(No Model.) 2 Sheets—Sheet 1.

A. DUPPLER.

ELECTRICAL SELECTING INSTRUMENT.

No. 566,896. Patented Sept. 1, 1896.

Fig. 1.

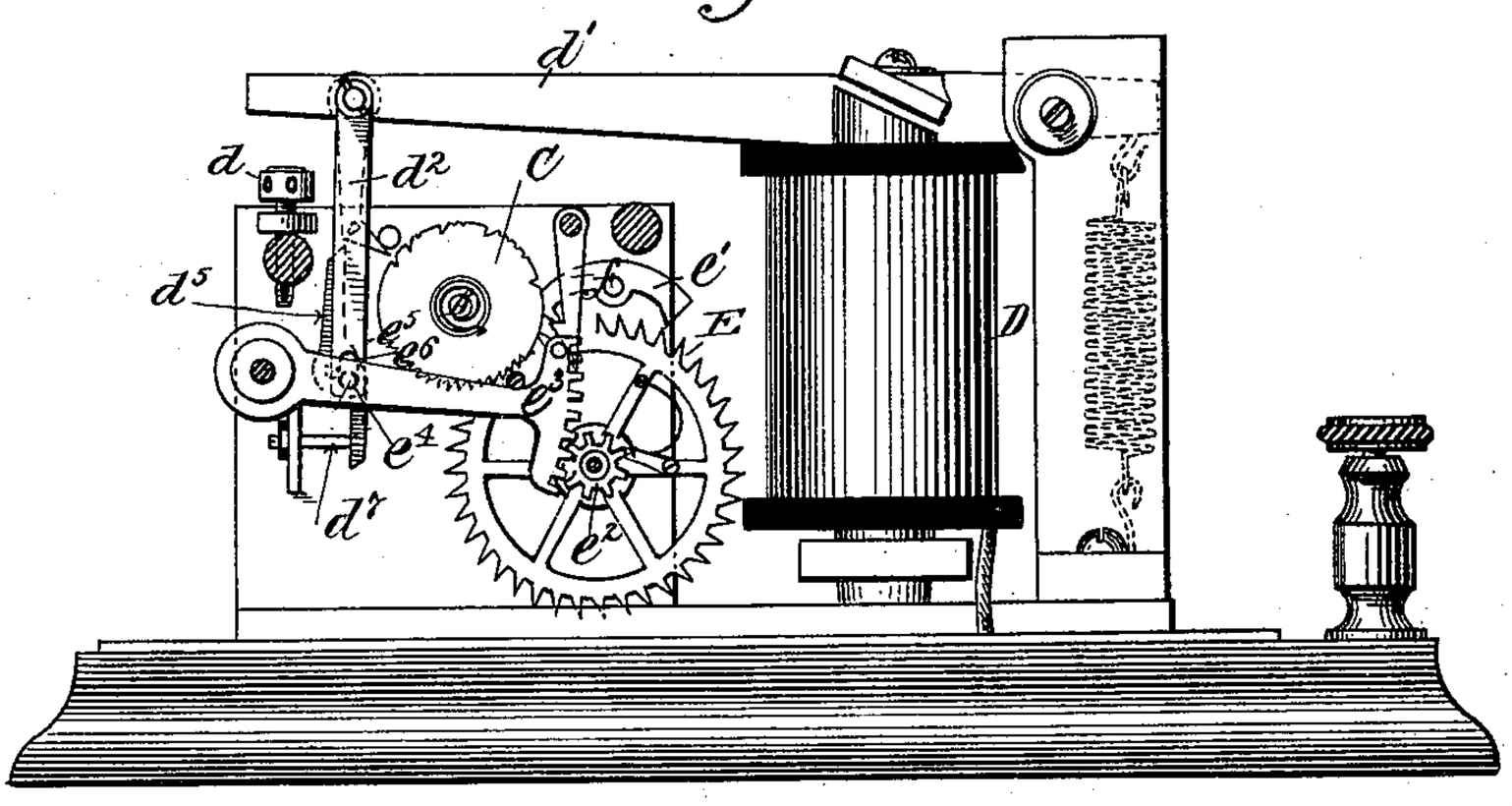


Fig. 2.

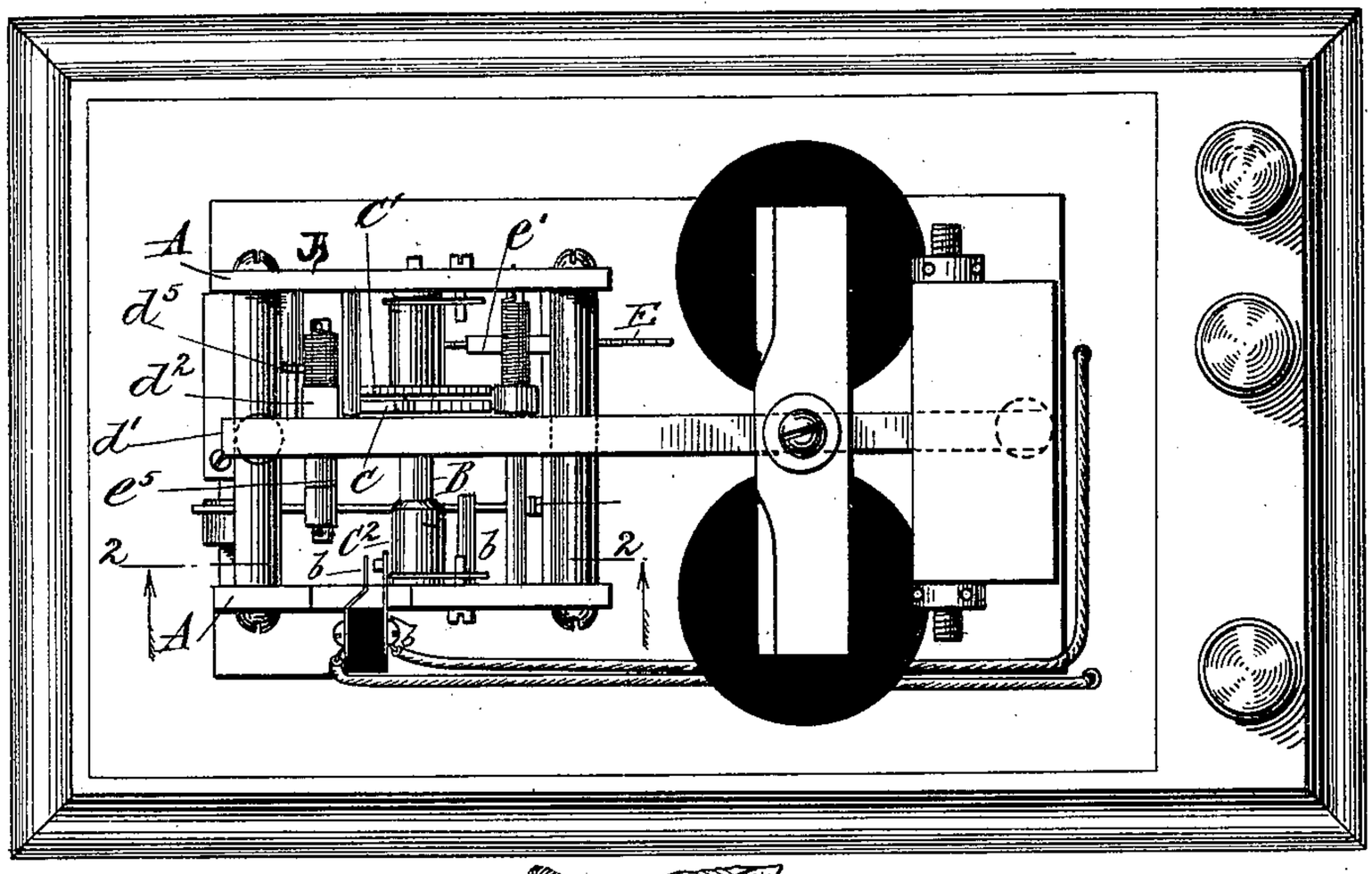
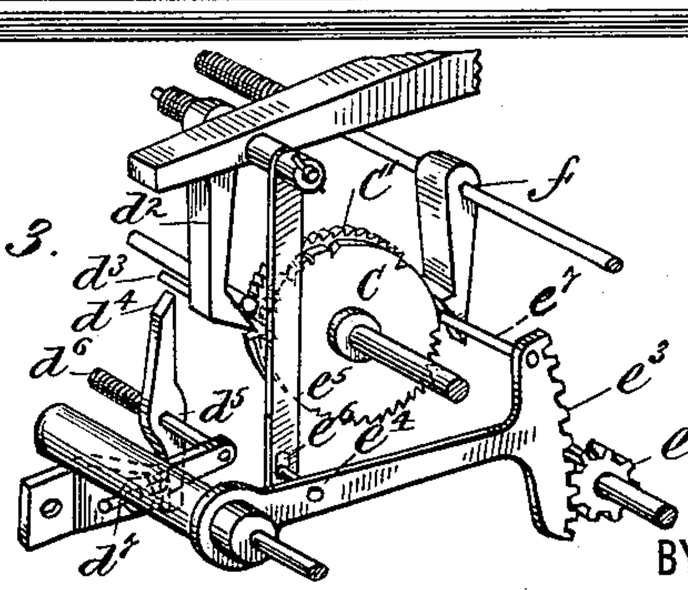


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

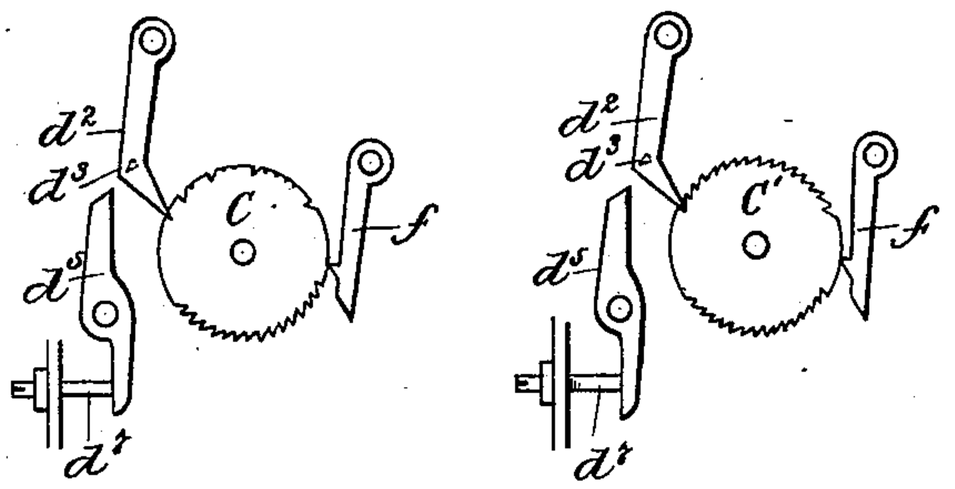


Fig. 5.

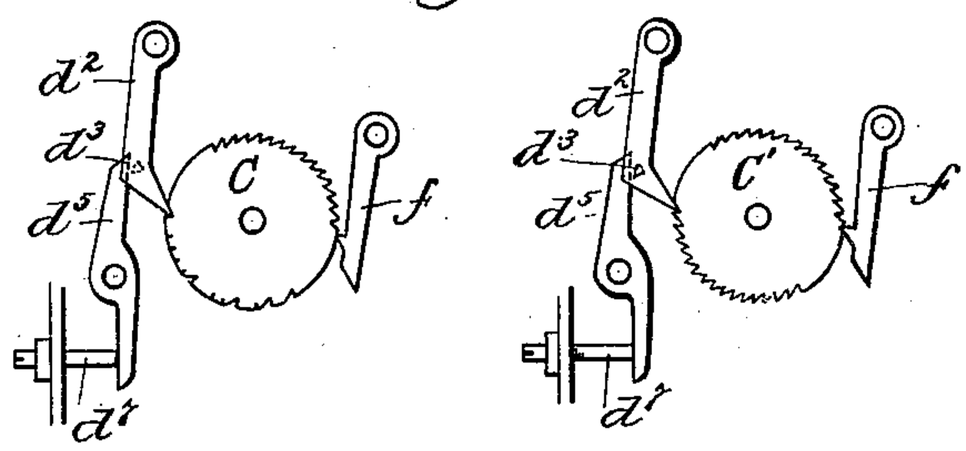


Fig. 8.

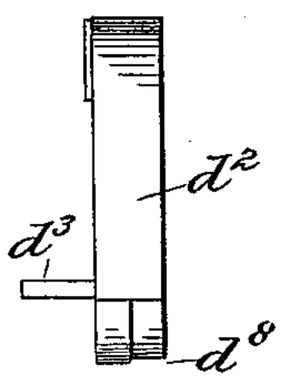


Fig. 6.

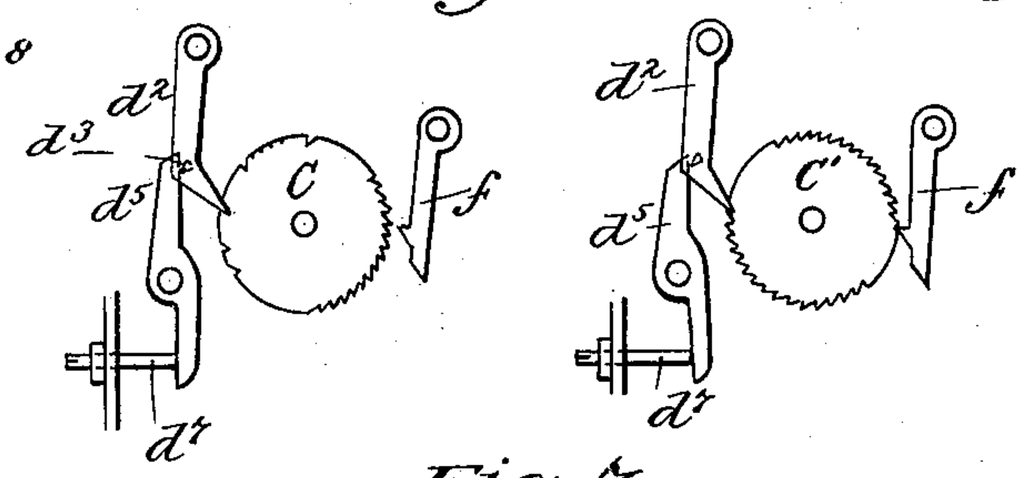


Fig. 9.

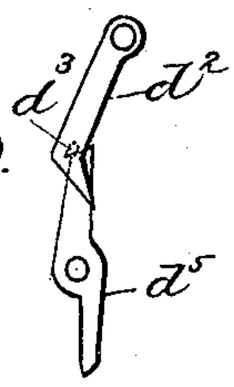
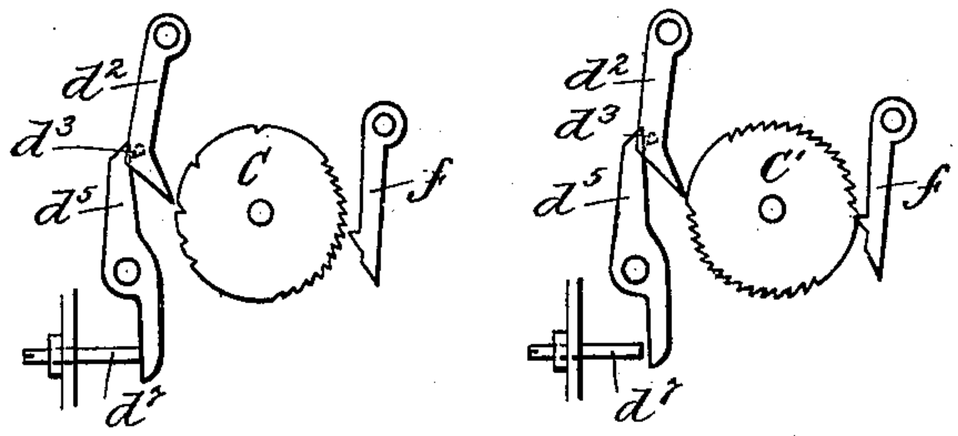


Fig. 7.



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BY Price & Steuart

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UNITED STATES PATENT OFFICE.

ANTON DUPPLER, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO THE ELECTRIC SELECTOR AND SIGNAL COMPANY, OF WEST VIRGINIA.

ELECTRICAL SELECTING INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 566,896, dated September 1, 1896.

Application filed February 12, 1895. Serial No. 538,076. (No model.)

To all whom it may concern:

Be it known that I, ANTON DUPPLER, of Jersey City, Hudson county, New Jersey, have invented certain new and useful Improvements in Electrical Selecting Instruments, of which the following is a full specification.

The accompanying drawings illustrate the invention, of which—

Figure 1 is a side view of the instrument with one of its supporting-walls removed, taken on line 2 2, Fig. 2, looking in the direction of the arrows; Fig. 2, a top or plane view of the instrument; Fig. 3, a perspective view of the operating parts of the instrument. Figs. 4, 5, 6, and 7 are views of the combination-wheel and guardian-wheel in different positions, illustrating the operation of the instrument when operated by a true combination and also when a false combination is attempted. Fig. 8 is a view of the actuating-pawl, showing its operating edge shorter as applied to the combination-wheel than on the guardian-wheel; Fig. 9, a view showing the inclined plane with projection on pawl riding thereon.

The standards or side walls A are erected upon a suitable base and support the operating mechanism of the selector.

Upon a shaft B, suitably journaled in the frame, is mounted the combination-wheel C. This shaft is provided with a spring, which may be coiled and placed within the drum c^2, which exerts its tension against the impelling-pawls and restores the selector to zero at the proper time. The entire combination is cut mechanically on the periphery of this wheel and is represented thereon by deep and shallow notches, whose purpose will be more fully explained hereinafter, and when the true and correct combination of impulses is received by this selector from a transmitter the entire combination may be worked out upon this single wheel, the instrument brought to the end of its phase by a current in a single direction transmitted through the coils of a single magnet actuating a single armature-lever, or the same operation may be performed by hand.

D is an electromagnet of the usual form, d' an armature-lever, and d^2 a pawl pivoted to the lever to coöperate with the combination-wheel and impel it to work out the phase of the instrument. The pawl is provided with the usual spring, whose tension is exerted to hold the actuating or free end of the pawl against the periphery of the wheel. It is also provided with a projection d^3, which slides upon the inclined plane d^4 and throws the pawl out of contact with the wheel at proper times, thus preventing impulses from the transmitter, which actuate the armature of the electromagnet, from turning the wheel, as will be more fully explained hereinafter. In this connection there is a retarding device connected with the instrument and a provision for lost motion which comes into play and performs functions which assist in the proper working out of the phase of the instrument.

The retarding device consists of the ratchet-wheel E and anchor e', connected by means of pinion e^2, rack e^3, pin e^4, and arm c^5 with the armature-lever d', and serves at the proper time to retard the movement of the lever. The arm e^5 is slotted, as shown at e^6, and within this slot the pin e^4 on the rack-arm enters and plays therein sufficiently to accomplish its purpose.

Returning to the inclined plane d^4 and the projection d^3 on the operating-pawl d^2 it will be seen that these devices are adjusted with each other in a way to secure proper coöperation, which may be explained as follows: The inclined plane is pivoted at d^5. Its spring d^6 draws the upper end inwardly until stopped by the set-screw d^7, where it remains held. It may have a slight movement outwardly at the top, but when such movement is made it returns again to its set position. When the armature-lever is up to the limit of its backward stroke, the parts are in the position shown in Figs. 1 and 3, with the projection d^3 above the upper end of the inclined plane. When the armature-lever descends, this pawl passes inside of the inclined plane to propel the wheel, or outside to slide upon the plane, throw out the pawl, prevent it from impelling the wheel, and leave it standing still, and these functions are effected by the position which the free end of the operating-pawl occupies to the combination on the wheel. As the combination is mechanically represented on this wheel by

deep and shallow notches in its periphery, the projection d^3 and inclined plane d^4 are so arranged with each other that when the end of the pawl is in a deep notch and descends its projection d^3 passes inside of the inclined plane, and the pawl propels the wheel; but if the pawl is in a shallow notch or on a space between the notches the projection will, in descending, pass outside, and, sliding down upon the inclined plane, throw the pawl out of contact with the wheel, provided that when it starts its descent the projection is above the end of the inclined plane. Hence upon this wheel the shallow notches are arranged close to each other, or a shallow notch is arranged closely behind a deep one, and the transmitted impulses which operate upon the shallow notches are given quickly to be sure that the pawl in returning to take hold of a shallow notch shall not return far enough to pass the end of the inclined plane, and thus may continue to work upon the shallow notches by reciprocating wholly inside of the inclined plane. Between a shallow notch and a deep one there is a space which allows the pawl to go farther back, and in this case, although the projection passes beyond the end of the inclined plane, yet in descending it will pass inside, owing to the deep notch, which allows the parts to escape. From this it will be seen that this single wheel may be operated to the end of its phase by the transmissions of impulses having long and short intervals between them and operating a single armature-lever.

On the shaft of the combination-wheel is placed a crank which turns with the wheel and controls a circuit by acting upon the brushes *b b* to open or close them, as the case may be, and when this occurs the selector has completed its phase and is ready to be returned to zero. There is also placed on the instrument a stop *d*, which limits the downward throw of the armature-lever, so that in each instrument the armature begins its return movement from a fixed position, being the end of its downward stroke. In the operation of the instrument an independent checking device is provided and the lost motion in the parts hereinbefore described performs its service.

Pivoted to a suitable part of the framework is the check-pawl *f*, with its spring to hold it against the wheel, and from the rack e^3 projects the pin e^7, which comes against the inner side of the pawl and throws it out when the armature-lever returns backwardly. When the armature is down, the check-pawl is always in place, checking the wheel, and the armature may return back to the distance traveled by the pin in the slot. Within this distance the armature may return to allow the actuating-pawl to take hold of a shallow tooth without passing the projection beyond the end of the inclined plane and thus reciprocate to work the wheel, but if the projection passes above and gets outside it may slide up and down in response to the impulses within the distance of the lost motion without throwing out the check-pawl, and thus leave the wheel standing still when once out. Should it go back far enough to pass within, it will either drop into a deep notch or else go back and throw out the check-pawls, releasing the wheel, whose spring returns it to zero.

In the construction of selecting instruments a trouble has been encountered which is known among skilled mechanics as "creeping over," that is to say, with instruments which work upon a combination and employ a current of a single polarity a combination may be worked out properly upon a selected instrument, and yet on lines where many impulses are transmitted some one of the other instruments may be set off by creeping over its course, and to prevent this I have combined with the combination-wheel another wheel. The two wheels are separately and independently mounted upon the shaft, have separate and independent movements forward and backward, but both are worked by the same armature-lever and the same actuating-pawl. They work together in unison so long as the proper combination is sent out, but when a false movement is given by the actuating device this second wheel advances while the other stands still, and coming to the end of its course first operates the devices which throw the combination-wheel back to the end of its course, thus preventing it from creeping over. This wheel is, therefore, a movable restoring device, and its function is to look after and protect the combination-wheel and prevent it from creeping over. It may therefore be called a "guardian" device or wheel.

Let us suppose that the entire combination of any instrument is represented by sixteen impulses. Hence within this combination there must be sixteen notches or their equivalent in notches and spaces, that is to say, if an impulse be represented by a given length on the periphery of the wheel, then on the combination-wheel there would be represented forty-four notches, or spaces and notches, as will be seen by viewing Figs. 4 and 5. First, there are sixteen of the forty-four parts taken up in the combination proper, which consist of deep and shallow notches separated by spaces of varying lengths. Such notches and spaces may be called the "members" of the combination. Then follows a space equal to six notches, then a ratchet of fifteen teeth, then a space equal to seven teeth, and the other wheel has the same arrangement with a slight variation. It begins with sixteen ratchets occupying the space of the combination on the other wheel. Then follows a space equal to six ratchets. Then follow fifteen ordinary ratchet-teeth and an additional sixteenth tooth, slightly indented and not so deep as the others, and then a space equal to six teeth, completing the full number of forty-four. The number of sixteen impulses, representing

the combination, is not arbitrary. There may be any number.

Both wheels are set upon the shaft in unison with each other and perform their functions as follows: If the true combination of impulses and spaces are transmitted for a given selector, both wheels start from the position shown in Fig. 4, with the pawl on the combination-wheel in a deep notch at the beginning of the combination and the other side of the pawl resting in a tooth on the guardian-wheel and the check-pawl resting on the space near the end and ready to drop into the notches on both wheels as soon as they are propelled. Both wheels work together, arriving at the end of the combination in the position shown in Fig. 5. At this point the circuit is closed or opened, as the case may be, and the work of the instrument performed, when it is only necessary to allow the armature to go back and lift the check-pawl to restore the instrument to zero; but in other instruments on the line a false impulse or space has been given during the operation of this instrument, and these are prevented from creeping over as follows: The actuating-pawl is cut out a little on the part which works the combination-wheel, as shown at d^8, Fig. 8, so that it is a little shorter than the other. At the same time the check-pawl is a little shorter on the combination-wheel than on the other. Now it is evident that when short impulses are transmitted with short spaces between them, where a long space ought to be made, the pawl may still travel inside of the inclined plane, part of it riding on the space on the combination-wheel without turning it, while the other side of the pawl would continue to turn the other wheel, which would advance out of its relative position with the combination-wheel, as illustrated in Fig. 6, which shows the guardian-wheel at the end of its course with its longer check-pawl in the shallow notch, leaving the check-pawl on the combination-wheel free from the notches. Now in this position the armature returns and on the guardian-wheel its pawl rides upon the space marked "6." This action throws out the actuating-pawl from the combination-wheel, and, as its check-pawl is already thrown out, leaves the combination-wheel in the position shown in Fig. 7, free to be returned to zero by its spring. Thus the combination-wheel can never be brought to the end of its phase unless the exact counterpart of its combination is transmitted, as the projection d^8 will either travel on the inclined plane d^4, leaving it standing still until returned by the backward throw of the armature, or else the guardian-wheel will be advanced ahead of the combination-wheel until it arrives at the point where its action, in coöperation with the actuating-pawl, will return the combination-wheel to starting-point.

When the combination-wheel has been returned to starting-point, as above described, and the actuating impulses from the transmitter have ceased, the armature is drawn back by its retractile spring and actuates the releasing devices, which restore the guardian-wheel to zero.

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

1. In a selecting instrument a movable phase-completing device adapted to respond to a fixed combination of electrical impulses from a transmitter, and provided with notches, in combination with an electromagnet, and its armature-lever, and provided with an actuating-pawl arranged to coact with the notches in the phase-completing device, means actuated by a false impulse to throw the pawl out of the notches and means for retaining the phase-completing device when the pawl is thrown out.

2. In a selecting instrument a movable phase-completing device adapted to respond to a fixed combination of electrical impulses received from a transmitter, and provided with a series of deep and shallow notches constituting a mechanical representation of the fixed combination of electrical impulses, separated by spaces differing in length, in combination with an electromagnet provided with an armature-lever responding to the impulses to thereby work out the combination, and means governed by the length of the pauses between the impulses to allow the armature-lever to reciprocate without impelling the phase-completing device when a false impulse is transmitted.

3. In a selecting instrument a movable phase-completing device adapted to respond to a fixed combination of electrical impulses received from a transmitter, and provided with a series of deep and shallow notches constituting a mechanical representation of a fixed combination of electrical impulses, the shallow notches separated from each other by a short space representing the pause between short impulses and the deep notches separated from the shallow ones and from each other by a longer space representing a longer pause between the impulses, means for working out the combination controlled by the length of the pauses between the impulses, and means for preventing the phase-completing device from turning when a pause of false length is made between two impulses.

4. In a selecting instrument a movable phase-completing device adapted to respond to a fixed combination of electrical impulses received from a transmitter and provided with a series of notches separated by spaces in combination with an actuating-pawl cooperating with the notches to impel the phase-completing device to the end of its course when the proper combination of impulses is transmitted, and to ride upon the spaces between the notches without impelling the phase-completing device when a false impulse

is transmitted, and means for retaining the wheel in position while the pawl is riding on one of the spaces.

5. In a selecting instrument a movable phase-completing device adapted to respond to a fixed combination of impulses received from a transmitter and provided with a series of notches separated by spaces, in combination with an actuating-pawl coöperating with the notches to impel the phase-completing device to the end of its course when the proper combination of impulses is transmitted, means for throwing the pawl out of the notches when a false impulse is transmitted, an inclined plane to receive a projection from the pawl and slide thereon when the pawl is thrown out, and means for retaining the phase-completing device in position while the pawl is sliding on the inclined plane.

6. In a selecting instrument a movable phase-completing device provided with a series of deep and shallow notches representing a mechanical combination composed of members, said members separated from each other by spaces differing in length, in combination with impelling mechanism therefor to coöperate with the notches and thereby impel the phase-completing device to the end of its course, said impelling mechanism having a fixed and limited advance movement and three backward movements, viz: a short one for a shallow notch, a longer one for a deep notch, and a still longer one to return the selector to zero.

7. In a selecting instrument a movable phase-completing device provided with a series of notches separated by spaces, and constituting a mechanical combination of members, in combination with a movable restoring device provided with a series of successive notches or teeth, each of said devices being separately and independently movable, and an actuating mechanism therefor common to both devices, means for holding the phase-completing device and advancing the restoring device when the actuating mechanism is out of a notch on the phase-completing device.

8. In a selecting instrument a movable phase-completing device provided with actuating mechanism therefor and devices for restoring the same to zero in combination with a movable guardian device independently mounted and actuating mechanism therefor, means for operating both devices in unison actuated by working out the proper combination, or the impelling mechanism means for operating the same out of unison when an improper combination is attempted, and thereby advancing the guardian device to actuate the restoring mechanism of the phase-completing device, and prevent it from completing its course.

Signed at New York, in the county of New York and State of New York, this 26th day of January, A. D. 1895.

ANTON DUPPLER.

Witnesses:
CHAS. W. THOMPSON,
F. P. VOORHEES.