(No Model.) 3 Sheets—Sheet 1.

S. P. FREIR.

AUTOMATIC TELEGRAPH.

No. 561,547. Patented June 2, 1896.

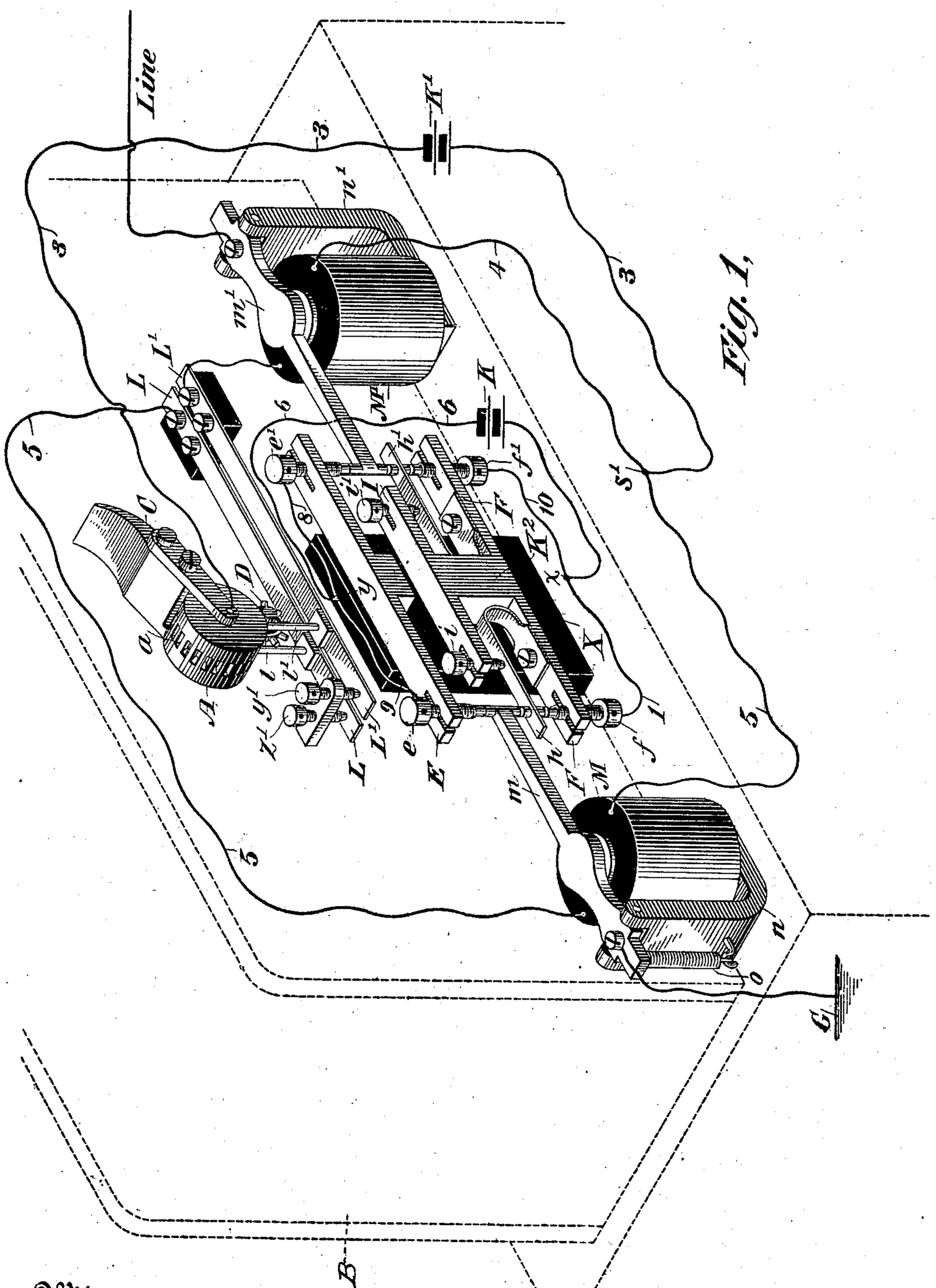

Fig. 1.

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Fig. 2,

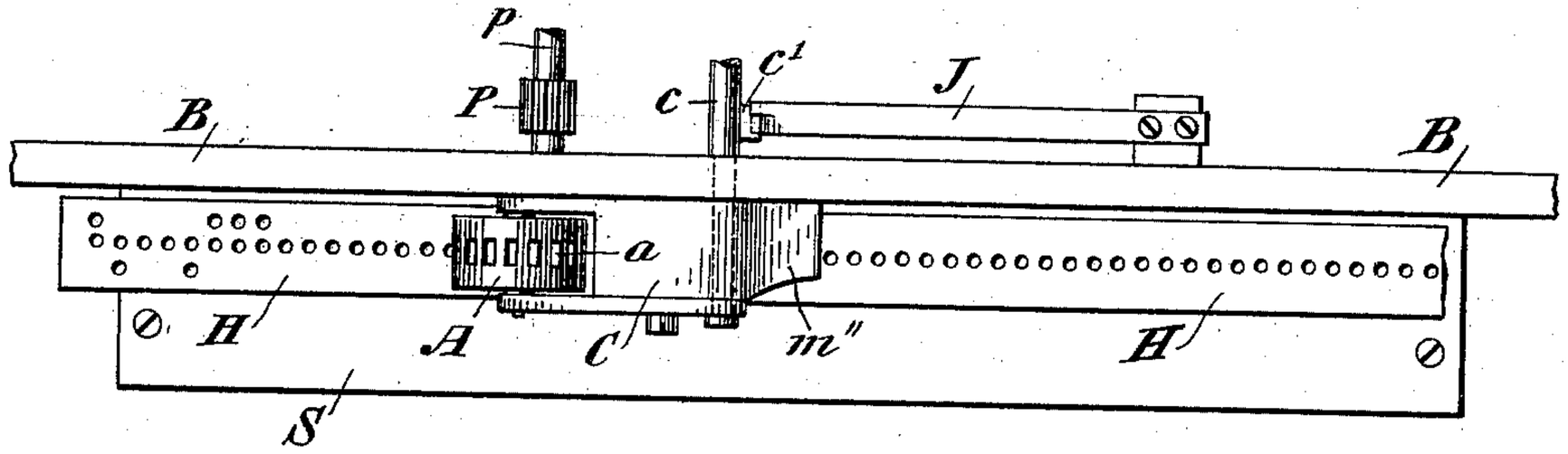

Fig. 3,

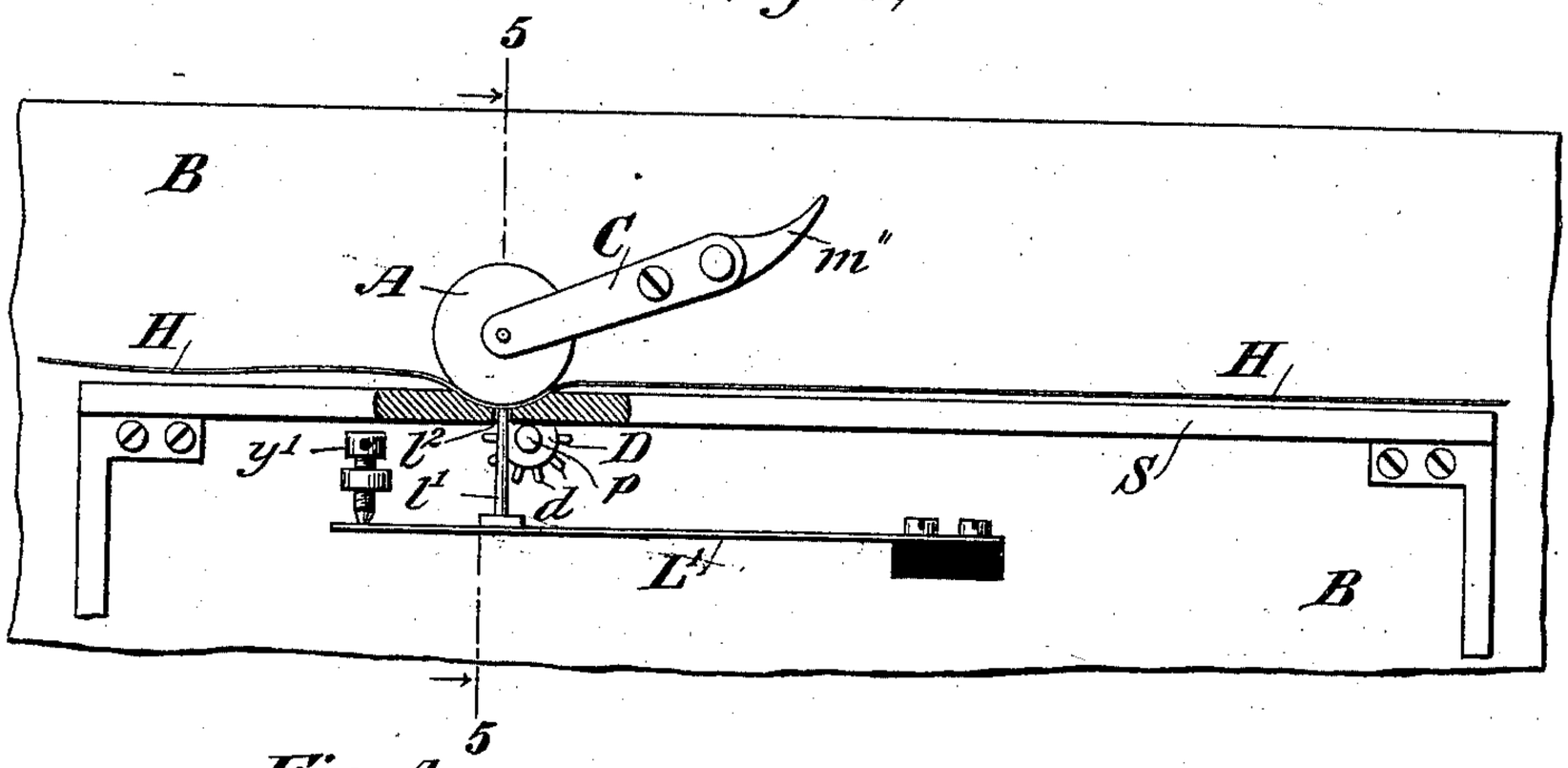

Fig. 4,

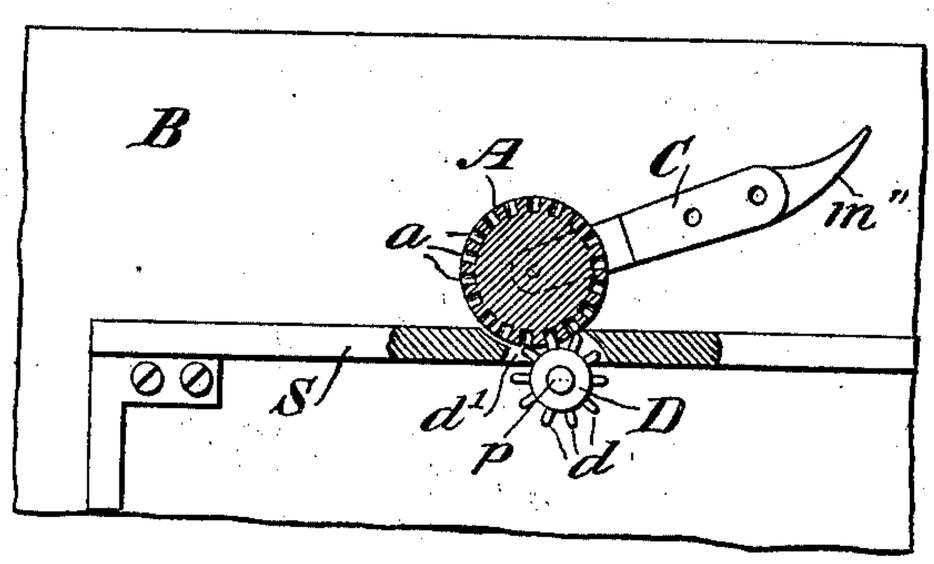

Fig. 5.

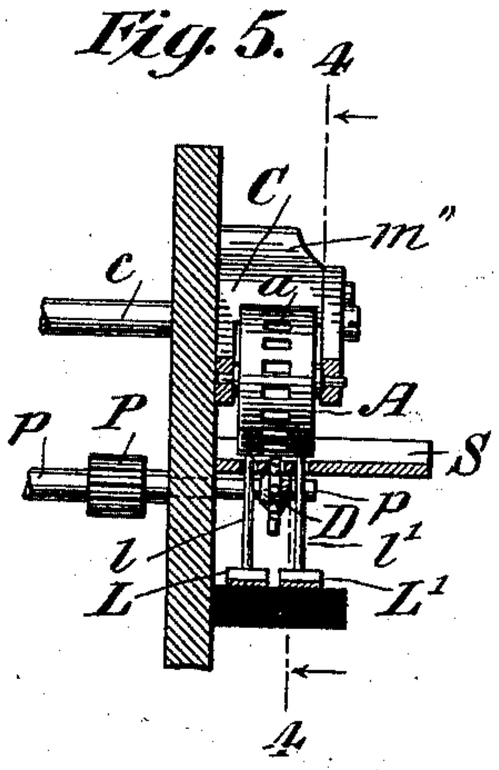

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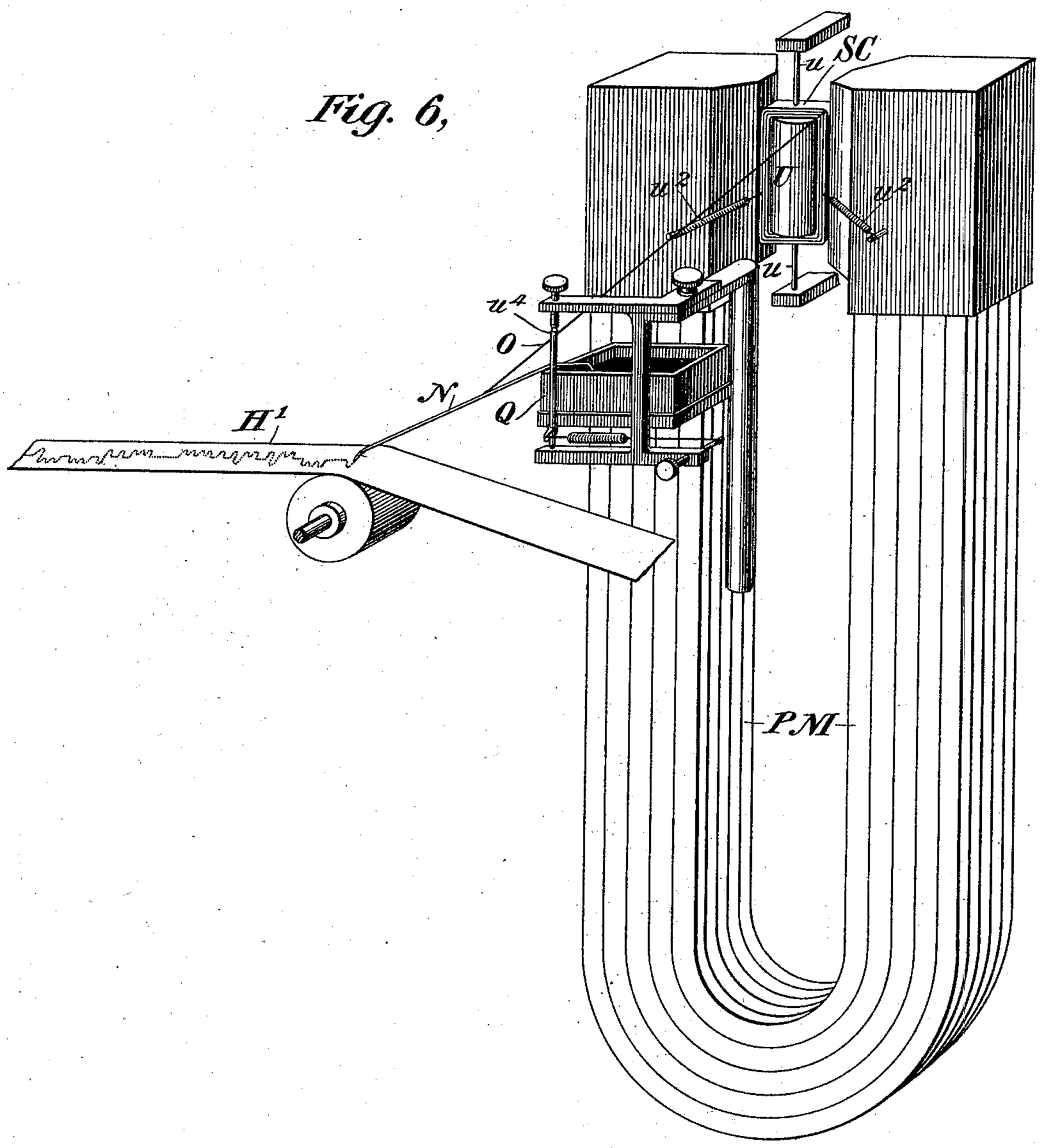
Fig. 6,



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UNITED STATES PATENT OFFICE.

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AUTOMATIC TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 561,547, dated June 2, 1896.

Application filed August 9, 1893. Serial No. 482,717. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL P. FREIR, a citizen of the United States, residing at Hasbrouck, Bergen county, State of New Jersey, have made a new and useful Improvement in Automatic Telegraphs, of which the following is a specification.

In long-line submarine telegraphy only the feeblest currents are used, and to make a telegraphic record a beam of light is thrown upon a screen in a dark room or a fragile pen is moved backward and forward across the middle line of a moving band of paper, thereby forming a wavy line, substantially as shown in Fig. 6. The signals for effecting such record have heretofore been manually transmitted by the manipulation of hand-keys.

My invention is particularly directed to an apparatus for automatically transmitting such signals; and to this end I have devised an arrangement in which a band of paper is employed with three longitudinal lines of perforations, the central line consisting of apertures of uniform frequency along the length of the paper, and it is by means of this range of perforations in combination with a feeding mechanism that the speed of the paper is controlled, while on either side of the central line of perforations is a row of holes intermittently arranged, those on one side corresponding with blank spaces on the opposite margin.

The perforations on one side of the strip of paper control a circuit-closer for sending positive currents to line, while the opposite row control negative transmissions. The undulations are not only irregular in form, but they are characterized by peculiarities due to the variable force applied to the transmitting-keys by the fingers of the operator; and it is the object of my invention to not only automatically send positive and negative pulses to actuate siphon-recorders, but also to give the automatic transmissions the appearance, as produced by the receiving-instrument, that they would have if they were sent manually. The peculiarities of hand transmission may possibly be regarded as defects rather than advantages; but it is desirable that they be reproduced in my automatic method, as it is largely through them that the signals are made intelligible to cable-operators.

In the accompanying drawings, Figure 1 is a perspective view representing the circuit connections and sending apparatus of my transmitter. Fig. 2 is a top view of a part of the transmitter, showing a fillet of paper and a part of the mechanism for controlling its feed movement. Fig. 3 is a side view of substantially the same parts, while Fig. 4 is a partial side view represented by the sectional lines 4 4 of Fig. 5, showing the paper-controlling mechanism. Fig. 5 is a sectional view through section 5 5 of Fig. 3, the paper-feeding device, however, being only in end view. Fig. 6 represents the ordinary siphon-recorder used on ocean-cables, in which I have shown a fillet of paper with a partially-recorded message sent by my automatic transmitter.

Referring to the drawings, B is a frame, within which is placed a clockwork or other suitable motor (not shown) for actuating my transmitting mechanism. Power is communicated from the motor to a shaft p by a pinion P, and upon the former is placed a small spur-wheel D, which is so arranged that its upwardly-projecting teeth come within the openings of the central row of apertures of the tape as the latter is passed between the contact-roller A and the concave space formed in the upper part of the shelf S. In this manner the paper fillet is fed along with a uniform speed by the driving action of the spur-wheel D, the teeth of which project through a space d' cut in the shelf S, thence through the paper and upwardly into the radial apertures a of contact-roller A, while the latter is pressed downward upon the paper under the force of a spring J. The free end of spring J presses upward against the toe c' of the shaft c, upon which is pivoted the bar C, upon whose free end is journaled roller A. The lever C on the opposite side of its pivot c is also provided with a thumb-piece m'', by means of which roller A may be raised at the pleasure of the transmitting-operator, and this device is necessary to enable the operator in case of error to return the strip of paper toward its initial position to rerun the message. The spur-wheel D and contact-roller A are com-

bined with two pins *l l'* or equivalent devices respectively mounted near the free ends of spring-bars L L'. These pins project upwardly through apertures l^2, Figs. 3 and 5, and upon the arrival of an aperture on one side or the other of the tape said pins alternately form metallic contact with wheel A under pressure from L or L'. Moreover, L L' also form contact, respectively, with set-screws *z' y'* at the left of said wheel. By this means electrical connection is closed not only through *l l'*, but as well through set-screws *z' y'* and springs L L', as said set-screws and roller A are both electrically connected to the metallic frame of the instrument. By means of a paper strip perforated, as shown in Fig. 2, it will thus be seen that electrical connection will first be made by way of pin *l*, spring L, and set-screw *z'*, and then by *l'*, spring L', and screw *y'*, while at times connection will be made through neither, as it often occurs in the formation of a message or signal that apertures are omitted on both margins of the tape. Electrical contacts could be made through pins *l l'* alone, but paper fiber is liable to be caught upon the ends and the electrical flow thereby impeded. I could also rely wholly upon screws *z' y'* for the electrical connection.

Referring particularly to Fig. 1, it will be seen that when an aperture comes within pin *l* and roller A a local electric circuit is closed from battery K' through wire 3, spring L, pin *l*, stop *z'*, wire 5, and electromagnet M. In this case the main-line circuit is closed from the distant station to armature *m'*, contact *e'*, wire 8, wire 6, battery K, point *x*, wire 7, anvil *f*, armature-lever *m*, to ground G, thus placing the zinc pole of the battery to line. On the other hand, if an aperture of the tape were to permit pin *l'* to come in contact with roller A a local circuit would be established, as follows: from pin *l'*, stop *y'*, spring L', electromagnet M, wires 4 3, battery K', roller A, and the bracket-supporting stops *z' y'*, and in this instance the main line from the distant station would be connected by armature-lever *m'*, anvil *f*, wire 10, battery K, wire 6, point *y*, wire 9, anvil *e*, armature-lever *m*, and earth G. In this case the copper pole of the battery is directed to the distant station. By this arrangement of batteries and apertures in the tansmitting-tape it is seen that positive and negative pulses may be transmitted to the distant station, and it is by this means that the wavy line is recorded by the siphon-receiver on either side of the central line of the receiving-paper.

The arrangement of anvils and contacts on either side of the armature-levers *m m'* are necessarily given a peculiar construction from the fact that it is desirable, as far as possible, to effect a variable-contact pressure corresponding with that produced by the fingers in manipulating transmitting-keys. For instance, as shown in Fig. 1, the insulating-piece X has mounted thereon a contact-bar E, within the ends of which are placed back contacts *e e'*, and beneath the bar is located a bracket device K^2, and upon the upper portion I are fixed contact-screws *i i'*, while upon the lower shelf F are mounted near its ends contact-screws *f f'*, and also springs *h h'*. Normally the armatures *m m'* are in an upper position in contact, respectively, with screws *e e'*. When, however, either of the armature-levers is depressed, it comes in contact with a spring before establishing rigid connection, and in the case of *m*, almost immediately upon leaving contact *e* in its downward stroke, it comes in contact with the anvil placed upon the end of the spring *h*, which in turn is forced against screw *f*. It is thus seen that after electrical contact is broken between *m* and *e* a circuit is first established between *m* and *f* through the length of the spring *h;* but finally a short circuit is formed through its upper and lower contacts. The same is also true respecting the operation of armature *m'* between its contacts.

In Fig. 6 is shown a siphon-recorder of the usual form, in which SC is a movable rectangular coil of fine insulated wire, mounted upon radial supports *u u* and surrounding a stationary soft-iron core U, the coil being free to oscillate in the annular space between the poles of a powerful permanent magnet PM and said core. The siphon-pen N is pivoted upon a vertical axis u^4 and is actuated by coil SC through fiber *o*. One end of the siphon is immersed in an ink-reservoir Q, while its opposite end is suspended in close proximity to a moving band of paper H', upon which a flow of ink is delivered, whereby the message is recorded during the backward and forward movement of the pen. The retractile springs u^2 u^2 are also attached to the rectangular coil and serve to return the latter to its central position after the passage of either a positive or negative current through said coil.

It is obvious that many variations of the apparatus above outlined may be employed without departing from the principle of my invention, and I therefore wish to broadly claim such apparatus in manner and form as follows:

1. In an automatic telegraph apparatus for transmitting messages to siphon or equivalent recorders, the combination of main-line transmitting apparatus by which the positive or negative pole of a battery or batteries may be directed to line, and variable-pressure main-line contact devices whereby the touch of the fingers in the manual transmission of messages of such character may be reproduced.

2. In an automatic telegraph apparatus for transmitting messages to siphon or equivalent recorders, the combination of local transmitting devices consisting of a paper tape provided with three rows of apertures and local relays, as set forth, and main-line transmitting devices having variable-pressure contacts which are brought into action respectively by the two marginal rows of per-

forations upon the transmitting-tape and by the local relays to transmit positive and negative pulses.

3. In an automatic telegraph apparatus for transmitting messages to siphon or equivalent recorders, the combination of local transmitting devices consisting of a paper tape provided with three rows of apertures and local relays, as set forth, and main-line transmitting devices which are brought into action respectively by the two marginal rows of perforations in the transmitting-tape and by the two relays, and variable-pressure main-line contacts controlled by said automatic transmissions for the substantial reproduction of manual transmission, substantially as described.

4. In an automatic telegraph for transmitting messages to siphon or equivalent recorders, the combination of a roller A, driving-wheel D, a perforated strip of paper having three rows of apertures, pins l, l', screws z', y', a local battery or batteries K', electromagnets M, M', armature-levers m, m', and contacts for connecting either pole of battery or batteries K' to the main line, as and for the purpose set forth.

5. In an automatic telegraph-transmitter for transmitting messages to be received upon siphon-recorders or equivalent devices, the combination of local magnets M, M', and a fillet of paper having perforations on the marginal sides of the transmitting-tape, armature-levers m, m', contacts e', f', and springs h, h' for effecting variation of contact-pressure as the main battery is connected to line.

6. In an automatic telegraph-transmitter for transmitting messages to siphon-recorders or equivalent receiving devices, a feed-roller A, having apertures a, a driving-wheel D, having teeth d, a fillet of paper provided with three rows of apertures, contact-pieces l, l', screws or stops z', y', connections L, L', and magnets M, M', for alternately directing the two polarities of current to line.

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