(No Model.)

J. M. JOY.

TELEGRAPHY.

No. 566,985. Patented Sept. 1, 1896.

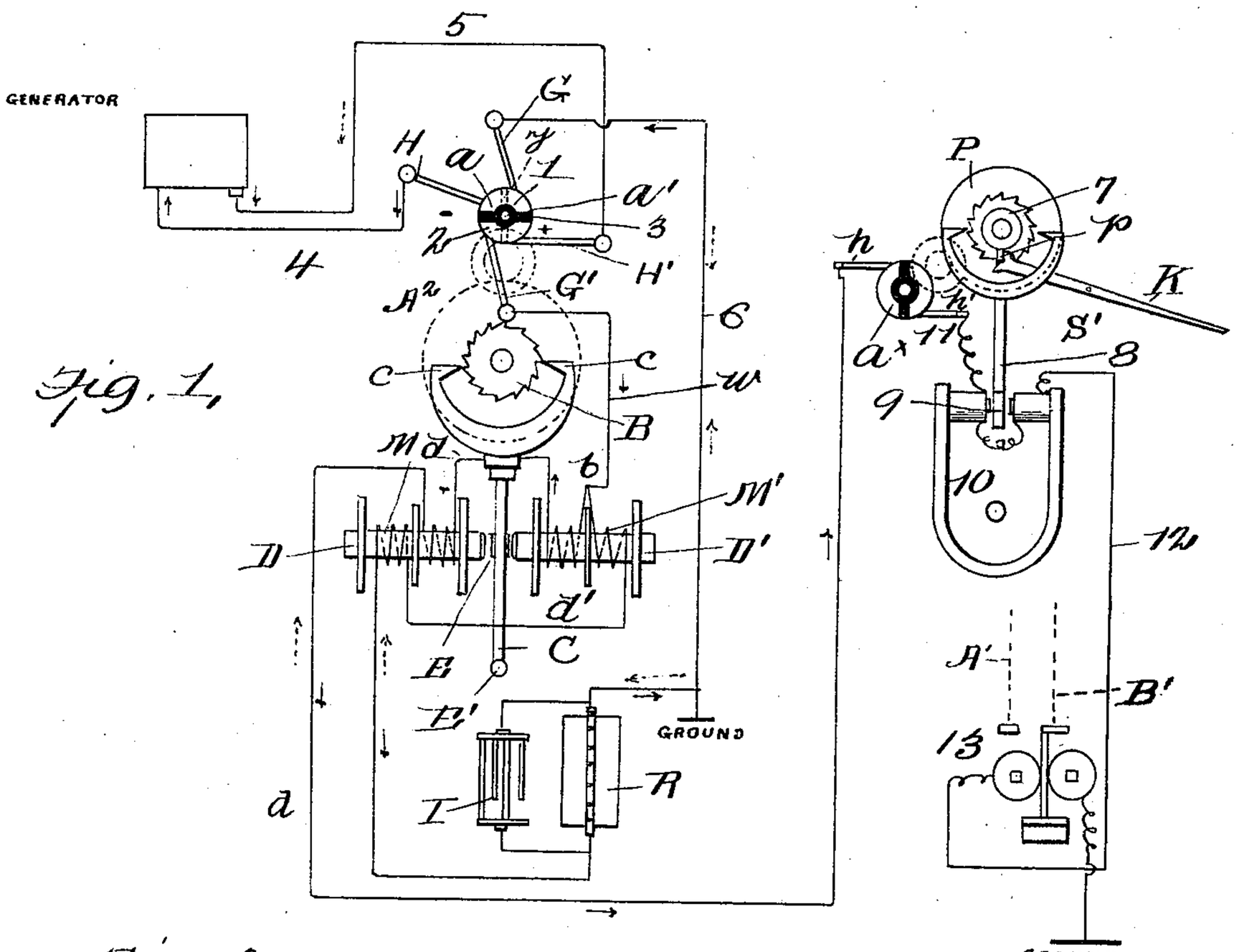
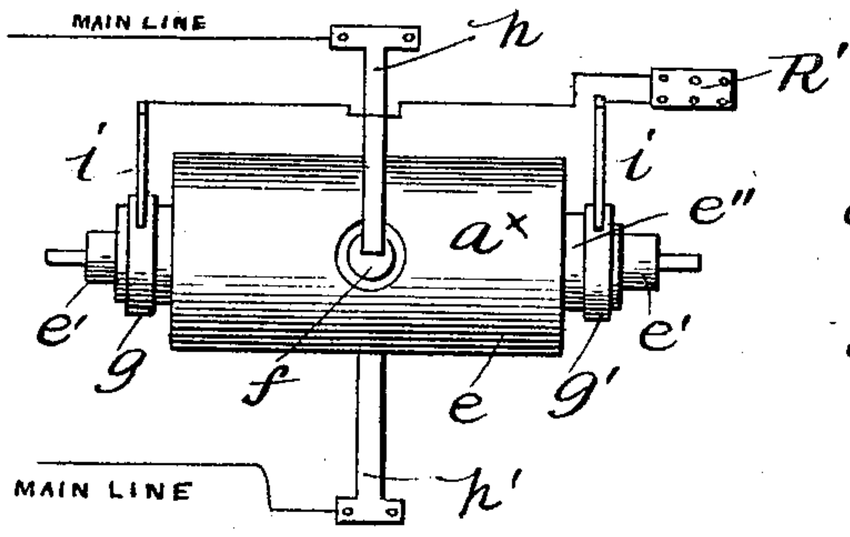


Fig. 1.

Fig. 2.



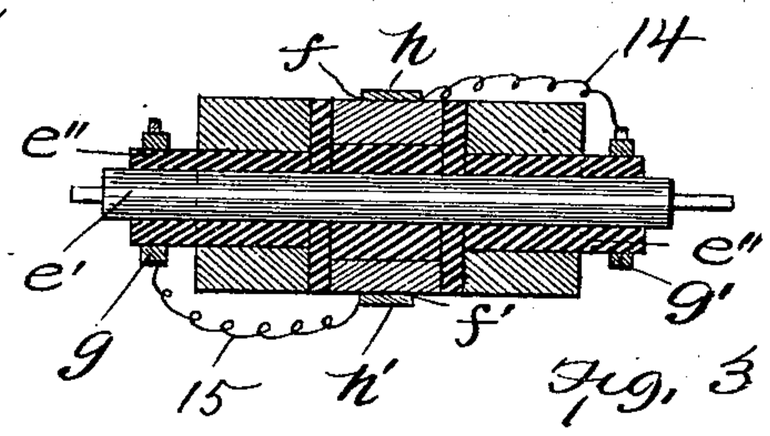
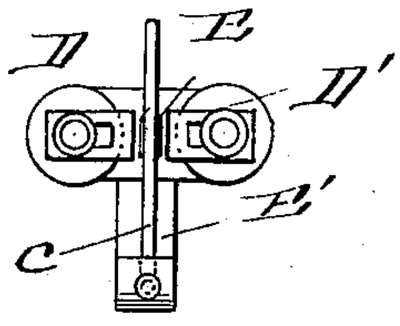


Fig. 3.

Fig. 4.



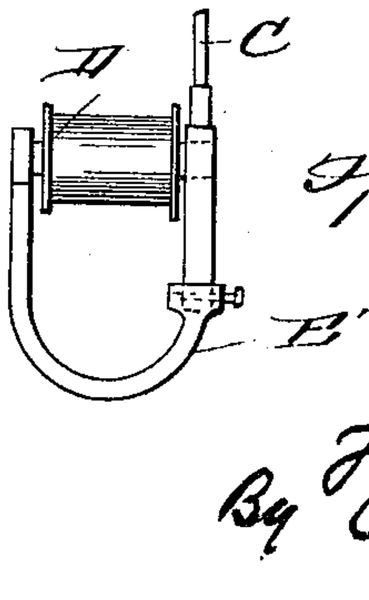


Fig. 5.

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TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 566,985, dated September 1, 1896.

Application filed June 17, 1895. Serial No. 553,002. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. JOY, of the city of New York, in the county of New York, in the State of New York, have invented new and useful Improvements in Single-Line-Battery Systems, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to improvements in single-line-battery systems for printing-telegraph instruments, more especially that class known as the "Essick," and which depend on alternating impulses and the prolongation of those impulses for their operation. In this class of instruments the open-circuit method is generally employed, which method consists in so arranging the apparatus that the current will be to line only when the message is being transmitted. At other times it is without current. In these systems each transmitter produces its own alternations of current, and it will be obvious that the open-circuit system must be used, which system necessitates a main-line source of current at each station, way-stations included, or the current must be brought to each station by additional wires.

The object of the present invention is to provide a closed-circuit system for the type of instruments heretofore mentioned, whereby any number of stations located at different points on a telegraph-line may use in common one main-line source of current for the operation of the transmitting and receiving instruments.

The invention consists in providing a closed-circuit system whereby a main-line source of current is supplied to each station from a centrally-located station, and in providing a centrally-located alternator for alternating the main-line current, the alternations, whether rapid or slow, serving to operate the necessary polarized and printing mechanism at each station on the line. Transmitting apparatus is provided which, while depending on a centrally-located pole-changer for its operation, directly governs the action of the pole-changer and determines the number of impulses which may be sent to print any given letter.

In the accompanying drawings, forming a part of this specification, Figure 1 is a diagrammatic view of my improved system; Fig. 2, a top plan view of one of the commutators forming part of said system; Fig. 3, a longitudinal sectional view of said commutator; and Figs. 4 and 5, detail views of the electromagnets and permanent magnet representing, respectively, an end view in elevation and a side elevation.

Referring to the several figures, especially to the diagram Fig. 1, the letter S′ indicates a way-station and A^2 a central station. At the central station there is located a pole-changer *a*, which is controlled by means of mechanism situated at the way-station, as will be hereinafter more fully referred to. There are also situated at the central station polarized magnets D D′, which are wound in opposite directions with coils M M′. These magnets are provided with an armature E, which is secured to an escapement-lever C, which in turn is secured at its lower end to a bracket E′ and vibrates between the poles of the said magnets. The escapement-lever is provided with pallets *c c*, which engage the teeth of an escapement-wheel B, which has its shaft journaled in suitable bearings made in the supporting-frame (not shown) of the apparatus, and is connected with a train of gearing which gives it a constant tendency to turn in the proper direction, said escapement-wheel being controlled in its rotation by the escapement-lever C.

The pole-changer *a* consists of two segments 1 and 2, mounted on a shaft *a′*, which is in connection with the gearing (not shown) of the escapement-wheel, so as to be rotated with said wheel. These segments are insulated from the shaft and from each other by means of insulating material 3.

Upon the periphery of the pole-changer bear the free ends of four brushes G G′ and H H′, which are suitably supported at their outer ends upon the frame of the instrument. The brushes H H′ are connected with the respective poles of the generator by means of conductors 4 and 5. The brush G is connected with the ground by means of conductor 6, and the brush G′ is connected with the respective coils of the magnet M′, at point *b*, by means of the conductor *w*. From said

point b the line divides, an artificial line branch d' of the differential coils being formed by the condenser I, which is shunted around a resistance R in the usual manner and connects with the conductor 6. The main-line branch d connects with the brush h of the way-station instrument, said brush bearing upon a contact f, as shown in Figs. 2 and 3, of a commutator $a^{\times}$, mounted on a shaft which is in connection with a train of gearing (not shown) controlled by an escapement-wheel 7 and a lever 8, provided with pallets to engage the teeth of said wheel, and carrying an armature 9, which vibrates between the poles of a polarized magnet 10. Bearing upon a contact f', opposite contact f, is a brush h', which is connected with one of the coils of the magnet 10 by a conductor 11, the other coil of said magnet being connected with one terminal of a polarized relay 13, which, by means of its armature, in connection with the conductors A' B', controls the receiving mechanism, which, however, forms no part of the present invention and is not shown.

The letter P indicates a pin-cylinder similar to that used in transmitters of the Essick type of instrument, said cylinder being provided with a pin p, which is adapted to be engaged by the end of a key-lever K to stop the rotation of the cylinder. The commutator $a^{\times}$ is geared with the pin-cylinder in the well-known manner.

Referring to Figs. 2 and 3, which show the construction of the commutator $a^{\times}$ in detail, the letter e indicates a metallic cylinder insulated from its shaft e' by insulating material e''. The metallic contacts $f f'$ are situated at diametrically opposite sides of the cylinder and are insulated from said cylinder and from the shaft. A metal ring g is located at one end of the commutator and a similar ring g' at the other end, both rings being insulated from the cylinder, but electrically connected with the contacts f and f', the ring g being connected with contact f' and ring g' with contact f. The brushes h and h' bear, respectively, upon the contacts f and f', and the brushes i and i' upon the rings g' and g, respectively, as shown in Fig. 2. The main-line current passes through brushes h h', and a balancing-resistance R' is connected in this circuit through the brushes i i'.

The operation of the system is as follows: When the instruments are in normal position, that is to say, before a key has been depressed, the current passes from the generator by way of conductor 5 to brush H', thence through segment 2 and brush G' to conductor w, and by conductor w to point b, where the current divides, one portion going to branch line d and the other to branch line d'. The main-line current passes over line d to brush h, through the commutator $a^{\times}$ to brush h', thence by wire 11 to the polarized magnet 10, thence by wire 12 to polarized relay P R and to ground. At the point b the current will divide in proportion to the resistance of the two branches d and d'. If the resistance of branch d' is twice as great as the resistance of the main branch d, then the current strength of branch d will be twice as great as that of branch d', and the escapement C will be caused to operate; but when the resistance of branch d becomes equal to that of branch d' the action of the coils immediately ceases, and no motion of the escapement can take place.

When brushes h h' are in contact with their respective contacts, the resistance R' is in the main-line branch. When a key is depressed, its end comes in contact with the pin p and stops the rotation of the cylinder P, and as the commutator $a^{\times}$ is geared to said cylinder its rotation will also be stopped. During this operation the commutator will have made one revolution, breaking the contacts between brushes h h' and contacts f f', and as the brushes bear upon the cylinder e during its rotation the resistance will be cut out; but when the commutator has completed its revolution the resistance will be thrown into the main-line branch d.

By referring to Figs. 2 and 3 the operation of cutting in and out the resistance R' will be readily understood. In the position shown the current passes from brush h to contact f by conductor 14 to ring g' to brush i, through resistance R' to brush i, through ring g and conductor 15 to contact f' and by brush h' off to line, but when the resistence is cut out the path of the current will be through the cylinder e. The operation of depressing the key causes the current in the artificial line d' to overbalance that of the main line d by cutting out the resistance R', and the magnet D' will be caused to attract the armature E and move the escapement-wheel one step, which operation will cause the pole-changer a to make a half-revolution, as indicated by dotted lines y. When in this position, the brushes H and H' will be in contact with the segment 1 and the brushes G' and H in contact with segment 2. The current in conductors w and 6 will then be in reverse direction, as indicated by the dotted arrows; but it will be understood that the current always passes in the same direction through the connections between the generator or battery and the pole-changer. The alternations in the current thus established through the coils M M' of the polarized magnet D D' cause the armature to vibrate, continuing the rotation of the pole-changer a, sending alternate currents, which currents, passing through the brush h, cylinder e, polarized magnet 10, operate the armature g continuously with the armature E and pass through the polarized relay, causing the same to operate the receiving instrument through a local circuit.

The commutator $a^{\times}$ at the way-station rotates synchronously with the pole-changer a at the central station, and the said commu-

tator is arranged to have one complete revolution at each step movement of the pin-cylinder.

It is not deemed essential to show all of the circuit connections at the way-stations *s'*, as these shown are sufficient, when taken in connection with Figs. 2 and 3, to enable those skilled in the art to clearly understand the same.

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

1. In a single-line-battery system for printing or analogous telegraph apparatus, the combination of a closed electric circuit including several stations, a source of current in the circuit at one of the stations, an alternator at the same station for alternating the current from the source, and transmitting apparatus at the stations adapted to govern the action of the pole-changer and to determine the number of its impulses, as set forth.

2. In a single-line-battery system for printing or analogous telegraph apparatus, the combination of a closed electric circuit including several stations, a source of current in the circuit at one station, a power-impelled commutator at the same station, an escape-wheel on a shaft geared to the alternator, an escapement to govern the movement of the escape-wheel, magnets to operate the escapement having differentially-wound coils, said coils being in the main line, and a branch of the main line differing in resistance from the main line, and means at the various stations to make the resistance in the main line and the said branch equal, as set forth.

3. In a single-line-battery system for printing or analogous telegraph apparatus, the combination of a closed electric circuit including a central station and several other stations, a source of current at the central station, a power-impelled pole-changer to alternate the source of current, an escapement for controlling the movement of the pole-changer, differentially-wound magnets in the main line and a branch of the main line to operate the escapement, said branch having normally a greater resistance than the main line, and suitable means at the stations for including in the main line a resistance, as and for the purpose described.

4. In a single-line-battery system for printing or analogous telegraph apparatus, the combination of a closed electric circuit including a central station and several other stations, a source of current at the central station, a power-impelled pole-changer to alternate the source of current, an escapement for controlling the movement of the pole-changer, differentially-wound magnets in the main line and a branch of the main line to operate the escapement, said branch having normally a greater resistance than the main line, an artificial resistance at a remote station sufficient to balance the resistance of the branch, and means to include the resistance in the main line when desired, as and for the purpose set forth.

5. In a single-line-battery system for printing or analogous telegraph apparatus, the combination of a closed electric circuit including a central station and several other stations, a source of current at the central station, a power-impelled pole-changer to alternate the source of current, an escapement for controlling the movement of the pole-changer, differentially-wound magnets in the main line and a branch of the main line to operate the escapement, said branch having normally a greater resistance than the main line, an artificial resistance sufficient to balance the resistance of the said branch when included in the main line, at each of several stations, and means at said stations for including the resistances in circuit when desired, as set forth.

6. In a single-line-battery differential system, the combination of a single battery, a rotatable power-impelled pole-changer mounted on a shaft and adapted to alternate the current from the battery, an escape-wheel geared to the pole-changer to revolve more slowly than the latter, an escapement for the said wheel provided with an armature, magnets with differentially-wound coils thereon to vibrate the armature, said coils being in the main line, and a branch thereof having a higher resistance than the main line, a transmitting instrument at a remote station having a commutator in circuit with the main line and a resistance, and means whereby the operation of a key-lever of the transmitter will include the resistance in the main line, as and for the purpose described.

7. In a single-line electric differential system, the combination of a source of electricity, a closed main circuit connected to the source, an alternator to alternate the current, means to control the alternator operated by differentially-wound magnets connected in the said closed circuit and a branch of said circuit, said branch being of a higher resistance than the main circuit, a transmitting instrument at a remote station comprising a revolving pin-cylinder, pivoted key-levers to engage the pin-cylinder, a commutator operated by the cylinder, and a resistance capable of being thrown into the main line when the cylinder is arrested in its movement by a key-lever, as set forth.

8. In a single-line electric differential system, the combination of a source of electricity, a closed main circuit connected to the source, an alternator to alternate the current, means to control the alternator operated by differentially-wound magnets connected in the said closed circuit and a branch of said circuit, said branch being of a higher resistance than the main circuit, a transmitting instrument at a remote station comprising a revolving pin-cylinder, pivoted key-levers to engage the pin-cylinder, a commutator operated by the cylinder, and a resistance adapted to be included in the main line when the

commutator is arrested in its movement, an escapement operated by magnets in the main line to control the movement of the pin-cylinder, and a stop carried by a key-lever adapted to move in the path of a pin on the cylinder to stop the same when desired, as and for the purpose described.

9. The combination in a rotatable commutator of a shaft, a metallic cylinder mounted on the shaft but insulated therefrom, a single pair of conducting-segments in diametrically opposite sides of the cylinder and insulated from the latter, insulated rings on the ends of the commutator, and brushes making contact with the rings, cylinder and segments, as set forth.

10. The combination with a pin-cylinder of a printing-telegraph transmitter, of a shaft geared to the pin-cylinder a metallic cylinder mounted on the shaft but insulated therefrom, conducting-segments in diametrically opposite sides of the cylinder and insulated from the latter, insulated rings on the ends of the commutator, brushes making contact with the rings, cylinder and segments, and a variable resistance electrically connected to the segments, as set forth.

In testimony whereof I have hereunto signed my name.

JOHN M. JOY. [L. S.]

Witnesses:
GEORGE L. HOFFMAN,
HENRY HERROLD.