H. C. HORSTMANN.

ELECTRIC SELECTING MECHANISM.

APPLICATION FILED SEPT. 16, 1908.

929,133.

Patented July 27, 1909.

6 SHEETS—SHEET 1.

Fig. 2.

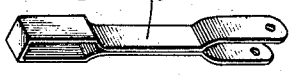
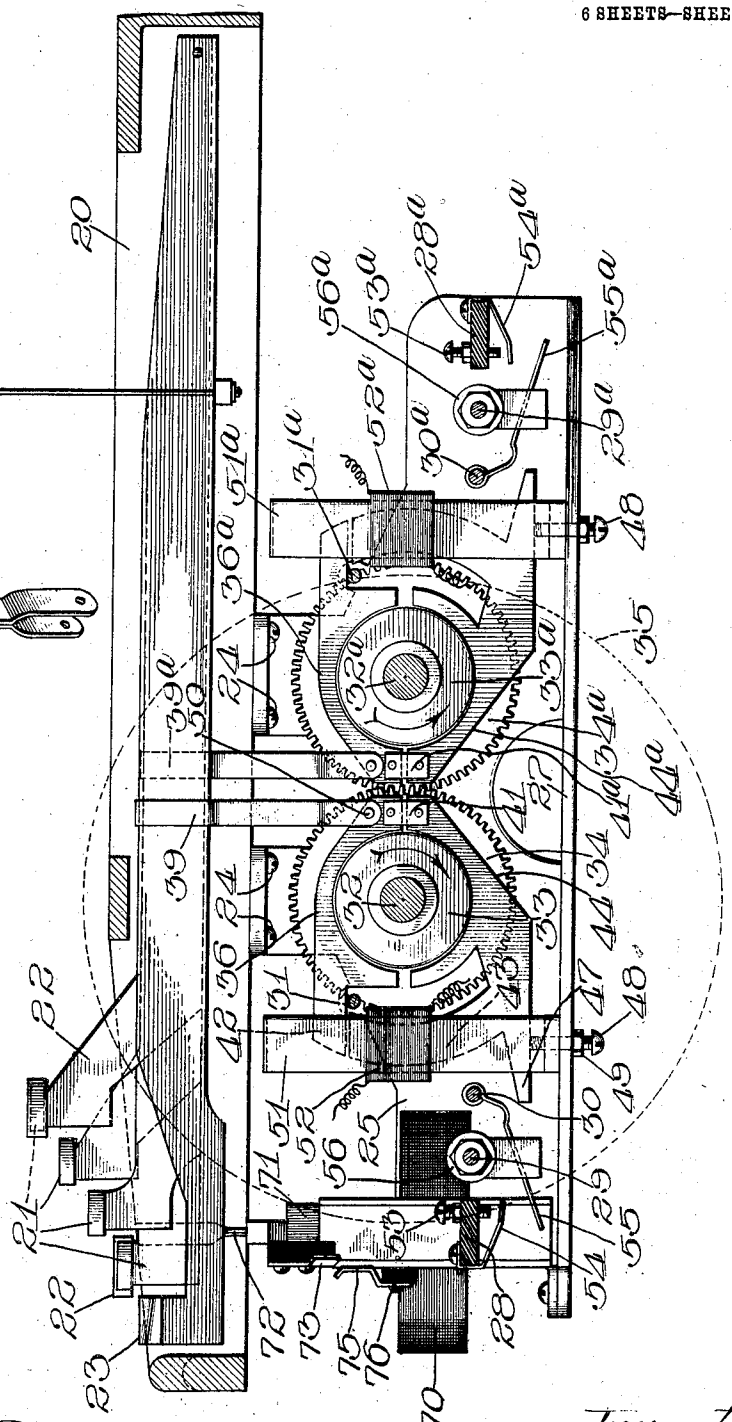


Fig. 1.



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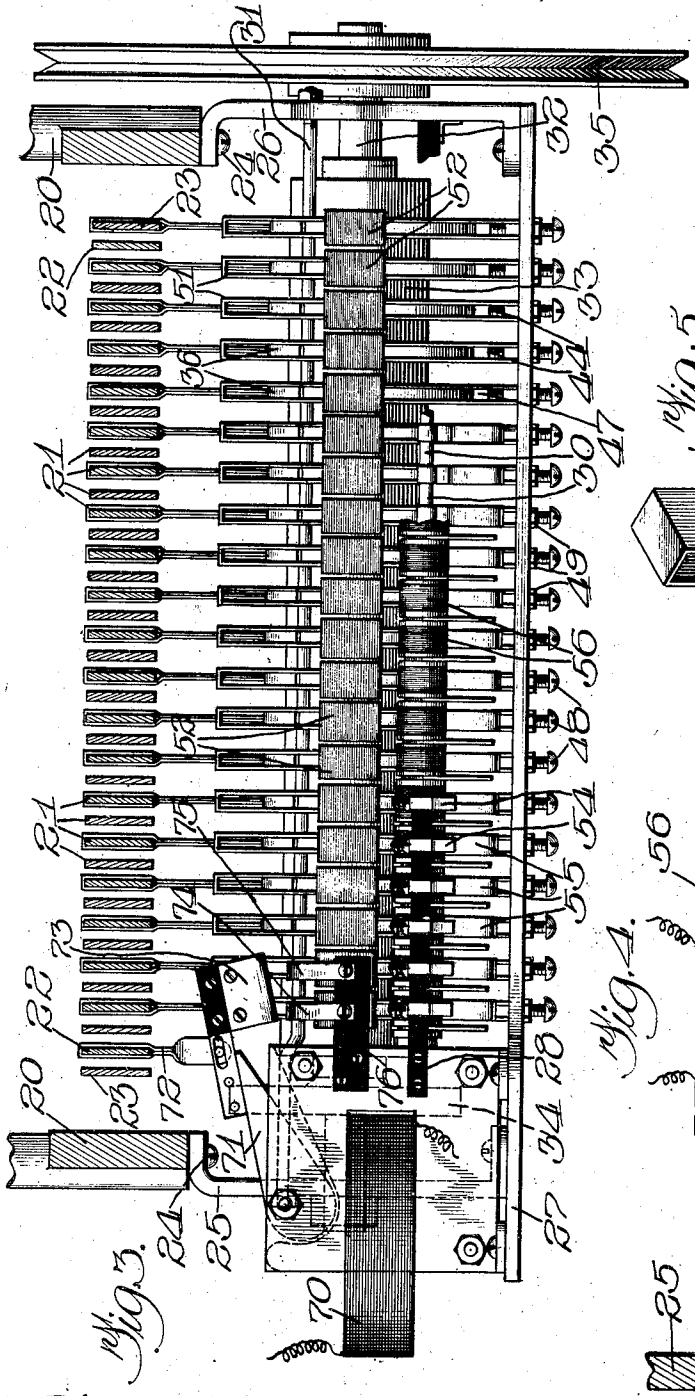

Fig. 3.

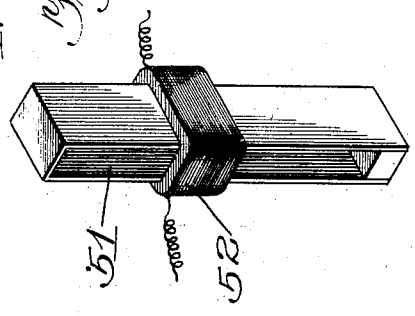

Fig. 5.

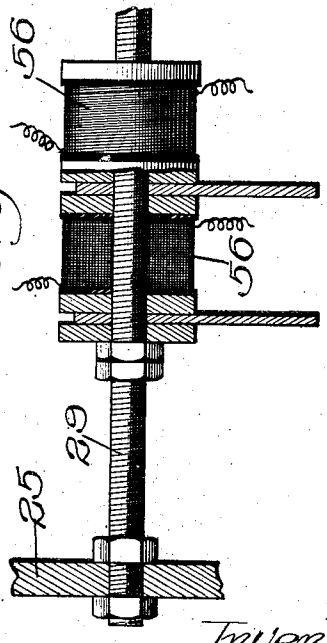

Fig. 4.

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6 SHEETS—SHEET 3.

Fig. 6.

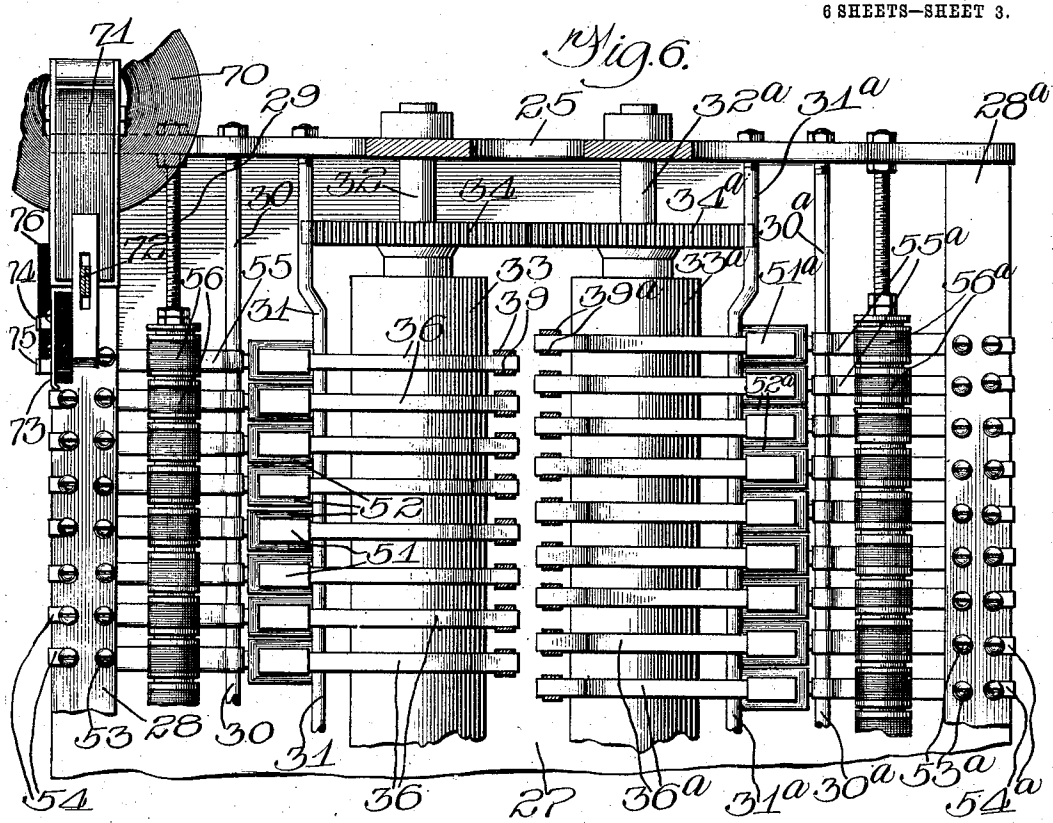


Fig. 7.

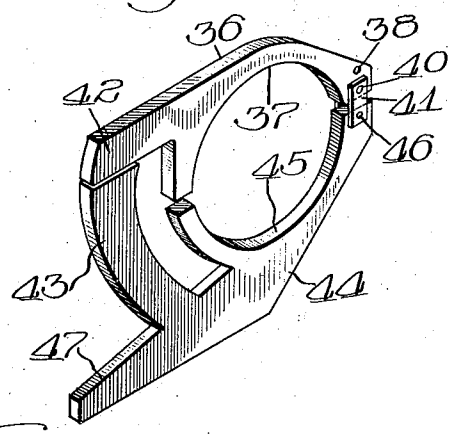
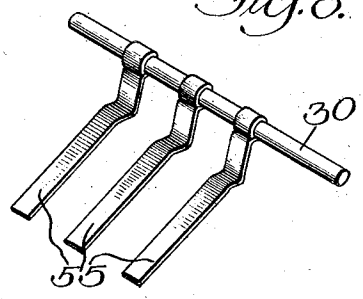


Fig. 8.



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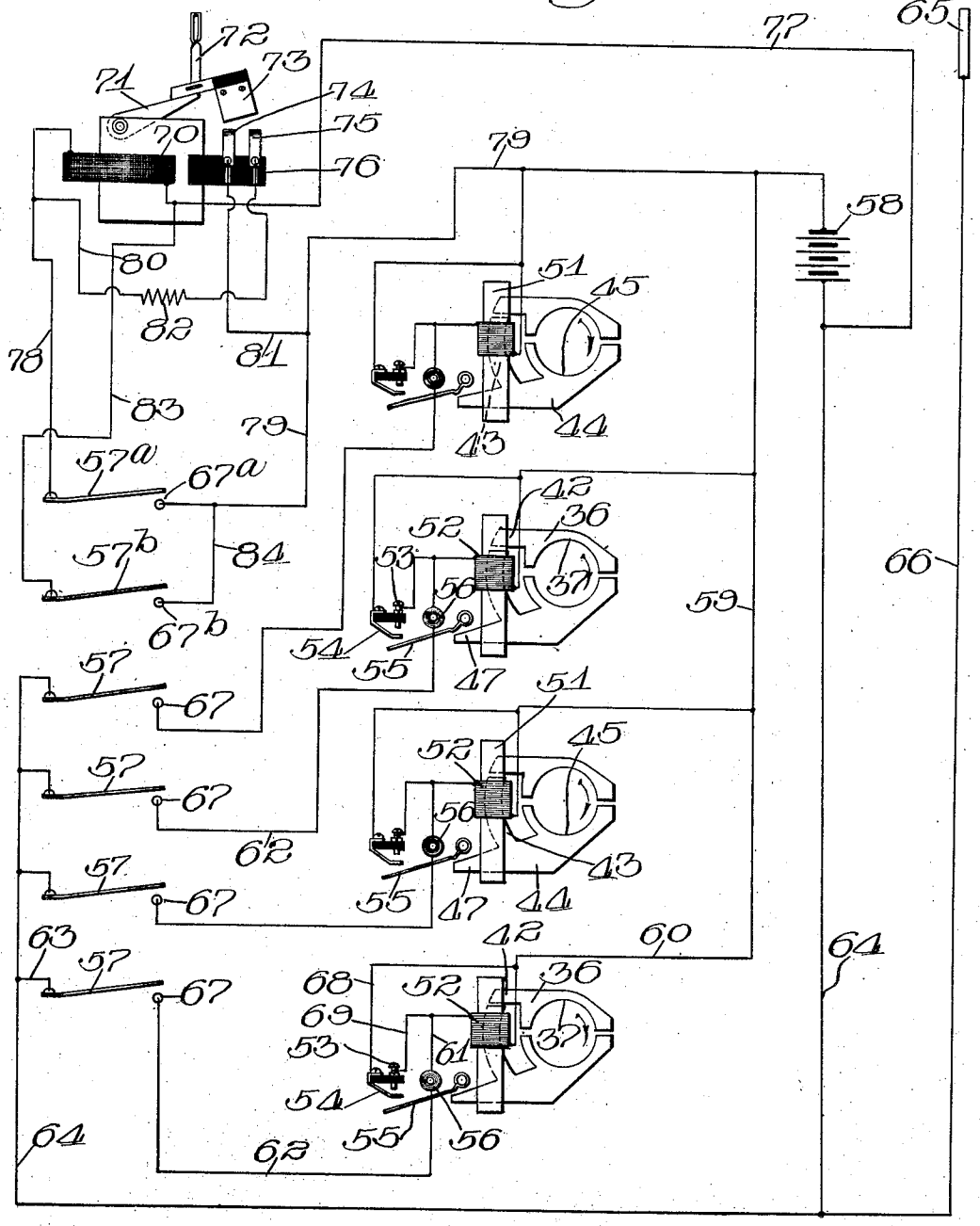
6 SHEETS—SHEET 4.

Fig. 9.



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6 SHEETS—SHEET 5.

Fig. 10.

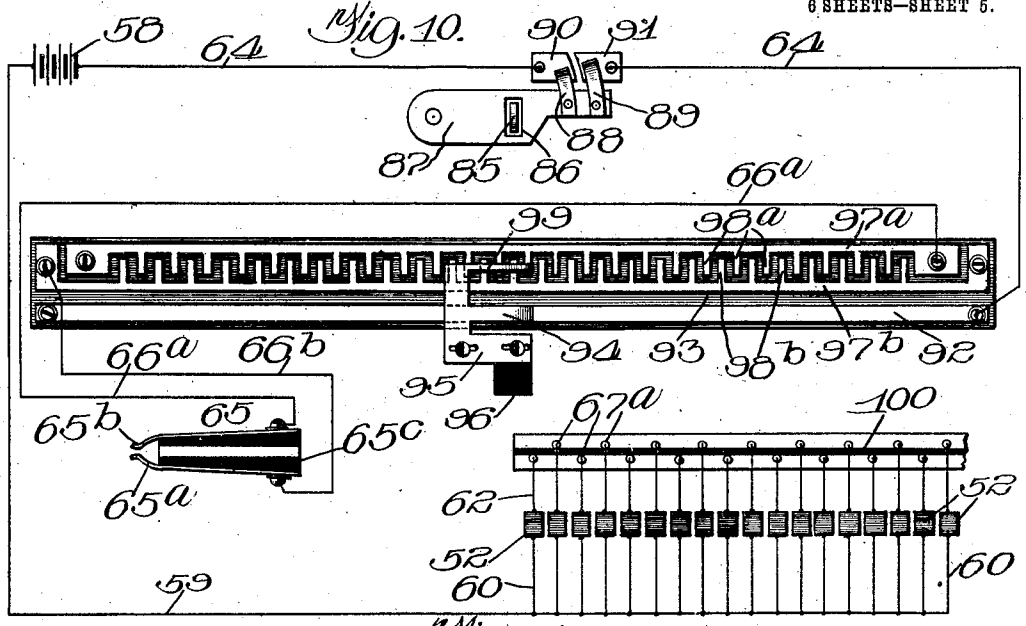
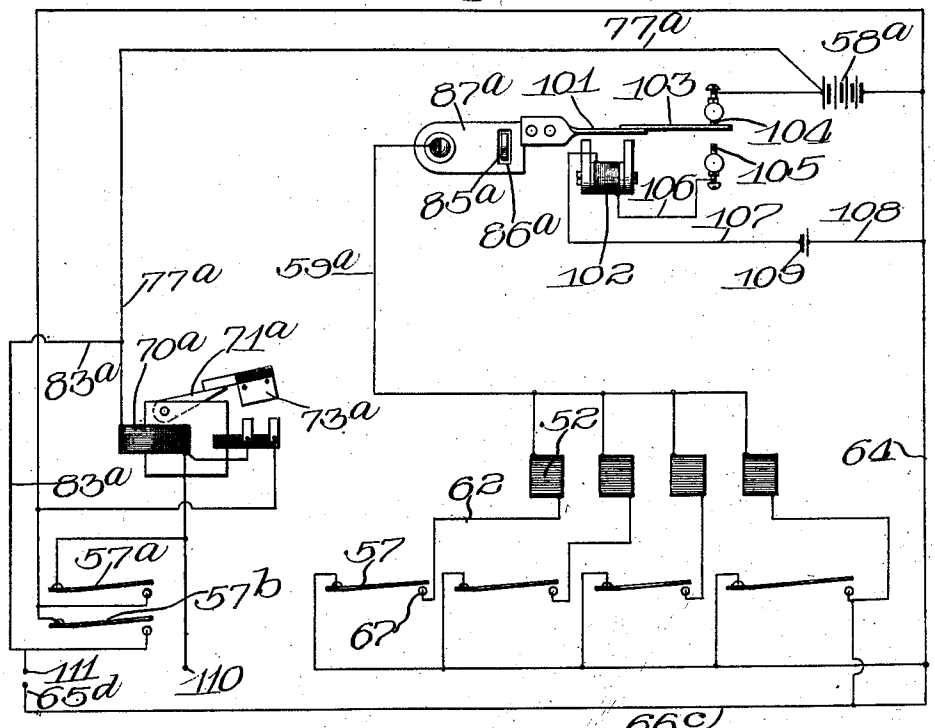


Fig. 11.



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6 SHEETS—SHEET 6.

Fig. 12.

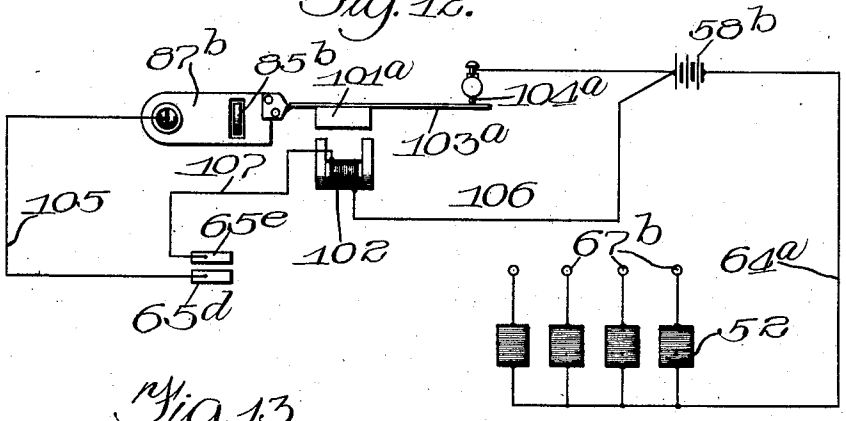


Fig. 13.

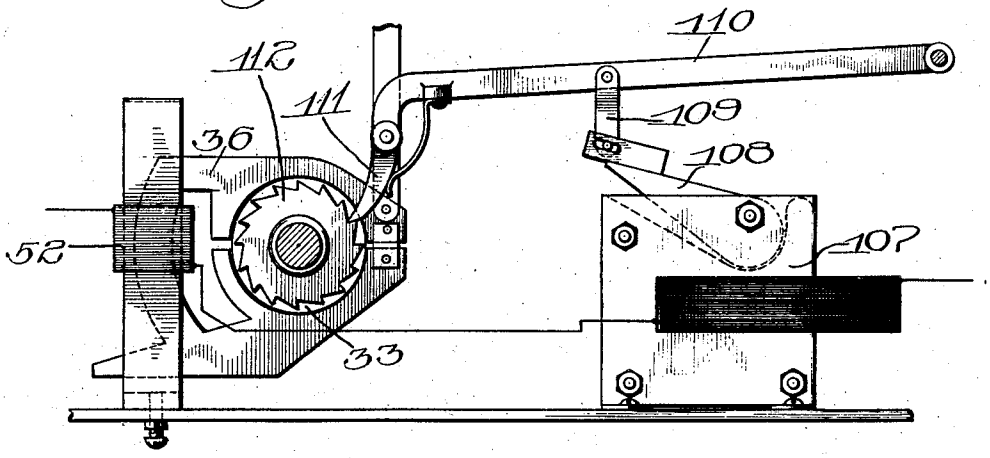
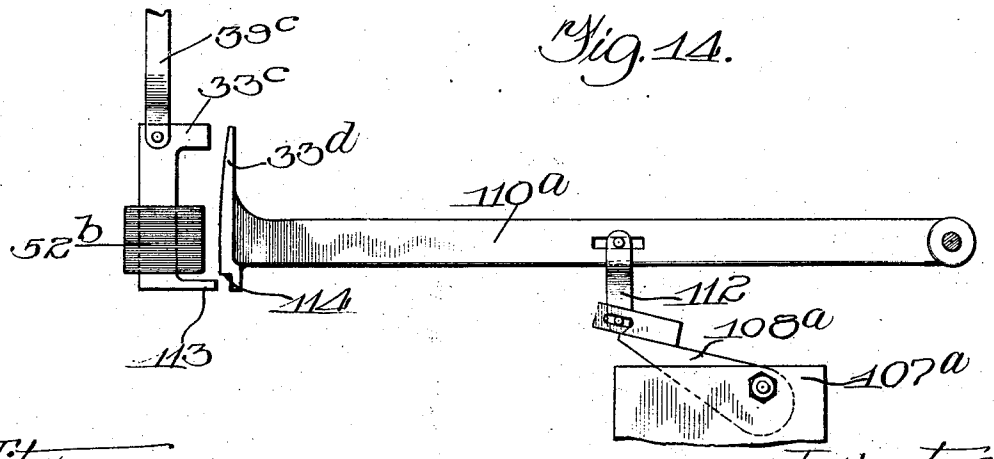


Fig. 14.



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UNITED STATES PATENT OFFICE.

HENRY C. HORSTMANN, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-FOURTH TO SAMUEL EVANS AND ONE-FOURTH TO JOHN HOWARD McELROY, BOTH OF CHICAGO, ILLINOIS.

ELECTRIC SELECTING MECHANISM.

No. 929,133. Specification of Letters Patent. Patented July 27, 1909.

Application filed September 16, 1908. Serial No. 453,284.

To all whom it may concern:

Be it known that I, HENRY C. HORSTMANN, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Selecting Mechanism, of which the following is a full, clear, and exact specification.

My invention is concerned with a novel electric selecting mechanism, and it is designed primarily to furnish a simple and efficient apparatus adapted to be connected to or combined with any ordinary form of a key-operated typewriting machine so that the keys may be operated by closing electric circuits, instead of manually, as where the machine is used in the ordinary manner.

In carrying out my invention, I employ a clutch for each key, which clutch is adapted to grip a preferably constantly rotating cylinder when the circuit for that key is closed and be carried with the cylinder until the connected key has been moved far enough to actuate the attached type bar or perform whatever duty it has. While I may leave the clutch in engaging position with its cylinder after its work is done, this might cause unnecessary friction and wear of the parts where the cylinder rotates constantly, and I prefer to provide means for breaking the circuit through the clutch, or short-circuiting it about the clutch magnet, so that the clutch is released the instant the work is done, or even sooner, as I contemplate regulating the force of the blow by releasing the clutch at a fixed time before the blow is delivered, and thus govern the strength of the impact. This feature of breaking the circuit, when it is employed, may be carried out in a variety of ways, a few of which I illustrate.

To illustrate my invention, I annex hereto six sheets of drawings, in which the same reference characters are used to represent identical parts in all the figures, of which,—

Figure 1 is a vertical section through a portion of a typewriting machine to which my invention has been added; Fig. 2 is a detached, perspective view of one of the links employed to connect the key bars to the clutches; Fig. 3 is a front elevation, with some of the mechanism broken away on different vertical planes; Fig. 4 is an enlarged detail illustrating the magnets which hold the actuating solenoids short-circuited; Fig. 5 is an enlarged perspective view of one of the clutch-guides and the solenoid wound thereon; Fig. 6 is a partial top plan view in section below the key levers; Fig. 7 is a perspective view of one of the clutches detached; Fig. 8 is a perspective view of some of the switch members for short-circuiting the solenoids; Fig. 9 is a diagrammatic view of four of the key lever clutches, the shift-bar actuating magnet, and the circuits therefor; Fig. 10 is a diagrammatic view of a modified form of clutch releasing mechanism; Fig. 11 is a similar view of still another form of clutch releasing mechanism; Fig. 12 illustrates a modification of the mechanism shown in Fig. 11; and Figs. 13 and 14 illustrate modifications of the mechanism for driving the cylinder.

While I contemplate employing my invention in connection with any apparatus in which an electric selecting system is desired, I have devised it primarily for use with an electrically controlled or operated typewriter, and accordingly have shown it as applied to a standard typwriting machine, so that it can be operated either by the electric selecting system, or in the ordinary manner, as may be desired.

As the typewriting machine to which my invention is shown as applied is of a standard make, such as the well known Remington machine, I have only illustrated a portion of the frame 20, a few of the key levers 21, the carriage shift keys 22 for upper and lower case letters, and the space bar 23.

To the under side of the frame 20 is attached, as by the screws 24, the frame for the apparatus proper, which frame consists of the side pieces 25 and 26, connected by the base plate 27, the bars 28 and 28^a of insulation, the magnet rods 29 and 29^a, the armature supporting rods 30 and 30^a, and may also be connected by the clutch supporting rods 31 and 31^a, which are preferably capable of being given a slight adjustment vertically by any suitable means. The side pieces 25 and 26 also have journaled therein the shafts 32 and 32^a, to which are secured the cylinders 33 and 33^a, which are geared together as a convenient means of compelling them to rotate together by the gear wheels 34 and 34^a, and which are driven in any suitable manner, as by a belt passing over a

pulley wheel 35 secured to the shaft 32, which belt may be conveniently run by a small electric motor.

The upper clutch members 36 and 36ª are preferably stamped up from sheet metal, and have the semi-circular engaging surface 37 of the proper size to fit snugly on the surface of the cylinders 33 and 33ª, the aperture 38 for the links 39 and 39ª, the aperture 40 for the pivot plates 41 and 41ª, and the extension 42, which acts as an armature for the core portion 43 of the associated lower clutch members 44 and 44ª. These clutch members 44 and 44ª have the semi-circular engaging surface 45, the aperture 46 for the pivot plates 41 and 41ª, the core portion 43, which is curved on the arc of a circle with the shafts 32 and 32ª as a center, and may have the switch-operating extension 47, as hereinafter explained. The position of the lower clutch members is controlled by suitable means, as the set screws 48 screwed through the base plate 27 and secured by the jaw nuts 49. The associated clutch members 36 and 44, and 36ª and 44ª, are preferably secured by the double-jointed pivoted connection formed by the pins passing through the apertures 40 and 46 and the pivot plates 41 and 41ª. The links 39 and 39ª loop over the key levers as shown, and are secured by the pins 50 passing through the apertures 38, and may be designed as shown, so that the clutches move idly over the cylinders with the key levers when they are operated manually, but are preferably designed with the two sides separated an equal distance throughout the length of the link, so that the key levers may be operated manually without affecting the clutches. The armature extension 42 and the core portion 43 extend into the clutch guides 51 and 51ª, best shown in Fig. 5, which assist in holding the clutches in a vertical plane, and serve as a spool for the solenoids 52 and 52ª wound thereon, and through which the cores 43 reciprocate, and which are secured by the set screws 48.

With the understanding that each solenoid 52 and 52ª is in a circuit devoted to the letter or character printed by its associated key lever 21; and that some suitable means is employed for energizing the solenoids by closing the circuits in which they are located, the operation of the fundamental portion of my apparatus can now be understood. The cylinders 33 and 33ª are constantly rotating, and when any circuit is closed the pull of its solenoid draws its core 43 up toward its armature 42, so that the bearing surfaces 37 and 45 engage the cylinder, which then carries the clutch with it, drawing down the link 39 or 39ª to depress the lever to actuate the type bar and print the desired character. Of course it will be understood that the duplicate arrangement of the cylinders, clutches, solenoids, etc., is for the purpose of economizing on space and to get the clutches and solenoids in a practicable size, and yet enable them to be applied to a standard typewriting machine without changing its dimensions.

To prevent the wear which would occur between the clutches and the cylinders if the circuit were not broken by releasing the key the instant any clutch had moved its full distance with the cylinder, I preferably provide means for breaking or short-circuiting the current through the solenoids at or a short time before the clutches have moved their full stroke with the cylinders, and for this purpose I mount on the bars of insulation 28 and 28ª, the adjustable contact screws 53 and 53ª, and the spring contact strips 54 and 54ª, so that when the extensions 47 approach the limit of their movement, they strike the armature switches 55 and 55ª strung on the rods 30 and 30ª, and swing them up so that they contact with the strips 54 and 54ª, and bring them against the set screws 53 and 53ª to close short circuits about the solenoids 52 and 52ª. To hold each of these short circuits closed until the key is released, I provide the electromagnets 56 and 56ª, best shown in Fig. 4, which are strung on the rods 29 and 29ª, whose pole pieces attract and hold the armature switches 55 and 55ª, when they are brought within their fields by the action of the extensions 47.

Referring to Fig. 9, the circuits for the apparatus thus far described will be seen. Supposing that the lowermost letter switch 57 is closed, the current flows from the battery 58 through the common conductor 59, and the branch 60, through the solenoid 52, thence through the conductor 61 through the magnet 56, thence through the conductor 62 to the switch 57, thence through the branch 63 to the main conductor 64, which leads to the battery. When the stock letter form shown in my application No. 320,519 filed June 7, 1906, is employed, the sweeping contact 65 connected by a flexible conductor 66 with the conductor 64 may be considered as brought into engagement with the contacts 67 of the switches 57, when it will be manifest that the circuit will be closed through the electromagnet 56 and the solenoid 52 in the same manner. When the extension 47 swings the armature switch 55 up to close the short circuit through the contact strip 54 and contact screw 53, the conductors 68 and 69, which are practically of no resistance as compared with the solenoid 52, take practically all the current, deënergizing the solenoid and releasing the clutch, which is carried back to initial position by the action of the spring (not shown) lifting its connected key lever. Of course the circuit is broken at the switch 57 at least slightly before the time another switch 57 is closed to print another letter.

Where my invention is to be employed in

connection with a machine of the Remington type, in which the carriage is shifted to print upper-case letters, the shift keys 22 have associated therewith the powerful shift-key magnet 70, which may be of the design best shown in Fig. 3, and have the swinging armature 71 connected by a pin and slot connection with a link 72 connected to one of the shift keys. This armature carries an insulated bridge piece 73 for the contacts 74 and 75 supported on the insulating bracket 76. The wiring connections for this shift magnet 70 are shown in Fig. 9. A pair of switches 57^a and 57^b are manipulated directly, and when the switch 57^a is closed to print capitals, the current flows from the battery 58 through the conductor 77, magnet 70, conductor 78, switch 57^a, and conductor 79 to the battery. This energizes the magnet 70 and pulls down the shift key, and at the same time closes a circuit through the magnet 70 independent of the switch 57^a through the wires 80 and 81 leading from the conductors 78 and 79 to the contacts 75 and 74 now connected by the bridge piece 73. The wire 80 preferably contains a resistance 82. The machine will now continue to print capitals until the switch 57^b is closed, which through the wires 83 and 84 connected to the switch terminals and the conductors 77 and 79 short-circuits the magnet 70 and releases the shift key 22, which automatically returns to inoperative position. It will be understood that I might open the circuit through the holding switches 74, 73 and 75, instead of short-circuiting the magnet.

Referring now to the proposed modifications of the clutch releasing mechanism, I have in Fig. 10 shown one form that is operated by the action of the escapement lever 85, which projects through a slot 86 in a circuit-breaker lever 87 carrying the spring contacts 88 and 89 adapted to leave the stationary contact pieces 90 and 91 placed in the conductor 64 which connects one side of the battery 58 and the contact strip 92 mounted on a strip of insulation 93 secured on the frame of the machine, so that as the carriage slides across it, the finger 94 of the contact piece 95 mounted on the block of insulation 96 carried by the carriage will slide over said strip 92. The insulation 93 also carries the pair of contact strips 97^a and 97^b, whose surfaces are flush with the surface of the strip 93 and which have the inwardly projecting and alternated points 98^a and 98^b, which are adapted to be alternately engaged by the contact finger 99 of the contact piece 96, the tips of the fingers 94 and 99 being rounded off so that they will move freely over the contact strips 92 and 97^a and 97^b freely in either direction. The strips 97^a and 97^b are respectively connected by the flexible conductors 66^a and 66^b with the spring fingers 65^a and 65^b of the sweeping contact 65 for the stock letter, which fingers are separated by the insulation 65^c. A line of the stock letter in this case is made up of the pins 67^a staggered alternately on opposite sides of the insulating strip 100, and connected by the conductors 62 with the solenoids 52, which in turn are connected by the conductors 60 with the common conductor 59 leading to the other side of the battery 58. The operation of this modification will be readily apparent. As the contact piece 65 is swept over the contacts 67^a, the strips 97^a and 97^b are alternately in circuit, and as the fingers 98^a and 98^b are separated the distance moved by the carriage of the typewriter as each letter is printed, the circuit is broken the instant the letter is printed by the movement of the escapement lever 85 acting on the contact lever 87, and when it springs back, the movement of the contact 95 and the finger 99 have broken the circuit for the contact 67^a, whose letter has just been printed, and as a consequence the contact 65 must be moved on to the next contact 67^a before a circuit can be closed again.

In Fig. 11, I have shown a simpler modification of the releasing mechanism shown in Fig. 10. In this form the contact lever 87^a carries the armature piece 101, which is pulled into contact with the poles of the electromagnet 102 by the escapement lever 85^a when a letter is printed. This piece 101 carries an extension 103, which normally engages the contact 104, in which condition the connections from the battery 58^a through the conductor 59^a are uninterrupted, as in continuous conductor shown in Fig. 9. When the letter is printed, this circuit is broken at the contact 104, but another circuit is formed through the contact 105 and conductors 106, 107 and 108, this circuit including the magnet 102 and a small battery 109, which has strength enough to insure the magnet 102 holding the armature 101 so long as the key 57 is down. When it is released, the contact 104 is engaged by 103, and the main circuit may again be closed. The direction of the current through the small battery is preferably opposed to that of the current through the main battery so as to prevent interference by the residual magnetism in the circuit. I have illustrated in this figure the same shift-key magnet 70^a and the two shift keys 57^a and 57^b as are employed in Fig. 9, and their operation is the same as in that form. The flexible conductor 66^c may be employed with the sweeping contact 65^d for a form letter, and when it touches the contacts 110 and 111, the shift-key magnet 70^a is energized and held, and short-circuited to release it, just as if the keys 57^a and 57^b respectively were closed.

In Fig. 12, I have illustrated a modification of the form shown in Fig. 11, in which the same lever 87^b is actuated by the escape-

ment lever 85[b], and carries an armature 101[a] which engages with the pole pieces of an electromagnet 102. The battery 58[b] has parallel circuits, one of which extends to the binding post 104[a], thence through the contact 103[a] connected to the lever 87[b], thence through the conductor 105 to the contact 65[d], which engages with some one of the contacts 67[b] of the stock letter. Thence the current passes through the magnets 52 as before, and through the conductor 64[a] to the battery. The second circuit is from the battery 58[b] through the conductor 106, through the coils of the electromagnet 102, through the conductor 107 to the contact 65[e], and thence through the contact 67[b] of the stock letter as before. It will be understood that the two contacts 65[d] and 65[e] are carried by the sweeping contact member 65, and it will be understood that the resistance of the circuit including the magnet 102 is much greater, say, ten times, that of the circuit. With this arrangement, it results that when the two circuits are closed by sweeping the contacts 65[d] and 65[e] over the contacts 67[b] of the stock letter, both circuits are closed and the type-writing machine is operated, so that the escapement lever 85[b] carries the armature 101[a] into the field of the electromagnet 102 so as to be attracted and held thereby as long as the circuit through the electromagnet remains closed. This arrangement, of course, insures the release of the clutch member from the rotating cylinder, and prevents the same key from repeating.

In Fig. 13, I have represented a modification in which the cylinder 33 is not operated continuously, but is operated intermittently as each key is actuated. For this purpose I employ a powerful electromagnet 107, the armature 108 of which is suitably connected, as by the link 109, with an actuating lever 110, which carries a spring-pressed pawl 111 which engages the teeth 112 on the end of the cylinder 33. The same clutch members 36 and 44 are provided and the same electromagnet 52 and connections, and the electromagnet 52 is in series with the electromagnet 107, with the result that when the circuit is closed through any of the electromagnets 52, that electromagnet is saturated and the clutch is immediately engaged with the cylinder 33, after which the electromagnet 107, requiring more current to complete its saturation, acts to pull down the armature 108, and thereby the lever 110, and actuate the cylinder to carry the clutch mechanism, and thereby the actuating lever, with it. This modification enables me to dispense with the means for releasing the clutch mechanism, as the cylinder is only actuated so far at each operation as is necessary to cause the letter to be printed, and no more.

In Fig. 14, I have illustrated still another modification of the same general character as that shown in Fig. 13, where, instead of the cylinder 33, I employ a bar 33[d] which is common to all the keys, and is connected by the link 112 with the armature 108[a] of the electromagnet 107[a]. The solenoids 52[b] for the keys are in series with the electromagnet 107[a], but instead of the form of clutch shown in the other figures, I employ an armature 33[c], which has the strips 39[c] connected to the key levers as before. This armature 33[c] is of the shape shown, and when the magnet 52 is energized, the magnetic circuit created causes the armature to swing over so that its lower end 113 passes beneath the engaging edge 114 of the bar 33[b]. This action occurs before the bar 110[a] is drawn down, so that the resulting action is substantially the same, although simpler than that of the mechanism shown in Fig. 13.

While I have shown and described my invention as embodied in the form which I at present consider best adapted to carry out its purposes, it will be understood that it is capable of modifications, and that I do not desire to be limited in the interpretation of the following claims except as may be necessitated by the state of the prior art.

What I claim as new, and desire to secure by Letters Patent of the United States, is:

1. In a device of the class described, the combination with a cylinder and means for rotating it, of a plurality of electrically controlled clutches adapted to grip the cylinder, actuating elements attached to the clutches, a plurality of circuits, one for each clutch, and means for selectively energizing the circuits to engage the various clutches with the cylinder and move the associated actuating elements.

2. In a device of the class described, the combination with a cylinder and means for constantly rotating it, of a plurality of electrically controlled clutches adapted to grip the cylinder, actuating elements attached to the clutches, a plurality of circuits one for each clutch, and means for selectively energizing the circuits to engage the various clutches with the cylinder and move the associated actuating elements.

3. In a device of the class described, the combination with a cylinder and means for constantly rotating it, of a plurality of electrically controlled clutches adapted to grip the cylinder, actuating elements attached to the clutches, a plurality of circuits one for each clutch, means for selectively energizing the circuits to engage the various clutches with the cylinder and move the associated actuating elements, and means for automatically deënergizing each circuit when its clutch has moved with the cylinder a fixed distance.

4. In a device of the class described, the combination with a cylinder and means for rotating it, of a plurality of clutches adapted

to grip the cylinder, an electromagnet for each clutch adapted when energized to move its clutch into and hold it in engagement with the cylinder, a plurality of circuits in which the electromagnets are severally located, actuating elements attached to the clutches, and means for selectively closing the circuits to engage the various clutches with the cylinder and move the associated actuating elements.

5. In a device of the class described, the combination with a cylinder and means for rotating it, of a plurality of clutches adapted to grip the cylinder, an electromagnet for each clutch adapted when energized to move its clutch into and hold it in engagement with the cylinder, a plurality of circuits in which the electromagnets are severally located, actuating elements attached to the clutches, means for selectively closing the circuits to engage the various clutches with the cylinder and move the associated actuating elements, and means for automatically deënergizing each circuit through a magnet when its clutch has moved with the cylinder a fixed distance.

6. In a device of the class described, the combination with the cylinder, and means for rotating it, of a clutch adapted to coöperate therewith and composed of two parts pivotally connected at one side and having bearing surfaces adapted to engage the cylinder, and an electromagnet to draw the free sides of the clutch together to grip the cylinder and rotate therewith.

7. In a device of the class described, the combination with the cylinder, and means for rotating it, of a clutch adapted to coöperate therewith and composed of two parts pivotally connected at one side by a double pivoted joint and having bearing surfaces adapted to engage the cylinder, and an electromagnet to draw the free sides of the clutch together to grip the cylinder and rotate therewith.

8. In a device of the class described, the combination with the cylinder, and means for rotating it, of a clutch adapted to coöperate therewith and composed of two pieces, each having a bearing surface to engage the cylinder, and one having a curved core and the other an opposed armature, and a solenoid adapted to draw the core therethrough toward the armature to grip the cylinder, after which the clutch moves with the cylinder.

9. In a device of the class described, the combination with the cylinder, and means for rotating it, of a clutch adapted to coöperate therewith and composed of two pieces, each having a bearing surface to engage the cylinder, and one having a curved core and the other an opposed armature, a solenoid adapted to draw the core therethrough toward the armature to grip the cylinder, after which the clutch moves with the cylinder, a circuit in which the solenoid is included, a switch member affecting said circuit, and a projection carried by one of said clutch members adapted to strike the switch member after the clutch has moved with the cylinder a fixed distance.

10. In a device of the class described, the combination with the cylinder, and means for rotating it, of a clutch adapted to coöperate therewith and composed of two pieces, each having a bearing surface to engage the cylinder, and one having a curved core and the other an opposed armature, a solenoid adapted to draw the core therethrough toward the armature to grip the cylinder, after which the clutch moves with the cylinder, and means to regulate the distance of the clutch members from the cylinder when the solenoid is deënergized.

11. In a device of the class described, the combination with the cylinder, and means for rotating it, of a clutch adapted to coöperate therewith and composed of two pieces, each having a bearing surface to engage the cylinder, and one having a curved core and the other an opposed armature, a solenoid adapted to draw the core therethrough toward the armature to grip the cylinder, after which the clutch moves with the cylinder, and a slotted guiding member through which the core and armature pass, and about which the solenoid is wound.

12. In a device of the class described, the combination with the pair of parallel cylinders and means for rotating them in synchronism, of a plurality of two-part clutches for each cylinder, the two parts being pivoted together between the cylinders, each part having a semicircular bearing surface to engage the cylinder and one having a core and the other an opposed armature, said core and armature being outside the space between the cylinders, a corresponding plurality of solenoids coöperating with the clutches as described, a corresponding plurality of circuits in which the armatures are included, selective mechanism for closing the circuits, and actuating elements connected with the clutches between the cylinders.

13. In a device of the class described, the combination with the cylinder, and means for rotating it, of a clutch adapted to coöperate therewith and composed of two pieces, each having a bearing surface to engage the cylinder, and one having a curved core and the other an opposed armature, a solenoid adapted to draw the core therethrough toward the armature to grip the cylinder, after which the clutch moves with the cylinder, and means to regulate the distance of the clutch members from the cylinder when the solenoid is deënergized, consisting of the set screw coöperating with the lower clutch member.

14. In a device of the class described, the combination with an actuator common to a plurality of actuating elements, and means for moving it, of a plurality of electrically controlled clutches adapted to grip the actuator, actuating elements attached to the clutches, a plurality of circuits, one for each clutch, and means for selectively energizing the circuits to engage the various clutches with the actuator and move the associated actuating elements.

15. In a device of the class described, the combination with an actuator common to a plurality of elements, and means for moving it, of a plurality of electrically controlled clutches adapted to grip the actuator, actuating elements attached to the clutches, a plurality of circuits, one for each clutch, means for selectively energizing the circuits to engage the various clutches with the actuator and move the associated actuating elements, and means for automatically deenergizing each circuit when its clutch has moved with the actuator a fixed distance.

16. In a device of the class described, the combination with an actuator common to a plurality of actuating elements, and means for moving it, of a plurality of clutches adapted to grip the actuator, an electromagnet for each clutch adapted when energized to move its clutch into and hold it in engagement with the actuator, a plurality of circuits in which the electromagnets are severally located, actuating elements attached to the clutches, and means for selectively closing the circuits to engage the various clutches with the actuator and move the associated actuating elements.

17. In a device of the class described, the combination with an actuator common to a plurality of actuating elements, and means for moving it, of a plurality of clutches adapted to grip the actuator, an electromagnet for each clutch adapted when energized to move its clutch into and hold it in engagement with the actuator, a plurality of circuits in which the electromagnets are severally located, actuating elements attached to the clutches, means for selectively closing the circuits to engage the various clutches with the actuator and move the associated actuating elements, and means for automatically deënergizing each circuit through a magnet when its clutch has moved with the actuator a fixed distance.

In witness whereof, I have hereunto set my hand and affixed my seal, this 14th day of September, A. D. 1908.

HENRY C. HORSTMANN. [L. S.]

Witnesses:

JOHN HOWARD MCELROY,

FREDERICK C. GOODWIN.