No. 726,566. PATENTED APR. 28, 1903.

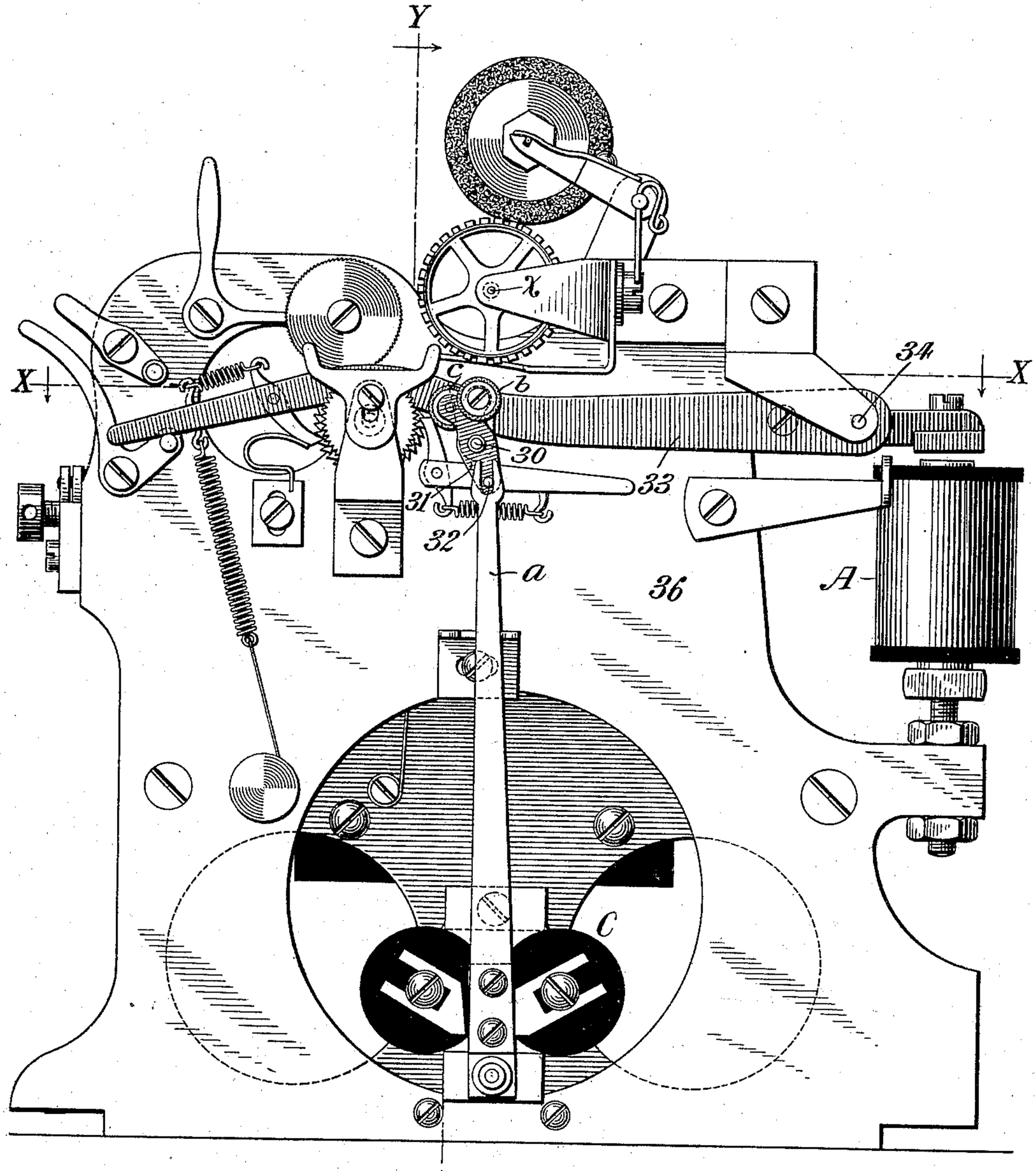
W. P. PHELPS.

PRINTING TELEGRAPH SYSTEM.

APPLICATION FILED MAR. 6, 1902.

NO MODEL. 8 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

C. E. Ashley

John C. Sanders

INVENTOR:

William Pitt Phelps

By his Attorney

C. L. Burlingame

No. 726,566. PATENTED APR. 28, 1903.

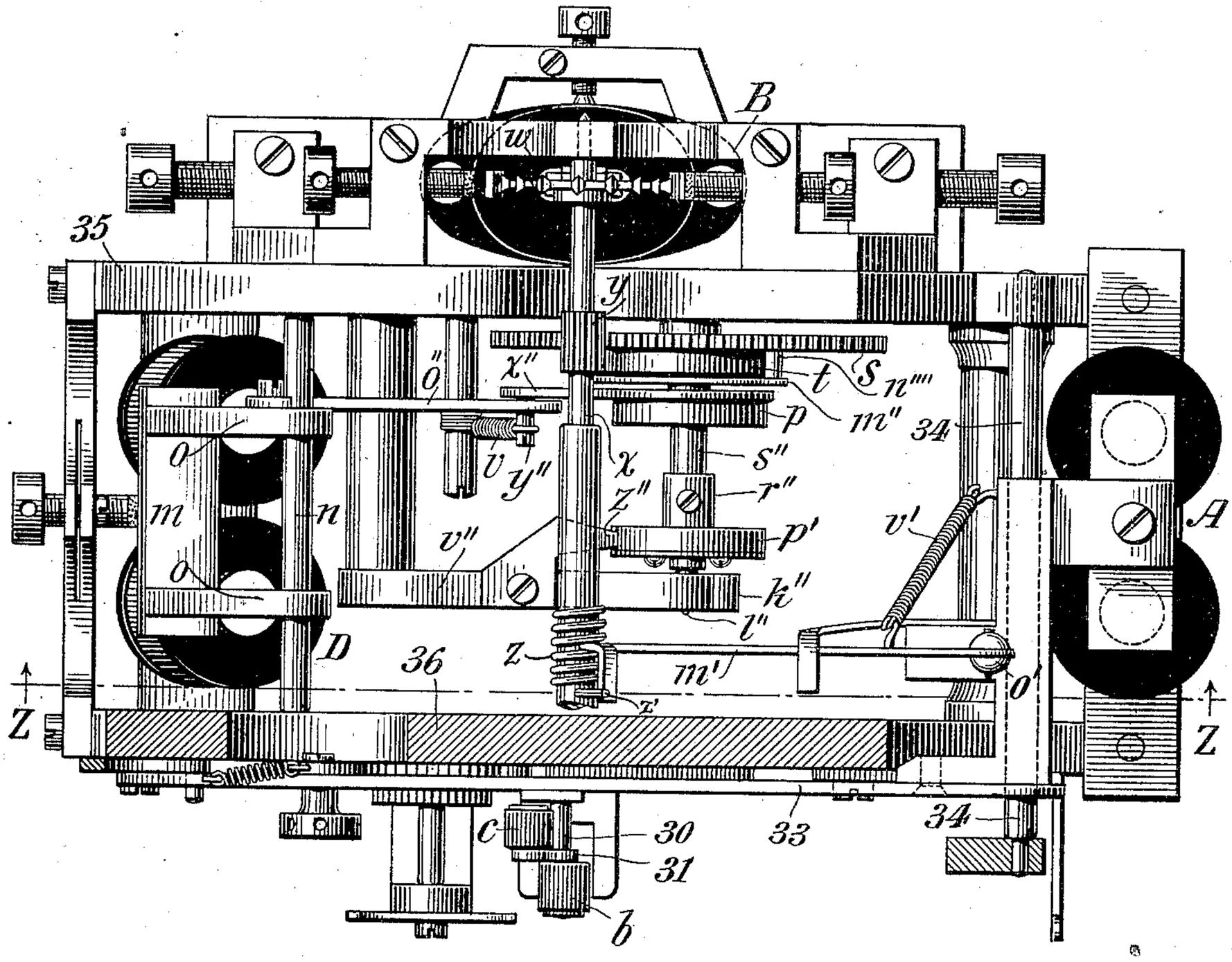
W. P. PHELPS.

PRINTING TELEGRAPH SYSTEM.

APPLICATION FILED MAR. 6, 1902.

NO MODEL. 8 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:
C. E. Ashley
John C. Sandere

INVENTOR:
William Pitt Phelps
By his Attorney
C. L. Burlingham

No. 726,566. PATENTED APR. 28, 1903.

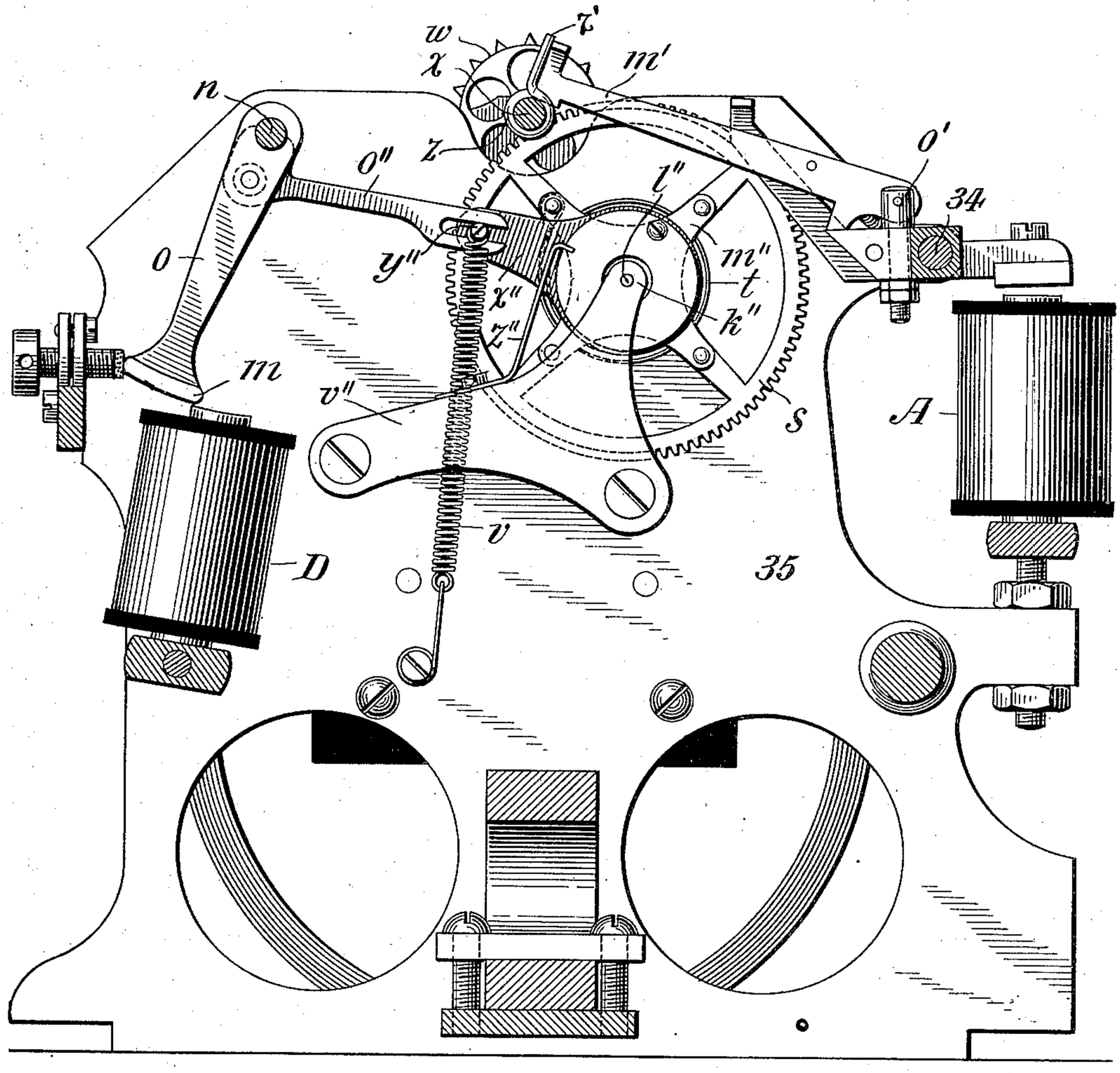
W. P. PHELPS.

PRINTING TELEGRAPH SYSTEM.

APPLICATION FILED MAR. 6, 1902.

NO MODEL. 8 SHEETS—SHEET 3.

Fig. 3.



WITNESSES:

C. E. Ashley

John C. Sanders

INVENTOR:

William Pitt Phelps

By his Attorney

C. L. Burlingham

No. 726,566. PATENTED APR. 28, 1903.

W. P. PHELPS.

PRINTING TELEGRAPH SYSTEM.

APPLICATION FILED MAR. 6, 1902.

NO MODEL. 8 SHEETS—SHEET 4.

Fig. 4.

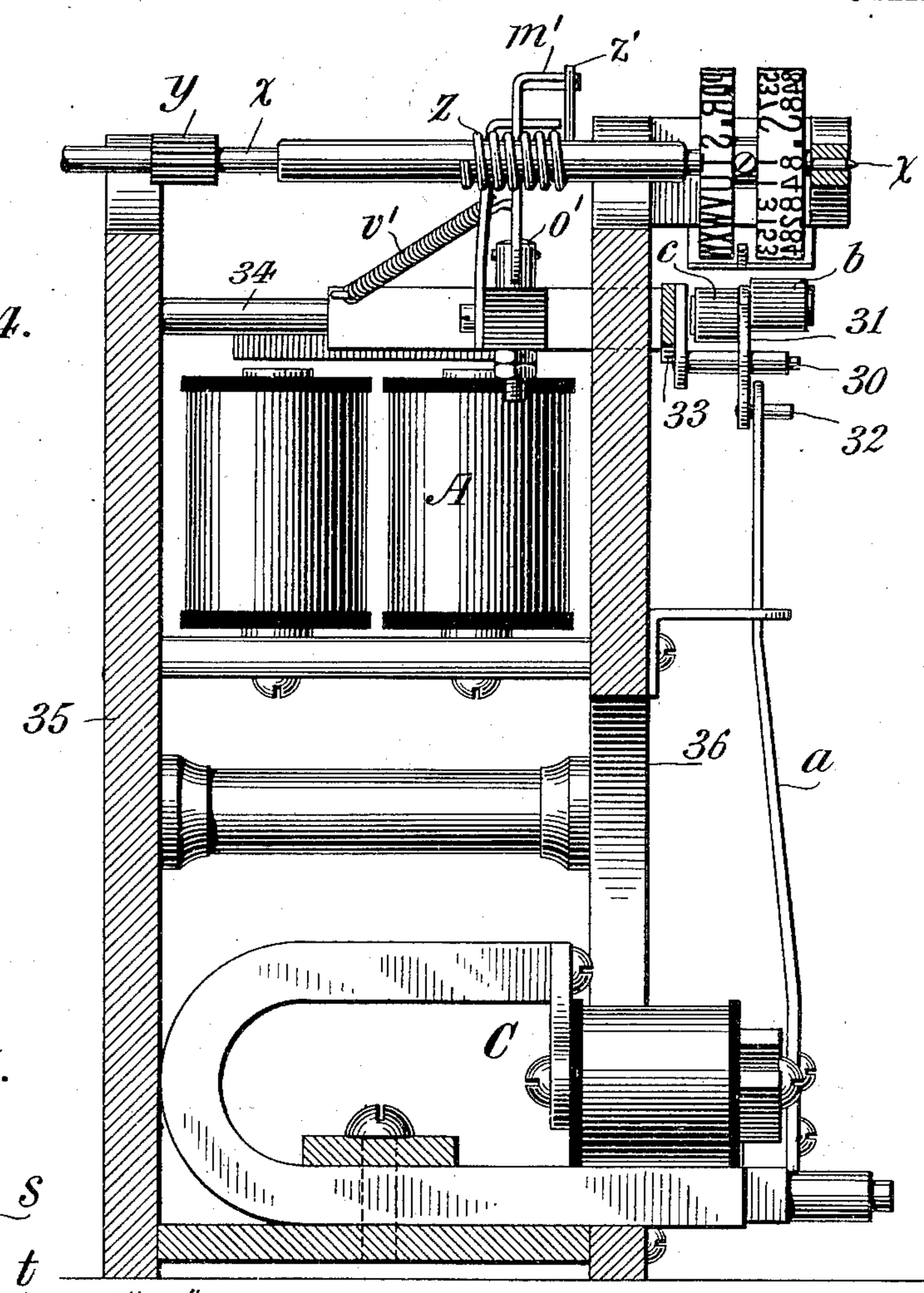


Fig. 5.

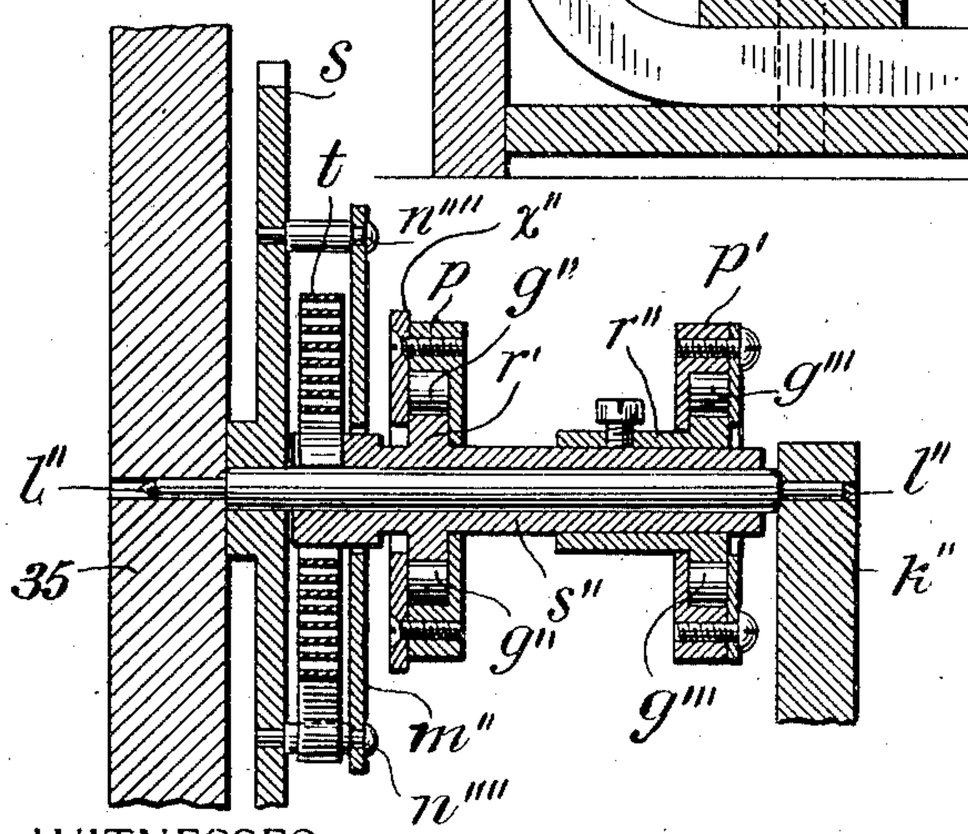
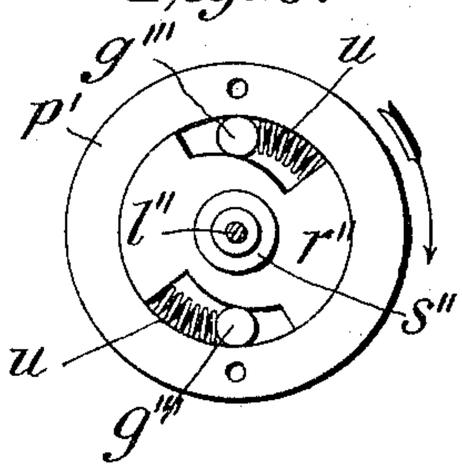


Fig. 6.



WITNESSES:
C. E. Ashley
John C. Sanders

INVENTOR:
William Pitt Phelps
By his Attorney
C. L. Burlingham

No. 726,566. PATENTED APR. 28, 1903.

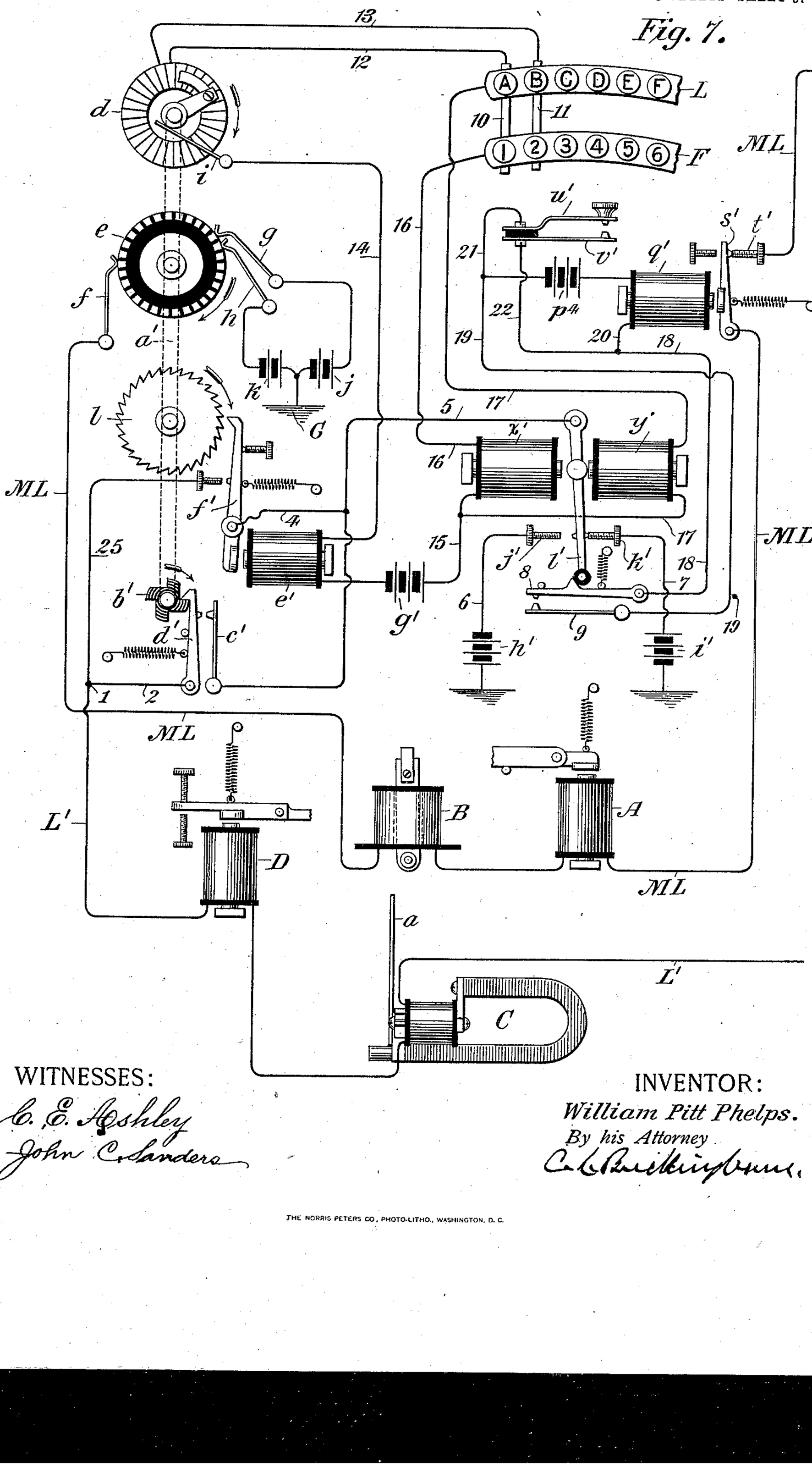
W. P. PHELPS.

PRINTING TELEGRAPH SYSTEM.

APPLICATION FILED MAR. 6, 1902.

NO MODEL. 8 SHEETS—SHEET 5.

Fig. 7.



WITNESSES:

C. E. Ashley

John C. Sanders

INVENTOR:

William Pitt Phelps.

By his Attorney

C. L. Burlingame.

No. 726,566. PATENTED APR. 28, 1903.

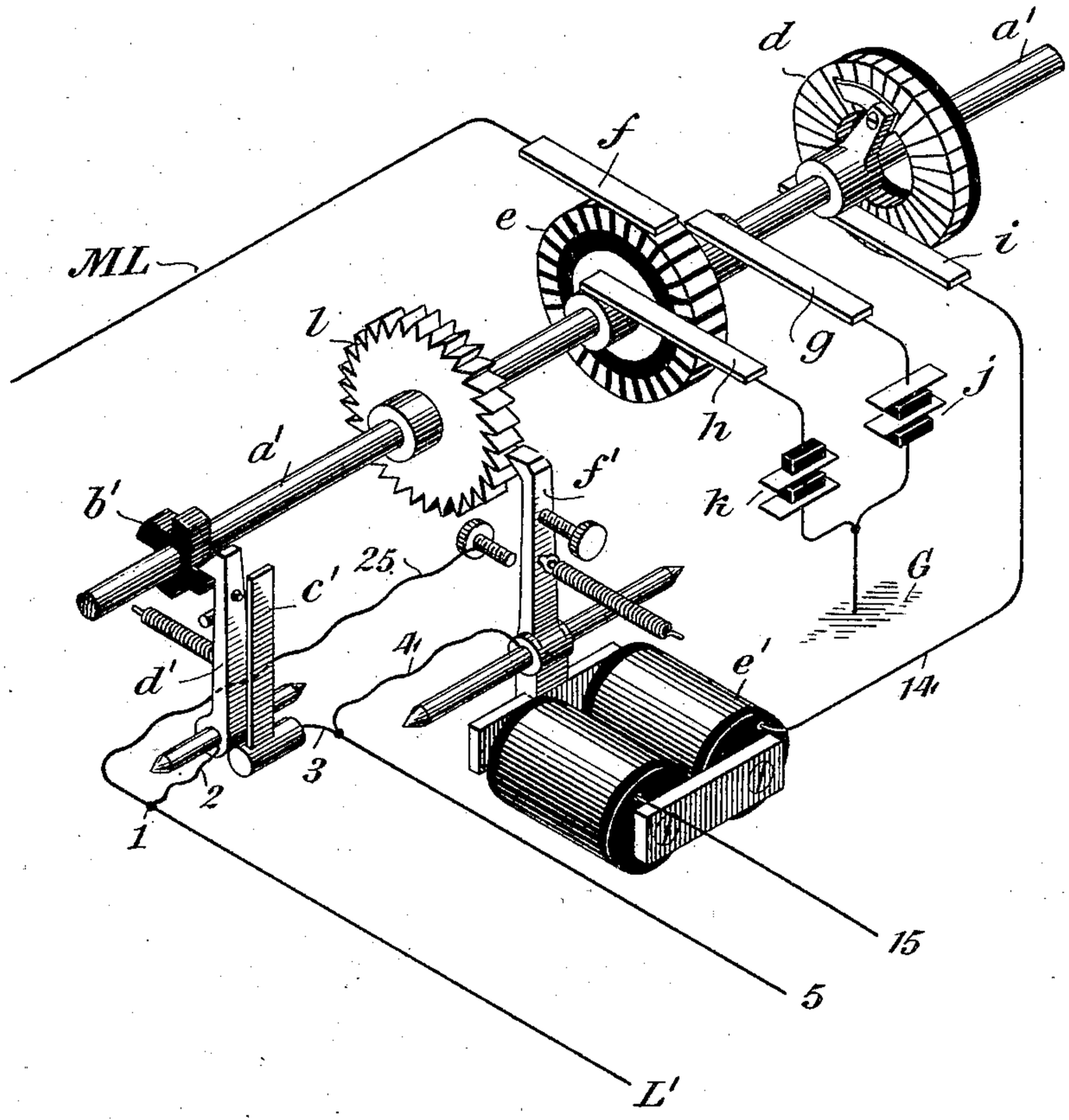
W. P. PHELPS.

PRINTING TELEGRAPH SYSTEM.

APPLICATION FILED MAR. 6, 1902.

NO MODEL. 8 SHEETS—SHEET 6.

Fig. 8.



WITNESSES:

C. E. Ashley

John C. Sanders

INVENTOR:

William Pitt Phelps.

By his Attorney

A. L. Burlingham

No. 726,566. PATENTED APR. 28, 1903.

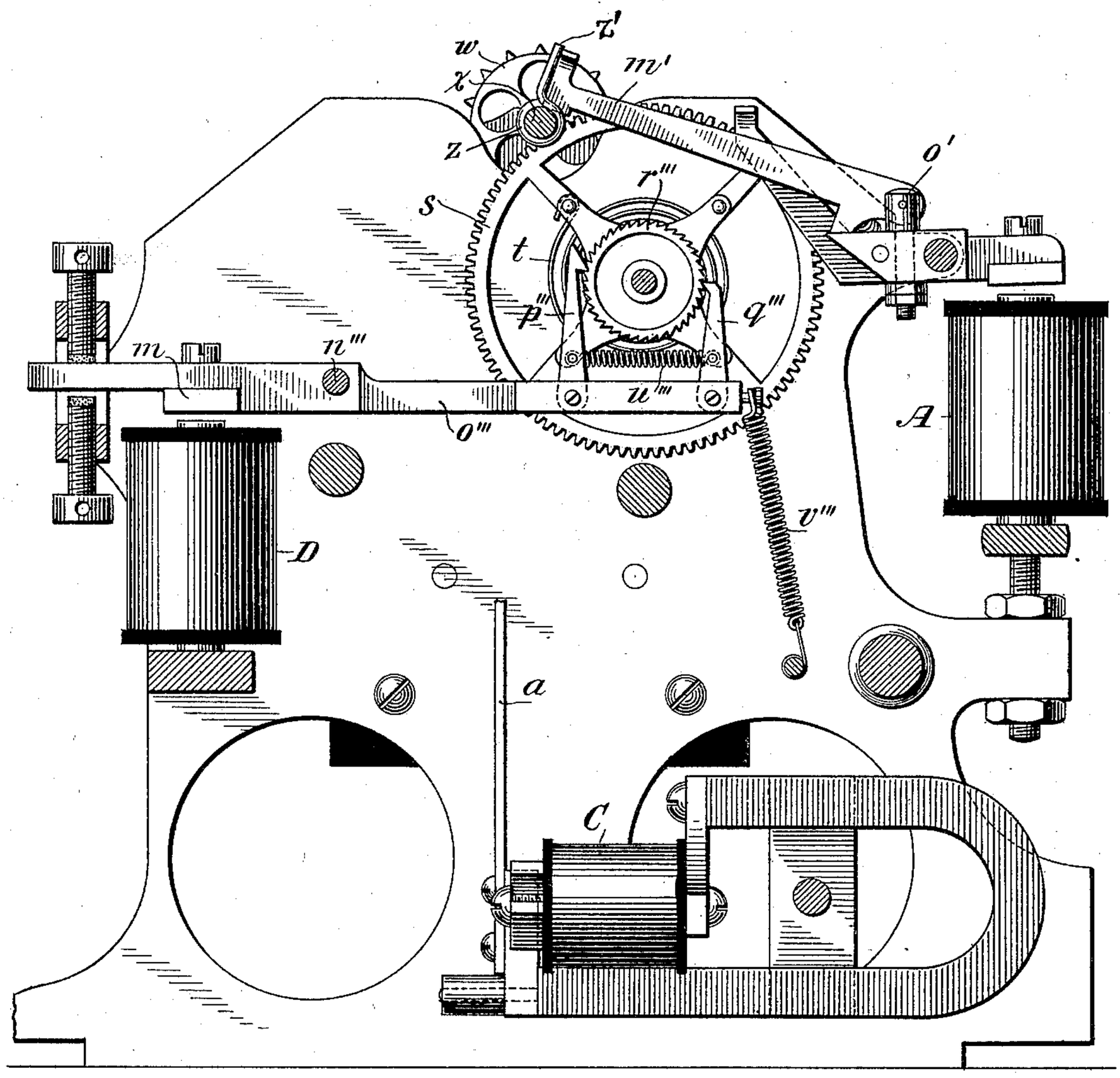
W. P. PHELPS.

PRINTING TELEGRAPH SYSTEM.

APPLICATION FILED MAR. 6, 1902.

NO MODEL. 8 SHEETS—SHEET 7.

Fig. 9.



WITNESSES:

C. E. Ashley

John C. Sanders

INVENTOR:

William Pitt Phelps.

By his Attorney

C. L. Burlingham.

No. 726,566. PATENTED APR. 28, 1903.

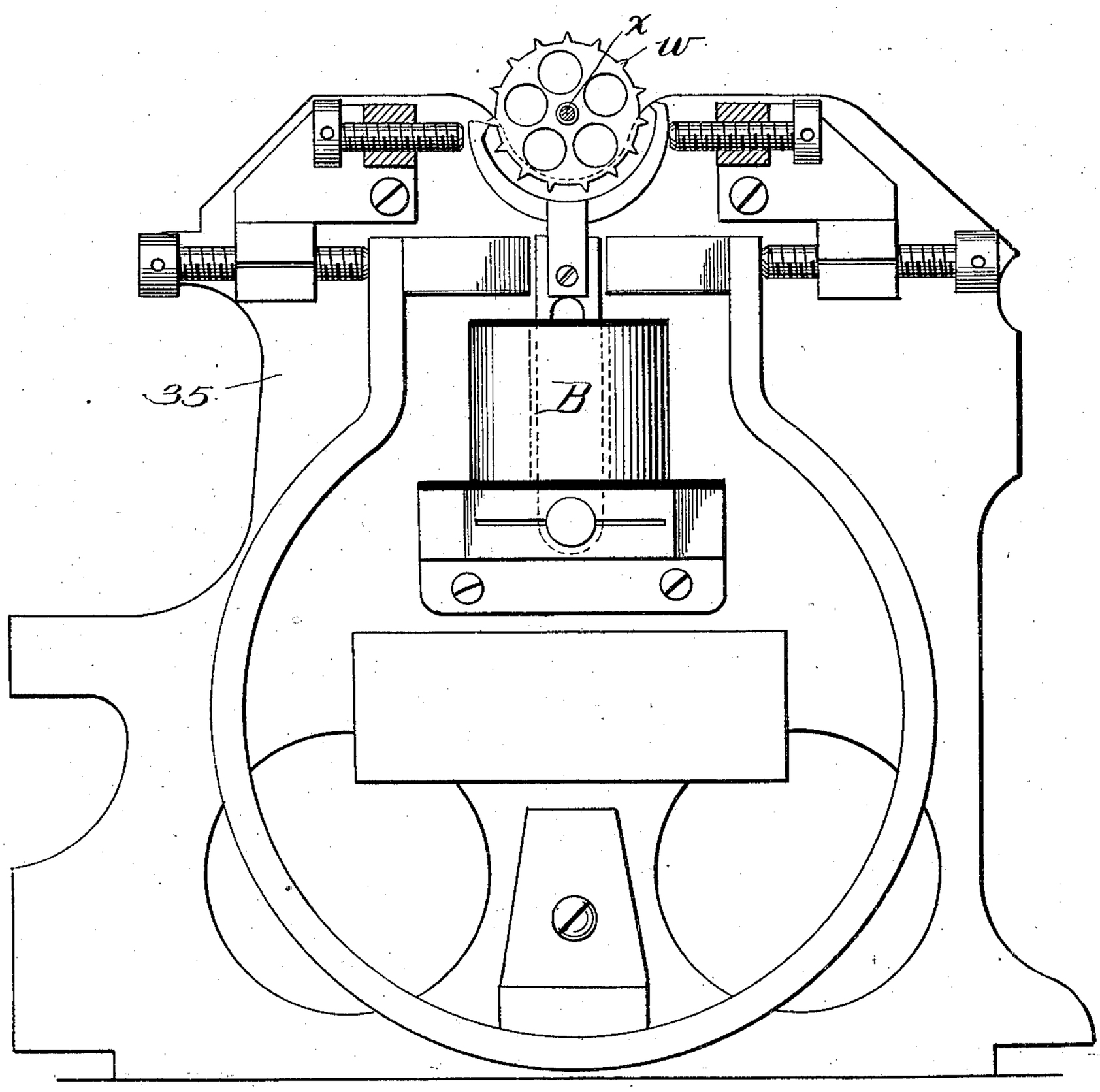
W. P. PHELPS.

PRINTING TELEGRAPH SYSTEM.

APPLICATION FILED MAR. 6, 1902.

NO MODEL. 8 SHEETS—SHEET 8.

Fig. 10,



WITNESSES:
F. Hunicutt Pope
W. M. Conner.

INVENTOR
William Pitt Phelps
BY
Chapin Haywood & Marble
ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM PITT PHELPS, OF MERCHANTSVILLE, NEW JERSEY, ASSIGNOR TO WESTERN UNION TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PRINTING-TELEGRAPH SYSTEM.

SPECIFICATION forming part of Letters Patent No. 726,566, dated April 28, 1903.

Application filed March 6, 1902. Serial No. 96,945. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM PITT PHELPS, a citizen of the United States of America, residing in Merchantsville, Camden county, New Jersey, have made a new and useful Improvement in Printing-Telegraph Systems, of which the following is a specification, reference being had to the accompanying drawings.

The principal object of my invention is to provide printing-telegraph instruments of the "stock-ticker" class with a self-winding apparatus whereby the heavy weights which are manually wound at the receiving instruments may be dispensed with. Self-winding devices have long been used; but in no instance has a serviceable and reliable apparatus of this class been devised which has not been detrimental to the speed of the machine, and particularly is this true where the winding is done by the press-arm or where the winding-magnets have been placed in circuit with those of the type-wheels and press mechanism.

In double-type-wheel printing systems it is advantageous to employ an auxiliary main line for no other purpose than to actuate the press-shifting apparatus, for by other plans the shifting from the printing of figures to letters, or vice versa, is accomplished only when the type-wheels are in certain positions of rotation or, as often occurs, only after they have been rotated a considerable distance. By employing an auxiliary main line, however, the shifting may be done on the instant, without moving the type-wheels at all. In fact, while the wheels are held in one position letters and figures may be alternately printed with all that rapidity with which the press may be raised and lowered.

One of the essential features of my invention consists in utilizing such auxiliary main line both for actuating the press-shifting apparatus and to convey currents from the transmitter to drive a spring-winding apparatus by which the type-wheels of the printers are rotated. Preferably, such currents are sent over the auxiliary main line by automatically opening and closing said circuit at the transmitter, while at the same time the press-shifting apparatus may be actuated by current reversals; but to enable the transmission of current reversals at all times supplemental means must be employed for closing the auxiliary circuit at moments when it is broken by the commutator, which periodically transmits currents to the spring-winding magnets.

Of course current reversals might be employed to drive the spring-winding apparatus, and the press-shifting apparatus might be actuated by a neutral magnet; but the preferable plan is the one above outlined, in which the spring-winding apparatus is driven by a neutral magnet under the action of pulsatory currents, positive or negative, while the press-shifting apparatus is actuated by the armature of a polarized magnet, which is set in one direction or the other, according to the polarity of current flowing.

My invention also comprises various novel details found to be necessary to the main features of invention, as above outlined.

Referring to the accompanying drawings, Figure 1 is a side elevation of my improved printing-receiver. Fig. 2 is a top view and a partial horizontal section on line X X, Fig. 1, of such receiver. Fig. 3 is an interior view and a partial vertical section on line Z Z, Fig. 2. Fig. 4 represents an interior elevation and also a partial vertical section in a plane represented by line Y Y, Fig. 1. Fig. 5 is a sectional view showing the winding and retaining ratchets combined with a motor-spring for actuating the type-wheels. Fig. 6 is a side view of my preferred form of ratchet for winding the motor-spring, looking toward the left of Fig. 5. Fig. 7 is a diagrammatic view of the transmitting apparatus and circuits. Fig. 8 is a perspective drawing showing essential parts of said transmitter. Fig. 9 is a modification of the self-winding arrangement shown in Figs. 3 and 5. Fig. 10 is a side elevation of the side of the printing-receiver opposite that shown in Fig. 1 and shows particularly the escapement mechanism controlling the rotation of the type-wheels.

As shown in Figs. 1 to 4, 35 and 36 are vertical side plates of my printing-receiver, which are held together by horizontal bolts and a

base-plate, all serving as a supporting-frame for the various parts of said instrument. As appears in these figures, there are two type members or wheels for each receiving instrument, one bearing letters and the other figures, which are mounted upon a shaft x, carrying a pinion y, which is driven by spur-wheel s. A step-by-step rotation of shaft x is controlled through an escapement-wheel w and oscillating pallets, which are vibrated by a magnet B under the action of main-line alternating currents and which constitute mechanism for determining the position of the type-wheels at the instant of printing, while within the same circuit is placed a press-magnet A, which is actuated by prolonging in the usual manner either a positive or negative pulse to raise a press-lever 33, pivoted upon a shaft 34. Upon the press-lever underneath the type-wheels a lever 31, having two upwardly-projecting arms, is pivoted at point 30, and upon the upper ends of said arms are placed two press-rollers or pressers b c. When the lever 31 is tilted, as shown in Figs. 1 and 4, the press-roller b is placed underneath the center of the figure-wheel, and in this position if the press-lever 33 is raised by magnet A a figure impression will be taken, but roller c will not reach the letter-wheel. If the lever 31 is moved to an opposite position, the roller b will be displaced to one side and roller c brought underneath the center of the letter-wheel, and in this case upon actuating the press-lever 33 letters will be printed, but not figures. Upon the lower end of lever 31 is placed a horizontal pin 32, by which said lever is moved backward and forward by a forked arm a, as shown in Fig. 1, which in turn is actuated by a polarized magnet C, placed in the auxiliary circuit L', whereby arm a is moved to one side or the other, according to the direction of current flowing.

Among the various details shown in Figs. 1 to 4 is the unison device, which is of the usual form, consisting of a spiral z on the type-wheel shaft, within the threads of which rests the free end of a lever m', which is horizontally pivoted upon press-arm 33 at o'.

If a series of alternating currents were transmitted and the press-arm were not actuated, the lever m' would be carried outward toward the side plate 36, bringing the bent end of said lever into the path of the rotating radial pin z', the latter being an integral part of a wire forming the spiral threads z, thereby holding the type-wheel in a unison position until released by the press-lever 33. The free end of arm m' would then be lifted clear of the spiral threads and radial pin and drawn inward to a non-engaging position by spring v'.

One form of apparatus for driving the type-wheel, although not the preferred form, Fig. 9, is actuated by a magnet D, placed in the auxiliary line L' with the press-shifting polarized magnet C. In the operation of this apparatus a definite number of pulses is transmitted to line during each rotation of the transmitter, and thereby an armature m is successively attracted, which in turn oscillates an arm o''', pivoted at n''', near the outer end of which are pivoted pawls p''' q'''. Such pawls are connected together and are pressed toward each other by a spiral spring u''', thus causing their upper ends to engage with the teeth of ratchet-wheel r''', to the hub or shaft of which is attached one end of a spiral spring t, while the other end of said spring is connected with spur-wheel s, which engages with pinion y upon the type-wheel shaft. The magnet D being of the neutral type is energized to actuate its armature m by either a positive or negative current. If now a current is sent through magnet D, the armature m is attracted and the outer end of armature-lever o''' is raised, in which case the free end of pawl p''' rides over the teeth of the ratchet-wheel r''', while the point of pawl q''' in its upward movement drives said ratchet-wheel in an anticlockwise direction. Upon the cessation of current through magnet D the armature-lever o''' is drawn downward by spring v''', when the point of pawl q''' slides over the teeth of the ratchet-wheel, while the pawl p''' in its downward movement draws with it the ratchet-wheel again in an anticlockwise direction. By this means as intermittent currents pass through magnet D the ratchet-wheel r''' is rotated step by step, and thereby the inner end of the spiral spring t is wound and tightened around the shaft of said ratchet-wheel in an anticlockwise direction, and thereby power is stored which serves to drive the spur-wheel s in the same direction. Thus during the operation of the printing-telegraph instrument the spring t is constantly being put under a tension, which asserts itself to drive the type-wheel shaft as escapement-pallets are moved backward and forward by magnet B to release the teeth of wheel w.

In my preferred form of self-winding arrangement, Figs. 1 to 6, are employed the same spur-wheel s, the same spiral spring t, and the same magnet D. In this case, however, I have replaced ratchet-wheel r''' and pawls p''' q''' with friction ratchet devices which are more nearly noiseless and are subject to less injurious wear.

As shown in Figs. 2, 3, and 5, spring t is located between the spur-wheel s and a plate m'', and its outer end is affixed to a bolt n'''', extending from wheel s, while its inner end is attached to a sleeve s''. Wheel s is rigidly affixed to a shaft l'', the latter being journaled at one end in supporting-plate k'' and at the other end in frame-plate 35. Sleeve s'' is also supported upon shaft l''; but the sleeve is free to rotate upon the shaft. Sleeve s'' is provided with two hubs—r' at the left and r'' at the right—the latter being more fully shown in Fig. 6, and surrounding these hubs are rings or housings p p'. The ring p, however, is free to rotate in one direction

about the hub r', but not in the other direction, because in the latter case p is clutched to r'.

As shown in Fig. 6, the hub r'' is provided with two recesses, within each of which is placed a roller g''' and a spiral spring u. If force were applied to the periphery of the ring p' to rotate it in an anticlockwise direction, the roller g''' under the action of spring u would be forced toward the narrower ends of the recesses, and thereby the hub r'' would be clutched into rigid connection with said ring p'. If, however, force were applied to the periphery of the ring p' to drive it in a clockwise direction, the rollers g''' would no longer be forced into the narrower parts of the recess of hub r'', and in this case the ring would move freely around hub r''. Rings p and p' are alike in construction, as are r' and r''; but, as will presently be shown, p and r' serve as a driving-ratchet, while p' and r'' constitute a retaining-ratchet.

As shown in Figs. 2 and 3, the ring p is provided with a radially-projecting plate or arm x'', having near its outer end a horizontal pin y'', which works within the opening of a forked arm o''. When the magnet D, Fig. 3, is energized, the armature m at the end of lever o, which is pivoted at n, is swung directly over the magnet-core, and the arm o'', which is rigidly affixed to arm o, is lifted and with it arm x'', thereby giving ring p a clockwise direction of rotation; but in this case the sleeve s'' is not rotated, because the ring is free to rotate about the hub r'. Upon a cessation of current through magnet D, however, the armature m is thrown to the left under the action of retracting-spring v, and the arm x'' is again brought to its lowermost position, and during this movement ring p clutches with hub r' and an anticlockwise movement is communicated to the spring t. During the clockwise rotation of p, when the latter is unclutched from r', if there were no retaining-pawl the hub r' would freely rotate in a clockwise direction and the spring t would be unwound. To avoid this difficulty, ring p' and hub r'' (shown in Fig. 6) are applied near the right end of sleeve s''. The hub r'' is rigidly fixed to sleeve s'' and rotates with it. The part p', while rotatably disconnected from hub r'', is held against rotation by a latch z'', bolted to the frame-plate v'', Fig. 3, whose upper end is fastened within a peripheral notch of ring p'. In other words, if armature m were attracted by magnet D and arm x'' were thereby raised, ring p would be unclutched from hub r', Figs. 5 and 6, and would be rotated independently of sleeve s'' and hub r'', whereupon an unwinding action within spring t would occur unless said sleeve were withheld by a retaining-pawl; but ring p' and hub r'' constitute such a retaining-ratchet, for hub r'' would be clutched to the stationarily-held ring p' by rollers g'''. Upon the lowering of arm x'' by spring v ring p is clutched to hub r', but in this case hub r' freely rotates within ring p', since rollers g''' no longer clutch the ring and hub together—that is to say, hub r'', ring p', spring u, and clamping-rollers g''' serve as a retaining-ratchet to prevent the unwinding of spring t when ring p is loosened from hub r' during the upward movement of arm x''.

The transmitter, with its main lines and its various local circuits, is shown in Figs. 7 and 8, M L being the main line, within which are placed type-wheel and press magnets B A, while within the second or auxiliary line L' are placed magnets D C for actuating the winding and press-shifting devices for each printer. A receiving-printer is usually placed in the immediate view of the transmitting operator and as such is an adjunct of the transmitter, whereby the operator may at all times inspect the messages as printed which he transmits. The magnets of such a printing-receiver are shown in Fig. 7, A being a neutral press-magnet, B a polarized escapement-magnet, and C a polarized magnet for controlling two press-rollers b c, whereby printing from either of the two type-wheels may be effected, while D is a neutral magnet responsive either to positive or negative currents for winding the motor-spring t, Fig. 5, of the printer.

To a horizontal shaft a', Figs. 7, 8, are attached a rotating arm which trails over a circular range of insulated segments d, a circuit-reversing wheel e, a ratchet-wheel l, and a rotating cam b'. The shaft a' is under a constant tendency to rotate; but, as in transmitting apparatus of this class, it may be locked against rotation at the time of printing, while its driving-motor continues to rotate. This result is usually accomplished by a friction device between shaft and motor.

Each segment of d is connected with a pair of keys of the transmitter-keyboard, as shown in Fig. 7, where 12 extends to a metallic bar 10, forming a back contact for key "A" of the alphabet and key "1" of the figures. Likewise 13 joins the next section of d with a back contact 11, common to keys "B" and "2." A back contact of keys "C" and "3" would similarly be joined with the next following segment of d to the left, and so on throughout the keyboard. Upon the hub of the trailing arm bears a contact-spring i, which is connected by wire 14 to a neutral electromagnet e', a local battery g', conductor 15, and either of two branches 16 and 17 to metallic bars F L at the keyboard, and such circuit is completed by branch 16 by depressing a figure-key or through branch 17 by depressing a letter-key. Thus the circuit is completed through 13 and branch 16 by depressing key "2," or through 13 and branch 17 by depressing key "B." It is thus seen that the local circuit of battery g' is closed with the sunflower-arm in any particular position, either by depressing a letter or a figure key, with only the difference in the two cases that when a figure-key is depressed current is passed through

the magnet x', whereas if the corresponding letter-key were closed current would flow through magnet y'.

It is through the agency of the magnets x' y' that a current of one polarity or the other is directed to line L′ for determining the position of the press-rollers b c of the printers. As shown in Fig. 7, current has last been passed through magnet y', thereby moving the armature-lever l' to make contact at k' through wire 7, battery i', and thence to earth. In this case a positive current is sent to line, the circuit from battery i' being completed by armature-lever l', wire 5, and thence either through wire 4, armature-lever f', wire 25 to point 1, or through spring c', contact-arm d', wire 2 to point 1. The lever l' would remain in the positions here shown indefinitely, if only letters were printed. If, however, a figure-key were depressed, lever l' would be drawn to the left by current flowing through magnet x', when contact would be made with point j' through wire 6 to the negative battery h'. In this case a negative current is sent to line L′ either by 4 f' 25 or c' d', wire 2.

The reversing commutator by which to-and-fro pulses are transmitted to line for rotating the type-wheel and operating the press mechanism is of the usual form and is diagrammatically represented in Figs. 7 and 8 as a circular range of insulated segmental contacts e, upon the periphery of which bears a brush f. These segments are of metal and are divided into two alternate sets, one set being connected to a metallic hub at the left, Fig. 8, upon which bears a contact-brush h in connection with the negative pole of battery k, while the other set is connected to a like hub at the right, upon which bears a brush g, connected with the positive pole of battery j. The opposite poles of batteries k and j, as here shown, are connected to earth at G, while brush f is connected to the main line M L. As the transmitter-shaft a' rotates, one segment after another of commutator e is brought into contact with brush f and reversals of short duration are sent into line M L, and either a prolonged positive or negative current is sent to line, according as the shaft a' is arrested in a position to leave the brush f in contact with a segment connecting with battery j or with battery k. A ratchet-wheel l is also rigidly fixed to shaft a' and is provided with a number of teeth equal to the metallic segments of d and of e and also of the characters of a type-wheel. While shaft a' is rotating to bring the type-wheels into printing positions the ratchet-arm f' is withdrawn from the teeth of wheel l by a retracting-spring; but when the type-wheels have reached a printing position said pawl is thrust forward within the teeth of wheel l by the local magnet e'. This is accomplished as follows: Magnet e' is energized upon closing the local circuit at two points. At one point it is closed by depressing either a letter or figure key and at a second point by the trailing arm of the sunflower d when the arm reaches the segment connected with the key that has been depressed. In other words, the trailing arm is normally in rotation, and it would continue to rotate indefinitely if a transmitting-key were not depressed; but upon depressing either a figure or letter key the local circuit is closed except at the sunflower, and obviously it will also be closed at the sunflower as soon as the trailing arm reaches the particular segment to which the key depressed is connected. Of course the sunflower-arm would continue rotation if means, as magnet e' and pawl f', were not provided to arrest it. Thus it is seen that upon depressing any key of the transmitter-board a local circuit is closed to a sunflower-segment, that as the sunflower-arm in its rotation reaches such section the local circuit is completed, and that the rotation of shaft a' and the trailing arm are locked by wheel l and pawl f', and, further, that as the pawl f' is brought forward to lock the wheel l a back contact is closed, thereby completing a branch circuit 4 f' 25. A four-notched cam-wheel b', of insulating material, is also rigidly fixed to shaft a', which in its clockwise rotation serves to make an electrical connection four times in each rotation between pawl d' and spring c', and to thereby connect circuit L′ with either battery h' or i', according to the position of the armature-lever l', and by this means pulses are periodically sent over the auxiliary main line L′ to actuate the winding apparatus of spring t, Figs. 3, 5, and 9.

It will now be seen that while by means of the cam b' and the contact-arms d' c' a current may be periodically sent from battery h' or i' to line L′ for winding the actuating-spring t, the line would not at all times without some additional means be left in a serviceable condition for actuating the press-shifting apparatus—that is to say, during the larger part of rotation of cam b' the circuit is broken between d' and c'—and at such times the press-shifting apparatus could not be operated. To avoid this difficulty, the auxiliary branch 4 f' 25 is provided. By the latter means the circuit L′ will be closed with either battery h' or i' whenever a figure or letter key is depressed, for, as already seen, upon the depression of either a letter or figure key magnet e' will be energized upon completing the local circuit at the sunflower d, and as arm f' is actuated to lock the wheel l and shaft a' against rotation the circuit 4 f' 25 will be completed.

With the apparatus thus far outlined still another difficulty would arise. If the operator after using the letter-keys, for example, were to depress a figure-key, and thus energize the locking-magnet before the press-arm had fallen, said press-arm would remain up and the character corresponding to the key depressed would not be printed, because for printing the hammer action of the press-

arm is necessary. To avoid this difficulty, the main line M L is automatically broken at the transmitter at a moment preceding the shifting by means of a relay q'. Normally armature-lever s' is in back contact with t' to close the circuit M L at relay q'; but the magnet q' is energized and the main line broken by each movement of l'. The armature-lever l' has at its free end an insulated roller, which in each of its to-and-fro movements passes over a cam formed upon the upper surface of arm 8, which is driven down to make contact with arm 9 and to thereby close a circuit through magnet q' by wire 19, battery p^4 20 18. Thus if the operator had been transmitting letters and wished next to transmit figures armature-lever l', which while transmitting letters was in the position shown in Fig. 7, would be moved to the left, thus changing the polarity of the battery upon line L', while at the same time the local circuit of magnet q' would be closed, thereby breaking the circuit M L, whereby at the moment of actuating the press-shifting apparatus the press-lever would be allowed to fall to its lowermost position, as shown in Fig. 1. To merely repeat the same character requires that the operation of the press mechanism and paper-feeding apparatus which is actuated thereby be repeated, and this I accomplish by means of a hand-key u'. By depressing and releasing key u' contact with v' is made and broken, and the local circuit from battery p^4 through relay q' by wires 20 22 21 is thereby opened and closed to actuate the press mechanism and paper-feeding apparatus of the printer; but to repeat the impression of a character the key of the board when depressed for a first impression must be held in its downward position while repeatedly depressing u'. Repetition of a character may also be accomplished by repeatedly depressing and releasing the key of that character; but the desired object can be accomplished with greater rapidity of operation of the instrument by operating the key u', as above described, while the key of the character to be printed is held down, since in such case the shaft a' and the parts carried thereby remain locked and only the press mechanism and paper-feeding mechanism operate.

The magnet D and armature m, Fig. 3, for actuating the winding apparatus constitutes a particular feature of the present invention. In this case the armature m is provided with a back-stop; but when the spring t is wound to a considerable tension the amplitude of vibration of the armature will be diminished, and it will seldom reach its back contact. Again, in this case there is no such impact between armature and stop upon its forward movement when attracted as occurs in apparatus such as is shown in Fig. 9. Moreover, the work which the armature will perform in winding the spring t becomes practically self-adjusting and is reduced almost in proportion as the tension of the spring is increased, while its activity to wind the spring is correspondingly greater when the spring is only slightly wound.

The speed at which a stock-ticker may be operated is usually limited by the press mechanism, from the fact that the press-arm is heavy and is ordinarily lifted against the tension of a strong retracting-spring, and to further burden the press-arm with the work of winding an apparatus for driving the type-wheel would proportionately lower the speed of a part already too slow and correspondingly diminish the running capacity of the printer. My object, above all else, has been to provide an automatic winding apparatus for driving the type-wheels which should in no manner encumber the press mechanism. Of course a rotary motor might be used in an auxiliary line to wind a spring or to otherwise store power for driving the type-wheels of a printer, while still employing reversals of current to operate the press-shifting mechanism, for the armature of an ordinary motor would rotate in the same direction whether current were sent to line in one direction or the other to determine whether letters or figures should be printed. Such an arrangement would be less serviceable than the preferred forms above described; but it and other equivalents no less than the preferred forms I wish to include in the claims that follow.

What I claim, and desire to secure by Letters Patent, is—

1. In a printing-telegraph, the combination with type-member-actuating mechanism comprising a power-storing motor member, a magnet, and means operated thereby for storing power in said motor member; and electrically-controlled mechanism for governing the position of two type members, said mechanisms being in different circuits, of shifting mechanism and press mechanism, both comprising magnets, one of which is in circuit with the magnet of the type-member-actuating mechanism, the other magnet being in circuit with the mechanism determining the position of the type members; said shifting mechanism adapted to permit impressions to be taken from either of the two type members at will.

2. In a printing-telegraph, the combination with type-member-actuating mechanism comprising a spring, a magnet, and means operated thereby for winding said spring, of shifting mechanism for permitting impressions to be taken from either of two type members, at will, said shifting mechanism comprising a magnet in circuit with the magnet of the type-member-actuating mechanism, said shifting mechanism arranged to be operated at will independent of the operation of the spring-winding mechanism.

3. In a printing-telegraph, the combination with type-member-actuating mechanism comprising a spring, a magnet, and means oper-

ated thereby for winding said spring, of shifting mechanism for permitting impressions to be taken from either of two type members, at will, said shifting mechanism comprising a magnet in circuit with the magnet of the type-member-actuating mechanism, said mechanisms arranged each to respond only to current variations different from those variations which actuate the other mechanism.

4. In a printing-telegraph, the combination with type-member-actuating mechanism comprising a spring, a magnet, and means operated thereby for winding said spring, of shifting mechanism for permitting impressions to be taken from either of two type members, at will, said shifting mechanism comprising a magnet in circuit with the magnet of the type-member-actuating mechanism, said mechanisms arranged, the one to respond to variations of current strength independent of direction, the other to respond to current reversals.

5. In a printing-telegraph, the combination with type-member-actuating mechanism comprising a spring, a magnet, and means operated thereby for winding said spring, press mechanism, and electrically-controlled means governing the position of the type members, of shifting mechanism for permitting impressions to be taken from either of two type members, at will, said shifting mechanism comprising a magnet in circuit with the magnet of the type-member-actuating mechanism, said shifting mechanism and type-member-actuating mechanism arranged each to respond only to current variations different from those variations which actuate the other of said two electrically-connected mechanisms.

6. In a printing-telegraph, the combination with type-member-actuating mechanism comprising a spring, a magnet, and means operated thereby for winding said spring, press mechanism adapted to coact with either of two type members at will, a shifting-magnet and mechanism operated thereby for shifting the press mechanism to coact with one or the other of the type members, said shifting and spring-winding magnets being in circuit with each other, their respective mechanisms being arranged each to respond only to current variations different from those variations which actuate the other mechanism, of electrically-controlled means governing the positions of the type members.

7. In a printing-telegraph, the combination with two type-wheels, actuating mechanism therefor comprising a spring, spring-winding mechanism, and a magnet for operating the same, and press mechanism adapted to coact with either type-wheel at will, of shifting mechanism comprising a magnet in circuit with the magnet of the type-member-actuating mechanism, said shifting and spring-winding mechanisms arranged each to respond only to current variations different from those variations which actuate the other mechanism.

8. In a printing-telegraph, the combination with two type-wheels, actuating mechanism therefor comprising a spring, spring-winding mechanism, and a magnet for operating the same, and press mechanism adapted to coact with either type-wheel at will, of shifting mechanism comprising a magnet in circuit with the magnet of the type-wheel-actuating mechanism, said shifting and spring-winding mechanisms arranged, the one to respond to variations of current strength independent of direction, the other to respond to current reversals.

9. In a printing-telegraph system, the combination with a printing instrument having two type members, actuating mechanism therefor comprising a spring, a magnet, and means operated thereby for winding said spring, a shifting-magnet in circuit with said spring-winding magnet, and shifting mechanism operated thereby for permitting impressions to be taken from either of said type members, at will, of a circuit for said spring-winding and shifting magnets, and a transmitter arranged to operate the spring-winding mechanism through said circuit and also, at will, to operate said shifting mechanism.

10. In a printing-telegraph system, the combination with a printing instrument having two type members, actuating mechanism therefor comprising a spring, a magnet, and means operated thereby for winding said spring, a shifting-magnet in circuit with said spring-winding magnet, and shifting mechanism operated thereby for permitting impressions to be taken from either of said type members at will, said mechanisms arranged each to respond only to current variations different from those variations which actuate the other mechanism, of a circuit for said spring-winding and shifting magnets, and a transmitting instrument having means for producing in said circuit current variations of one type for actuating the spring-winding mechanism, and current variations of another type for actuating said shifting mechanism.

11. In a printing-telegraph system, the combination with a printing instrument having two type members, actuating mechanism therefor comprising a spring, a magnet, and means operated thereby for winding said spring, a shifting-magnet in circuit with said spring-winding magnet, and shifting mechanism operated thereby for permitting impressions to be taken from either of said type members at will, said mechanisms arranged, one to respond to variations of current strength independent of direction, the other to respond to current reversals, of a circuit for said spring-winding and shifting mechanisms, and a transmitting instrument having means for producing in said circuit variations of current strength and direction at will.

12. In a printing-telegraph system, the com-

bination with a printing instrument having two type members, electrically-operated press mechanism and mechanism governing the position of the type members having magnets included in a common circuit, and having also electrically-operated type-member-actuating mechanism, and shifting mechanism for shifting the press mechanism to coact with one or the other of said type members, said type-member-actuating and press mechanisms having magnets included in a common circuit, and arranged each to respond to current variations different from those which actuate the other mechanism, of a main-line circuit including the magnets of the press mechanism and the mechanism governing the position of the type members, an auxiliary main line including the magnets of the type-member-actuating and shifting mechanisms, and a transmitting instrument adapted to produce in each of said lines current variations to operate either of the mechanisms controlled by each line at will.

13. In a printing-telegraph system, the combination with main and auxiliary lines, and a printing instrument having press mechanism and mechanism determining the position of type members, both controlled by the main-line circuit, and having also type-member-actuating mechanism and shifting mechanism controlled by the auxiliary-line circuit, of a transmitting instrument having circuit-varying means controlling the main-line circuit and the mechanisms operated thereby, and other circuit-varying means controlling the type-member-actuating mechanism and the shifting mechanism through said auxiliary circuit, and arranged to operate the shifting mechanism at will.

14. In a printing-telegraph system, the combination with main and auxiliary lines, and a printing instrument having press mechanism and mechanism determining the position of type members, both controlled by the main-line circuit, and having also type-member-actuating mechanism and shifting mechanism controlled by the auxiliary-line circuit and arranged each to respond only to current variations different from those variations which actuate the other mechanism, of a transmitting instrument having circuit-varying means controlling the main-line circuit and the mechanisms operated thereby, and other circuit-varying means controlling said auxiliary-line circuit and arranged to produce therein current variations of one type to operate said actuating mechanism, and current variations of another type to actuate said shifting mechanism.

15. In a printing-telegraph system, the combination with main and auxiliary lines, and a printing instrument having press mechanism and mechanism determining the position of type members, both controlled by the main-line circuit, and having also type-member-actuating mechanism and shifting mechanism controlled by the auxiliary-line circuit and arranged to respond the one to variations of current strength independent of direction, the other to respond to current reversals, of a transmitter having keys and circuit-varying means controlling the main-line circuit and the mechanisms operated thereby; and having also circuit-reversing means controlling the direction of current in the auxiliary line, and means for varying the strength of such auxiliary-line current, the one operated by said keys, the other operated periodically.

16. In a printing-telegraph system, the combination with main and auxiliary lines, and a printing instrument having press mechanism and mechanism determining the position of type members both controlled by the main-line circuit, and having also spring-winding mechanism and shifting mechanism controlled by the auxiliary-line circuit, the former operated by current pulses in the auxiliary line, the latter by reversal of the current in said line, of a transmitting instrument having keys and circuit-varying means controlling the main line and the mechanism operated thereby, and having also current-reversing means controlled by said keys and controlling the direction of the auxiliary-line current, and a circuit-interrupter for alternately completing and breaking the auxiliary-line circuit.

17. In a printing-telegraph system, the combination with main and auxiliary lines, and a printing instrument having press mechanism and mechanism determining the position of type members both controlled by the main-line circuit, and having also spring-winding mechanism and shifting mechanism controlled by the auxiliary-line circuit, the former operated by current pulses in the auxiliary line, the latter by reversal of the current in said line, of a transmitting instrument having keys and circuit-varying means controlling the main line and the mechanism operated thereby, and having also current-reversing means controlled by said keys and controlling the direction of the auxiliary-line current, a circuit-interrupter for alternately completing and breaking the auxiliary-line circuit, and means for completing a shunt-circuit around said circuit-interrupter when current reversal occurs.

18. In a transmitter for printing-telegraph systems, the combination with contact-keys, a rotary shaft, a sunflower having a contact-arm rotated by said shaft, a current-reversing device for controlling a main-line circuit operated in synchronism with said contact-arm, and magnetically-controlled locking means for arresting the rotation of said contact-arm and the operation of said current-reversing device, of local circuits connected to the sunflower-segments and key-contacts and controlling said locking device, and a circuit-varying device for controlling an auxiliary circuit, having an operating-cam driven by said shaft.

19. In a transmitter for printing-telegraph

systems, the combination with contact-keys, a rotary shaft, a sunflower having a contact-arm rotated by said shaft, a current-reversing device for controlling a main-line circuit operated in synchronism with said contact-arm, a ratchet-wheel on said shaft, and a locking pawl and magnet therefor, of local circuits connected to the sunflower-segments and key-contacts and to said locking-magnet, a current-reversing device for reversing an auxiliary-line circuit, controlled by said keys, and a circuit-interrupter for such auxiliary circuit, having an operating-cam driven by said shaft.

20. In a transmitter for printing-telegraph systems, the combination with contact-keys, a rotary shaft, a sunflower having a contact-arm rotated by said shaft, a circuit-varying device for controlling a main-line circuit operated in synchronism with said contact-arm, a ratchet-wheel on said shaft, and a locking pawl and magnet therefor, of local circuits connected to the sunflower-segments and key-contacts and to said locking-magnet, a current-reversing device for reversing an auxiliary-line circuit, controlled by said keys, a circuit-interrupter for such auxiliary circuit, having an operating-cam driven by said shaft, and contact-pieces operated by said locking-pawl when in engagement with the ratchet-wheel, for closing a shunt around the said circuit-interrupter.

21. In a transmitter for printing-telegraph systems, the combination with main-line-circuit-varying means for operating press mechanism and mechanism determining the position of printing members of a printing instrument, and other circuit-varying means for operating shifting mechanism of such printing instrument, of a circuit-interrupter controlling the main-line circuit of the transmitter and operating simultaneously with said second circuit-varying means, arranged to interrupt the main line momentarily when said second circuit-varying means operates.

22. In a transmitter for printing-telegraph systems, the combination with main-line-circuit-varying means for operating press mechanism and mechanism determining the position of printing members of a printing instrument, and current-reversing means for reversing the current in a circuit for operating shifting mechanism of such receiving instrument, comprising a movable arm, of a main-line relay, a local circuit controlling the same, and contact-points for said local circuit which are operated momentarily by the arm of the current-reversing device during the motion thereof.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM PITT PHELPS.

Witnesses:

RICHARD J. O'NEILL,

JOHN C. SANDERS.