No. 875,410. PATENTED DEC. 31, 1907.

J. BURRY.

PRINTING TELEGRAPH RECEIVER.

APPLICATION FILED NOV. 19, 1904. RENEWED SEPT. 16, 1907.

5 SHEETS—SHEET 1.

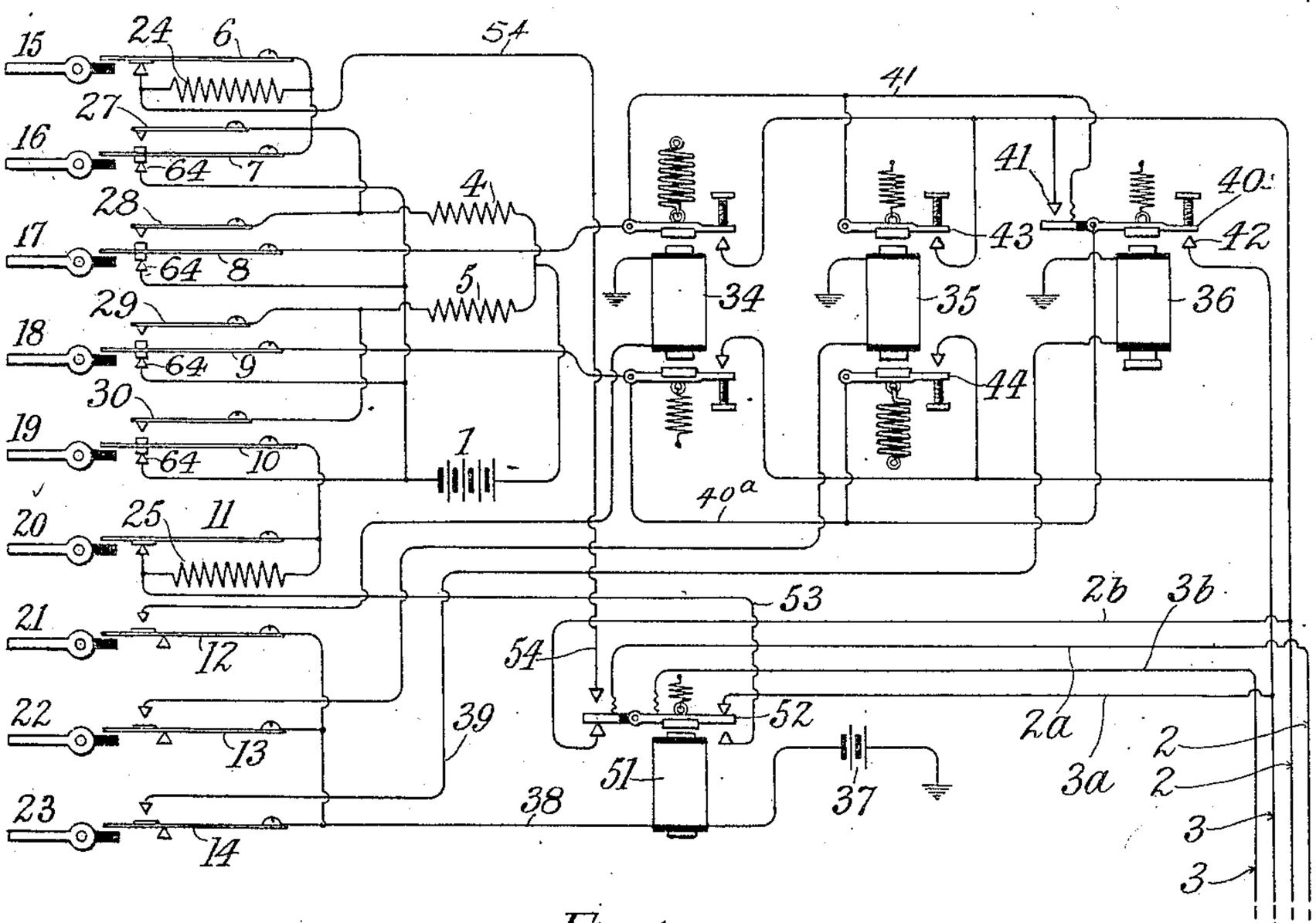

Fig. 1

Witnesses
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5 SHEETS—SHEET 2.

Fig. 2

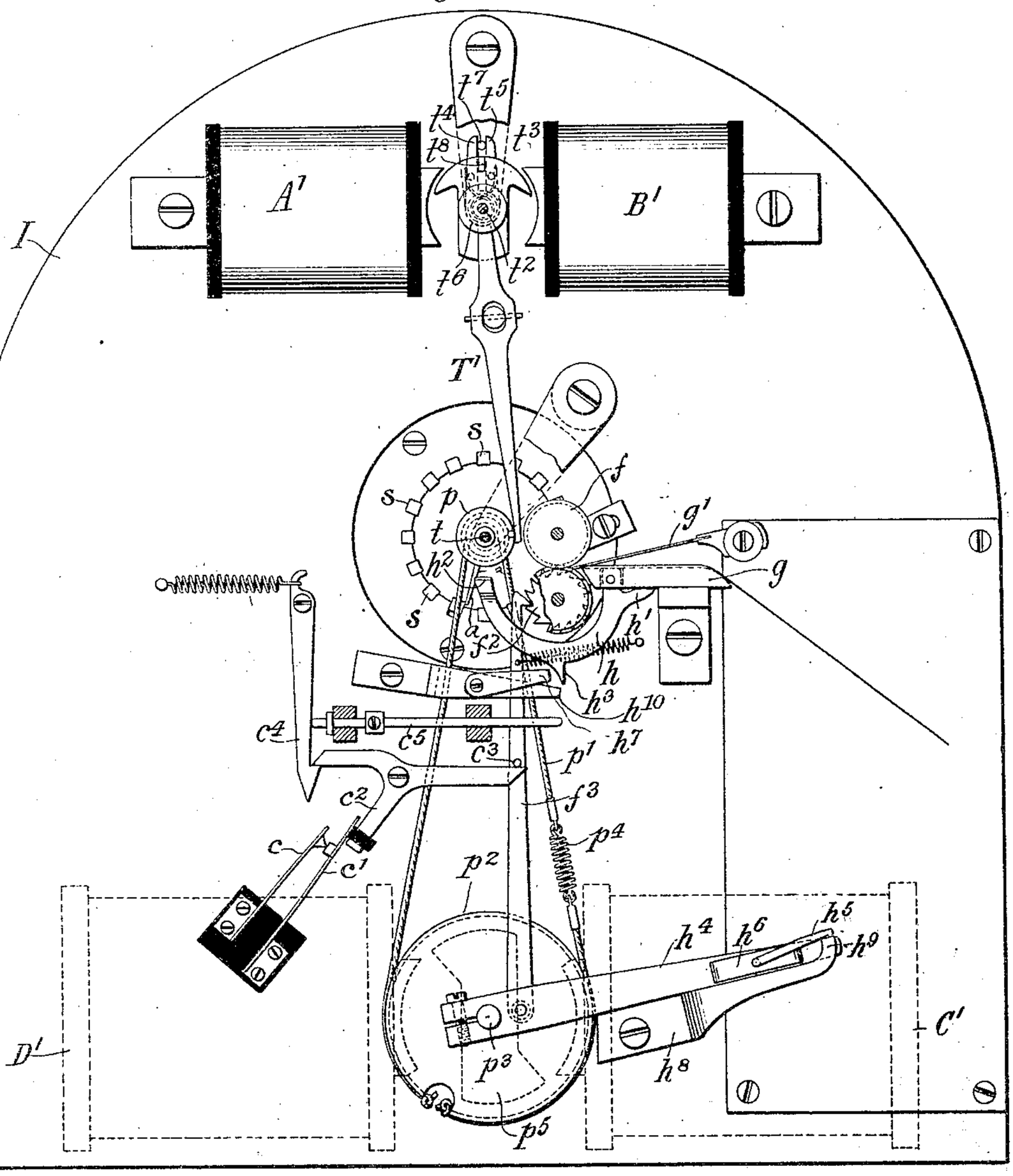
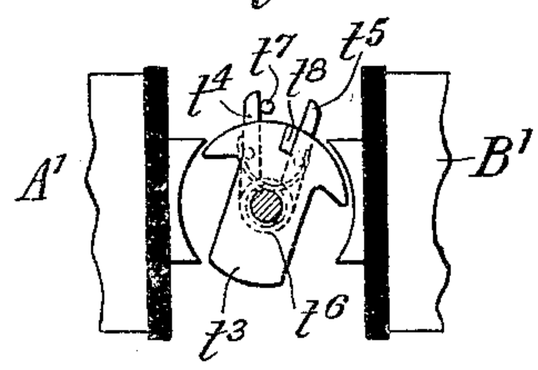


Fig. 9



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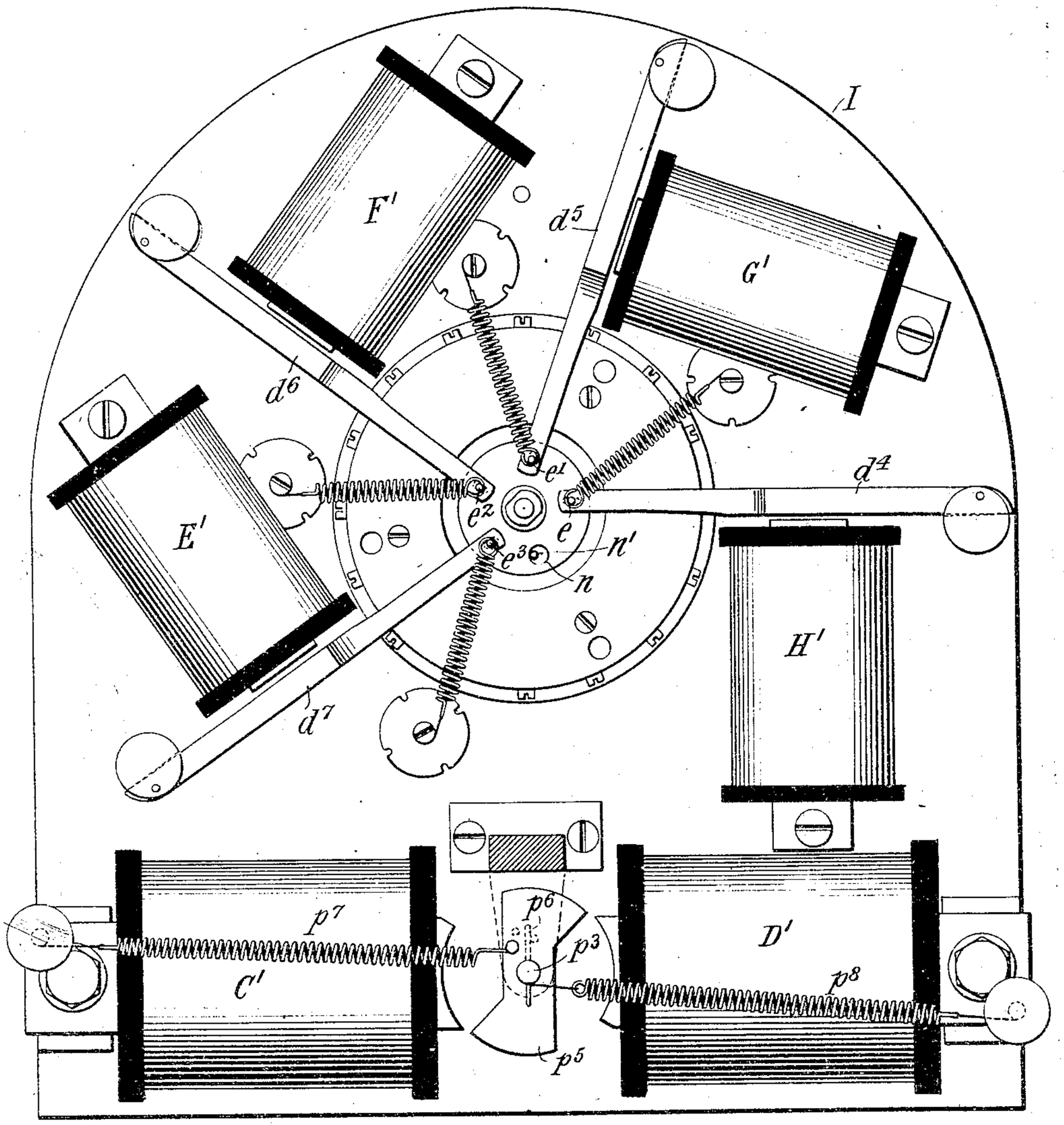
5 SHEETS—SHEET 3

Fig. 3



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5 SHEETS—SHEET 4.

Fig. 4

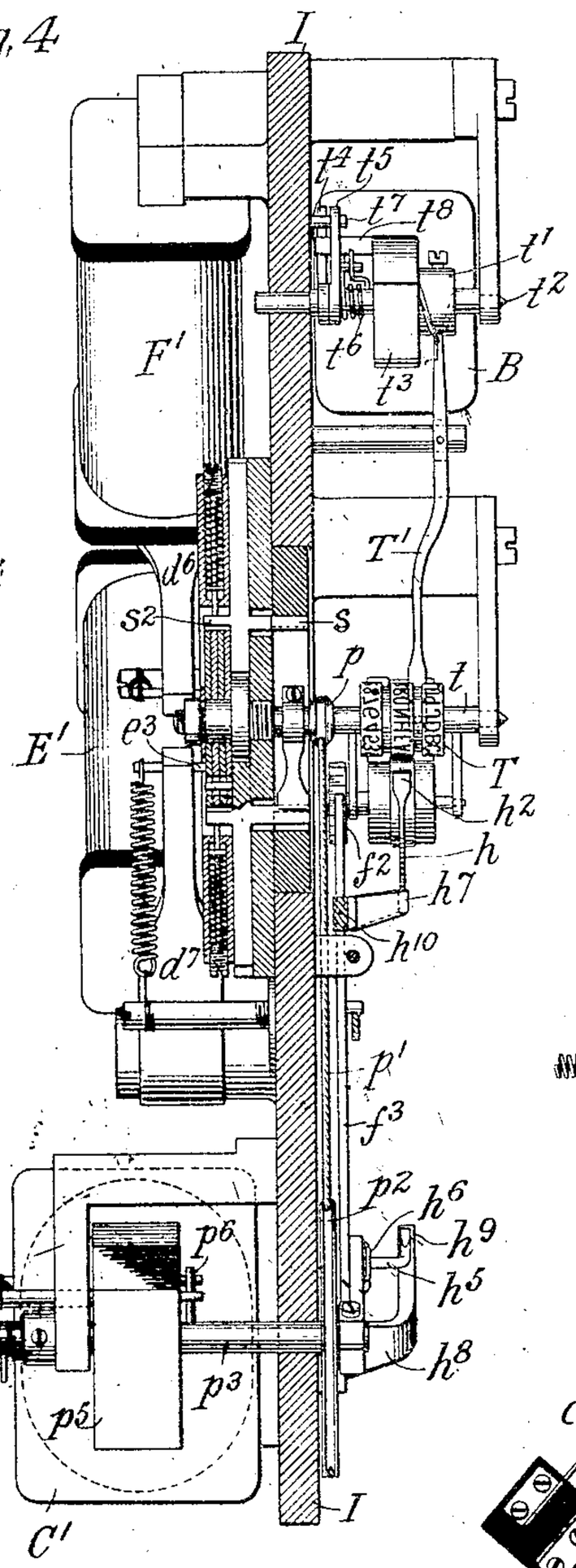


Fig. 7

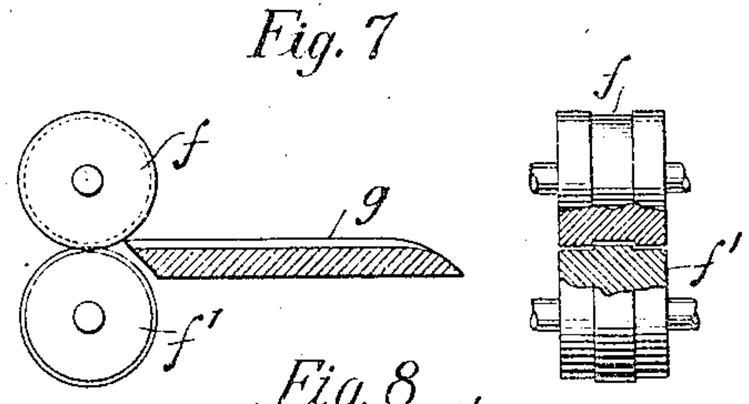


Fig. 8

Fig. 6

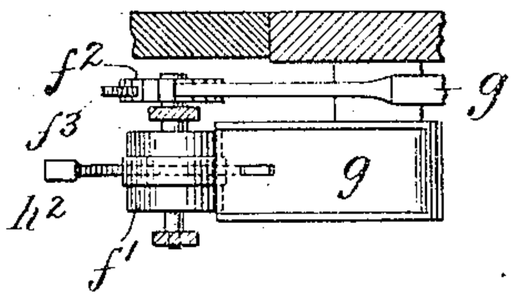


Fig. 5

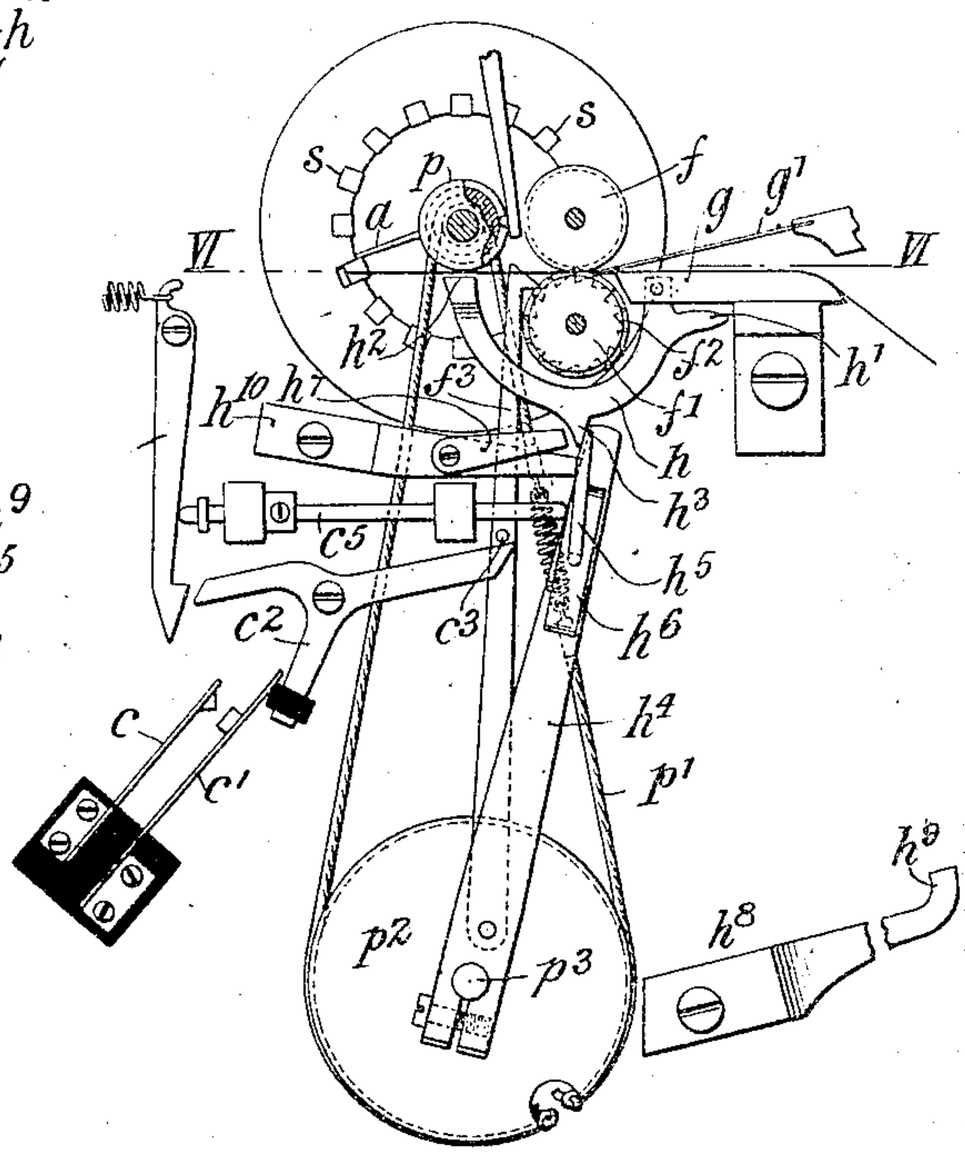
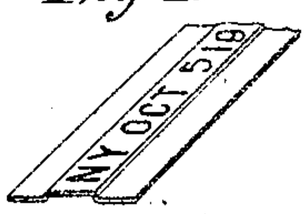


Fig. 10



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No. 875,410. PATENTED DEC. 31, 1907.

J. BURRY.

PRINTING TELEGRAPH RECEIVER.

APPLICATION FILED NOV. 19, 1904. RENEWED SEPT. 16, 1907.

5 SHEETS—SHEET 5.

Fig. 11

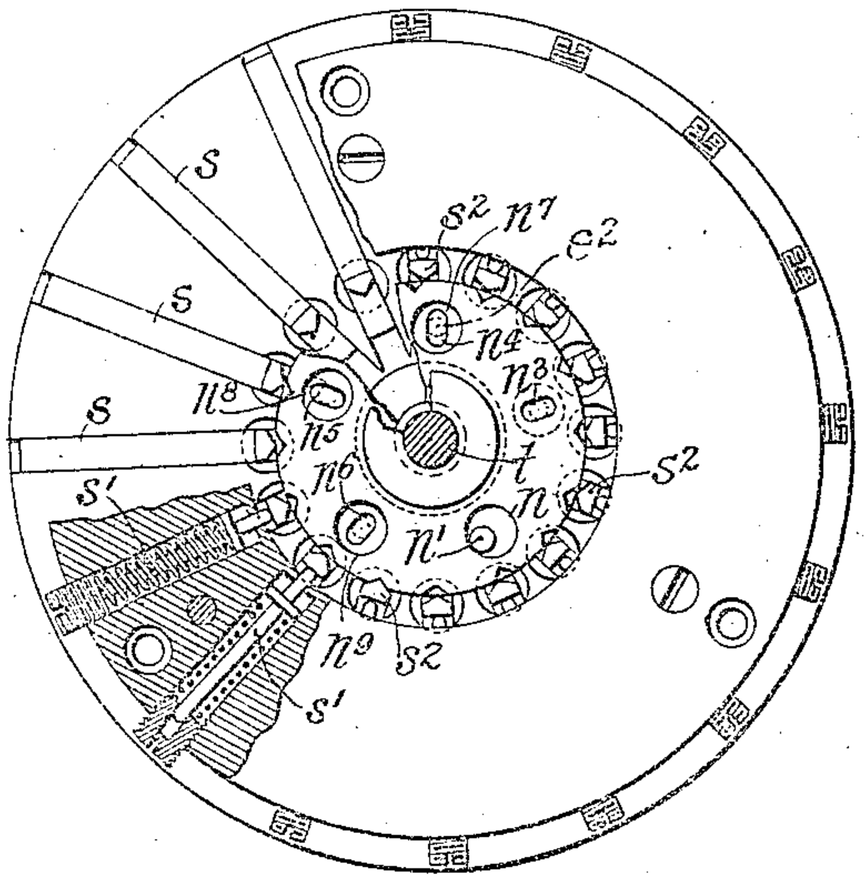


Fig. 12

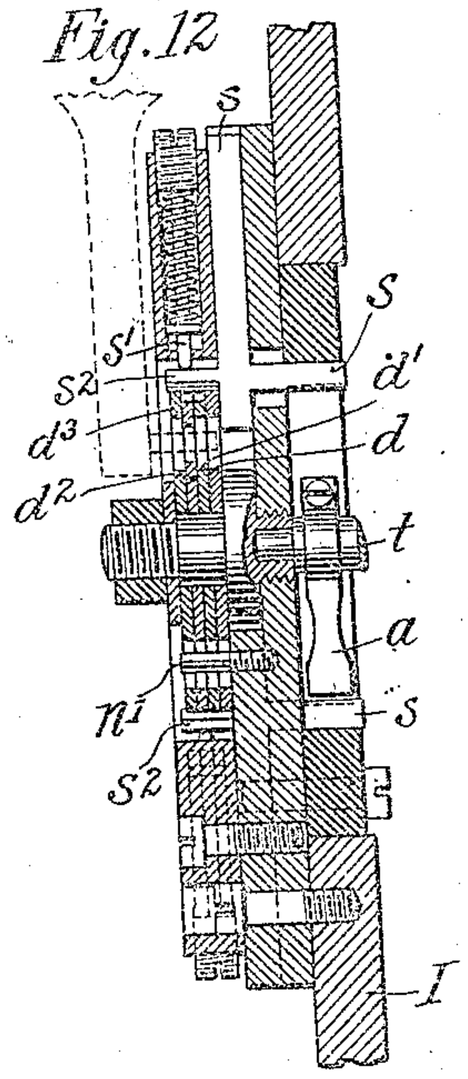


Fig. 13

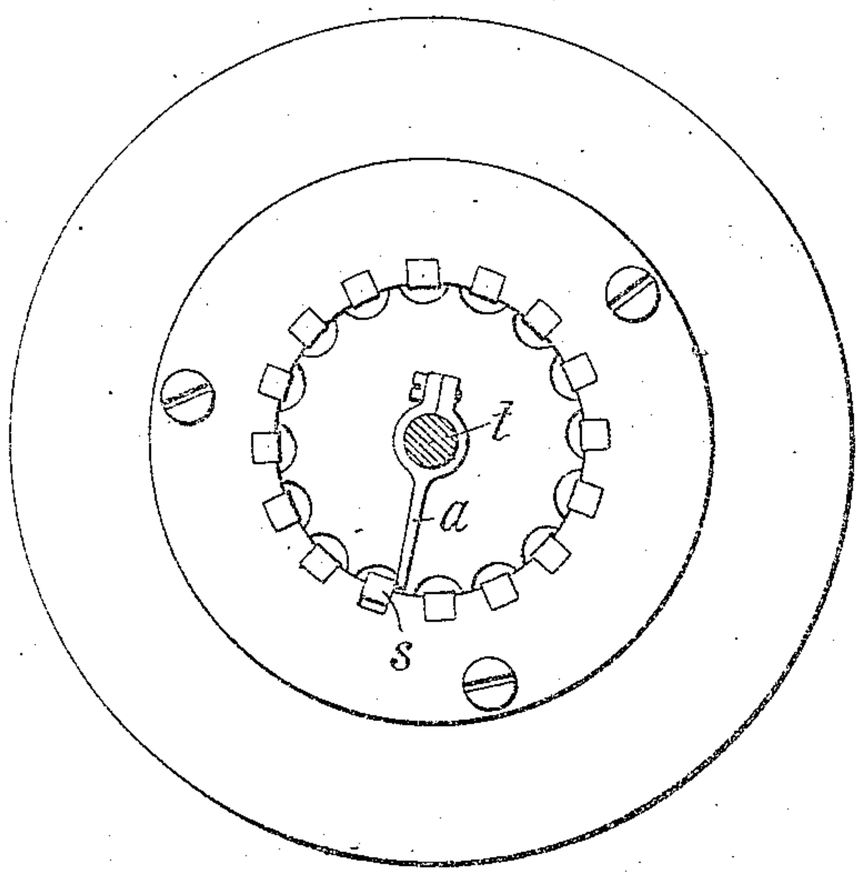
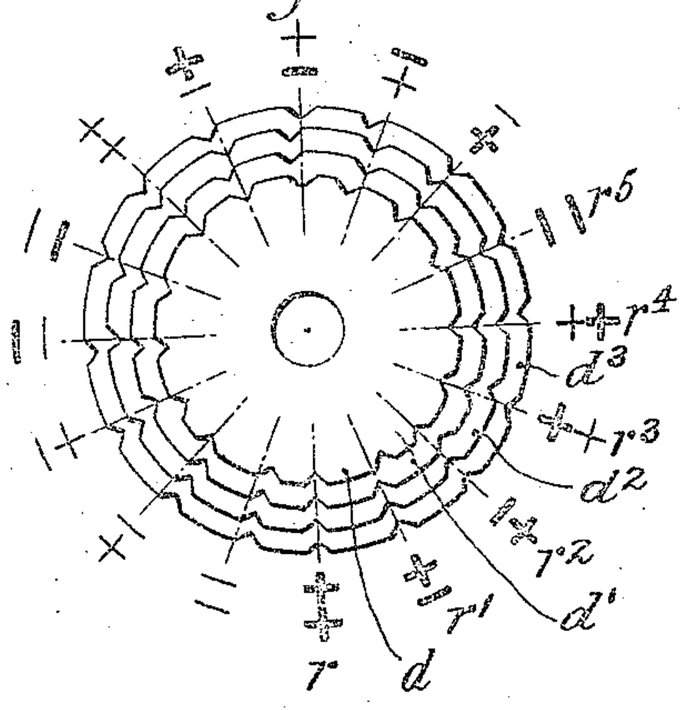


Fig. 14



Witnesses
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UNITED STATES PATENT OFFICE.

JOHN BURRY, OF RIDGEFIELD PARK, NEW JERSEY.

PRINTING-TELEGRAPH RECEIVER.

No. 875,410. Specification of Letters Patent. Patented Dec. 31, 1907.

Application filed November 19, 1904. Serial No. 233,484. Renewed September 16, 1907. Serial No. 392,976.

To all whom it may concern:

Be it known that I, JOHN BURRY, a citizen of the United States, residing at Ridgefield Park, in the county of Bergen, State of New Jersey, have invented certain new and useful Improvements in Printing-Telegraph Receivers, of which the following is a specification, reference being had to the drawing accompanying and forming part of the same.

My invention relates to "receiving" or printing apparatus for type-telegraph systems, and has for its object to provide an apparatus of this character which shall be simple in construction and yet positive and rapid in operation.

It is designed especially for use in connection with transmitting or "sending" devices which employ a plurality of transmission or main circuits, over which are sent current impulses of the same or different polarity, simultaneously or in different orders of succession. Such a transmitter is described and claimed in my copending application Ser. No. 217,570, filed July 21, 1904.

The present invention in its preferred form involves the use of a plurality of magnets, energized preferably by a local circuit controlled by suitable relays which are operated by the current sent from the transmitter, which magnets select the proper character and effect the printing of the same on the impression surface. The types or characters are carried on a wheel, rotated by suitable magnets until engaged by one of a plurality of stops, which is thrown out by one or more of the selecting magnets. The wheel is thus brought to rest with the proper character at the printing position. The selection of the proper character depends upon the polarity and strength of the impulses delivered over the transmission circuits, and upon their order of succession. Thus, with two circuits, by varying the strength, polarity and order of the impulses, no less than forty-eight distinct combinations may be obtained, which may readily be utilized to select as many different characters in the printing devices.

Referring now to the drawings for a more complete explanation of the preferred form of my invention, Figure 1 is a diagram illustrating the same combined with a suitable transmitter. Fig. 2 is a front elevation of the receiver, Fig. 3 is a rear elevation of the same. Fig. 4 is a vertical cross-sectional view, through the center of Fig. 3. Fig. 5 is a detail view of the devices for making the impression on the printing surface, in the positions which they occupy immediately after an impression has been made. Fig. 6 is a section on line VI—VI, of Fig. 5, showing one of the feed rollers for feeding the printing tape, and the guide for delivering the tape thereto. Fig. 7 is a detail view of the feed rollers, showing the same in side and end elevation. Fig. 8 is a detail view of the type wheel, showing the enlargement thereof by the lever which shifts the wheel longitudinally of its axis, to bring the various circular rows of types or dies to the impression point. Fig. 9 is a detail of the mechanism for effecting the longitudinal movement of the type wheel. Fig. 10 shows a portion of the printing tape, as embossed by the feed rollers for the purpose of permitting only the impression of the selected type or die to be made. Fig. 11 is a detail of the devices for controlling the rotation of the type wheel, viewed from the rear of the apparatus. Fig. 12 is a central cross section of Fig. 11. Fig. 13 is a front view of the devices shown in Fig. 11, and Fig. 14 is a diagram illustrating the principle of the disks which select the stops for controlling the rotation of the type-wheel.

Referring for the present more particularly to Fig. 1, which shows diagrammatically the transmitter described in my above mentioned application, let 1 represent a source of current, usually an incandescent lamp circuit, the current from which is reduced to meet the practical requirements of the two transmission circuits 2, 2, 3, 3, by being caused to pass to these lines through rheostats 4, 5. For convenience of explanation, these lines are shown as complete metallic circuits.

Numerals 6 to 14, inclusive, designate resilient metal strips carrying ordinary platinum contact points and normally resting on terminal stops. Numerals 15 to 23 designate levers or keys with insulating ends lying under the said strips respectively, and arranged when depressed to raise the strips off their terminal stops. The strips 11 and 6 by engagement with their terminal stops short circuit resistances 24 and 25 respectively, while with each of the remaining strips there is associated a contact terminal connected to one of the two line or one of the three local circuits respectively, as will be more

fully described. Following now the connections from the battery 1 as they normally exist when the apparatus is out of action, it will be seen that the path from one pole of the battery divides between resistances 4 and 5. From the former it further divides to the terminals 27 and 28 of the keys 16 and 17 and from the latter to terminals 29 and 30 of keys 18 and 19. The opposite pole of the battery is connected permanently with the stops 64 of keys 16, 17, 18 and 19, from which it results that the depression of keys 16 and 18 sends impulses of a given direction through each line circuit, while a similar operation of keys 17 and 19 sends impulses of opposite direction through these circuits. The path for such currents however, is normally through the strip 6 in circuit 2 and strip 11 in circuit 3, which shunt the resistances 24 and 25 respectively, but if simultaneously with the depression of the keys which send such impulses, keys 15 or 20 be depressed, the path for the currents will be through said resistances, and hence the currents will be correspondingly weakened. Thus, it will be seen that by the depression of keys 15, 16, 17, 18 and 19 and 20, in proper groups, any one of sixteen combinations of weak, strong, positive or negative impulses of current may be sent over the two lines, 2 and 3.

The numerals 34, 35 and 36 designate three relay magnets employed for varying the time relations of the impulses transmitted by the above described means over the two line circuits. Magnets 34 and 35 have each two armatures, one quick acting, the other sluggish, this difference being secured by varying the mass of the armature, or the sensitiveness of their retractile springs or otherwise. The magnet 36 has a single quick acting armature.

The magnets 34, 35 and 36 are energized by a local battery 37, through circuit connections controlled by keys 21, 22 and 23 respectively, and operate to direct the weak or strong impulses through one circuit in advance of, subsequently to, or simultaneously with the impulse in the other circuit, as will be understood by the following description of the operation of the instrument.

Assume that a strong impulse of current in a direction which we may call positive, is to be sent through both lines simultaneously. Keys 16, 18 and 23 will be depressed. The closing of key 23 directs the current from battery 37, through wires 38 and 39 and the magnet 36. Its armature 40 is attracted and simultaneously closes a break in each of the circuits 2 and 3, by engagement with its stops 41 and 42, hence as these two circuits have been connected with the main battery by keys 16 and 18, each will receive an impulse of strong current of a given direction. The course of the currents in the two circuits in Fig. 1 is as follows: battery 1, resistance 4, contact 27, strips 7 and 6, wire 54, wire 2^a, down the right hand wire 2, through the receiver, up left hand wire 2, contact 41, wire 41^a, strip 8 at key 17, stop 64, and back to the left hand side of the battery 1; in circuit 3, 3, the current flows from battery 1, resistance 5, strip 29, strip 9, wire 40^a, armature 40 and its contact 42, down right hand wire 3, through the receiver, up left hand wire 3, wire 3^b, armature 52, wire 53, strip 11 at key 20, contact 64 and strip 10 at key 19, and back to the battery. Assume, however, that while each circuit is to receive the same impulse as in the preceding illustration, that in circuit 2 is to precede that in circuit 3. Keys 16 and 18 and 22 will therefore be depressed. The last named key closes the circuit of magnet 35, which first attracts its sensitive armature 43 that closes a break in circuit 2, and then its sluggish armature 44 which closes a similar break in circuit 3. The impulse in the first named circuit will therefore precede that in the other.

As another illustration, assume that a weak impulse of given direction in circuit 2 is to follow a strong impulse of the same direction in circuit 3. Key 15 will be depressed to throw in resistance 24. Key 16 to send a positive impulse in circuit 2; key 18 to send a strong impulse in circuit 3, and key 21 to operate magnet 34 to close the break in circuit 3 in advance of that in circuit 2.

If in any of the illustrations given the key 17 or 19 had been closed in lieu of key 16 or 18, the current would have been directed through the respective circuits in an opposite direction.

Further description of the operation of the instrument would be superfluous in view of what now appears, that each key has its special function, which it always performs when depressed. That is to say, keys 15 and 20, weaken the current impulse, whatever its direction, by interposing a resistance in the circuits, keys 16 and 18 send impulses in a given direction over the two circuits respectively, while keys 17 and 19 send impulses in an opposite direction over their respective circuits. So likewise key 23 causes the impulses in the two circuits to flow at substantially the same instant of time; key 22 causes the impulse in circuit 2 to precede that in circuit 3, and key 21 reverses this order of succession. By depressing, therefore, at least three, or at most five, of the keys simultaneously, any of forty eight different combinations of impulses may be transmitted to the receiving apparatus.

As the lines are normally open at the transmitting end, or at both ends through the transmitter, if the system be equipped with a double set of instruments, it is necessary for the person operating a transmitter to switch in or out the receiver, so as to leave it always in condition to be operated from the opposite

end of the line when impulses are not being actually transmitted. To accomplish this automatically, I interpose in that portion of the circuits which includes the receiver a cut-out magnet 51, having a pivotal armature 52 with an insulating section which divides it into two portions. Contact points are fixed on opposite sides of the armature, as shown. In the position shown in the figure, circuit 2, 2, is closed through the wire 2^a, the left hand portion of armature 52, and wire 2^b. Circuit 3, 3, is closed through wire 3^a, the right hand portion of armature 52, and wire 3^b. The transmitting devices are thereby cut out of circuit. When, however, the battery 37 is brought in, as it will always be by one of the keys 21, 22, or 23, the armature 52 is attracted and opens both shunts, connecting both circuits with the transmitter, through wires 53, 54, as will be readily understood.

In each of the two circuits at the receiving end is a polarized relay 45, 46. A positive impulse whether weak or strong will therefore throw the armature or vibrating tongue over to one side and in contact with the stop on that side, while a negative impulse will throw said armature to the opposite side. In each of said circuits is also a neutral relay, 47, 48, with two armatures of different degrees of sensitiveness, or their equivalents. For example, each magnet is provided with an armature 49 having a comparatively weak retractile spring, so that all impulses flowing through the magnet will draw said armature down into contact with a spring retracted lever 50, while a strong impulse will draw down both levers 49 and 50. The movement of such lever may be availed of to make or to break local circuits, and if these circuits be in turn controlled by the tongues of the polarized relays so that, for example, one will be made or broken when the tongue is on one of its contacts and the other when it is on the opposite contact, it is evident that a large number of mechanical conditions in the receiver may be established according to the particular combination of impulses received by the two polarized and neutral relays. These conditions may be taken advantage of in many ways to operate or control a suitable recording mechanism.

In the printing instrument proper, are eight magnets, A, B, C, D, E, F, G, H, controlled by the relays just described, as follows. A weak impulse sent over circuit 3, 3, for example, will cause the armature 49 of magnet 47 to be drawn down into contact with the stop on the adjacent lever 50, thereby completing a local circuit through battery *b*, wire *b'*, magnets B, D, F, H, wire b^2, lever 50, armature 49, and wire b^3, back to the battery, provided the polarity of the impulse is such as will cause the armature of polarized relay 45 to be drawn over against its blank stop. If the impulse is of the opposite direction, the armature of relay 45 will make contact with its circuit terminal, thereby placing a shunt around magnet F, causing the same to be inoperative. Supposing the first impulse to be strong, the relay 47 will also draw down its lever 50, thereby putting a shunt around magnet H. If the second impulse is strong, not only would the armature of relay 45 cut out magnet F, but lever 50 of the relay 47, would also cut out magnet H, thereby rendering both inoperative. Similar control of magnets E and G is effected through the polarized relay 46, and neutral relay 48 of circuit 3, 3. As for magnets A, C, B, D, it will be seen that the first two are energized whenever an impulse of any character, weak or strong, positive or negative, is sent over circuit 2, 2, while the last two are similarly energized by circuit 3, 3. One set is brought into operation in advance of the other according to the order of succession of the impulses over the two circuits. From the foregoing it will be seen that a large number of working combinations may be made by the magnets A, B, C, D, E, F, G, H, by varying the polarity, strength, and order of the impulses in the two circuits. In fact, as before stated, forty-eight distinct combinations may be so made.

Having thus briefly described the principle of the preferred embodiment of my invention, I shall now proceed to the description of a convenient apparatus for utilizing the same for the production of legible impressions at the receiving end of the system. The devices comprising the same are conveniently mounted on a plate I, supported in any suitable way. For purposes of description the apparatus naturally divides itself into several parts, of which I shall describe first

The type wheel or carrier.—The types or dies which produce the legible impressions are preferably carried by a cylinder or wheel T, in three circular rows of sixteen characters or spaces each, as shown, (Figs. 4 and 8), and is mounted on the shaft *t* so as to rotate therewith but to move longitudinally thereon.

Devices for shifting the type wheel longitudinally to bring a desired row to the impression point.—For this purpose I provide a pivoted lever T', carrying at its lower end a stud which engages the type wheel in the slot between two of the rows of type. Its upper end extends into a helical groove on a small drum *t'* mounted rigidly on a shaft t^2, so that partial rotation of the shaft one way or the other will throw the type wheel to the right or left on its shaft *t* and so bring the first or third row of type to the printing position, while with the cam drum in the position shown in Fig. 4 the central row will be presented. To rotate the cam shaft t^2 in this manner the following devices are provided, shown more clearly in Fig. 2. The shaft carries an armature t^3, one end of which is en-

larged, located between the magnets A′, B′, corresponding to the magnets A, B, of Fig. 1. If these magnets are energized simultaneously both will exert their force on the armature and no movement of the same will result. Consequently the drum t' and type wheel T will remain in the positions shown. But if one of the magnets be energized before the other, the first will draw the head of the armature over, as in Fig. 9, thereby partially rotating the cam drum and shifting the type wheel correspondingly. The other magnet then being energized, it will assist the action by exerting its force more on the lower end of the armature, which is now nearer to it than is the upper, enlarged end. For the purpose of restoring the cam drum and type wheel to their normal positions, the shaft t^2 is yieldingly connected with jaws t^4, t^5, (Figs. 2 and 9), which are loosely mounted on the shaft, by a coil spring t^6, the ends of which engage studs on the said jaws, as shown. The latter both abut against a stud t^7 on the plate I, when the armature t^3 is in its normal position. But when partially rotated by the magnets A′, B′, an arm t^8, which projects from the armature, engages the corresponding jaw and carries it away from the stud t^7, as shown in Fig. 9. When the magnet ceases to be energized the tension of the spring t^6 immediately throws the armature back to its central position.

From the foregoing it will be seen that the position of the type rows relative to the impression point depends upon the order of succession of the impulses in the two magnets A′, B′, which are controlled by the circuits 2, 2, 3, 3, respectively.

It is evident that the precise number of rows of characters is merely arbitrary and not of the essence of the invention, and more or less than three may be used if desired. Likewise the mechanism for causing impressions to be made from the different rows may be varied, or such well known expedients as shifting the tape or platen, or both, may be resorted to, if desired.

Mechanism for rotating the type wheel to bring a desired character to the printing position.—The rotation of the type wheel is effected by a pulley p on the shaft t, connected by a cord p' with a larger pulley p^2 on a shaft p^3 journaled in the lower part of the plate I, Figs. 2, 4 and 5. The cord engages the pulley p, frictionally, so as to slip thereon if the said pulley is held against movement, but is positively secured to the pulley p^2, as shown, the spring p^4 being provided to make the tension of the cord or belt constant. The pulley p^2, Fig. 2, rotates counterclockwise, and I therefore place the spring p^4 on the right hand or compression reach of the belt p'. If it were in the other or tension reach it would yield more or less, depending upon the load connected with pulley p, thus making the movement of the latter uncertain. But in its present location the spring can yield only after the friction between the pulley p and belt p' has been overcome,—that is, only after the type wheel shaft has been stopped.

For the purpose of rotating the shaft p^3 the same is provided with an armature p^5, located between magnets C′, D′, corresponding to magnets C, D, of Fig. 1. Since these magnets effect the printing also, they may be termed the "working magnets" and by reason of the power required of them they may be somewhat larger than the others in the apparatus. The armature is enlarged at each end, as shown, so that its motion will be in the same direction whichever magnet is energized first.

It is desirable that the motion of the armature should be uniform whether a shorter or longer movement is necessary to bring the desired letter to the impression point. For this purpose it is provided with a constant load which must be overcome before the rotation of the shaft can begin. The armature is mounted loosely on the shaft, but has two pins which engage an arm p^6, carried by the shaft. An adjustable spring p^7 draws the armature over until the right hand pin (Fig. 3) is in contact with the arm. When only one of the magnets is energized the armature will not be drawn towards it, because a single magnet is not strong enough to overcome the load. But when both are energized the armature is drawn over turning on the shaft, until the left-hand pin strikes the arm p^6, whereupon the shaft begins to rotate. By this time, however, the air gaps between the armature and magnet cores are closed, so that the full force of the magnets can be exerted to best advantage. The spring p^8, connected with the shaft p^3, brings the latter and with it the armature, back to the normal position when the magnets cease to be energized.

Actuated by the magnets C′, D′, the type wheel T and shaft t rotate until an arm a on the latter strikes a stop, as s, projected into its path, as shown in Fig. 13. There are sixteen stops for this purpose, corresponding to the sixteen spaces on each row of the type wheel, so that by projecting the proper stop the type wheel may be brought to rest with any desired letter or space at the impression point. Of course the rotation of the type-wheel shaft t could be effected in various ways, as by an independent motor of any convenient construction, so long as at the time the proper stop is projected, or immediately thereafter, the power is effective to carry the type wheel around until the movement of the same is arrested by the stop.

As shown more clearly in Figs. 11 and 12, each stop s is mounted to slide radially toward the shaft t, and has two arms, one of

which extends through the plate I toward the arm a, and the other, s^2, in the opposite direction, under a spring pressed plunger s', by which it is constantly pressed toward the shaft.

Loosely mounted on the shaft t, inside of the circular row of arms s^2, are four disks, d, d', d^2, d^3, each having sixteen unequally spaced notches, so that the notches in only one row across the four disks can be in register at any one time. The corresponding arm s^2 will then drop into the row of registered notches, and the other arm of the stop s will project into the path of the arm a and bring the type wheel to rest with the corresponding character at the impression point. The disks are all of the same size, but in Fig. 14 they are shown as of successively larger diameters, to better illustrate the register of the notches. It will be seen that in the figure the only notches in register are at the point r. To bring notches into register at r', disk d must be moved. At the point r^2, disk d' must be moved; at the point r^3, disk d^2, at the point r^4, disk d^3. At r^5, disks d and d' must be adjusted, and so on around the entire periphery, for sixteen different combinations.

For the purpose of shifting the disks to bring notches into register at the different points, the disks are connected with armatures d^4, d^5, d^6, d^7, (Fig. 3), actuated by magnets E′, F′, G′, H′. At the inner ends of the armatures are pins, e, e', e^2, e^3, working in slots, as shown in Fig. 3. The pins are secured rigidly to their respective armature levers, and extend through apertures in the adjacent disks to radial slots n^3, n^4, n^5, n^6, in their respective disks, (Fig. 11). Thus, supposing the disks d, d', d^2, d^3, to be actuated by armatures d^4, d^5, d^6, d^7, respectively, the disk d is provided with an aperture n^7 large enough for the pin e' to project therethrough to the disk d' and to have a limited movement in the aperture n^7 as the armature is raised and dropped. Both disks d and d' have openings, as at n^8 through which the pin e^2 extends to the disk d^2, and the three disks d, d', d^2, all have similar openings, as at n^9 through which the pin e^3 reaches the last disk, d^3. It will therefore be seen that each disk may be shifted by its armature independently of the others. To limit the motion of the disks to the extent just necessary to bring the notches into register they are all provided with apertures of the same size, which register when the disks are in a normal position, as indicated at n, Fig. 3, which may correspond to a space, one of the sixteen positions on the typewheel being left blank. Into these openings projects a fixed stud n', which the disks will strike and so be stopped when they have been shifted the required amount, as will be readily understood.

For the purpose of retracting the disks to the normal position, adjustable springs e^4, e^5, e^6, e^7, are provided, engaging the pins e, e', e^2, e^3, respectively, as shown in Fig. 3.

The magnets E′, F′, G′, H′, which control the armatures and through them the type wheel disks, correspond to the magnets E, F, G, H, of Fig. 1, and are, it will be remembered, energized in various combinations, sixteen in number, according to the polarity, strength, and order of the impulses sent over circuits 2, 2, 3, 3. Thus, referring to Figs. 1, 3, and 14, a strong positive impulse over circuit 2, 2, will short circuit the battery b around magnets F′, H′, and a strong negative current in the other circuit will cut out magnet G′, thus energizing only magnet E′. Whereupon its armature is raised, shifting disk d, which brings all the notches at the position r' into register. Strong positive currents over both circuits would have cut out all four magnets, thus leaving the disks in their normal position. A strong positive impulse in circuit 2, 2, and a weak impulse of the same sign in the other, would cut out all the magnets but G′, whereupon only disk d^2 would be shifted, bringing the notches at the position r^3 into register, and so on for the different combinations. Of course, in the complete operation of selecting a character, such ones of the magnets E′, F′, G′, H′, as are energized at all are energized simultaneously; so that upon the magnets themselves, differences in the order of succession of the impulses in circuits 2, 2, 3, 3, have no effect. Likewise the polarity and strength of the impulses in the main lines has no immediate effect on these magnets, the function of the variation in polarity and strength being merely to select one or more of the magnets for operation. Hence each magnet could, if desired, be energized and controlled by an independent transmission circuit, with or without the interposition of a local circuit. In such case the selective combinations could be made by permutations of the magnets. That is, by operating magnet E′ for one letter or character; magnets E′ and F′ for another; magnets E′ and G′ for a third, and so on. By using more magnets the number of such combinations could be increased almost indefinitely. In this way the number of characters in a row of the type wheel could be increased, so that only two rows might be required instead of three, or even only one row.

As before stated, the order of the impulses in circuits 2, 2, 3, 3, has no ultimate effect on the controlling magnets E′, F′, G′, H′. But if impulse of circuit 2, 2, either weak or strong, precedes the impulse in the other, the magnet B′, Figs. 2 and 4, will be energized first, throwing lever T′ inward, and moving the type wheel in the same direction on its shaft, until the outer row of characters is in the printing position. The reverse order of

the impulses would bring the inner row to the impression point, while simultaneous impulses would maintain the wheel in its original position, as previously explained. It will thus be seen that by varying the polarity, strength, and order of the current impulses in the two circuits any desired character on the type wheel may be brought to the printing position.

The devices for feeding the paper to the impression point.—The apparatus herein illustrated is intended to print upon a strip of paper, similar to that used by the ordinary "stock ticker". If the tape or strip is wider than a single row of characters on the type wheel, not only will the proper letters be printed thereon, but characters on the adjacent row or rows may also produce an impression, thus making a confusing imprint. I therefore provide the feed rollers f, f', which feed the tape between the platen and type wheel, with a co-acting rib and groove, as shown in Fig. 7, so that the tape is embossed longitudinally, as shown in Fig. 10. By this means only the embossed portion of the strip strikes the type wheel, as will be readily seen. It will be understood, however, that the embossing of the tape is not an indispensable feature of the invention. In passing to the feed rollers the tape travels over a guide g, Figs. 5, 6, and 7, having a groove, as shown, to receive the tape and hold the same against sidewise displacement.

Connected with the lower feed roller is a ratchet f^2, engaged by a pawl f^3 carried by the pulley, p^2 on the working magnet shaft p^3. When the pulley is rotated by the magnets C', D', the pawl rises on the ratchet to the position shown in Fig. 5. When the pulley is retracted by the springs p^7, p^8, (Fig. 3), the pawl engages the ratchet, rotating the same and the feed rollers enough to carry the tape forward one space, as in Fig. 2. A flat spring g' bearing on the ratchet f^2 prevents any accidental retraction of the same.

The mechanism for effecting the printing.—Pivoted to the guide g is a curved platen or hammer h, having a finger h' to limit its downward movement, and a striking face h^2, to carry the tape up against the type wheel. The platen also has a lug h^3, near its central portion, to be struck by the actuating lever h^4. The latter is rigidly secured on the shaft p^3, rotated by the working magnets C', D', which latter also rotate the type wheel. The parts are so proportioned and arranged, however, that the lever h^4 will not strike the platen until the pulley is almost at the end of its movement, the belt p' slipping on the small pulley p if the type wheel shaft is stopped before the large pulley completes its movement. The printing is therefore not effected until the desired character has been brought to the impression point.

In order to make the force of the platen uniform in striking the paper against the type wheel and to cushion the blow thereof, the lever h^4 is provided with a pivotal finger h^5, which is utilized as the part to strike the lug h^3, on the platen. This finger turns with a certain amount of friction, determined by the spring plate h^6. The result is that when the platen has been struck with the desired force the friction finger will yield, allowing the lever h^4 to continue its movement, the force of the blow being determined, however, by the force necessary to overcome the friction of the finger h^5. In the path of the lever h^4 is a stop h^{10}, Fig. 5, limiting the movement thereof. This stop carries a finger h^7, which projects into the path of the lug h^3 to engage the same and prevent the platen from being thrown upward farther than enough to bring the tape against the type wheel with the desired degree of firmness. Upon retraction of the shaft p^3 to its normal position, the lever h^4 is brought to rest upon an arm h^8, mounted on the side plate I, and having an upturned finger h^9. The friction finger h^5 strikes the finger h^9 and is raised to its normal position, as in Fig. 2, ready for another printing operation.

The mechanism for breaking the local circuit after each impression.—In order to prevent sparking at the local circuit contacts of the relays 45, 46, 47, 48, Fig. 1, when the local circuit controlled thereby is broken, I provide a resistance R which is automatically thrown into the circuit at the time of the printing operation, and cut out again immediately after the circuit is broken. Hence the resistance is then normally cut out, as by the lever R', Fig. 1, pressed against its contact by an arm R^2. This operation is effected by the following devices. The resistance is connected across the spring contacts c, c', Figs. 2 and 5, which latter are in series with the magnets C', D'. Engaging one of the contacts is a three armed lever c^2, one arm of which extends under a pin c^3 on the pawl f^3, so that in the normal position of the parts, Fig. 2, the lever will be drawn down and the contacts brought together, thus cutting out the resistance. The other end of the lever is held by a pawl c^4, so that it will still hold the contacts together when the pawl f^3 is lifted by the energization of magnets C', D'. But just as the lever h^4 is completing its movement upward, it strikes a plunger c^5, which bears against the pawl c^4, pushing the latter out of engagement with the lever c^2 and permitting the same to drop. The contacts are thereby allowed to separate, leaving the parts in the position shown in Fig. 5, with the resistance in series with the local circuit of battery b. The circuit is then broken, by the relays in circuits 2, 2, 3, 3, without sparking; whereupon the lever h^4 falls, allowing the pawl c^4 to be again brought into the path of the lever c^5

and engage the same when drawn down by the pin c^3. In this way the contacts c, c' are again closed, and the resistance cut out.

While I have described specifically only one form of my invention, it is evident that the same is capable of other embodiments. It is also evident that the various sets of mechanism included in the invention, such as the devices for shifting the type carrier longitudinally, for rotating the type wheel, etc., may be used in other receiving apparatus, and with other transmitters.

What I claim is:

1. In a telegraph instrument for recording legible impressions corresponding to current impulses over a plurality of transmission circuits, the combination with a plurality of circuits, of mechanism for producing the impressions, and devices for controlling the impression mechanism, dependent for operation on variation in the polarity, strength, and order of succession of the current impulses sent over the plurality of circuits, as set forth.

2. In a telegraph instrument for recording legible impressions corresponding to current impulses over a plurality of transmission circuits, the combination with a plurality of circuits, of a longitudinally movable type or die carrier, mechanism for producing impressions therefrom, and means for shifting the type or die carrier, dependent upon the order of succession of the current impulses over the plurality of transmission circuits, as set forth.

3. In a telegraph instrument for recording legible impressions corresponding to current impulses over a pluraliity of circuits, the combination with a plurality of circuits, of a rotatable and longitudinally movable type or die wheel, mechanism for producing impressions therefrom, means for controlling the rotation of the type wheel, dependent upon the direction and strength of the current impulses, and means for shifting the type wheel longitudinally, dependent upon the order of succession of the current impulses over the plurality of circuits, as set forth.

4. In a telegraph for recording legible impressions corresponding to current impulses over a plurality of transmission circuits, the combination with a plurality of circuits, of a rotatable and longitudinally movable type or die wheel, means for controlling the rotation of the type wheel, dependent upon the direction and strength of the current impulses, means for shifting the type wheel longitudinally, dependent upon the order of succession of the current impulses in the circuits and means for producing impressions from the type wheel, operated by the current impulses independently of their direction, strength or order of succession, as set forth.

5. The combination with a longitudinally adjustable type or die carrier, and means for adjusting the same, of a plurality of magnets arranged to act upon the said adjusting means, and means for energizing the magnets simultaneously or in different order, as set forth.

6. The combination with a longitudinally adjustable type or die carrier, and means for adjusting the same, of a plurality of magnets arranged to act upon a common element of said adjusting means, and means for energizing the magnets simultaneously or in different order, as set forth.

7. The combination with a longitudinally adjustable type or die carrier, and mechanism for adjusting the same, of a pair of magnets, a rotatable armature actuated by the magnets, means enabling the armature to actuate the said adjusting mechanism, and means for energizing the magnets simultaneously or in different order, as set forth.

8. The combination with a rotatable type or die wheel, and means for rotating the same, of a plurality of normally retracted stops for limiting the movement of said type wheel, means for projecting said stops singly, a plurality of disks controlling said stops, a plurality of magnets for actuating the said disks, and means for energizing the magnets singly or in different groups, as set forth.

9. The combination with a rotatable type or die wheel, and means for rotating the same, of a plurality of stops for limiting the movement of the type wheel, a plurality of disks holding the stops in retracted position and having notches in their peripheries, a plurality of magnets, each operatively connected with one of the disks to partially rotate the same, and means for energizing the magnets singly or in different groups, to bring different sets of notches on the disks into register and permit the corresponding stop to be projected, as set forth.

10. The combination with a rotatable type or die wheel, and means for rotating the same, of a plurality of disks concentric with the type wheel, having notches in their peripheries, a plurality of stops for limiting the movement of the type wheel, arranged radially about and bearing on the peripheries of the said disks, a plurality of magnets to actuate said disks, and means for energizing the magnets singly or in different groups to bring different sets of notches on the disks into register and permit the corresponding stop to be projected, as set forth.

11. The combination with a rotatable type or die wheel, and means for rotating the same, of a plurality of disks having unequally spaced notches in their peripheries, a plurality of stops for limiting the movement of the type wheel, arranged radially about the disks and bearing on their peripheries, a plurality of magnets, one for each disk, operatively connected therewith to partially rotate the same, and means for energizing the magnets singly or in different groups, to actuate the disks and bring different sets of

notches on the disks into register, to permit the corresponding stop to enter the registered notches and be projected into operative position, as set forth.

12. The combination with a rotatable type or die wheel, of a rotatable armature operatively connected with the type wheel to rotate the same, magnets for actuating the armature, a platen adjacent to the type wheel, an arm connected with the armature to actuate the platen, devices for feeding a band or strip between the type wheel and the platen, and mechanism connecting the feeding devices with the said arm, whereby the movement of the latter causes the band or strip to be fed forward a predetermined amount at each printing operation, as set forth.

13. The combination with a type or die carrier, of a rotatable armature, an arm connected with the armature, a platen arranged to be actuated by the arm, feeding devices, including a roller, for feeding a band or strip between the platen and the type wheel, a ratchet connected with the said roller, and a pawl carried by the said arm and engaging the ratchet, as set forth.

14. The combination with a type or die carrier having characters arranged in rows thereon, of devices for feeding a band or strip and embossing the same, and a platen for carrying the embossed portion against the type or die carrier, whereby the impression on the band will be confined to the embossed portion, as set forth.

15. The combination with a type or die carrier having characters arranged in rows thereon, and means for shifting the type or die carrier to bring the different rows singly to the impression point, of devices for feeding a band or strip to the impression point and embossing a portion of the band substantially equal in width to a single row of characters on the type or die carrier, and a platen for striking the embossed portion of the band against the row of characters at the printing position, whereby an impression will be made only from a character in the row at the impression point, as set forth.

16. The combination with a printing mechanism, of electromagnetic devices for actuating the same, a circuit for energizing said devices, means for making and breaking the circuit, and means operated by the said electromagnetic devices for throwing resistance into the circuit before the said circuit is broken and for cutting out the resistance after the circuit is broken, as set forth.

17. The combination with a movable type or die carrier, and mechanism for actuating the same to bring different characters thereon to the impression point, of electromagnetic devices for actuating said mechanism, and means for providing a constant load to be overcome by the electromagnetic devices before the said mechanism is affected, as set forth.

18. The combination with a movable type or die carrier, and mechanism for actuating the same to bring different characters thereon to the impression point, of a rotatable armature, means enabling the armature to operate the said mechanism, electromagnets to rotate the armature, and a constant load connected with the armature, as set forth.

19. The combination with a movable type or die carrier, and mechanism for actuating the same to bring different characters thereon to the impression point, of a rotatable shaft connected with the said mechanism, an armature mounted on the shaft with provision for lost motion, electromagnets for rotating the armature, and means for applying a constant load to the armature, as set forth.

20. The combination with a rotatable shaft, and an armature loosely mounted thereon, of a pair of pins carried by the armature, an arm rigidly mounted on the shaft extending between the pins, a spring holding the armature in a normal position on the shaft, and electromagnets arranged to operate against said spring, as set forth.

21. The combination with a rotatable type or die wheel, a pulley connected therewith, a driving pulley, and means for rotating the same, of a friction belt passing over the first mentioned pulley and rigidly connected to the periphery of the other, and means for making the tension of the belt constant, as set forth.

22. The combination with a rotatable type or die wheel, a pulley connected therewith, a driving pulley, and means for rotating the latter in one direction only, of a friction belt over the pulleys, and a spring in the compression reach of said belt, as set forth.

23. The combination with a type or die carrier, and a pivoted platen for producing impressions therefrom, of an oscillating arm for striking the platen, to actuate the same, and a frictionally mounted finger carried by the arm, adapted to strike the platen and cushion the blow thereon, as set forth.

JOHN BURRY.

Witnesses:
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S. S. DUNHAM.