(No Model.) 5 Sheets—Sheet 1.

T. M. FOOTE.

TELEGRAPHY.

No. 270,775. Patented Jan. 16, 1883.

Fig. 1.

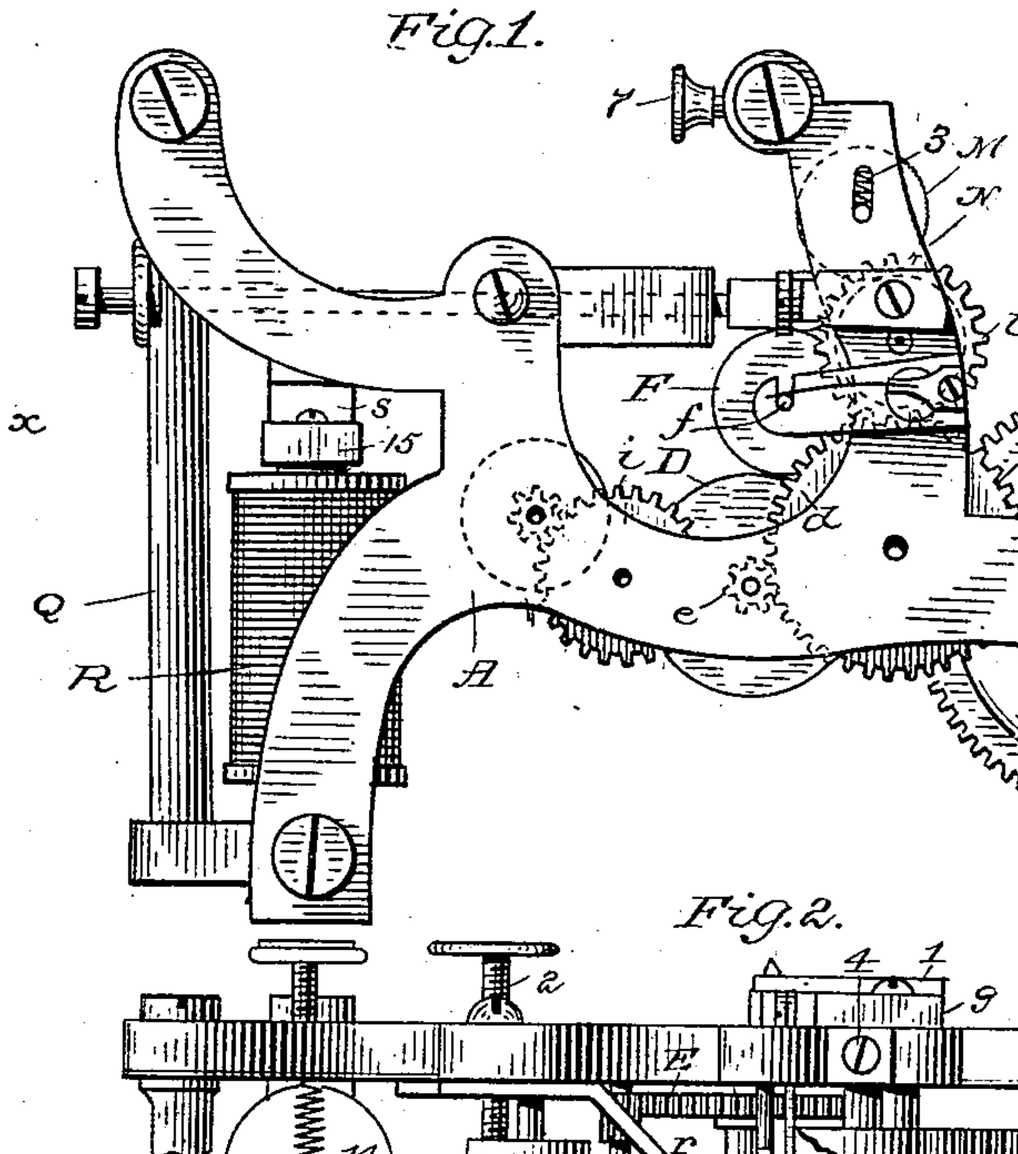


Fig. 2.

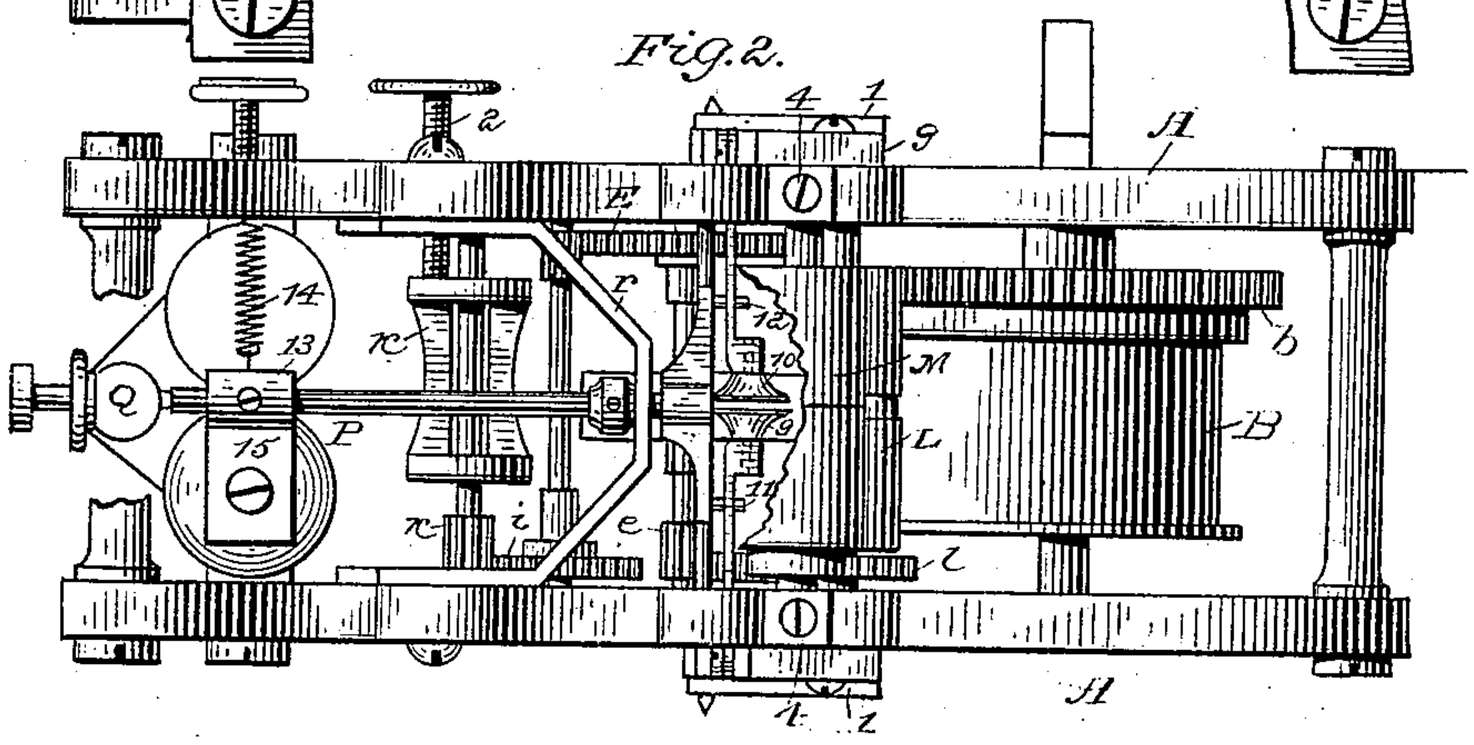
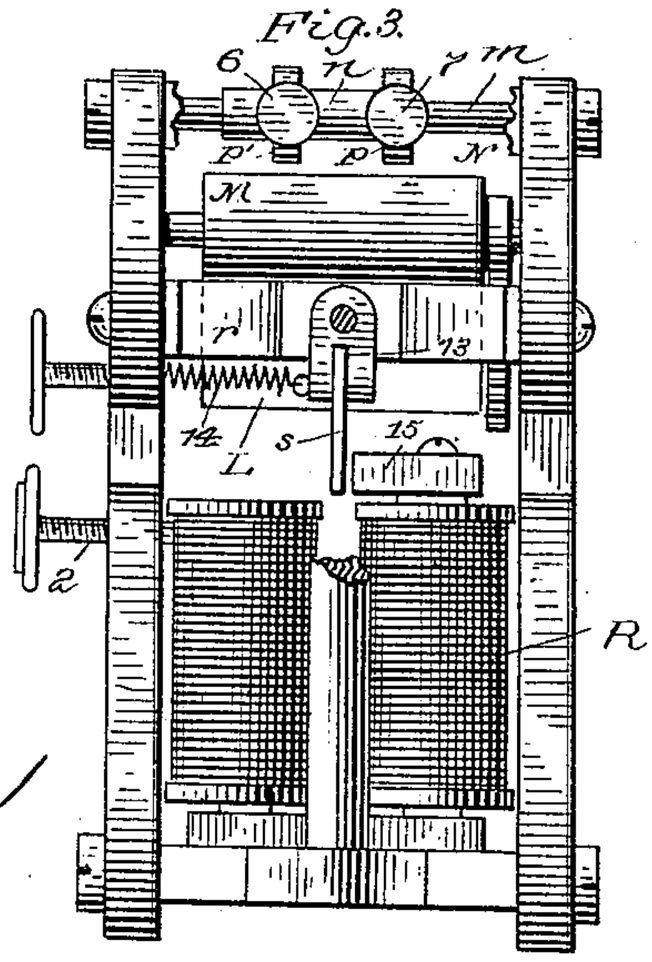


Fig. 3.



Attest:
Walter S. Truesdow
F. L. Middleton

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by
Elec. Sheen
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(No Model.)

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T. M FOOTE.

TELEGRAPHY.

No. 270,775. Patented Jan. 16, 1883.

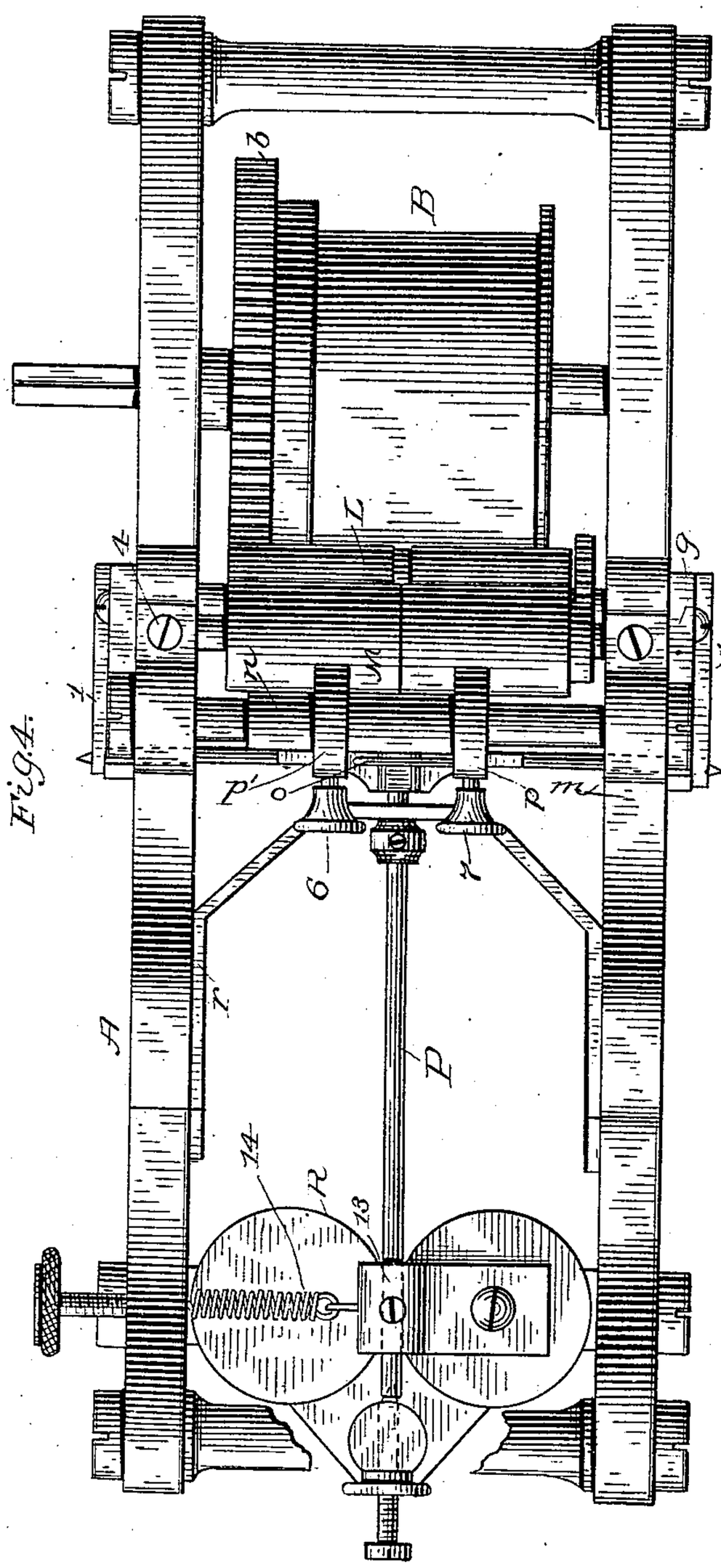

Fig 4.

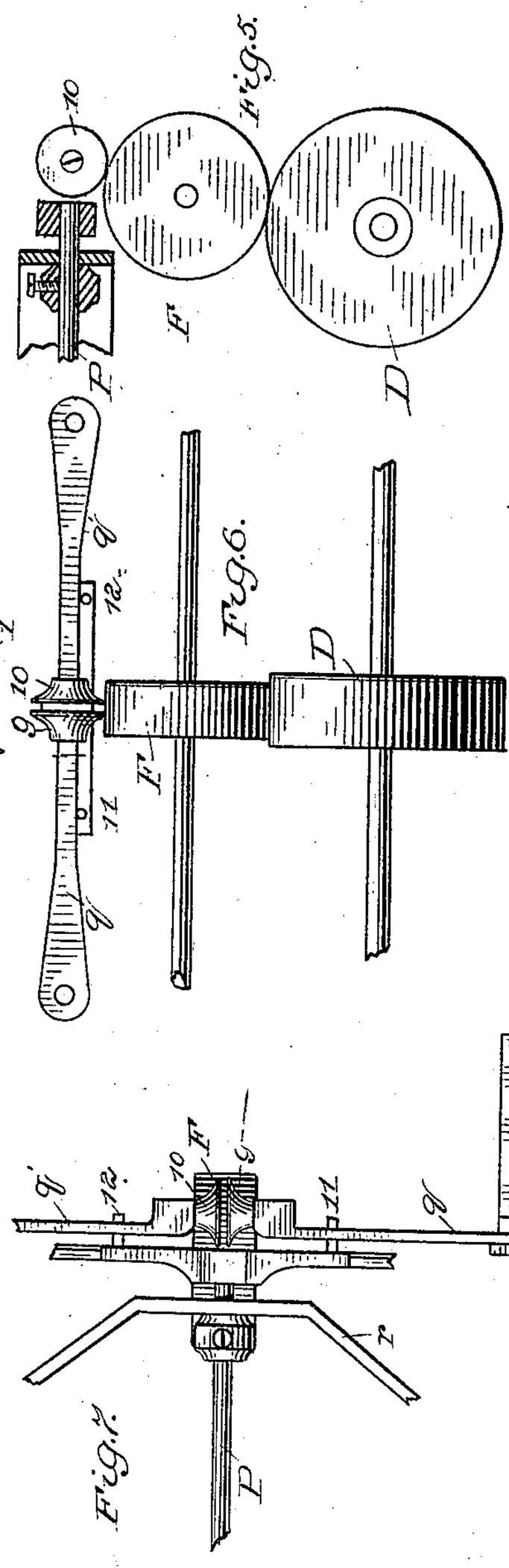

Fig 6.

Fig 5.

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(No Model.)

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TELEGRAPHY.

No. 270,775. Patented Jan. 16, 1883.

Fig. 8.

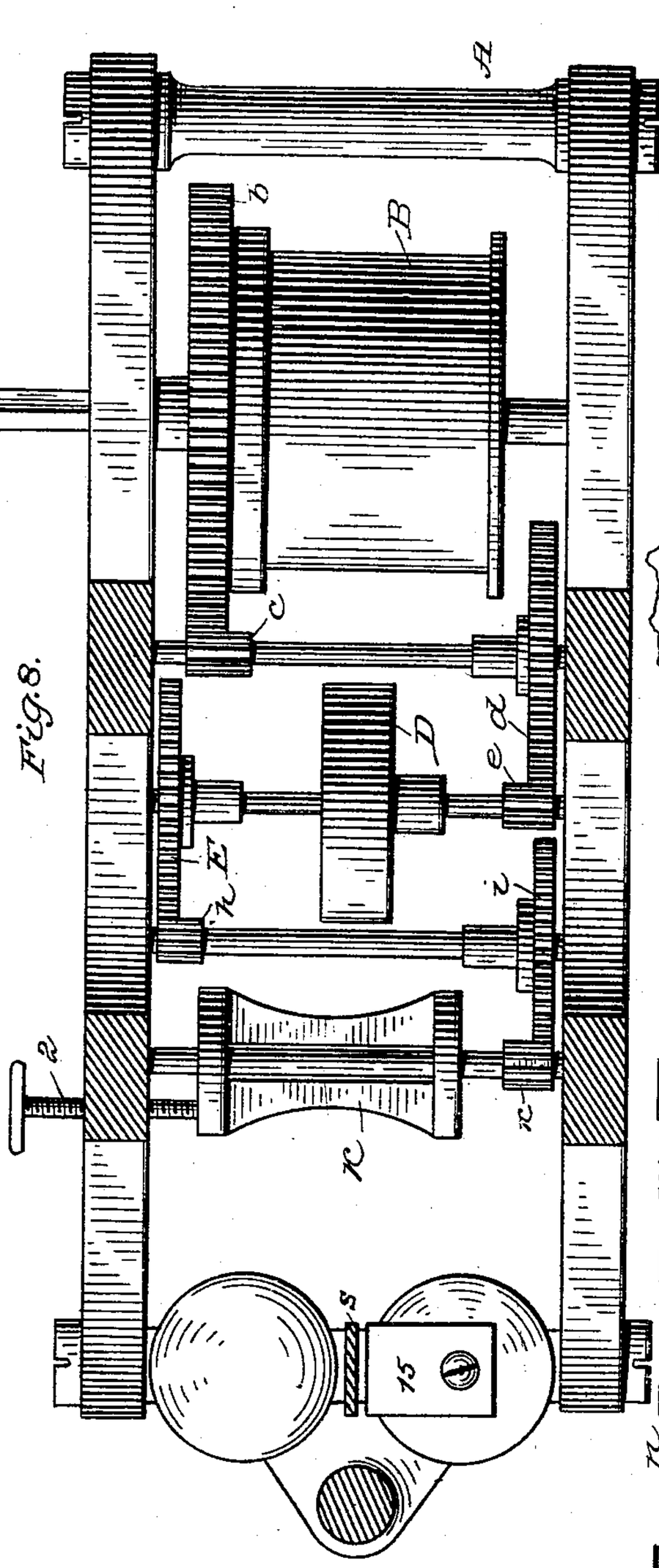


Fig. 9.

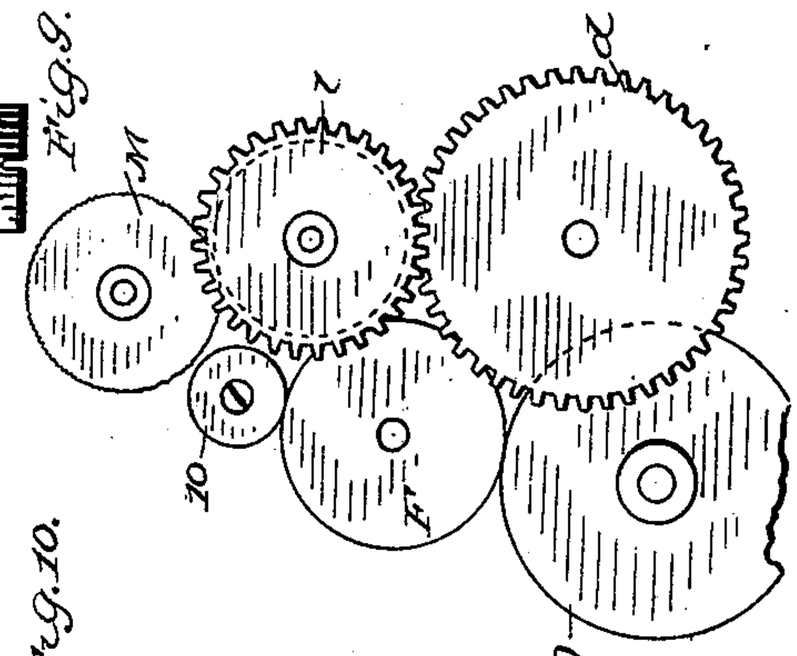


Fig. 10.

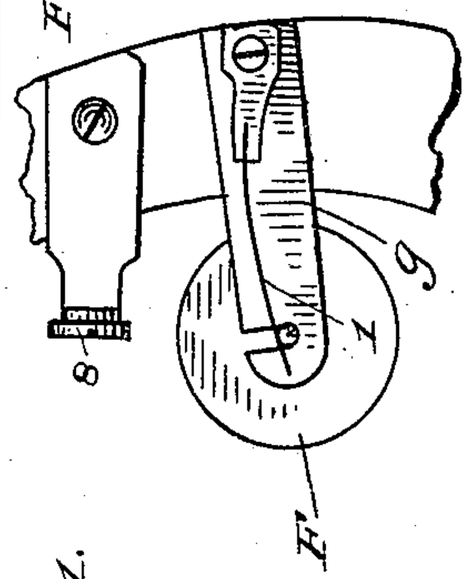
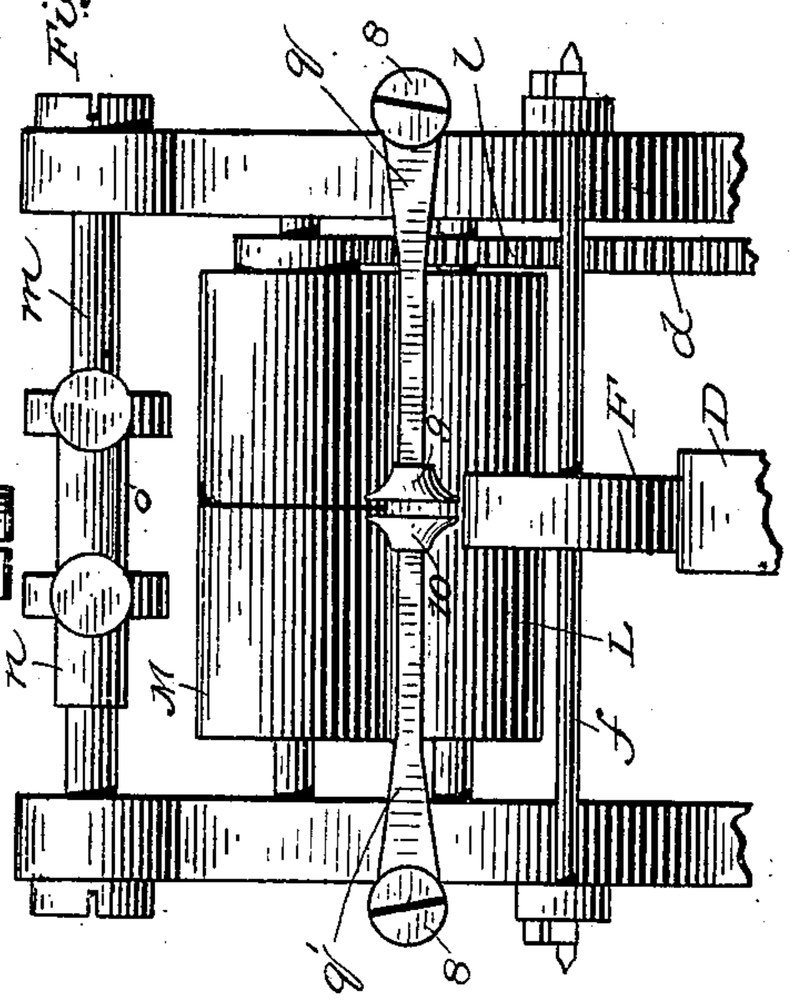


Fig. 11.



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No. 270,775. Patented Jan. 16, 1883.

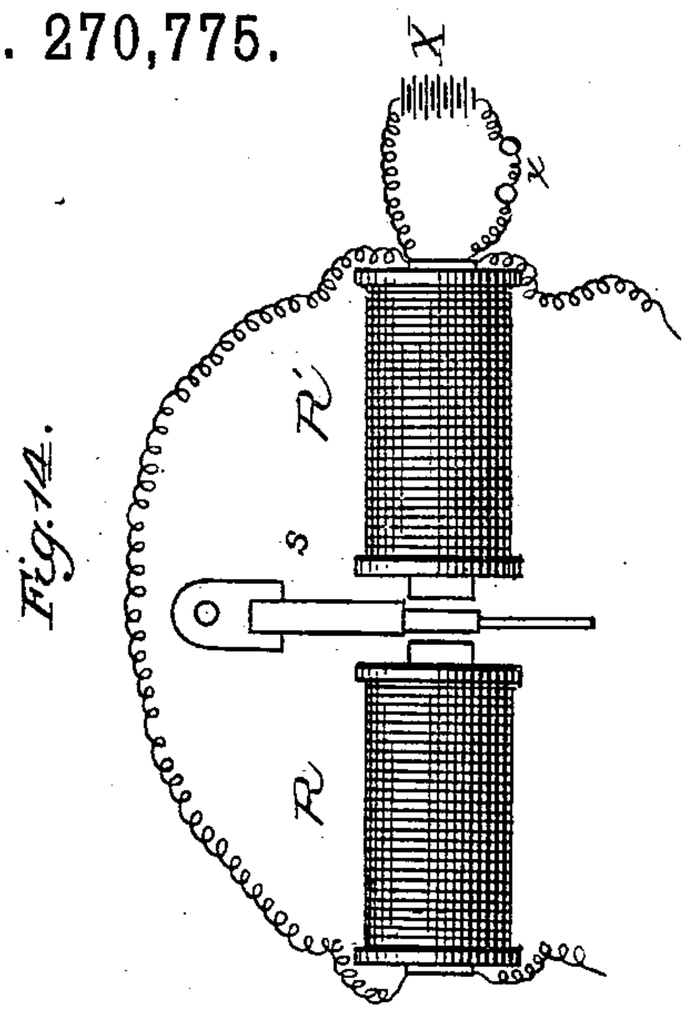

Fig. 14.

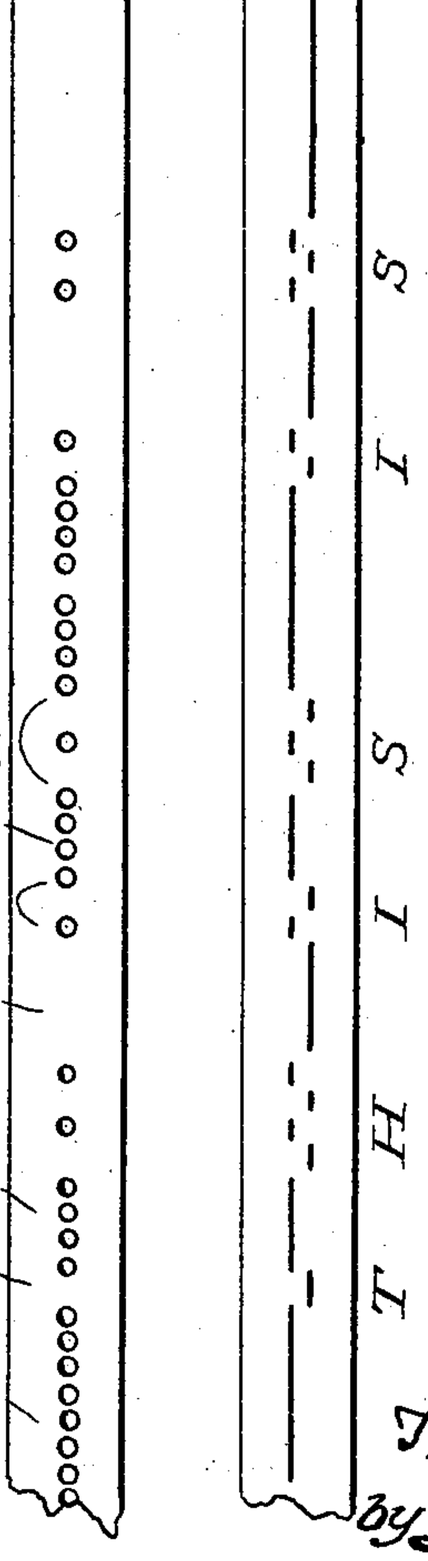

Fig. 13.

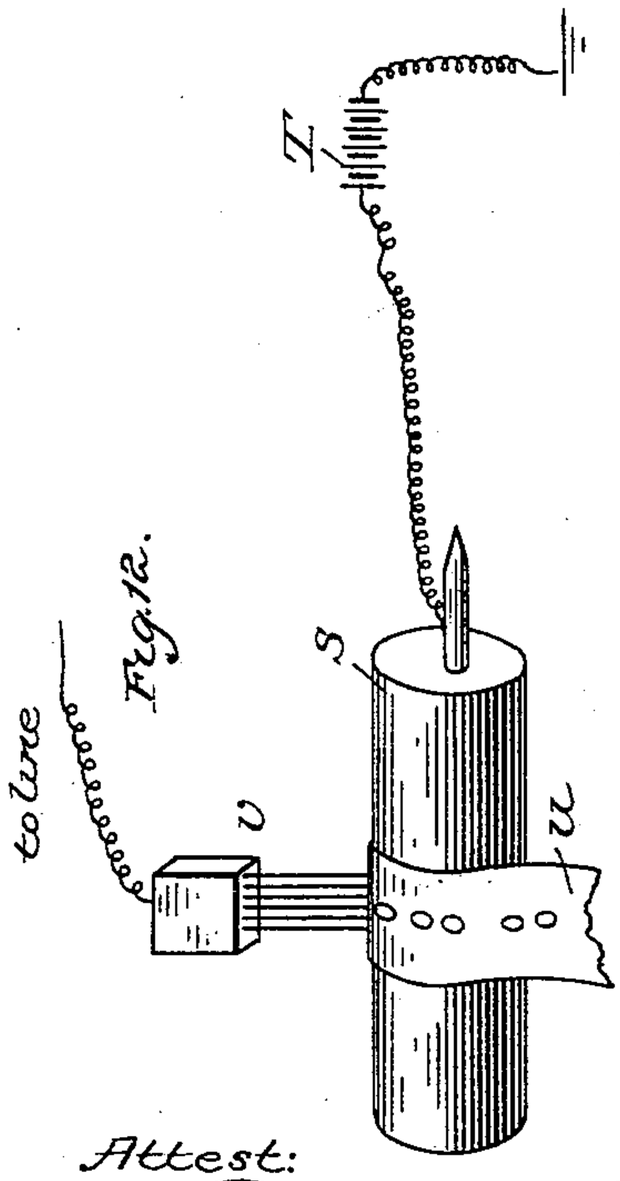

Fig. 12.

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(No Model.)

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TELEGRAPHY.

No. 270,775. Patented Jan. 16, 1883.

Fig. 15.

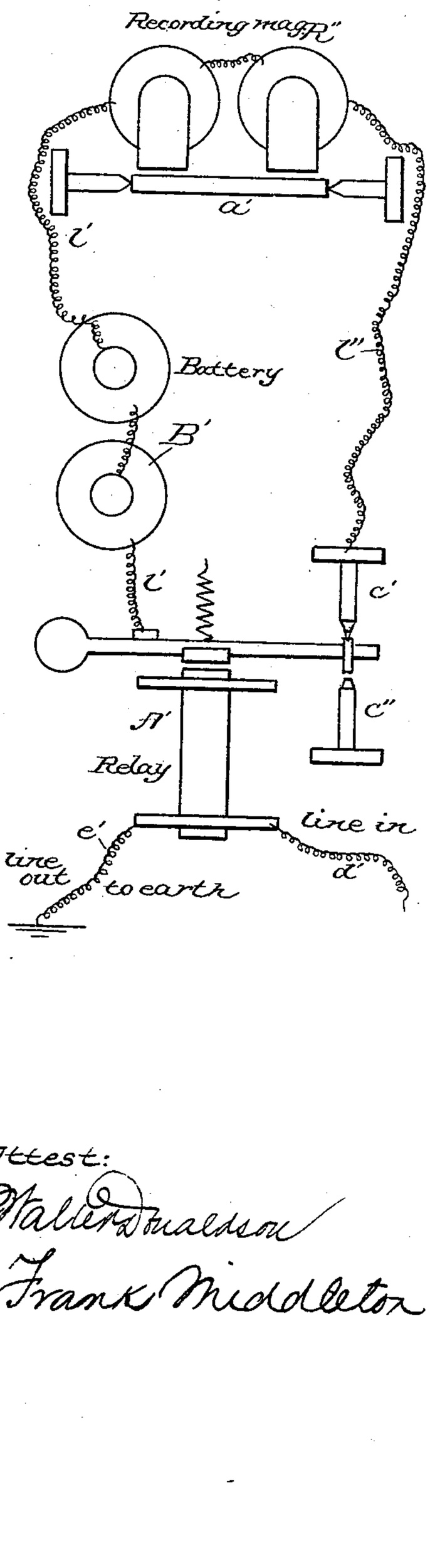
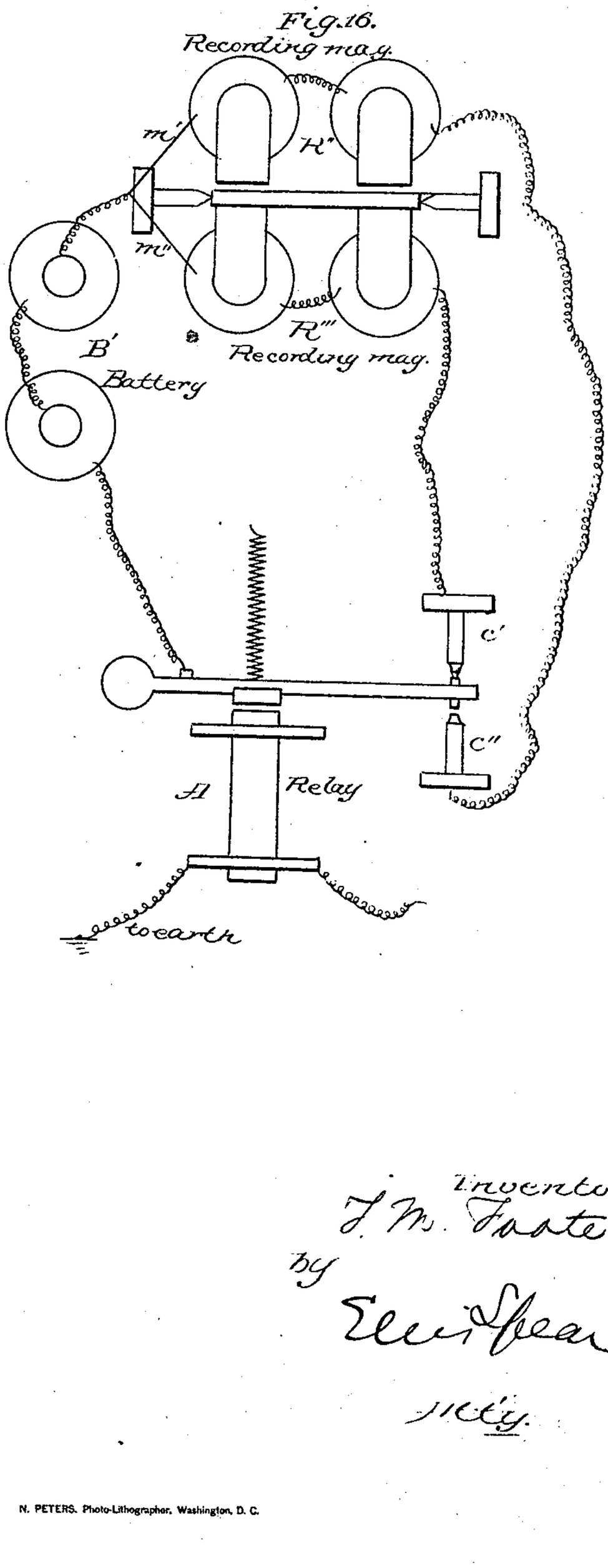


Fig. 16.



Attest:
Walter Dwaldson
Frank Middleton

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UNITED STATES PATENT OFFICE.

THEODORE M. FOOTE, OF NEW YORK, N. Y.

TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 270,775, dated January 16, 1883.

Application filed April 27, 1882. (No model.)

To all whom it may concern:

Be it known that I, THEODORE M. FOOTE, of New York, in the county of New York and State of New York, have invented a new and Improved System of Telegraphy; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to a system of electro-telegraphy, which I prefer to distinguish by the name of "Foote's telegraph system," to a form of perforated fillet, and to an ink writer or recorder adapted to this system.

It consists of a receiving-instrument, of construction hereinafter described, in which two pens are operated alternately, one by electrical impulse over the line and the other by a local force, whereby impulses of a single polarity transmitted over the line are utilized to make a record in dots and dashes on one line, while other dots and dashes, constituting the other part of the complete record, are made in the intervals between the impulses aforesaid.

It consists, further, of an improved fillet adapted to be used in connection with the said receiving or recording instrument.

In automatic telegraphy in which an ink record is made, and which has certain advantages over the chemical system, not necessary to specify here, it has been found necessary to use alternate impulses of opposite polarity to operate the inking devices and to prevent tailing. This requires at least one impulse for every recorded mark.

My object is to cause impulses of a single polarity to operate one inking or marking device, and at the same time to cause the recording-instrument, by means of the breaks, to record dots and dashes in another line upon the fillet, the two lines, one caused by the current and the other by the breaks in the same instrument, composing a complete and intelligible record. I thus reduce the work of the transmitting-instrument and double the speed of the apparatus. The general plan by which I accomplish this result includes a recording-instrument in which both inking devices are adapted to be brought alternately into contact with the paper, one remaining in contact when not moved by an electrical impulse, and the other brought into contact with the paper by said impulse, which at the same time moves the first out of contact. It includes, further, a transmitting-fillet perforated in one line by a system of holes, in which system single holes or groups of holes are arranged with interposed blank spaces between holes or groups of holes, these blank spaces in the fillet being of such length as to cause the inking device operated by the break, or during the interval of the break, to be composed of lines of the same length as the lines caused by the impulses transmitted by the holes or groups of holes. In other words, the record is made up of a single line or row of holes in which a single hole transmits an impulse to form a dot upon the fillet moving under the inking device at uniform and regulated speed in the receiving-instrument; or a group of holes placed closely together, so as to transmit practically a continuous impulse, records in like manner a dash corresponding in length to the length of the group, while the spaces between said groups cause breaks, during which the receiving-instrument is, so to speak, self-recording, the short breaks, caused by the short spaces, forming on the receiving-fillet dots, while the long breaks, caused by the long spaces, form dashes corresponding in length to the length of the spaces. This will be described more fully hereinafter, and is illustrated in the drawings.

In the accompanying drawings, Figure 1 shows a side elevation of the receiving-instrument. Fig. 2 shows a top view of the same, with a part broken away. Fig. 3 is an end elevation. Fig. 4 is a top view enlarged. Figs. 5, 6, and 7 show details of construction. Fig. 8 is a horizontal section on line *x x* of Fig. 1. Figs. 9, 10, and 11 represent details. Fig. 12 shows a suitable form of transmitter; Fig. 13, the fillet with its perforations, and with the record in a line parallel therewith, each mark being made opposite the perforation or group of perforations and the spaces by which they are caused. Fig. 14 is a modification. Fig. 15 is a diagram illustrating a method of working the system herein described on a local circuit with a single set of magnets and springs. Fig. 16 is a similar diagram, showing the method of working the system on a local circuit with two sets of recording-magnets.

In these drawings, A A represents any suit-

able frame-work on which the working parts of the instrument are supported.

A drum, B, adapted to be moved by a weight or spring, is fixed on a shaft with a main cogged drive-wheel, *b*, and through a train of gearing, *c d e*, drives a shaft having its bearings in the frame, and carrying a wheel, D, on which the inking-roller F bears, and by which it is turned. The inking-roller is on a shaft, *f*, the ends of which are held in slotted arms *g*, Figs. 1 and 10, and they are pressed down by light springs 1, by means of which the roller is held in proper working contact with its drive-wheel D.

Upon the shaft of the wheel D is a cogged wheel, E, which, through a train of gearing, *h*, *i*, and *k*, drives a fly, K. A set-screw, 2, passed through a threaded hole in the frame, may be brought to bear against the wheel, which forms one end of the fly, to stop the machine. The devices above described serve to move the inking-roller and to regulate the speed.

In order to move the paper fillet, I provide rollers L and M. The lower, L, has a pinion, *l*, upon its shaft, gearing into the pinion *d*, and receiving motion therefrom. Its bearings are in the standards N. The roller M is in contact with L, the ends of its shaft projecting into slots in the standards N, as shown in Fig. 1. It is pressed down by means of springs 3, the tension of which is regulated by screws set vertically into the ends of the standards, above the springs, as shown at 4 in Fig. 2. The rollers are finely milled to take proper hold of the paper. Mounted in the same standards, above this pressure-roller M, is a shaft, *m*, upon which is a loose sleeve, *n*. This sleeve has at one end a fixed collar, *p*, carrying a pin, *o*, projecting parallel with the sleeve and near to it. Near the other end of the sleeve is a collar, *p'*, loose thereon. The collar *p'* is held to the sleeve by means of a set-screw, 6, and the sleeve is held to the shaft *m* by another set-screw, 7, passing through the collar *p*. These devices guide the fillet to the pens, and the construction described permits lateral movement of the collars to adjust them to different widths of the strip. They may be turned upon the shaft *m* to bring the pin *o* into any proper position suitable to properly hold the paper.

The pens are carried upon arms *q q'*, pivoted at 8 8. They consist of wheels 9 10, adapted to turn freely on said arms. They are shown more clearly in Fig. 11. They have very slight vertical movement between the roller M and the inking-roller, touching on each side of the central peripheral line thereof, slightly in the rear. They are operated by means of arms 11 12 on a rock-shaft, P, by means of pins set in said arms and projecting underneath the arms *q q'*. This shaft is supported in a bent bar, *r*, fixed to the frame in a post, Q, at the end. It is provided with an armature, *s*, set in a block, 13, fixed to the rock-shaft. This armature, when not acted upon by the magnet, is drawn to one side by means of a spring, 14, which connects it to a thumb-screw in the frame. A temporary magnet, R, is set in the frame, to the core of which is fixed a metal piece, 15, projecting toward the free end of the armature *s*, but leaving space for the vibration of said armature sufficient to give the shaft P the proper motion to move the pens from the inking-roller to the paper. The force of the spring 14 is so adjusted to that of the temporary magnet that the magnet will overcome the spring when under the full influence of the electrical current, but the spring will overcome the magnet when said current is materially diminished. The result of this construction is that the pen 10 on the arm *q'* remains in contact with the paper when the circuit in the line connected with the helix of the temporary magnet is broken, but will be removed from the paper when the circuit is closed, the arm *q'* falling by gravity as soon as the supporting-pin has dropped. This dropping of the pin, which raises and supports the pen 10, occurs when the pen 9 is lifted by the other pin and arm, 11, or when the pen 9 is brought into contact with the paper; but upon the cessation of the current, or when it is materially diminished in force, the constant force of the spring returns the pen 10 to the paper and holds it thereon until the spring is again overcome by the force of the temporary magnet, due to the closing of the circuit. Thus the pens may be made to touch the paper alternately, and may be held thereto for any length of time required, the one, which may be called the "line" pen, being held in contact by the current, and the other, which may be called the "spring" pen, being held in place by the spring during the breaks in the current, and as the duration of the makes and breaks may both be accurately determined in respect to their length both pens are alike under accurate control, and both may be made to record dots and dashes of a determined length. Further, as will now be apparent, the instrument is continually working, as well during the cessation of the current as during its continuance, the breaks forming that part of the record contained in one line, exactly as the makes form their proper record in the other, and the marks which go to make up the record are practically double the number of impulses sent.

The transmitter is of very simple and ordinary construction, and is illustrated in the diagram Fig. 12, in which S is an ordinary contact-drum in electrical connection with one pole of a battery, T, the other pole of which is connected to the earth. The fillet U passes over this drum and under the brush V, which is in electrical connection with the line.

The fillet U is shown in Fig. 13, in which the method of perforation is fully illustrated. The first letter represented, beginning upon the left, is the letter "T." The first group of perforations (marked 1) produces a long or

space dash by means of the line-pen, made opposite thereto. Next follows a space, (marked 2,) the length of which is to produce a single dash on the recording-fillet by means of the spring-pen, which indicates the letter T. Following this is a group of four perforations, so close to each other that the current transmitted thereby is practically continuous. This brings again into action the line-pen, causing the dash opposite to said group, and representing the space between the holes. After the group marked 4 is a short space, 5, interrupting the current long enough to permit the spring-pen to form the dash opposite thereto. This is succeeded by a single perforation, 6, causing the line-pen to make a dot in the other row—a perforation repeated to complete the four dots representing the letter "H." Then follows the blank space, alternating with the perforation and causing the spring-pen again to alternate with the line-pen, forming a space-dash opposite the 7. A perforation and short space (marked 8) cause the pens to operate successively and form two dots, representing the letter "I." The next spacing-dash alternates with the last dot, and is formed by a group of perforations, (marked 9.) After this group a short blank, a single perforation, followed by another short blank, (marked 10,) causes the receiving-instrument to record three dots, representing the letter "S." This is sufficient to illustrate fully the principle and mode of operation throughout the whole alphabet.

I have shown in the receiving-instrument a spring adapted to work alternately with the temporary magnet and in a contrary direction thereto; but a weight may be used for the same purpose.

Instead of a weight, I may use an additional temporary magnet as a local means for operating the spring-pen, without an impulse over the main line, as illustrated in Fig. 14. In this figure, R represents the temporary magnet, heretofore described, and *s* the armature upon the rock-shaft. R′ represents another temporary magnet, the helix of which is in the circuit of a local battery, X. The pole of the magnet R′ is located, as shown, so as to draw the armature *s* away from that of R, and to apply the pen 10 to the paper, the force of the battery X being sufficient for that purpose; but outside the helix of the magnet R, in the circuit of the local battery, is another coil reversely wound and placed in the line. A resistance, *x*, is placed in the circuit of the local battery, and the apparatus is so adjusted that the current from the line counterbalances the local battery and demagnetizes the core of R′ at the same instant that the core of R is rendered magnetic. When the line-circuit is broken the local circuit, which is always closed, resumes its action unchecked and instantly draws to itself the armature *s*, and during the break applies the pen 10. The action is in all respects the same as that described in connection with the spring.

The Diagrams 15 and 16 on Sheet 5 illustrate the method of working the system on a local circuit. In Diagram 15 a single set of recording-magnets is shown at R″, the armature of which, *a′*, is mounted upon pivots, and is to be moved one way by a spring, in the same manner as shown in the recording-instrument above described. The magnets are connected by a line, *l′*, to armature of relay A′, including a local battery, B′. The other end of the helix of the recording-magnets R″ is connected by the line *l″*, as shown in the figure, by a screw, to the back platinum point, *c′*, though it may, with the same result, be connected to the front point, *c″*. The magnet of the relay A′ is included in the lines *d′ e′*, the former of which is the "line in" and the latter the "line out," or to earth, according to the position of the station, whether terminal or immediate. If the local circuit is connected to the back relay-screw, then this circuit will be closed when the line is open and open when the line is closed. If the connection of the line *l″* be made with the front relay-screw, then the local circuit is closed when the line is closed and open when the line is open. In Diagram 16 the relay and the main connection are the same, and indicated by the same letters; but instead of the spring in the recorder I use a second set of magnets, R‴, one set being connected to the relay-screw of *c′* and the other to that of *c″*. The local battery B′ is connected to both sets of recording-magnets by wires *m′ m″*.

It will be understood from an arrangement shown in Diagram 16 that when the main line is closed the front relay-screw will complete the local circuit for one set of record-magnets, and the rear relay-screw will complete the local circuit of the other set of magnets when the line is closed. Thus the armature of the recorder is operated both on the opening and closing of the circuit of the main line.

Having thus described my invention, what I claim is—

1. In a receiving-instrument, two pens supported on suitable levers, adapted to form a record on the receiving-fillet in two lines, a temporary magnet in the line-circuit, mechanism, as described, intermediate between the pen-arms and the armature of the temporary magnet, whereby an electrical impulse over the line operates the said intermediate mechanism to apply one pen to the fillet, and mechanism, substantially as described, connected to said intermediate mechanism, adapted to apply the other pen in the intervals between the said electrical impulses.

2. In a receiving-instrument, two pens on suitable arms, a rock-shaft having arms adapted to operate on the pens alternately, an armature connected to said rock-shaft, a temporary magnet in the main line, adapted to operate through said armature on the rock-shaft to apply one pen to the fillet, and a spring or weight connected to the shaft and arranged

to operate the other pen in the intervals between the impulses.

3. In a receiver of substantially the class described, two pens arranged to form a record in two lines, a rocking shaft provided with arms acting on the pen-levers, and an armature, and a temporary magnet in the line-circuit, whereby the armature is drawn to one side when the circuit is closed and one pen applied to the paper, in combination with devices, substantially as described, acting, when the circuit is broken, to draw the armature in the opposite direction and apply the other pen, substantially as described.

4. A transmitting-fillet adapted to transmit in accordance with the described system, consisting of perforations and groups of perforations in one line, said perforations and groups of perforations being arranged in the fillet to transmit impulses of greater or less duration to form dots and dashes, and also consisting of interposed spaces fitted to cause breaks of different lengths adapted to the formation of dots and dashes on the receiving-fillet, said transmitting-fillet being combined and operating in connection with the transmitting-instrument, substantially as described.

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

THEODORE M. FOOTE.

Witnesses:
ROBT. A. MORRISON,
LOUIS SIMON.