(No Model.) 4 Sheets—Sheet 1.

A. LE BLANC.

ELECTRIC SELECTOR.

No. 566,914. Patented Sept. 1, 1896.

Fig 1.

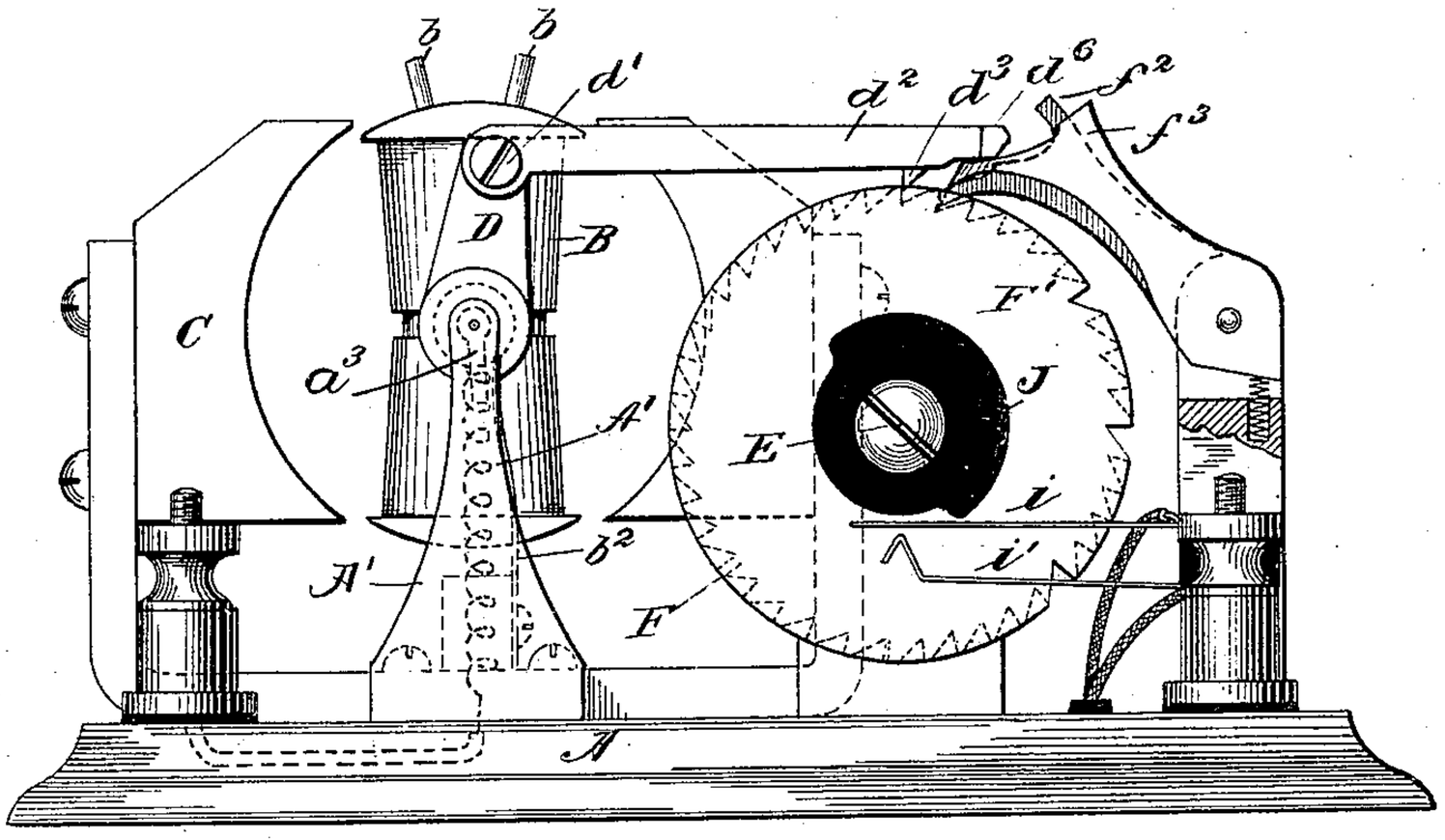
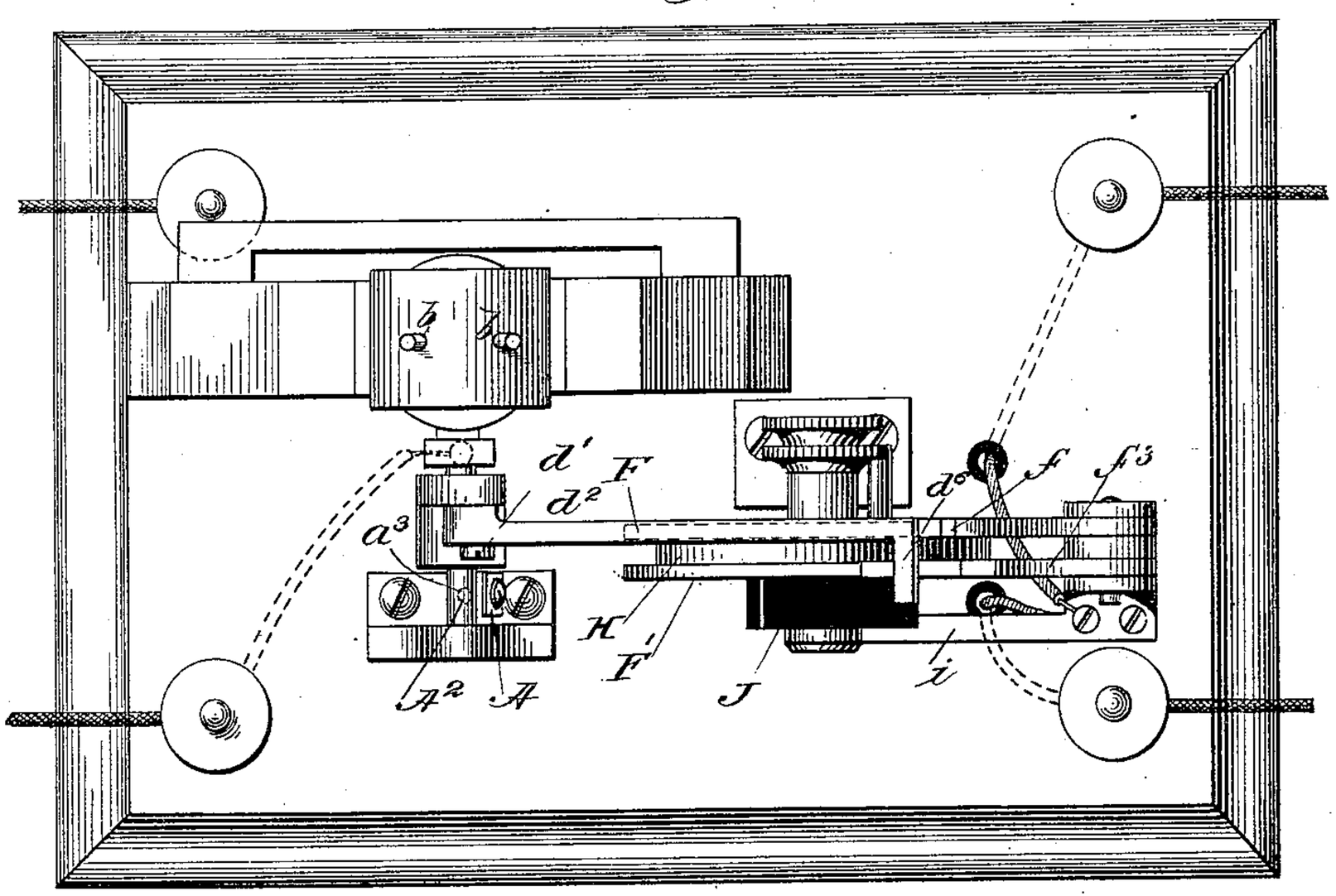


Fig. 2.



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No. 566,914. Patented Sept. 1, 1896.

Fig. 3.

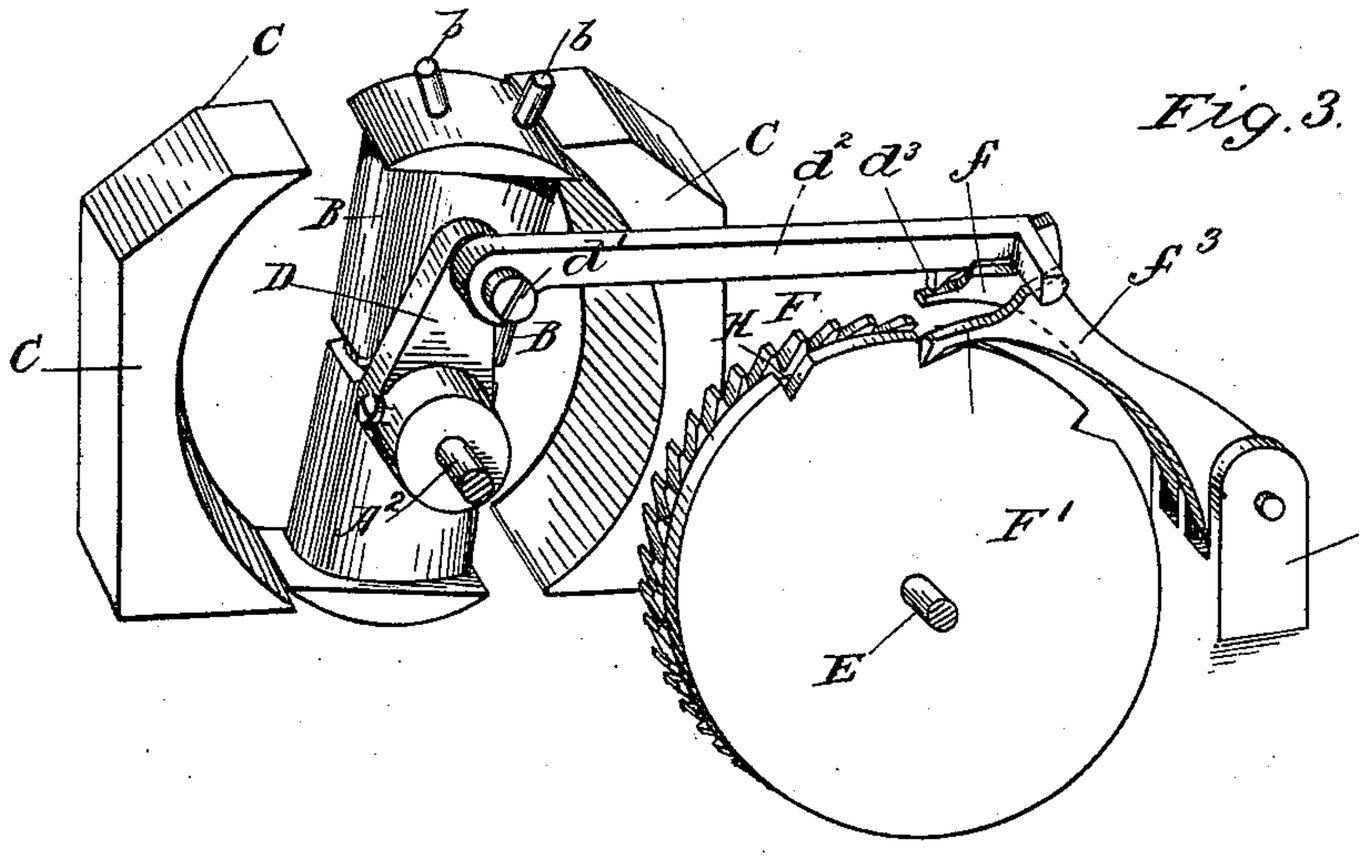


Fig. 4.

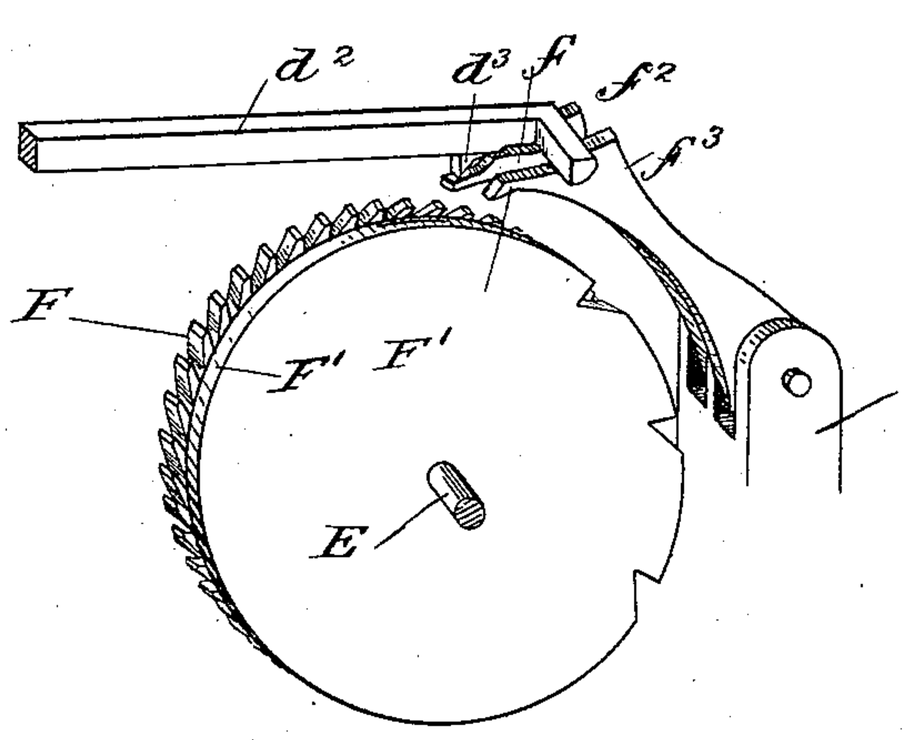
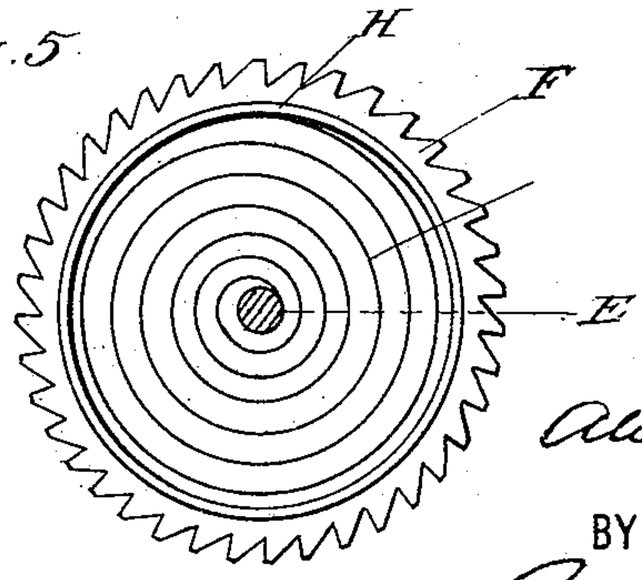


Fig. 5



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No. 566,914. Patented Sept. 1, 1896.

Fig 6

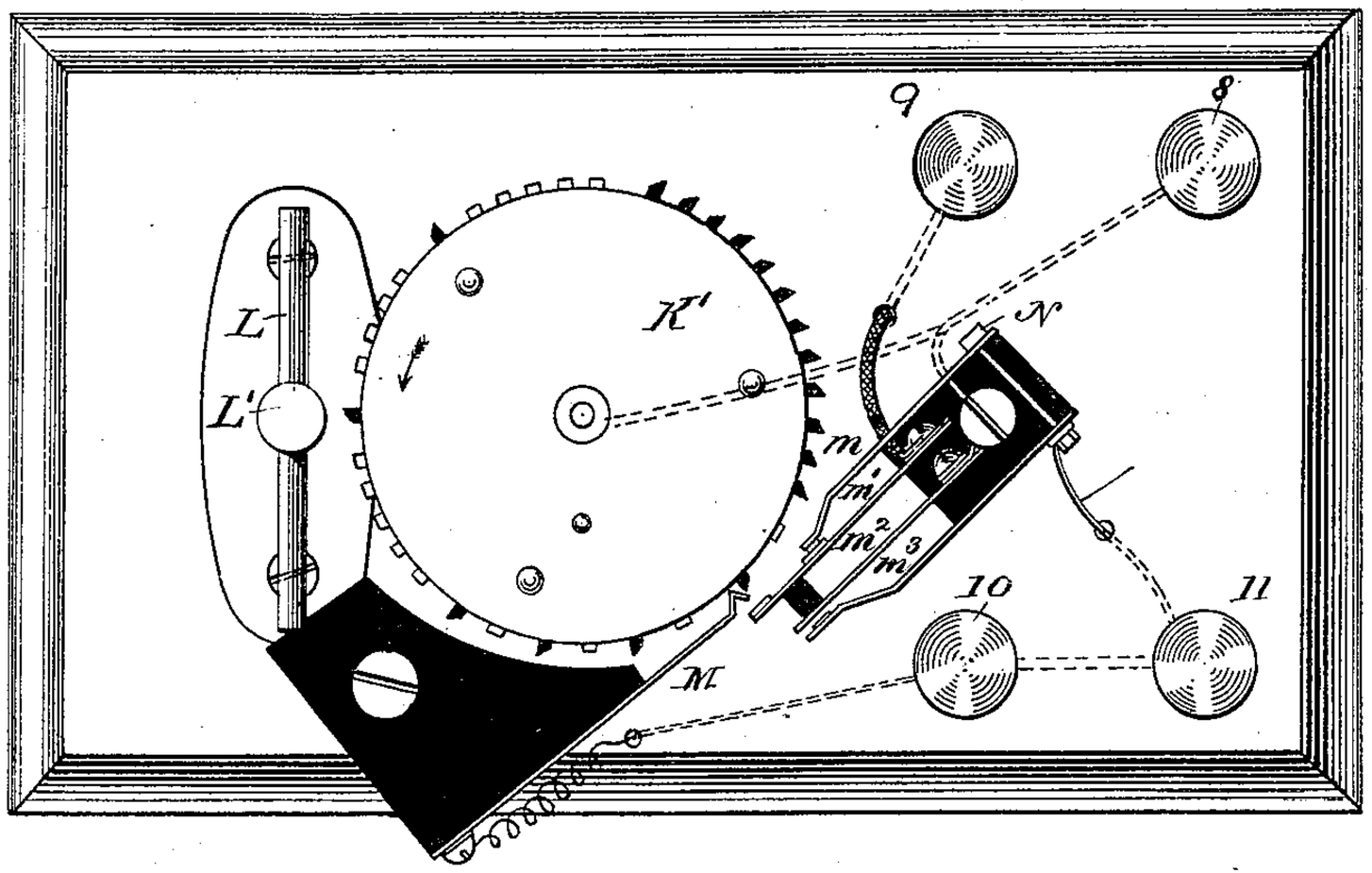


Fig. 7.

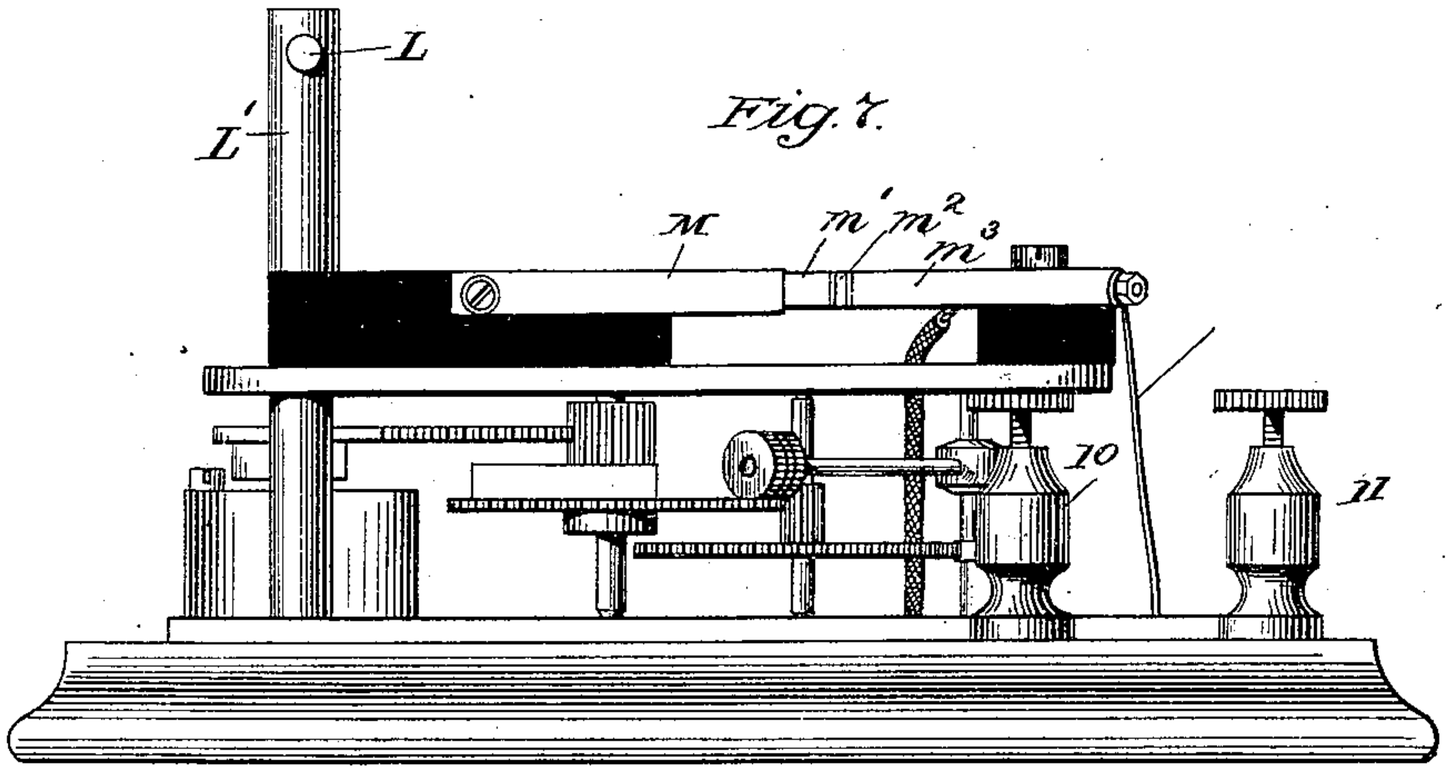
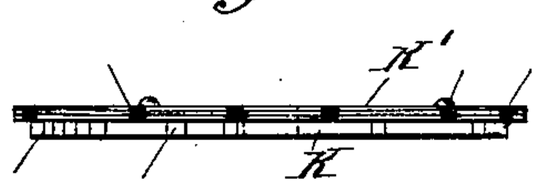


Fig. 8.



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(No Model.) 4 Sheets—Sheet 4.

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ELECTRIC SELECTOR.

No. 566,914. Patented Sept. 1, 1896.

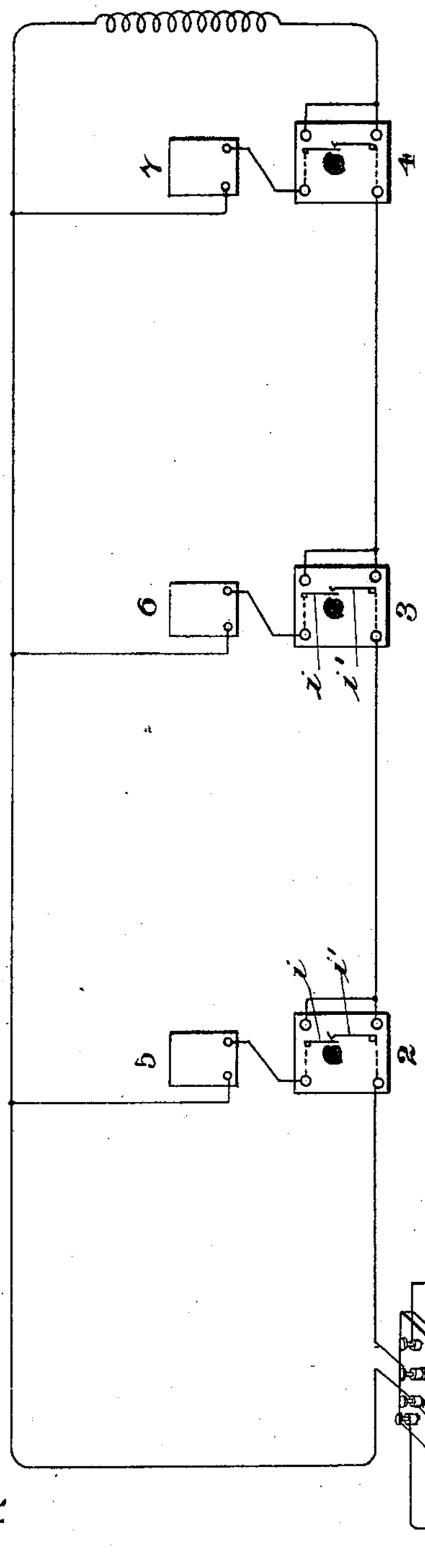

Fig. 9.

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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. 566,914, dated September 1, 1896.

Application filed October 3, 1893. Renewed March 31, 1896. Serial No. 585,660. (No model.)

To all whom it may concern:

Be it known that I, ALEXIS LE BLANC, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Electric Selectors and Adaptations Thereof, of which the following is a full specification.

The accompanying drawings illustrate the invention, of which—

Figure 1 is a side elevation of the selector; Fig. 2, a plan or top view of the same; Fig. 3, a view of the device with the armature operating to lift one of the retaining-pawls, leaving the other to hold and retain the wheel in position; Fig. 4, a view of the retaining-pawls, both lifted to release the wheel and allow it to return to starting-point; Fig. 5, a view of the impelling-wheel and spring for returning the instrument to starting-point; Fig. 6, a plan view of a transmitting instrument; Fig. 7, a side view of same; Fig. 8, an edge view of the wheels of the transmitter; Fig. 9, a diagram of the selecting instruments connected with mechanical devices.

The apparatus is intended to be operated by the transmission of electrical impulses sent out by a suitable transmitter or by the ordinary telegraph-key or a pair of keys so arranged as to be capable of transmitting currents of opposite polarity.

Upon a suitable base, as A, are erected the standards A′, which are properly journaled or countersunk to receive the ends of the shaft A^2, and on this shaft is secured the armature B. A magnet, as C, is provided with convex pole-pieces whose curve conforms to the rounded ends of the armature.

The device may be constructed with either the magnet or the armature polarized; that is to say, if constructed with a polarized magnet, then the armature should be wound so that currents transmitted through the coils will turn the armature to one pole or the other of the magnet, according to the polarity of the current transmitted. If the armature be polarized, the magnet should be constructed as an electromagnet to attract the armature to either side, according to the polarity of the impulse transmitted through its coils. As the operating devices of the apparatus must coact with each other, it is desirable that the armature should have a throw of fixed length, and for this purpose any suitable arrangement of stops may be used. In the drawings these stops are shown as plugs *b b*, which strike against the ends of the pole-pieces and thus limit the stroke of the armature on each side. There should also be a provision for returning the armature to normal position between the impulses or at times when the current is off. A good device for attaining this end is shown in the drawings. A bar a^3 is secured to the shaft A^2, whose free end plays against the spring b^2, whose action is always to keep the armature in normal position when not responding to an impulse.

Secured to the shaft A^2 is the crank or arm D, which works with the armature. This crank is provided with the pin d', to which pin is pivoted one end of the pawl d^2.

Suitably journaled in the framework is the shaft E, to which are secured two wheels F and F′. The wheel F is constructed with an indented or toothed periphery. Into these teeth the hook d^3 on the free end of the pawl d^2 drops and turns the wheel in obedience to the impulses, and is raised up at proper intervals to take hold of another tooth or to release the wheels of all the selecting instruments not specially called, and also to restore the instrument called to starting-point when its work is done. There are also pivoted to the framework of the apparatus two retaining-pawls f^2 f^3, whose function is to check and hold the wheels until thrown out at the proper time. f^2 operates on the wheel F and f^3 on the wheel F′. The wheel F has its teeth succeeding each other around the entire circumference, or around so much of it as may be necessary, and is the wheel which is impelled by the pawl. It may be constructed in the form of a bar or sector.

The wheel F′ has a few notches arranged to suit a predetermined arrangement of impulses, and may be called the "combination-wheel," and the two coöperate together and perform their work as follows: A series of impulses transmitted consecutively in one direction would turn the wheel F on the selected instrument, as well the wheels on all of

the other selecting instruments through their entire courses, and the theory upon which the instruments work is to turn the wheel of the selected instrument by means of the impulses, and at intervals during the course of its revolution to throw back to zero or starting-point the wheels of all the selecting instruments on the line except the one specially selected, which must complete its phase, and is only thrown back at the end of it; and this is effected by the following instrumentalities: As the wheel F is provided with teeth or notches around its periphery, so the wheel F′ is provided with a smooth surface, upon which its pawl rides, except here and there a notch, into which its pawl may drop when required. Any one of the notches of the wheel F may be selected as a starting-point, and from this point the notches are calculated on the wheel F′ to form the combination of the selecting instrument. For example, let us suppose that we desire a particular selecting instrument to respond to the following combination of impulses: 5 4 5, as shown in Fig. 1. Then on the wheel F′ a notch would be made at the proper distance from the starting-point to allow the pawl to drop when five impulses had been transmitted in a given direction to impel the wheel F five teeth. From this point another notch would be placed on the wheel F′ at the distance of four notches on the wheel F, and then another would be placed at the distance of five notches. Thus the retaining-pawl on the wheel F would drop into a notch at each impulse, while the retaining-pawl of F′ would only drop into the notches at five impulses, then four, and then five. At each of these drops of the pawl the instrument is arranged to receive an impulse of opposite polarity, and this impulse will restore all the other instruments than the one selected to starting-point.

The arm d^2, Fig. 1, is provided with the extension d^6, which strikes against the retaining-pawls to release the wheels. The pawl f^3 is so constructed that when it is dropped into a notch the extension d^6 will ride over its top without disturbing it, but when it is raised out of the notch and is resting on the plane surface of the wheel the extension d^6 will strike and throw it out, while the pawl f^2 is so constructed that when the impulse is given in the opposite direction it is always thrown out, but when this impulse is given and the pawl f^2 is thrown out the pawl f^3 is in its notch of the selected instrument and escapes the action of the projection d^6, remaining in its place and retaining the wheel in position. Thus it will be seen that in order to restore the instrument to zero it is necessary that the pawl f^3 be out of its notch and resting on the raised surface of the wheel, so that the projection d^6 will lift both pawls, as shown in Fig. 4, and allow the returning-spring to restore the instruments to zero. A box H, located for convenience between the wheels, contains the returning-spring. In propelling the wheel to complete its phase this spring is wound, and when the pawls are released from the wheels the reaction of this spring restores them to starting-point.

It is easy to see that the combination of the instruments not selected for operation may be so arranged that the pawls of all of them will be in position to be released and returned by the reverse impulse, except the one selected for operation, that is to say, that the pawl f^3 will be resting on one of the raised surfaces of the wheel F′, and when this instrument has completed its course the pawl f^3 rides upon the raised surface, when an opposite impulse will restore it.

It will also be seen from the construction of the device that any two succeeding impulses of opposite character will restore all the instruments to zero. Hence at the end of each phase or combination succeeding impulses of opposite polarity are transmitted to restore the instruments, and these may be called the "unisoning" impulses.

Upon the shaft which carries the wheels is placed the cam J, which turns with the shaft and wheel. It is usually constructed of some insulating material, and when the instrument has completed its phase closes the brushes i and i'. With the ordinary uses for call-bells for telephone or telegraph work the contact of these brushes closes a circuit through the call-bell and rings it. The device may also be used to advantage in selecting and operating a mechanical device, as shown by the diagram Fig. 9, in which 1 shows the transmitting instrument, 2, 3, and 4 the selecting instruments, and 5, 6, and 7 the mechanical devices, each connected with a selecting instrument.

It will be observed that the brushes i and i' on each of the selecting instruments, as shown on the diagram Fig. 9, are open, and that the current passes through each of the selecting instruments until the brushes i and i' on a selected one are brought in contact. The current is then shunted through these brushes to the mechanical device in connection therewith, that is to say, when the brushes on No. 2 selecting instrument are contacted the circuit is closed through the mechanical device No. 5, when brushes of No. 3 selecting instrument are contacted No. 6 mechanical device is brought into circuit, and so on. Each of these mechanical devices is provided with its electromagnet and armature-lever, as usual, for operating the mechanical device, and as the armature-lever will respond to impulses of either polarity, so when the selecting instrument has completed its phase and has been actuated by impulses of one polarity all impulses thereafter sent out of opposite polarity will leave the selecting instrument standing still, and these opposite-polarity impulses are then used to operate the mechanical device, while the selecting instrument is held in place with the circuit in the mechanical device closed through the

brushes *i* and *i'*. When the work is done, the selecting instrument is returned to starting-point by an impulse of one polarity followed by one of opposite polarity, as already described; and the same operation is true of other instrumentalities than a mechanical device, and will apply equally to electrical instrumentalities, as well as mechanical. So long as the instrument is connected by means of the selector to the same transmitter, and that transmitter is then required to do some other work upon the instrument thus connected, that work should be done by impulses of a polarity opposite to those which turn the wheels.

In connection with the operation of selecting instruments by the use of currents of opposite polarities I have devised an automatic transmitter and provided it with appliances by means of which any selecting instrument of that character (whether the armature performs its work by movements in alternate or opposite directions or by movements in the same direction) may be operated without professional or expert skill. It consists of two disks placed together on a shaft, which by means of a spring turns the shaft and disks one revolution. One of these disks is provided with teeth of conducting material and the other with teeth of insulating material, or the entire wheels may be made one of conducting and the other of insulating material.

Figs. 6, 7, and 8 illustrate the transmitting device. Upon a suitable shaft are placed the two disks; K, the conducting-disk, and K' the insulated disk. A handle L is connected with a shaft L', and when turned winds up a spring, whose recoil turns the disks through suitable gearing connections with the shaft upon which the disks are mounted.

The teeth of conducting material may be called "contacts" and transmit the impulses of the required polarity to operate a selected instrument to the end of its phase, and the teeth of insulating material perform several functions. First, at the end of each member of the combination as arranged upon a particular instrument they make connections and close circuits to transmit impulses of an opposite polarity to those which impel the selecting instrument and operate to return to starting-point all the selecting instruments on the line other than the one selected; second, to transmit impulses at the completion of the phase of the selected instrument to operate the mechanical device brought into connection with the transmitter by the selected instrument, and, third, to coöperate with the impulses of opposite character to bring all the instruments on the line to starting-point when the work is done.

Upon a suitable part of the framework of the machine are erected the switch-contacts m m' m^2 m^3. m and m^3 are joined together. A spring switch-brush M is also suitably attached, so that its free end will contact with the teeth of the wheels. The conducting-teeth make contact by sliding upon the free end of this switch-brush. The non-conducting teeth are higher and actuate the switch-brush to open one circuit and close the other. For example, the current enters from binding-post 8 to the conducting-wheel, while a branch is connected to brush m^2. From wheel it passes to brush M and wire to binding-post 10, thence to 11, thence to line, back to bolt N, brush m m', to binding-post 9. Each of the impulses through this line is given by the conducting-teeth contacting with brush M. When one of the high non-conducting teeth strikes this brush, it opens the first circuit by separating brushes m and m' and contacts the brushes m^2 and m^3. The current is now from binding-post 8 to brush m^2, thence through m^3 to binding-post 11, thence through line to binding-post 10, thence to brush M and m' to binding-post 9, and out to line.

These selecting instruments may be used for any and all the purposes to which any class of selecting instruments may be adapted. They may also be used with any transmitter adapted to transmit impulses of opposite polarities.

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

1. In an electric selecting instrument a magnet provided with an armature responding to impulses of opposite polarities, in combination with devices actuated mechanically by the armature in responding to impulses of one polarity, whereby the selecting instrument is brought to the end of its phase and devices actuated by the armature in responding to an impulse or impulses of opposite polarity to those above referred to whereby all other selecting instruments within the circuit are restored to starting-point without affecting the one selected for operation.

2. In an electric selecting instrument a magnet provided with an armature responding to impulses of opposite polarities in combination with devices actuated mechanically by the armature in responding to impulses of one polarity, whereby the selecting instrument is brought to the end of its phase and devices actuated by the armature in responding to an impulse of opposite polarity to those above referred to whereby the same instrument is restored to starting-point.

3. In an electric selecting instrument, a magnet provided with an oscillating armature responding in direction of its movement according to the polarity of the impulse transmitted, means for completing the phase of a selected instrument, operated mechanically by the movement of the armature in one direction, and means for restoring the same instrument to zero operated by the movement of the armature in the opposite direction.

4. In an electric selecting instrument a magnet provided with an oscillating armature responding in direction of its movement according to the polarity of the impulse transmitted, means for completing the phase of a se-

lected instrument operated mechanically by the movement of the armature in one direction and means for restoring all other instruments on the line to zero operated by the movement of the armature in the opposite direction.

5. In an electric selecting instrument, a magnet provided with an armature responding in direction of its movement according to the polarity of the impulse transmitted, means for completing the phase of an instrument selected, actuated mechanically by the movement of the armature in one direction and means for restoring other instruments on the line to starting-point at intervals during the operation of the instrument selected by movement of the armature in the opposite direction.

6. 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 an impelling-bar arranged to release both retaining-pawls when one of them is resting on the raised space between its notches.

7. The combination with an electrical impulse-transmitting instrument adapted to transmit impulses of opposite polarities, of a series of selecting instruments each provided with an impelling-pawl responding to impulses of one polarity to complete its phase and of an opposite polarity to restore it to starting-point, a retaining-pawl to hold the selector in position when its phase is completed, and be released by contact with the impelling-pawl, in responding to the impulses of opposite polarity.

8. An electric selecting instrument provided with a movable device for completing its phase in combination with a transmitting instrument arranged to transmit impulses of opposite polarity, mechanical devices responding to impulses of one polarity from said transmitter for giving to the phase-completing device a forward movement, a mechanical device for holding and retaining the phase-completing device in position, and means operated by the actuating-pawl of the selector in response to an impulse or impulses of opposite polarity for releasing the phase-completing device at the end of its journey or at intermediate points while completing its phase movement and thereby allowing it to be returned to normal position.

9. An electrical transmitting instrument adapted to transmit impulses of opposite polarities and a selecting instrument in circuit therewith adapted to respond to impulses from said transmitter of one polarity to complete its phase and of an opposite polarity to restore it to starting-point, in combination with other instrumentalities out of circuit with said transmitter, means actuated by the selector in responding to its impulses to thereby connect the other instrumentalities operatively with the transmitter, and devices for operating the other instrumentalities when connected actuated by impulses of a polarity opposite to those which complete the phase of the selector.

10. An electrical transmitting instrument adapted to transmit impulses of opposite polarities and a selecting instrument in circuit therewith adapted to respond to impulses from said transmitter of one polarity to complete its phase and of an opposite polarity to restore it to starting-point, in combination with other instrumentalities out of circuit with said transmitter, means actuated by the selector in responding to its impulses to thereby connect the other instrumentalities operatively with the transmitter, devices for operating the other instrumentalities when connected actuated by impulses of a polarity opposite to those which complete the phase of the selector, and means for holding the selector and circuit in position during the operation of the other instrumentalities.

11. A series of selecting instruments adapted to respond to impulses of opposite polarities, in combination with a transmitting instrument in circuit therewith and provided with means suitably arranged for transmitting impulses to the selector of one polarity to thereby complete the phase of one of the selecting instruments, and means for transmitting impulses of an opposite polarity to thereby return all the selecting instruments on the line to starting-point other than the one selected for operation.

Signed at New York, in the county of New York and State of New York, this 29th day of September, A. D. 1893.

ALEXIS LE BLANC.

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