(No Model.)

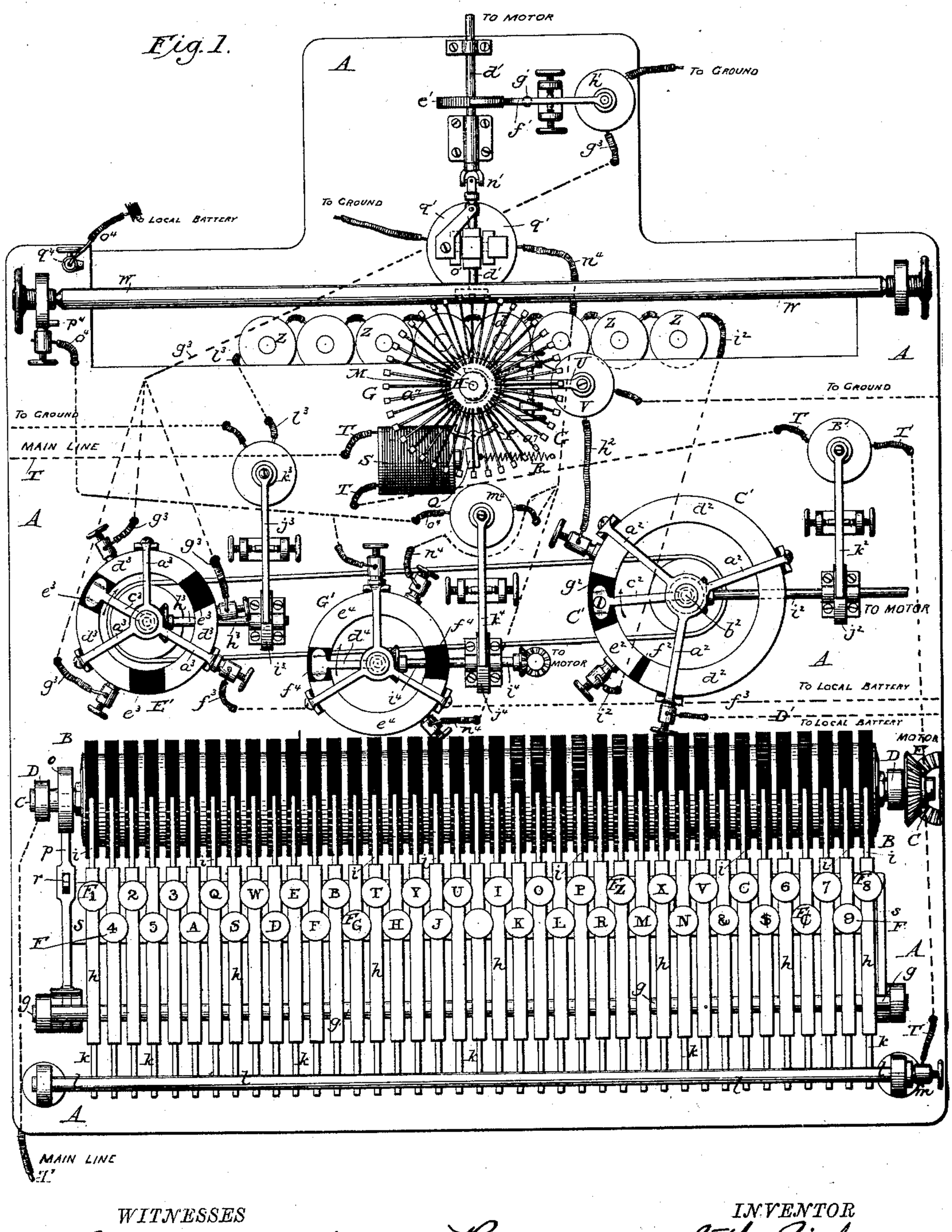
4 Sheets—Sheet 1.

A. BIXBY.

PRINTING TELEGRAPH.

No. 374,444. Patented Dec. 6, 1887.

Fig. 1.



WITNESSES

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(No Model.) 4 Sheets—Sheet 2.

A. BIXBY.

PRINTING TELEGRAPH.

No. 374,444. Patented Dec. 6, 1887.

Fig. 2.

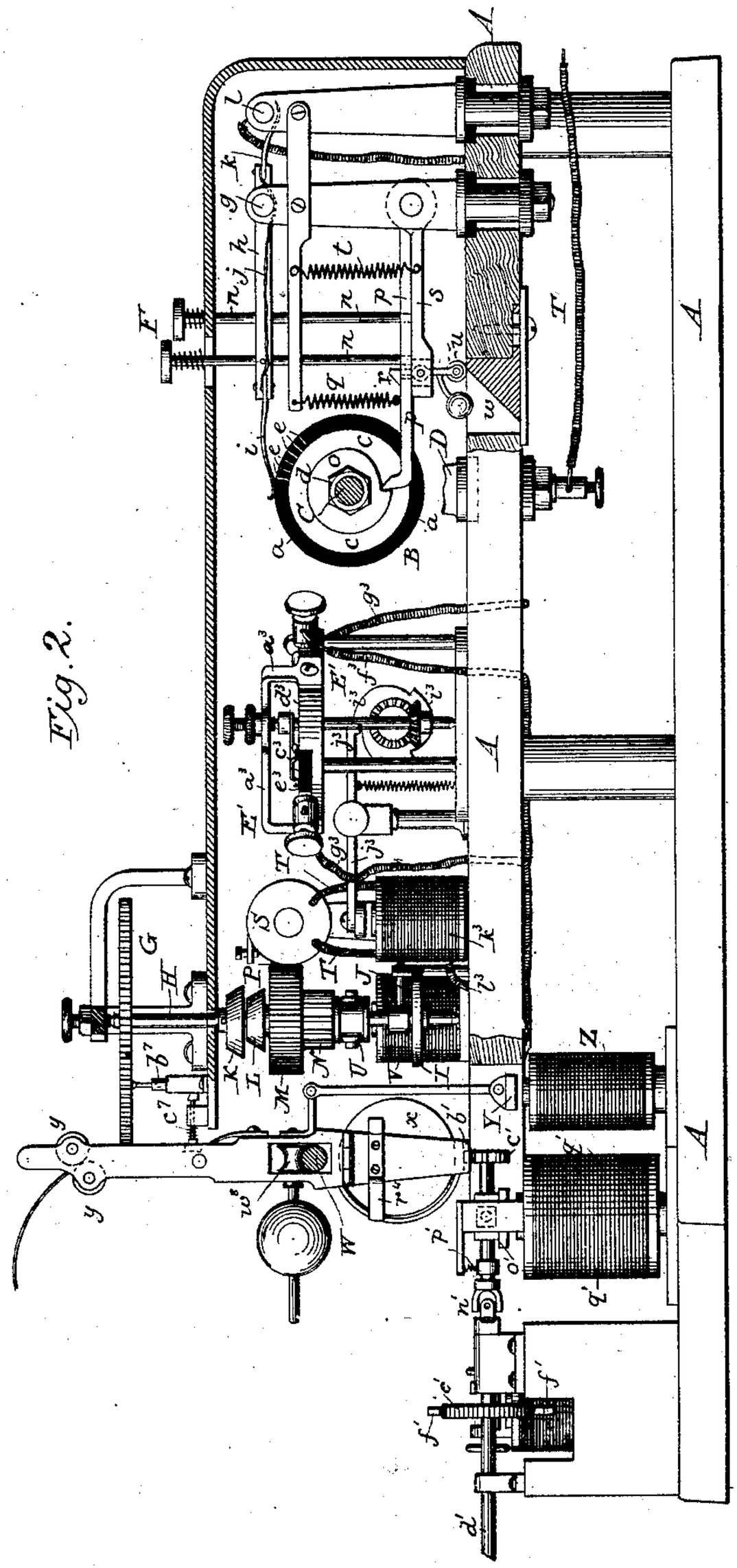

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Fig. 4.
on line 1–1.

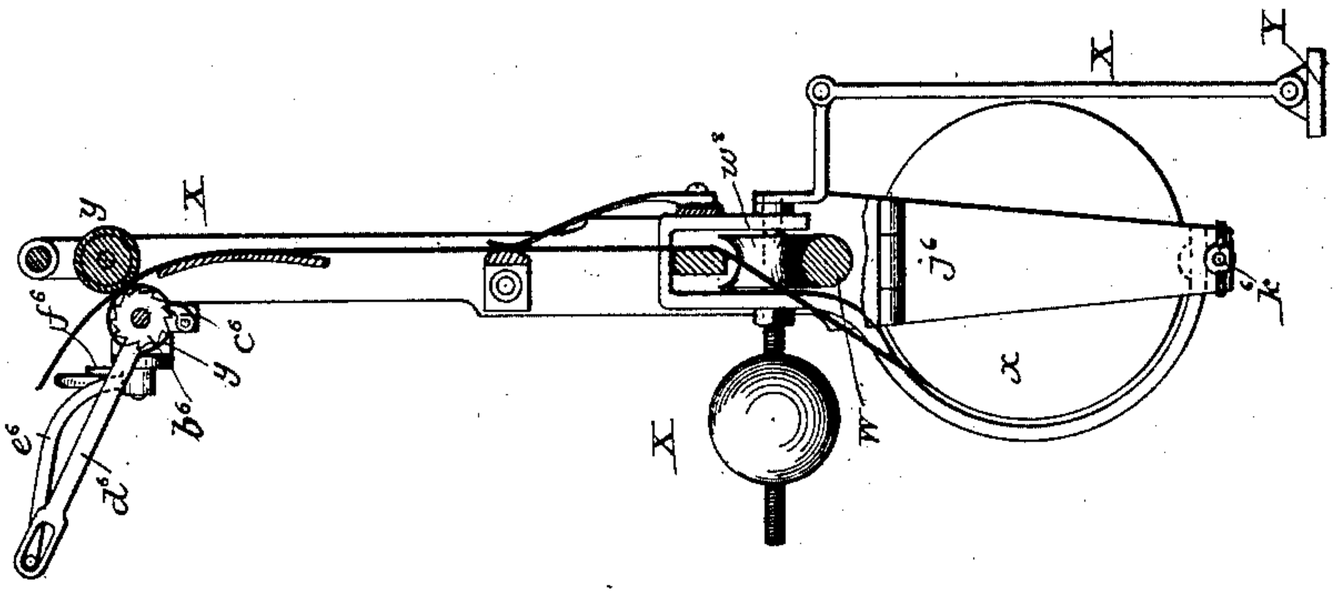
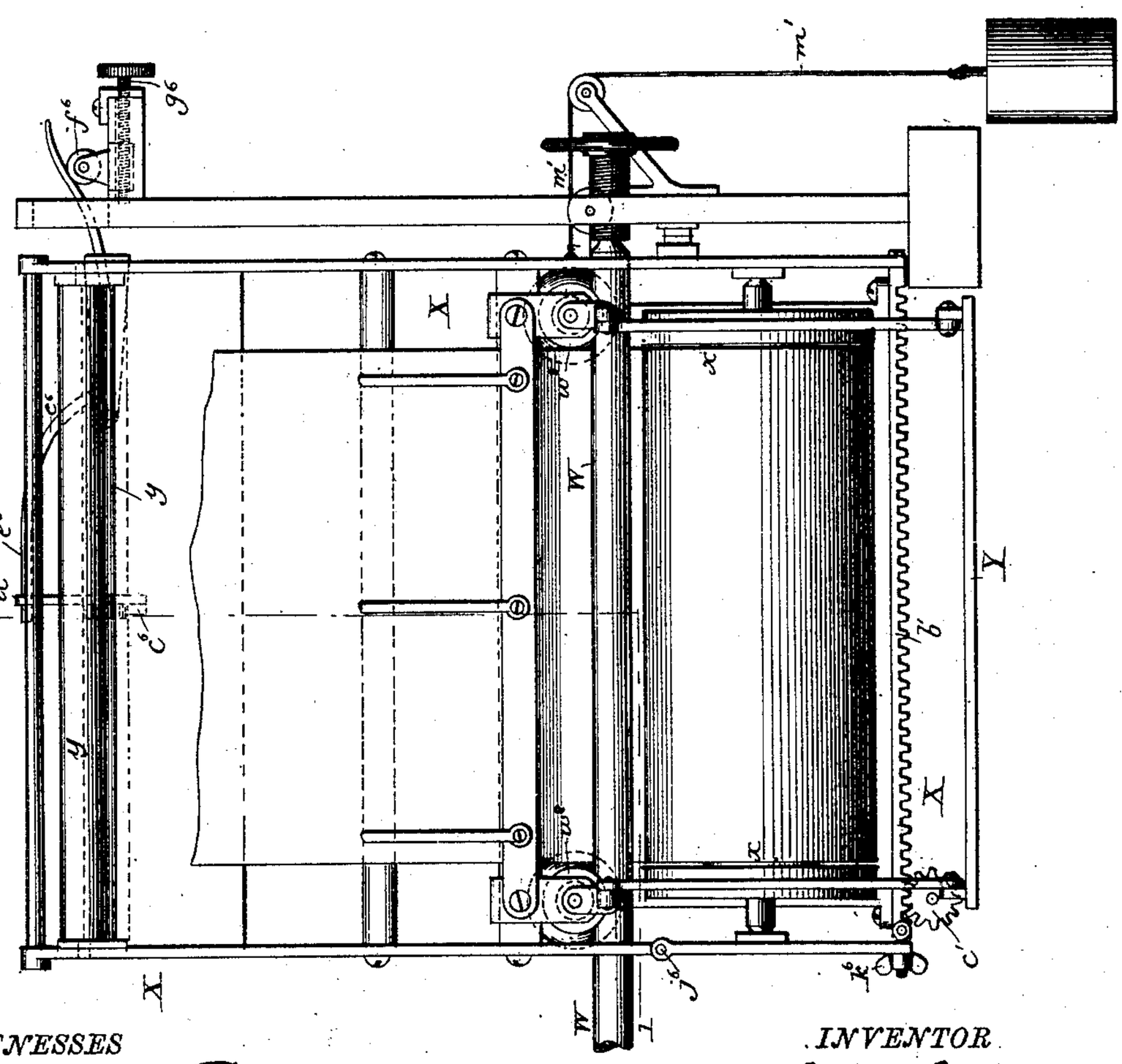


Fig. 3.



WITNESSES

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Fig. 14.

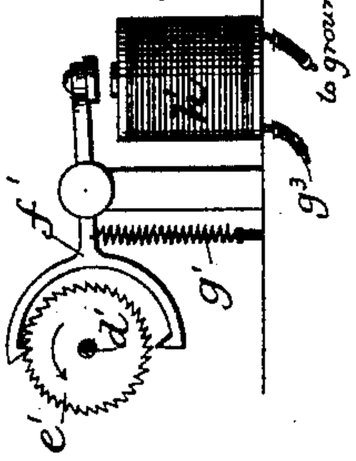


Fig. 11.

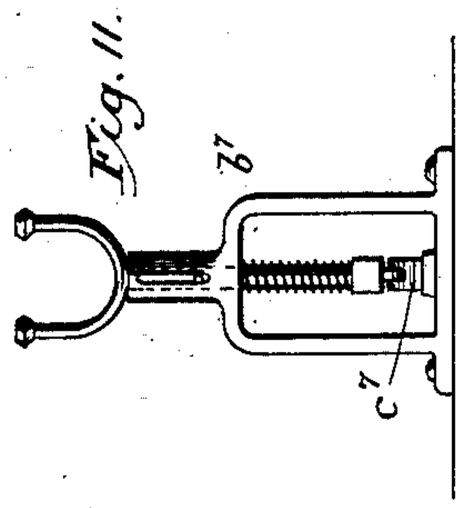


Fig. 13.

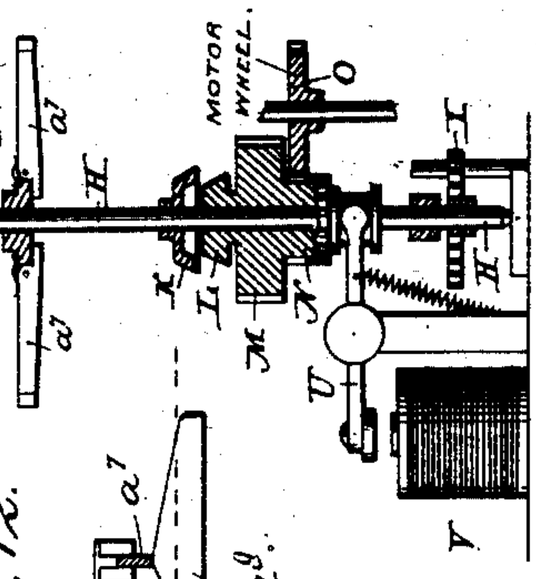


Fig. 12.

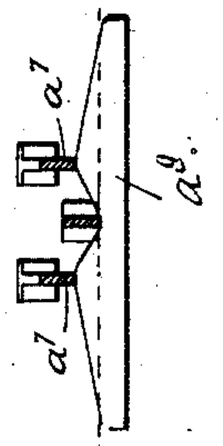


Fig. 9.

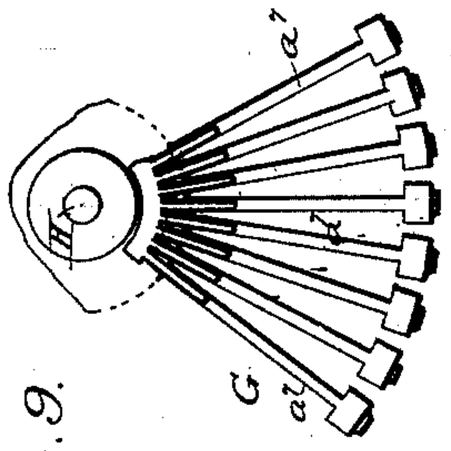


Fig. 10

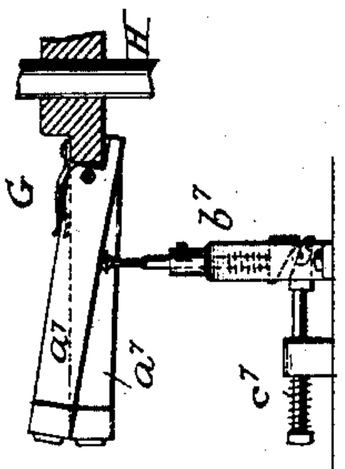


Fig. 5.

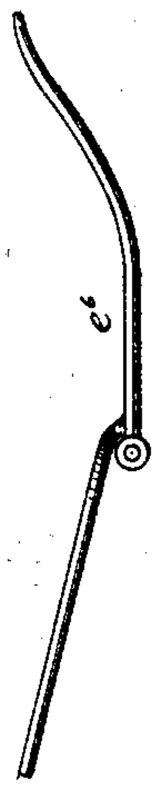


Fig. 6

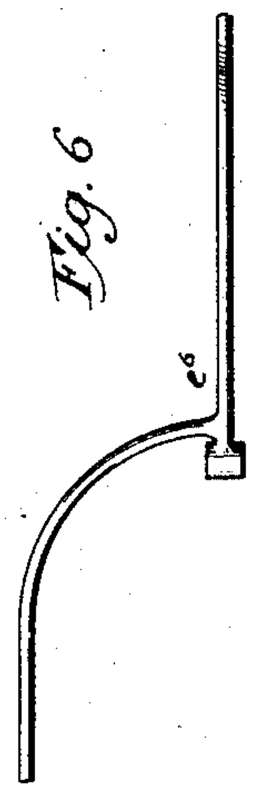


Fig. 8.

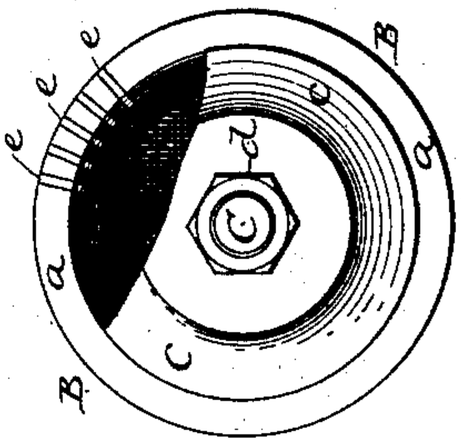
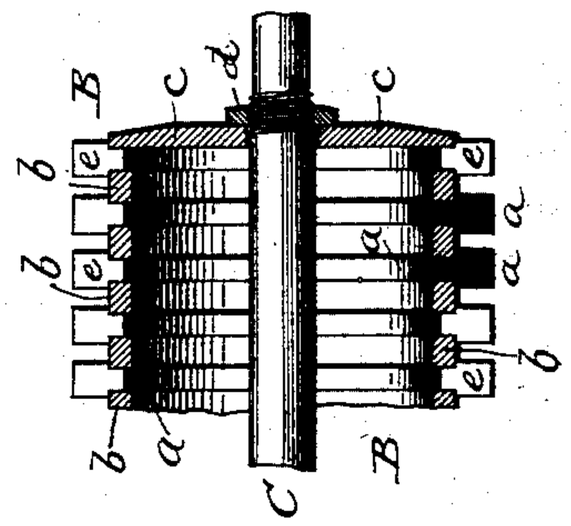


Fig. 7.



WITNESSES

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Arthur Bixby

By C. F. Dodge

Attorney

UNITED STATES PATENT OFFICE.

ARTHUR BIXBY, OF BALTIMORE, MARYLAND, ASSIGNOR OF THREE-FOURTHS TO SAMUEL G. B. COOK, OF SAME PLACE.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 374,444, dated December 6, 1887.

Application filed September 1, 1886. Serial No. 212,393. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR BIXBY, of the city of Baltimore and State of Maryland, have invented certain Improvements in Printing-Telegraphs, of which the following is a specification.

My invention relates to an instrument controlled by finger-keys and adapted to print the messages transmitted thereby. The transmitting mechanism may be combined with a printing mechanism at a distant office, and also, if desired, with a printing mechanism forming a part of the local or home instrument.

In my instrument the series of circuit-breaking or signaling wheels differ in the number of breaks or interruptions in their periphery, and are combined to form a cylinder which is connected to a motor and held normally at rest. A series of conducting finger-keys serve to release the cylinder and to make contact with the respective wheels, so that the action of each key is followed by a single rotation of the cylinder and the transmission of a distinctive number of electrical impulses over the line to the printing mechanism. The printing mechanism consists, primarily, of a rotary wheel provided with peripheral type, and of a paper-carriage movable to and from the type-wheel to cause the impressions, and also movable longitudinally to cause the impression of the successive characters in line. The type-wheel is mounted loosely on its spindle and turned forward step by step to bring the required letter at the printing-point by a friction-clutch on the spindle, which is in turn rotated by a magnetically-actuated escapement. The magnet for this purpose is actuated by the impulses transmitted over the line by the finger-keys and cylinder, before alluded to. After the printing action the type-wheel clutch is disengaged and the wheel returned instantly to its original position by a spring connected thereto. The clutch is engaged and the paper-carriage moved to cause the impression by magnets in a local circuit controlled through a power-driven switch by the primary or main-line circuit. The carriage is advanced by a magnetically-controlled escapement acting through a pinion, and this pinion is held out of engagement by another magnet at the proper time to allow the retreat of the carriage. The passage of the currents to the various parts of the apparatus at the proper time is controlled by two power-driven switches in addition to the one before mentioned, the several switches being controlled electrically, as hereinafter explained.

In the accompanying drawings, Figure 1 represents a top plan view of a combined transmitting and printing instrument constructed on my plan, the paper-carriage being removed to expose other parts to view. Fig. 2 is an end elevation of the machine, portions being shown in vertical section. Fig. 3 is an elevation of the paper-carriage. Fig. 4 is an end elevation of the same, partly in section, on the line 1 1. Fig. 5 is a side elevation, and Fig. 6 a top plan view, of the lever for operating the paper-feeding rolls. Fig. 7 is a longitudinal central section through one end of the transmitting-cylinder. Fig. 8 is a side view of one of the transmitting wheels or rings. Fig. 9 is a plan view, on a larger scale, of part of the type-wheel. Fig. 10 is a cross-section of the same, showing the lift-rod for elevating the type adjacent to the one to be printed. Fig. 11 is an elevation of the lift-rod. Fig. 12 shows a modification of the type-lifting mechanism. Fig. 13 is a vertical central section through the type-wheel and the devices for driving and controlling the same, certain of the parts being shown in side elevation. Fig. 14 is an elevation of the escapement mechanism through which the advance of the paper-carriage is controlled.

Referring to the various figures, A represents a bed or base plate, which may be of any form adapted to give support to the various parts hereinafter described.

B represents the horizontal transmitting-cylinder lying across the front of the bed-plate, the ends of its shaft C being mounted in supporting-posts D, insulated from the bed A. At one end the cylinder-shaft is connected by beveled gears E, or equivalent connections, to a motor of any suitable character adapted to effect its rotation—such, for example, as a gear-train actuated by a spring or weight.

The cylinder is composed, as shown in Figs. 1, 2, 7, and 8, of a series of signaling wheels

or rings, *a*, and intervening metal rings, *b*, the series being mounted on the central shaft and clamped tightly together by means of end plates, *c*, and nuts *d*. The wheels *a* are constructed each of vulcanized fiber or other non-conducting material, and are each provided in the periphery with a series of conducting-plates, *e*, extending radially inward, and in electrical contact with the internal conducting-ring, *b*. Each wheel contains a distinctive number of conducting-faces. The connection of these conducting-plates with the central rings, in the manner described, establishes an electrical connection throughout the entire length of the cylinder, so that the current may pass from any one of the surfaces *e* to the post supporting the end of the cylinder.

Above the cylinder are mounted on a common insulated pivot-rod, *g*, a series of levers or fingers, *h*, having at their inner ends conducting-fingers *i*, each connected by a wire, *j*, to a conducting-finger, *k*, on the outer end of the lever. A conducting-bar, *l*, insulated from the main frame and provided with a binding-screw, *m*, at one end, overlies the entire series of fingers *k*. A series of finger pieces or keys, F, one for each lever, are mounted on vertical spindles *n*, extending downward through the frame and pivoted to the respective levers *h*, as shown, so that the depression of a finger-key will operate the corresponding lever *h* and cause its finger *i* to make a contact with one of the signal-wheels, while at the same time the finger *k* at its opposite end will make a contact with the conducting-bar *l*, so that whenever one of the conducting-surfaces of the wheel encounters the finger *i* a circuit is completed from the standard D through the wheel, the finger *i*, conductor *j*, finger *k*, and rod *l* to the binding-screw *m*, whence the current passes to the printing mechanism, hereinafter described. During each revolution of the cylinder, while the finger *i* is in contact with a signal-wheel, the current will be interrupted as many times as there are non-conducting surfaces on the wheel, and, as a consequence, a corresponding number of electrical impulses will be transmitted to the line and the printing mechanism, the depression of each finger-key causing the transmission of a distinctive number of impulses—that is to say, a number differing from that produced by the depression of any other key. The cylinder is held normally at rest by means of a shouldered disk, *o*, secured to its end and engaging one end of a stop-lever, *p*, which is held normally in engagement by a spring, *q*. The depression of this lever is effected by a weighted hook, *r*, attached to a plate, *s*, having a pivot concentric with that of the lever and extended across the machine from one end to the other beneath the entire series of finger-key spindles *n*. The plate *s* is held normally in an elevated position by a spiral spring, *t*. Whenever a finger-key is depressed its spindle depresses the plate *s*, causing the hook *r* to draw the detent-arm *p* downward, and thereby release the cylinder, which is set in motion the instant that the contact-finger *i* bears thereon. As the finger-key is depressed, a roller, *u*, on the heel of the hook *r*, sliding against an inclined surface, *w*, causes the hook to disengage the arm *p*, which instantly rises to stop the cylinder at the end of its first revolution, although the finger-key may remain depressed. This insures a single rotation at each depression of a finger-key. When the finger-key is released, the plate *s* rises to its original position, and the hook *r* again engages the stop-lever *p*. The hook *r* may be provided with a weight, as shown, to cause its engagement, or a spring may be substituted.

Having thus described the means by which the impulses are transmitted to the main line, I will now proceed to describe the printing mechanism, referring first to the printing-wheel and its adjuncts, and later to the means by which motion is communicated thereto.

G represents the printing-wheel, provided with raised letters or type on its periphery, and mounted on a vertical spindle, H, seated in stationary bearings on the frame, so that the wheel may revolve freely. To the spindle there is connected one end of a spiral spring, I, attached at its opposite end to the frame, and serving to urge the type-wheel constantly in a backward direction. An arm, J, secured to the spindle and acting against a rigid stop, serves to limit the backward motion of the type-wheel, and in connection with the spring I acts to restore the wheel always to its normal or initial position after it has been released by the devices which turn it forward. The forward rotation of the type-wheel is effected by means of a friction-disk, K, secured thereon and arranged to co-operate with a friction-disk, L, attached to the arbor of an escapement-wheel, M, which revolves loosely around the spindle of the type-wheel, having a limited longitudinal motion thereon. The escapement-wheel is attached to and driven by a pinion, N, which will receive motion through a gear, O, from a motor of any suitable character—such, for example, as a clock-train driven by a weight or spring or an electric motor. The motor tends constantly to turn the escapement-wheel and the friction-plate L in a forward direction; but their motion is restricted by an ordinary pallet, P, pivoted to the main frame. This pallet is connected to a soft-iron plate or armature, Q, drawn in one direction by a spring, R, and in the opposite direction by an electro-magnet, S, mounted on the main line T, so that the electric impulses from the cylinder are communicated directly thereto. Through this arrangement the successive impulses are caused to operate the armature and turn the wheel forward from its initial point step by step a distance corresponding with the different impulses produced through the particular finger-key which may be actuated. The parts are so proportioned that when a key representing any given

letter is depressed the number of impulses produced thereby is such as to turn the wheel the proper distance to bring the corresponding letter thereon to the printing-point.

In order that the escapement-wheel may rotate the type-wheel, it is necessary that the clutch-plate L shall be lifted into engagement with the plate K before or at the instant that the escapement commences its action. This is effected by encircling the lower end of the pinion N by a loose ring or collar attached to a lever, U, one end of which is provided with or fashioned into an armature arranged above an electro-magnet, V, so that the magnet, drawing down one end of the lever, carries the other end upward, and thus lifts the plate L into engagement. This clutching-magnet V is actuated by a local circuit, hereinafter described. When the magnet V is discharged, the clutch-plate L drops out of action and the spring returns the type-wheel to its starting-point.

For the purpose of presenting the paper to the type-wheel, I extend horizontally across the rear end of the frame a rod or guide, W, and mount thereon an upright sliding frame or carriage, X, such as shown in Figs. 2, 3, and 4. The carriage is made in a skeleton form and provided with rollers w^8, to reduce the friction. In its lower end it is provided with a roll, x, to carry the paper, which extends thence upward past the edge of the type-wheel and between two feed-rolls, y, at the top. The upper end of the carriage stands normally away from the wheel; but it is moved toward the wheel at the proper moment to effect the impression by means of an armature, Y, suspended from its inner side and arranged to travel with the carriage over the upper ends of a row of electro-magnets, Z, mounted on the frame. These magnets, being excited, depress the armature Y and cause the frame to tip or rock around the supporting-shaft W as a fulcrum toward the type-wheel. For convenience of reference the magnet Z will be hereinafter designated as the "printing-magnet." The carriage is moved forward step by step after the successive impressions by means of a rack, b', attached longitudinally to its lower edge, and engaging a pinion, c', on one end of a horizontal jointed shaft, d', urged constantly forward by means of any suitable motor connected therewith, but limited in its motion by an escapement-wheel, e', fixed upon it and engaging a vibratory escapement lever or pallet, f'. This lever is urged in one direction by a spring, g', and is moved in the opposite direction by the attraction of an electro-magnet, h', hereinafter designated as the "feed-magnet." This magnet is connected with a local battery, and is momentarily charged through the medium of a switch, hereinafter described, after each impression of the type-wheel. Through its action and that of the spring the escapement-lever permits the pinion c' to rotate intermittingly, thereby advancing the carriage. The motor employed to drive the feed-shaft d' may be a gear-train driven by a weight or spring or a motor of any other suitable character.

In order to return the carriage to the starting-point after the completion of each line, I provide for the disengagement of the driving-pinion c' therefrom and attach to one end of the carriage a weighted cord, m', passing over a suitable guide and acting to draw the carriage backward when the pinion is disengaged. To permit the disengagement of the pinion, its shaft d' is divided at or near its middle and the two parts connected by a universal joint, n', allowing the end which carries the pinion to rise and fall. This end is mounted in a box or bearing, o', and is held normally in its elevated active position by a spring, p'. The box o' is attached to a soft-iron armature directly over a magnet, q', which, when excited, depresses the box and the pinion, disengaging the latter from the rack. The magnet is charged for this purpose by a local battery, the current being controlled as hereinafter explained. For convenience of reference the magnet will hereinafter be termed the "carriage-returning magnet."

I will now describe the arrangement of the various circuits by which the mechanisms heretofore explained are brought into action at the proper time. The main-line conductor T, connected with a suitable battery, is attached to one of the supporting-posts of the cylinder, whence the current passes through the cylinder, the keys, and the rod l, as before described, to the binding-screw m. From this point the main conductor T is extended to a magnet, B', controlling, as hereinafter explained, a switch, C', and from said magnet to the type-wheel magnet S, and thence to the distant station.

To secure the proper action of the type-wheel it is necessary that its clutching-magnet V shall be thrown into action at the same instant that the wheel-feeding magnet S is charged by the main line, so that the type-wheel shall be locked to the escapement-wheel at the same time that the latter commences its rotation. It is also necessary that the printing-magnets Z shall be actuated as soon as the type-wheel has been turned to the proper point. For the purpose of thus charging the magnets V and Z in succession I employ the mechanically-driven rotary switch C', connected to a local-battery wire, D'. The switch is constructed as follows: Three conducting-arms, a^2, to one of which the battery-wire is connected, are fixed in position and insulated from the other parts, except at the center, where they support the vertical shaft b^2 of a horizontally-revolving conducting-arm, c^2, arranged to travel in a circular path over a long conducting-plate, d^2, a short conducting-plate, e^2, and intermediate insulating-blocks, f^2 and g^2. The plate d^2 is connected to the clutching-magnet V by a conductor, h^2. The plate e^2 is connected by a conductor, i^2, to the printing-magnet

Z. The shaft of the conductor-arm c^2 is geared to a second shaft, i^2, connected to a suitable motor, which urges it constantly forward, and provided with a disk, j^2, having a single notch in its periphery. An armature-lever, k^2, actuated by a magnet, B′, in the main circuit, as before alluded to, stands normally in engagement with the disk j^2, thereby holding the switch-arm c^2 at rest upon the insulated surface g^2. When the first impulse is received from the cylinder over the main conductor T to actuate the type-wheel escapement, the magnet B′ disengages the lever or detent k^2 from the disk j^2, whereupon the motor acts to revolve the arm c^2 of the switch in the direction indicated by the arrow. When the arm encounters the plate d^2, the current passes from the local-battery wire D′ through the arms a^2 c^2, plate d^2, and wire h^2 to the clutching-magnet V, thus bringing the driving devices into action upon the type-wheel at the same time that the escapement commences its action. These connections are maintained during the entire time that the arm c^2 is moving over the plate d^2. As it reaches the end of this plate, and before leaving the same, it also comes in contact with the plate e^2, the effect of which is to divide the battery-current momentarily, and, while retaining the clutching-magnet V in a charged condition, to direct the current over the wire i^2 to the printing-magnet Z, thus effecting the impression. The impression occurs while the type-wheel is at rest, but while it is still held in position through the action of the clutching-magnet, so that it cannot turn backward. As the switch-arm c^2 continues its movement, it passes finally onto the insulated surface g^2, thereby discharging the clutching-magnet V, so that the type-wheel may turn backward, and discharging the printing-magnet Z, that the paper-carriage may fall away from the type-wheel. The armature-lever k^2 will of course be vibrated by the impulses received over the main line through the magnet B′; but being once lifted out of the notch in the disk j^2 it rides on the periphery of the latter until the switch-arm c^2 has completed a single revolution, whereupon the parts are automatically stopped by the re-engagement of the lever k^2 in the notch of the disk j^2.

It will be remembered that the advance of the carriage step by step is effected through the feed-magnet h' and pinion c'. In order to charge this magnet momentarily after each impression, I employ a rotary power-driven switch, E′, very similar in its construction to the switch C′, already described, but differing therefrom in that its revolving arm c^3 moves over three conducting-plates, d^3, and intervening insulated surfaces e^3. The conducting-arm c^3 is connected, through its supporting-arms a^3, with a wire, f^3, leading to a local battery, and the three conducting-plates d^3 are connected to branches of a wire, g^3, leading to the feed-magnet h', and thence to the ground. The switch E′ is geared to a shaft, h^3, connected with a suitable motor, and provided with a notched disk, i^3, held normally at rest by an armature-lever, j^3, actuated by an electro-magnet, k^3. A conductor, l^3, transmits the current from the printing-magnet Z to the magnet k^3, and thence to the ground. When, therefore, the printing-magnets are charged to effect the impression, the magnet k^3 is also charged, and the lever j^3 caused to disengage the disk i^3, and thereby unlock the switch E′, which acts to transmit the electric impulse to the feed-magnet h'. The arm c^3 makes but a third of a revolution at a time, moving from one to another of the conducting-plates. This action is secured by providing the disk i^3 with three peripheral notches, as shown in Fig. 2.

As the magnet q', for returning the paper-carriage, is operated only at long intervals, I control its exciting current by a rotary power-driven switch, G′, similar in its general construction to those already described. In this switch the conducting-arm d^4 travels, during each revolution, over two conducting-plates, e^4, and intervening insulations f^4. The shaft of the finger is geared to a shaft, i^4, connected to a motor and provided with a notched disk, j^4, held in check by an armature-lever, k^4, actuated by an electro-magnet, m^4. The conducting-finger c^4 is connected with a local battery and the conducting-plates e^4 connected by a wire, n^4, with the returning-magnet q', whence the current may pass to the ground. The finger d^4 rests normally on an insulated surface and the magnet q' is discharged; but when the magnet m^4 is charged it releases the finger d^4, which, forming a contact with the plate e^4, causes the local-battery current to be transmitted momentarily to the returning-magnet q'.

In order to effect this action of the switch at the proper time, I connect its controlling-magnet m^4 on one side with a wire leading to ground, and on the opposite side by a wire, o^4, to an insulated contact-stud, p^4, at or near one end of the carriage-guide. Near this stud p^4, I locate another insulated contact-stud, q^4, from which the line passes to a local battery. On one end of the carriage I arrange an insulated conducting-finger, r^4, of any suitable form, adapted to encounter the conductors p^4 and q^4 as the carriage completes its retrograde movement, thereby closing the circuit through which the switch-magnet m^4 is actuated, and releasing the switch G′. When the circuit is thus closed by the carriage, the switch G′, being set in motion thereby, acts to charge the magnet q' and disengages the feed-pinion from the paper-carriage, which is returned to the starting-point by the weighted cord. The switch G′ acts to keep the magnet q' charged for a sufficient length of time to allow the retrograde motion of the carriage.

The several switches may be operated by distinct motors; but it is preferred to connect them with each other and with a single motor to insure their action at the proper time or in the proper order of succession. In Fig. 1 two switches are shown connected by elastic belts encircling pulleys on the shafts of each.

For the purpose of advancing the paper in the carriage to cause the printing of successive lines, I provide the carriage at its top with the two horizontal rolls *y*, between which the paper is passed. To one of these rolls I apply a ratchet-wheel, b^6, engaged by a pawl, c^6, on a lever, d^6, which encircles the journal of the shaft of the roller. The outer end of this lever is slotted and receives one end of an angular lever, e^6, which is pivoted to the frame and arranged to encounter a stationary adjustable roll, f^6, mounted on a standard on the main frame. As the carriage completes its movement, the lever e^6, riding upon the roller f^6, receives motion therefrom, and, actuating in turn the lever d^6, revolves the rolls. The roller f^6 is mounted on a sliding block connected with an adjusting-screw, g^6, by which its position may be changed at will to vary the movement of the lever e^6, and thus change the distance to which the paper is moved and thereby the distance between the lines of print.

In order to permit the convenient introduction and removal of the rolls of paper, I mount the journals of the paper-carrying roll *y* in the sides of the paper-carriage and hinge one of these sides at the lower end, as shown at j^6, so that it may be turned outward at will. When in action it is held in place by a thumb screw, k^6, or equivalent fastening.

Operation: The paper being placed upon the carriage and the carriage moved to the extreme right, the various switches stand in the positions indicated in Fig. 1, the cylinder stands at rest, and all the circuits are broken. The operator depressing a finger-key, the lever *p* is disengaged and the cylinder commences to revolve, the finger *c* forming a contact with one of the wheels, so that the electric impulses corresponding in number to the particular letter to be printed are transmitted through the rod *l* and conductor T to the magnets B′ and S. The magnet B′ releases the switch C′, which immediately establishes one of the local circuits through the clutching-magnet V. This magnet immediately couples the type-wheel to its driving-motor, while at the same time the escapement-magnet S, receiving the series of impulses from the main line, actuates the escapement and permits the rotation of the type-wheel until the latter brings the proper letter to the printing-point. As soon as this is done, the switch C′ transmits the local current through the printing-magnet Z, by which the impression is effected. Immediately thereafter the second switch, E′, released by the current from the printing-magnets passing through the magnet k^3, transmits a single impulse from the local line to the feed-magnet h', allowing the wheel c' to turn forward under the influence of its motor and advance the carriage. By this time the switch C′ has resumed its original position, and, the clutch-magnet V being discharged, the type-wheel has returned under the influence of its spring to its original position. The various parts are now in their original condition and the printing of the next letter is effected in like manner. At the completion of the line the finger *r* on the carriage closes the local circuit embracing the magnet m^4, which releases the switch G′, through which a current is transmitted to the returning-magnet q', and the feed-pinion thereby disengaged and held out of gear until the weight returns the carriage to the starting-point, the paper being advanced on the carriage by the action of the levers and rolls before described.

The type-wheel may have a continuous periphery with the type formed thereon; but, in order to prevent interference with the adjacent letters in the act of printing, I prefer to construct the wheel as in Figs. 1, 9, and 10, consisting of a central hub with a series of radial arms, a^7, each carrying at its outer end a single letter or type, and at its inner end pivoted to the hub of the wheel. If preferred, these arms may be made of spring metal and fastened rigidly to the hub of the wheel. When thus constructed, I locate below the wheel adjacent to the hub a lift-rod, as shown. The lift-rod is forked at its upper end, and its stem is seated to have vertical play in the hollow socket of a bracket, b^7, secured to the frame of the instrument. The lower end of the lift-rod terminates in a head inclined or wedge-shaped on the lower surface to ride upon a friction-roll journaled in the end of a push-rod, c^7, sliding in bearings secured to or forming a part of the foot or bracket b^7. The push-rod and lifter-rod are held normally out of engagement with each other and with the type-arms by springs, as shown, and the end of the push-rod lies in the path of a bar or other device fixed to the paper-carriage, whereby when the carriage is moved forward toward the type-wheel the push-bar will engage the lifter-rod, which latter will raise the two type arms adjacent to the one carrying the type about to be used.

In place of the lifting-rod *b*, I may, if preferred, employ a stationary cam-track, *a*, such as shown in Fig. 12, lying beneath the arms of the type-wheel. At its middle, directly opposite the printing-point, this track has a depression which permits the arm for the time being in use to fall to the printing-point. On each side of this point the track is raised, so as to lift and sustain the two arms which lie on opposite sides of the one in use, so that their characters are prevented from giving an accidental impression. I prefer to tip the upper end of the lifter-rod with rubber or some other cushioning substance to deaden sound.

In order to insure the falling of the type-arms a^7 to their normal position after they have been lifted, I secure to the hub of the type-wheel a circular series of light springs, one resting upon the upper surface of each type-arm. This separation or elevation of the type-bars at the moment of printing insures a clean impression.

I am aware that a series of independent circuit-breaking wheels have been secured rigidly on a driving-shaft; also, that a series of cir-

cuit-breaking wheels have been mounted loosely on a rotary shaft and each combined with an individual key and clutch for locking it momentarily to the shaft, and this I do not claim. I believe myself to be the first to build up a cylinder of non-conducting wheels provided with conducting-surfaces and intermediate conducting rings or washers, as herein shown, and the first to combine with a series of circuit-breaking wheels, which revolve in unison, a single stop device to arrest the motion of the wheels, and a series of conducting fingers or keys acting with the respective wheels, but all acting in common on the stop to release the wheels.

Having thus described my invention, what I claim is—

1. A transmitting-cylinder consisting of the central shaft having end plates or collars, the series of non-conducting wheels, each having conducting-plates inserted in its periphery, and the series of conducting-rings seated between the wheels at or near the periphery, and serving, as shown and described, the double purpose of maintaining a proper separation of the wheels and of establishing an electrical communication between the peripheral conducting-surfaces throughout the series.

2. A hollow transmitting-cylinder consisting of the shaft and its end plates, *c*, the wheels B, each made of non-conducting material, with an open center, and peripheral conducting-plates *e*, and the intermediate conducting-rings, *b*, seated in the side faces of the wheel in contact with plates *e*, as shown, whereby the plates and rings are enabled to sustain each other.

3. In combination with a rotary cylinder comprising a series of signal-wheels and arranged to revolve always in the one direction, the finger-key levers, each bearing a conductor to make contact with the corresponding wheel, the stop *p*, to arrest the cylinder at the end of each revolution, and the bar or arm *s*, arranged to be mechanically actuated by each and all of the keys, and to effect in its turn the disengagement of the stop, whereby each key, when depressed, is enabled to act mechanically in releasing the cylinder, and at the same time to carry the conducting device into contact with the transmitter.

4. In combination with the transmitting-cylinder having the series of signal-wheels, the finger-key levers, each acting directly to carry a conductor into contact with the cylinder, the stop *p*, to arrest the rotation of the cylinder, the plate or arm *s*, acted upon by all the key-levers, and the dog *u*, by which the plate is caused to rise instantly and independently to its position for stopping the cylinder.

5. In combination with the cylinder and the arm or lever to hold the same against rotation, the finger-keys, the movable plate on which the finger-key stems are supported, the latch connecting said plate to the arm which holds the cylinder, and the inclined surface to effect the automatic disconnection of the latch that the arm may rise and stop the cylinder during the depression of the finger-key.

6. The rotary type-wheel and its returning-spring, in combination with the frictional driving-clutch, the escapement to control its motion, and the magnets for operating the clutch and the escapement.

7. In combination with the type-wheel and its spindle provided with the friction-collar, the movable friction clutch or disk to drive the same, the lever by which said clutch is carried, and the magnet to operate said lever.

8. In combination with the transmitting-cylinder and the main-line conductor extending therefrom, the type-wheel, its escapement, the escapement-actuating magnet mounted in the main line, the driving-clutch, its controlling-magnet V, and the mechanical switch C′, for connecting the magnet D with a local circuit, said switch combined with and controlled by a magnet, B′, in the main line.

9. In combination with the transmitting-cylinder, the type-wheel, the escapement and clutch for actuating said wheel, the magnets controlling said escapement and clutch, the paper-carriage, its feeding-pinion *c*′, connected with the motor, the escapement to control said pinion, the magnet *h*′, to actuate said escapement, and the two mechanically-actuated switches D′ and E′, whereby the clutch-magnet and the feed-magnet are controlled.

10. In combination with the type-wheel, the escapement and the clutch for operating the same, and the magnets S and T, for operating said escapement and clutch, the paper-carriage, its feeding-pinion, the escapement and magnet controlling said pinion, the magnet Q, to disengage the pinion, the printing-magnet Z, the three mechanically-driven switches C′, E′, and G′, their controlling-magnets, and connections, substantially as described, governing the circuits of said controlling-magnets.

11. The type-wheel having the independently-movable type-bearing arms, in combination with the lifting device, substantially as described, acting to lift the two arms which are for the time being at opposite sides of the printing-point out of line with the intermediate arm, whereby the printing action is confined to the last-named arm, as described.

In testimony whereof I hereunto set my hand this 6th day of August, 1886, in the presence of two attesting witnesses.

ARTHUR BIXBY.

Witnesses:
ANDREW PARKER,
W. H. SHIPLEY.