No. 744,046. PATENTED NOV. 17, 1903.

H. CASEVITZ.

ELECTRIC PRINTING TELEGRAPH APPARATUS.

APPLICATION FILED MAR. 14, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.

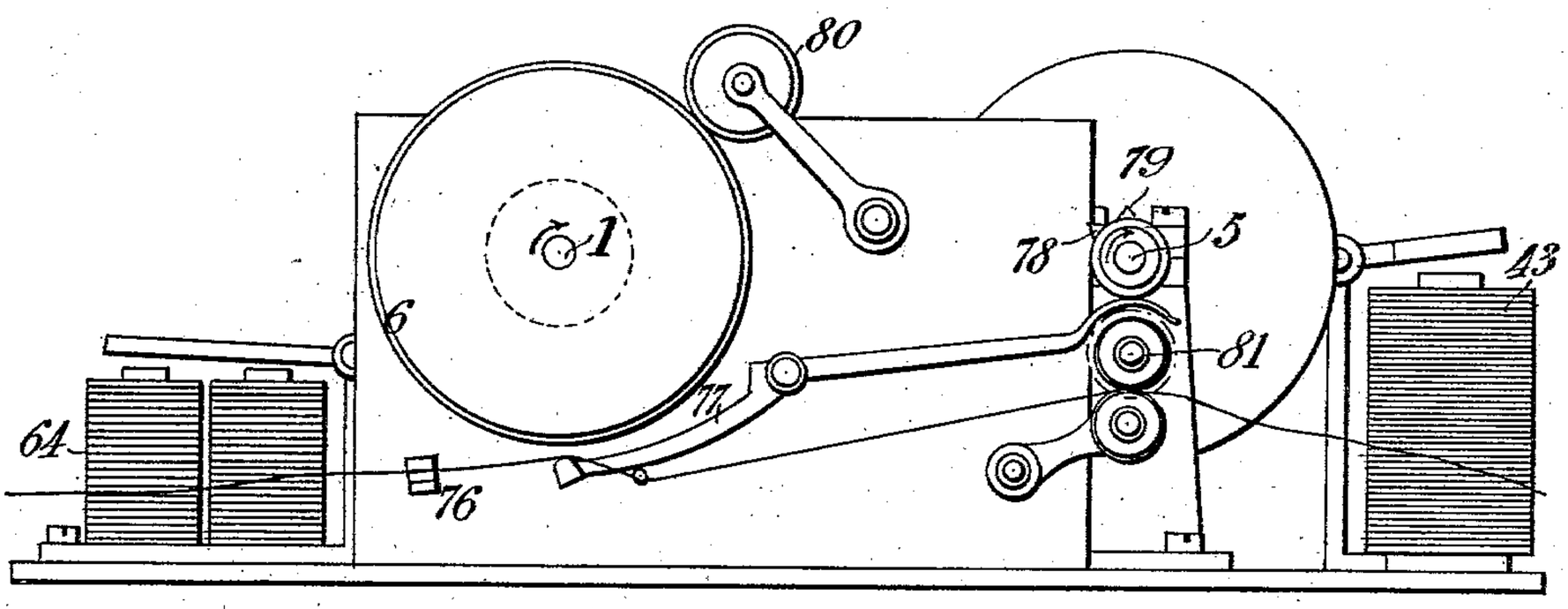


Fig. 2.

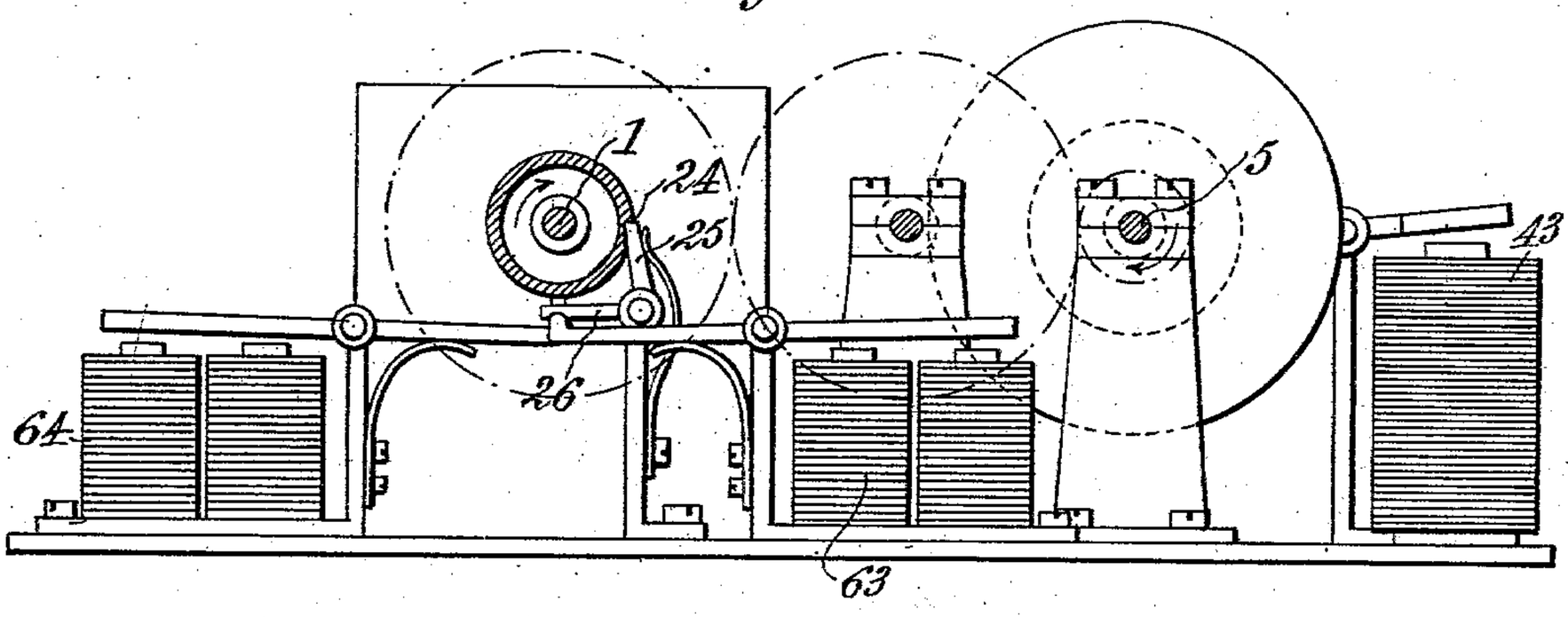
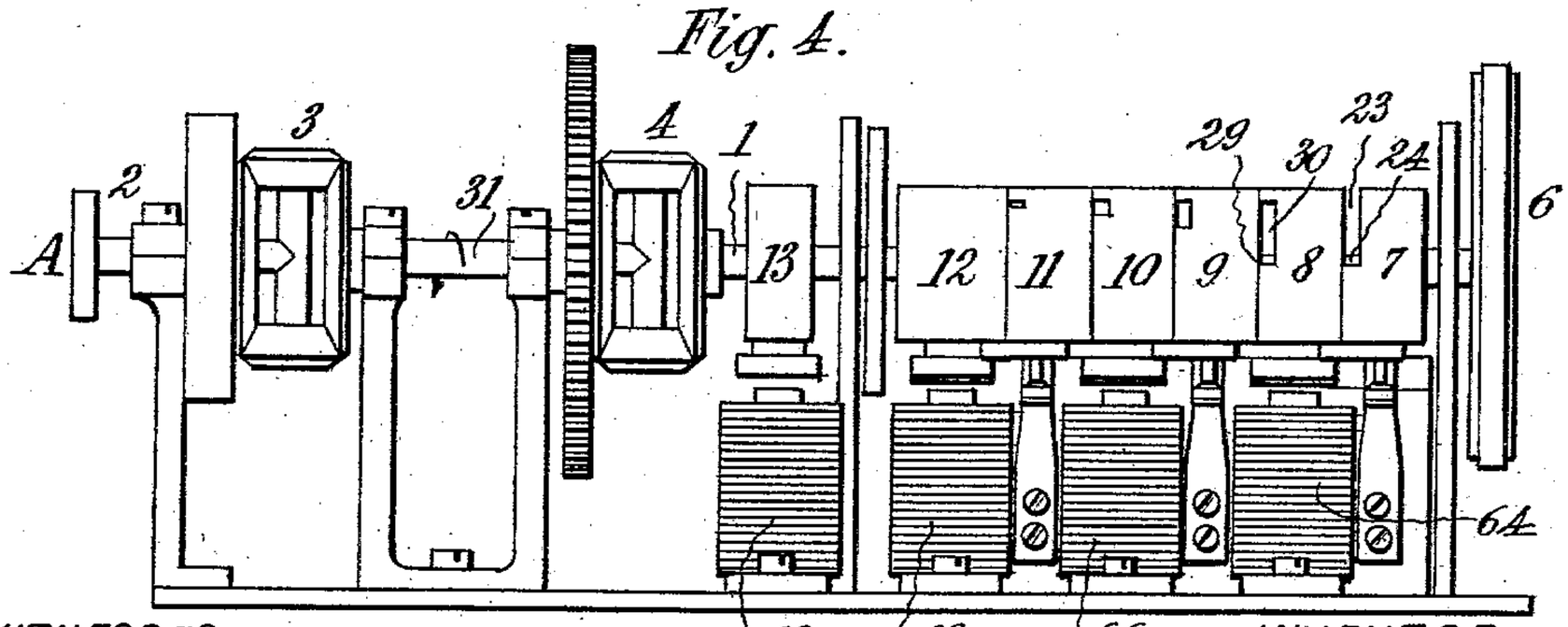


Fig. 4.



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Thomas J. Wallace

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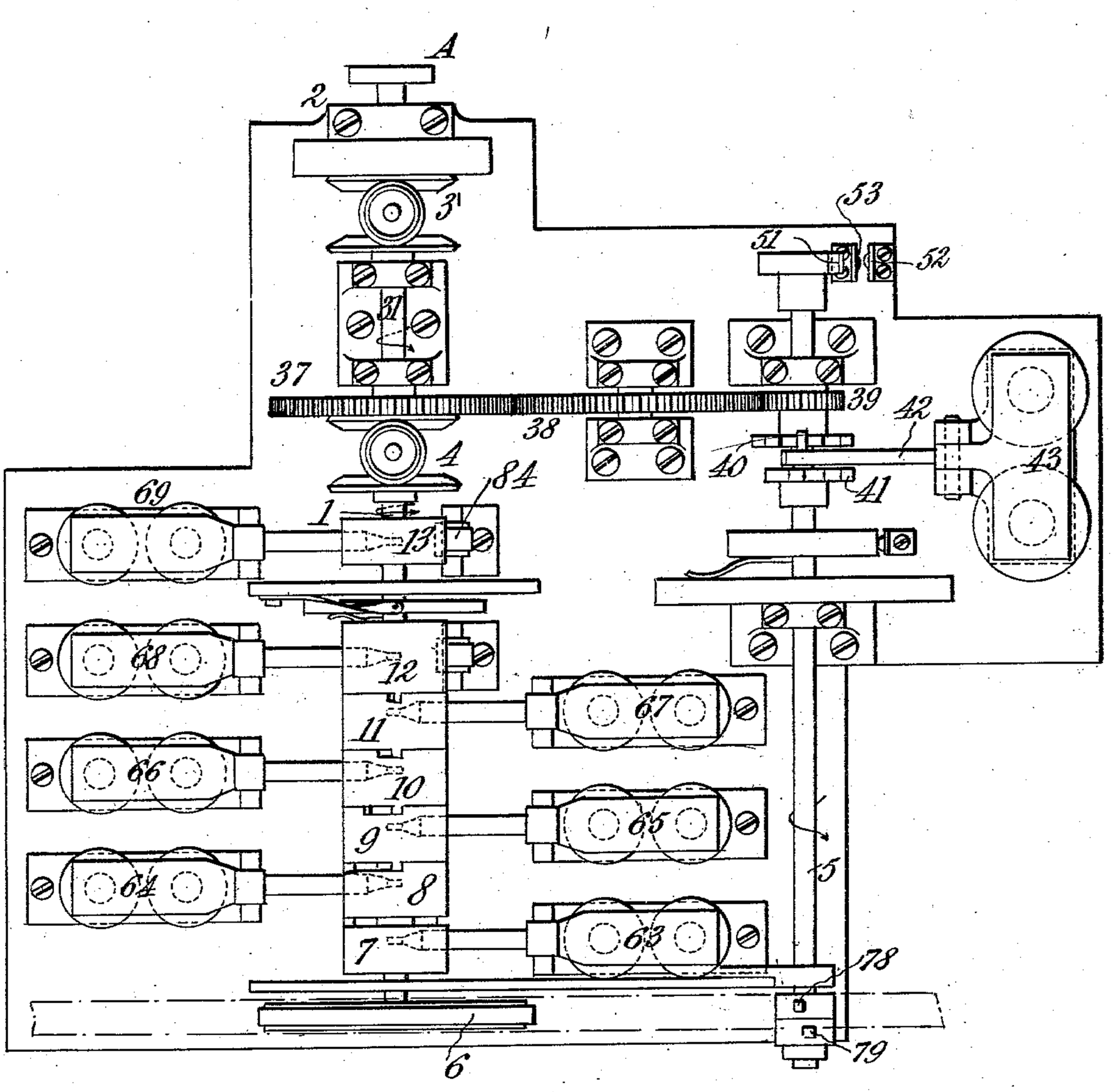
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 3.



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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 5.

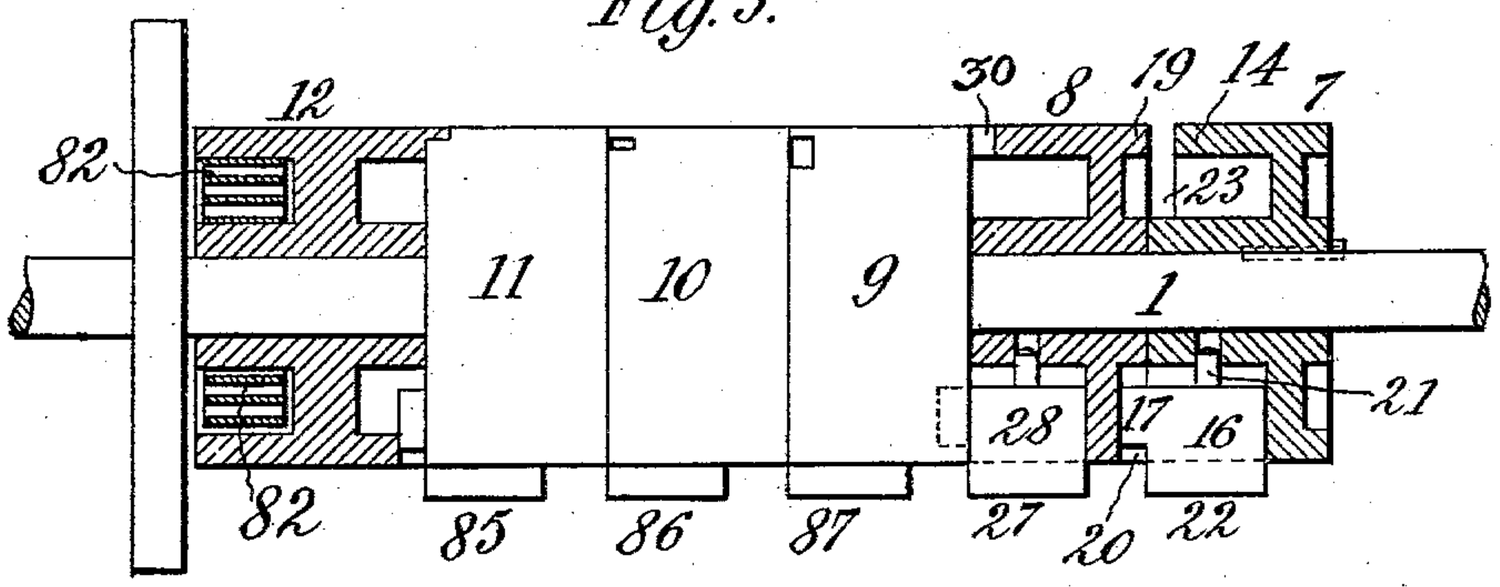


Fig. 6

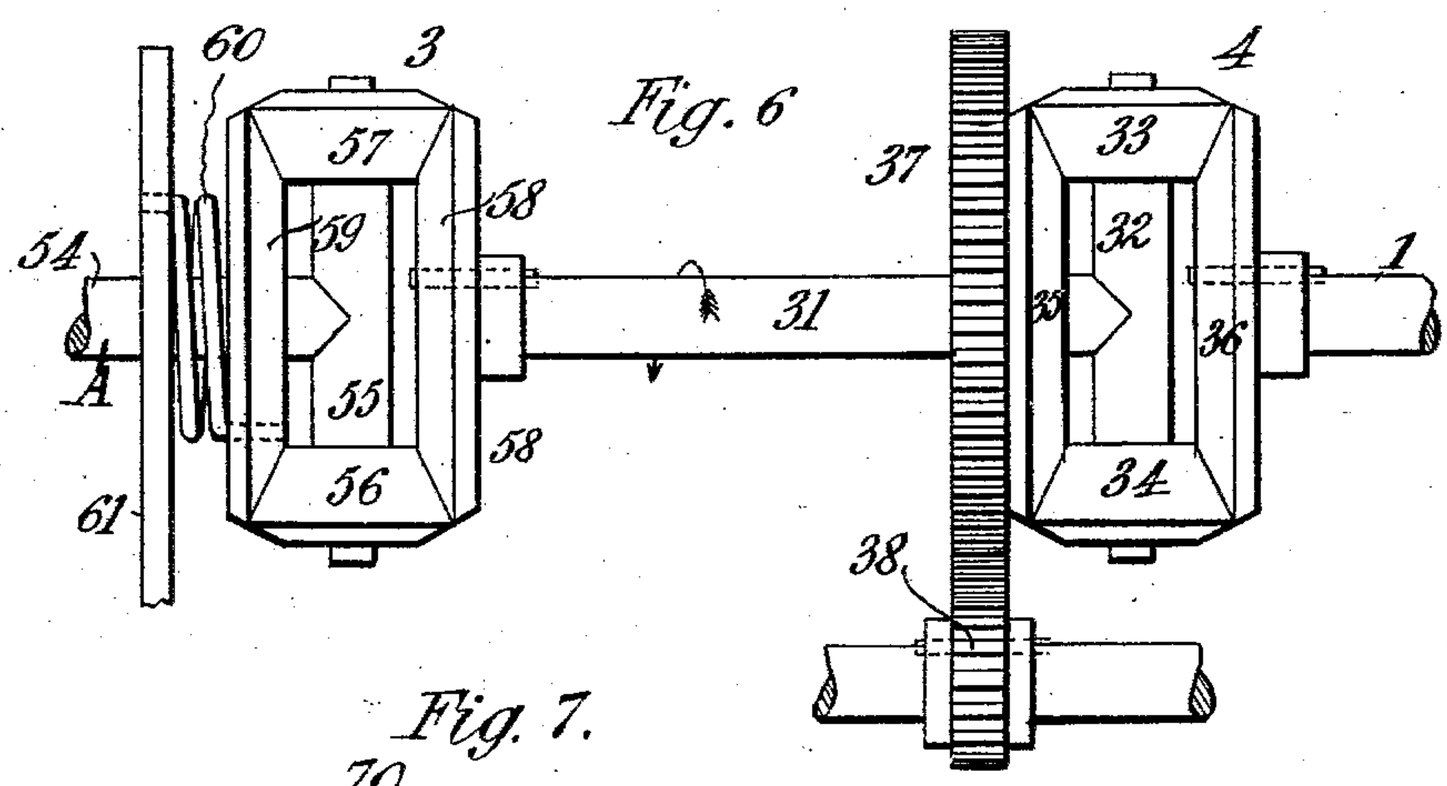
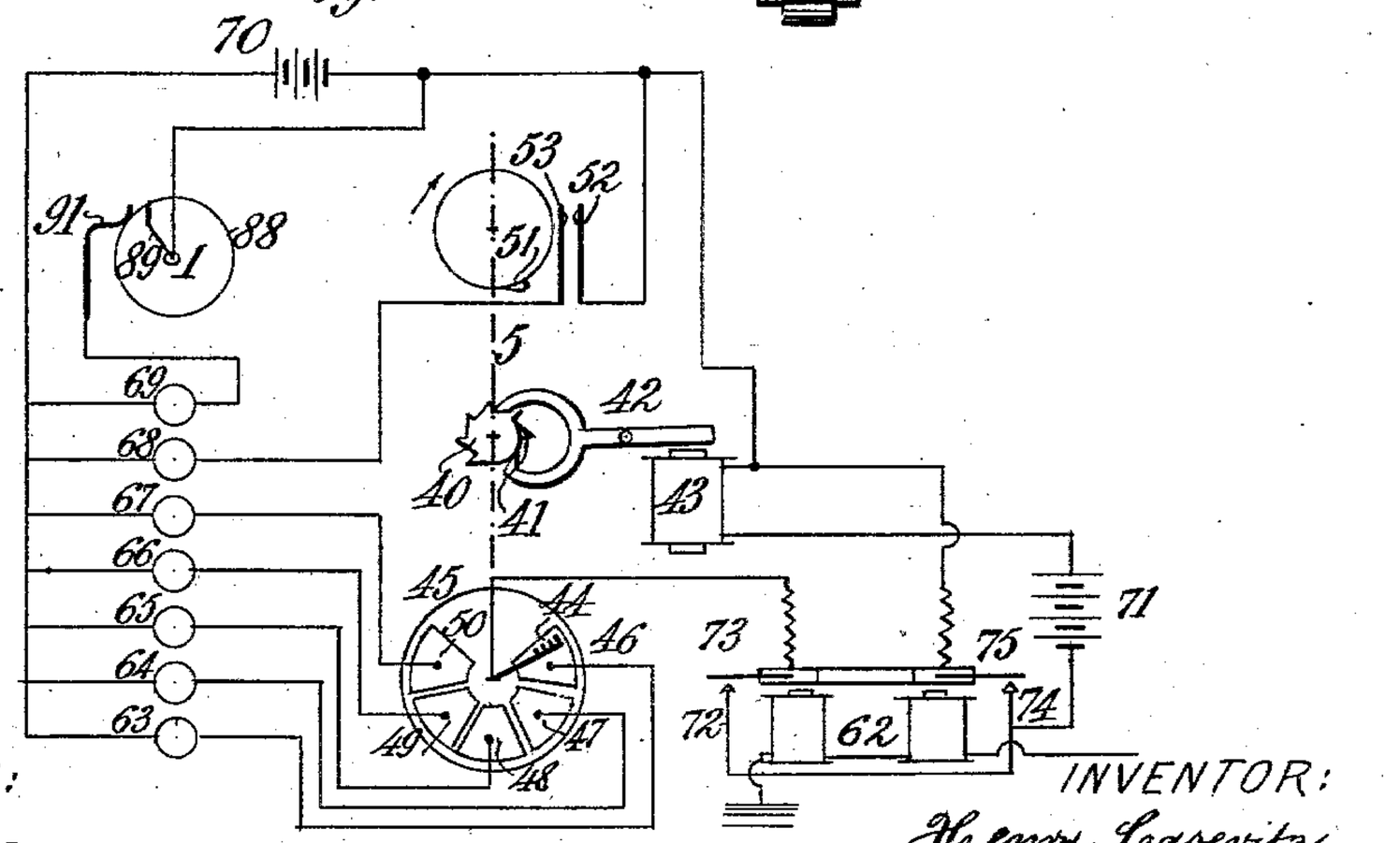


Fig. 7.



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APPLICATION FILED MAR. 14, 1903.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 8.

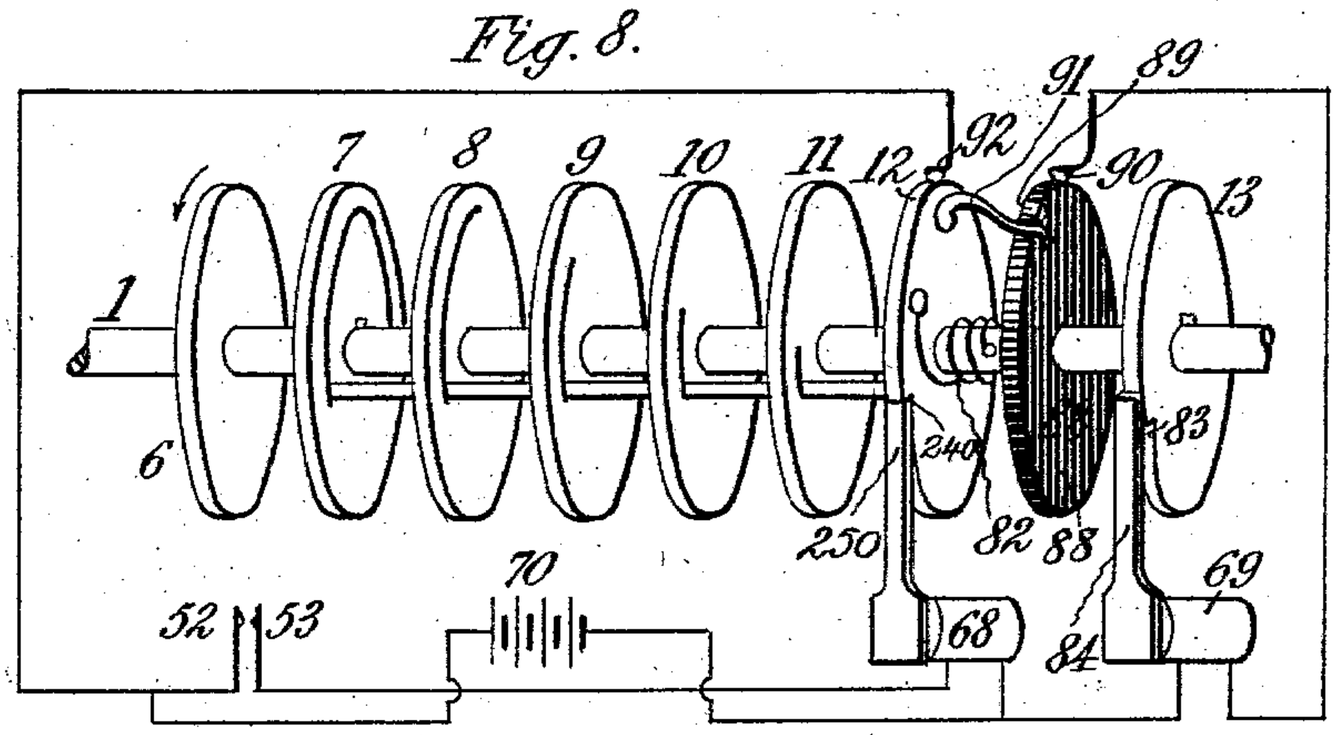


Fig. 9.

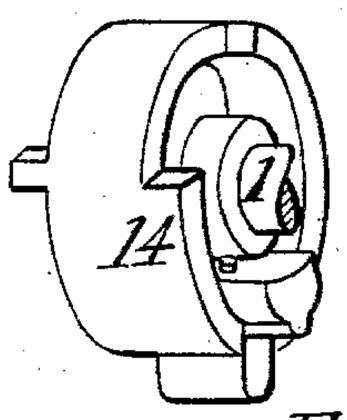


Fig. 10.

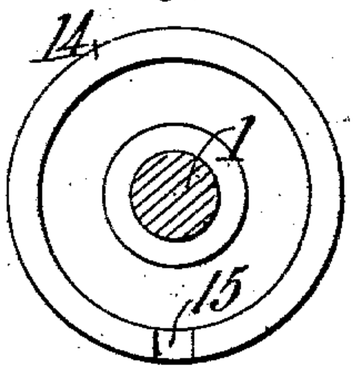


Fig. 11.

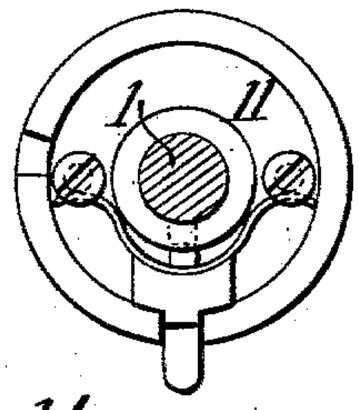


Fig. 12.

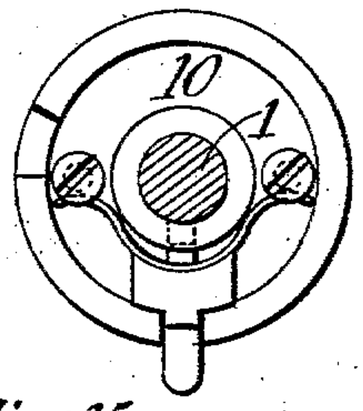


Fig. 13.

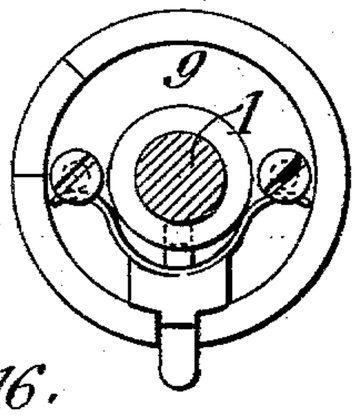


Fig. 14.

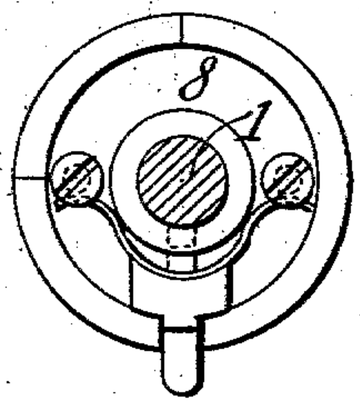


Fig. 15.

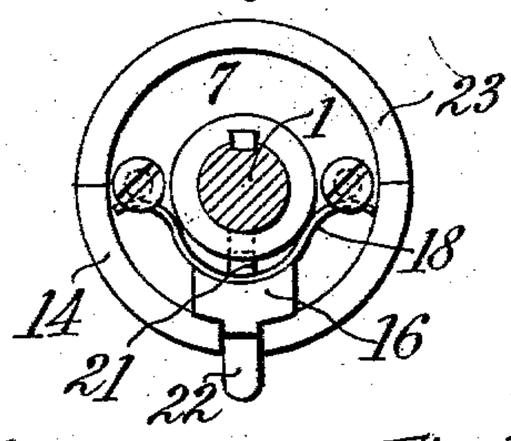


Fig. 16.

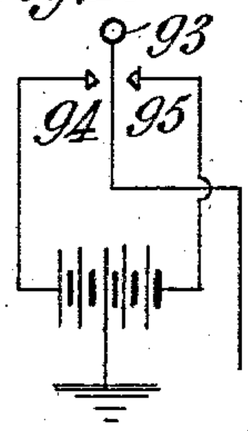


Fig. 17.

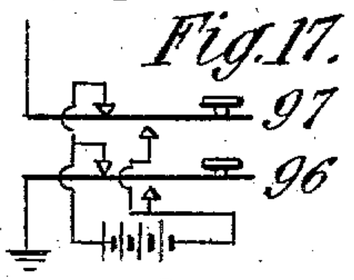


Fig. 18.

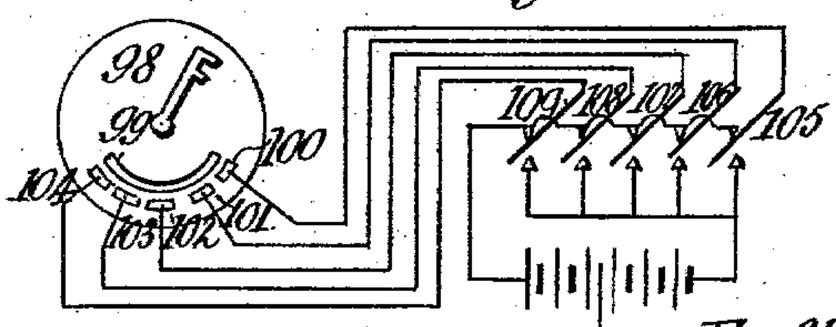


Fig. 19.

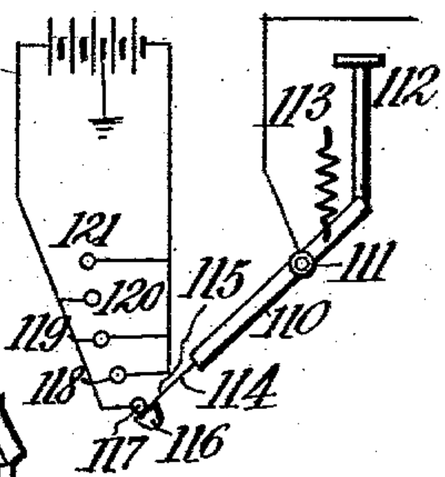


Fig. 20.

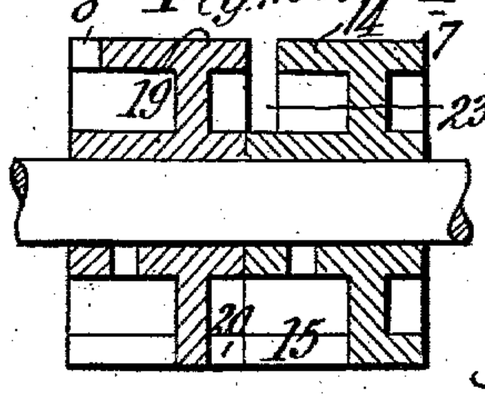
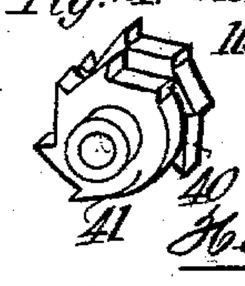


Fig. 21.



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No. 744,046. Patented November 17, 1903.

UNITED STATES PATENT OFFICE.

HENRY CASEVITZ, OF PARIS, FRANCE.

ELECTRIC PRINTING-TELEGRAPH APPARATUS.

SPECIFICATION forming part of Letters Patent No. 744,046, dated November 17, 1903.

Application filed March 14, 1903. Serial No. 147,746. (No model.)

To all whom it may concern:

Be it known that I, HENRY CASEVITZ, a citizen of the Republic of France, residing in Paris, France, have invented certain new and useful Improvements in Electric Printing-Telegraph Apparatus, of which the following is a specification.

This invention relates to improvements on the printing-telegraph apparatus for which I have applied for Letters Patent in the United States on the 10th of October, 1901, Serial No. 78,241.

The present improved construction is based, like the original apparatus and like other known apparatus, on the principle of transmission through the line-wire for each type of a certain number of currents—such as six, for example—sometimes positive and sometimes negative; but, as in my original apparatus, it is distinguished from other known apparatus by one or more of the following features: first, suppression of all systems of synchronism; second, the mounting directly upon one and the same axis driven by clockwork of the type-wheel and of the device registering the direction of the currents received, to which I have given the name of "register," without its being necessary to interpose either a clutch or a special selection system, as in the "Baudot" apparatus or in the apparatus described in German Patent F.5,232 VII/21^{a3}, and without requiring the apparatus to be continuously actuated; third, utilization of the whole or nearly the whole of the circumference of the shaft, and consequently of the wheel carrying the printing-types; fourth, absolute impossibility of the apparatus getting out of regulation, as there is no part capable of regulation.

I will describe the improved apparatus with reference to the accompanying drawings, in which—

Figure 1 shows a front view of the apparatus; Fig. 2, a longitudinal section; Fig. 3, a plan; Fig. 4, a side view; Fig. 5, details of the arrangement of the drums; Fig. 6, details of the differential gear and speed-regulators; Fig. 7, a diagram plan of the electrical circuits; Fig. 8, a diagrammatic perspective view showing the electrically-operated mechanism for resetting to zero; Fig. 9, a perspective view of one of the drums; Fig. 10, a view of one of the drums without the accessory parts; Figs. 11 to 15, detail sections of the several drums. Figs. 16, 17, 18, 19 show the different keys employed as transmitters; Fig. 20, a section through the drums 8 and 9; Fig. 21, a detail hereinafter described.

A shaft 1, Figs. 2 and 15, and a shaft 5 tend to be rotated in the direction of the arrow by the action of clockwork situated at A, but omitted for the sake of clearness. The clockwork is connected to a coupling 2 and by means of a regulator 3 and of differential gear 4, the action of which will be presently described, actuates the shafts 1 and 5.

On shaft 1 is fixed a type-wheel 6, Figs. 1, 3, 4, 8, and a drum 7, Figs. 3, 4, 5, 8, 9, 15, and 20, a loose drum 8 being mounted at the side of 7. The left-hand side of 7 has a rim 14, in which is a slot 15, through which projects a piece 16 having a projection 17 and acted upon by a spring 18, which presses it outward, 16 being guided by a pin 21, working in a hole of the boss of 7. The drum 8 also has a rim 19 on its right-hand side, in which is a notch 20, with which engages the projection 17. The rim 14 of drum 7 has another slot 23, and a projection 24, Fig. 4, on drum 8 projects into this. From this arrangement it will be seen that normally the drums 7 and 8 are coupled together by the parts 16 17 and the notch 20, while if 16 be retracted by bearing against its base 22, Figs. 5 and 15, the drums 7 and 8 will be disengaged from each other and can be turned relatively to each other, but only to the extent allowed by the stud 22, which limits its motion to the length of the slot 23. The latter is made of such a length that the distance through which drum 7 can turn is equal to sixteen thirty-fourths of the circumference.

At the side of drum 8 is a drum 9, and the slot formed in the left-hand rim of drum 8 is of such a length that the drum can only turn relatively to 9 to the extent of eight thirty-fourths of the circumference. Drum 9, on the other hand, can only be turned relatively to drum 10 to the extent of four thirty-fourths of the circumference. The drum 10 can only turn through two thirty-fourths of the circumference relatively to drum 11, and this can only turn through one thirty-fourth relatively to drum 12. This drum, which is also

loose on shaft 1, has a stud on its right-hand rim, but has no slot in its left-hand rim. It has, however, on its periphery a notch 240, Fig. 8, with which is engaged the end of a spring-catch 250.

As above stated, the clockwork A tends to turn shaft 1 in the direction of the arrow; but upon this shaft is fixed the drum 7 which, being coupled to drum 8 tends to turn this also, as in like manner all the drums 9, 10, 11, and 12 are coupled together and as 12 is held by catch 250 it results that in the normal condition none of the drums can move. If now pressure be exerted on the part 22 of piece 16, the projection 17 will pass out of the slot 20 of drum 8, so that drum 7 can now turn with the shaft 1 under the action of the clockwork until the end of the slot 23 arrives at the stud 24—that is to say, until the shaft 1, and consequently the type-wheel 6, have turned through sixteen thirty-fourths of the circumference. On pressing upon the part 27 of the piece 28 of drum 8 this will be disconnected from drum 9, and as 7 and 8 are coupled either by the projection 17 of piece 16 or by stud 22 butting against the end of slot 23 the drums 7 and 8 can turn together until the stud 29 of drum 9 butts against the end of slot 30 of drum 8—that is, through eight thirty-fourths of a revolution. In the same way if 9 be uncoupled from 10 and coupled to 7 and 8 these and also the type-wheel 6 can turn through four thirty-fourths of a revolution relatively to drum 10; if 10 be uncoupled from 11, then 7 8 9 10 can turn through two thirty-fourths, and if 11 be uncoupled from 12, 7 8 9 10 11 can turn through one thirty-fourth of a revolution. Thus, according as one or other of the pieces 16 18, &c., is acted upon, the type-wheel can be turned through sixteen thirty-fourths, eight thirty-fourths, four thirty-fourths, two thirty-fourths, and one thirty-fourth of a revolution. By combining one or more of these partial rotations the type-wheel can be turned through any desired number of thirty-fourths of a revolution, the number of thirty-fourths required depending on the number of characters in the keyboard. The types on the wheel described are, including the zero, thirty-two, two thirty-fourths of the circumference being reserved to facilitate the return to zero, the sucessive engagements of the parts in the return to zero being surer when a considerable amplitude is provided between the last type and the zero or starting type. The clockwork at A can also effect the rotation of shaft 5. For this purpose an intermediate shaft 31, Figs. 3, 4, 6, is rotated by the clockwork through the regulator 3. This shaft carries a cross-head 32, on which are mounted two bevel-wheels 33 34, gearing, first, with the bevel-wheel 35, which by means of gears 37, 38, and 39 drives shaft 5; secondly, they are engaged with the bevel-wheel 36, mounted on shaft 1. Shaft 5 carries, first, a double ratchet-wheel 40 41, (see Fig. 21 for details,) held by the armature 42 of the electromagnet 43. It has five teeth arranged on five-sevenths of its circumference, so that if the fifth tooth escapes the armature the shaft 5 can complete remaining two-sevenths of a revolution without being stopped. Secondly, 5 carries a contact-arm moving round on an insulated disk that carries five contact-plates 46 47 48 49 50. Thirdly, it carries two cams 78 and 79, actuating, respectively, the impression device and the other the advance of the paper. Fourthly, it carries a disk with contact-piece 51, adapted to make contact between two contact-springs 52 and 53 each time that it passes them.

When the aappratus is at rest, the differential gear 4 tends to rotate the shafts 1 and 5; but 1 is held by the pawl 25, engaged in the notch 24, and 5 is held by the ratchet-wheel 40 41. It will be readily understood that the differential gear allows either shaft 1 or shaft 5 to rotate independently of the other or both to rotate simultaneously.

The regulator 3 has for its object to allow the intermediate shaft, and consequently the shafts 1 and 5, to start instantaneously without being retarded by the inertia of the clockwork mechanism, which owing to its mass is always slow in starting. The regulator also deadens the shocks due to the sudden stoppage of the shafts 1 and 5, and it reduces the pressure which the abutment devices upon or at the sides of these shafts exercise upon each other. This regulator is similar in construction to the differential gear—namely, a shaft 54, connected to the clockwork A and having a cross-head 55, on which are mounted two bevel-pinions 56 and 57, gearing with the bevel-wheels 58 and 59, of which 58 is fixed on the intermediate shaft 31. To the wheel 59 is fixed the one end of a spring 60, the other end of which is fixed to the platen 61 of the apparatus. Thus the clockwork puts a tension on spring 60, so that when either shaft 1 or 5 is set free to turn the shaft 31, which actuates them, first receives its motion from the spring 60, which unwinds but is at once rewound by the clockwork. The spring 60 also has the effect of deadening the shock on the stopping of the shafts 1 and 5.

The apparatus operates as follows: It has seven movements. The first five serve for the reception of the current from the line-wire. The sixth effects the impression, and the seventh brings the devices back to zero and feeds the paper forward. A relay 62, Fig. 7, receives the current from the line-wire. Five electromagnets 63 64 65 66 67 are connected, on the one hand, respectively, with the contact-plates 46 to 50 of the distributing-disk 45 and, on the other hand, through the medium of a local battery 70 and an electromagnet 43, actuating the ratchet-wheels 40 41, with one of the poles of a second local battery 71, the other pole of which is put in connection through the relay 62 either with the contact-arm 44 or directly with the electro-

magnet 43. If the current from the line-wire is positive, the relay 62 connects 72 and 73, and the current from the battery 71 takes the following course: Zn 71, 72, 73, 44, 46, (or 47, 48, 49, 50, according to the position of the contact-arm,) electromagnet 63, (or 64, 65, 66, 67,) battery 70, electromagnet 43, Cu 71. Consequently the following actions will take place simultaneously: (*a*) The electromagnet 43 by means of the ratchet 40 41 causes shaft 5 to turn through one-seventh of a revolution, and consequently moves the contact-arm 44 onto the next contact-plate. (*b*) One of the electromagnets 63 to 67 acts upon one or other of the pieces 16 28, &c., so as to liberate shaft 1 to a greater or less extent. If, on the contrary, the line-current is negative, the relay connects 74 and 75, and the current passes as follows: Zn 71, 74, 75, 43, Cu 71, and in this case only the electromagnet 43 operates and the contact-arm advances one step without any of the electromagnets 63 to 67 having operated. Consequently each of the line-currents causes the contact-arm 44 to advance one step; but only a positive current actuates one or other of the electromagets 63 to 67, and consequently one of the drums 7 to 11.

The mode of effecting the impression is as follows: In consequence of the liberation during the first five periods of motion of one or more of the drums 7 to 11 the type-wheel 6 is brought into the desired position (according to the direction of the successive currents sent through the line) for printing the desired character upon a strip of paper 76 traveling underneath it. The fifth period of motion being completed, the incomplete ratchet-wheel 40 41 completes its rotation alone—that is to say, the remaining two-sevenths of the revolution—and in this way at the sixth period of motion the cam 79 raises the lever 77, which in approaching the paper toward the type, situated at that moment at the bottom of the type-wheel, effects the printing thereof upon the paper. The type-wheel is continuously inked by means of an inking-pad 80. For advancing the paper and resetting to zero the action is as follows: At the seventh period of motion, which takes place immediately after the period of impression, the cam 78 acts upon a toothed wheel 81, Fig. 1, and thus causes the paper 76 to advance one step. At the same time the cam 51 establishes the contact 52 53, which closes the circuit 53, electromagnet 68, battery 70, contact 52. The electromagnet 68 serves for setting back the apparatus to zero. Its armature controls the pawl 250, which holds the drum 12, which drum is mounted loose upon shaft 1, being connected thereto by the spiral spring 82. Each time that the clockwork mechanism A rotates the shaft 1 the spring 82 is put in tension in the desired direction for causing the drum 12 to follow the motion when it is released by the ratchet and pawl 240 250. As soon as this takes place the drum 12 is consequently rotated by the action of the spring. On the other hand, the shaft 1 continues to revolve under the action of the clockwork, the only thing that impeded its rotation being the stoppage of the drum 12 by means of the ratchet and pawl 240 250. A seventh drum 13 is fixed on the shaft 1, and this drum is stopped a little before the shaft 1 has completed a rotation by means of a notch 83 and pawl 84. At this moment the spring 82 can complete its unwinding, and the drum 12 is thereby made to catch up the drum 11 again, whereupon these two drums are coupled together by the tongue 85, which falls into a notch. The two drums 11 and 12 then continue to revolve until they have caught up the drum 10, which is then coupled thereto by the tongue 86. In like manner drums 10 11 12 are coupled with drum 9, then drums 9 10 11 12 are coupled with drum 8, and lastly drums 8 9 10 11 12 are coupled with drum 7. At this moment the spring 82 will have become entirely unwound, and all the drums will then be coupled together in the normal position of rest. The shaft 1, however, is not in its zero position, as it is still held by the ratchet and pawl 83 84. For the purpose of disengaging the ratchet and pawl an insulating-plate 88, Fig. 8, fixed on the shaft 1, carries a metallic contact 89, which at the moment when shaft 1 is in the position corresponding to engagement of the ratchet and pawl 83 84 is situated in front of a contact-brush 90. Moreover, when the spring 82 is entirely unwound and the drum 12 has caught up the other drums, as described, a spring-contact 91, carried by the drum 12, is also in contact with the plate 89, so that this spring-contact establishes the electrical contact 90 91, which closes the circuit of the battery 70 by means of the electromagnet 69, Figs. 7 and 8, following the path Zn 70, 92, 91, 89, 90, 69, Cu 70. The electromagnet 69 consequently attracts its armature 84, which is disengaged from 83, so that the shaft, together with its drums, can complete its rotation until the pawl 250 engages with the notch 240 of drum 12. During this slight motion the contact-piece 89 has passed beyond the spring-contact 90, and the circuit is consequently broken.

I have shown at Figs. 16 to 19 various arrangements of transmission devices which may be employed in addition to those described in my aforesaid application for Letters Patent.

As will be seen from the above description, it suffices for transmitting a signal and printing a certain character to send into the line-wire a certain number of successive currents (five in the case of the apparatus described.) Fig. 16 shows a simple key constituted by a hand-lever 93, connected to the line-wire, which by a simple lateral motion can be put in communication either with the contact 94, which has the effect of sending a positive current into the line, or contact 95, which sends a negative current. Fig. 17 shows a double Morse key with two currents, whereby on

pressing upon the key 96 a positive current is sent into the line, while on pressing on the key 97 a negative current is sent. Fig. 18 shows the Baudot transmitter, which can also be used for this apparatus, dispensing with all devices having the object to effect synchronism. The contact-brush 98 puts successively through the medium of the contact-plates 100 to 104 each of the keys 105 to 109 in contact with the line-wire connected to the plate 99. The raised keys thus send into the line-wire a positive current and the closed keys a negative current.

Fig. 19 shows a new arrangement of special key which is similar to one of the keys of the special keyboard described in my said previous application, but which acts in a more simple manner. It consists of a lever 110, pivoted at 111 and actuated by the key 112, this lever being connected to the line-wire. Five contact-pieces 117 to 121 are arranged in an arc corresponding to that described by the free end of the lever 110. This end of the lever carries a spring-arm 114, which has at its upper side an insulating-piece 115 and at its under side a metallic contact-piece of a double battery, according to the order in which the successive currents should be sent for producing a certain signal. In depressing the key 112 the surface 115 rubs upon the several contact-plates, but no current is sent, as 115 is of insulating material. On the other hand, when 112 is at the end of its travel and it is let go the spring 113 brings it back to its original position and during this time the contact 116 passes successively over the contact-plates and puts them one after the other in communication with the line-wire through the axis 111.

It is to be observed that without increasing the number of the drums in the above-described apparatus it is possible to double or treble the number of characters that can be printed by the type-wheel either by mounting in the spaces between the type characters a different set of type, the impression of which is obtained by a slight rotation of the type-wheel upon its axis, as in the Hughes apparatus, or by mounting two type-wheels side by side and by displacing laterally either the type-wheels or the paper strip, so as to bring the one or the other type-wheel into action.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. In an electric printing-telegraph apparatus wherein a certain number of successive currents of different sign are received by an electromagnet device adapted to control the registration or failure of registration of the current sent, according to its sign, each registered current being made to rotate a shaft carrying the type-wheel through a certain angle determined by the order of arrival of the said current, a registering mechanism consisting of a number of drums, of which the first is fixed upon the shaft of the type-wheel while the others are loose thereon, means for coupling all the drums together, means for uncoupling any two contiguous drums, a device whereby each drum, when uncoupled from the next in advance thereto, can turn through a certain angle relatively thereto, such angle being different for each consecutive drum, substantially as described.

2. In an electric printing-telegraph apparatus, a receiving mechanism consisting of a shaft carrying a type-wheel, a series of drums on said shaft of which only the first one is fixed to the shaft, the others being loose thereon but all being coupled together firstly by a stud on the one drum engaged in a peripheral slot in the contiguous drum such slots being of different lengths so as to allow a different amount of relative motion between each two contiguous drums, and secondly by a locking-tongue on the one drum engaged by spring action in a slot in the contiguous drum, so as to prevent relative motion between the two, and means actuated by electric currents for retracting said tongue from said slot so as to allow of said relative motion between the drums, substantially as and for the purpose described.

3. In an electric printing-telegraph apparatus, a receiving mechanism consisting of a shaft carrying a type-wheel, a series of drums on said shaft of which only the first one is fixed to the shaft, the others being loose thereon but all being coupled together firstly by a stud on the one drum engaged in a peripheral slot in the contiguous drum such slots being of different lengths so as to allow a different amount of relative motion between each two contiguous drums, and secondly by a locking-tongue on the one drum engaged by spring action in a slot in the contiguous drum, so as to prevent relative motion between the two, the said slots of different lengths being proportioned to each other as the successive powers of the numeral 2, so that the rotation of one or more drums has the effect of allowing the shaft and type-wheel to assume the different positions required for bringing one of the type characters in front of the paper strip traveling in front of it, substantially as described.

4. In an electric printing-telegraph apparatus, a receiving mechanism consisting of a shaft carrying a type-wheel, a series of drums on said shaft of which only the first one is fixed to the shaft, the others being loose thereon but all being coupled together firstly by a stud on the one drum engaged in a peripheral slot in the contiguous drum, such slots being of different lengths so as to allow a different amount of relative motion between each two contiguous drums, and secondly by a locking-tongue on the one drum engaged by spring action in a slot in the contiguous drum, so as to prevent relative motion between the two, and means for causing the type-wheel to be displaced laterally or transversely relatively to the paper strip, or the latter to be so dis-

placed relatively to the type-wheel, for the purpose of doubling or tripling the number of positions which the type-wheel can assume, substantially as described.

5. In an electric printing-telegraph apparatus, a receiving mechanism consisting of a shaft carrying a type-wheel, a series of drums on said shaft of which only the first one is fixed to the shaft, the others being loose thereon but all being coupled together firstly by a stud on the one drum engaged in a peripheral slot in the contiguous drum such slots being of different lengths so as to allow a different amount of relative motion between each two contiguous drums, and secondly by a locking-tongue on the one drum engaged by spring action in a slot in the contiguous drum, so as to prevent relative motion between the two, and electromagnets controlling the said drums, connected successively with a local battery by means of a contact-arm actuated by an incomplete ratchet-wheel, such connection being effected by means of a relay receiving currents from the line-wire and adapted on the one hand to transmit or not transmit the line-currents to the electromagnets according as the currents are positive or negative, but on the other hand to transmit the local current of whatever sign to the electromagnet that actuates the said incomplete ratchet-wheel, substantially as described.

6. In an electric printing-telegraph apparatus, a receiving mechanism consisting of a shaft carrying a type-wheel, a series of drums on said shaft of which only the first one is fixed to the shaft, the others being loose thereon but all being coupled together firstly by a stud on the one drum engaged in a peripheral slot in the contiguous drum such slots being of different lengths so as to allow a different amount of relative motion between each two contiguous drums, and secondly by a locking-tongue on the one drum engaged by spring action in a slot in the contiguous drum, so as to prevent relative motion between the two, and means for resetting the type-wheel mechanism to zero, consisting of a special drum connected to the type-wheel shaft by a helical spring which is wound up by the rotation of the shaft when this is brought into position for printing a type character, such spring being unwound again when a special electromagnet allows of the rotation of the special drum, and means for preventing the rotation of the type-wheel shaft until the unwinding of said spring is completed and said drum has effected the recoupling of all the other drums, substantially as described.

7. In an electric printing-telegraph apparatus, a receiving mechanism consisting of a shaft carrying a type-wheel, a series of drums on said shaft of which only the first one is fixed to the shaft, the others being loose thereon but all being coupled together firstly by a stud on the one drum engaged in a peripheral slot in the contiguous drum such slots being of different lengths so as to allow a different amount of relative motion between each two contiguous drums, and secondly by a locking-tongue on the one drum engaged by spring action in a slot in the contiguous drum, so as to prevent relative motion between the two, and differential gear driven by the clockwork mechanism and adapted to drive both the type-wheel shaft and an auxiliary shaft substantially as described.

8. In an electric printing-telegraph apparatus, a receiving mechanism consisting of a shaft carrying a type-wheel, a series of drums on said shaft of which only the first one is fixed to the shaft, the others being loose thereon but all being coupled together firstly by a stud on the one drum engaged in a peripheral slot in the contiguous drum such slots being of different lengths so as to allow a different amount of relative motion between each two contiguous drums, and secondly by a locking-tongue on the one drum engaged by spring action in a slot in the contiguous drum, so as to prevent relative motion between the two, and a regulating device constructed as a differential mechanism and driven by the clockwork, one of the wheels of said regulator being connected to a fixed part of the apparatus by a helical spring by means of which the force of the clockwork can be stored and which deadens shocks resulting from the stoppage of the mechanism, substantially as described.

9. In an electric printing-telegraph apparatus, a receiving mechanism consisting of a shaft carrying a type-wheel, a series of drums on said shaft of which only the first one is fixed to the shaft, the others being loose thereon but all being coupled together firstly by a stud on the one drum engaged in a peripheral slot in the contiguous drum such slots being of different lengths so as to allow a different amount of relative motion between each two contiguous drums, and secondly by a locking-tongue on the one drum engaged by spring action in a slot in the contiguous drum, so as to prevent relative motion between the two, and a transmitting device consisting of a lever connected to a finger-key and having a spring-arm one side of which is of insulating material while the other side is of conducting material, and a series of contact rods or plates connected with the poles of a battery, over which plates the spring-arm of the lever passes the insulating-surface of the arm being made to rub on said contact rods or plates when the lever is turned in one direction by the depression of the key, while on releasing the key, the lever is brought back to its original position by a spring and the conducting-surface of the spring-arm in rubbing over the contact rods or plates, causes successive currents to be sent into the line-wire, which is connected to the pivot of the key-lever, substantially as described.

10. In an electric printing-telegraph apparatus, a receiving mechanism consisting of a shaft carrying a type-wheel, a series of drums

on said shaft of which only the first one is fixed to the shaft, the others being loose thereon but all being coupled together firstly by a stud on the one drum engaged in a peripheral slot in the contiguous drum such slots being of different lengths so as to allow a different amount of relative motion between each two contiguous drums, and secondly by a locking-tongue on the one drum engaged by spring action in a slot in the contiguous drum, so as to prevent relative motion between the two, and means actuated by electric currents for retracting said tongue from said slot so as to allow of said relative motion between the drums, and a key-transmitting device adapted to convey consecutive currents to the means for actuating said locking-tongues, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HENRY CASEVITZ.

Witnesses:
MARCEL ARMENGAUD, Jeune,
AUGUSTUS E. INGRAM.