

No. 697,934.

Patented Apr. 15, 1902.

G. W. COHEN.  
RAILWAY SAFETY BLOCK SYSTEM.

(Application filed Aug. 8, 1901.)

(No Model.)

6 Sheets—Sheet 1.

FIG. 1.

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RAILWAY SAFETY BLOCK SYSTEM.

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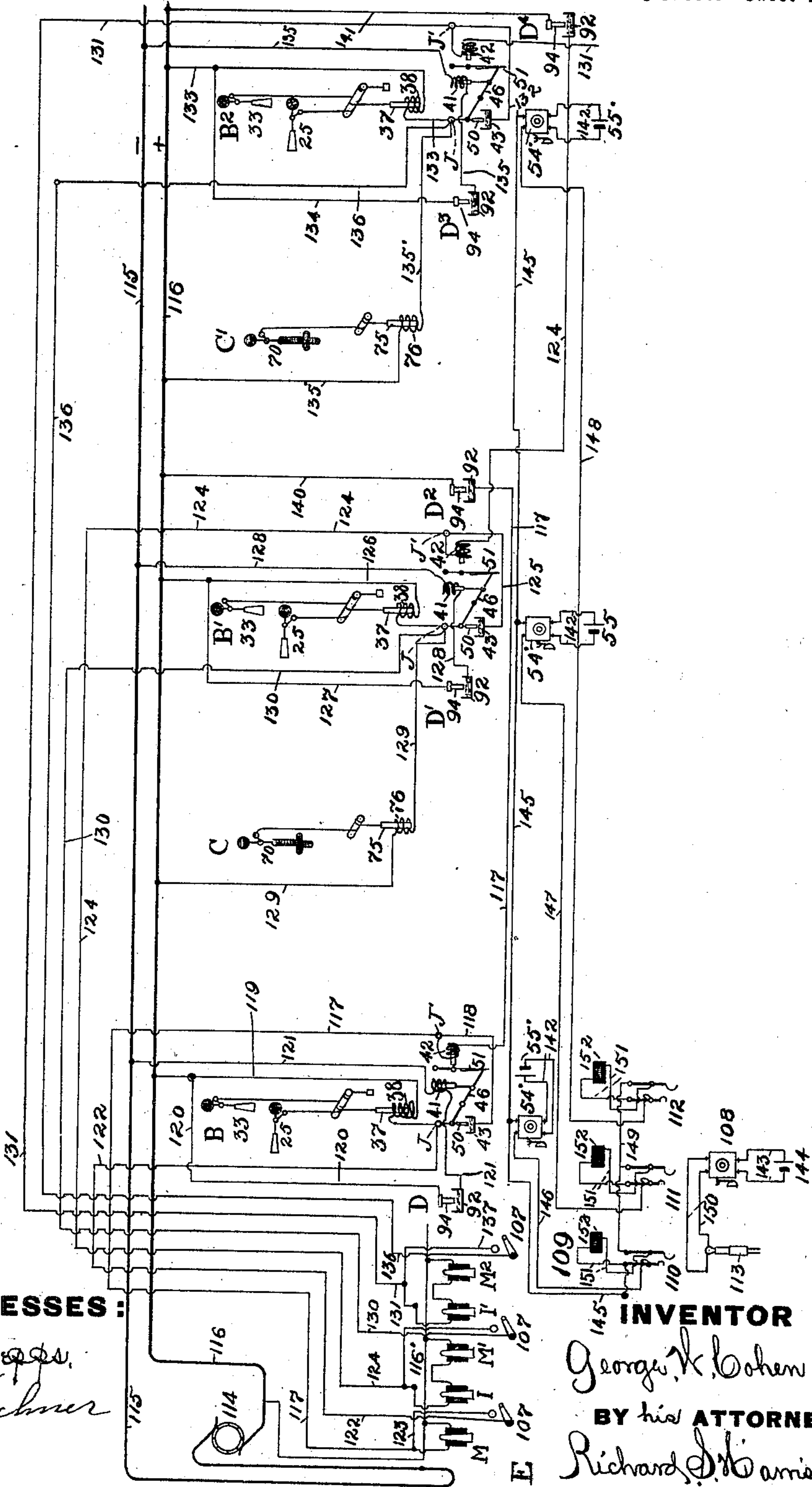
(No Model.)

6 Sheets—Sheet 2.

FIG. 11.

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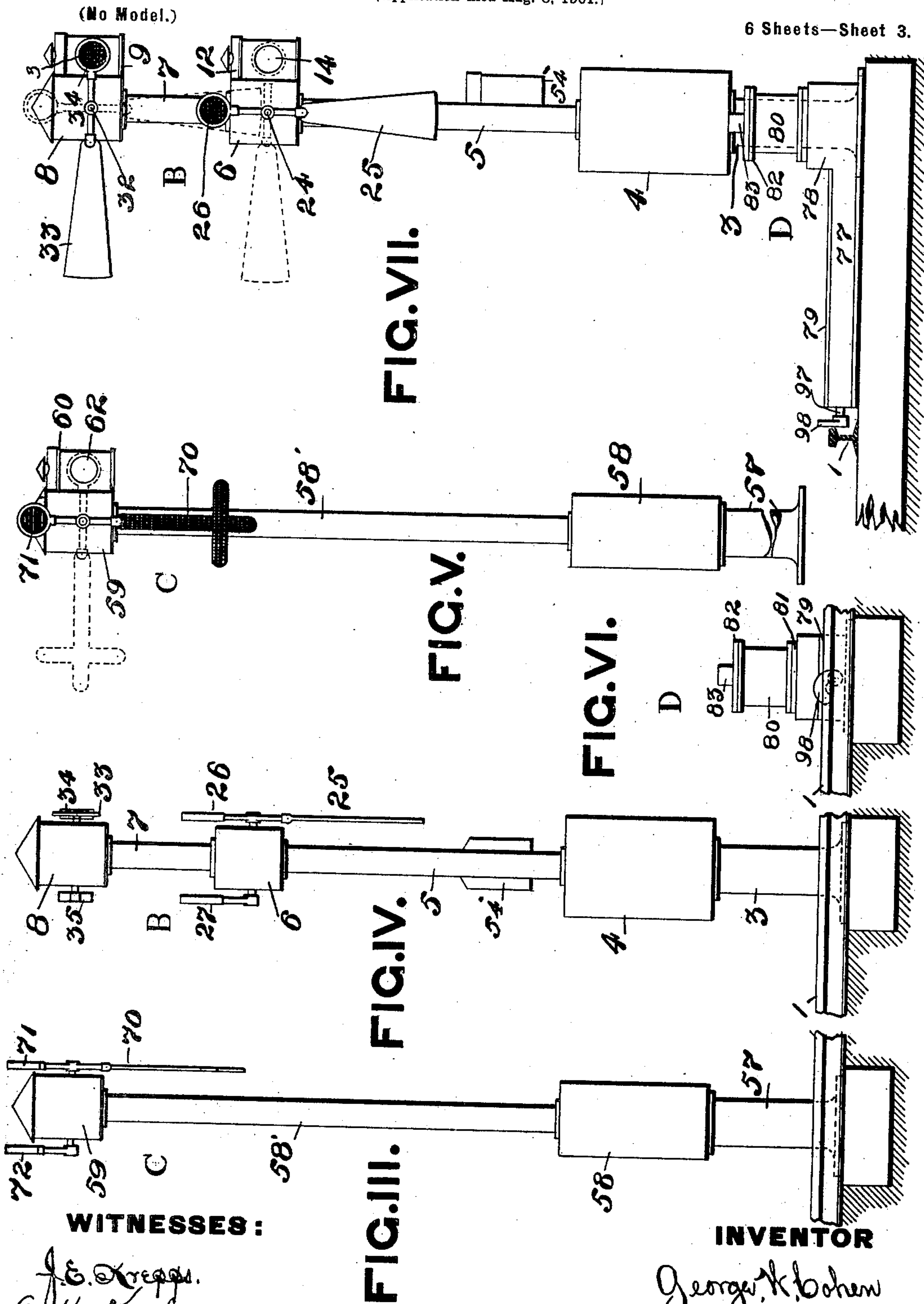
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6 Sheets—Sheet 3.



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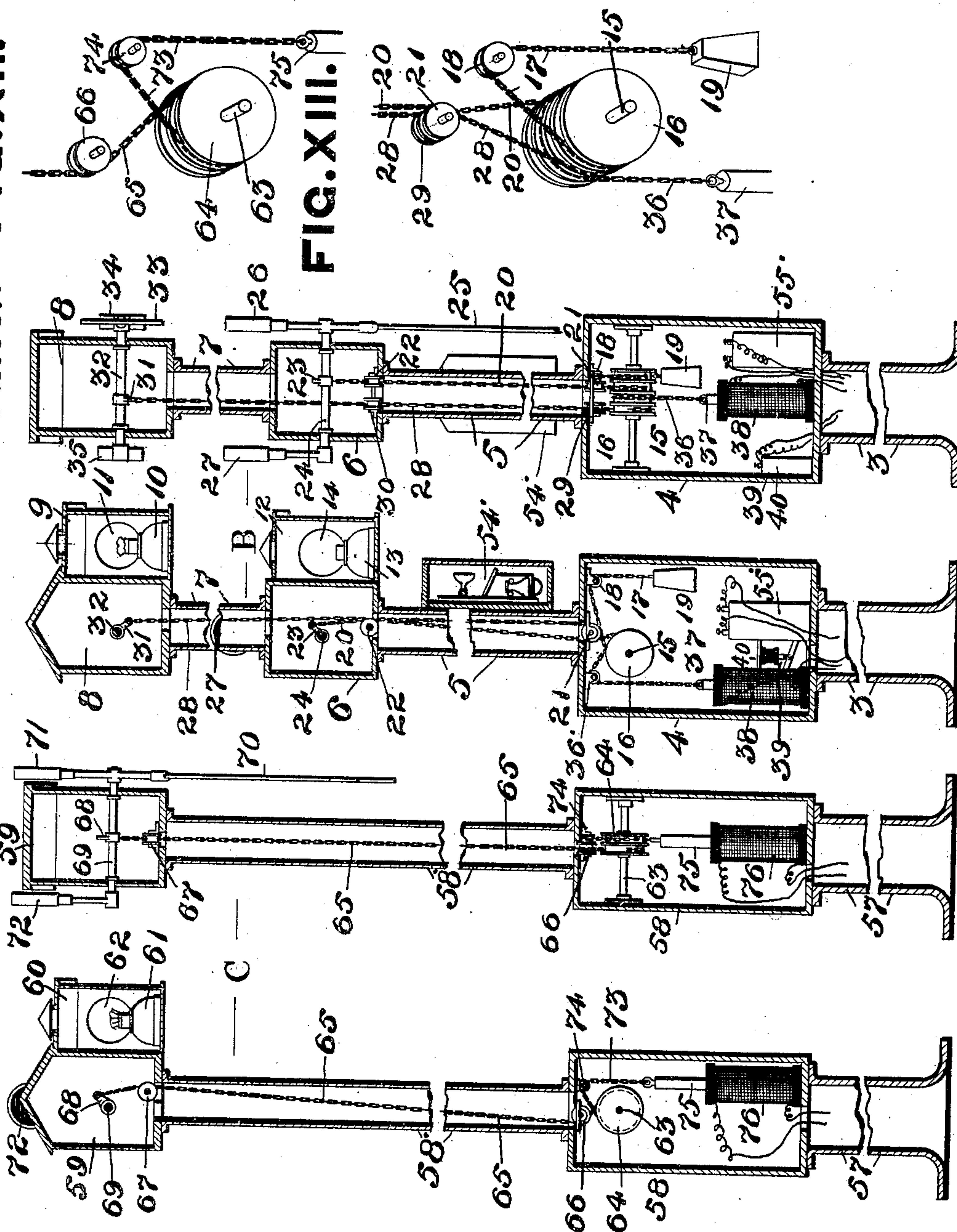
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RAILWAY SAFETY BLOCK SYSTEM.

(Application filed Aug. 8, 1901.)

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6 Sheets—Sheet 4.

FIG.VIII. FIG.IX. FIG.XI. FIG.XII.



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6 Sheets—Sheet 5.

FIG. XIV.

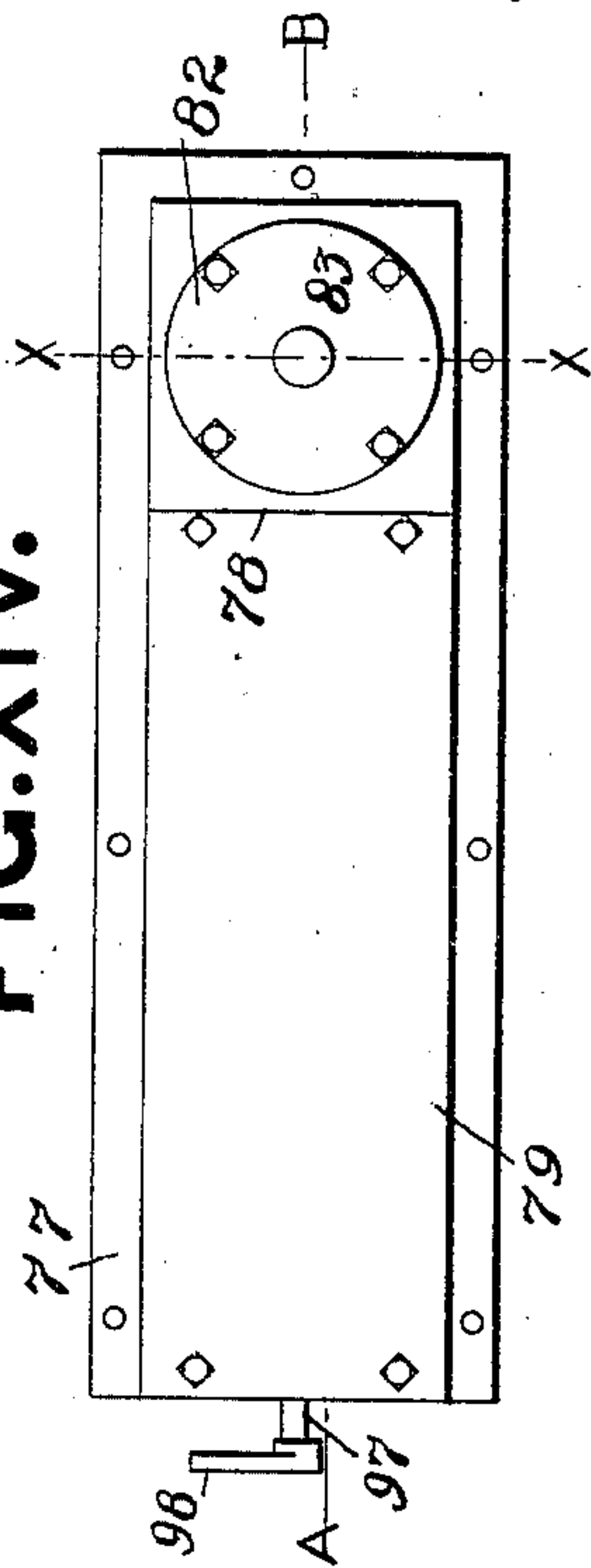


FIG. XV.

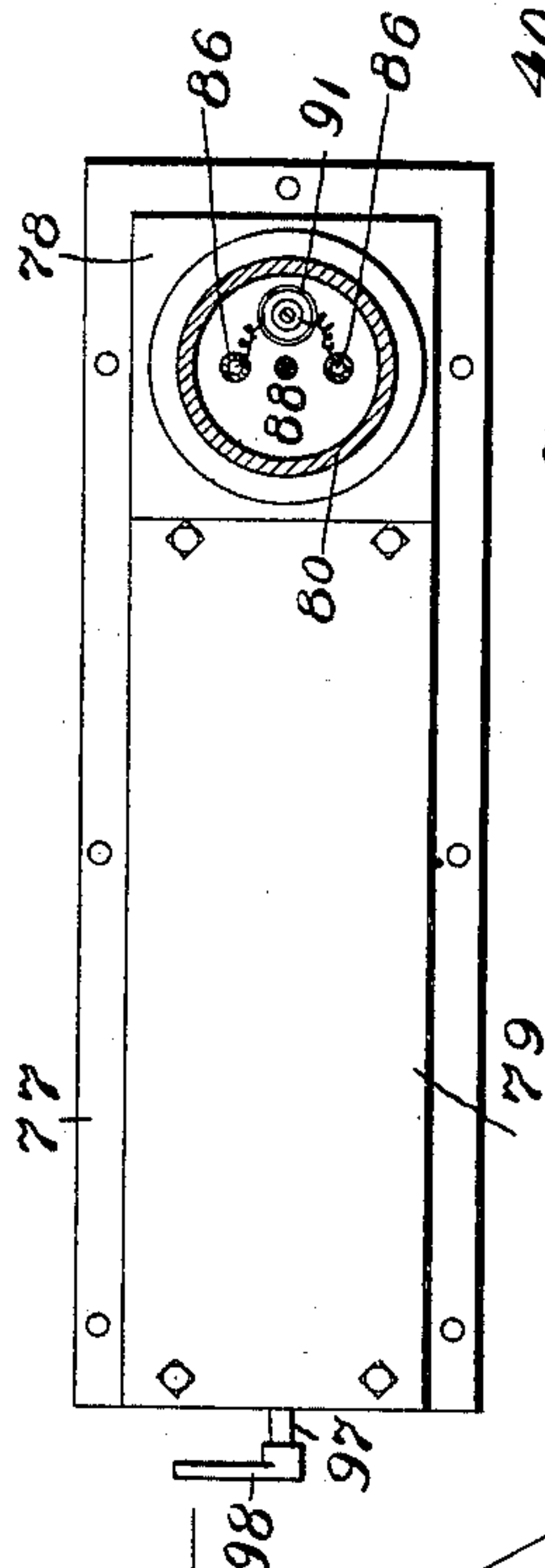


FIG. XVI.

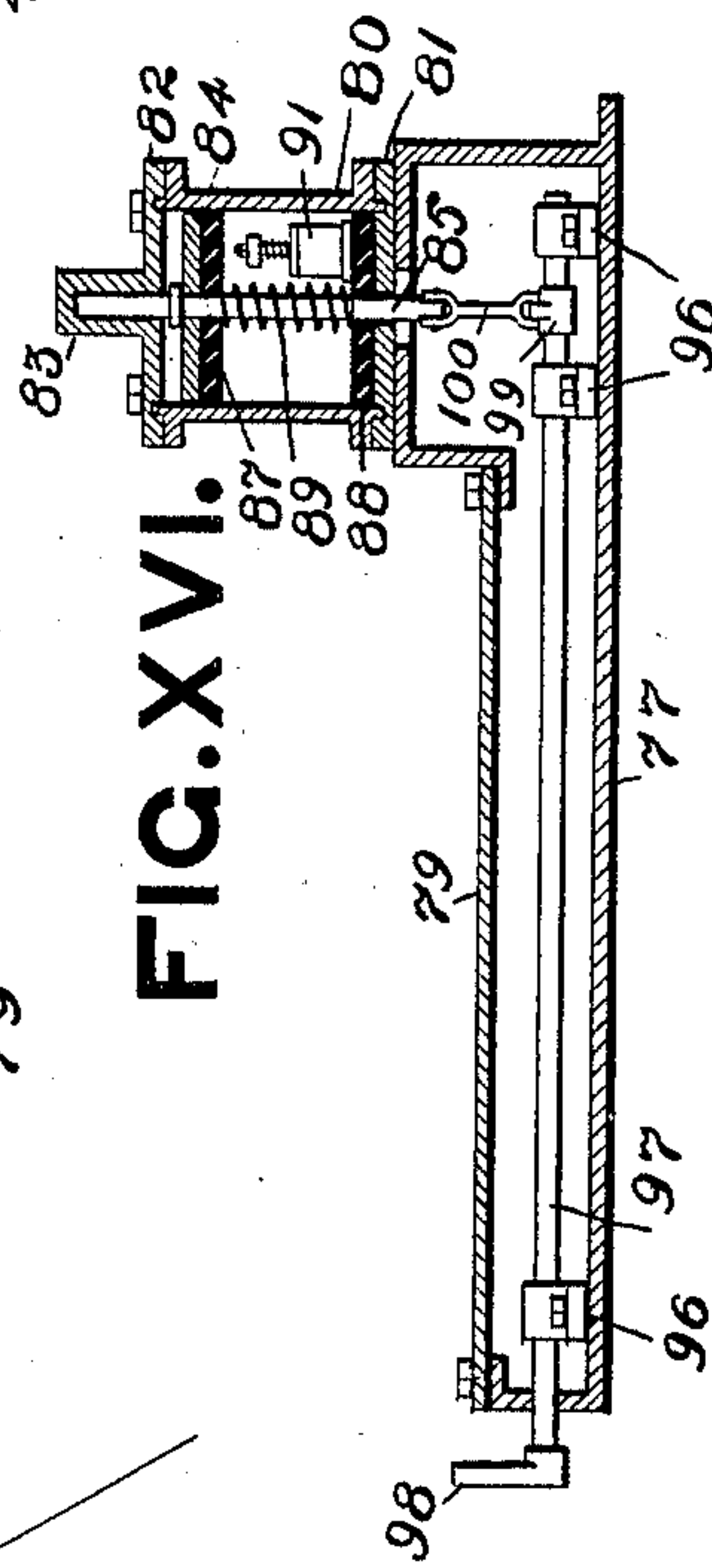


FIG. XVIII.

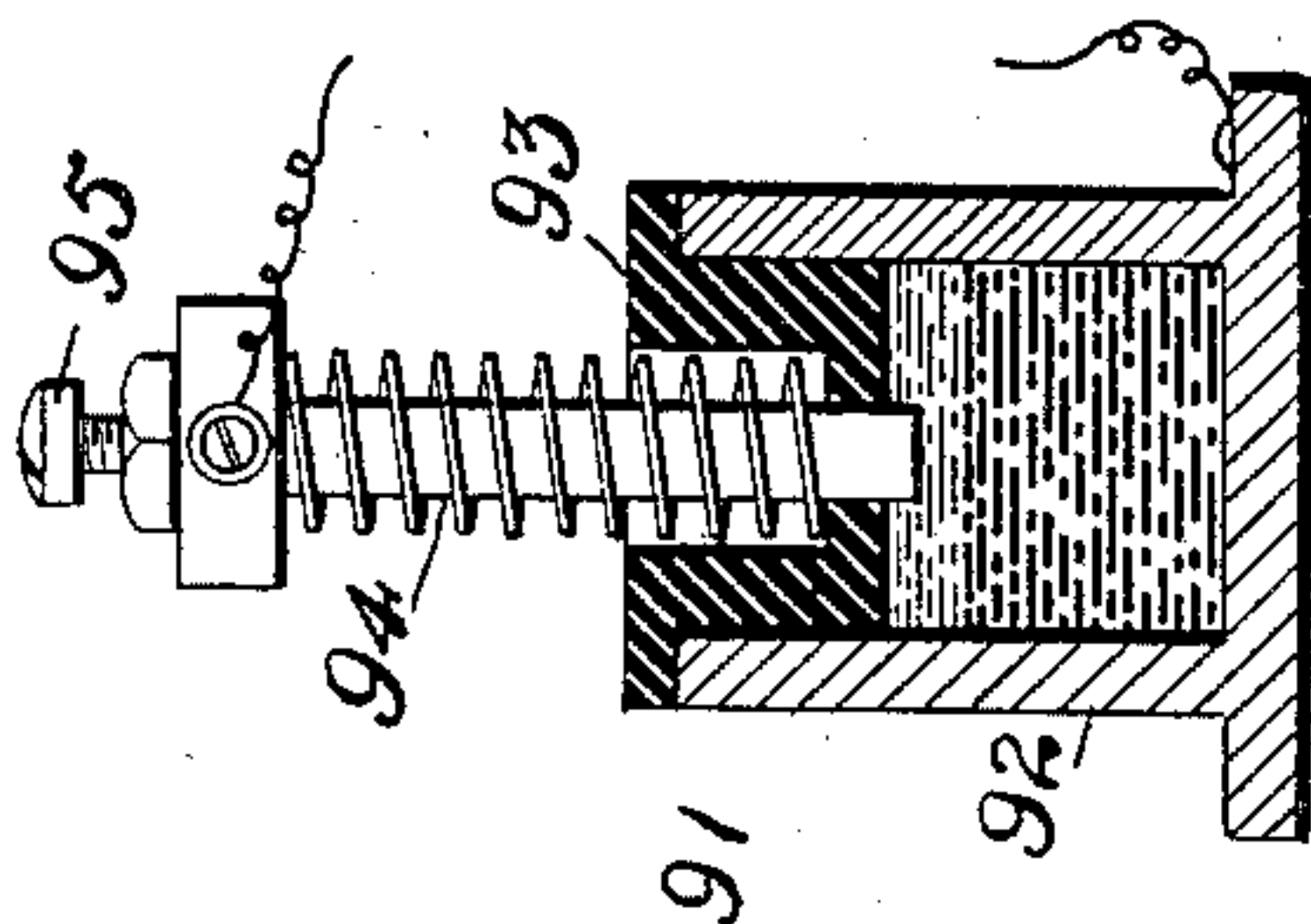


FIG. XVII.

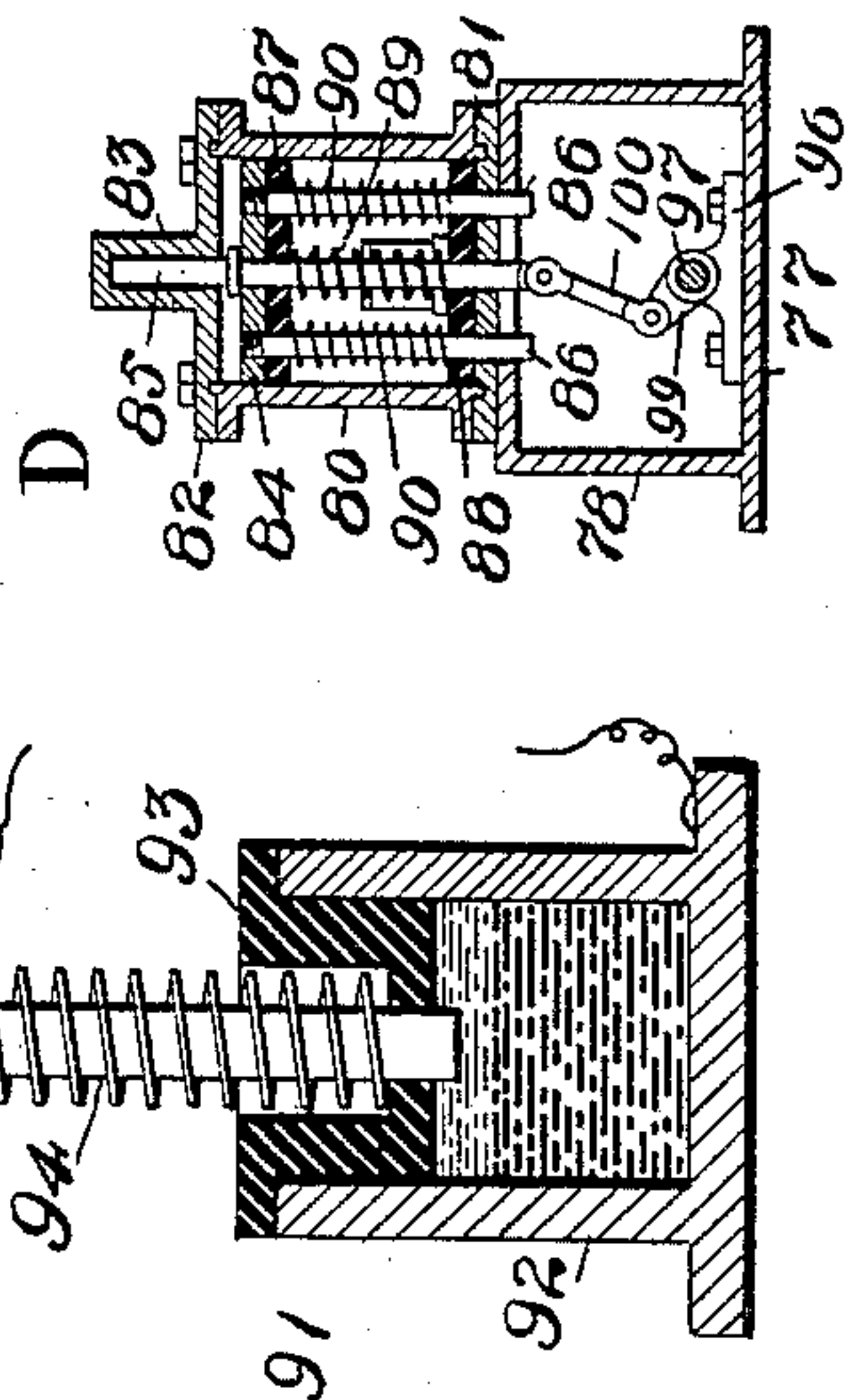
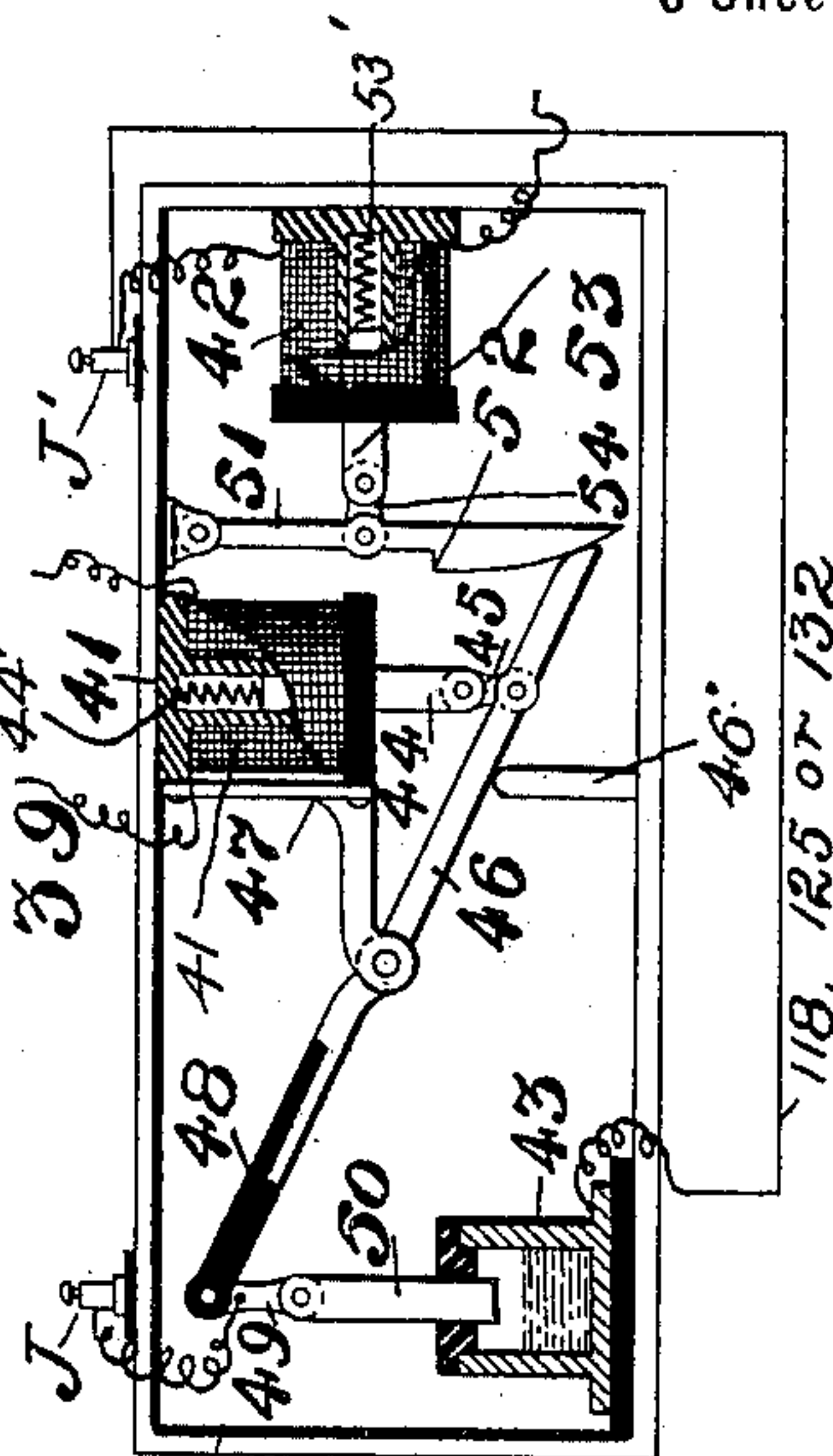


FIG. XIX.



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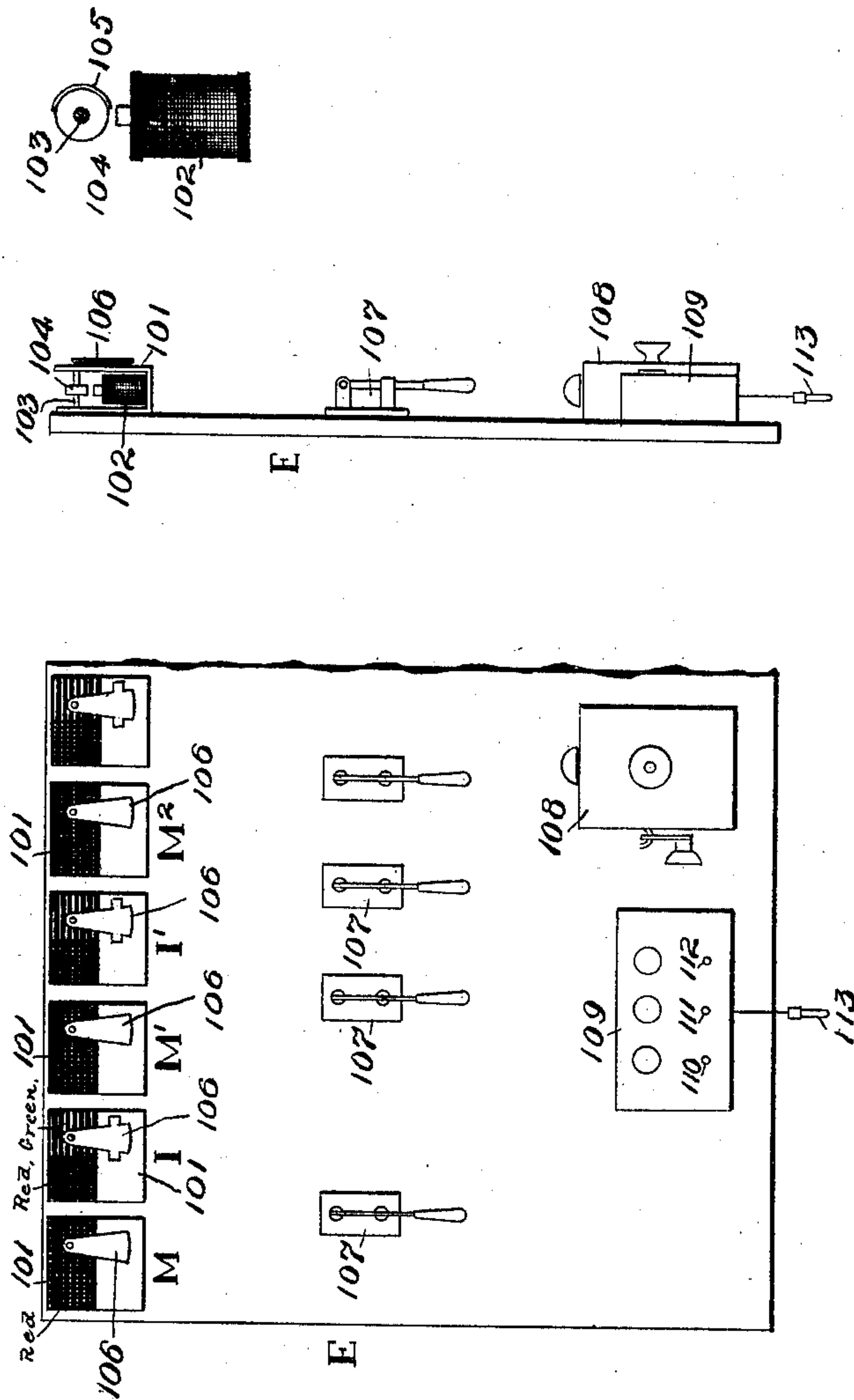
G. W. COHEN.  
RAILWAY SAFETY BLOCK SYSTEM.

(Application filed Aug. 8, 1901.)

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6 Sheets—Sheet 6.

FIG. XX. FIG. XXI. FIG. XXII.



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# UNITED STATES PATENT OFFICE.

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## RAILWAY SAFETY-BLOCK SYSTEM.

SPECIFICATION forming part of Letters Patent No. 697,934, dated April 15, 1902.

Application filed August 8, 1901. Serial No. 71,280. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. COHEN, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Railway Safety-Block Systems, of which improvement the following is a specification.

This invention relates particularly to that class of railway signal systems in which electrical and mechanical devices jointly cooperate.

The object of my invention is to provide improvements in what is known as the "safety block-signal system" for prevention of collisions, &c.

Briefly, the invention consists in dividing the track or tracks into blocks or sections of predetermined lengths, each provided with visual signal devices capable of being operated by a car or cars passing therethrough in either direction.

Provision is made in my improved system whereby the train-despatcher at his headquarters may by reference to visual signals displayed therein follow the train throughout its entire course or determine its location. Further, provision is established between each block and said despatcher's headquarters whereby communication may be had in case of accident, &c., all of which will be hereinafter fully described.

In order to make my invention fully understood, I have in the accompanying drawings by different views and positions illustrated a system and parts thereof whereby my objects may be fully carried into effect, in which views—

Figure I is a plan view representing a length of track divided into blocks and equipped with my improved system. Fig. II is a diagram representing the electric circuit and mechanism operatively connected. Fig. III is a side elevation of one of the intermediate signal-stands in which the signals thereof are displayed in their safety positions. Fig. IV is a side elevation of one of the main signal-stands wherein the signals are set to position

of danger. Fig. V is a front elevation of said intermediate signal-stands. Fig. VI is a side elevation of one of the circuit switch-stands. Fig. VII is a front elevation of said main signal and said circuit switch-stand. Fig. VIII is a broken front elevation of one of the intermediate signal-stands sectioned longitudinally. Fig. IX is a broken side elevation of the same longitudinally sectioned. Fig. X is a broken front elevation of one of the main signal-stands sectioned longitudinally to disclose its interior working parts and wherein the signals are shown as set to danger position. Fig. XI is a broken side elevation of the same longitudinally sectioned. Fig. XII is an enlarged perspective view of a portion of the mechanism removed from one of the intermediate signal-stands. Fig. XIII is a similar view of a portion of the mechanism removed from one of the main signal-stands. Fig. XIV is an enlarged plan view of one of the circuit switch-stands. Fig. XV is a plan view of one of the circuit switch-stands partly in section. Fig. XVI is a front elevation of the same sectioned longitudinally, as on line A B of Fig. XIV. Fig. XVII is a side elevation through one of said switch-stands on the line X X of Fig. XIV. Fig. XVIII is a vertical sectional view of one of the circuit-contact devices enlarged and removed from the switch-stand. Fig. XIX is a front view of one of the automatic circuit-controlling switches as employed in the main signal-stands. Fig. XX is a front view of a portion of the switch and indicator board. Fig. XXI is a side view of the same. Fig. XXII is an enlarged view of one of the indicator-operating magnets and armature removed from said board.

Having set forth the different views illustrated in the drawings, I shall after describing the detail parts and their connections separately take up and set forth the operation and effect.

Referring again to said drawings for the detail parts thereof, the numerals 1 represent the rails of a single track, subdivided into blocks characterized as A, A', and A<sup>2</sup>, along one side of which is stationed the main signal-



stands B, B', B<sup>2</sup>, and B<sup>3</sup>, the intermediate signal-stands, C C', and C<sup>2</sup>, and the circuit switch-stands D, D', D<sup>2</sup>, D<sup>3</sup>, D<sup>4</sup>, D<sup>5</sup>, and D<sup>6</sup>, all of which stands are electrically connected in conduit 2.

As all of the main stands, intermediate stands, and circuit switch-stands are of like structure, to avoid unnecessary repetition a separate and distinct detailed description of, say, main stand B, intermediate stand C, and circuit switch-stand D will suffice.

The main signal-stand B consists of a hollow base 3, inclosure or box 4, tubular extension 5, intermediate inclosure 6, tubular extension 7, and inclosure 8. Upon one side of said inclosure 8 is secured a lamp-casing 9, having therein a lamp 10, provided at opposite sides with windows 11, and upon the side of the said inclosure 6 is secured a similar lamp-casing 12, which is provided with a lamp 13 and opposite windows 14. Extending across the said inclosure 4 is a shaft 15, upon which is mounted and secured a four-grooved pulley or drum 16. Secured to the periphery of said pulley in one of the grooves is a chain 17, which extends upwardly over a fixed pulley 18 and has connected to its free end a weight 19. A chain 20 is secured within another of said grooves to the periphery of the said wheel, passing upwardly over the fixed pulleys 21 and 22, and connects to a crank 23 upon a shaft 24, which extends across the said inclosure 6, said shaft having mounted upon one end the semaphore-arm 25, carrying the red-glass signal 26 and upon its opposite end a crank-arm carrying a red-glass signal 27. A chain 28 is attached to the periphery of said pulley 16 in another of said grooves, passing upwardly over the pulleys 29 and 30, and connects to a crank 31 upon the shaft 32, which extends across the said inclosure 8, said shaft having mounted upon one end the semaphore-arm 33, carrying the red-glass signal 34 and upon the opposite end a crank-arm carrying the red-glass signal 35. Another chain 36 is attached to the periphery of said pulley 16 in the remaining groove, passes over a fixed pulley 36', and has connected to its free end an armature-core 37, said core being arranged to operate within a solenoid-magnet 38, which is secured within said inclosure. An automatic switch 39 is arranged within said inclosure and consists of a casing 40, provided with insulated binding-posts J and J' and (see Fig. XIX) having insulatedly mounted therein the solenoid-magnets 41 and 42 and a cup 43, containing mercury and oil. The solenoid 41 is provided with a spring 44 to outwardly actuate the armature-core 44. Upon the outer end of this core is pivotally attached a link 45. This link connects with a lever 46, which is pivotally attached to a bracket 47, insulatedly attached to said solenoid. The opposite end of said lever is insulated at 48 and is connected by a link 49 with mercury-cup plunger 50. Pivotaly suspended from the upper side of said casing 40

is a lever 51, having a shoulder 52 formed thereon. This lever engages the end of the said lever 46 and is attached to the solenoid-core 53 by a link 54. This core is actuated outwardly by a spiral spring 53' at its rear. The downward movement of the lever 46 is limited by a post 46'. To the one side of the signal-stand is attached a suitable telephone 54', and the battery 55' therefor is secured within the said inclosure 4.

The intermediate signal-stand C consists of a hollow base 57, inclosure or box 58, tubular extension 58', and upper inclosure 59. Upon one side of the upper inclosure is secured a lamp-casing 60, having a lamp 61 and opposite windows 62. A shaft 63 extends across the inclosure 58, upon which is mounted a double-grooved pulley or drum 64, and within one of its grooves is attached a chain 65, which passes up and over the pulleys 66 and 67 and attaches to a crank 68 upon the shaft 69, which extends across the upper inclosure 59, said shaft having secured to one end a cross-shaped semaphore-arm 70, having a partly-red and partly-green glass signal 71 thereon and at its opposite end a crank-arm carrying a red and green signal-glass 72. Another chain 73 is attached at one end to said pulley 64, passing over a pulley 74, and connects at its free end with an armature-core 75, said core being arranged to operate within a solenoid-magnet 76 at the base of said inclosure.

The circuit switch-stand D consists of a box having a raised portion 78 and loose cover 79 thereon. Mounted upon the raised portion of the box is a cylinder 80, having heads 81 and 82, said head 82 being provided with a central extension or boss 83. Within said cylinder is arranged a plunger-head 84, having a solid rod 85 and tubular rods 86 attached thereto. The plunger-head and lower cylinder-head are provided with insulator-plates 87 and 88, and between said insulator-plates and upon said rods are arranged spiral springs 89 and 90. Secured to the lower insulating-plate is a mercury contact device 91, consisting of a metal cup 92, which contains mercury covered with oil and has an insulated head 93 fitted thereto, said head being provided with a spring-actuated plunger 94, which is provided at its upper end with an adjusting-screw 95. Within the base of this switch-stand are arranged the bearings 96, having mounted therein the longitudinal shaft 97. This shaft is provided at its outer end with a crank 98 and near its inner end with a crank 99, said crank 99 being connected to the plunger-rod 85 by a connecting-rod 100.

At the train-despatcher's headquarters is arranged a suitable indicator-board E. This board is provided with a visual signal for each main and each intermediate stand, (designated as M I M' I' M<sup>2</sup>, and so on, in accordance to the number of signal-blocks established.) Each of these visual signals consists



of a plate 101. The upper portion of the signals M, M', and M<sup>2</sup> are painted red and the lower white and the upper portion of the signals I and I' painted red and green at the top and white below. Back of each of these plates is secured a magnet 102, and above this magnet, projecting through the signal-plate, is arranged a rotatable shaft 103, having mounted thereon a disk 104, carrying a radial armature 105. To the end of this shaft, which projects through the plate, is secured a small white semaphore or indicating arm 106. Switches 107 are secured to this board, and below these switches are arranged a telephone 108 and annunciator 109, said annunciator in this case showing but three spring-jacks 110, 111, and 112 and one plug 113.

Reference to the diagram view at Fig. II for a description of the circuits, the numeral 114 designates a generator, and the numerals 115 and 116 the circuit-wires thereof. Beginning at the switchboard a branch wire 116' extends from one of the main wires, and to this branch wire is connected one end of the magnet controlling the signal M, the other end of said magnet being connected with a wire 117, which extends to the mercury-cup 92 of the circuit switch-stand D<sup>2</sup> and includes therein the solenoid 42 of the automatic switch in signal-stand B. The mercury-cup 43 of the automatic switch in this stand is connected to the said wire 117 at binding-post J' by a branch wire 118. To the plunger-contact 50 of said automatic switch and the main wire 116 is connected a wire 119, which includes in its circuit the semaphore-operating solenoid 38 of said stand B. From this wire 119 extends a branch wire 120, which connects with the plunger 94 of the mercury-contact device in stand D. A wire 121 extends from the main wire 115 to the mercury-cup 92 of said switch-stand D, including in its circuit the solenoid 41 of the automatic switch device in said signal-stand B. Another wire 122 connects at one end with the aforesaid wire 119 at binding-post J and at its opposite end with one of the switch members 107 at the indicator-board, the other switch member being connected by a wire 123, extending from the wire 117. The magnet controlling signal M' on the indicator-board is connected at one end to aforesaid branch wire 116' and at its opposite end with one end of the signal-magnet I. The opposite end of said magnet I is connected to a wire 124, which extends to the mercury-cup 92 of circuit-controlling stand D<sup>4</sup> and has included in its circuit the solenoid 42 of the automatic switch in signal-stand B'. The mercury-cup 43 of the automatic switch in this stand is connected to the said wire 124 at binding-post J' by a wire 125. To the plunger 50 of this automatic switch and the main wire 116 is connected a wire 126, which has included therein the semaphore-operating solenoid 38 of said stand B'. From this wire 126 extends a wire 127 to the plunger 94 in the circuit-controlling switch-stand D'. A wire 128 connects the mer-

cury-cup 92 in said stand D' with the main wire 115 and has included in its circuit the solenoid 41 of the automatic switch device in said signal-stand B'. Another wire 129 connects with the said wire 126 at binding-post J to the solenoid 76 in intermediate signal-stand C, and from this solenoid to the main wire 116 another wire 130 branches from said wire 126 at binding-post J and connects to one of the switch members 107 at the switchboard, the other switch member being connected to the aforesaid wire 124. A wire 140 connects the plunger 94 of the circuit switch-stand D<sup>2</sup> with the main wire 116. The magnet controlling the signal M<sup>2</sup> on the indicator-board is connected at one end to the said wire 116' and at its opposite end with one end of the signal-magnet I'. The opposite end of this magnet I' is connected to a wire 131, which extends to and connects with the plunger of the mercury-cup in the next circuit-controlling device (not shown) in the following block and has included in its circuit the automatic switch-solenoid 42 in signal-stand B<sup>2</sup>. The mercury-cup 43 of the automatic switch in this stand B<sup>2</sup> is connected with the said wire 131 at binding-post J' by a wire 132. To the plunger 50 of this automatic switch and the main wire 116 is connected a wire 133, which has included in its circuit the semaphore-operating solenoid 38 of said stand B<sup>2</sup>. From this wire 133 extends a wire 134 to the plunger 94 in circuit-controlling switch-stand D<sup>3</sup>. A wire 135 connects the mercury-cup 92 in said stand D<sup>3</sup> with the main wire 115 and has included in its circuit the solenoid 41 of the automatic switch device in said signal-stand B<sup>2</sup>. Another wire 135' connects the said wire 133 at one end to the binding-post J and at the other end with the solenoid 76 of the intermediate signal-stand C' and from this solenoid to the main wire 116. Another wire 136 branches from said wire 133 at binding-post J and connects to one of the switch members 107 at the indicator-board, the other switch member being connected to the wire 131 by a wire 137. A wire 141 connects the plunger 94 of circuit switch-stand D<sup>4</sup> with the main wire 116.

Each telephone on the main signal-stands is connected by wires 142 to an independent battery 55' and the one located at the switchboard by wires 143 to a battery 144. A wire 145 extends from the telephone on the main signal-stand at the end of the line and connects to one of the contact members of the spring-jack 110 of the switchboard-annunciator. Each of said telephones on the signal-stands is connected at one of its binding-posts to said wire 145. Another wire 146 connects the telephone at signal-stand B with one of the contacts on said annunciator-jack 110. A wire 147 connects one contact member of the annunciator-jack 111 with the telephone on signal-stand B' and a wire 148 connects one contact member of jack 112 with the telephone on signal-stand B<sup>2</sup>. One con-



tact member of each annunciator-jack is connected to a wire 149. The telephone 108 of the switchboard is connected in circuit with the contact-plug 113 by wires 150. Each annunciator-jack is connected by wires 151 to its individual magnet 152.

As I have shown and described the apparatus extending from the despatcher's headquarters and including practically the first three blocks of the system and as the remaining blocks in the system are but a continuation and substantially alike, an operative description of those shown will suffice.

In the diagram view at Fig. II and plan view at Fig. I the signals are shown as in their normal or safety positions, and if it be assumed that a train is about to enter block A the operation would then be as follows: As the train enters block A the wheels of the locomotive or cars come in contact with the crank 98 of the circuit switch-stand D, depressing the same momentarily as the wheels pass thereover, causing the plunger-head 84 to descend in response thereto and force the plunger 94 into contact with mercury in cup 92, establishing the circuit through solenoid 41 of the automatic switch in stand B, elevating lever 46, causing one end thereof to engage or lock in the shoulder of the lever 51, and also causing the plunger 50 at its opposite end to make contact with the mercury in cup 43, establishing the circuit through the solenoid 38 and through the medium thereof elevates the semaphore-arm 33 and lowering the semaphore-arm 25, which position in this system indicates "danger" or that a train is entering or upon said block. At the same time that this circuit is established the magnet on the indicator-board at signal M is energized, causing the signal thereof to be elevated to red space and correspond with the danger position assumed by semaphore on said stand. As the train proceeds in this block and finding the semaphore-signal on the intermediate signal-stand C set to safety position it proceeds upon its way, passing over and depresses crank 98 of switch-stand D', causing contact between plunger 94 and mercury-cup 92, establishing the circuit through the solenoid 41 of automatic switch in stand B', elevating lever 46, causing one end thereof to engage or lock in the shoulder of lever 51 and at its opposite end make contact between the plunger 50 and mercury-cup 43, establishing the circuit through semaphore-operating solenoid 38 in stand B' and through the medium thereof elevates semaphore-arm 33 and lower arm 25 and at the same time establishes the circuit through the solenoid in intermediate stand C and elevates the semaphore 70 thereof, and at the same moment that these circuits are established the magnets of I and M' on the indicator-board are energized, causing the signals thereof to be elevated to the red spaces thereon and correspond with the danger positions assumed by the semaphores on said stands. The train

still continues upon its way, passing switch-stand D<sup>2</sup>, depressing the crank thereof and causing contact between plunger 94 and mercury-cup 92 in said stand, establishing the circuit momentarily through solenoid 42 of the automatic switch in signal-stand B, causing the lever 51 to be drawn away from lever 46, releasing said lever 46, which immediately drops and breaks connection between mercury-cup 43 and plunger 50, breaking the circuit through solenoid 38 in stand B, causing semaphore-arm 25 to be elevated and semaphore 33 to lower by action of weight 19, and at the same time causes the signals M on indicator-board to lower to correspond with said semaphore-signals on stand B, indicating "safety" between said stand B and intermediate stand C. The train still continues upon its way if intermediate stand C' indicates "safety," passing switch-stand D<sup>3</sup>, depressing the crank thereof, causing contact between plunger 94 and mercury-cup 92 in said stand, establishing the circuit through solenoid 41 of automatic switch in stand B<sup>2</sup>, elevating lever 46, causing one end thereof to engage or lock in the shoulder of lever 51 and at its opposite end make contact between the plunger 50 and mercury-cup 43, establishing the circuit through the semaphore-operating solenoid 38 in said stand B<sup>2</sup> and through the medium thereof elevate semaphore-arm 33 and lower arm 25 on said stand B<sup>2</sup>, and at the same time establishes the circuit through the solenoid in the intermediate stand C' and elevates the semaphore 70 thereof, and at the same moment that these circuits are established the magnets of indicators I' and M<sup>2</sup> on the indicator-board are energized, causing the signals thereof to be elevated to the red spaces thereon and correspond with the danger position assumed by the semaphores on said stands C' and B<sup>2</sup>. The train still continues upon its way, passing switch-stand D<sup>4</sup>, depressing the crank thereof, causing contact between plunger 94 and mercury-cup 92 in said stand, establishing the circuit through solenoid 42 of automatic switch in stand B', causing the lever 51 to be drawn away from lever 46, releasing said lever 46, which immediately drops, breaking connection between mercury-cup 43 and plunger 50, breaking the circuit through solenoid 38 in stand B', causing semaphore-arm 25 to be elevated and semaphore 33 to be lowered by action of weight 19, and at the same time causes the signals I and M' on indicator-board to lower to correspond with said semaphore-signals on said stand B' and intermediate stand C, thereby indicating "safety" between entire block from B' to B<sup>2</sup>. As the train continues along the road the crank on each succeeding stand is depressed, causing a display of signals, as described throughout the entire system.

If a train should become wrecked in any block, the conductor of said train proceeds to the nearest main signal-stand and by the telephone thereon communicates with the de-



spatcher's office, notifying him of such accident. The despatcher being notified throws the proper switch 107 on indicator-board to complete circuit through solenoid 38 on signal-stand immediately back of said wreck, causing semaphore-arm 33 to be elevated and semaphore 25 to be lowered, also elevating indicator-arm on indicator-board which corresponds thereto, indicating to all approaching trains of the blockade in said block. When the track or block has been cleared of such wreck, the despatcher is notified by telephone and upon receiving such notice disconnects the said switch 107 to cause said signals to resume their safety positions and permit trains to proceed as before. By the use of these switches 107 and the telephones stationed at the blocks all trains along the road may be stopped and communicated with for instructions at any block desired, or in case of accident, &c., of any character communication from any block may be established with the despatcher's office, doing away with the use of telegraphers and receiving prompt assistance in case of emergency, which in many cases would result in saving of life.

In the intermediate stands, it will be noted that the semaphore signal-blade is in the form of a cross, and the glass half red and half green, by which the same may be readily distinguished from the main signals, and the object thereof is to give positive warning to the engineer as to the condition of the approaching block-stand.

In most signal systems the stands are provided with a single semaphore-arm only to denote "danger" or "safety," causing confusion through improper workings at times. In my system I employ two reversing semaphores. Thus while the one denoting "safety" is down the one which denotes "danger" is up, thereby enabling the engineer to positively distinguish the signals from some distance as he approaches the same.

In this system it will be observed that no overhead bridges, towers, and attendant are required, as the entire system is worked from the despatcher's headquarters.

It will be noted that on my indicator-board I employ signals of a form corresponding with those on the block-signal stands along the road, which at a glance will readily be distinguished from one another and differ from any other now in use in such systems.

An important feature in this system is that after a train has passed over one of the switch-stands and set the semaphore-arms on the block ahead of said switch-stand it is impossible in any way to displace the signal so set until the train has passed entirely out of the block, as the lever 98 of the said switch-stands will be under such tension by the springs as to be inoperative only by such pressure as is capable of being produced by a heavy body or car.

From the time that the first wheel of the

engine or car passes over the crank of the switch-stands and as each succeeding wheel passes thereover a vibration of the signal on the indicator-board will be produced, thereby enabling the despatcher to tell when the car or engine has entered the block and the last car or engine has left same, as such vibration will immediately cease and the indicator become rigid.

Another important feature of my invention is the automatic switch employed in each of the main signal-stands, wherein I employ an interlocking magnet in connection with a mercury dash-pot, thereby making a non-freezing and positive circuit-breaker.

By complying with the signals and instructions in this system it will be seen that collisions, &c., are avoided.

Alterations may be made in some of the detail parts of construction or substitution of other details or the rails may be connected in circuit with the generator to dispense with the main wires 115 and 116 and convert the same into a track system when such change would be beneficial without departing from the principles employed in my invention.

Having thus fully shown and described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An electromechanical railway signal system, comprising a plurality of main signal-stands placed along the railway to divide the same into blocks or sections each of which is provided with a pair of oscillatable signal-arms, intermediate signal-stands each having a single signal-arm thereon, an indicator-board having indicators thereon representing each block, a miniature oscillatable arm on each indicator, means whereby a train on entering the first block will automatically and simultaneously oscillate the signal-arms of the first main stand and its indicator from safety to danger positions, means at the terminus of said block whereby the train on leaving the same will automatically and simultaneously oscillate the signal-arms on the intermediate stand therein and the succeeding main stand at the entrance of next block and their respective indicator-arms from safety to danger positions, means at the entrance of said block whereby the signal-arms of the first block-stand and its indicator will be automatically restored by the train to their normal or safety position, means at the terminus of the same and each succeeding block whereby the signals of the intermediate stand therein and the succeeding main stand thereof with their respective indicator-arms will be automatically and simultaneously oscillated by the train from safety to danger positions, and means at the entrance of said last-mentioned and each succeeding block whereby the signal-arms on said intermediate and main stand and their respective indicators will be automatically and simultaneously restored by the train from danger to safety positions.



2. An electromechanical railway signal system, comprising a plurality of main signal-stands placed along the railway to divide the same into blocks or sections each of which is  
 5 provided with a pair of oscillatable signal-arms, intermediate signal-stands each having a single signal-arm thereon, an indicator-board having indicators thereon representing each block, a miniature oscillatable arm on  
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 20 spective indicator-arms from safety to danger positions means at the entrance of said block whereby the signal-arms of the first block-stand and its indicator will be automatically restored by the train to their normal or safety  
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 30 ally and simultaneously oscillated by the train from safety to danger positions, and means at the entrance of said last-mentioned and each succeeding block whereby the signal-arms on said intermediate and main stand and their  
 35 respective indicators will be automatically and simultaneously restored by the train from danger to safety positions, and means at said indicator-board whereby the signals controlling each block may be separately operated  
 40 therefrom to danger or safety positions independent of the train-actuating means.

3. An electromechanical railway signal system, comprising a plurality of main signal-stands placed along the railway to divide the  
 45 same into blocks or sections each of which is provided with a pair of oscillatable signal-arms, intermediate signal-stands each having a single signal-arm thereon, an indicator-board having indicators thereon representing  
 50 each block, a miniature oscillatable arm on each indicator, means whereby a train on entering the first block will automatically and simultaneously oscillate the signal-arms, of the first main stand and its indicator from  
 55 safety to danger positions, means at the terminus of said block whereby the train on leaving the same will automatically and simultaneously oscillate the signal-arms on the intermediate stand therein and the succeeding  
 60 ing main stand at the entrance of next block and their respective indicator-arms from safety to danger positions, means at the entrance of said block whereby the signal-arms of the first block-stand and its indicator will  
 65 be automatically restored by the train to their normal or safety position, means at the ter-

minus of the same and each succeeding block whereby the signals of the intermediate stand therein and the succeeding main stand thereof with their respective indicator-arms will be  
 70 automatically and simultaneously oscillated by the train from safety to danger positions, means at the entrance of said last-mentioned and each succeeding block whereby the signal-arms on said intermediate and main stand  
 75 and their respective indicators will be automatically and simultaneously restored by the train from danger to safety positions, and a telephone arranged on said indicator-board and each of said main signal-stands. 80

4. An electromechanical railway signal system comprising a plurality of main signal-stands placed along the railway to divide the  
 85 same into blocks or sections each of which is provided with a pair of oscillatable signal-arms, intermediate signal-stands each having a single signal-arm thereon, an indicator-board having indicators thereon representing  
 90 each block, a miniature oscillatable arm on each indicator, means whereby a train on entering the first block will automatically and simultaneously oscillate the signal-arms of the first main stand and its indicator from safety  
 95 to danger positions, means at the terminus of said block whereby the train on leaving the same will automatically and simultaneously oscillate the signal-arms on the intermediate stand therein and the succeeding main stand  
 100 at the entrance of next block and their respective indicator-arms from safety to danger positions, means at the entrance of said block whereby the signal-arms of the first block-stand and its indicator will be automatic-  
 105 ally restored by the train to their normal or safety position, means at the terminus of the same and each succeeding block whereby the signals of the intermediate stand therein and the succeeding main stand thereof with their  
 110 respective indicator-arms will be automatically and simultaneously oscillated by the train from safety to danger positions, means at the entrance of said last-mentioned and each succeeding block whereby the signal-arms on said  
 115 intermediate and main stand and their respective indicators will be automatically and simultaneously restored by the train from danger to safety positions, means at said indicator-board whereby the signals controlling  
 120 each block may be separately operated therefrom to danger or safety positions independent of the train-actuating means, and a telephone arranged on said indicator-board and each of said main signal-stands.

5. An electromechanical-operated block-signal system, a signal-stand, comprising a  
 125 stand, a pair of oscillatable signal-arms mounted on one side thereof which are positioned at right angles to one another, a pulley or drum mounted therein, a chain extending  
 130 from said drum to a crank on each of said arms, a weight suspended from said drum to actuate the same in one direction, a core sus-



pended from said drum, and a solenoid-magnet arranged in said stand which when energized is adapted to act upon said core and rotate said drum in an opposite direction to reverse the positions of said signal-arms.

6. In an electromechanical-operated block-signal system, an intermediate block-stand, comprising a stand, a vertical oscillatable signal-arm mounted upon one side thereof, a pulley or drum arranged therein, a chain connecting said signal-arm with said drum, a core suspended from said drum, and a solenoid-magnet in said stand which is adapted when energized to act upon said core and rotate said drum to elevate said signal-arm to a horizontal position.

7. In an electromechanical block-signal system, a circuit-closer, comprising, a casing, a horizontal shaft extending therefrom having cranks rigidly fixed at its outer and inner end, a vertical chamber on said casing, a piston-plunger in said chamber connected to said inner crank and normally upheld by spring-pressure, and means in said chamber whereby a circuit is closed by the downward movement of said plunger when said outer crank is depressed.

8. In an electromechanical railway signal system, a train-actuated circuit-closer, comprising a chamber, a piston-plunger operatively arranged in said chamber, a crank-lever adapted to engage with and be depressed by the wheels of a train, means connecting said lever with the plunger to move the latter in one direction when depressed, circuit-closing members in said chamber and insulated therefrom which are adapted to be brought into engagement by said plunger when so moved, and means for restoring said plunger and crank to their normal position.

9. In an electromechanical railway signal system, a train-actuated circuit-closer, comprising a chamber, a piston-plunger operatively arranged in said chamber, a crank-lever adapted to engage with and be depressed by the wheels of a train, means connecting said lever with the plunger to move the latter in one direction when depressed, circuit-closing members in said chamber and insulated therefrom which are adapted to be brought into engagement by said plunger when so moved, means for restoring said plunger and crank to their normal positions, and means carried by one of said circuit members whereby engagement of the plunger therewith may be adjusted.

10. In an electromechanical semaphore-signal system operated by the train, the combination therewith, of indicating devices representing said semaphores, and means whereby said devices will automatically and simultaneously indicate the positions assumed by said semaphores.

11. In an electromechanical semaphore-signal system operated by the train, the combination therewith, of oscillatable indicators representing said semaphores, and means

whereby said indicators will automatically and simultaneously oscillate to positions assumed by said semaphores.

12. In an electromechanical semaphore-signal system operated by the train, the combination therewith, of indicating devices representing said semaphores, means whereby said devices will automatically and simultaneously indicate the positions assumed by said semaphores, and means independent of that actuated by the train for separately actuating any one of said semaphores and its indicator.

13. In an electromechanical semaphore-signal system operated by the train, the combination therewith, of oscillatable indicators representing said semaphores, means whereby said indicators will automatically and simultaneously oscillate to positions assumed by said semaphores, and means independent of that actuated by the train for separately actuating any one of said semaphores and its indicator.

14. In a railway signal system, the combination of a signal-circuit having a make-and-break mechanism therein, a second circuit having therein a train-actuating circuit-closer and a mechanism to operate the make-and-break mechanism of said signal-circuit when closed by the train, means to automatically lock said make-and-break mechanism in the position assumed at closure of said second circuit, and a third circuit having therein a train-actuating circuit-closer and a mechanism to act upon and release said lock when closed by the train to effect a restoration of said signal-circuit.

15. In a railway signal system, the combination of a signal-circuit having a make-and-break mechanism therein, a second circuit having therein a train-actuating circuit-closer and a mechanism to act upon and bring together the make-and-break members of said signal-circuit when closed by the train, means to automatically lock said make-and-break members when brought together at closure of said second circuit, and a third circuit having therein a train-actuating circuit-closer and means for acting upon and releasing said lock when closed by the train to effect a restoration of said signal-circuit.

16. In a railway signal system, the combination of a signal-circuit having therein a signal indicator therefor and a make-and-break mechanism, a second circuit having therein a train-actuating circuit-closer and a mechanism to operate the make-and-break mechanism of said signal-circuit when closed by the train, means to automatically lock said make-and-break mechanism in the position assumed at closure of said second circuit, and a third circuit having therein a train-actuating circuit-closer and a mechanism to act upon and release said lock when closed by the train to effect a restoration of the signal and its indicator.

17. In a railway signal system, the combi-



nation of a signal-circuit having therein a signal an indicator therefor and a make-and-break mechanism, a second circuit having therein a train-actuated circuit-closer and a mechanism to act upon and bring together the make-and-break members of said signal-circuit when closed by the train, means to automatically lock said make-and-break members when brought together at closure of said second circuit, and a third circuit having therein a train-actuating circuit-closer and means for acting upon and releasing said lock when closed by the train to effect a restoration of the signal and its indicator.

18. In a railway signal system, the combination of a signal-circuit having therein a signal an indicator therefor and a make-and-break mechanism, a second circuit having therein a train-actuating circuit-closer and a mechanism to operate the make-and-break mechanism of said signal-circuit when closed by the train, means to automatically lock said make-and-break mechanism in the position assumed at closure of said second circuit, a third circuit having therein a train-actuating circuit-closer and a mechanism to act upon and release said lock when closed by the train to effect a restoration of the signal and its indicator, and means independent of that operated by the train to operate said signal and indicator.

19. In a railway signal system, the combination of a signal-circuit having therein a signal an indicator therefor and a make-and-break mechanism, a second circuit having

therein a train-actuating circuit-closer and a mechanism to act upon and bring together the make-and-break members of said signal-circuit when closed by the train, means to automatically lock said make-and-break members when brought together at closure of said second circuit, and a third circuit having therein a train-actuating circuit-closer and means for acting upon and releasing said lock when closed by the train to effect a restoration of the signal and its indicator, and means independent of that operated by the train to operate said signal and indicator.

20. In a railway signal system, the combination of a circuit having a signal and a make-and-break mechanism therein, a second circuit having therein a train-actuating circuit-closer and a mechanism to operate the make-and-break mechanism of said signal-circuit when closed by the train, means to automatically lock said make-and-break mechanism in the position assumed at closure of said second circuit, a third circuit having therein a train-actuating circuit-closer and a mechanism to act upon and release said lock when closed by the train to effect a restoration of said signal, and means independent of that operated by the train for operating said signal.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

GEORGE W. COHEN.

Witnesses:

RICHARD S. HARRISON,  
 J. E. KREPPS.