(No Model.) 9 Sheets—Sheet 1.

F. SEDGWICK.

PRINTING TELEGRAPH INSTRUMENT.

No. 454,884. Patented June 30, 1891.

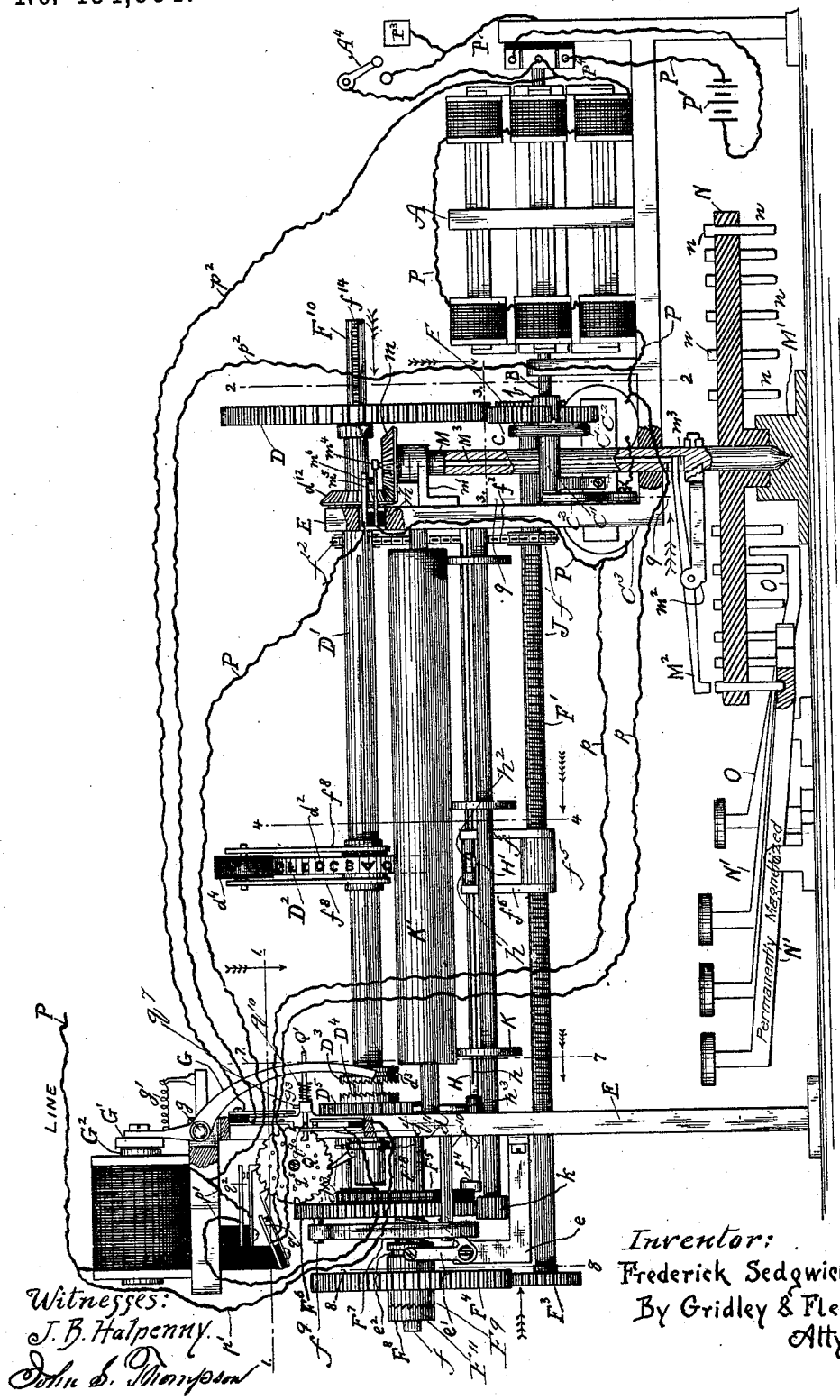


FIG. 1.

(No Model.) 9 Sheets—Sheet 2.

F. SEDGWICK.

PRINTING TELEGRAPH INSTRUMENT.

No. 454,884. Patented June 30, 1891.

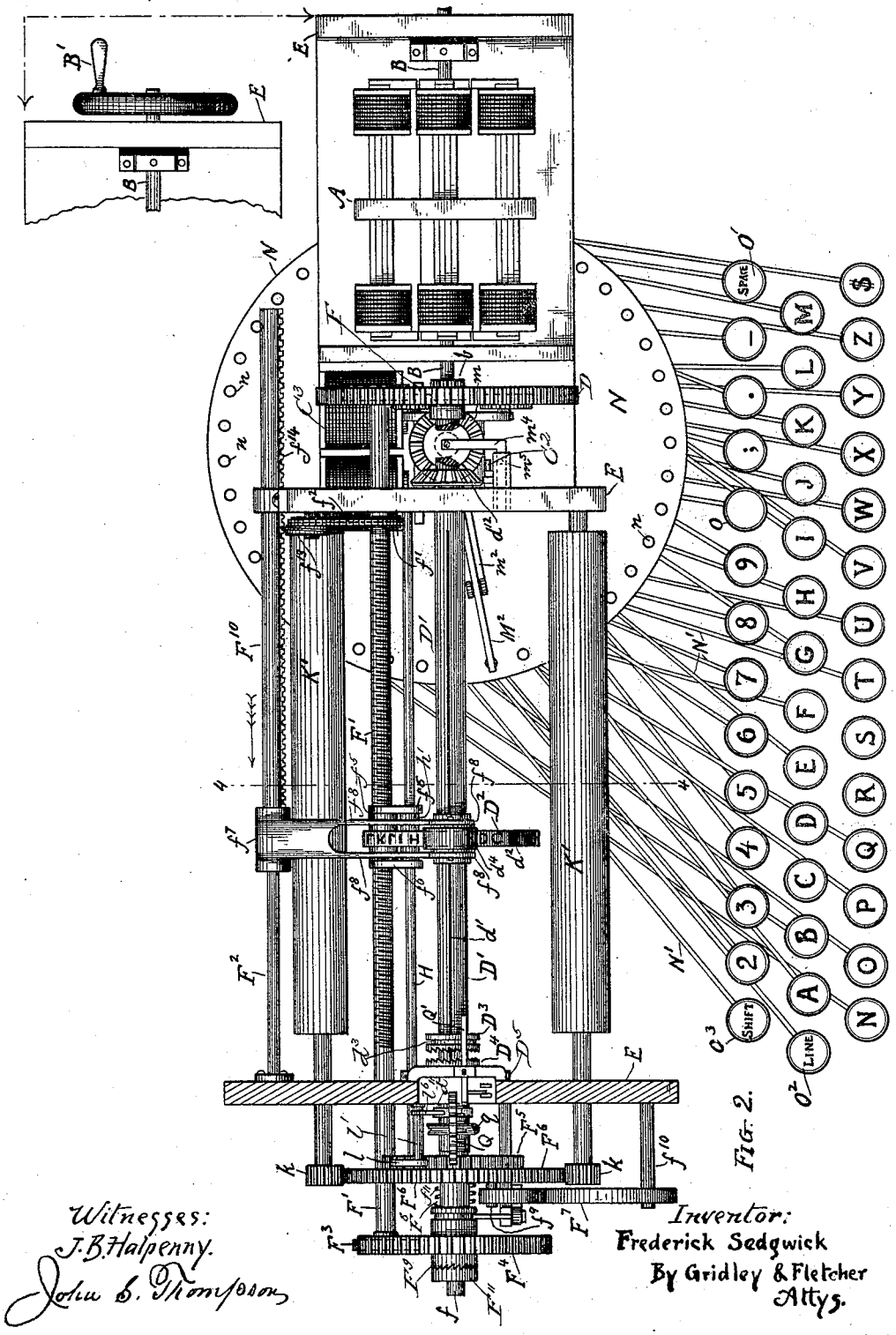


Fig. 2.

Witnesses:
J. B. Halpenny.
John S. Thompson

Inventor:
Frederick Sedgwick
By Gridley & Fletcher
Attys.

(No Model.) 9 Sheets—Sheet 3.

F. SEDGWICK.

PRINTING TELEGRAPH INSTRUMENT.

No. 454,884. Patented June 30, 1891.

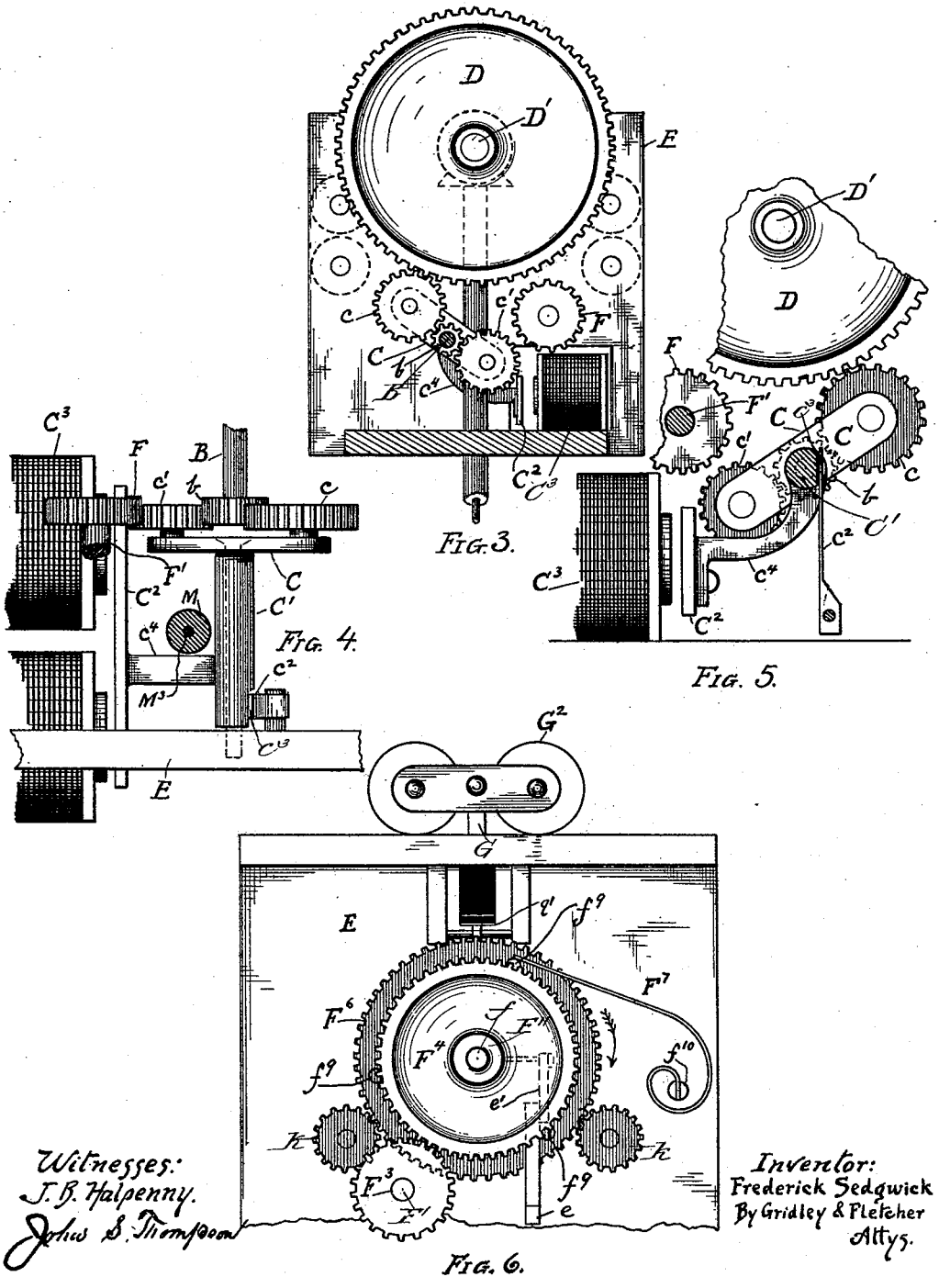


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

(No Model.) 9 Sheets—Sheet 4.

F. SEDGWICK.

PRINTING TELEGRAPH INSTRUMENT.

No. 454,884. Patented June 30, 1891.

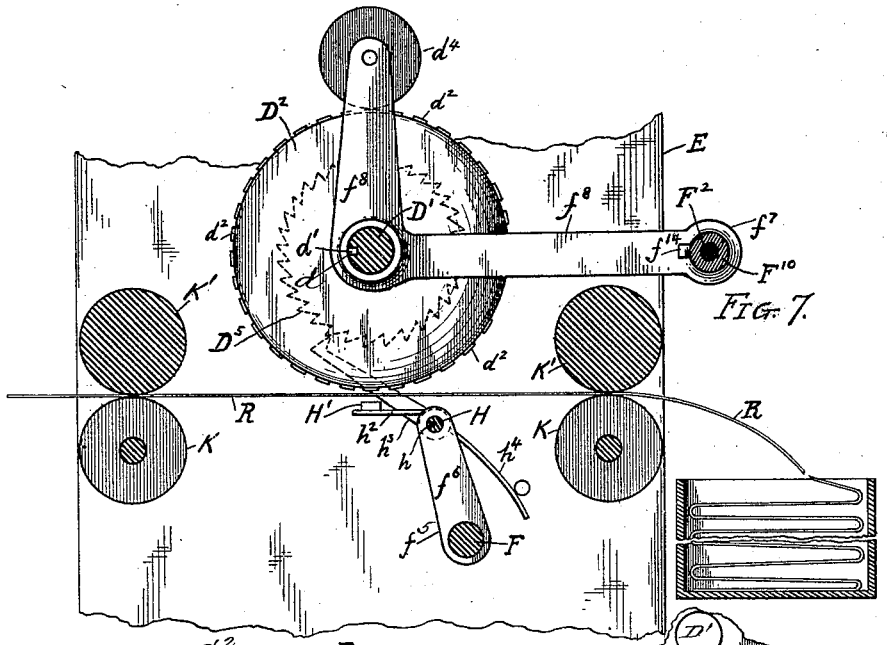


FIG. 7.

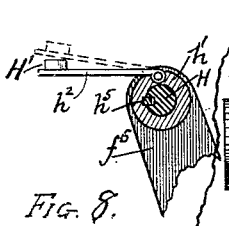


FIG. 8.

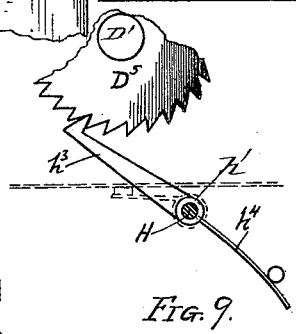


FIG. 9.

FIG. 10.

Witnesses:
J. B. Halpenny.
John S. Thompson

Inventor:
Frederick Sedgwick
By Gridley & Fletcher
Attys.

(No Model.) 9 Sheets—Sheet 5.

F. SEDGWICK.

PRINTING TELEGRAPH INSTRUMENT.

No. 454,884. Patented June 30, 1891.

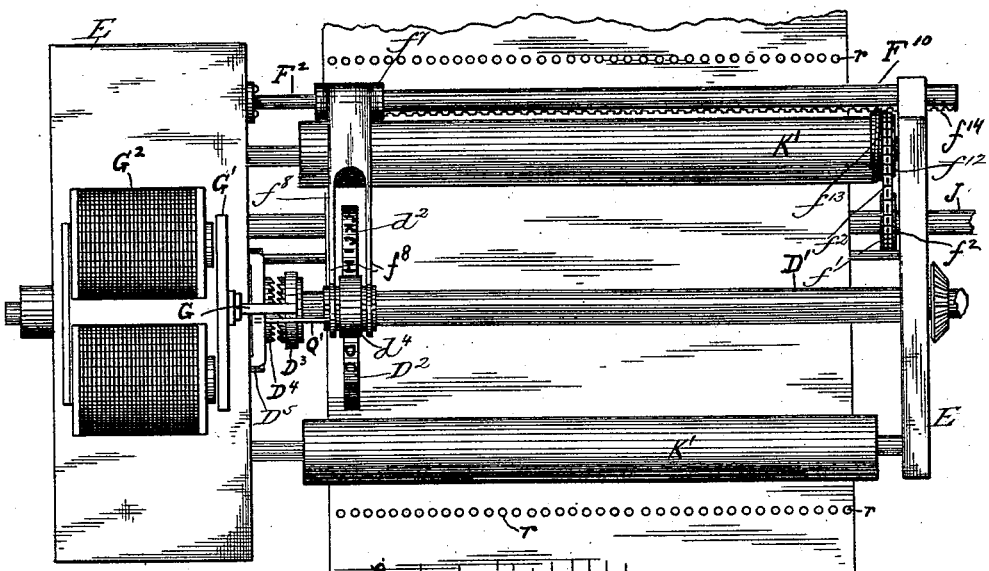
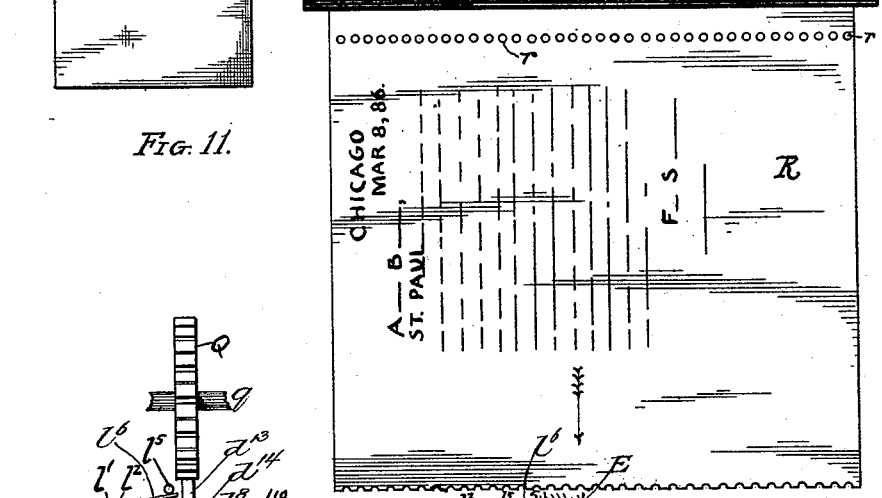


FIG. 11.



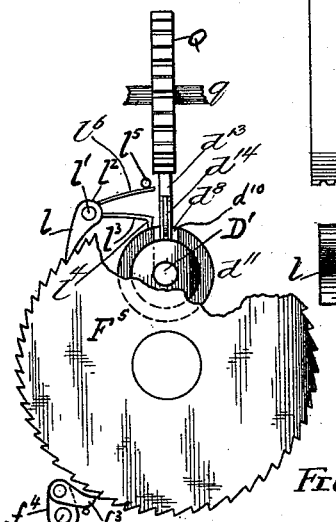


FIG. 12.

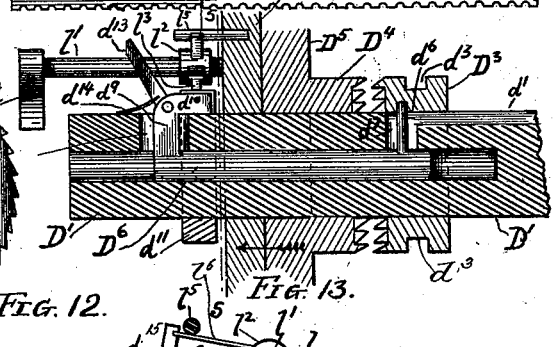


FIG. 13.

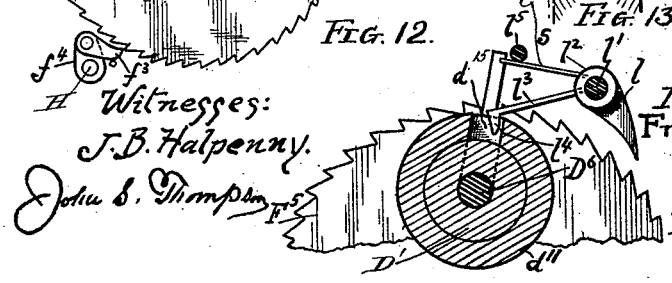


FIG. 14.

Witnesses:
J. B. Halpenny.
John S. Thompson

Inventor:
Frederick Sedgwick
By Gridley & Fletcher
Attys.

(No Model.) 9 Sheets—Sheet 6.

F. SEDGWICK.

PRINTING TELEGRAPH INSTRUMENT.

No. 454,884. Patented June 30, 1891.

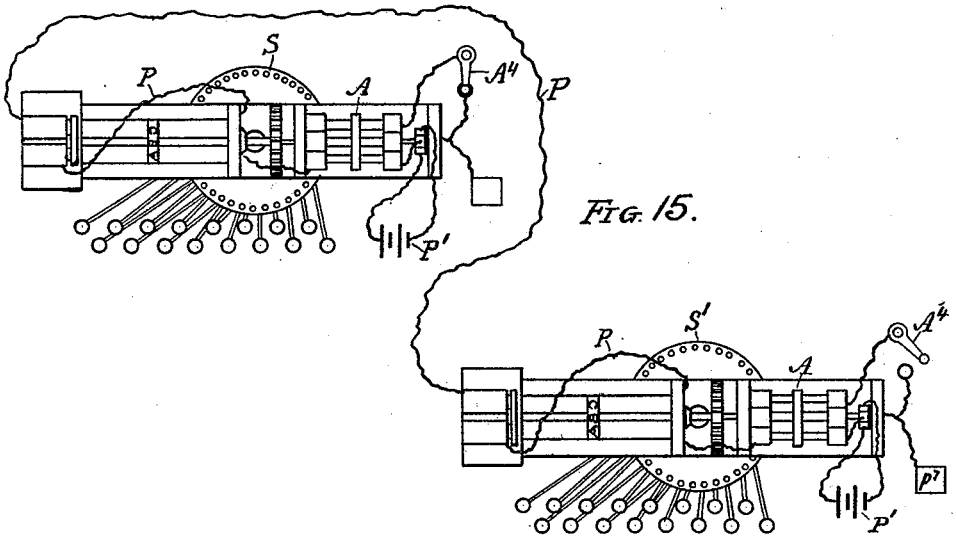


FIG. 15.

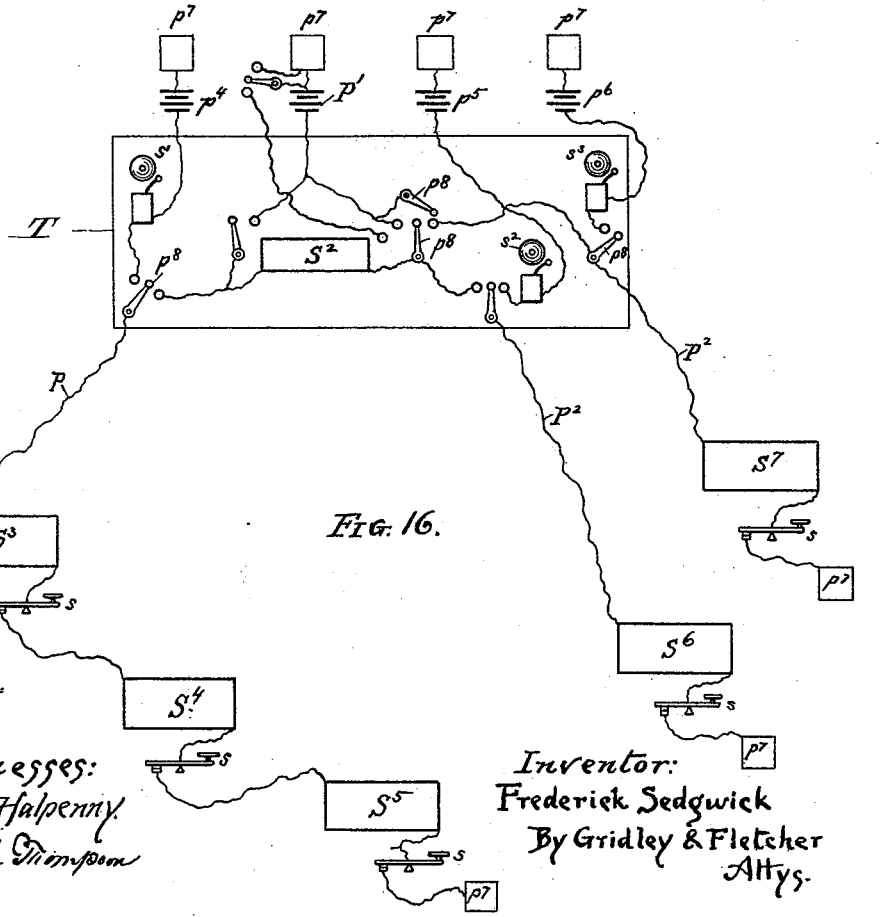


FIG. 16.

Witnesses:
J. B. Halpenny.
John S. Thompson

Inventor:
Frederick Sedgwick
By Gridley & Fletcher
Attys.

(No Model.) 9 Sheets—Sheet 7.

F. SEDGWICK.

PRINTING TELEGRAPH INSTRUMENT.

No. 454,884. Patented June 30, 1891.

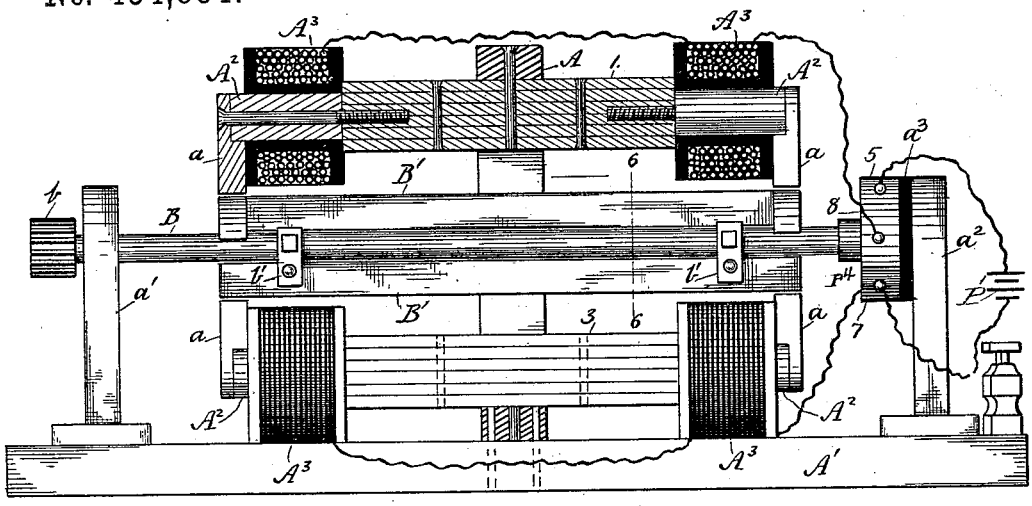


FIG. 17.

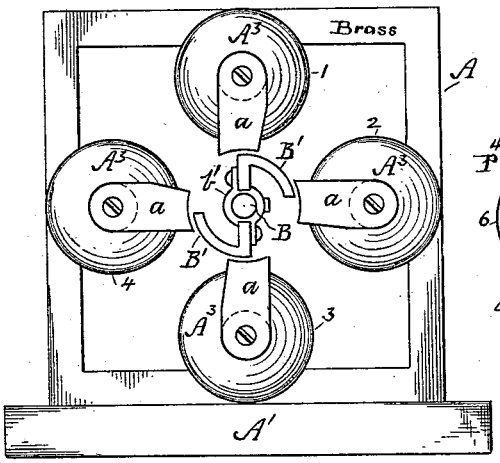


FIG. 18.

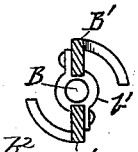


FIG. 19.

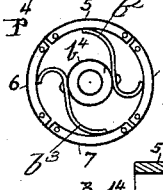


FIG. 20.

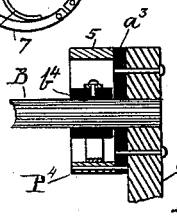


FIG. 21.

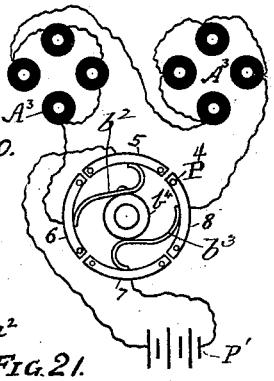


FIG. 22.

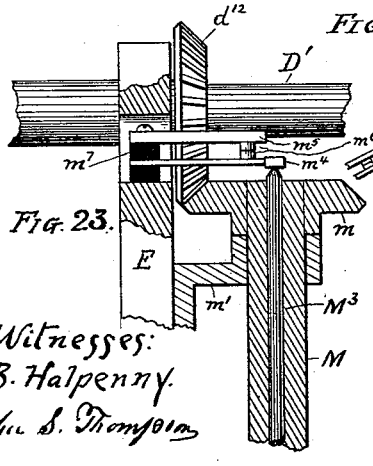


FIG. 23.

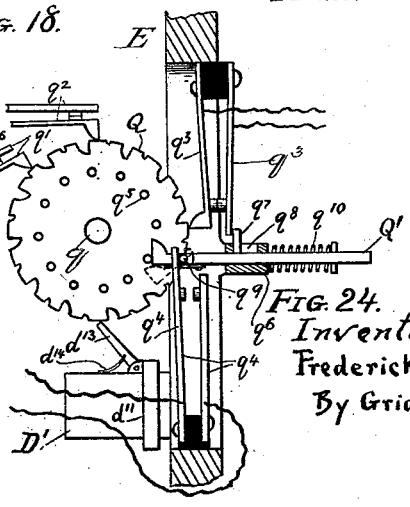


FIG. 24.

Witnesses:
J. B. Halpenny.
John S. Thompson

Inventor:
Frederick Sedgwick
By Gridley & Fletcher
Attys.

(No Model.) 9 Sheets—Sheet 8.

F. SEDGWICK.

PRINTING TELEGRAPH INSTRUMENT.

No. 454,884. Patented June 30, 1891.

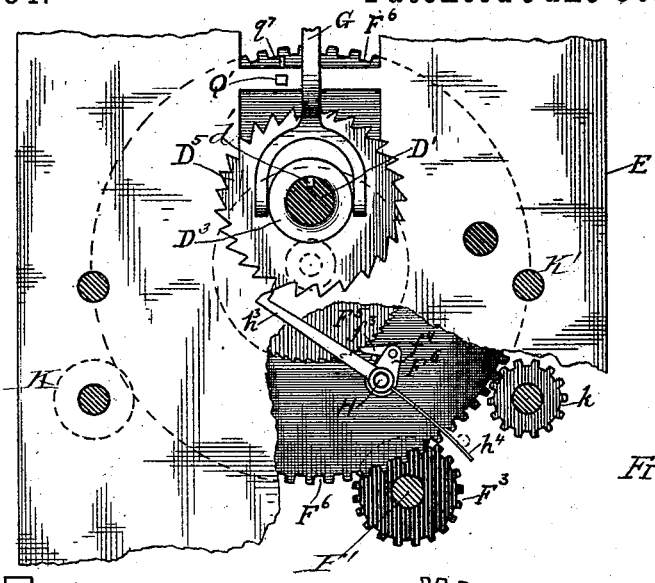


FIG. 25.

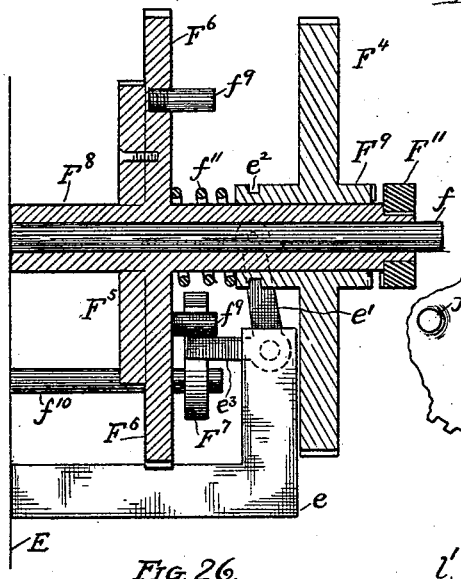


FIG. 26.

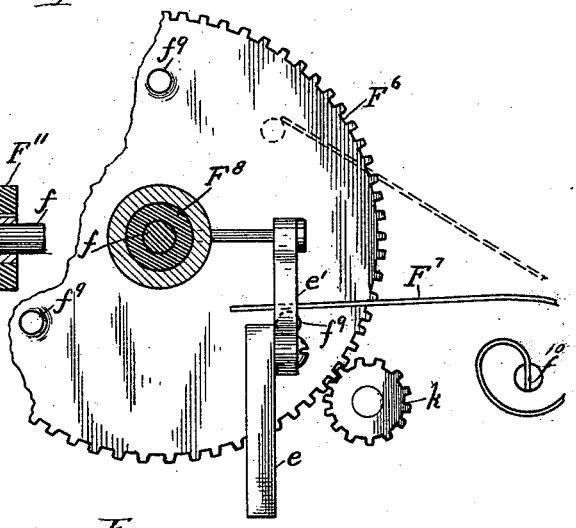


FIG. 27.

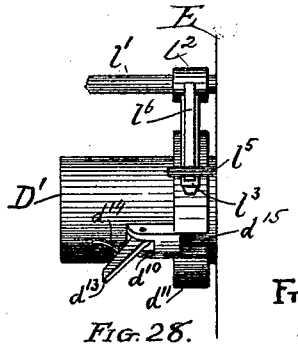


FIG. 28.

Witnesses:
J. B. Halperny.
John S. Thompson

Inventor:
Frederick Sedgwick
By Gridley & Fletcher
Attys.

(No Model.) 9 Sheets—Sheet 9.

F. SEDGWICK.

PRINTING TELEGRAPH INSTRUMENT.

No. 454,884. Patented June 30, 1891.

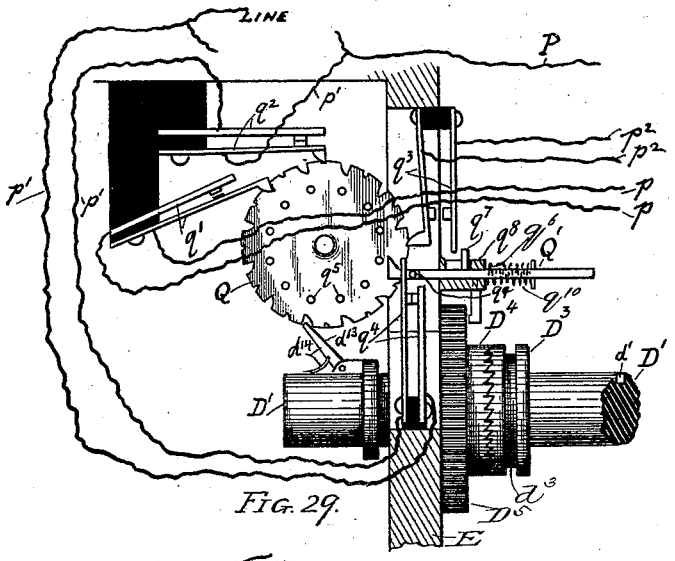


FIG. 29.

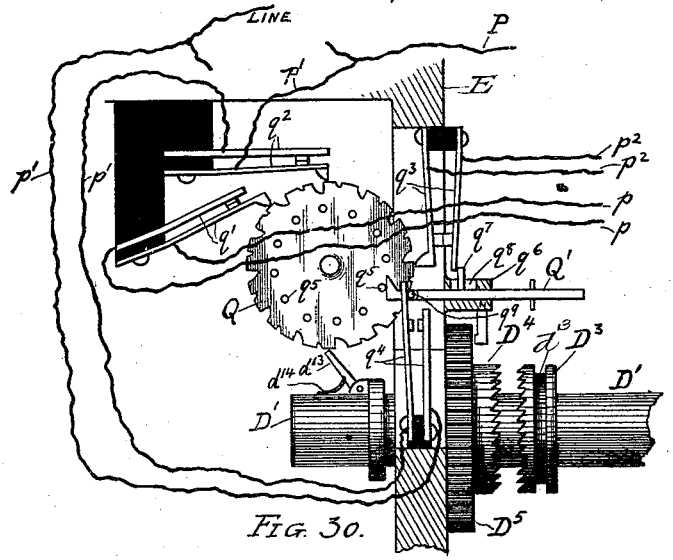


FIG. 30.

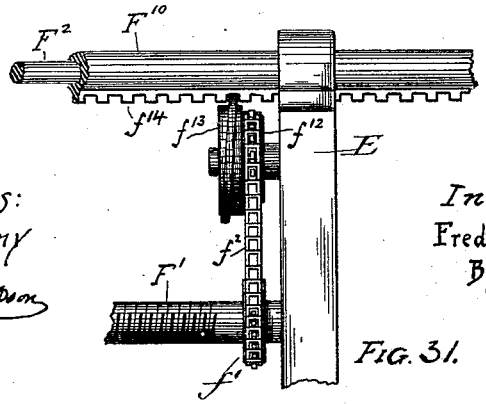


FIG. 31.

Witnesses:
J. B. Halpenny
John S. Thompson

Inventor:
Frederick Sedgwick
By Gridley & Fletcher
Attys.

UNITED STATES PATENT OFFICE.

FREDERICK SEDGWICK, OF CHICAGO, ILLINOIS.

PRINTING-TELEGRAPH INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 454,884, dated June 30, 1891.

Application filed June 1, 1886. Serial No. 203,703. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK SEDGWICK, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Printing-Telegraph Instruments, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a side view of said machine with a portion of the key-board removed, the key-disk and a portion of the vertical shaft connected therewith being shown in section. Fig. 2 is a plan view of said instrument, a portion of the same being in horizontal section upon the line 1 1, Fig. 1. Fig. 3 is a detail end view taken upon the line 2 2, Fig. 1, viewed in the direction of the arrow there shown. Fig. 4 is a plan view in detail, taken upon the line 3 3, Fig. 1. Fig. 5 is an enlarged detail view of a portion of Fig. 3, taken upon the line 9 9, viewed in the direction of the arrow there indicated, said view illustrating the shifting-gears in a reverse position from that shown in Fig. 3. Fig. 6 is a left end view of a portion of said machine as shown in Fig. 1. Fig. 7 is a transverse vertical sectional view in enlarged detail, taken upon the line 4 4, Figs. 1 and 2, and viewed in the direction of the arrow there shown, the same being intended to show the paper between the rolls. Fig. 8 is an enlarged detail view of the type-hammer. Fig. 9 is a detail view of the ratchet and detent forming a part of the mechanism for spacing the letters and causing the impression. Fig. 10 is an enlarged detail view of the left end of said machine as shown in Fig. 1, a portion of the gearing and other parts being removed to show the clutch-sleeve. Fig. 11 is a plan view of a portion of said machine, showing the manner of feeding the paper therein and the way in which the printing appears upon each page. Fig. 12 is an enlarged detail view of the ratchet mechanism for spacing the letters. Fig. 13 is an enlarged central longitudinal sectional view in detail of a portion of the type-shaft. Fig. 14 is an enlarged transverse sectional view of said type-shaft, taken upon the line 5 5, Fig. 13, viewed in the direction of the arrow there shown. Fig. 15 is a plan view in diagram showing two of said instruments connected in circuit. Fig. 16 is a diagram of a series of said instruments connected with one at a central office. Fig. 17 is a side view of my improved synchronous motor, in which one of the magnets is removed to show the armature, while another is shown in longitudinal section. Fig. 18 is an end view of the magnets and armature. Fig. 19 is a transverse sectional view in detail of the armature, taken upon the line 6 6, Fig. 17. Fig. 20 is an interior end view of the commutator or pole-changer. Fig. 21 is a central longitudinal sectional view of the same. Fig. 22 is an outline view in diagram showing the manner in which the magnet-cores are preferably wound and their connection with the battery and commutator. Fig. 23 is an enlarged detail view in central section of the vertical shaft and the connecting gears. Fig. 24 is an enlarged detail view of the circuit-breaking mechanism for controlling the motor-shunt and that of the magnet operating the type-hammer. Fig. 25 is a vertical sectional view taken upon the line 7 7, Fig. 1, viewed in the direction of the arrow there shown, a portion of the plate or frame E being broken away to show the parts beyond. Fig 26 is a vertical sectional view through the axis of the wheels F^4, F^5, and F^6, Fig. 1, as viewed from the rear. Fig. 27 is an enlarged detail view taken upon the line 8 8, Fig. 1, viewed in the direction of the arrow there shown. Fig. 28 is an enlarged detail side view of a portion of one end of the type-wheel shaft. Fig. 29 is a detail view of the circuit-breaking device in which the relations are the reverse of those shown in Fig. 10. Fig. 30 is a like view showing the parts in a slightly-changed position, and Fig. 31 is an enlarged plan view in detail of the worm-wheel and a portion of the rack for producing a lateral movement of the type-wheel.

Like letters and figures of reference designate corresponding parts in the different figures.

The object of my invention is to provide a printing-telegraph machine or electric type-writer which may be operated by means of a rotary motor and the usual key-board and may be used singly as a type-writer or connected with one or more like machines or instruments, all of which may be operated synchronously by the manipulation of any one of

the series or by that of a machine common to all, said machines being so constructed that they may be caused to establish and maintain while in circuit a fixed relation to each other as to the position and movement of the printing mechanism.

A further object is to so construct said machine that messages may be printed speedily and simultaneously by the transmitting and receiving machines upon pages or sheets as distinguished from a ribbon or slip, each machine being adapted to be used in turn to transmit or receive messages.

I accomplish said objects preferably in the manner hereinafter more particularly described and claimed.

In the drawings, A represents a synchronous motor, described below. The object of adopting said synchronous motor in lieu of an ordinary motor or clock mechanism or an electric motor as commonly constructed is to enable me to actuate two or more of said machines rapidly and in unison without the employment of escapements or governors either upon the motor itself or upon the printing-instrument.

B represents the driving-shaft of said motor, having thereon a pinion *b*, (better shown in Figs. 3 and 4,) which engages with two loose pinions *c c'*, located upon the respective ends of a tilting arm or lever C, rigidly attached to a loose sleeve C', Fig. 4, having its bearing upon a pin attached rigidly to the frame E of said machine, said sleeve being retained normally in a position whereby the pinion *c* upon one end of said cross-arm C is held in engagement with a spur-wheel D, which result is accomplished, preferably, by means of a spring c^2, Figs. 4 and 5, acting upon a flat portion c^3 of the sleeve C'. Attached rigidly to said sleeve is an arm c^4, Figs. 3, 4, and 5, to which is attached a soft-iron armature C^2 in proximity to an electro-magnet C^3, the circuit of which is normally shunted, as hereinafter described. The movement of the arm c^4, when attracted by the magnet C^3, overcomes the resistance of the spring c^2, tilts the arm C, and causes the pinion or idle-wheel *c'* to engage with a pinion F, to which is attached a screw-threaded shaft F', hereinafter referred to, extending to the opposite end of the machine.

Secured in suitable bearings in the frame E is a type-wheel shaft D', to one end of which is keyed the spur-wheel D.

Upon the shaft D' is mounted a type-wheel D^2, which is caused to revolve with said shaft by means of a key *d*, Fig. 7, engaging loosely within a slot *d'*, Figs. 2 and 7, by which arrangement said type-wheel is free to move longitudinally upon said shaft. Said type-wheel is provided upon its periphery with such letters, characters, and spaces d^2 as may be found essential. Mounted upon said shaft in the same manner as said type-wheel, so as to revolve therewith, is one member D^3 of a clutch, (better shown in Fig. 10,) which is provided with an annular groove d^3, with which are caused to loosely engage the lugs of a yoke upon the end of a vertical lever G, Figs. 1 and 10, pivoted to the top of the frame at *g*, to the upper end of which lever is attached a soft-iron armature G' in suitable proximity to an electro-magnet G^2. (Likewise shown in Fig. 6.) A spiral spring *g'* is attached to the opposite side of said lever, of sufficient strength to actuate the arm G when the magnet G^2 is not excited, at which time the toothed clutch D^3, the teeth of which correspond in number to the characters and spaces upon the type-wheel, is thrown into engagement with a complementary clutch member D^4, to which is rigidly attached a ratchet-wheel D^5, the two being loose upon the shaft D'. Extending lengthwise of the machine and having suitable bearings in the frame E at the respective ends is a shaft H, provided with a longitudinal groove *h*, Figs. 1 and 7, throughout its length. Attached to said shaft is a loose sleeve *h'*, from which is extended laterally a loosely-pivoted arm h^2, as shown in Fig. 8, upon the end of which is a type-hammer H', located in a vertical plane with the axis of the type-wheel D^2.

In addition to the gear F, the shaft F' is provided upon its opposite end with a gear F^3, which meshes into a gear F^4, Figs. 1, 2, 6, and 25, having its bearing upon a loose sleeve F^8, which in turn bears upon an arm *f*, attached rigidly to the frame E. Upon the outer end of the sleeve F^8 is a clutch member F^{11}, rigidly attached thereto, with which a corresponding clutch F^9 upon the hub of the wheel F^4 is held in normal engagement by means of a spring f^{11}. Said clutch members are in engagement, except as hereinafter stated, and hence the wheel F^4 is revolved by the movement of the sleeve F^8 and in turn revolves the wheel F^3, thus actuating the shaft F' and moving the type-hammer and type-wheel longitudinally upon the shafts H and D, respectively, sufficiently to form the necessary space between the printed lines, as indicated in Fig. 11, said type-wheel being only so moved at the beginning of each line. It should be borne in mind in this connection that the spaces between the letters, as well as the transfer from one end of a line to the other, is accomplished by moving the paper, as hereinafter stated. A rigid arm *e*, Figs. 1 and 26, is secured to the frame, to which is pivoted an elbow-lever *e'*, the end of one arm of which is caused to engage in an annular groove e^2 in the hub of the wheel F^4, while the arm e^3 is so placed that the spring F^7 will engage therewith in its downward movement, and thus throw the clutch F^{11} out of engagement.

The shaft F' has attached rigidly thereto a sprocket-wheel *f'*, Figs. 1, 2, 11, and 31, which is connected by a suitable drive-chain f^2 to a secondary sprocket-wheel f^{12}, having a worm f^{13} adjacent thereto and adapted to revolve therewith in engagement with a rack

f^{14}, said chain causing the two sprocket-wheels to rotate in unison, F′ being the driving-shaft. Parallel with the shaft F′, I place a stationary rod F^2, Fig. 2, which serves as a guide and support for a loose sleeve F^{10}, upon which the rack f^{14}, Figs. 1, 2, and 31, is placed. A step-by-step movement of a ratchet-wheel F^5, moved by a pawl f^3 upon the end of an oscillating arm f^4, Figs. 1, 12, and 25, attached to the shaft H, revolves the wheels F^4 and F^6 and gradually raises and compresses a spring F^7. The shaft H is in turn rocked by means of an arm or detent h^3, Figs. 1, 7, and 10, attached rigidly thereto, which is caused to engage with the teeth of a ratchet-wheel D^5 by a spring h^4, so that as the end of the detent h^3 falls into a notch between the ratchet-teeth the shaft H is tilted. This movement is produced by the influence of the magnet G^2 upon the armature G′, which occurs simultaneously with the stamping of each letter, the same movement of the shaft H serving to throw the type-hammer H′ against the paper, as hereinafter shown.

Upon the shaft F′ is placed a screw-threaded sleeve f^5, to which are rigidly attached arms f^6, through the opposite end of which is loosely passed the shaft H. Between the ends of said arms is placed upon said shaft a loose sleeve h', having a key h^5, Fig. 8, in engagement with the slot h, so that as the shaft F′ is revolved the sleeve thereon is moved longitudinally, and the arms f^6 thereon, moving therewith serve to slide the sleeve h' upon the shaft H, and with it the type-hammer. A like sleeve f^7, Figs. 2 and 11, is attached rigidly to the end of the sleeve F^{10}, having arms f^8, connected in like manner with the type-wheel shaft upon the respective sides of the type-wheel D^2. By the movement of the sleeves F^{10} and h' the type-wheel and type-hammer are moved in unison. A suitable ink-roll d^4 is placed above the type-wheel upon an axis supported by the arms f^8.

Sustained at their respective ends within suitable bearings in the frame E are pairs K K′ of rollers, one pair being upon each side of the shaft H and parallel therewith, the location of said rolls being more clearly shown in Figs, 1, 2, 7, and 11. The rolls K K, respectively, are provided with pinions k k, which in turn engage with the teeth of a spur-wheel F^6, rigidly attached to the ratchet-wheel F^5. Said spur-wheel is provided with a series of pins f^9, upon which is caused to bear the end of a coiled spring F^7, (better shown in Figs. 1, 2, 6, and 27,) which is attached to a stud f^{10}, secured to the frame E. The pressure of the spring F^7 tends to revolve the wheel F^6 in the direction indicated by the arrow shown in Fig. 6, while the step-by-step motion of said wheel in an opposite direction serves to raise said spring gradually to the position shown in Fig. 6, the wheel F^6 at each step movement being retained in position by a pawl l upon the end of a short shaft l', Figs. 2, 12, 13, and 14, having a bearing in the frame E.

To the shaft or arm l', Figs. 2, 12, 13, and 14, is rigidly attached a sleeve l^2, from which is radially extended a rigid arm l^3, having upon the end thereof a beveled detent l^4, the end of which rests normally against a ring d^{11} upon the shaft D′. A portion of the end of said shaft D′ is hollow and has loosely inserted therein a rod D^6, as clearly shown in Fig. 13, into which a pin d^6, Fig. 13, is rigidly inserted, which connects it with the clutch member D^3, a slot d^7 being formed in the shaft D′ to permit a reciprocating movement of the clutch member D^3 and rod D^6.

Upon the opposite end of the rod D^6 and extending outwardly through a slot d^8 is an arm d^9, which is bent at right angles, the bent portion d^{10} lying parallel with the shaft D′ and forming a block to fill a notch or broken portion d^{15} in the ring d^{11}, Figs. 14 and 28, when the clutch member D^3 is disengaged from its counterpart. When engaged, the block d^{10} is pushed out of place, as shown in Fig. 28, and upon the revolution of the shaft D′ the detent l^4, Fig. 14, is forced by the spring l^6, which rests against the pin l^5, into the notch d^{15}, as clearly shown in Figs. 14 and 28, which disengages the pawl l from the teeth of the wheel F^5 and permits the spring F^7 to revolve the wheel F^6 in an opposite direction, the release of the pawl l being facilitated by the action of the pawl f^3 in releasing the pressure of the ratchet-wheel F^5 against it. It should be borne in mind, however, that the detent l^4 does not act, as stated, with each revolution of the type-shaft, but only when the removal of the block d^{10} occurs opposite to said detent, which is hereinafter more fully explained.

Connected with the type-shaft D′ by means of bevel-gears d^{12} m, Figs. 1, 2, and 23, I provide a hollow vertical shaft M, supported at the top by means of a bracket m', and having a pivotal bearing at the bottom in a step M′, Fig. 1. Rigidly attached to said shaft and extending radially therefrom in a horizontal plane is an arm m^2, to the end of which is loosely pivoted a lever M^2, the inner end of which extends into a mortise m^3, Fig. 1, in the hollow shaft M. A loose rod M^3 is placed within said hollow shaft and is supported and its weight sustained upon the end of said lever M^2, the opposite end of which is sufficiently heavy to more than counterbalance said rod, so that the normal position of the two is as shown in Fig. 1. The upper end of the rod M^3 is pointed and in contact with the end of a weak spring m^4 in proximity to a parallel arm m^5, said spring and arm, respectively, being provided with contact-points m^6, which are normally retained in contact by means of said rod. The spring m^4 and arm m^5 are attached to an insulating-plate m^7 upon the frame E, thus forming a circuit-breaker in circuit with the main-line wire P.

Supported loosely upon the step M′, substantially as shown in Fig. 1, is a circular disk N, through which the shaft M protrudes. Upon the periphery of said disk is a series of perforations corresponding in number to the characters upon the type-wheel, into which I loosely insert a corresponding number of pins n. Suitable key-levers N′ connect said pins, respectively, with a bank of keys, as shown in said last-named figures. Upon the depression of a key a pin n is raised sufficiently to be brought into contact with the outer end of the lever M^2 as the latter is revolved, thus raising it and permitting the rod M^3 to fall, and with it the spring m^4, thus momentarily breaking the main-line circuit. A key O is placed beneath the disk N, as in Fig. 1, and when depressed raises the entire disk N, thus causing all the pins n in succession to be touched by the lever M^2 as it revolves. This is for the purpose of establishing a relation between the transmitting and receiving machine, which will be more fully explained in describing the operation thereof. I also provide a shift-key O^3, Fig. 2, corresponding with a space upon the periphery of the type-wheel upon which no character is placed, but is radially in the same plane with the reciprocating block d^{10}, to which is loosely pivoted a pawl d^{13}, Figs. 1, 10, 12, 13, and 28, which projects obliquely from the shaft D′, substantially as shown in the various figures, and so sustained by means of a spring d^{14}. Said pawl revolves continuously with the shaft D′, while at the same time it is reciprocated with each revolution of said shaft, but in a radial plane which bears a corresponding relation to the character or space to be presented upon the type-wheel, so that if the space mentioned corresponding to the shift-lever is in a vertical plane above the shaft D′ the pawl d^{13} will also be in said plane at the time it is reciprocated. Above said shaft D′ and in the vertical plane of its axis I place a notched disk Q, arranged to revolve in suitable bearings, the axis q, Fig. 2, of which is in a plane at right angles to that of said shaft D′. The notches upon the periphery of said disk are alternately deep and shallow, as shown, and are so placed with relation to the pawl d^{13} that one will always stand in the plane of its revolution, the end of said pawl passing through a notch as the former rotates. The block d^{10} is always in its normal position when the pawl d^{13} passes the disk, except when the shift-key or the key O is depressed, in which event the block is pushed forward, and with it the pawl, just as the latter is passing and in the same plane with the disk Q, so that instead of passing through the notch without touching the disk, as at other times, it engages with the latter and rotates it the distance of one notch, at which point it is brought to a rest by the stoppage of the type-wheel.

A series of spring circuit-breakers q' q^2 q^3 q^4, attached to suitable insulating-plates upon the frame, as clearly shown, and provided with proper contact-points, are arranged tangentially around the disk Q, the first three of said circuit-breakers having detents which engage, as shown, with the notches of said disk, and it is only when the detents of said springs rest in the deep notches that the respective circuits except q^3 are broken, the only object of the shallow notches being to enable the disk Q to serve as a ratchet-wheel, as hereinafter stated, in addition to breaking the circuits with said contact-points, the pawl d^3 acting in both the deep and shallow notches to rotate the disk. The normal tendency of the springs to which they are attached is to separate the contact-points q' q^2 q^3 and to close the contact-points q^4. The circuit-breakers q' and q^4 are normally closed and the others normally open; but q^3 differs from the first two in that it still remains open when the detent is out of the notches, except when the pin q^7 is pushed forward to close it, as hereinafter stated. A series of pins q^5, corresponding in number and placed in radial lines with the deep notches of the disk, project laterally therefrom concentric with its axis.

In a bearing q^6 I arrange a horizontal rod Q′, adapted to be reciprocated, so that one end may engage with the pins q^5, Figs. 10, 24, 29, and 30, while the opposite end projects sufficiently to cause it to be pushed forward by the type-wheel arm f^8 when the latter is transferred to the top of the page, as shown in Fig. 11, by the movement of the sleeve F^{10}. The rod Q′ is provided with a pin q^7, projecting upwardly therefrom through a slot q^8, which thus limits the movement of the rod, but permits the pin q^7 to strike the end of the spring of the circuit-breaker q^3, as shown in Fig. 24, which closes said circuit-breaker when its detent is not in one of the notches of the wheel Q. This action only occurs when the rod Q′ is pushed forward, as shown in said last-named figure, by the movement of the type-wheel to the beginning of a page, the arm f^8, Fig. 1, which supports the ink-roller, being adjusted to strike said rod at this time. At all other times the rod Q′ is retained in the position shown in Figs. 10 and 29 by means of a spring q^{10}. A secondary pin q^9 is attached to the rod Q′ and arranged to engage with the spring of the circuit-breaker q^4 when the rod Q′ is pushed forward, as stated, and open the shunt-circuit p' p', in which said circuit-breaker is interposed. At the same time the circuit-breaker q^3 is closed by the action of the pin q^7 and the movement of the disk Q sufficiently to throw the detent of said circuit-breaker out of the notch in its periphery. The circuit-breakers q^2 and q^4 are identical in their action to the extent that they both break the same shunt-circuit; but the object of the latter is to accomplish this result when it is desirable to retain both the circuit-breakers q' and q^3 closed, at which time the wheel Q is necessarily in a position to also close the

circuit-breaker q^2, and hence the circuit in which the latter is interposed must be opened by other means. This can be better comprehended when an understanding is had of the circuits which are made with the various parts of the machine, and the purpose of each of said circuits is as follows: The line-wire P, in which a battery P′ is interposed, is connected with the ground at P^3, the commutator P^4, battery P′, motor A, the terminals of the electro-magnet C^3, the circuit-breaker $m^4 m^5$, which is normally closed, the terminals of the helix G^2, and thence with the secondary machine or machines and the ground. Shunt-wires p p branch from said main wire at the magnet C^3, as shown in Fig. 1, to the circuit-breaker q', which is normally closed. Secondary shunt-wires p' are run from the main-line wire P upon opposite ends of the magnet G^2 to the circuit-breakers q^2 q^4, Fig. 10, the former of which is normally open and the latter normally closed, while wires p^2 tap the main line P at the terminals of the motor.

It is essential in order to obtain the best results that the respective motors by which two or more machines are operated should be synchronous, though mechanical motors arranged to run at approximately the same rate of speed may be used with more or less success. I prefer to use my improved synchronous motor, which forms the subject of a separate application filed herewith, and which is therein more particularly described. Referring to Figs. 17 and 18, in which the construction of said motor is shown, A represents a frame, of brass, attached to a suitable base A′, said frame serving as a support for a series of magnets 1 2 3 4, preferably polarized, all of which are indicated in Fig. 2. In arranging said magnets I prefer to place the poles thereof alternately in opposite directions—that is to say, the positive pole of No. 1 may be at the right, that of No. 2 at the left, and so on through the series—by which arrangement the first and third and the second and fourth magnets, or those diametrically opposite to each other, possess like polarities. Said magnets are provided, preferably upon both ends, with soft-iron pole-extensions A^2, rigidly attached thereto, having helices A^3, all of which, when the magnet-poles are reversed, as described, are wound in the same direction, though a like result may be accomplished by placing the poles of the magnets 1 2 3 4 in the same direction and alternately reversing the direction of winding the spools upon each magnet. To the end of the cores A^2, I attach inwardly-projecting pole-extensions a, the ends of which are concentric with a shaft B, having attached thereto by means of brass clips b' armatures B′ B′, said shaft having its bearings in supports a' a^2, attached to the base. Upon the post a^2 I attach an insulating-plate a^3, to which is secured a series of segmental flanges 5 6 7 8, concentric with the shaft, but separated from each other, Figs. 20, 21, and 22. Brushes or springs b^2 b^3, Figs. 20 and 22, preferably bent as shown, are attached to a vulcanite ring b^4 to form a metallic connection, respectively, with two adjacent segments, the brushes and segments forming a commutator or pole-changer. The opposite segments, as 5 and 7, are connected with the battery P′, while the remaining segments 6 and 8 are connected with the terminals of the spools A^3. Thus as the shaft rotates the currents are alternately reversed and the alternate magnets successively neutralized and strengthened, accordingly as the polarity of the current conforms to that of the magnets 1 2 3 4. When two machines are connected in circuit, as in Fig. 15, the shafts of the motors revolve in exact synchronism. By applying an ordinary cut-out A^4 to each instrument it is obvious that either may be used alternately as a receiving or transmitting machine, the local battery and pole-changer being cut out of circuit by each operator when he ceases to use his machine.

Having described the various parts of said machine and their respective relations, I will now explain its operation, and I may here say that a description of the operation of one instrument is practically a description of that of a number, as their action is identical when "corrected" and in circuit. Each machine may in turn become a transmitter or receiver, the only difference, generally speaking, in the action in either case being that the transmitter is the one in which the keys are operated, or, in other words, the source from which the respective circuits are made and broken to produce certain results. All the machines are in one sense "receivers," in that the transmitting-machine prints its own message just as it is printed on all the others. This may be further explained after describing the action of one machine. In order that the description may conform to the drawings, I will assume that the paper-roll R and the type-wheel D^2 are in the respective positions shown in Fig. 11. The circuit-breaker q' being closed, as it is at all times except when it becomes necessary to shift the type-wheel and paper, the current will have been shunted from the magnet C^3 and the lever C tilted by the spring c^2, Fig. 5, causing the gears c D to engage. The type-wheel being at the top of the page, the rod Q′ is pushed forward, thus causing the pin q^7 to close the circuit-breaker q^3, which temporarily shunts the circuit from the motor, but leaves the magnet G^2 in circuit. The depression of a key, as described hereinafter, breaks the circuit through said magnet when the clutch D^3 is thrown forward by the spring g', thus actuating the pawl d^{13} and moving the disk Q, so as to let the detent of the circuit-breaker q^3 drop into a deep notch, which breaks the shunt-circuit p^2 p^2 for shunting the current at the motor, and the motor thus brought into circuit will start, revolving the type-wheel shaft and shaft M at a high rate of speed. Upon touching any one of the keys N′ a pin n is raised and brought into contact with

the revolving arm M^2, the outer end of which is momentarily raised, thus permitting the shaft M^3 to drop when the main or line circuit passing through the magnet G^2 is broken by the spring m^4, and the armature G′ is drawn back by the spring g', thus throwing the clutch members D^3 D^4, the notches in which correspond, respectively, with the number and position of the characters and spaces upon the type-wheel, into engagement for a sufficient time to move the ratchet-wheel D^5 one notch, when the detent h^3, Figs. 7 and 9, slips off from the end of the tooth and is suddenly thrown by the spring h^4 into the next notch. Said detent, being rigidly attached to the rock-shaft H, causes the latter to tilt, which moves the arm f^4 and its pawl f^3, Figs. 12 and 25, thus moving the wheels F^4 F^6 one notch, which, through the pinions k, Figs. 25 and 27, moves the rolls K K′ and draws the paper R, Figs. 7 and 11, forward, as indicated by the arrow in Fig. 11, a sufficient distance to form the space between the letters. At the same time, the desired letter upon the type-wheel being presented opposite to the type-hammer H′, the tilting of said shaft H, as described, causes the hammer to strike beneath the paper, as indicated in Fig. 9, which produces the impression upon the opposite side by bringing it into contact with the desired character on the type-wheel. A given space upon the type-wheel is provided for word-spacing and corresponds with a space-key O′, Fig. 2, which when depressed produces the same action as described of the type-hammer and type-wheel; but no character is printed. As the depression of a key breaks the circuit with the main line, it is obvious that the entire machine, including the motor, will to a certain extent be effected, and, theoretically, the machine may be said to stop; but the break is of such short duration that it is imperceptible and cannot be taken into account, practically. When the above operation is repeated until a line is completed lengthwise of the paper-roll, as shown in Fig. 1, one of the pins f^9, Figs. 6 and 27, will have raised the spring F^7 to the position shown in Fig. 6, at which time a key O^2, Fig. 2, representing a space on the type-wheel in the same radial plane with the opening in the ring d^{11}, is depressed, which causes the block d^{10} to be removed at a time when it is opposite the detent l^4, Figs. 12, 13, and 14, so that said detent falls into the notch d^8, and thereby raises the pawl l, which with said detent is rigid with the rock-shaft l', out of engagement with the ratchet-wheel D^6, which permits the spring F^7 to act, whereby the wheel F^6 is rotated, as shown in Fig. 27, carrying with it the wheel F^4, connected by the clutch F^8, so that the shaft F′ is rotated sufficiently to laterally move the type-hammer and, through the chain f^2, worm-wheel f^{13}, and sliding sleeve F^{10}, the type-wheel the space of one line. At the same time the wheel F^6, through the pinions k k, reverses the rolls K K′ and runs the paper back sufficiently to commence a new line. I prefer to perforate the paper at regular intervals, as shown at r, Fig. 11, so that it may be readily detached in sheets of the desired width, and instead of placing it upon a roll I prefer to fold it in alternate directions within a suitable receptacle, as shown in Fig. 7, this arrangement requiring the expenditure of less power. When a message covering the whole or any part of a sheet is completed and a transfer is to be made to a new page, the space-key O′ is repeatedly depressed, which has the effect to continue the step-by-step movement of the paper toward the operator until it is moved sufficiently, so that the rollers K K′ nearest him will have passed the perforated line r, Fig. 11, at which time the wheel F^6 will have been revolved by the ratchet F^5 and pawl f^3, Fig. 25, sufficiently so that the end of the spring F^7, Fig. 27, will have slipped off from the pin f^9, upon which it has been bearing during the formation of the previous lines, and will be brought into contact with the arm e^3 of the lever e', which limits the downward movement of the spring F^7 and likewise disengages the clutch members F^9 F^{11}. A further depression of the space-key carries the paper still farther toward the operator, so as to provide the desired margin upon said paper when the next succeeding pin f^9 is brought into contact with the spring F^7. As soon as the action last described is completed and the paper is rolled forward upon a new page it is essential that the type-wheel should be shifted to the top of the page. This movement is accomplished by depressing the shift-button O^3, which represents a space upon the type-wheel designed to be presented opposite the type-hammer when the pawl d^{13} is in the same plane with the disk Q. The clutch D^3 being thrown forward into engagement pushes the pawl and revolves the disk Q one notch, thereby opening the shunt-circuit p p at q' and exciting the magnet C^3, which, attracting the armature C^2, tilts the arm C, thereby disengaging the gears c D, when the type-wheel shaft is stopped, the clutch D^3 and disk Q occupying the respective positions shown in Fig. 29. At the same time, the spring F^7 having actuated the lever e^3 and disengaged the clutch F^{11}, as stated, the gear c' engages with the pinion F and rapidly revolves the shaft F′ in a reverse direction from that taken in spacing the lines until the type-wheel is transferred to the end of the type-shaft or the head of the page, in which act the arm f^8 strikes the rod Q′, which is pushed against a pin q^5, thus rotating the disk Q sufficiently, as shown in Fig. 30, to raise the detents q' q^2 q^3 out of the notches, which, in connection with the action of the pin q^7, engages the contact-points of all of said circuit-breakers. As the circuit-breaker q^3 is closed, the current is shunted from the motor over the wires p^2 p^2, when the entire machine is brought to a rest. Simultaneously with the action just described the circuit-breaker

q^4 is opened by the pin q^9, when the magnet G^2 is momentarily excited and disengages the clutch D^3.

The foregoing fully describes the operation of a single machine. It remains to describe the combined action of two or more machines, as well as their action as transmitting and receiving instruments, respectively. From the foregoing description of the motor it has been seen that when two or more motors are in circuit they operate synchronously—that is to say, the armatures of the two rotate in exact unison. It follows, therefore, that when two printing-instruments such as described are connected with said motors and in electric circuit, as shown in Fig. 15, the type-wheel of the one will be revolved synchronously with that of the other, and that when the circuit is broken by the depression of a key both instruments will be actuated alike. Fig. 15 shows two instruments in circuit, each having a battery and a circuit-closer A^4. Assuming that it is desired to use S′ as the transmitting-instrument, the circuit-closer A^4, which is designed to short-circuit or "ground" the battery, is opened, as shown, and that connected with the instrument S is closed. Both instruments are then in condition to be operated by the battery at S′. As the operator at S′ is not aware of the position of the type-wheel in the instrument S, it is therefore essential that he first establish a relation between the two. It has been shown that upon touching the shift-key O^3, which corresponds to a space upon the type-wheel designed to be brought into the same plane with the disk Q, the latter is so actuated by the pawl d^{13} as to open the circuit-breaker q', thus breaking the shunt-circuit with the magnet C^3, which, being excited, tilts the rock-shaft C′ and causes the gears c' F to be brought into engagement. As the motors are constantly running, except when stopped in the manner stated, the purpose of which is hereinafter more fully set forth, the shaft F′ is rotated until the type-wheel and hammer are brought to the extreme left of the machine, or what may be called the "head" of a page. If, therefore, the operator could know when the action takes place in the machine S which causes the pawl d^{13} to engage the disk Q, he would know when the type-wheels were occupying the same relative position in the two machines. This he cannot know directly; but he can assume that if all the keys upon his instrument are depressed in regular order, or, what is equivalent, if all the pins n are successively brought into contact with the lever M^2 in the machine S, that the space last mentioned upon the type-wheel, which I call the "zero-space," will have been brought into the same plane with the disk Q, and hence the circuit-breaker q' will have been opened, the magnet C^3 excited, and the type-wheel brought to the top of the page in said receiving-machine. This is accomplished by depressing the key O, which raises the disk N sufficiently to cause the sweep or lever M^2, which rotates in unison with the type-wheel shaft, to touch all of the pins n successively. As soon as the zero-key O is touched in his own machine the operator knows that the pawl d^{13} in both instruments must strike the respective disks Q, thus opening the circuit-breakers q' and exciting the respective magnet C^3, thereby transferring both type-wheels to the top of a page; but the relative longitudinal position of the type-wheels upon the respective shafts F′ may differ, and one may have farther to go than the other before reaching the top of the page. I provide for this contingency by means of the shunt-wires p^2 p^2, Fig. 1, which are connected with the circuit-breakers q^3. As soon as the type-wheel in the receiving-machine reaches the top of the page and has pushed forward the rod Q′ said circuit-breaker is closed and the current is caused to pass over said shunt-wires p^2 p^2 before reaching the motor of the receiving-instrument, which is thereby instantly stopped while said zero-space in the machine S is opposite the type-hammer. The motor at S′ being still in circuit continues to run, and the type-wheel in the transmitter is carried to the top of the page, when it automatically closes the circuit-breaker q' and stops the transmitting-machine. The transmitting-motor still being in circuit continues to run and to revolve the type-shaft in said machine, but does not actuate the motor at S, which is still shunted. The magnets G^2 in both machines are, however, still in circuit. The depression of a key in the transmitting-machine breaks this circuit, and the clutches D^3 are engaged, which causes the type-wheels to be moved laterally one space. This releases the rod Q′, which opens the circuit-breaker q^3, and breaks the shunt-circuit p^2 p^2 with the motor at S, which is thereby started, when the operator knows that both type-wheels are revolving in unison and that each occupies a position distant the space of one letter from the top of its page. Before touching the key, as last mentioned, to start the receiving-motor the pawl d^{13}, disk Q, and the circuit-breakers in proximity thereto in the respective machines occupy the relative positions shown in Fig. 30. The movement of said key breaks the line-circuit and annuls the magnets G^2, when the clutch member D^3 in each instrument is reciprocated, carrying with it the pawl d^{13}, which is still in line with the disk Q, thus continuing the movement of said disk farther than it was actuated by the rod Q′ and enough to permit the detents in circuit-breakers q^2 q^3 to fall into the deep notches. This action opens the circuit-breakers q^3, and hence breaks the shunt-circuit p^2 p^2, which shunts the current before reaching the receiving-motor, and hence said motor is again started, as above described. As stated, the depression of the key O causes all of the characters upon the type-wheel to be printed in successive order upon the page, and hence it is not desirable to employ said key except when the operator is ignorant of the

position of the type-wheel in the receiving-machine for the purpose of establishing a relation between the two. At all other times the key O^3 should be used, which, the relation being once established, serves to shift the type-wheels in like manner. Upon the depression of a key, after the action above described, the parts of the circuit-breaking mechanism assume the relative positions in the respective instruments as shown in Fig. 10. The receiving instrument or instruments, as the case may be, having been corrected and a known relation having been established between it or them and the transmitter, the operator proceeds in the manner hereinbefore set forth in describing the operation of a single machine. So long as this relation is known by the operators of the respective machines each may in turn be used as a transmitting or receiving instrument, and each prints its own message, as well as that received thereby. If local batteries are used, as shown in Fig. 15, each operator should disconnect his own battery upon ceasing to use his instrument.

The only respect in which the instrument as a receiver differs from that as a transmitter is that the keys thereon do not act; but, as the depression of the keys in the sending-instrument serves successively to break the circuit with the main line, and hence to momentarily nullify the magnet G^2 therein, it follows that it must produce a like effect upon the corresponding magnet in the receiving-instrument, and as the type-wheels necessarily rotate in unison they must likewise start and stop in unison when said circuit is made or broken. When either the key O or O^3 is depressed on the transmitter, the zero-space is brought opposite the type-hammer and the pawl d^{13} opposite the disk Q in each machine, and the action resulting therefrom, which is above described as occurring in a single instrument, is identical in both.

As the motor is designed to be run at a considerable rate of speed, and as the pawl d^{13} is therefore rapidly reciprocated, it may be necessary to insure its engagement with the disk Q to lessen the speed of the motors when the type-wheel is shifted or the relation established between the two instruments. Any kind of brake for impeding the speed of the motor may be employed for this purpose, or it may be accomplished by placing a crank B′ upon the motor-shaft, as indicated in the "offset" to the drawings in Fig. 2, which the operator may grasp before depressing the key O to establish the relation, as stated, and by means of said crank impede the motion of the machine, turning slowly a sufficient number of times to revolve the type-wheel once, when the handle may be released and the motor allowed to run, as usual; but this may not be found necessary in practice.

Before establishing a relation between two machines it is evident that the type-wheel in the transmitting-machine may be nearer to the top of a page than that in the other, in which case it would, upon striking the key to establish a relation, reach the top of the page first and thereby shunt the current from its own motor before the type-wheel in the receiving-machine would have time to reach a corresponding position. It is therefore advisable for the operator, before attempting to establish a relation, to either run his type-wheel to the position on its shaft corresponding to the bottom of a page or to turn the crank B′ a sufficient number of times, so that he may be sure that the type-wheel in the receiving-machine may have reached the desired position.

It is obvious that any number of said machines may be operated in a given circuit from a local battery, and the plan contemplated by me is to use the same in connection with a central office and a main battery, as shown in Fig. 16, in which T represents said central office, S^2 the central-office machine, adapted to be connected with a main line P and a series of machines S^3 S^4 S^5, as well as with branch lines P^2, connecting with separate machines S^6 S^7. Each of said machines is provided with the usual call-button s, connecting with call-bells s' s^2 s^3 and local batteries p^4 p^5 p^6, respectively, while the machine S^2 is adapted to be connected with the main battery P′, said batteries and instruments having, likewise, the necessary ground connections p^7. Suitable switches p^8 are likewise provided for the purpose of connecting or disconnecting the various lines and calls. Should the operator at S^6 desire to communicate with S^7, he first calls the central office and asks to be put into communication with the number representing that instrument, whereupon the necessary switches are turned to effect this result; or it is obvious that he can in like manner communicate with the main line or that an operator upon the main line may communicate with another upon any given branch.

To enable the operator to manipulate the keys rapidly and at the same time to insure the contact of the sweep M^2 with each of the pins n before the latter have fallen after being raised by a key, I prefer to make the disk N of soft iron and the levers N′ of steel and to slightly magnetize the latter, so that when the key is depressed the end in proximity to the disk will be retained against the same by magnetic attraction until the sweep M^2 will have struck the pin raised thereby, and the impact or jar of the contact will release the lever from its contact with the disk, when the former will fall to its normal position.

Said machines under the system described may be placed in private offices and other places and connected by branch lines with a central office and employed, if desired, in lieu of the ordinary type-writer when not in use for telegraphic purposes. This may be accomplished by employing a local battery, as shown in Fig. 1, and short-circuiting the in-

strument in any well-known way when used as suggested.

In transmitting press dispatches my invention is of especial value in that an operator at a central office may at once correct all the machines in circuit and transmit to all simultaneously, thus dispensing with as many operators as there are receiving-stations.

Having thus described my invention, I claim—

1. The combination, with a single main line and an electro-generator, of a series of rotary electric motors, each consisting of polarized magnets forming a cylindrical field, an armature within said field having radial arms, a commutator for controlling the action of said armature, whereby the currents may be alternately reversed, a type-wheel, and mechanical connection between said type-wheel and armature, substantially as shown and described.

2. The combination, with a single main line and electro-generator, of two polarized rotary synchronous motors, two printing-instruments having their type-wheel shafts connected with said motors, a magnet upon each of said instruments and in circuit with the main line for normally maintaining the disconnection of the impression mechanism, a series of keys, a circuit-breaker in operative connection with said keys for breaking the line-circuit upon the depression of a key, and an impression mechanism for impressing the character when said main circuit is broken, substantially as shown and described.

3. The combination, in a printing-telegraph instrument, of a motor having a rotary armature actuated by polarized magnets and normally connected by means of intermediate gears with the type-wheel shaft, a main line and circuit-breaker therein connected with the keys of the instrument, a magnet in said main-line circuit for normally disengaging a clutch upon said type-wheel shaft, the teeth of which clutch correspond in number and position to the characters upon the type-wheel, impression mechanism connected with said clutch, and means for engaging said clutch upon the depression of a key and the breaking of the line-circuit, substantially as shown and described.

4. The combination, in a printing-telegraph instrument, of a rotary motor consisting of polarized magnets forming a cylindrical field, a rotary armature within said field, a pole-changer, a normally-rotating type-wheel and type-wheel shaft, the latter connected by intermediate gears with said armature, a shunt-circuit, a magnet therein in proximity to an armature attached to a tilting arm upon a rock-shaft, gears upon said arm arranged to mesh, respectively, into the gear of the type-wheel shaft or that of a screw-shaft connected with the type-wheel, whereby said type-wheel may be shifted from the bottom to the top of a page, substantially as shown and described.

5. The combination, in a printing-telegraph, of a rotary motor having its armature normally connected by means of gears with the type-wheel shaft, an armature arranged upon a tilting lever pivoted in alignment with the axis of the armature-shaft, a normally-shunted magnet in proximity to said armature, gears upon said tilting lever engaging with the gear upon the armature-shaft of the motor, a type-wheel arranged to slide loosely upon its shaft, a screw-threaded shaft parallel with the type-wheel shaft and having a nut connected with said type-wheel, gears upon said screw and type-wheel shafts, respectively, in position to engage alternately with the gears upon said tilting arm, and a shift-key and intermediate connections for shifting the current from the main line to said shunt-circuit, whereby the type-wheel may be transferred at will to the beginning of a page.

6. In a printing-telegraph, a tilting arm bearing upon a rock-shaft and provided with gears upon its respective ends meshing into that of the motor-shaft, a spring for maintaining one of said gears in normal engagement with the type-wheel-shaft gear, a magnet and armature for tilting said shaft, and means, as a shunt-circuit and electro-magnet, for exciting said magnet at a predetermined time, whereby the power of the motor may be transferred from the type-wheel gear to one upon a threaded shaft for shifting the type-wheel to the beginning of a page, substantially as and for the purposes set forth.

7. In a printing-telegraph instrument, the combination of a rotating type-wheel shaft, a loose clutch member thereon normally disengaged from its counterpart, which revolves with the shaft, a ratchet-wheel connected with said loose member, having a detent upon an arm rigidly attached to a rock-shaft and held in resilient engagement with said ratchet-wheel, an arm and pawl upon said rock-shaft engaging with a secondary ratchet-wheel, and intermediate gears connecting with the paper-rolls, a type-hammer upon said rock-shaft, and means, as a screw-shaft and gears, for moving the same lengthwise thereon in unison with the lateral movement of the type-wheel and for momentarily engaging said clutch members with the depression of each key, substantially as described, and for the purposes set forth.

8. In a printing-telegraph instrument, a rotating type-wheel shaft having a loose clutch member thereon normally at rest and disengaged from its counterpart, which revolves with the shaft, a ratchet-wheel connected with said loose member, having a detent upon an arm rigidly attached to a rock-shaft parallel with the type-wheel shaft and held in resilient engagement with said ratchet-wheel, an arm and pawl upon said rock-shaft engaging with a secondary ratchet-wheel attached to a gear, a pawl engaging with said secondary ratchet-wheel to normally prevent its reverse movement, a coiled spring connecting with said gear for moving it in an opposite direction

from that normally described by said secondary ratchet-wheel, a type-hammer upon said rock-shaft, a threaded shaft and nut for moving the same lengthwise thereon in unison with the movement of the type-wheel upon its shaft, and means, as described, for momentarily engaging said clutch members upon the depression of each key and for disengaging at a predetermined time the pawl which holds said secondary ratchet-wheel, whereby said spring may be permitted to act and shift the paper for a line-space, substantially as described.

9. The combination, in a printing-telegraph instrument, of a type-wheel upon a revolving type-wheel shaft, the clutch members D^3 D^4, ratchet-wheel D^5, having a spring-detent engaging therein and attached rigidly to a rock-shaft type-hammer H, pawl and arm f^3 f^4, ratchet-wheel F^5, gear-wheel F^6, connecting with the paper-rolls, spring F^7, engaging with the pins f^9, and pawl l, with means, as described, for disengaging the same and for actuating said clutch upon the depression of a space-key, substantially as set forth.

10. In combination with the ratchet-wheel F^5 and its coacting parts, the pawl l, rigid arm l^3, having a detent upon its extremity, opposing spring l^2, ring d^{11}, and reciprocating block d^{10}, connected with the clutch member D^3, whereby said block d^{10} may be removed from the ring when in the same radial plane with said detent upon touching a key conforming to a space in a like plane upon the type-wheel, thus releasing said pawl and permitting said spring F^7 to act substantially in the manner and for the purposes specified.

11. The combination of the ratchet-wheel D^5, detent h^3, spring h^4, and rock-shaft H, having a type-hammer loosely attached to a sliding sleeve thereon, and means, as gears, a screw-shaft, and nut, for sliding said sleeve in unison with the type-wheel, whereby a stroke of said hammer may cause an impact of the paper against the type-wheel whenever the detent h^3 slips off from the end of a ratchet-tooth, substantially as described.

12. The combination of the ratchet-wheel D^5, detent h^3, spring h^4, and rock-shaft H, having a type-hammer loosely attached to a sliding sleeve thereon, and a screw-shaft and nut for sliding said sleeve in unison with the type-wheel oscillating arm f^4, having a pawl engaging with a ratchet-wheel connected with suitable paper-rolls, whereby a new space may be presented upon the paper for each stroke of the type-hammer, substantially as and for the purposes set forth.

13. The combination of the wheel F^6, having a series of pins projecting laterally therefrom, and a coiled spring F^7, adapted to engage therewith, a ratchet connected with said wheel, a ratchet and pawl for producing a step-by-step motion of said wheel in a direction opposite to that of the pressure of said spring, a pawl for normally preventing a backward movement of said wheel F^4 in normal engagement with a clutch upon the hub of the wheel F^6 and connected with a threaded shaft-nut and gears for shifting the type-hammer the space of a line, means for releasing the ratchet connected with said wheel F^6, and a shift-lever e' for disengaging said clutch by the action of the spring F^7, substantially as and for the purposes set forth.

14. The magnet G^2, normally in circuit, in combination with an armature upon a lever G, spring g', clutch member D^3, counterpart D^4 and its connecting parts, revolving pivoted arm M^2, attached to a hollow shaft revolving in unison with the type-wheel, rod M^3, circuit-breaker m^4 m^6, in circuit with said magnet, and a series of pins in the track of said revolving arm, with suitable keys for raising the same, respectively, substantially as specified.

15. In a printing-telegraph having a rotary type-wheel, the combination of a series of paper-rolls having their axes parallel with that of the type-wheel shaft, a step-by-step mechanism, as described, for rotating them one step in one direction with each character impressed, and means, as described, for reversing their movement at the end of each line, a rack and worm-gear in operative connection with the type-wheel, and a rotary motor and shunt-circuit, as set forth, whereby the type-wheel and type-hammer may be shifted laterally and the paper drawn back to enable the type-wheel to stand at the beginning of a line and at the top of a page, substantially as shown and described.

16. The combination of a rotary motor, a revolving type-wheel, a threaded shaft having intermediate connections with the type-wheel and type-hammer for shifting the same at the end of a line, a rock-shaft controlled by a magnet normally shunted for shifting the motor-power from the type-wheel shaft to said threaded shaft, and a circuit-breaker for opening said shunt, and means, as described, for actuating the same upon the depression of a given key, substantially as and for the purposes specified.

17. The combination, with a main line and electro-generator, of a series of synchronous motors, a series of printing-instruments having rotating type-wheels, screw-shafts and coacting mechanism, as described, in said respective instruments for shifting said type-wheels laterally, a normally-shunted magnet, armature, rock-shaft, and gears, as specified, for transferring the motor-power from the type-wheel shaft to said screw-shaft, and means, as set forth, for breaking said shunt-circuit at a predetermined time, substantially as shown and described.

18. The combination, with a main line and electro-generator, of a series of synchronous motors, a series of printing-instruments having rotating type-wheels, screw-shafts and coacting mechanism, as described, in said respective instruments for shifting said type-wheels laterally, a normally-shunted magnet,

armature, rock-shaft, and gears, as specified, for transferring the motor-power from the type-wheel shaft to said screw-shaft, and a compound circuit-breaking mechanism consisting of the disk Q and its circuit-breakers and connecting-shunts, and means, as specified, for actuating the same upon the depression of a given key, substantially as shown and described.

19. The combination, in a page-printing telegraph, of a main line, an electro-generator, a rotary motor, a revoluble laterally-movable type-wheel having its shaft in operative connection with the armature of said motor, rolls for actuating the paper web, mechanism, as specified, for moving said type-wheel and paper-rolls, respectively, in the required order, a series of shunts for bringing said mechanism into operation, a notched wheel in operative connection with a series of circuit-breakers connected with said respective shunts, and means for actuating said wheel, substantially as shown and described.

20. In a printing-telegraph, a series of rotary motors in electric circuit connected, respectively, with a series of instruments having rotary and laterally-shifting type-wheels, magnets for actuating the impression and type wheel shifting mechanism, respectively, shunts connecting with said motors and magnets, respectively, a compound circuit-breaking mechanism, as the disk Q and its circuit-breakers, connecting therewith, and means, as described, for operating the same upon the depression of a given key, substantially as described.

21. The combination, in a printing-telegraph, of the disk Q, circuit-breakers q' q^2 q^3 and their respective connections, rotating pawl d^{13}, connected with the clutch member D^3, and a key corresponding to a space upon the type-wheel in the same radial plane with said pawl, whereby the latter may be reciprocated at a predetermined time in a plane with said disk, substantially as and for the purposes set forth.

22. The combination, in a printing-telegraph, of the disk Q, circuit-breakers q' q^2 q^3 q^4 and their respective electrical connections, rotating pawl d^{13}, connected with the clutch-member D^3, a key corresponding to a space upon the type-wheel in the same radial plane with said pawl, and a rod Q', adjusted to engage successively with a series of pins upon said disk and having pins adjusted to engage said circuit-breakers q^3 q^4, said rod being projected in the line of movement of the type-wheel when shifted to the beginning of a page, substantially as and for the purposes specified.

23. In a printing-telegraph, the combination of the disk N, provided with pins n, and the magnetized key-levers N', substantially as and for the purposes specified.

FREDERICK SEDGWICK.

Witnesses:
D. H. FLETCHER,
M. M. GRIDLEY.