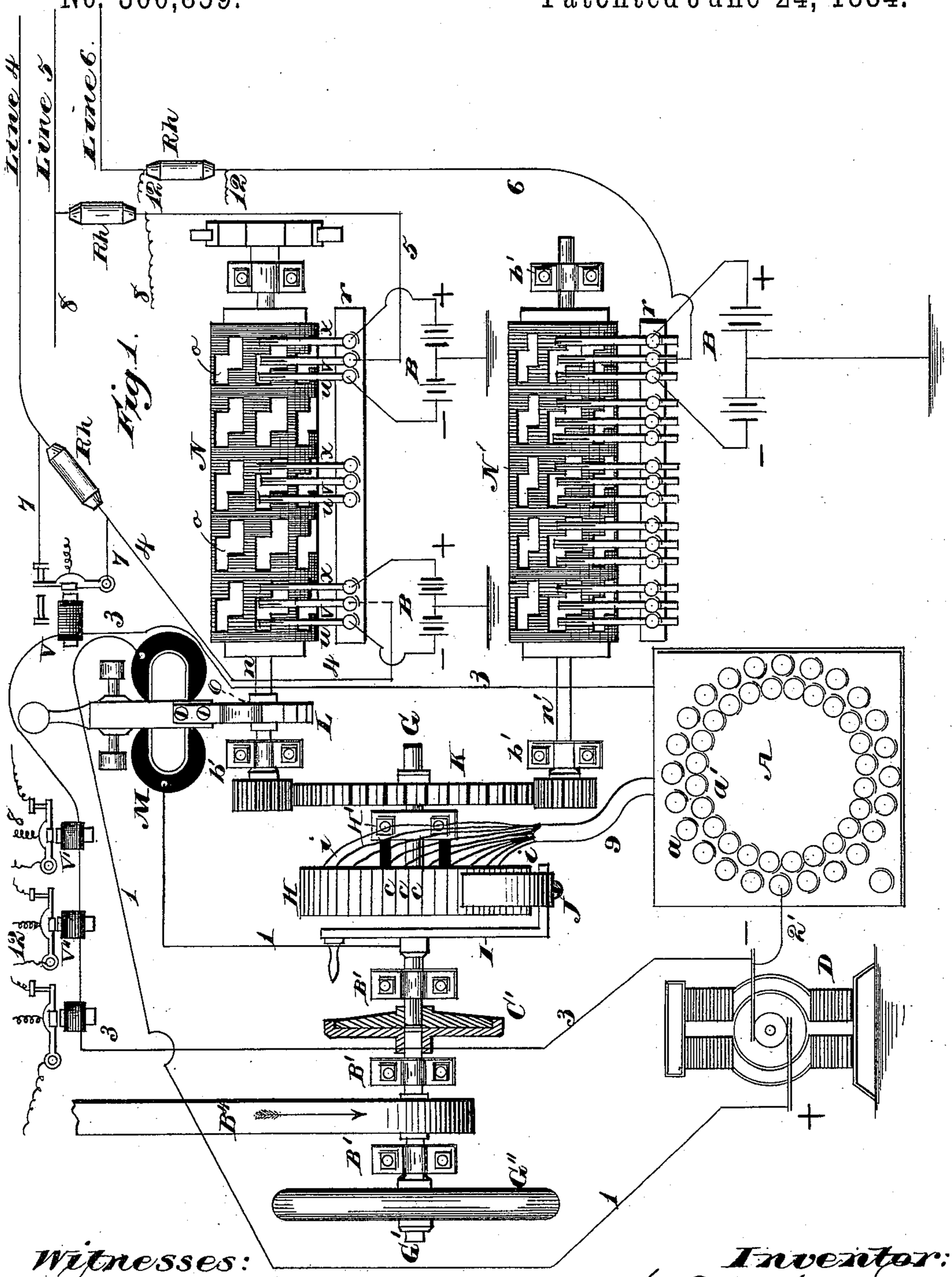
(No Model.) 3 Sheets—Sheet 1.

S. D. FIELD.

TRANSMITTER FOR PRINTING TELEGRAPHS.

No. 300,859. Patented June 24, 1884.



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(No Model.) 3 Sheets—Sheet 2.

S. D. FIELD.

TRANSMITTER FOR PRINTING TELEGRAPHS.

No. 300,859. Patented June 24, 1884.

Fig. 2.

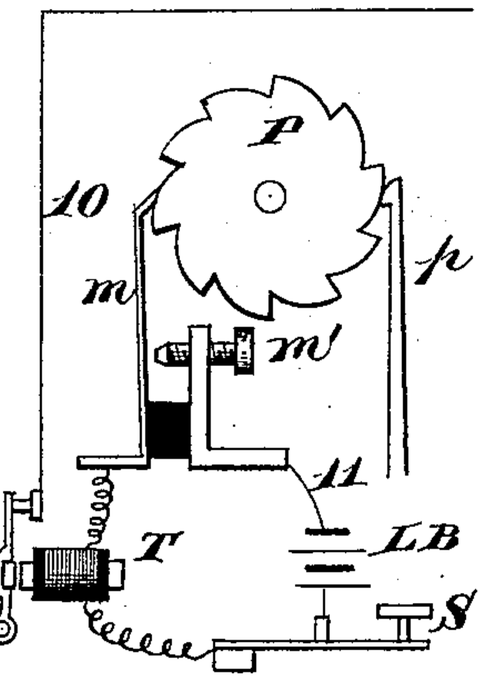
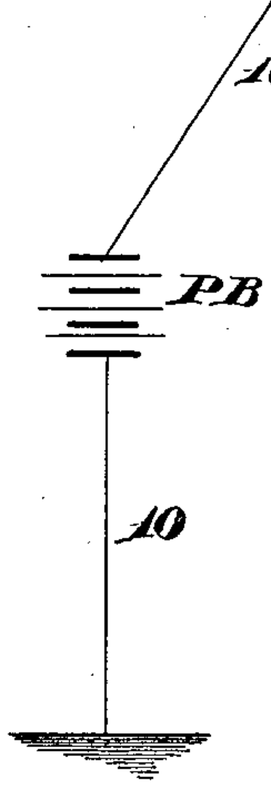


Fig. 3.



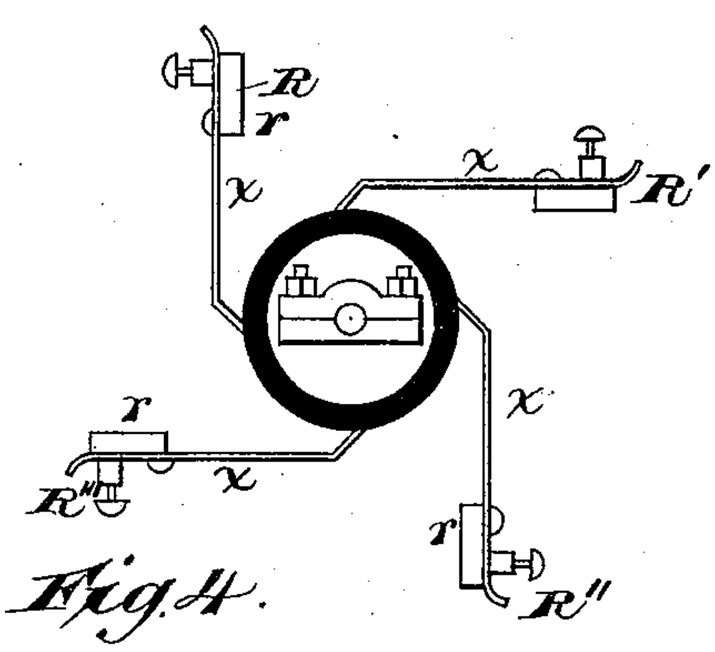
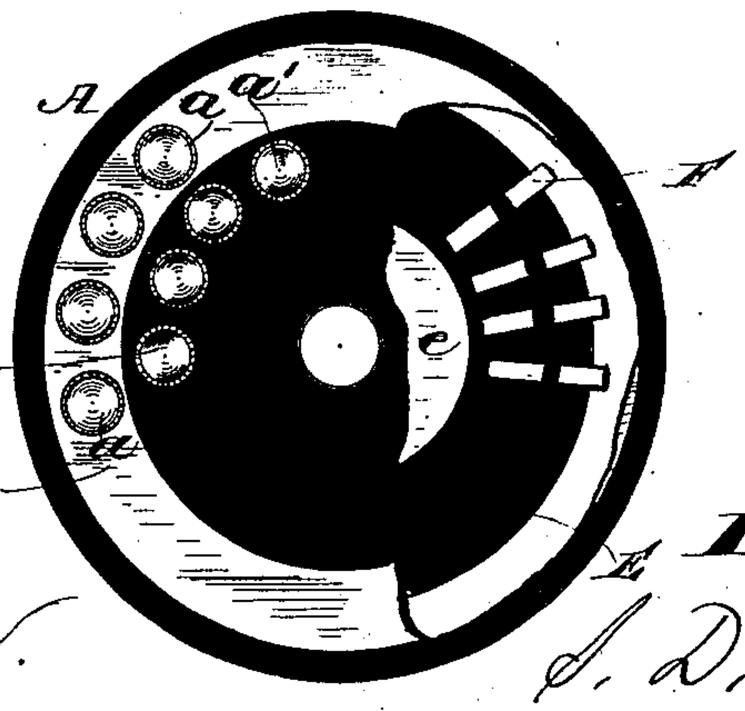


Fig. 4.



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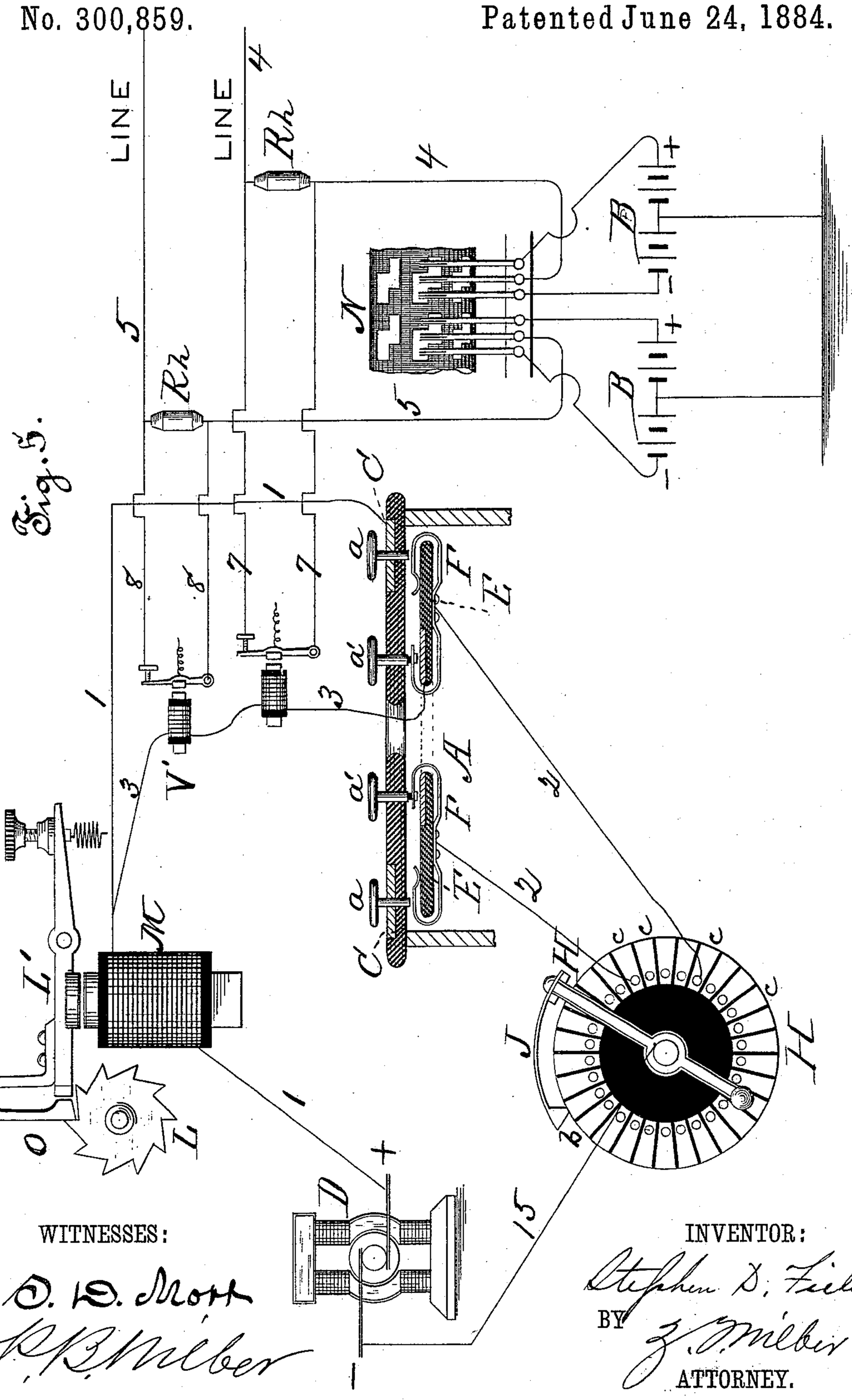
(No Model.) 3 Sheets—Sheet 3.

S. D. FIELD.

TRANSMITTER FOR PRINTING TELEGRAPHS.

No. 300,859. Patented June 24, 1884.

Fig. 5.



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UNITED STATES PATENT OFFICE.

STEPHEN D. FIELD, OF NEW YORK, N. Y., ASSIGNOR TO THE COMMERCIAL TELEGRAM COMPANY, OF SAME PLACE.

TRANSMITTER FOR PRINTING-TELEGRAPHS.

SPECIFICATION forming part of Letters Patent No. 300,859, dated June 24, 1884.

Application filed August 6, 1883. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN D. FIELD, of New York, in the county of New York and State of New York, have invented a new and useful Improvement in Transmitters for Printing-Telegraphs; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The object of my invention is to furnish a rapidly and easily manipulated transmitter capable of controlling a large number of printing-telegraph circuits, each of which may, in turn, contain a large number of printing-telegraphs, and which, in addition, shall automatically control the circuit or circuits for positioning the type-wheels and the circuit or circuits for effecting the printing. Preferably I propose to use this transmitter with a two-wheel and a two-line printer, although, as hereinafter set forth, it may be used with a one-wheel printer and with a one-line printer.

The key-board has a box-like frame made of insulating material, upon the top of which are two ranges of keys—one for one type-wheel, the second for the other type-wheel. Preferably, for ease of manipulation, these are arranged in two concentric circles. These keys consist simply of shanks and heads, a spring taking under each head to hold the key normally up to its upward limit of motion. One of the ranges of keys—say No. 1—passes through a strip of conducting metal let into or fixed upon the top of the key-board frame and connected to one of the circuits, to be hereinafter described, so that all the keys of such range are in electrical connection with such circuit. The other, or range No. 2, passes directly through the top of the key-board frame, and hence is insulated from range No. 1. Within the key-board box, and slightly below the normal position of the ends of the keys, is fixed an insulating-strip corresponding in form to the form of the ranges of keys. Upon one part thereof, underneath the second range of keys, is a conducting-strip connected in circuit, as hereinafter described. Affixed to the under part of this insulating-strip is a series of metallic springs equal in number to the number of keys in either range. The ends of each spring are bent up around and over the insulating-strip, so that the free ends of each spring rest underneath two keys—one end under one key in the first range, the other under the corresponding key in the second range. The ends of the keys in this second range are tipped with insulation, their function, on depression, being to force the ends of the springs underneath them into connection with the metal spring on the insulating-strip within the key-board box, while the first range on depression forms connection directly between the strip on the key-board through which they pass and the springs beneath them. Each of these springs is connected to a segment of a disk. This disk is made of insulating material, having upon it, but insulated from each other, a set of segments equal in number to the number of springs. This disk has a sleeve mounted upon a main shaft and fastened so that this main shaft may rotate while the disk remains stationary. This main shaft is divided into two parts united by a clutch. Upon one of the parts is fixed a pulley or other means for communicating motion thereto, and, if desired, a fly or balance wheel, while upon the other part is mounted a rotating arm and a gear-wheel, to be hereinafter described. The clutch referred to is such a one that the two parts of the shaft shall revolve as one, unless the movement of the parts containing the arm and gear-wheel be impeded by some positive stop. This clutch, therefore, may be any effective kind of friction or of magnetic clutch. For throwing pulsations or reversals upon the line, one or a number of cylinders of insulating-surface may be used, each mounted upon its own shaft, supported in suitable bearings, and upon which cylinders proper metallic spaces are placed with metallic fingers connected to the line and battery bearing thereon, as hereinafter described. Upon the shaft of each of these cylinders is a pinion or gear meshing into the gear-wheel on the main shaft, so that all are rotated thereby. Upon each cylinder is arranged a series of metallic contact-plates—one series for each line or circuit to be controlled by the cylinder. When the transmitter is to be used for simple make-and-break pulsations, these plates are simple rectangles on which contact two fingers—one

connected to the line, one to the battery. When reversed currents are to be transmitted, these plates are of zigzag shape, and three fingers bear thereon, the outer fingers being connected, respectively, to the + and — poles of a divided battery, while the center finger is connected to the line. Each series of these plates consists of a number arranged in the same line around the cylinder, and a corresponding number of series of contact-fingers may be used. The number of such plates in each series and the relation of the teeth in the gear of the cylinders upon the shaft and in the gear upon the main shaft should be so adjusted that during one revolution of a cylinder a number of pulsations equal to the number of keys in each range should be thrown upon the line. Upon the shaft of one of the cylinders is fixed a stop-ratchet having teeth corresponding in number to the number of contact-plates in any one series. Operating upon this is a stop-pawl controlled by a magnet, and arranged, when stopping this cylinder, and consequently all deriving motion from the same prime motor, to stop them with the contact-fingers upon the metal plates. The stop-magnet is controlled by a circuit, as follows: The arm referred to as on the main shaft sweeps over the segments of the disk mentioned, each segment being connected to one of the springs underneath the keys. This arm is connected in the circuit of a source of electricity, which circuit also passes by two branches to the metal strips in the key-board, and by the springs in the key-board box, and by the segments.

There are then two breaks in this circuit—one at the key-board, one at the disk. If, now, a key be depressed, one break is closed. As the rotating arm passes over the segment connected thereto, the other break is closed and the circuit is complete, causing the stop-magnet to attract its armature carrying the stop-pawl and stop the rotation of the arm and the cylinders.

In some forms of printers it is desirable that two strengths of current be used, in order that two different effects may be accomplished over one wire, magnets in the circuit having springs of different degrees of resilience being used. These two different effects may be an escapement and printing mechanisms, or an escapement and unison mechanisms, or as printing and unison mechanisms. This use of two different strengths of current is well known in the art, and to it, *per se*, I lay no claim. To enable this use of two strengths, however, of the current is the object of the two branches of the circuit before referred it. At the transmitting-station in each line-circuit is placed a resistance, whose cutting in or out of circuit shall make the necessary variations in the effective strength of the current upon the line. In each circuit is arranged a shunt around its resistance, controlled by a relay-magnet, which is in a branch circuit from the source of electricity, this branch circuit connecting to the metal strip in the insulating-piece beneath the range of keys No. 2. If it be desired to normally have the resistance out of circuit, the shunt-circuit is completed through the front stop of the relay-magnet; but if normally to be in circuit the reverse connection will be made. Then, if one of the second range of keys be depressed, it completes circuit not only through the stop-magnet, but also through the relay-magnet, so as to control the opening or closing of the shunt and leave in or out of the main circuit the resistance. The other branch, leading to the strip with which range 1 is connected, passes directly back to the source of electricity, always leaving the line in its normal condition. In order to control the printing circuit or circuits, there are placed upon the end of the shaft of a cylinder, or of as many of the cylinders as may be desired, a wheel having ratchet-shaped teeth, a pawl taking therein on one side to prevent retrograde motion. A key is so arranged that it shall be lifted from its anvil by the impingement of a bent end upon the higher part of the teeth, but shall contact upon its anvil when its bent end falls into the space between the teeth, permitting the key to connect with its anvil and close directly, or through the medium of a relay or relays, the printing-circuit. While the cylinder is in rotation, this key is consequently kept away from its anvil, or at most allowed to touch it only so slightly or so briefly that the printing-circuit does not become energized; but when the cylinder comes to rest the key automatically closes the printing-circuit. In order to at any time repeat the printing of a letter without repositioning the type-wheels, a key is introduced in the printing-circuit, by which it may be broken and made irrespective of and while the transmitter is at rest. By the constructions and arrangments indicated I am enabled to make a transmitter very rapid and certain in its operation, the slightest manipulation of the keys sufficing to stop the type-wheels at the proper position, and the printing being immediately and automatically accomplished. These arrangements may be better understood by reference to the drawings, in which—

Figure 1 is a view partly in plan and partly in section, with diagrammatic circuit-connections illustrating the invention; Fig. 2, an end view of the printing-controller; Fig. 3, a section of the cylinders. Fig. 4 is a plan view, partly broken away, of the key-board; Fig. 5, a view mainly diagrammatic, with an end of the disk and of the stop mechanism and a section of the key-board.

G G′ is the main driving-shaft, divided into the parts G and G′, connected by the clutch C′. (Here shown as a friction-clutch, but which may be a magnetic or any other form of clutch adapted to cause the two parts of the shaft to rotate together unless an impediment or stop be brought to bear upon one of them.) This shaft is supported in suitable bearings, B′ B′.

Upon the part G′ is fixed a pulley, over which passes the belt B″, by which motion is

communicated to it, although any other suitable device for communicating motion may be used. A fly or balance wheel, G″, may be used to give regularity of motion.

Upon the part G is rigidly mounted the arm I and the gear-wheel K, the latter meshing into and communicating motion to the gears *k k′*. The arm may be provided at one end with an extension and handle, *i*, by which it may be rotated by hand. At its other end a curved spring-arm, J, terminating in a contact, *b*, is formed and placed so as to sweep over a disk, H, which is hollowed so that G may be rotated therein, as in a sleeve, H being fastened by insulating-supports to one of the bearings B′. The gears *k k′* are mounted on shafts *n n′*, supported in bearings *b′ b′*. Upon these shafts are the cylinders N N′. While two only are shown, any desired number may be used, the number being limited by the relative sizes of K *k k′* and N N′. Upon each of these cylinders, whose surfaces are of insulating material, are mounted one or more series of metallic contact-plates, *o o*, five being shown, each series being composed of a number arranged in the same circumferential plane around the cylinder. When intended to send reversed or alternating currents over a line, these plates are of zigzag shape, as shown—that is, the two extremities are in different planes longitudinally, the extremities being connected by a metallic part lying in both planes. For each series of these plates longitudinally there are three fingers, *u v x*, which normally bear upon the surface of the cylinder, the two outer fingers contacting with the extremity of a plate, while the center one contacts with the center of the plate. The two outer fingers are connected to the + and — poles, respectively, of a divided battery having a central ground-connection, while the center finger is connected to the line. It will be readily understood from this that as a plate passes under the fingers two impulses of opposite polarity will be sent to line. These fingers *u v x* are supported in a base, *r*, and there may be a number of them around the same cylinder, as shown in Fig. 3, where there are four sets, R R′ R″ R‴. If it were desired to transmit simple pulsations without change of polarity, the metal spaces *o o* would be mere rectangles and only two fingers used, one connected to the battery and the other to the line. The relation in number of teeth between K and *k* and the number of metal spaces *o* in each series in the cylinders is such that during one rotation of G, and consequently of the arm I, a number of impulses equal to the number of keys in a range is sent. For instance, while A is shown with only twenty-four keys in each range, owing to limited space in the drawings, in practice it is proposed to give it thirty—the number of segments in H; hence the adjustment of K *k* and the spaces *o* is such that during one rotation of G fifteen spaces *o* in a reverser should pass under one series of fingers. It follows, then, that so long as the cylinders N N′ are rotated impulses or reversals will be sent to the lines connected to each set of fingers. In order to stop this rotation at any desired point, a magnetic stop is shown.

Upon the shaft of one of the cylinders—say *n*—is placed a ratchet-wheel, L, into whose teeth may take the spring-pawl O, made of reversed U shape, as shown in Fig. 4, to give some spring or compensation for the shock of the sudden stoppage of the cylinders, &c. This pawl O is attached to the armature-lever L′ of the magnet M, included in a circuit to be hereinafter described. The teeth of L are so adjusted relatively to the metal spaces *o o* on N and the other cylinders as to stop them in such position that two of the fingers of a set are always, when the cylinders are at rest, contacting upon a metal space. Therefore, whenever M is charged, the rotation of the cylinders will be stopped and the line or lines remain charged during such stoppage. The charging of M to stop the rotation at the proper time—that is, when the wheels of the distant instruments are properly positioned—is accomplished by the following mechanism.

A is a key-board having two concentric circular ranges of keys, *a a′*, although it is evident these keys might be in straight parallel lines. These keys are simply straight pins with enlarged heads, springs tending to normally keep them up and away from the metal springs F on the insulating-ring E. The top of the key-board is made of some insulating material and its base is formed as a box. Upon the top a metal strip, C, is let in, through which all the keys of the range *a* pass, making electrical contact therewith, while the range *a′* passes through the plain top, being thereby insulated from the range *a* and from each other. Within the bottom, and immediately below the two ranges of keys, is a strip or ring of insulating material, E, upon which and below the range *a′* is a metallic strip, *e*.

Fixed to E are a series of metal strips or springs equal in number to the number of keys in either range. The ends of each strip are bent up around and over E, so that one end is under a key *a* and the other end under a key *a′* and over the metal piece *e*. It should have been noted that the ends of the keys *a′* are tipped with insulating material, their function being simply to force the end of a spring, F, into contact with *e*.

The disk H, before referred to, consists of a series of segments, *c c*, insulated from each other and from the rest of the apparatus. The segments are equal in number to the springs F, and each spring is connected to a corresponding segment by a wire, 2. These wires 2, for convenience, may be grouped into a cable, 9, between A and H. As before stated, the arm I, carrying the spring J, ending in contact *b*, is rotated by shaft G, so that *b* is carried over the segments in succession.

D represents a dynamo, being here typical of any form of generator. The simplest form

of circuit-connections between all these parts for controlling M is the circuit through the range of keys *a*. Several arrangements of the circuit may be made, all, however, substantially the same in principle.

In Fig. 1 a connection, 2, is made from either pole of the dynamo—say, for convenience of description, the — pole to C—while the springs F are connected to the segments *c* by connections 2 2. From the other or + pole of the generator a connection, 1, leads through the magnet M to the arm I. In Fig. 4 the springs and segments are also connected by 2 2, while from the + pole of the generator the connection 1 passes through M to the strip C, the other pole of the generator being connected to arm I. In both these circuitings it will be seen that normally there is a break between the keys *a a* and the plate F in the circuit 1 2, passing through M, and that there is a second break in all the circuits leading from F to the segments on the disk H, excepting the circuit of the particular disk *b* may be on at the moment. If a key *a* be depressed, closing the break between *a* and F, the circuit through M will be complete when *b* contacts with the segment connected to the depressed key. Thereupon M attracts L′, which stops all the mechanism rotated by G, holding the instrument at the distant end in the desired position, or that indicated by the depressed key. In some printing-telegraphs the positioning of one of two type-wheels for printing is effected or controlled by a change in the normal strength of the current. The circuit of the second range of keys, *a′*, is arranged for this. In Fig. 1 this circuit is from the machine *via* 3 through relay-magnets V V′ V″ to strip *e*, from the other pole of the machine *via* 1 through M to I J, then by 2 2 to the springs F. In Fig. 2 it is *via* 1 through M, beyond which 3 branches from 1 through the relays V V′ to *e*, while from the other pole it is *via* 15 to I J, thence by 2 2 to springs F. If, now, a key in range *a′* be depressed, *e* and F are connected and the circuit through M and the relays V V′ closed, operating the relays as well as the stop. In each line-circuit 4 5 6 is a rheostat, R*h*, whose being in or out of circuit shall effect the necessary variations, there being shunt-circuits 7 8 12 thereto, controlled by the relays V V′ V″—one rheostat, shunt, and relay for each line-circuit. As shown, the shunts lead to the levers and back stops of the relays, so that the shunts are normally closed and the resistances shunted out. When, however, the relay is charged on depression of a key *a′*, the shunt is broken, and the line-current immediately varied by the introduction of the resistance. If it be desired to have the resistances normally in circuit, the relay-connections of the shunts would be reversed. The printing-circuit is best shown in Fig. 2, P being a ratchet-toothed wheel upon the shaft of one of the cylinders—say *n*—a pawl, *p*, being provided to prevent any retrograde motion. A spring-key, *m*, is arranged before P, and having its upper end bent or beveled, so as to be struck or vibrated by the teeth of P. An anvil, *m′*, is so adjusted that the key may contact therewith when its upper end falls into a space between the teeth. This key may control directly the printing-circuit, or control it through a relay, T, and local circuit 11. While P is in rotation the rapidly-recurring blows of the teeth upon *m* prevents it from contacting with *m′*, at least sufficiently to cause a closure of the printing-circuit. The teeth of P are so adjusted relatively to the cylinders that whenever their and its motion is stopped the end of *m* may fall between the teeth, allowing *m* and *m′* to contact, immediately and automatically closing the printing-circuit. In the circuit 11 a key, S, is placed, by which the printing-circuit may be broken, so as to repeat the printing of a letter without repositioning the type-wheels.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, in a transmitter, of one or more cylinders, each provided with conducting spaces, fingers, or springs taking thereon, and circuit-connections for controlling one or more main lines, a prime motor therefor, a magnetically-operated stop controlling the motion of the cylinder or cylinders, and a key-board having circuit-connections, as set forth, and controlling the magnetic stop, substantially as set forth.

2. The combination, in a transmitter, of one or more cylinders revolved by a prime motor, and each controlling the pulsations on one or more main lines, and a key-board and local circuits, one for each character on the key-board, and controlling the movement of the cylinders, substantially as set forth.

3. The combination, in a printing-telegraph transmitter, of a cylinder or cylinders provided with contact spaces, fingers, or springs, contacting therewith and controlling the pulsations on the main-line escapement-circuit, a magnetic detent controlling the rotation of the cylinders, a local circuit controlling the magnetic detent and having two breaks therein, a key closing one break, and a traveling circuit-closer and segmental disk closing the other break, substantially as set forth.

4. In a printing-telegraph transmitter, the combination of a cylinder or cylinders having conducting-spaces upon the periphery thereof, and sets of fingers or springs adapted to contact therewith and control the pulsations upon the main-line escapement-circuit, a local circuit, a magnetic detent, a disk formed of segments insulated from each other, and a circuit-closer traveling over such segments, whereby the rotation of the cylinder and the pulsations upon the escapement-circuit are controlled, substantially as set forth.

5. In a transmitter for printing-telegraphs, the combination, with the cylinder or cylinders having conducting-spaces upon the periphery thereof, and fingers or springs con-

tacting therewith to control the pulsations upon the escapement-circuit, of a ratcheted wheel upon the shaft of one or more of the cylinders, and a key or spring operated thereby to automatically control the printing-circuit, substantially as set forth.

6. In a printing-telegraph transmitter, the combination of an insulated cylinder provided with the zigzag conducting-spaces, as set forth, a series of springs or fingers contacting therewith, each set of springs or fingers having one finger or spring connected to the line, while two others are respectively connected to opposite poles of the battery, a main-line and battery connections, each set of the series of fingers or springs controlling one main escapement-line, substantially as set forth.

7. The combination, in a transmitter, of a key-board having two concentric or parallel ranges of keys and a series of springs or fingers equal in number to the keys in either range and fixed upon an insulating-base, each spring being acted upon by two keys, one from each range, a disk composed of segments equal in number to the springs and circuit-connections, one for each spring to its corresponding segment, substantially as set forth.

8. In a transmitter, the combination of a key-board having two ranges or sets of keys, two local circuits, one for each range of keys, a magnetic stop for the transmitter, controlled by both circuits, and a relay placed in one circuit and controlling a shunt to a resistance in the main circuit, substantially as set forth.

9. A printing-telegraph transmitter consisting of the combination of a cylinder or cylinders provided with conducting-spaces, a series of fingers or springs adapted to contact therewith, each set of the series of fingers or springs, in conjunction with a series of spaces, controlling a main escapement-circuit, a prime-motor for the cylinder or cylinders, a clutch connecting them, a magnetic detent controlling the operation of the clutch thereon, local circuits, as set forth, a key-board, disk of insulated segments, and traveling circuit-closer controlling jointly the magnetic detent, substantially as set forth.

10. A transmitter embodying the following elements: a cylinder or cylinders and a series of fingers, as described, controlling the main circuit, a prime motor therefor, and a clutch connecting the motor and cylinder or cylinders, a magnetic stop controlling the movement of the cylinder or cylinders, local circuits controlling the stop, and a key-board controlling the local circuits, substantially as set forth.

This specification signed and witnessed this 1st day of August, 1883.

STEPHEN D. FIELD.

Witnesses:

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L. A. MCCARTHY.