(No Model.) 3 Sheets—Sheet 1.

A. LE BLANC.

ELECTRIC SELECTOR.

No. 566,915. Patented Sept. 1, 1896.

Fig. 1.

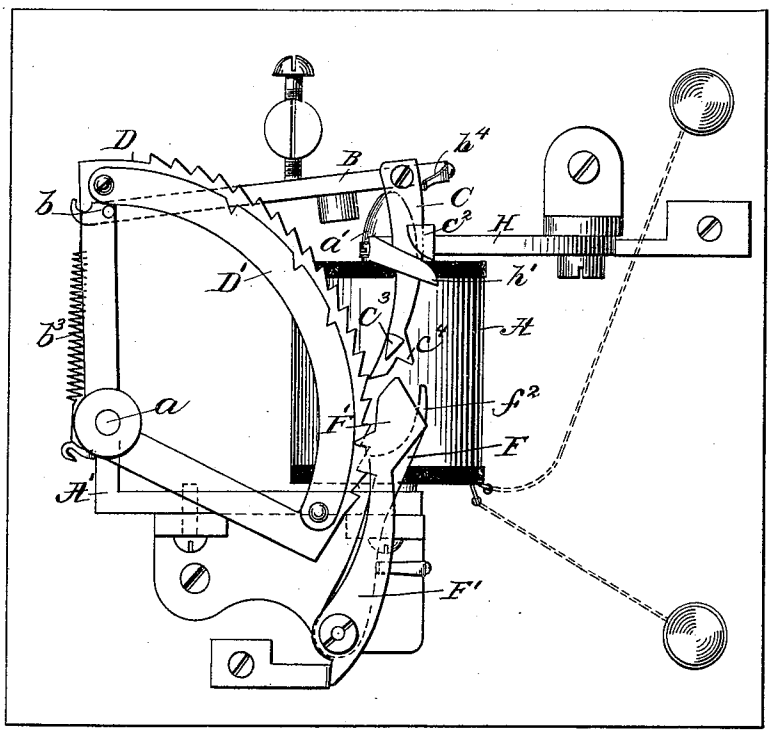


Fig. 2.

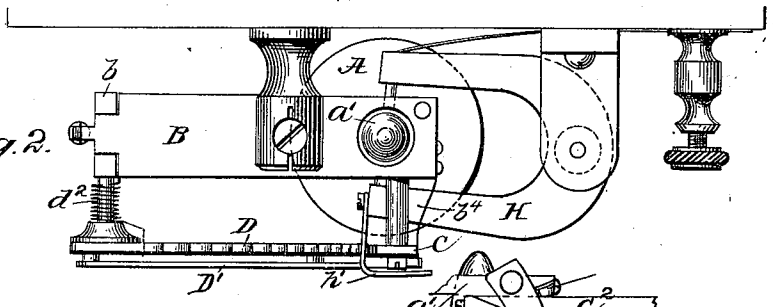
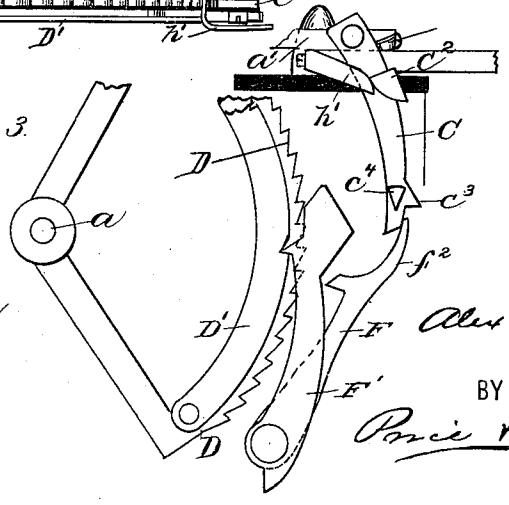


Fig. 3.



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(No Model.) 3 Sheets—Sheet 2.

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ELECTRIC SELECTOR.

No. 566,915. Patented Sept. 1, 1896.

Fig. 4.

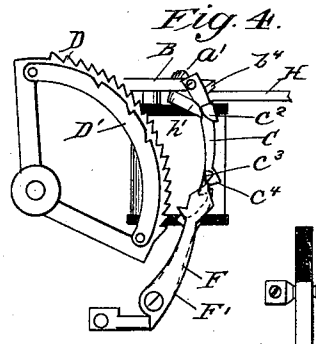


Fig. 5.

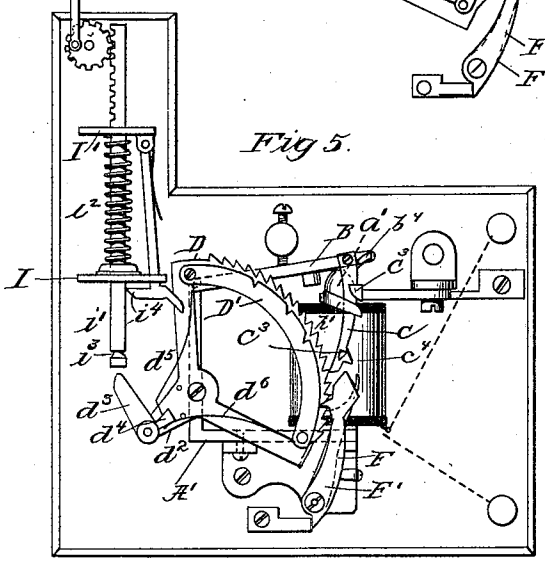


Fig. 6.

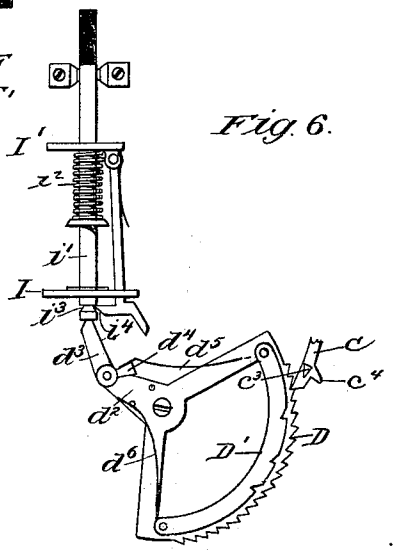


Fig. 7.

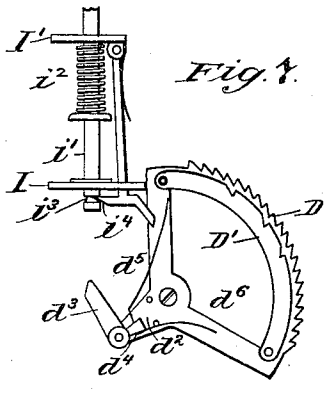
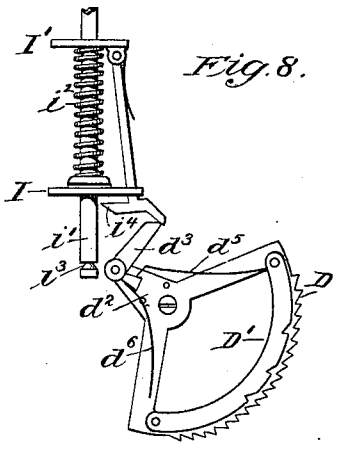


Fig. 8.



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(No Model.)

3 Sheets—Sheet 3.

A. LE BLANC.

ELECTRIC SELECTOR.

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Fig. 11.

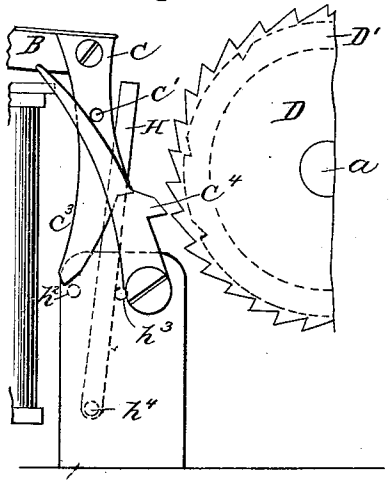


Fig. 9.

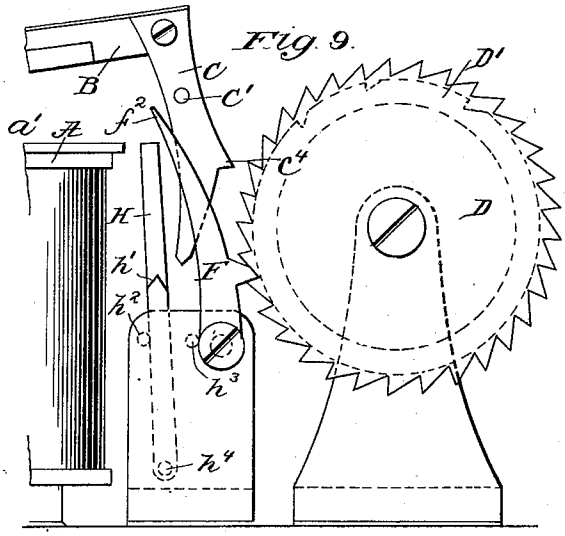


Fig. 12.

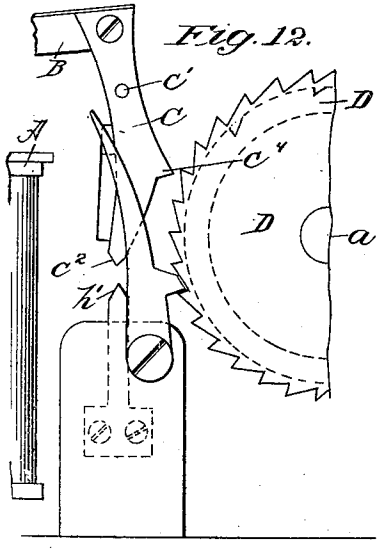
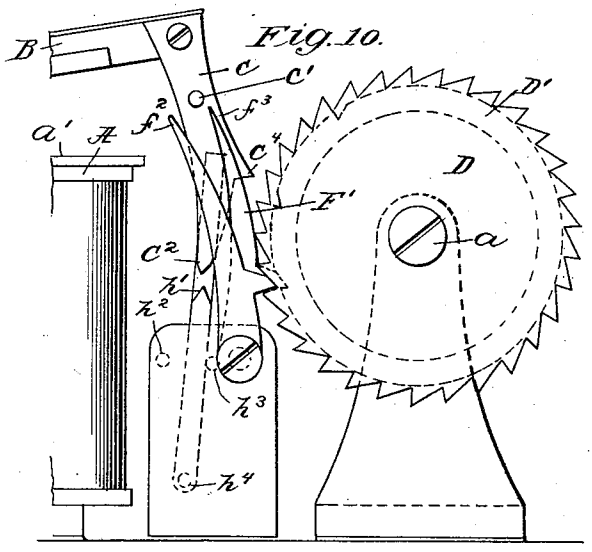


Fig. 10.



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UNITED STATES PATENT OFFICE.

ALEXIS LE BLANC, OF NEW YORK, N. Y., ASSIGNOR TO THE ELECTRIC SELECTOR AND SIGNAL COMPANY, OF WEST VIRGINIA.

ELECTRIC SELECTOR.

SPECIFICATION forming part of Letters Patent No. 566,915, dated September 1, 1896.

Application filed November 11, 1893. Renewed March 31, 1896. Serial No. 585,561. (No model.)

To all whom it may concern:

Be it known that I, ALEXIS LE BLANC, of the city, county, and State of New York, have invented certain new and useful Improvements in Electric Selectors and Mechanical Connections, of which the following is a full description.

The drawings accompanying this application illustrate the invention, of which—

Figure 1 is a side elevation of the selecting instrument; Fig. 2, a top or plan view of the same; Fig. 3, a view of the sector and retaining-pawls, showing one of the pawls thrown out while the other holds the sectors; Fig. 4, a view of the same with both retaining-pawls thrown out and the wheels returned to starting-point; Fig. 5, a view of the selecting instrument and mechanical device in normal position; Fig. 6, a view of the sector and mechanical device when both have arrived at the end of their phase movements; Fig. 7, a view of the mechanical device caught and held in position while the the selector is returned to starting-point; Fig. 8, a view of the action of the selector in releasing the mechanical device and showing that device returned to starting-point; Fig. 9, a modified form of selecting instrument and guiding device in normal position; Fig. 10, the same, showing position of retaining-pawls and guiding device to throw out one of the pawls and leave the other to hold the sector; Fig. 11, the same, showing both retaining-pawls thrown out. Fig. 12 shows the polarized magnet attached to pawl-hanger and a stationary projection to guide it to throw out pawls.

In another application for Letters Patent I have shown and described a selecting instrument operated by impulses of opposite polarities, in which the impulses of one polarity are used to impel the wheels of the selecting instrument and those of opposite polarity to release them; and the particular form selected to illustrate that invention is represented therein by an oscillating armature which controls the selecting instrument and actuates it to complete its phase by movement of the armature in one direction and actuates the releasing mechanism for restoring the apparatus to zero by movement of the armature in the opposite direction. The principle of controlling the selecting instrument in the present device by means of impulses of opposite polarities to impel the wheels and release them is the same as that described and claimed in said pending application, but in this device I have shown how the same principle may be applied by actuating an armature in one and the same direction by the impulses of different polarities. It will be understood that with this selecting instrument there must be used a transmitting instrument capable of transmitting through the coils of the magnet impulses of different polarities.

Upon a suitable support is erected the electromagnet A, and from the base of the magnet extends an iron frame A′, which projects upwardly and furnishes pivotal points for the wheel or sector, as shown at *a*, and for the armature-lever, as shown at *b*.

B is the armature-lever, provided with the usual retractile spring b^3. As the armature is made of iron, it will be attracted to the pole of the electromagnet by a current of either polarity transmitted through its coils. The pole a' of the magnet I prefer to make cone-shaped and form an opening in the armature-lever to conform to the shape of the pole-piece and give a steady and strong attractive force thereto. Upon the free end of the armature B is pivoted the pawl-hanger C, which is held normally in position to engage with the ratchets in the sector by the spring b^4. Suitably journaled in appropriate standards are the shafts of the wheels or sectors D D′. They are secured to the shaft and both move together. They may be cast in one piece, or, as shown in Figs. 1 and 3, the sector D′ may be constructed of a piece of suitable material and bolted or otherwise secured to the sector D. As they move together, they also coöperate with each other in responding to a predetermined arrangement of impulses. The wheel D has its teeth or notches on its periphery arranged in succession, and the wheel D′ has a notch here and there and arranged at intervals on its periphery. These notches are calculated and arranged with reference to the wheel D to correspond with a predetermined arrangement for each selecting instrument.

F and F′ are the retaining devices, con-

structed in the form of pivoted spring-pawls. They coact with the sectors and with the releasing device, F with the sector D, and F′ with the sector D′, and both with the pawl-hanger C. By this arrangement it will be seen that at the end of each step of the sectors the retaining-pawl F drops into a notch on the sector D and holds the sector, and that the pawl F′ rides upon the peripheral surface of the sector D′ until it drops into one of the notches on that sector. A suitable spring, as d^3, arranged upon the shaft, returns the wheels or sectors to starting-point. The sectors are impelled in a given direction by the operation of the armature-lever and its pawl and stores up a force in this spring, which throws back the sectors to starting-point when the retaining-pawls are released from the wheels. The upper or free ends of these retaining-pawls are constructed differently. The pawl F is formed with a projection or extension f^2, so that when the armature-lever E is attracted to the pole of the magnet the pawl-hanger C will always throw out that pawl. As shown in the drawings, the free end of the pawl F′ is constructed so that the pawl-hanger C will also throw it out when resting on the plane surface between the notches of its sector, but will escape it when resting in a notch and leave it to hold and retain the wheel or sector in place. The lug c^3 operates upon the end of retaining-pawl F′, and projection c^4 cooperates with end of pawl-hanger C to throw out pawl F. It will thus be seen that to release the wheels and allow them to be returned to starting-point both pawls must be thrown out, and this operation may be accomplished by constructing the pawl-hanger C with suitable projections and making the ends of the retaining-pawls alike. Pivoted to a suitable part of the frame is a guiding device. As shown in the drawings, it is constructed in the form of a polarized horseshoe magnet H. Its free ends are its poles and have a movement limited by suitable stops. It is attracted in one direction or the other according to the polarity of the current transmitted through the coils of the electromagnet A. A lug or guiding device h' is secured to one of the free ends of this magnet, which coöperates with a lug c^2 on the pawl-hanger C. During the impulses which are transmitted to impel the sectors the current is of a polarity which will throw out the lug h' from the path of the lug c^2 and allow it to escape. When, however, the impulses are transmitted of a different polarity, either to release the sector of a selected instrument at the end of its phase movement or to release the sectors of all the other selectors not chosen for operation, the free end of the horseshoe magnet is attracted in the opposite direction, bringing the guiding-lug h' in the path of the lug c^2, and thereby deflect the pawl-hanger C from its normal course. Now, when the pawl F has dropped into one of its notches on the instrument selected for operation, the pawls F′ on all or many of the selecting instruments, other than the one specially selected, are resting upon one of the raised surfaces between the notches on wheel D′, and as a consequence both pawls of those instruments are lifted, leaving the wheels free, while in the selected one the lever strikes the pawl F and throws it out, leaving F′ to retain it in place. If necessary, the spring h^2 may be used to aid the impulse in throwing the lug h' out of the path of c^2. The end of pawl-hanger C may be provided with the projection c^3 c^4, the latter operating upon the extension f^2 of the retaining-pawl F and the former upon the retaining-pawl F′. Impulses of one polarity from the transmitter will operate the wheel or sector to the end of its course, while impulses of a different polarity operate to release the sectors and adjust the guiding device to deflect the pawl-hanger C to actuate the retaining-pawls, as already described, or the guiding device may be stationary and the pawl-hanger itself may be actuated by the impulse, as shown in Fig. 12. A predetermined arrangement of impulses governs each selecting instrument, and this predetermined arrangement is made mechanically upon each instrument by calculation. Let us take the instrument shown in the drawings for illustration. The predetermined arrangement is shown as 6 3 4, which means that starting from the normal position of the instrument, Fig. 1, there are first transmitted six impulses, each of which impels the sector D one tooth, when at the end of the sixth the pawl F′ drops into its first notch on sector D′. During the entire six impulses and until the last one of the six has been transmitted this pawl has been riding upon the raised surface of the wheel, and at any time during its course and before it has dropped into the notch an impulse of opposite polarity would lift both retaining-pawls and restore the instrument to starting-point. The next notch of the sector D′ is located at a distance of three notches on the wheel D, which represents three impulses, and the next four notches. Now all of the sectors of the instruments not selected for operation are differently arranged, so that when the selected instrument, as illustrated in the drawings, has been impelled six notches an impulse of a different polarity is given, then at three, then at four. These opposite-polarity impulses will return all of the instruments on the line not especially selected to starting-point at the end of some one of the members of the predetermined arrangement. It will also be seen that an impulse of one polarity followed by an impulse of an opposite polarity will at all times restore the selectors to starting-point.

Connected with this instrument there are attachments by which a mechanical device may be operated by the same impulses which operate the selecting instrument. Extending from the sector-shaft, Figs. 5, 6, 7, and 8, is the arm d^2, and to this arm is pivoted the hanger d^3. Attached to the hanger is a lug d^4.

The springs d^5 d^6, suitably secured at one end to a part of the frame of the machine, have their other or free ends impinging against the sides of the lug d^4. The action of these springs is to keep the hanger in normal position. A mechanical device to be operated by the selector may be constructed as follows: Suitable standards I I', erected upon the frame of the machine and provided with apertures, serve as bearings for the rod i'. A spiral spring i^2, attached at one end to the rod and abutting the standard I' at the other end, exerts its tension to keep the rod i' in normal position and to return it to normal position after it is forced forward. One end of the rod is provided with the notch i^3. A spring-catch i^4 enters the notch and holds the rod at the end of its stroke. It will be observed that the free end of the arm d^3 when in normal position points to the countersunk end of the rod i', and when the sector moves the arm actuates the rod to thrust it forward, while the socket in the end of the rod keeps it in place. Figs. 5, 6, 7, and 8 of the drawings also illustrate the action of the selector and the mechanical device. When both devices are at starting-point, as shown in Fig. 5, the hanger d^3 points direct toward the end of the rod i', and in this figure the device is shown connected with the blades of a semaphore. When the mechanical device is forced to the end of its phase, it is caught and held by the catch i^4. At this point the selector has finished its own phase and the pawl F' is raised out of its last notch and resting on the plane surface beyond, the hanger C is ready to descend and throw out both of the pawls to release the sector. This position is shown in Fig. 6. When the wheels are released and returned to starting-point, the mechanical device is still held by its catch. This position of the instrument is shown in Fig. 7. At the next operation of the sector the hanger d^3 strikes the catch i^4 and releases the mechanical device, which now returns to normal position, as shown in Fig. 8. The selector is then returned to normal position, when both devices assume the position shown in Fig. 5.

A modification of the selecting instrument is shown in the Figs. 9, 10, 11, and 12, wherein the retaining-pawls F and F' are constructed with the extensions f^2 f^3. The pawl-hanger C, which impels the wheels D D', is provided with a pin c', and when the impulses are given of a polarity to impel the wheels this pin readily passes beyond the surface edges of the retaining-pawls and allows the projection c^4 to engage with a notch of the selector-wheel. A permanent magnet, as H, is pivoted as shown at h^4. It has a stroke limited by the stops h^2 and h^3 and may move backward and forward within those limits. It is provided with a lug h', which acts as a guiding device for the extended end c^2 of the pawl-hanger C. The upper end of the magnet H has a polarity opposite to that of the magnet A when the impulses are transmitted to impel the wheels D D'. Consequently when those impulses are given that end of the magnet is attracted toward the pole a' of the magnet A and sweeps over to the left until stopped by the pin a^2. At the starting-point the projections f^2 f^3 of the pawls F and F' are in line with each other and form the same contour, that is to say, when the projection on the pawl F has dropped in a tooth on the wheel A and the projection f' of the pawl F' is resting on a raised surface between the notches of its wheel the projections f^2 f^3 of those pawls have the same lines, and as the lug h' has been thrown out of the way the pawl-hanger C descends and impels the wheels D D', while the pin c' escapes the projections f^2 f^3 on the retaining-pawls. When, however, the projection f^3 drops into one of the notches on its wheel, the pawl F assumes the position shown in Fig. 10. When an impulse is given of opposite polarity, the polarized lever H flies over against the stop h^3, and as the armature-lever descends the projection c^2 on the end of the hanger C will pass to the other side of the guiding-piece h' and will be guided thereby to throw the hanger to the left and bring the pin c' in contact with the pawl F on the instrument especially selected; but as the pawl F' has dropped into a notch on the wheel D' the pin c' passes behind it, and the instrument selected is retained in position, while other instruments upon the line are so arranged that when an impulse of opposite polarity is transmitted their pawls F' will be found resting upon one of the raised surfaces of their wheels or sectors and both pawls will be thrown out together, (see Fig. 11,) restoring them to starting-point either at the first or second or third member of the combination.

I prefer the form of the apparatus first described, whose operation is as follows: When a selecting instrument of any number is required to be operated, the instruments all stand at the starting-point. A description of the mode of operation of the instrument shown in the drawings will describe the operation of any and all of them. The predetermined arrangement upon that instrument, as already stated, is 6 3 4, and the first operation of the device is to send out six impulses of a given polarity. The retaining-pawl F drops into a notch with each impulse and retains the sector in place, while the armature-lever and its pawl-hanger C are retracted to prepare for another impulse. At the end of the sixth impulse the pawl F' drops into its first notch on the sector D'. All of the other instruments upon the line not especially selected for the purpose, or many of them, have their sectors so arranged that their pawls F' will drop into a notch on the wheel D' at some other number than 6. An impulse of opposite polarity is now given, which throws the permanent magnet, with its lug h', to the opposite limit of its stroke,

whereby the projection c^2 upon the pawl-hanger is deflected from its course, so that upon the instrument especially selected it will strike the projection f^2 of the retaining-pawl F, lift it out of place, and leave the pawl F′ to hold the sector and prevent it from returning to starting-point. Upon all the other instruments on the line which have a different number for the first member of its predetermined arrangement the pawl-hanger will lift both of the retaining-pawls and all of them will be returned to starting-point. The next three impulses of the first polarity are then given, when the pawl F′ drops into its second notch. An impulse of opposite polarity is again transmitted, which returns to zero most, if not all, of those instruments on the line which have not been returned the first time. Then four impulses of the first polarity are given, which operate the sector of the selecting instrument to the end of its phase, and then an impulse of opposite polarity is given to return any instrument on the line remaining which has not been returned at previous impulses. The operation of the selector and the mechanical device together has already been described.

The machines are all so arranged that an impulse of one polarity followed by an impulse of another polarity will restore all of the instruments to zero. When, therefore, a selecting instrument has completed its work, it will be restored back to starting-point by an impulse of the first polarity followed by an impulse of opposite polarity. The machine is very accurate, may be operated wherever a selecting instrument of any description may be operated, and may be applied to all the uses and purposes to which selecting instruments are generally applied.

One of the features of the apparatus, as shown in the figures, enables me to compensate for the saturation of the electromagnet, that is to say, when an impulse of given polarity has been transmitted through the coils of the magnet the core becomes saturated by the impulse, which saturation increases as the impulses are repeated, and generally it takes a perceptible time to dispense with its influence. Therefore, when the polarized magnet H has been repeatedly attracted by the magnet A, it would be sluggish in its return to its other stop, as it would be retarded by the residual magnetism in the magnet A; but the instant an impulse of opposite polarity is given it flies back to its stop and relieves the magnet A of its residual magnetism, which at once assumes a magnetism of opposite polarity and enables the device to perform accurate and rapid movements in all its parts.

When this instrument and a mechanical device are worked together, it will be seen that the same impulses which operate the sector of the selecting instrument operate the mechanical device to the end of its phase, and this phase movement of the mechanical device may be so arranged that it arrives at the limit of its movement in one direction at or about the same time that the sector of the selecting instrument arrives at the end of its phase. It will also be seen that when the catch has operated upon the mechanical device it holds it in place, allowing the sector of the selecting instrument to be returned to its starting-point, while the mechanical device is still held in position. With a return of the sector to its normal position any other selector upon the line may be operated, still leaving the mechanical device of the first instrument in position. It will also be seen that when in this position and it is desired to restore the mechanical device to its own normal position the devices now operate upon the releasing mechanism of the mechanical device, and thereby throw it back to its original position. It is possible also with this device to restore all the mechanical devices on the line at once and without going through the predetermined arrangement of impulses which governs or controls each of the selectors in series. For example, in the selector illustrated in the drawings the predetermined arrangement is 6 3 4, the aggregate of which is thirteen. Now beyond the notches on the wheels or sectors which complete the aggregate number there is on the sector D′ a raised space on which the pawl F′ rides. If, therefore, the aggregate of all the predetermined arrangements of the selectors on a given line were thirteen—for example, 6 4 3, or 6 5 2, or 6 1 6, or 5 3 5—it is plain that after fourteen impelling impulses were given the pawl F′ would rest on all the sectors upon this raised space and an impulse of opposite polarity would send them all to zero. Now it might happen that a particular mechanical device should be operated to the end of its phase and left there while the sector of the instrument were returned to zero. Then another might be operated, and another, and all of them left and retained in position by its respective catch. At the end of the day or at any time it may be desired to bring all of the sectors and all the mechanical devices to starting-point it would only be necessary to transmit fourteen impelling impulses consecutively, which would release all of the mechanical devices, then one impulse of opposite polarity, which would release all of the sectors, when all the devices would be returned to starting-point. Nor is it necessary to arrange the sectors so that all of them would aggregate the same number. In one the aggregate might be ten, in another eleven, in another twelve, and so on. In such case it would be necessary only to transmit impelling impulses in succession until their aggregate would be one more than that of the sector on the line which is arranged to contain the largest number, and then transmit an impulse of opposite polarity to return all of the mechanical devices and all of the selectors to starting-point.

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

1. In an electric selecting instrument an electromagnet provided with an armature-lever and means for transmitting electrical impulses of opposite polarity through the coils of the magnet, in combination with devices responding to the impulses of one polarity to thereby impel the selecting instrument to the end of its phase, and devices actuated by impulses of opposite polarity to thereby restore all other instruments on the line to starting-point, both operated by the movement of the armature-lever in the same direction.

2. In an electric selecting instrument an electromagnet provided with an armature-lever and means for transmitting impulses of opposite polarity through the coils of the magnet, in combination with devices actuated by impulses of one polarity to impel the selecting instrument to the end of its course, and devices operated by an impulse or impulses of opposite polarity for restoring the same to normal position at the end of its phase both operated by the movement of the armature-lever in the same direction.

3. In an electric selecting instrument two wheels or sectors adapted to respond to electrical impulses, one of said wheels having a series of successive notches around its periphery and means to impel the same in response to the impulses one notch at a time, the other wheel having its notches arranged at intervals and separated by a raised space between them, in combination with a retaining-pawl for each wheel and an impelling-pawl arranged to release both retaining-pawls when one of them is resting on the raised space between its notches.

4. In an electric selecting instrument adapted to respond to electrical impulses of different polarities to complete its phase, the combination of impelling devices actuated by impulses of one polarity and releasing devices actuated by impulses of the opposite polarity, and a guiding device actuated by the impulses to direct the actuating devices of the instrument to impel the wheels or release them according to the polarity of the impulse.

5. In an electric selecting instrument adapted to respond to electrical impulses of different polarities to complete its phase, the combination of a pawl-hanger actuated by impulses of one polarity and thereby impel the selecting instrument, retaining devices to hold the instrument when impelled and a movable guiding device actuated by the impulses to direct the pawl to impel the instrument, or throw out the retaining devices according to the polarity of the impulses.

6. The combination with an electrical-impulse-transmitting instrument adapted to transmit impulses of opposite polarities, of a selecting instrument and a mechanical instrument each having a phase movement and each adapted to complete its phase in response to the predetermined arrangement of impulses from said transmitter, and mechanism operated by said impulses to thereby return the selecting instrument to starting-point and leave the mechanical device at rest.

7. The combination with an electrical-impulse-transmitting instrument, of a selecting instrument and a mechanical device each having a phase movement and each responding to the same predetermined arrangement of electrical impulses to complete its phase, mechanism actuated by said impulses to thereby restore the selecting instrument to starting-point and leave the mechanical device at rest, and means actuated by a succession of impulses whereby the mechanical device is restored to starting-point.

Signed at New York city, in the county of New York and State of New York, this 9th day of November, A. D. 1893.

ALEXIS LE BLANC.

Witnesses:
C. R. WATERBURY,
E. C. ROWLAND.