right, and Fig. 10 is a section of the contacts showing the same in a spaced apart position, Figs. 3 to 10 inclusive being on an enlarged scale.

a designates a base, preferably made of slate or other insulating material and provided on its under side with suitable support posts 10. The base a is provided with terminals or binding posts 11 to receive the lead wires coming from and going to any suitable source of electricity, with the contacts and binding posts 12 adapted to be connected across the terminals of the condenser, and binding posts or terminals 13 adapted to be connected respectively with the terminals of a Ruhmkorff coil which is commonly used in X-ray and work of various other and similar descriptions. The base a is also provided with a switch arm 14 pivotally mounted on the contact post 15 and adapted at its free end, through a suitable spring or otherwise, to make contact successively with the contact points 16, 17 and 18, which are also mounted on the surface of the base a, stops 19 being provided to limit the movement of the said switch arm 14. In similar positions on the opposite sides of the base a, we preferably employ posts b, b', adapted respectively to receive the blocks c, c', which are secured therein in the desired positions by means of set screws 20 21, respectively.

d represents an armature shaft whose ends are journaled in the blocks c, c', and adjacent to the post b, the shaft d is provided with flattened portions 22 for a purpose to be hereinafter specified.

In a suitable position, a fly-wheel e, preferably made of fiber or other insulating material, is mounted on the shaft d and embedded in the fly-wheel e is a laminated soft iron armature f which is also mounted on the armature shaft d, the parts of the armature f being secured together by means of screws 23 and the armature being secured to and within the fly-wheel and both these parts to the shaft d by means of the set screw 24.

h is an electro-magnet provided with terminals 25 fixed in the base a and this magnet h is preferably mounted on the said base at such a height that when the armature f is in a horizontal position, it is in alinement with the core 26 of the magnet h. We also prefer to employ an auxiliary electro-magnet i, which is provided with terminals 27 mounted on the base a. The auxiliary electro-magnet, employed for starting purposes,—as will be hereinafter described,—is mounted on the base a in a position appreciably higher than the electro-magnet h and the core 28 of the magnet i is provided with a pole piece 29 preferably extending over approximately one-third the circumference of the fly-wheel e.

Adjacent to the post b and also to the flattened portion 22 of the armature shaft e, we provide a post k, whose upper portion is recessed, providing for the arms 30, 31, between which a block l is adapted to be received. This block l is provided with a circumferential recess 32 into which and through the arms 30, 31, a binding screw 33 is passed to secure the block l in the desired position in the post k, which for this purpose is centrally and longitudinally slotted as indicated at 34.

m is a contact shaft provided at one end with a movable contact n whose outer face is flat and whose inner portion n' is conical and provided with an irregular surface in order that so far as possible, the heat generated in this contact, may be readily dissipated. The contact shaft is passed through the block l and is journaled therein and surrounding the same and extending between the conical portion n' and the adjacent end of the block l, we employ a helical spring 35.

The contact shaft m is reduced at its opposite end as indicated at 36, and a bearing plate o, preferably of fiber or other insulating material to which is secured a contact plate r, is passed over the reduced end 36 of the contact shaft m and these parts are secured in position thereon by means of the nut 37 turned down on the screw-threaded extremity of the reduced end 36 or otherwise.

The parts immediately hereinbefore described, are so placed that the contact shaft m is at right angles to the armature shaft d and in such a position that the flattened portion 22 of the shaft d is adapted to come into contact with the lower portion of the plate o, so that in the turning of the shaft d, the movable contact n through the shaft m and plate o, is moved to the left in each quarter turn of the armature shaft from the position shown in Fig. 6 to the position at right angles thereto shown in Fig. 10, and in each succeeding quarter turn of the armature shaft d, the movable contact n through the shaft m, is returned to the position shown in Fig. 6, by means of the action of the spring 35, whereby a right line reciprocating movement is imparted to the said contact. In order to maintain the proper vertical position of the plate o, we prefer to employ a guide rod 38 secured in the block l and passing freely through an aperture made therefor in the plate o, and the contact plate r is provided with a binding post 39, to which by means of the nut 40 or otherwise, the extremity of the wire 41 is electrically connected. t is a post also mounted on the surface of the base a and centrally slotted, providing the arms 42, 43, between which and in alinement with the movable contact shaft m, an adjusting screw v is mounted. One extremity of the adjusting screw v is provided with a thumb-piece v' by which the same may be turned and at the other extremity the adjusting screw is provided with a stationary contact w of the same diameter and preferably of the same material as the movable contact n whose adjacent faces are adapted to come together and be separated,—making and breaking the electric circuit. The adjusting screw v may be secured in the desired position in the post t by means of a clamp screw 44 provided with the thumb-piece 45, by which the same may be turned, and the adjusting screw v may be provided at either side of the post t with rings or collars v^2, providing for the maximum and minimum adjustment of the period of interruption, at a given speed of the shaft d. As is shown in Fig. 6, we also prefer to provide the adjusting screw v with a bore 46, extending entirely through the same and also through the stationary contact w for the purpose of providing for circulation of air currents for the dissipation of the heat, so far as the same is possible, generated in the stationary contact w.

In the operation of the hereinbefore described interrupter apparatus, for use for instance in X-ray work, the lead wires from the source of electricity are connected to the posts 11, the condenser is connected across the post 12 and the Ruhmkorff coil across the terminals 13, as hereinbefore stated. Then in the position of the parts as indicated in Fig. 1, the various circuits are all open, due to the fact that the switch arm 44 is over the blank contact 16. Now upon moving the contact arm to bear against the contact 17, it will be apparent,—assuming the left binding post 11 is positive,—that the current from the source of electricity will pass by way of the wire 47 to the binding post 13, wire 48, switch arm 14, wire 49, through the auxiliary electro-magnet i and by way of the wires 50 and 51 to the negative or right hand binding post 11. Now it will be apparent that if the armature f is in the position shown in Figs. 1 and 2, or a position at right angles thereto, that the energizing of the magnet h will have no effect thereon. If however, the armature f is in any other than one of these four positions,—the energizing of the magnet h will impart an impulse to the armature f tending to turn the same to the position at right angles to that shown in Figs. 1 and 2. Now it will also be manifest that upon energizing the auxiliary magnet i by passing the current through the same by means of the circuits hereinbefore named, that due to the peculiar shape and extent of the pole-piece 29 at the extremity of the core 28 of the auxiliary magnet i, when the armature f happens to become stationary at the position shown in the drawing or the one at right angles thereto, that this energization of the auxiliary magnet will cause the armature f to move from either position and hence to assume a position in which the same will be affected by energizing the magnet coil h. Hence this auxiliary magnet coil i is only thrown into the circuit in starting the apparatus and may or may not be necessary in causing the apparatus to be self-starting, depending as explained, upon whether the armature f has become stationary in the position shown or that at right angles thereto, or in any one of the innumerable other positions. Now in moving the contact arm 14 still further to the right, so that the same bears against the contact 18, the electric circuits will be as follows:—by way of the wire 47, binding post 13, wire 48, contact arm 14, wire 52, through the magnet coil h, wire 53, wire 41, through the movable and stationary contacts n and w respectively, the wire 54, wire 51, to the right hand or negative binding post 11,—it being noted that inasmuch as the Ruhmkorff coil is connected across the posts 13, that in this circuit, this coil and the magnet coil h are connected in multiple with each other. The energizing of the coil h as hereinbefore explained, causes the turning of the shaft d through the armature f and in each revolution of the shaft d by means of the flattened portion 22, will cause two makes and breaks of the electric circuit through the contact points n and w and when the circuit is made at the said contact points, the magnet h and the Rhumkorff coil are in multiple, whereas when the circuit is broken at the said contact points, the magnet h and the Ruhmkorff coil are in series with one another, the circuit being as follows:—the wire 53, lower binding post 13, through the Ruhmkorff coil to the upper binding post 13, wire 48, switch arm 14, wire 52 to and through the magnet h, so that the self-induced current set up in the primary of the Ruhmkorff coil upon the discharge of the same, is dissipated in this circuit through the magnet h, whose winding is of high resistance comparatively to that of

the primary winding of the Ruhmkorff coil, whereby an additional impulse is produced and the number of interruptions increased through the greater speed at which the armature and its shaft *d* are thereby caused to rotate. It is also to be noted that the binding posts 12 are so wired that the condenser which may be employed is connected across the terminals of the contact points by wires 55, 56, and in order that the contacts *n* and *w* may have a maximum heat radiating capacity, we prefer to make these parts of silver.

We claim as our invention:

1. An interrupter for electric circuits, comprising a base, means for closing the electric circuit to be interrupted, a movable contact, means for imparting a reciprocating movement to the said movable contact, means whereby the last aforesaid means are made automatically operative upon the closing of the circuit by the first aforesaid means, and a stationary contact with which the said movable contact co-acts to make and break the electric circuit.

2. An interrupter for electric circuits, comprising a base, means for closing the electric circuit to be interrupted, a shaft, means for turning said shaft, means whereby the said means for turning the shaft are automatically started upon closing the circuit by the first aforesaid means, a movable contact, means for imparting a reciprocating movement to the said movable contact from the said shaft, and a stationary contact with which the said movable contact co-acts to make and break an electric circuit.

3. A mechanical interrupter for electric circuits, comprising a base, an armature, means for causing the armature to be self-starting, means for actuating the armature after the same has been started, a movable contact, means for imparting a reciprocating movement to the movable contact, a stationary contact, means for adjusting the position of the same and electrical connections to and from the parts aforesaid.

4. A mechanical interrupter for electric circuits, comprising a base, an armature, means for causing the armature to be self-starting, an electro-magnet for actuating the armature after the same has been started, a movable contact, means for imparting a reciprocating movement to the movable contact, a stationary contact, means for adjusting the position of the same and electrical connections to and from the parts aforesaid.

5. A mechanical interrupter for electric circuits, comprising a base, an armature, an auxiliary electro-magnet for starting the said armature, an electro-magnet for actuating the armature after the same has been started, a movable contact, means for imparting a reciprocating movement to the movable contact, a stationary contact, means for adjusting the position of the same and electrical connections to and from the parts aforesaid.

6. A mechanical interrupter for electric circuits, comprising a base, a fly-wheel, an armature embedded in the fly-wheel, a shaft upon which the said fly-wheel and armature are mounted, bearings for the said shaft, means for actuating the armature, a movable contact, means for imparting a reciprocating movement to the movable contact through the turning of said shaft, a stationary contact, means for adjusting the position of the same and electrical connections to and from the parts aforesaid.

7. A mechanical interrupter for electric circuits, comprising a base, a fly-wheel, an armature embedded in the fly-wheel, a shaft upon which the said fly-wheel and armature are mounted, bearings for the said shaft, means whereby the said armature is self-starting, an electro-magnet for actuating the said armature and its shaft after having been started, a movable contact, means for imparting a reciprocating movement to the movable contact through the turning of said shaft, a stationary contact, means for adjusting the position of the same, and electrical connections to and from the parts aforesaid.

8. A mechanical interrupter for electric circuits, comprising a base, a fly-wheel, an armature embedded in the fly-wheel, a shaft upon which the said fly-wheel and armature are mounted, bearings for the said shaft, an auxiliary electro-magnet for starting the said armature, a magnet for actuating the armature after having been started, a movable contact, means for imparting a reciprocating movement to the movable contact through the turning of said shaft, a stationary contact, means for adjusting the position of the same, and electrical connections to and from the parts aforesaid.

9. A mechanical interrupter for electric circuits, comprising a base, a movable contact, a stationary contact, means for normally maintaining the movable contact against the stationary contact, means for moving the movable contact away from the stationary contact against the action of the aforesaid means, and means for adjusting the position of the stationary contact in relation to the movable contact.

10. A mechanical interrupter for electric circuits, comprising a base, a contact shaft, a contact secured to one end of the said contact shaft, a block in which the said contact shaft is journaled, a post in which the said block is fixed, means for imparting a right line reciprocating movement to said contact and contact shaft, a stationary contact and means for adjusting the position of the same relatively to the aforesaid contact.

11. A mechanical interrupter for electric circuits, comprising a base, a contact shaft, a contact secured to one end of the said contact shaft, a block in which the said contact shaft is journaled, a post in which the said block is fixed, a spring surrounding the said contact shaft and extending between the said contact end thereof and the adjacent end of the said block, a plate secured to the opposite end of the said contact shaft, a contact on the said plate, means for engaging the said plate and co-acting with the said spring to impart a right line reciprocating movement to the said contact shaft and contact, a stationary contact and means for adjusting the position of the same relatively to that of the aforesaid contact.

12. A mechanical interrupter for electric circuits, comprising a base, a contact shaft, a contact secured to one end of the said contact shaft, a block in which the said contact shaft is journaled, a post in which the said block is fixed, a spring surrounding the said contact shaft and extending between the said contact end thereof and the adjacent end of the said block, a plate secured to the opposite end of the said contact shaft, a contact on the said plate, means for engaging the said plate and co-acting with the said spring to impart a right line reciprocating movement to the said contact shaft and contact, a second post, a hollow adjusting screw mounted in the said second post in alinement with the said contact shaft, a contact secured to the end of the said adjusting screw and means for securing the said adjusting screw and its contact in position in the said second post.

13. A mechanical interrupter for electric circuits, comprising a base, a shaft having a flattened portion, bearings for the said shaft, means for actuating the said shaft, a contact shaft, a contact secured to one end of the said contact shaft, a block in which the said contact shaft is journaled, a post in which the said block is fixed, means co-acting with the flattened portion of the said shaft for imparting a movement in one direction to the said contact and contact shaft, means for moving the said contact and contact shaft in the opposite direction, a stationary contact and means for adjusting the position of the stationary contact relatively to the aforesaid contact.

14. A mechanical interrupter for electric circuits, comprising a base, an armature shaft having a flattened portion, bearings for the same, an armature mounted on the said armature shaft, an electro-magnet for actuating the said armature shaft through the said armature, a contact shaft, a contact secured to one end of the said contact shaft, a bearing for the said contact shaft, means co-acting with the flattened portion of the said armature shaft for imparting a right line movement in one direction to the said contact and contact shaft, means for imparting a movement in the opposite direction to the said contact and contact shaft, a stationary contact and means for adjusting the position of the same relatively to the aforesaid contact.

15. A mechanical interrupter for electric circuits, comprising a base, an armature shaft having a flattened por-

tion, bearings for the same, an armature mounted on the said armature shaft, an auxiliary electro-magnet for insuring the self-starting of the armature shaft, an electro-magnet for actuating the said armature shaft through the said armature, a contact shaft, a contact secured to one end of the said contact shaft, a bearing for the said contact shaft, means co-acting with the flattened portion of the said armature shaft for imparting a right line movement in one direction to the said contact and contact shaft, a stationary contact and means for adjusting the position of the same relatively to the aforesaid contact.

16. A mechanical interrupter for electric circuits, comprising a base, a movable contact, means for imparting a reciprocating movement to the movable contact, a stationary contact, means for adjusting the position of the same relatively to that of the movable contact and means for determining the maximum and minimum adjustment of the said movable contact.

17. A mechanical interrupter for electric circuits, comprising a base, a movable contact, a stationary contact, means for normally maintaining the movable contact against the stationary contact, means for moving the movable contact away from the stationary contact against the action of the aforesaid means, means for adjusting the position of the stationary contact in relation to the movable contact and means for determining the maximum and minimum adjustment of the said movable contact.

18. A mechanical interrupter for electric circuits, comprising a base, a contact shaft, a silver contact secured to one end of the said contact shaft, a block in which the said contact shaft is journaled, a post in which the said block is fixed, a spring surrounding the said contact shaft and extending between the said silver contact end thereof and the adjacent end of the said block, a plate secured to the opposite end of the said contact shaft, a contact on the said plate, means for engaging the said plate and co-acting with the said spring to impart a right line reciprocating movement to the said contact shaft and silver contact, a second post, a hollow adjusting screw mounted in the said second post in alinement with the said contact shaft, a silver contact secured to the end of the said adjusting screw and means for securing the said adjusting screw in its silver contact in position in the said second post.

Signed by us this 16th day of January, 1907.

REINHOLD H. WAPPLER.
CHARLES F. FAYER.

Witnesses:
A. H. SERRELL,
B. M. ALLEN.