(No Model.) 2 Sheets—Sheet 1.

F. B. HERZOG & S. S. WHEELER.

ELECTRIC SIGNALING APPARATUS.

No. 573,221. Patented Dec. 15, 1896.

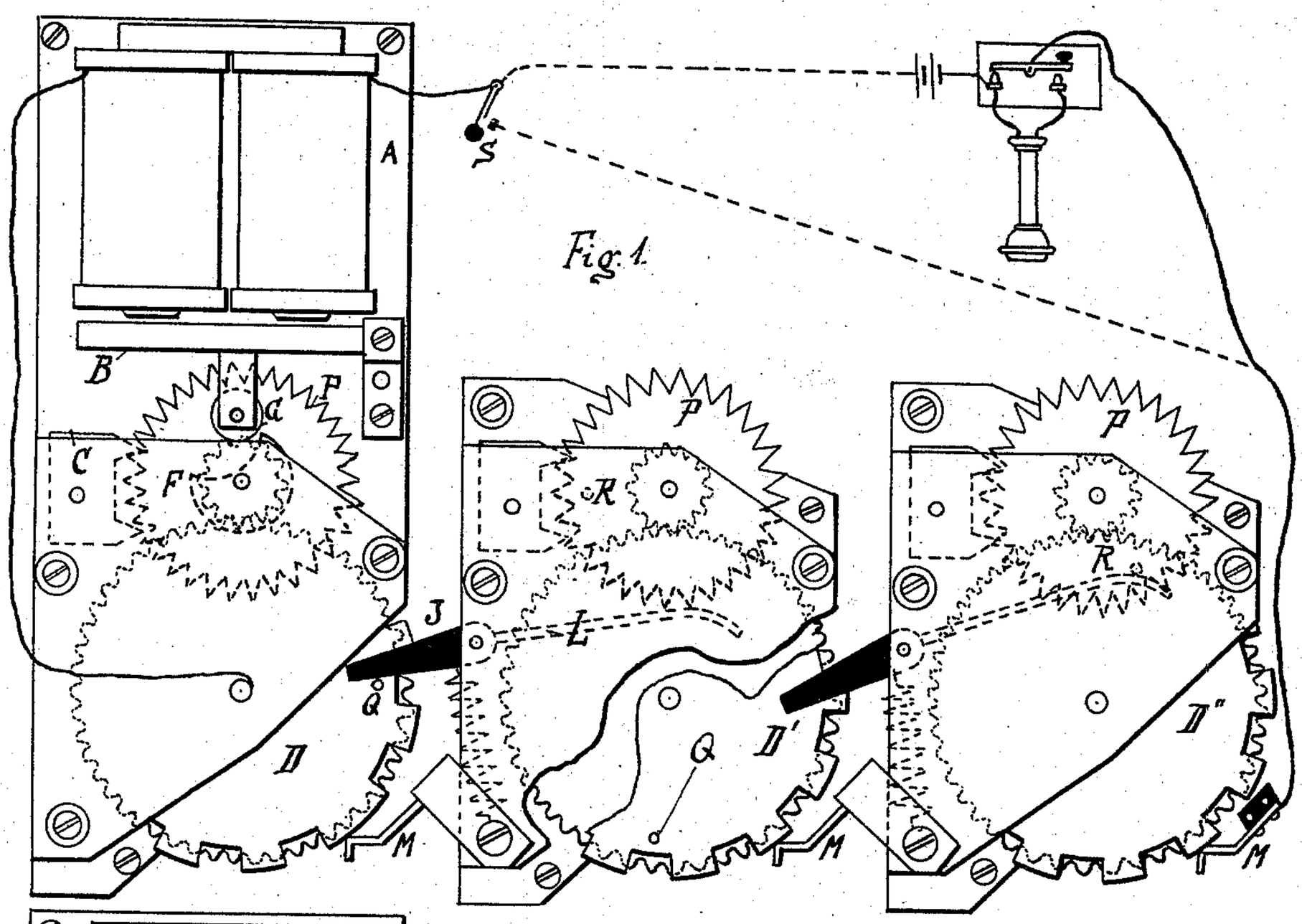

Fig. 1.

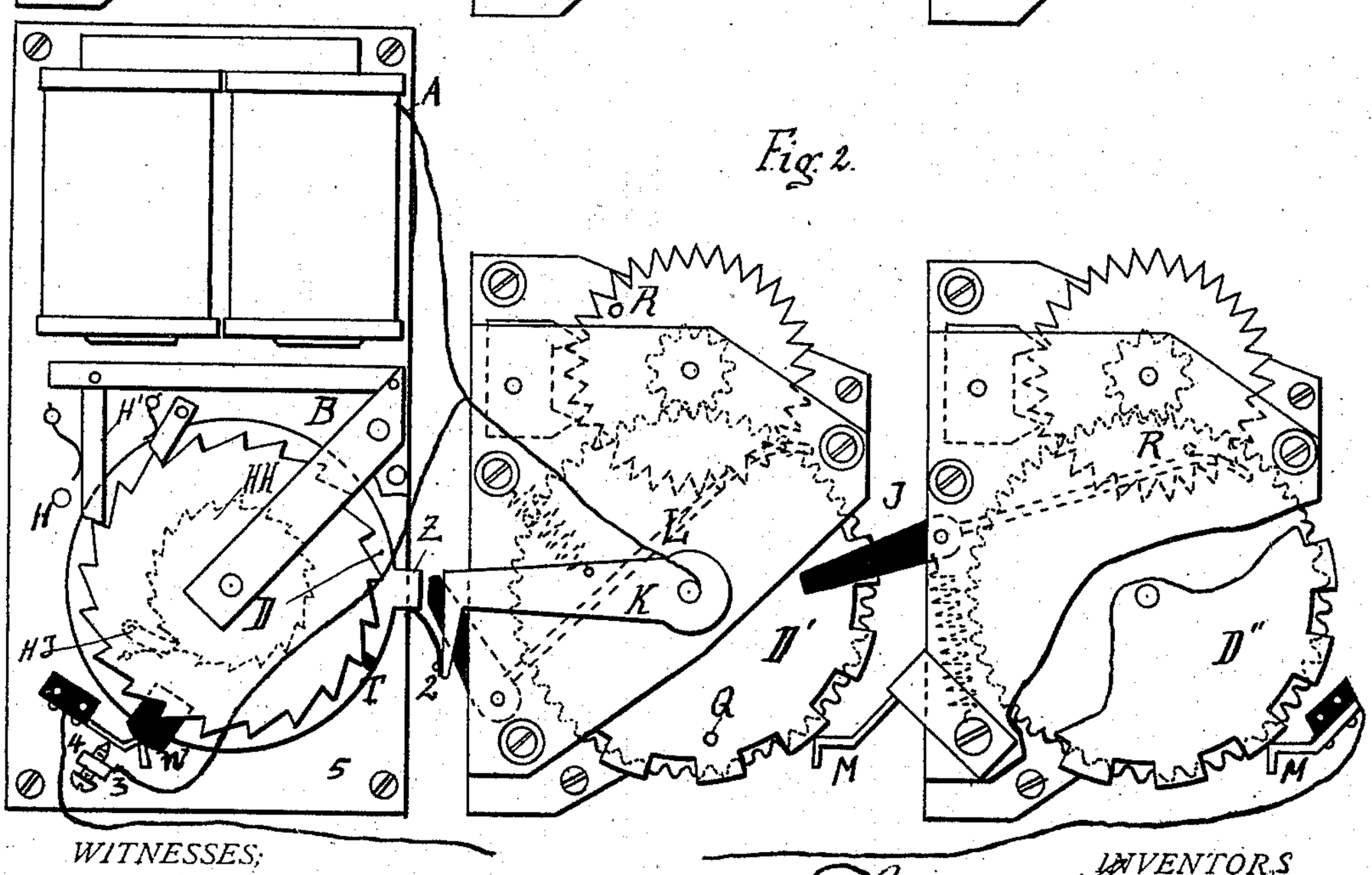

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 1a.

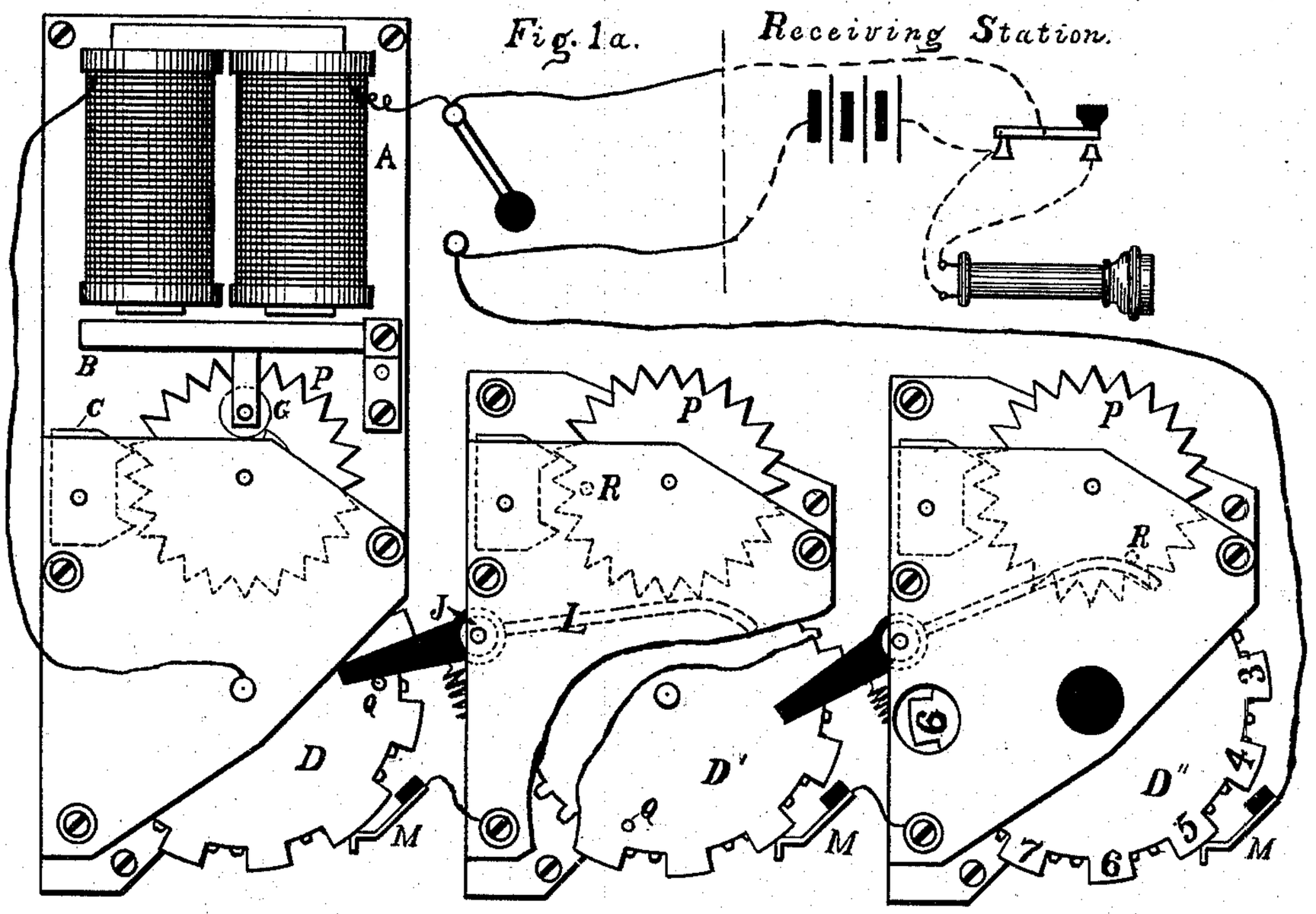


Fig. 1b.

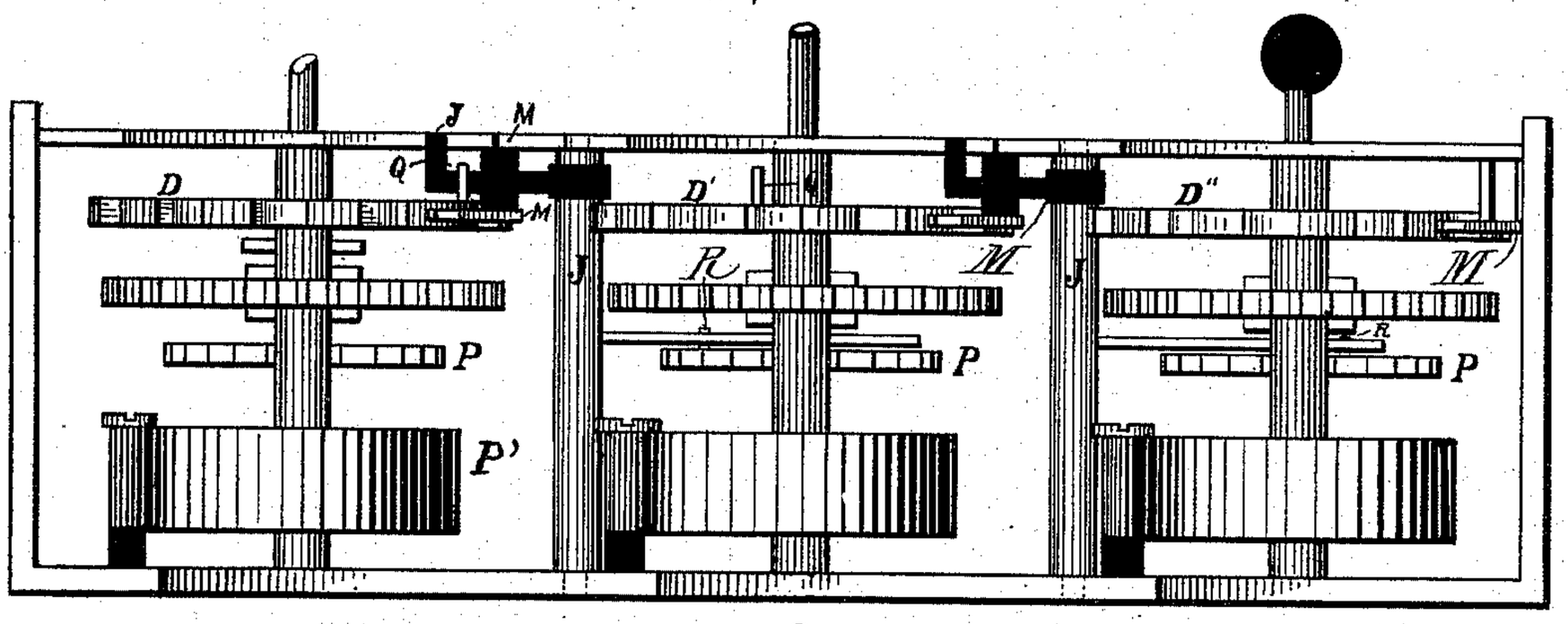
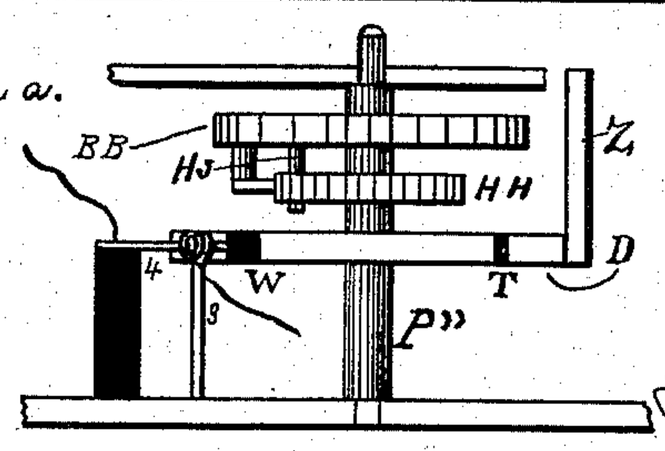


Fig. 2a.



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UNITED STATES PATENT OFFICE.

FELIX BENEDICT HERZOG AND SCHUYLER SKAATS WHEELER, OF NEW YORK, N. Y.; SAID WHEELER ASSIGNOR TO SAID HERZOG.

ELECTRIC SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 573,221, dated December 15, 1896.

Application filed January 25, 1886. Serial No. 189,665. (No model.)

To all whom it may concern:

Be it known that we, FELIX BENEDICT HERZOG and SCHUYLER SKAATS WHEELER, citizens of the United States, and residents of the city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Signaling Apparatus, (Case No. 26,) of which the following is a specification.

Our invention relates generally to electric signaling apparatus; and its object is to construct such signaling apparatus as will be capable of transmitting a number of separately variable signals at one transmission; to combine in one apparatus "impulse" and "spring-actuated" forms of the latent-signal transmitter invented by F. Benedict Herzog, types of which are shown in Patents No. 289,834, of December 11, 1883, and No. 292,115, of January 15, 1884, issued to him, and also a further object is to improve various details in signaling apparatus.

To this end our invention, generally stated, consists in constructing new forms of movement for signaling apparatus generally, and for so combining several such separate mechanisms with controlling mechanisms for causing one at the completion of its signal to begin to operate the other, as will be hereinafter set forth, and also various devices, details, arrangements, and combinations herein set forth.

Figure 1 represents generally a signal-transmitting mechanism capable of being set so as to transmit any signal from one to nine hundred and ninety-nine; Fig. 1ª, the same, showing more detail; Fig 1ᵇ, an elevation thereof; Fig. 2, a modification thereof; Fig. 2ᵇ, an elevation of the first portion or "movement" of the same.

In Fig. 1, A is a magnet operating armature B, and P is a movement substantially the same in each of the parts shown. It consists of an ordinary two or three wheel train of gearing, with the addition of a cam F on one of the spindles (preferably that of the scape-wheel) in the first movement. The main arbors of all of the movements bear break-wheels rigidly fastened thereto, which wheels are divided into a number of teeth, one of the teeth preferably being larger than the others. There is also a pin Q so placed that when the movement is in its normal condition of rest this pin will act upon the end J of the lever L in such a manner as to cause this to fall out of the range of pin R on the scape-wheel of the succeeding movement. Bearing upon the initial or large tooth is the contact-brush M, connected with the succeeding movement and insulated from the first excepting when its point makes contact. The last brush of the series is insulated from all of the mechanism excepting where its point touches the teeth of D'''. Fixed to the armature B is a projection fitting into the depression of cam F in such a manner as to offer as little friction as possible, the roller G serving for that purpose. The second movement of Figs. 1 and 1ª shows the front frame and the break-wheel broken away so as to show the gear-wheel.

The mode of operation is then as follows: The setting operator by means of a knob, crank, or pointer (not shown except in Figs. 1ª and 2ª) turns the arbor of the first train to the right against stress of spring P' until, by a suitable designating or indicating device, (such as a numbered disk coöperating with a pointer, or a pointer coöperating with a fixed dial, or numbers on the different teeth and means whereby but one number is exposed at a time, as shown in Fig. 1ª,) he turns the arbor a fraction of a revolution corresponding to the number of teeth that would have passed under the contact-brush M during such revolution, which number is indicated by the proper numeral designated. If the signal which he wishes to transmit is to consist of one digit only, the operation is performed. If it is to consist of two or more digits, the same operation is repeated with as many successive trains as there are digits to be transmitted, the number of these being unlimited. If the instrument is to be used as a "direct-signaling" instrument, the sending operator must, after having set the signal as before indicated, release the train by holding up the armature of the first movement, or, if this is dispensed with, (as can be done,) by removing a detent of some kind from the escapement of the first train; but if the movement is to be used as a "latent-signal" transmitter, as is the case with the connections made as shown in the drawings, the operator has nothing further to do. When the circuit is closed at the receiving-station,

the magnet A will become energized and attract the armature B, thus drawing the lug and roller G out of engagement with the cam and freeing the escape-wheel. As the train unwinds the circuit will be broken each time that a space on the periphery of the break-wheel passes under the contact-brush M, thus transmitting a number of impulses equal to the number of indications to which the break-wheel indicator has been set from its normal position. When the wheel in its revolution brings the initial tooth into contact with brush M, it can unwind no further, but just before this point it slightly moves pin Q, so that this raises the end J of the lever L, (until its end strikes the edge of the front plate, as shown,) depressing the other end L, which has until now served as a detent for some suitable part, such as the pin R on the scape-wheel of the next movement. The operation of these shifting devices permits this next movement to operate in the same manner as the first, (in case that it has been set,) and thus the operation continues with each successive train. It will be noticed that in the form shown the movements run down in the order, hundreds, tens, and units. The same instrument can be made to serve as a latent-signal instrument or as a direct-signal instrument by the addition of switching mechanism S, whereby, if the circuit be normally in a closed condition with a current in line, the operation of this switch will cut in the instrument after it has been properly set, the switch being so placed for the purpose of enabling the setting to be done without sending impulses along the line caused by the operation of setting.

Fig. 2 is a modification of the form first shown, in which, in addition to features before set forth, there is a combination of an arbitrary or fixed signal for each box, together with a multiple transmitter, as shown above, and also a combination in one instrument of transmitting mechanism which is in part actuated after the manner of the impulse or motor actuated transmitter shown in Patent No. 292,115, and in part by the well-known spring-actuated train. Magnet A, when repeatedly energized and deënergized, will attract armature B, and thus, in connection with pawl H′, limited in its motion by the stop H and the locking-click shown, will operate to turn the wheel BB step by step. On the same shaft with the wheel BB is a disk which has a projection Z, and also on its periphery an insulated spot T and a larger insulated spot W, projecting beyond the periphery. The other trains shown are same as those described in Figs 1, 1^a, and 1^b, with the exception that in the first one there is mounted upon the arbor the arm K, bent at the end, as shown, which has fastened to its extreme point a spring 2, the upper end of which spring is free, except as it engages with the projecting point Z of the circuit-wheel during the first stage of its movement.

The mode of operation is as follows: To set the first digit which the operator desires to send, he turns the knob or equivalent of the second, (*i. e.*, the first of the spring-actuated movements,) as described in connection with Fig. 1, but by so doing he at the same time, without any extra labor on his part, puts the apparatus in condition to transmit the arbitrary signal to designate to the receiving operator which one of a series of similar boxes in circuit is being employed. This is done by the action of arm K and lug Z on the under wheel of the first movement. A loose spring 2, fixed to the free end of K, catches the lug and revolves this out of its normal position far enough to permit the spring 2 to disengage itself and pass beyond as far as the arm may be turned. This short engagement between 2 and Z rotates the lower wheel on the first movement sufficiently to permit spring 4 to fall off of the insulation W, fall upon the metal periphery of the wheel, break with its former contact-point 3, and thereby throw the magnet into circuit. From this point the rest of the operation of the transmitting operator is the same as before, but the action of the receiving apparatus or operator is determined by the character of the apparatus at the central station and also by the fact whether the transmitting instrument is used as a direct or as a latent signal. If used as a latent-signal instrument on a closed circuit, in which the fact of the setting of any instrument on that circuit is announced to the receiving operator by the operation of suitable receiving mechanism which, coincident with the signal announcing the setting of the instrument, also renders all future disturbance impossible in that circuit without further action on the part of the receiving operator, because the line is permanently broken, (as is the case in several pending applications of said Herzog, *e. g.*, case filed September 29, 1894,) or if the condition of the magnet of the transmitting instrument is such that the normal condition of current in line will not operate it, the setting operator can proceed to set his apparatus as indicated above. This he can also do if there is normally no current in line; but if none of the above conditions exist then some provision, such, for instance, as that of the switch S, (shown in Fig. 1,) must be used, so that the main circuit is not broken until the whole apparatus has been set ready to transmit the entire signal. The specific organizations suggested above are not herein shown in detail, as they form no part of the present invention. The receiving operator when he is ready to release, actuate, or cause the instrument to operate closes the circuit at his end or cuts out a resistance, (the circuit and apparatus being as shown and described with Fig. 1.) In either case this action of his causes an attraction of armature B, which remains attracted until he restores the circuit to its normal condition, and thereby permits the armature to fall back, and thus causes it

to turn the wheels D and 5 a step. There are as many teeth on the periphery of wheel D as may be desired, the number of teeth, however, being the same in all of the instruments on the circuit. The receiving operator continues to send impulses along line, as before described, until in the course of the revolution of the wheels insulated point T is brought under the contact-brush 4, and inasmuch as the wheel is moved at the back stroke of the armature the recoil of the armature forces this insulating-point under and then out beyond the brush, the resultant break not affecting the transmitter-magnet, (see Patent No. 292,115,) although inasmuch as it cuts out the resistance of its own magnet this change in the total circuit-resistance is easily recognized by some equivalent of the receiver shown in the before-mentioned Patent No. 292,115. The operator then continues the impulses until the total number is equal to the number of teeth required to give one complete revolution to the wheels, and thus brings brush 4 back to its normal position, as hereinafter described. The operator is informed of the particular box in series by the number of steps which are required to bring this point T under the brush, and thereby break the circuit, this number being different for every box in series. There are various other ways described in other applications whereby he can distinguish which of a number of similar impulse-actuated transmitters in series is being employed, the means, generally stated, being as shown in above-mentioned Patent No. 292,115 and, as here applied, consisting of the high-resistance telephone, (shown,) which is normally out of circuit, but may be introduced whenever the key breaks the shunt, and during this period the current differentiations produced at the transmitter would be distinguished as clicks of different intensity. After he has brought the wheel round a complete revolution the brush 4 will be forced up into its normal condition, as shown, thus cutting out the magnet, and this step also throws the next train into movement by the action of the lug on lever L in connection with the pin Q. The successive trains are then operated as there described.

It will be seen that the above description embraces several features which for many purposes can be used independently of the others, and therefore we do not wish to limit ourselves to the use of all of them together.

Various modifications will suggest themselves, and we wish it to be understood that we embrace such modifications.

We claim—

1. The combination substantially as described in a signal-transmitting instrument of two or more separately-variable transmitting mechanisms, each including a motor, together with shifting devices.

2. The combination substantially as described of separately-variable signal-transmitting mechanisms, each including a motor, together with shifting devices, and means whereby the operation of one transmitting mechanism brings into action the next transmitting mechanism.

3. The combination substantially as described in an electric signaling instrument of separately-driven and separately-variable signal-transmitting mechanisms, each provided with a detent, and all except the last, provided with a shifting device.

4. The combination substantially as described in an electric signaling instrument of a transmitting mechanism which transmits a portion of the whole signal that can be transmitted by the instrument, another signal-transmitting mechanism, which transmits another portion of the signal, a separate motor for each, shifting devices between the two and a magnet controlling the operation of the whole.

5. The combination substantially as described in an electric signaling instrument of a normally-inoperative characteristic signal-transmitter controlled by one motor device, and a separate variable signal-transmitter, controlled by a second motor device.

6. The combination, in a signal-transmitting instrument, of several variable transmitting mechanisms, each including a motor; together with shifting devices, the whole being organized so that one, several, or all, of the movements may be operated, as desired.

7. The combination in a signal-transmitting instrument of two or more separately-variable transmitting mechanisms, each including a motor, together with shifting devices; each mechanism and its transmitting element being so adjusted with relation to the shifting devices that the time from the beginning of its operation until it shifts in the next mechanism varies according to the signal transmitted.

8. The combination in the signal-transmitting instrument of two or more separate transmitting mechanisms each including a motor and a shifting device whereby the first mechanism operated controls the next.

9. The combination in a signal-transmitting instrument of two or more separate transmitting mechanisms each including a motor and a shifting device on each prior operating mechanism and a detent on each subsequently-operating mechanism; said detent mechanically releasing the subsequently-operated mechanism on the completion of the signal transmitted by the one operating ahead of it.

Signed at New York, in the county of New York and State of New York, this 22d day of January, A. D. 1886.

F. BENEDICT HERZOG.
SCHUYLER SKAATS WHEELER.

Witnesses:
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