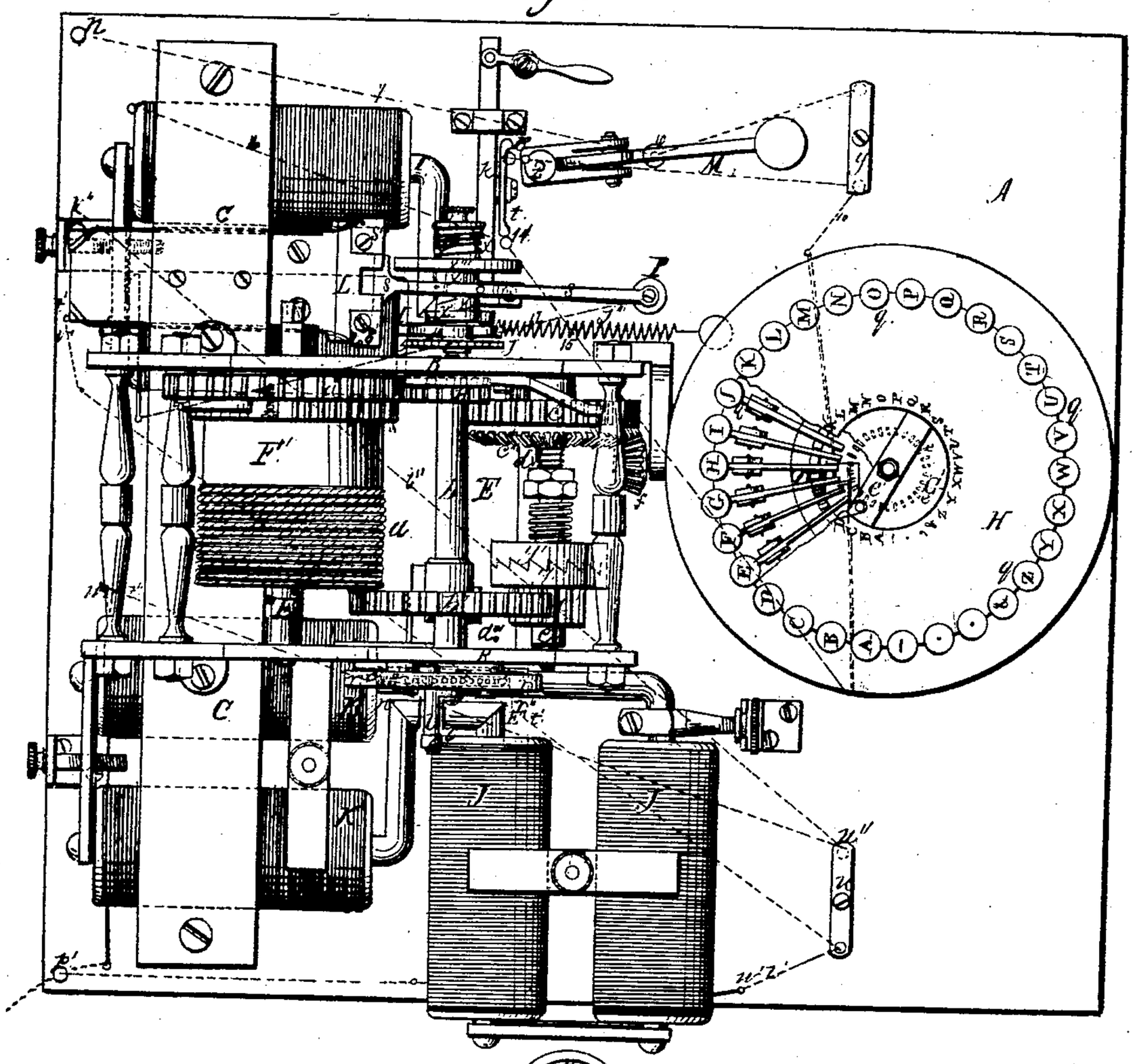
No. 14,731. PATENTED APR. 22, 1856.

A. J. PARTRIDGE.

ELECTROMAGNETIC PRINTING TELEGRAPH.

2 SHEETS—SHEET 1.

Fig. 1.



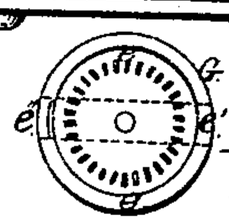


Fig. 6.

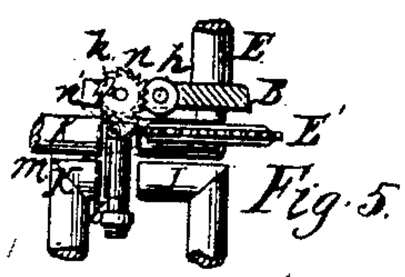
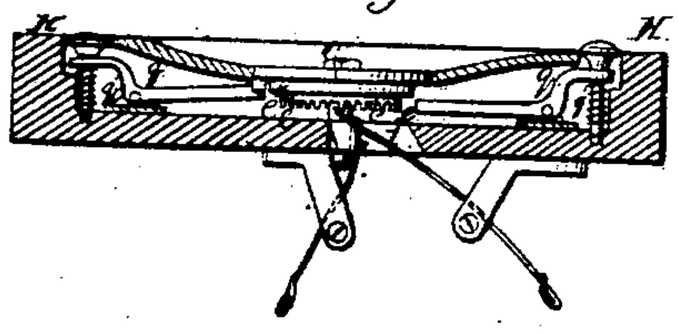


Fig. 5.

Fig. 4.



No. 14,731. PATENTED APR. 22, 1856.

A. J. PARTRIDGE.

ELECTROMAGNETIC PRINTING TELEGRAPH.

2 SHEETS—SHEET 2.

Fig: 2

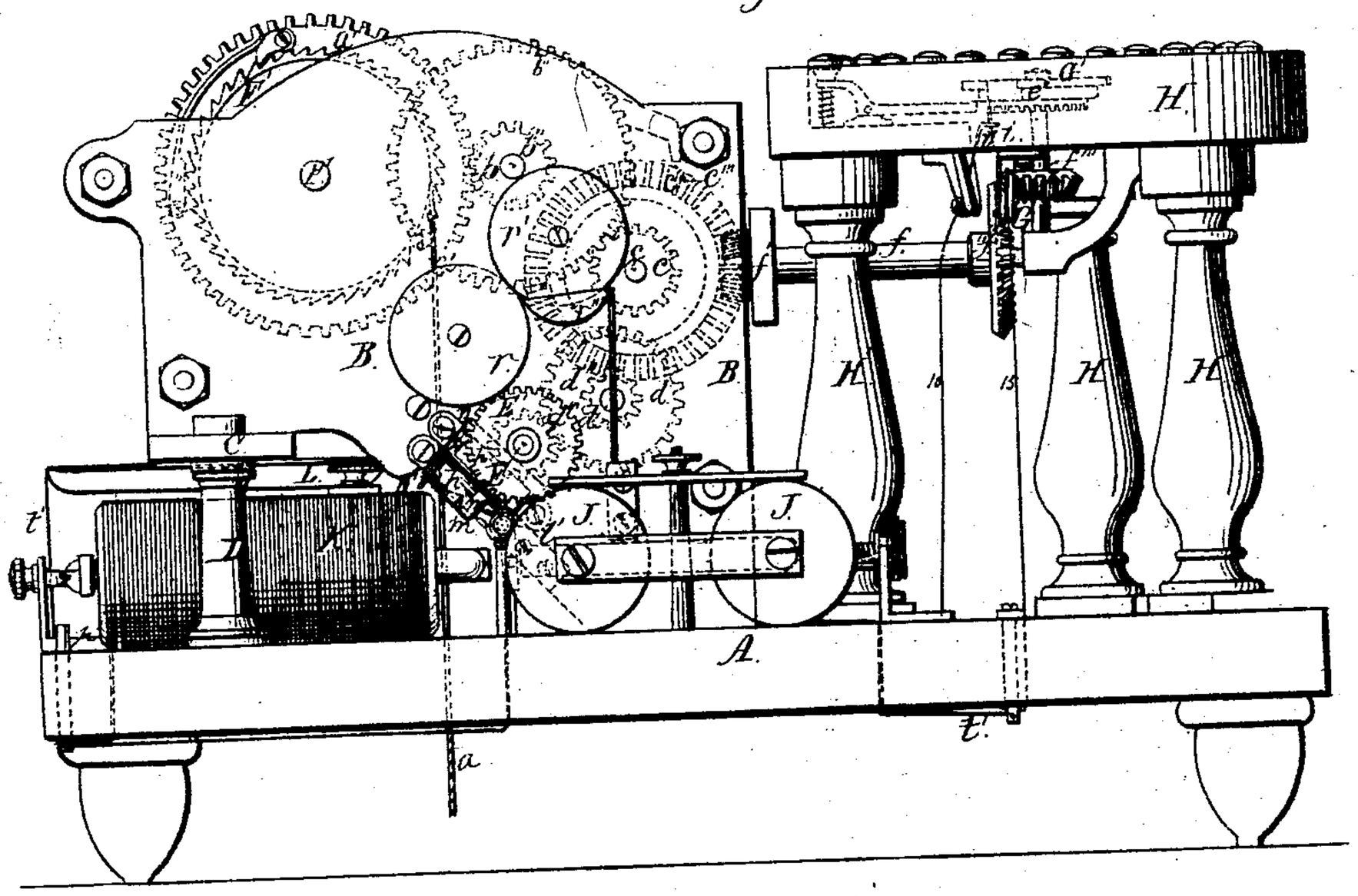
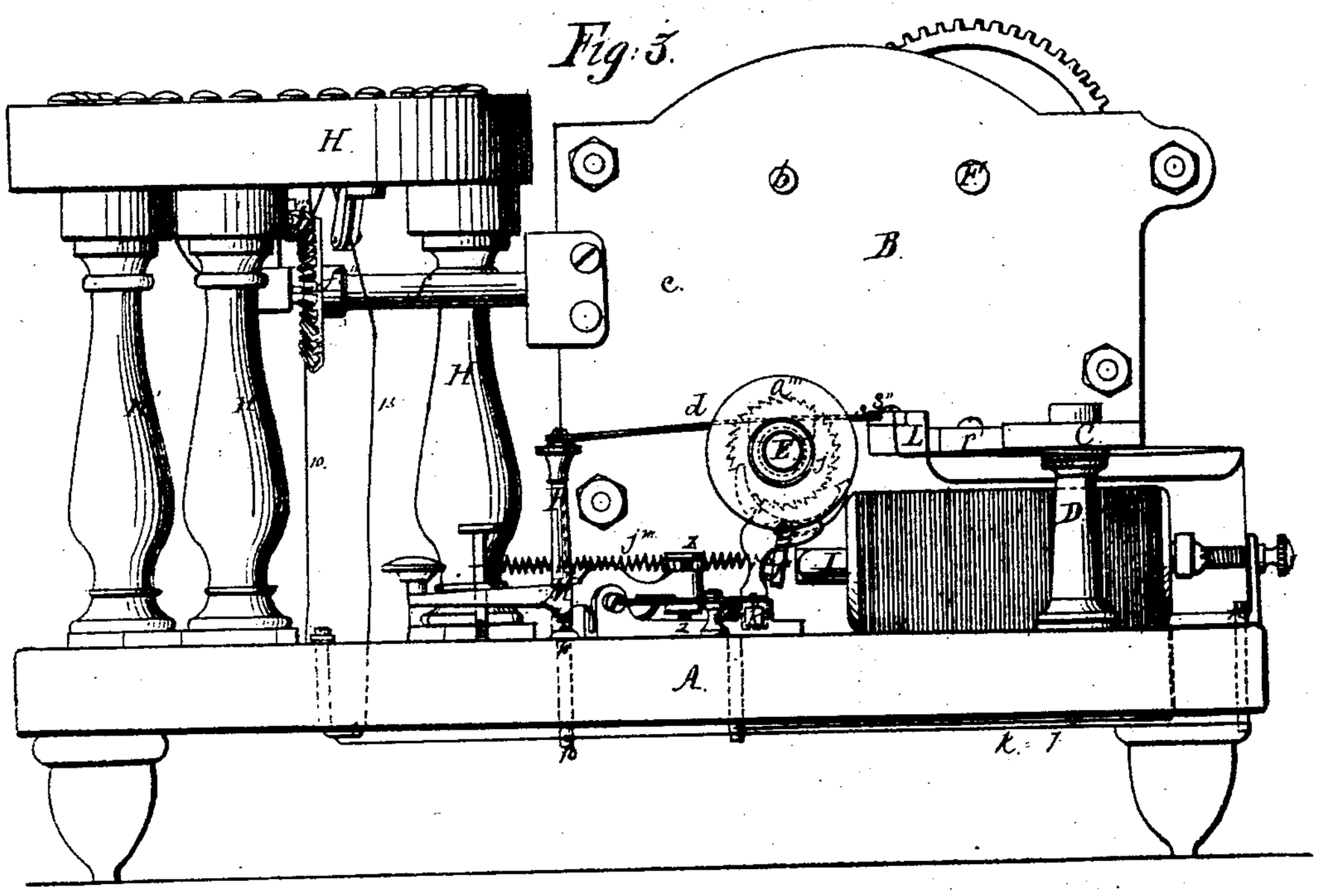


Fig: 3.



UNITED STATES PATENT OFFICE.

A. J. PARTRIDGE, OF SOUTHBRIDGE, MASSACHUSETTS.

IMPROVEMENT IN ELECTRO-MAGNETIC PRINTING-TELEGRAPHS.

Specification forming part of Letters Patent No. **14,731**, dated April 22, 1856.

To all whom it may concern:

Be it known that I, ALBERT J. PARTRIDGE, of Southbridge, in the county of Worcester and State of Massachusetts, have invented an Improved Electro-Magnetic Printing-Telegraph; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of the instrument employed at every station for the transmission and receipt of communications. Figs. 2 and 3 are opposite-side views of the same. Fig. 4 is a section of the composing part of the instrument. Fig. 5 is a detached view of the feed-rollers for moving the paper, the type rollers, and their appendages. Fig. 6 is an under-side view of what I call the "circuit-breaker."

Similar letters of reference indicate corresponding parts in the several figures.

In this telegraph an instrument is employed at every station, which is both a composing and printing instrument, and is capable of receiving communications without printing, and also of making a copy at the station from which the communication is sent. The several instruments of the line are connected by a circuit composed of a single conducting-wire and the ground. A description of one of these instruments will suffice to explain the whole operation of the telegraph.

A is a wooden base which carries the several parts of the instrument. On the back part of this base is erected a framing, B B C D, which contains the bearings for the horizontal shaft E of the type-wheel E′, and also the bearings for the horizontal shaft F of the barrel F′, round which is wound a cord, *a*, from which is suspended a weight which serves to set the shaft F in motion to transmit motion to the type-wheel and the key-board system.

Motion is transmitted from the shaft F, which may be termed the "main shaft" to the type-wheel shaft by means of a large spur-wheel, a', on the said main shaft, gearing with a smaller wheel, b', on a shaft, *b*, which shaft carries a large spur-wheel, b'', gearing with a smaller wheel, c', on a shaft, *c*, which shaft carries a large spur-wheel, c'', gearing with a smaller wheel, d', on a shaft, *d*, which shaft carries a large spur-wheel, d^2, gearing with a smaller wheel, d''', on the type-wheel shaft. The shaft *c* also carries a bevel-toothed wheel, c''', which gears with a smaller bevel-wheel, f', on a horizontal shaft, *f*, which carries a larger bevel-wheel, f'', gearing with a small bevel-wheel, f''', on a vertical shaft, G, which carries a revolving disk, G′, of wood or non-conducting material, which occupies the center of a stationary horizontal circular key-board, H, which is supported on a stand, H′ H′ H′, on the front part of the base A.

The relative sizes of the bevel-wheels are such as to cause the disk G′ to receive exactly the same number of revolutions as the type-wheel, and this causes an indicator or pointer, *g*, attached to the upper side of the said disk, always to point to a letter or sign of a fixed alphabet on the key-board, corresponding to that type of the type-wheel which is in a position to print on a strip of paper, which passes through a pair of feed-rollers, *h h*, (see Figs. 2 and 5,) the said alphabet on the key-board corresponding of course with the alphabet on the type-wheel.

The disk G′, which, from the duty it performs, may be termed the "circuit-breaker," is provided on its under surface with a series of teeth or projections, *e e*, of metal or other durable material, arranged in a circle concentric to its axis and corresponding in number with the types on the type-wheel. Under this circuit-breaker there are arranged two pieces of wire, *i i′*, which form portions of the circuit. These are shown in Figs. 1, 2, and 4, in the former of which figures the key-board is broken away to show them. The end of the piece of wire *i* stands in such a position that every tooth *e* of the circuit-breaker, in passing it, will spring it down and out of contact with the end of the piece *i′*, which lies across it, and thus break the circuit; but as the teeth severally pass the point of the said piece of wire *i* the said point springs up into the spaces between them, and the wire is thereby allowed to come into contact with the wire *i′* and thus close the circuit again. In this way the circuit is broken and closed as many times during the revolution of the type-wheel as there are types in the same. By thus breaking and closing the circuit at the instrument at the station from which the communication is being sent the movement of the type-wheel of the instrument or instru-

ments at the receiving station or stations is enabled to be controlled, so as to preserve at all times a proper relation to the key-board system of the instrument which is sending, by means of an escapement applied to the type-wheel shaft or shafts of the former instrument or instruments, the wheel *j* of the said escapement (see Figs. 1 and 3) being on the said shaft, and the verge *j'* being attached to the armature *j''* (see Fig. 3) of a helical magnet, I I, which magnet is always in the circuit.

It will be readily understood that, the escapement-wheel having the same number of teeth as the number of types on the wheel, the opening and closing of the circuit by the circuit-breaker of the sending-instrument, acting upon the armature *j''* of each receiving-instrument, in connection with a spring, *j'''*, applied to the armature, will govern the action of the escapement and thus cause the sending and receiving instruments to operate in unison, each being kept in operation by the weight and cord applied to its barrel F'.

The escapement of the sending-instrument is never in operation, the verge *j'* being thrown out of gear with the escapement-wheel by moving a sliding rod, *k*, to which it and the armature *j''* are attached.

In the drawings the verge is shown out of operation.

The operations of forcing the paper in contact with the type-wheel to receive the impression, and of moving the feed-rollers *h h* to feed the paper to give the necessary spaces between the letters or signs, are performed through the movements of an armature, *l*, which is suspended on a center, *l'*, to vibrate between the poles of a helical magnet, J J, and those of a magnet, K K, the said armature forming one arm of a lever of the first order, the opposite arm, *l''*, of which carries a spring-pawl, *n'*, engaging with a ratchet-wheel, *n*, on one of the feed-rollers and carrying a pad, *m*, which is capable of pressing the paper against that type which is in the proper position to print.

The above armature is entirely distinct from the circuit.

The helical magnets J J and K K are in two distinct branches of the circuit, the said branches both starting from a brass pillar, P, which forms a part of the main circuit and is connected by a wire, 17, with the magnet I, which magnet is connected with the wire *i*, and through the said wire *i* and the wire *i'* and the connections of the latter wire, hereinafter described, communicates with the pin *p*, to which the line-wire connects.

The branch circuits, passing through the magnets J J and K K, unite again at the pin *p'*, which is connected by the line-wire with the opposite pole of the battery to the pin *p*, and, according to whether the current passes through the magnet J J or that K K, either is active. The current, except at the time that one of the keys *q q* on the key-board is depressed, passes through the magnet J J, and hence at that time the armature *l* is attracted toward that magnet, as is shown in Fig. 2, but by depressing any one of the keys *q q* upon the key-board the current is changed, in a manner that will be presently described, to the branch of the circuit containing the magnet K K, which causes the armature to be drawn toward that magnet and causes the pad *m* of the armature-lever *l''* to force the paper against the type-wheel, as shown in Fig. 4, with sufficient force to receive an impression therefrom, the type being inked to produce the impression by means of an inking-roller, *r*, which revolves in contact with it, the said roller being supplied with ink from a roller, *r'*, which rotates in an ink-trough, *r''*.

The above change of current is only instantaneous, it being immediately changed again to the other branch of the circuit containing the magnet J J, which causes the armature to be drawn from the magnet K K toward J J, thus causing the pad *m* to be thrown away from the paper, and causing the pawl *n'* to act on the ratchet-wheel *n* and turn the feed-rollers far enough to move the paper to a proper position to receive the next impression.

The arrangement for changing the circuit from one magnet to the other and the manner in which it is operated by the depression of the keys on the key-board of the sending-instrument will now be described.

It has already been stated that the division or branching of the circuit takes place between the pillar P and the pin *p'*.

To the pillar P is pivoted a metal arm, *s*, which has a T-shaped extremity, which is capable by a slight vibrating movement of entering a slit in either of two small brass blocks, *s' s''*, which are secured to a slab, L, of ivory or some insulating material, bolted to the framing of the instrument. To the blocks *s'* is connected a wire, *t'*, which leads along one side of the slab L and down through a hole, *i'*, in the base A, and then across to a pin, *u'*, secured in the base, and from thence up through a hole, *w'*, to the helix of the magnet J J; and to the block *s''* is connected a wire, *t''*, which passes through a hole, *v''*, in the base, and then across to a pin, *u''*, secured in the base near the pin *u'*, and from thence up through a hole, *w''*, to connect with the helix of the magnet K K.

The arm *s*, which may be termed the "circuit-changer," is fitted on its under side with an ivory tongue to enter a groove in the loose portion *x* of a clutch, *x x'*, which is fitted to the type-wheel shaft. The two parts of this clutch are constructed with inclined teeth, like rag-wheels, so that if the loose portion *x* were to turn independently of the shaft, in contact with the piece *x'*, which is fixed to the shaft, it would receive a movement longitudinally to the shaft. The loose piece *x* of the clutch has a very light spiral spring, *x''*, applied to it in such a way as to exert just enough force upon it to hold it in contact with the piece *x'*,

but to produce as little friction as possible between them, and it carries a small fly-wheel, x''', the momentum of which is sufficient to cause x' to continue its revolution a short distance after the type-wheel shaft is suddenly arrested, as it is by the depression of one of the keys q q, as will be presently described. While the revolution of the type-wheel continues uninterruptedly, or with only such slight interruptions as are produced by the action of the escapement, there is no perceptible movement of the piece x of the clutch along the shaft, and the spring $x,''$ holding the said piece x closely engaged with the piece $x,'$ causes the circuit-changer to remain in contact with the block s'; but when the type-wheel shaft is suddenly and positively arrested by the depression of a key-lever the loose part of the clutch by the continuance of its revolution moves far enough along the shaft to move the circuit-changer into the slit in the block s'', thus, without breaking the circuit, changing or transferring it from the magnet J J to the magnet K K, and effecting the printing and feeding movement of the paper; but this change of circuit is only momentary, for as soon as the momentum of the fly-wheel x''' is spent the spring x'' forces back the part x of the clutch and returns the circuit-changer to the block s'.

The finger-keys q q on the key-board are all arranged radially round the circuit-breaker G′, each being a lever of the first order, with a knob on the outer extremity protruding through the top of the key-board, and a spring, q', placed under the knob to hold it up. The knobs have inscribed upon them an alphabet corresponding to the alphabet of letters and signs on the type-wheel.

On the under side of the circuit-breaker there is a projection, e''. (Shown in Fig. 6, which is an inverted plan of it detached from the machine, and shown also in Figs. 2 and 4.) This projection forms part of a metal bar, e', which is secured to the wooden disk. The operator, by depressing the knob of either of the key-levers with his finger, throws up the inner end of that lever, as shown in Fig, 4, to such a position that the revolution of the circuit-breaker will bring the projection e in contact with it, and thus cause the circuit-breaker to be arrested. The arrest of the circuit-breaker of the sending-instrument stops the operation of the whole of that instrument, and also prevents the action of the escapement of the receiving-instrument, and consequently stops that instrument also, and thus causes the change of circuit to take place, in the manner before described, through the momentum of the wheel x''' acting on the clutch.

The arrangement of the keys is such that any key of the sending instrument stops the type-wheel of the receiving-instrument in such a position that the type corresponding to the letter or sign marked on that key is in a position to print. The depression of the key only requires to be momentary, and as soon as the knob is released the sending-instrument commences its operation again, and the circuit-breaker of the sending-instrument sets the escapement of the receiving-instrument in operation again. It should be observed that when the stoppage of the circuit-breaker takes place the point of the wire i must be between two of the teeth e e, so as to stop with a closed circuit. It may be here remarked that the armature l is held steady during the opening and closing of the circuit consequent upon the action of the teeth e e upon the wire i by the weight of the printing-arm l'' attached to it, which holds it up toward the magnet J J until the circuit is changed to the magnet K K.

In order to prevent concussion and liability to breakage of the instrument, which might otherwise result from the sudden stoppage, a spring-clutch, y y', is employed to drive the shaft c, one part being fast to the wheel c', which is loose on the shaft, and the other being attached to the shaft so as to be capable of sliding thereon without turning. Instead of this clutch a ratchet and spring-pawl may be employed on this shaft to act before the weight in starting the instrument after a dead-stop.

A signal-key, M, is applied to the instrument represented in the drawings. This key is not absolutely necessary, but it may be employed for the convenience of "calling" and "answering" and for other signals, to save time. An alphabet may be used for this key, if desired.

Those connections of the circuit throughout the instrument which have not been before described will now be explained before explaining the operation of the telegraph.

To the pin p, where the line-wire connects, is connected a wire, 7, running under the base A, first to the fixed pin 10, which serves, when desired, to conduct the circuit through the signal-key, and from thence to the former of two pins, 8 9, which are connected by a movable metal button, y. From the latter pin two wires, 10 11, branch off, the former connecting with the wire i', and the latter connecting first with the stand of the signal-key and next with the first of two pins, 13 14, which two pins, when the verge is in operation, are connected by a metal button, t, attached to the rod k, which carries the verge, but which, when the verge is thrown out of operation, are disconnected. The wire i' connects with the wire i, as before described, except when the circuit is broken by the action of the circuit-breaker, and the wire i connects with a wire, 15, which connects with the pin 14. From the pin 14 a wire, 16, connects with the helix of the magnet I, from this magnet to the pin p', where the other connection of the line-wire is made. The connections have been before described, except that there is a button, u, by which the pins u u' may be connected or disconnected.

The *modus operandi* will now be explained.

To send a message the buttons y and u are

both closed and the verge disconnected, which opens the button *t*. The circuit through the sending-instrument is as follows, supposing the pin *p* to be connected with the positive pole of the battery: It passes along the wire 7 to the pin 8, through the button *y*, pin 9, wires 10 *i' i* 15, to the pin 14; thence by the wire 16 to one end of the coil of the magnet I I, through this coil, which it leaves by the wire 17, arriving at the pillar P, from whence it passes through the circuit-changer *s* to the block *s'*. It then passes along through the wire *t'* and magnet J J to the pin *p'*. The button *u* is only closed in sending to prevent the action of the circuit-changer *s* operating the armature *l;* but if a copy is required to be taken, the button *u* is opened and the magnets J J and K K act the same as in the receiving-instrument.

To receive a printed communication, the button *y* is closed and *u* opened, and the verge thrown into operation, which closes the button *t*. The button *t*, when closed, allows the button *y* to be opened to cut the wires *i i'* out of circuit, if desired. In that case the screw *z* of the signal-key should be screwed up so that the circuit will be made from the point 10 through the signal-key to the point 13, thence through the button *t* to the point 14, and on to the magnet I I. The course of the circuit from this magnet has been already described.

To receive a copy without printing, the instrument is arranged as above described, except that the button *u* is closed to connect the points *w' w''*, and the communication is read off from the indicator *g* and alphabet surrounding the circuit-changer.

I will here state that instead of arranging the axes of the feed-rollers perpendicularly to the axis of the type-wheel, as described, they may be arranged parallel, which would not require so nice a degree of accuracy.

Having thus fully described my invention, I will proceed to state what I claim and desire to secure by Letters Patent:

The within-described method of operating the circuit-changer *s* to change the circuit by means of the clutch *x x'* and fly-wheel *x'''* attached to the loose part thereof.

ALBERT J. PARTRIDGE.

Witnesses:
JOHN EDWARDS,
DANIEL F. BACON.