No. 889,205 PATENTED JUNE 2, 1908.

E. P. COOK.

RAILWAY SIGNAL SYSTEM.

APPLICATION FILED AUG. 30, 1907.

5 SHEETS—SHEET 1.

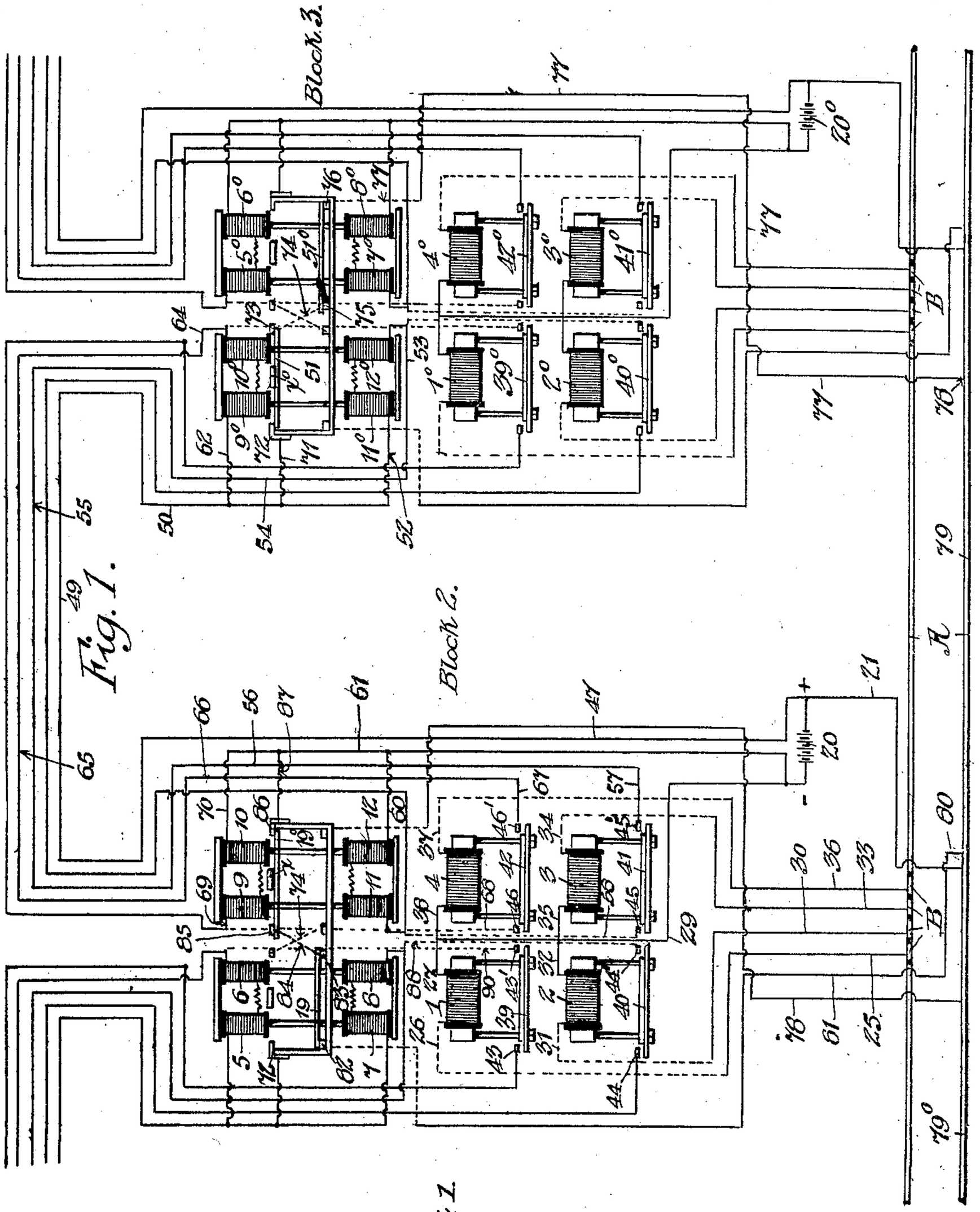

Fig. 1.

WITNESSES:
Chas. K. Davies.
Myron G. Clear

INVENTOR
Emory P. Cook,
BY
L. L. Parker
Attorney

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5 SHEETS—SHEET 2

Fig. 2.

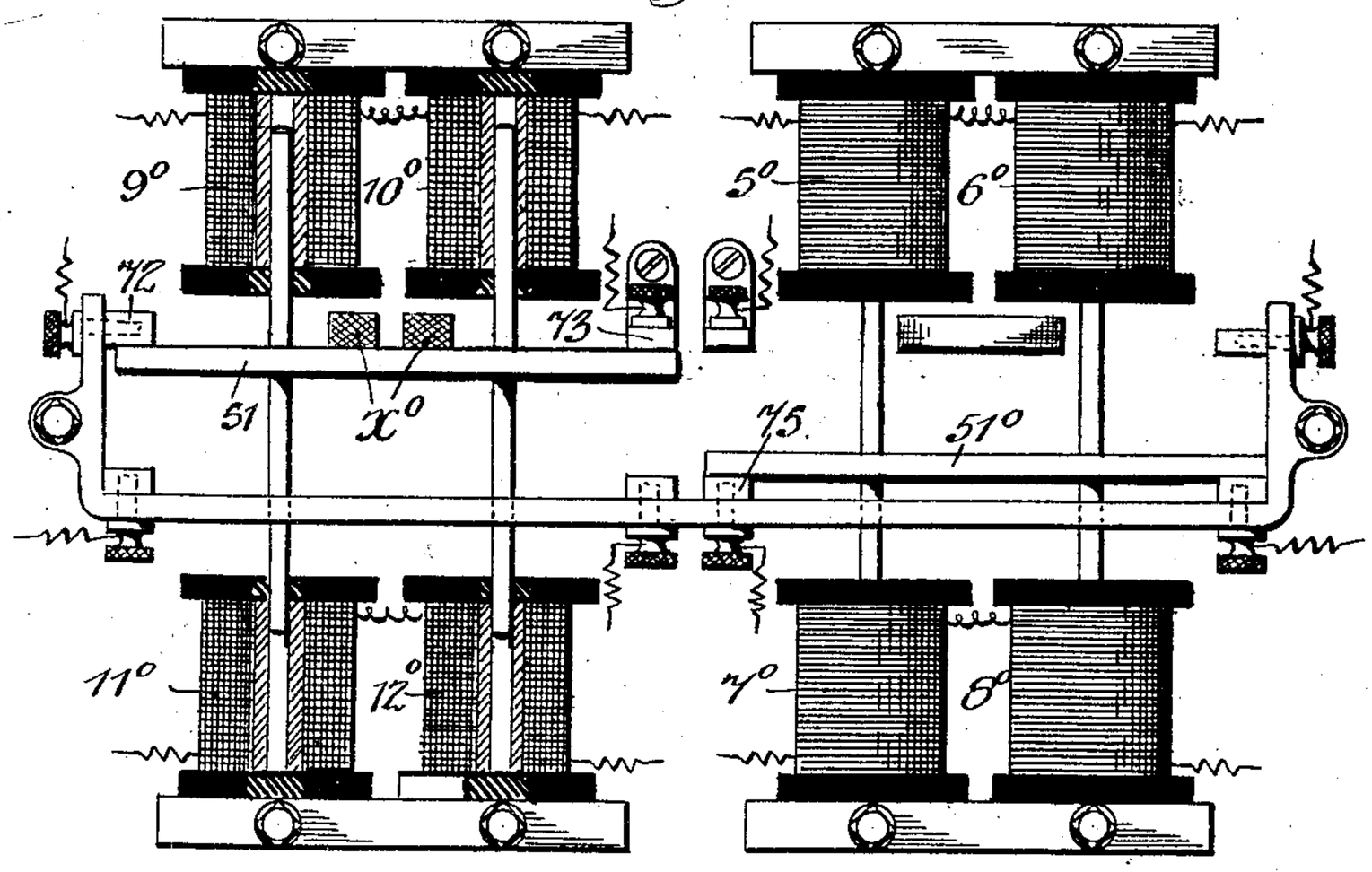


Fig. 3.

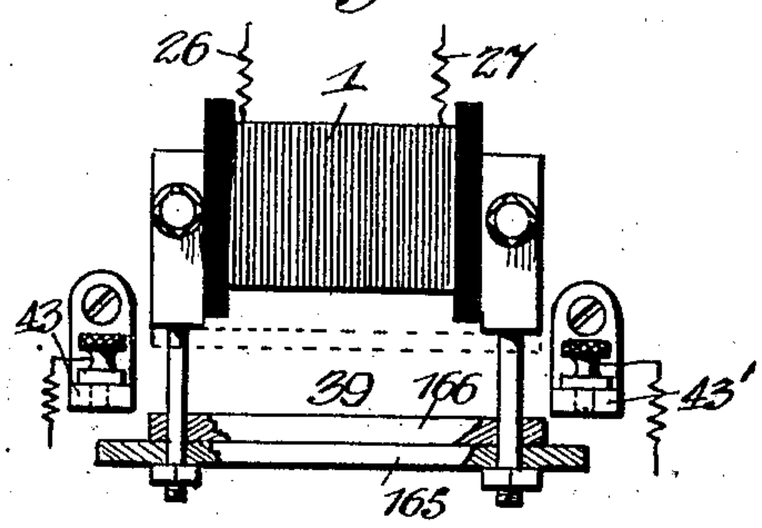
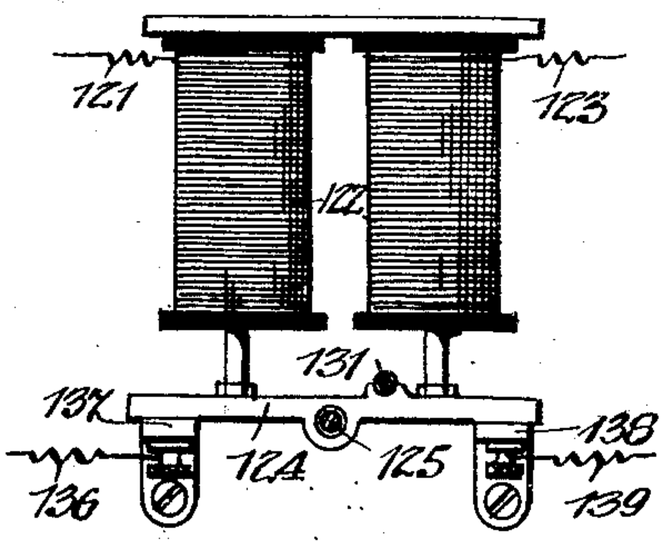


Fig. 4.



WITNESSES:

Chas. K. Davis.

Myron G. Clear

INVENTOR

Emory P. Cook

BY

A. L. Parker.

Attorney

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5 SHEETS—SHEET 3.

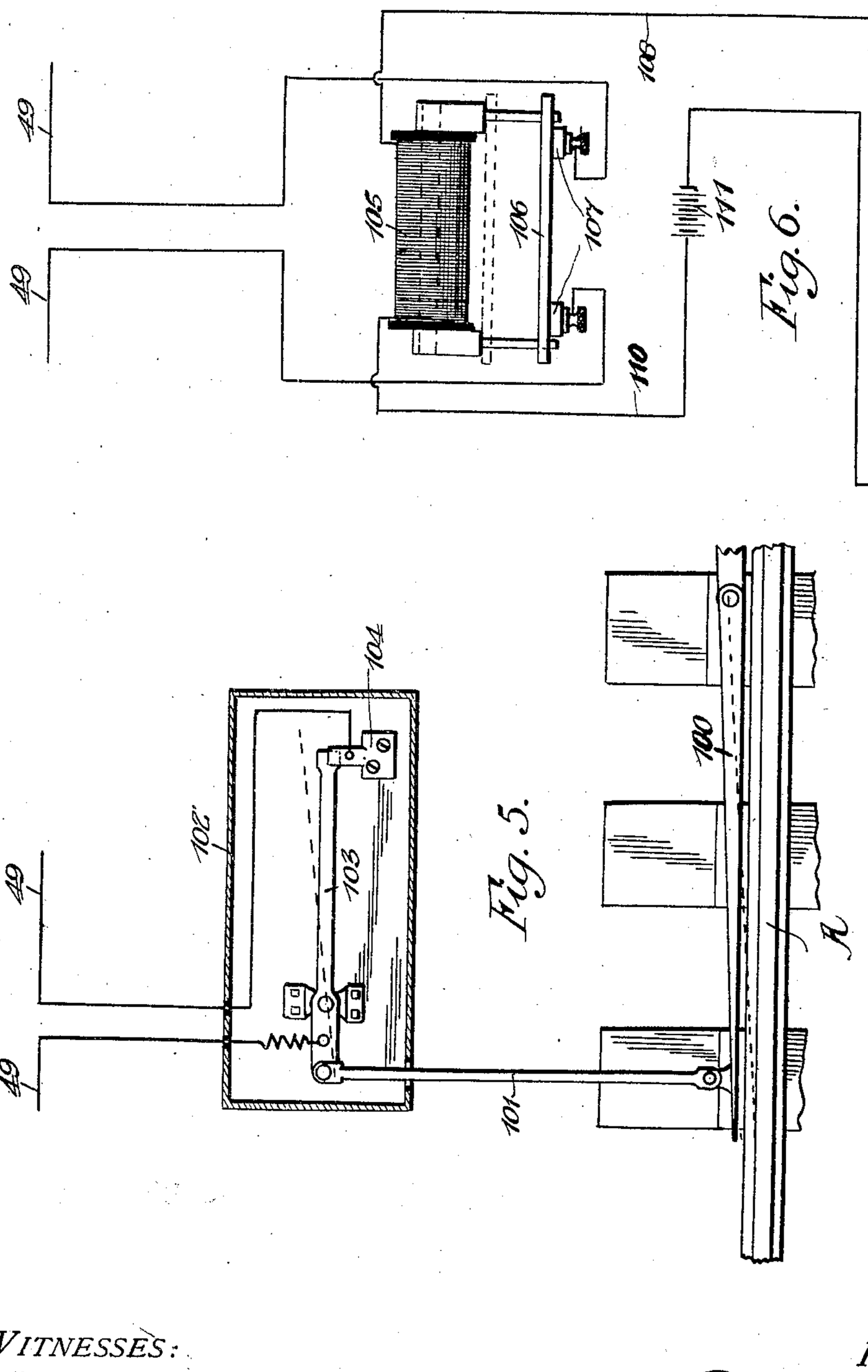

Fig. 6.

Fig. 5.

WITNESSES:

Chas. K. Davis

Myron G. Clean

INVENTOR

Emory P. Cook,

BY

C. L. Parker.

Attorney

No. 889,205. PATENTED JUNE 2, 1908.

E. P. COOK.

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6 SHEETS—SHEET 4.

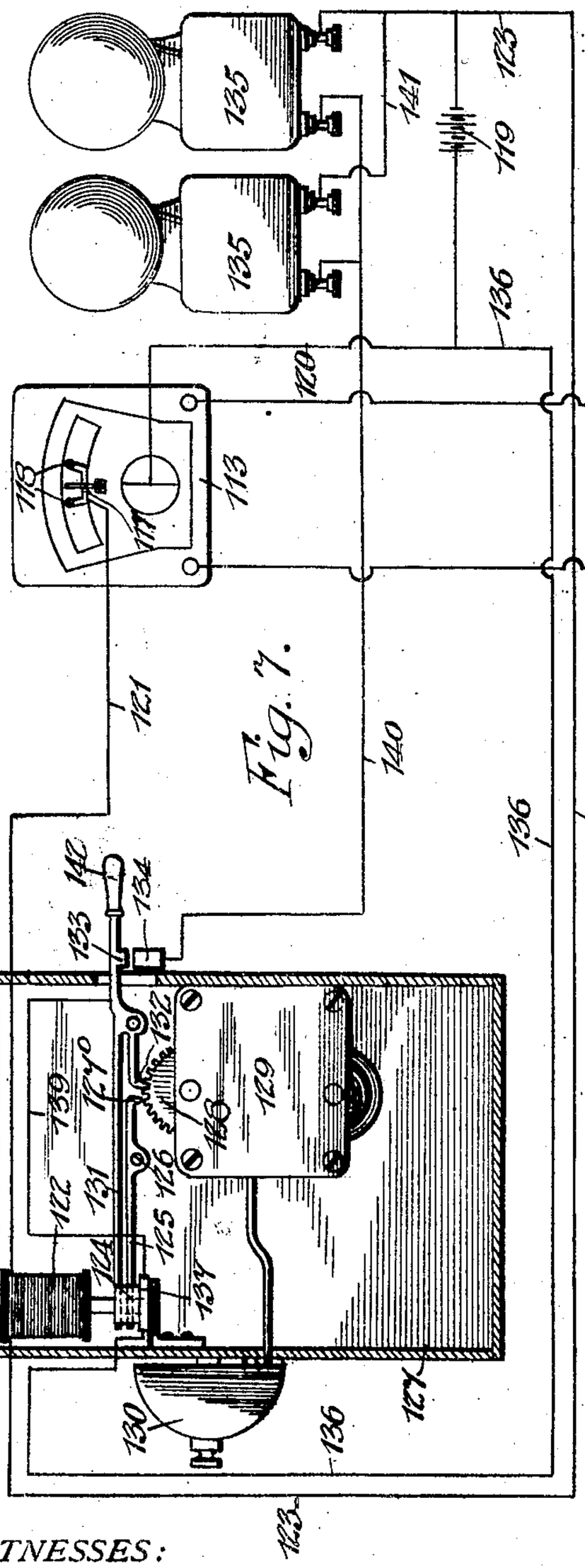


Fig. 7.

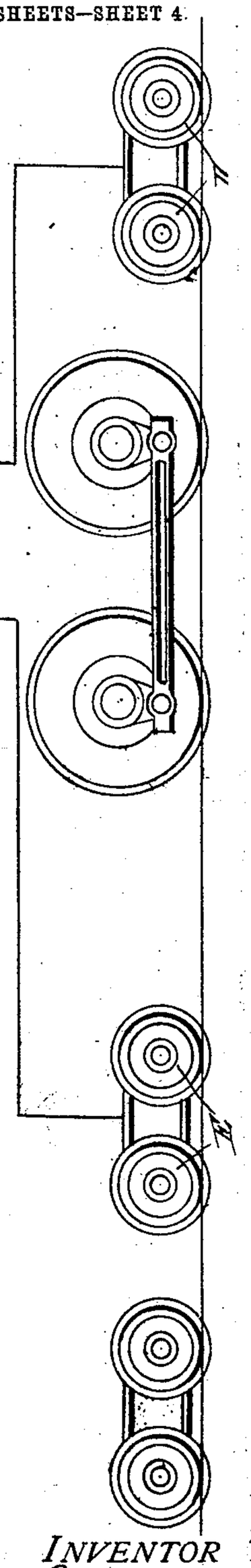
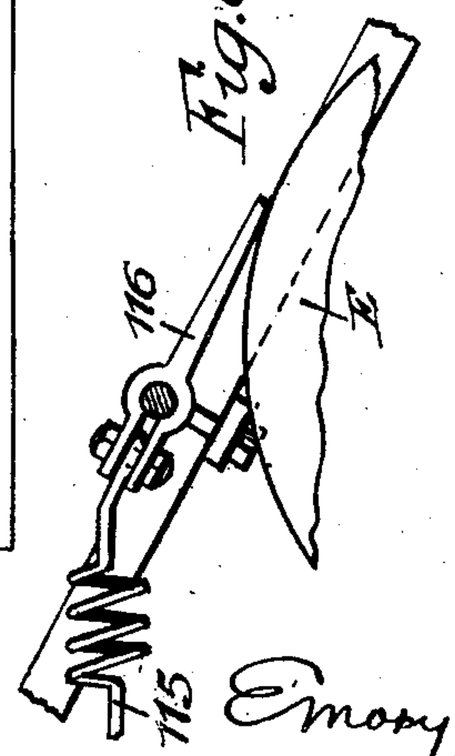


Fig. 8.



WITNESSES:

Chas. K. Davis

Myron G. Clegg

INVENTOR

Emory P. Cook.

BY

C. L. Parker.

Attorney

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E. P. COOK.

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5 SHEETS—SHEET 5

Fig. 9.

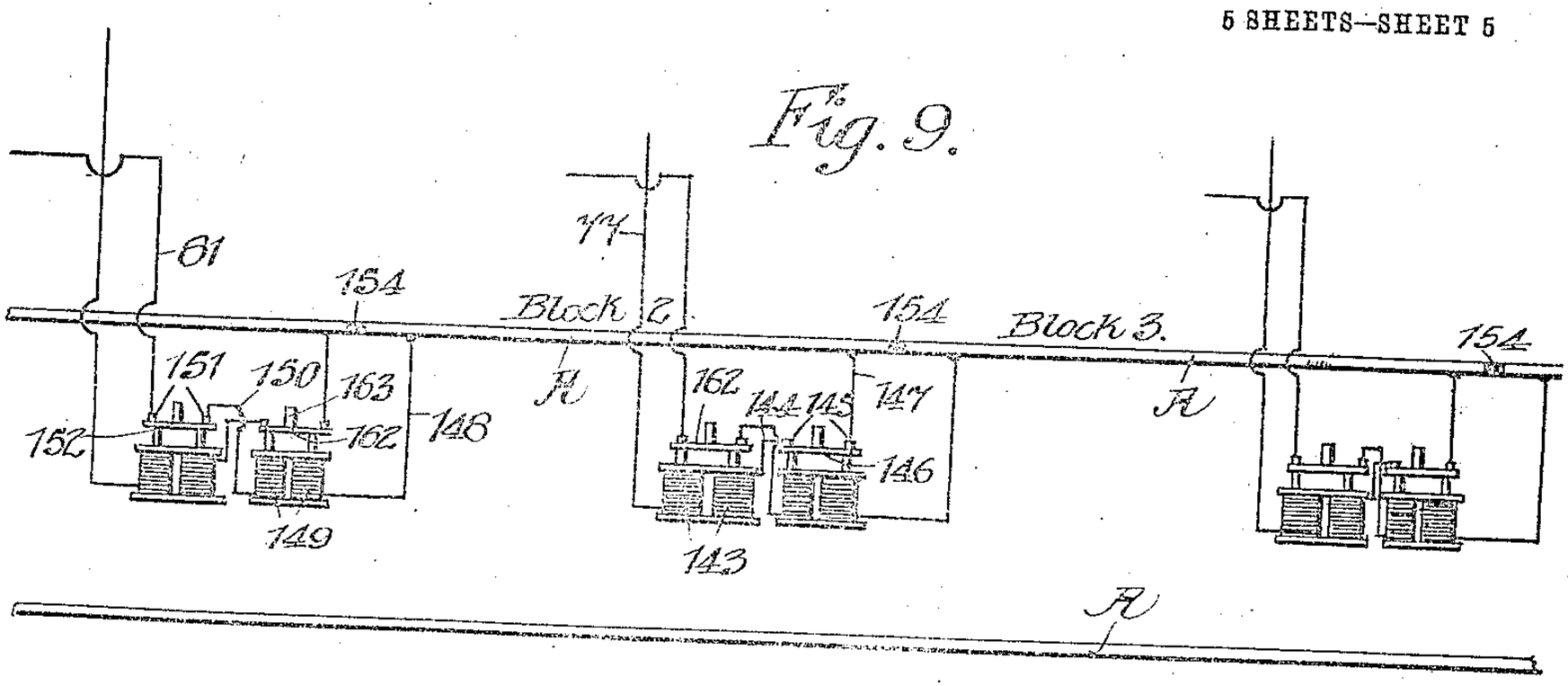


Fig. 10.

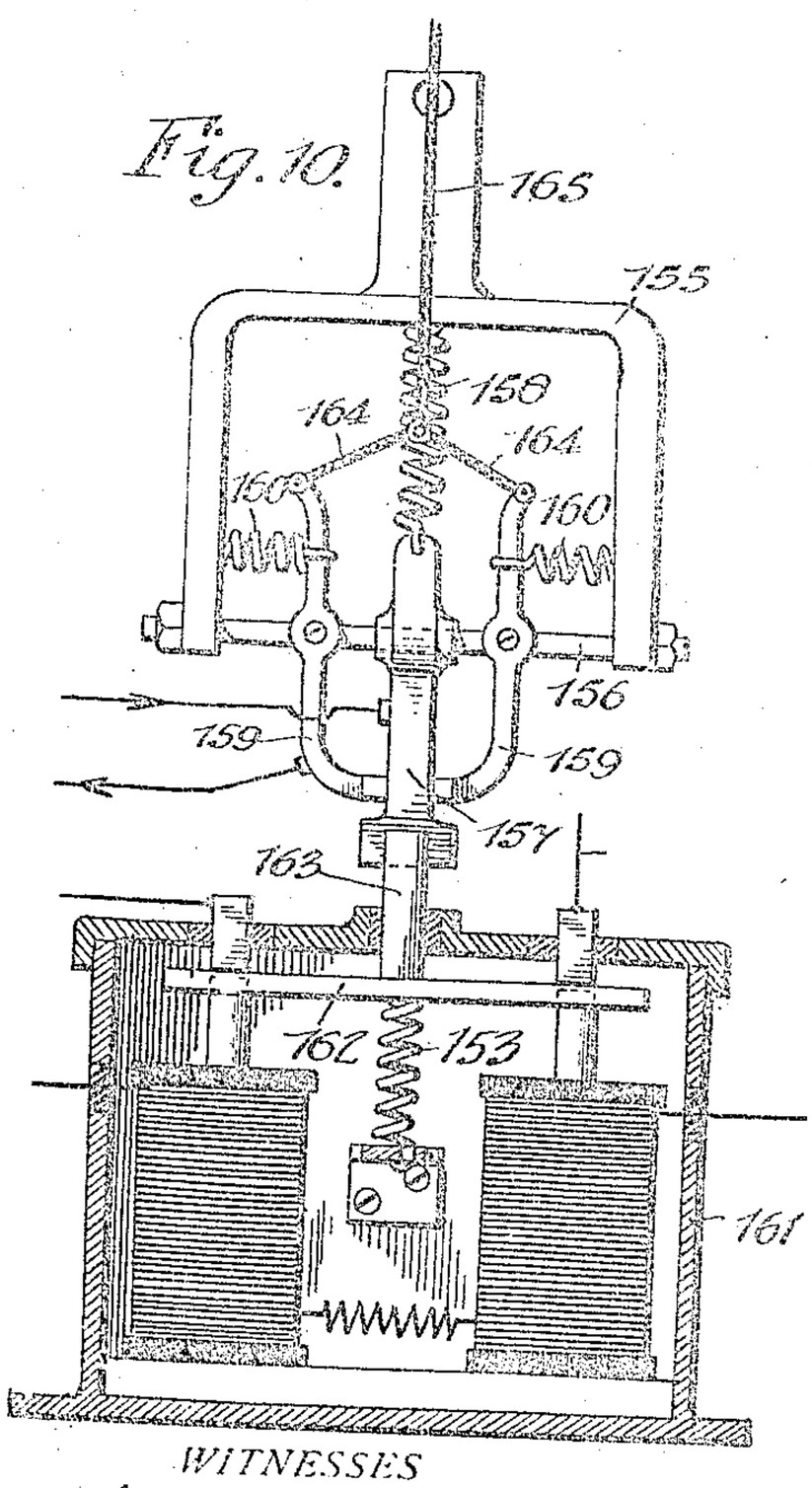
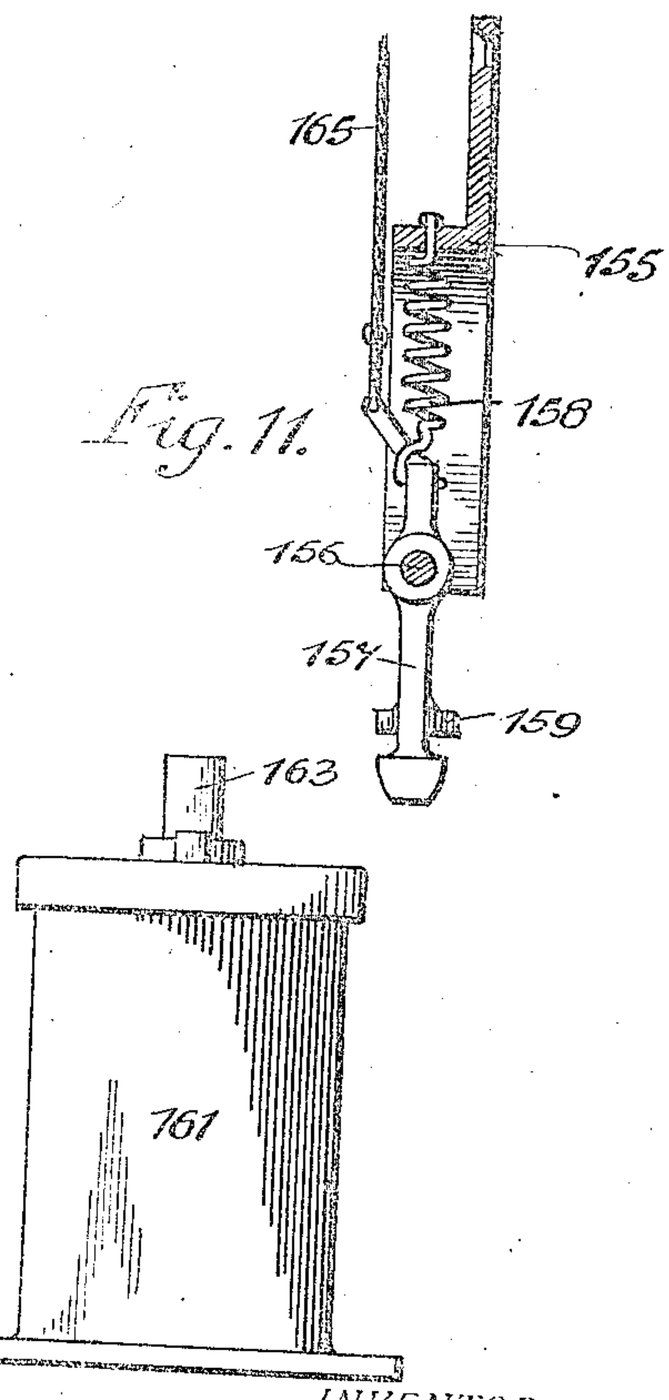


Fig. 11.



WITNESSES

Chas. T. Davies.

Myron G. Clear.

INVENTOR

Emory P. Cook

by C. L. Parker Attorney

UNITED STATES PATENT OFFICE.

EMORY P. COOK, OF OBERLIN, PENNSYLVANIA.

RAILWAY SIGNAL SYSTEM.

No. 889,205. Specification of Letters Patent. Patented June 2, 1908.

Application filed August 30, 1907. Serial No. 390,780.

To all whom it may concern:

Be it known that I, EMORY P. COOK, a citizen of the United States, residing at Oberlin, in the county of Dauphin and State of Pennsylvania, have invented certain new and useful Improvements in Railway Signal Systems, of which the following is a specification.

My invention relates to electric signal systems, and particularly contemplates the provision of an electric block signal system in which a train will be automatically signaled on the presence of another train within either of the adjacent blocks, and on the presence of an open switch, landslides or like obstruction or danger.

Broadly my invention consists in the provision of a normally open main circuit within each block adapted to be closed by the passing train, and in the provision of certain signals within the cab of the locomotive which will remain inactive when such closing of the main circuit is effected. The main circuit of each is, however, so arranged as to include in its completion, certain elements of the main circuit of the adjacent blocks, whereby when a train is in one block and another train is in the adjacent block neither train may complete its main circuit and the signals of both trains will, thereupon, be actuated.

My invention consists, further in the provision of each switch with contacts included within the main circuit of its block and so arranged as to prevent the closing of said main circuit when said switch is left open to a passing train.

My invention consists, further, in the provision of means within the main circuit of each block, which will operate to prevent the closing of said circuit when a landslide or washout occurs.

My invention further and specifically resides in the following features of construction, arrangement and operation as will be hereinafter described with reference to the accompanying drawings forming a part of this specification, in which like numerals are used to designate like parts throughout the several figures, and in which,

Figure 1 is a diagrammatic plan of the blocks and their main circuits, Fig. 2 is an elevation, partly in section, of certain elements within the main circuit, Fig. 3 is an elevation, partly in section, of another element of the main circuit, Fig. 4 is an elevation of an element of the cab circuit, Fig. 5 is a plan view of a switch and its contacts constructed according to my invention, Fig. 6 is a diagrammatic view of the auxiliary circuit for detecting landslides, washouts and like obstructions, Fig. 7 is a diagrammatic view of the locomotive cab circuit and its connections. Fig. 8 is a side view of the wheel contact or brush, Fig. 9 is a diagrammatic plan of a modified form of means for operating the engine signal, Fig. 10 is a front elevation partly in section of certain elements of the operating means shown in Fig. 9, and Fig. 11 is a side elevation thereof, partly in section.

In the practical embodiment of my invention, I provide the rails A with a plurality of insulated sections B, at the beginning and end of each block, each of said sections at one block being connected to their respective one of the magnets 1, 2, 3 and 4. As a train enters block 2 from block 1 as shown in Fig. 1, the circuits on magnets 1, 2, 3 and 4, will be successively closed through battery 20, wire 21, rail 79° through the axle of the locomotive, through one of the sections B through respective ones of the wires 25, 30, 33 and 36 to magnets 1, 2, 3 and 4, through said magnets and through their wires 27, 32, 35 and 38 and the common return wire 29 to battery 20.

As the magnets 1, 2, 3 and 4 are energized their respective armatures 39, 40, 41 and 42 will be raised to momentarily make contact with their contacts 43 and 43′, 44 and 44′, 45 and 45′, and 46 and 46′ respectively. As the armature 41 is raised to make contact between points 45 and 45′ a circuit will be completed through the solenoids 11 and 12 and 11° and 12° of block 2 as follows; battery 20, wires 47, 49, 50, 52 to solenoid 11°, through solenoids 11° and 12°, wires 53, 54, 55, 56, 57, contacts 45 and 45′, and armature 41, wire 58, solenoids 11 and 12, and wires 60 and 61 back to battery, and thus pulling the armatures 19° and 51 down, should they be raised. As the armature 42 is raised to make contact between points 46 and 46′ a circuit will be completed through the solenoids 9 and 10 and 9° and 10° as follows; battery 20, wires 47, 49, 50, 62 to solenoid 9°, through solenoids 9° 10°, wires 64, 65, 66, 67 through contacts 46 and 46′ by means of the armature 42, wires 68, 69 through solenoids 9 and 10, wire 70, wire 61 back to battery, thus raising the armatures

19° and 51 to the position shown in Fig. 1, said armatures being held upward by means of permanent magnets x and $x°$. The train has now, passed into block 2 and with armatures 19° and 51 in the upper position and armatures 19 and 51° of blocks 1 and 3 respectively in the lowered position, the main rail circuit of block 2 will be completed as follows; battery 20, wires 47, 49, 50, 71, contact 72, armature 51, contact 73, wire 74, contact 75, block 3, armature 51°, contact 76, wire 77 to rail 79 at 78, through rail 79 to wire 80, through wires 80, 81 to contact 82, block 1, armature 19 to contact 83, wire 84, contact 85, armature 19°, contact 86, wires 87 and 61 back to battery.

Now suppose a train enters block 2 from block 3. This will cause the completion of the circuit through magnets 4°, 3°, 2° and 1° in the order named, in the same manner as previously described with relation to magnets 1, 2, 3 and 4. This will raise armatures 40° and 39°, thus first lowering and then raising the armatures 19° and 51 as previously described. The armatures 19° and 51 of block 2 being raised and the armatures 19 and 51° of blocks 1 and 3 respectively being lowered, the train entering block 2 from block 3 completes the main circuit of block 2 as previously described. Thus it will be seen that when armatures 19° and 51 of block 2 are raised and armatures 19 and 51° of blocks 1 and 3 respectively are lowered the main circuit of block 2 may be completed, but should a train be within block 3 this would prevent the lowering of armature 51° and raising of armature 51, and thus prevent the closing of the main circuit in block 2. In this case, the main circuits of blocks 2 and 3 will be thrown open and signals will be sounded in the engine's cab of each train as will hereinafter be described.

Fig. 5 of the drawings illustrates a switch piece 100 located within one of the blocks and provided with a pivotal connecting arm 101 extending therefrom within a housing 102 and operating an oscillatory contact arm 103 by the movement of said switch piece. The wire 49 of the main circuit of the block is connected to the arm 103 and to a contact piece 104 with which said contact arm is normally in engagement. When, however, the switch piece 100 is against the rail A, the arm 103 will be moved out of contact with piece 104, thus preventing the closing of the main circuit of the block.

Fig. 6 illustrates an auxiliary circuit for preventing the closing of the main circuit in the case of landslides. A magnet 105 is provided with an armature 106 bridging contacts 107, to which the wire 49 of the main circuit is connected, while said magnet is inactive. The magnet 105 is provided with a wire 108 grounded at 109 and with a wire 110, having a battery 111 in circuit therewith, leading therefrom to a conductor wire 112 arranged along the rails at a short distance from the ground. Thus when a landslide (indicated at C) occurs the auxiliary circuit is completed through the ground from point 109 and the conductor wire 112, energizing the magnet 105 and drawing armature 106 upwardly thereagainst. The main circuit wires 49 will thus be prevented from completion. Thus it will be seen that should there be an open switch or a landslide within the block the main circuit of such block, may not be completed, while it is further my idea to provide towers at intervals along the system, in which the operator may break the main circuit or prevent its completion and thus stop the train. In either of these cases, and whenever the main circuit is not completed, signals will be sounded by an engine circuit within the locomotive cab.

Inasmuch as, currents will always divide in inverse proportion to the resistance of circuits, whether there are two or a hundred circuits in shunt, and inasmuch as the wheels of an engine make as good contact with the rails as a soldered connection, I propose to mount a milli-volt meter 113 within the locomotive cab, having its leads 114 and 115 connected respectively to the pony wheels D, and to the tender wheels E, by a brush contact 116 illustrated in Fig. 8. Thus part of the current sent through the rails will come up through the pony wheels D, through the milli-volt meter and its leads, and back through the wheels E of the tender. The slightest current will be sufficient to throw the pointer 117 of the meter 113 against one of the arms of the contact 118 to complete a circuit from the battery 119, through wire 120, pointer 117, contact 118, wire 121, to magnets 122, illustrated in detail Fig. 4, through wire 123 back to battery. This circuit will raise armature 124, rocking lever 125 on its pivot 126 within a housing 127, and throwing its forward hooked end 127° in engagement with a notched release wheel 128 of a spring motor 129 for operating a mechanical bell 130. Lever 131 resting on the armature 124 will also be raised withdrawing its engaging hook 132 from the notched wheel 128, and moving its contact plate 133 into contact with a piece 134 mounted on the housing 127. Should the main circuit of the block be open for any one of the causes heretofore named, the pointer 117 will fall, at once, to zero, breaking the circuits on magnets 122. Armature 124 will thereupon drop, closing a circuit on the electric bells 135 as follows; from battery 119, wire 136, contact 137, armature 124, contact 138, (Fig. 4), wire 139, contacts 133 and 134, wire 140, electric bells 135, wire 141 back to battery, thus ringing electric bells 135.

It will be understood that lever 131 does not drop with armature 124 while lever 125

does, thus releasing the notched wheel 128 of the spring motor 129 and allowing said motor 129 to ring the mechanical bell 130. The engineer will thus be signaled of an obstruction and will accordingly stop his train until such obstruction is cleared or explained, or until the main circuit is again closed. To stop the bells, the engineer need only throw the handle 142 of lever 131 upwardly thus parting the electric bell circuit and moving the hooked end 132 of said lever 131 into engagement with the notched wheel 128 of spring motor 129 and thus stopping the mechanical bell 130.

As an alternative form of means for completing the engine bell apparatus circuit just described, I may employ the apparatus illustrated in Figs. 9, 10, and 11. In this form, wires 77 of the main circuit illustrated in Fig. 1 will be led to solenoids 143, at the end of each block, and the current will pass through said solenoids 143, wire 144, contacts 145 and armature 146, wire 147, rails A to wire 148, solenoids 149, wire 150, contacts 151 and armature 152, wire 81 to contact 82 (Fig. 1). This would complete the main circuit and pull armatures 162 down at each end of block 2, while should the main circuit fail to close, said armatures will remain up under pressure of a coil spring, 153 (Fig. 10). Each block is similarly equipped, as shown, and the rails A, are provided with an insulated section 154, at the end of each block between the connections thereto of wires 147 and 148. In this form, the locomotive is provided with a depending yoke frame 155 having a supporting rod 156 secured therein. Movably mounted on said rod 156 is a contact arm 157 having a coil spring 158 attached to the frame 155 to hold said arm in a vertical position. A pair of contact arms 159 are pivoted on the rod 156 and are provided with coil springs 160 at their upper ends, attached to the frame 155 to pull said upper ends apart and through the lower ends thereof, into contact with the arm 157 when the same is in the vertical position. The casings 161 holding the solenoids 143 and 149 are mounted between the rails A, and their armatures 162, are provided with vertical members 163, projecting through the casing 161 and arranged in the path of the contact 157. Thus when the main circuit is open, the member 163 will strike contact arm 157 and open the engine circuit on the magnets 122, thus closing the circuit on the signal bells as described, while when the main circuit is properly closed the armature 162 and its member 163 will be drawn downwardly, out of the path of the contact arm 157. The contact arms 159 are provided with short connecting ropes 164, leading thereto from the operating rope 165, by which the engineer may pull the upper ends of the arms 159 inwardly and spread the lower ends thereof correspondingly to allow the contact arm 158 to return to the normal position after actuation.

By reference to Fig. 3, it will be noted that the armature 39 is in two parts, namely a lower long part 165 and an upper short part 166. Thus it will be seen that, when the magnet is energized both parts will be drawn upward, the lower long part 165 striking contacts 43 and 43′ and dropping at once to the normal position, and effecting only a momentary contact which is all that is desired.

Although, the elements herein shown and described are fully capable of performing their several functions I may employ other and different means of accomplishing my objects and wish to preserve all such means as fall within the spirit of my invention, and the terms of the following claims.

Having thus fully described my invention, I claim:

1. In an electric block signal system, a main circuit established within each block, and including in its completion, elements of the main circuit of the adjacent blocks, and an engine circuit including signals adapted to be actuated upon the failure of the main circuit to close, substantially as described.

2. In an electric block signal system, a main circuit established within each block, and including elements of the main circuit of the adjacent block, supplemental circuits, adapted to be completed by a train for arranging said elements to close said main circuit within the block, and to open the main circuits of the adjacent blocks, and a cab signal apparatus adapted to be actuated upon the failure of said main circuit to close, substantially as described.

3. In an electric block signal system, a main circuit established within each block and including elements of the main circuit of the adjacent blocks, supplemental circuits adapted to be completed by a train, for arranging said elements to close said main circuit within the block, and to open the main circuits of adjacent blocks, and an engine circuit including signals adapted to be actuated upon the failure of said main circuit.

4. In an electric block signal system, a main circuit established within each block, and including elements of the main circuit of the adjacent blocks, supplemental circuits, adapted to be completed by a train, for arranging said elements to close said main circuit within the block, and to open the main circuits of the adjacent blocks, and an engine signal apparatus including electrical and mechanical alarms adapted to be actuated upon the failure of said main circuit, to close, substantially as described.

5. In an electric block signal system, a main circuit established within each block, and including movable elements within itself and within the main circuits of the ad-

jacent blocks, a plurality of supplemental circuits within each block and adapted to be completed by a train within a block to arrange said element to close the main circuit of the block and open the main circuits of adjacent blocks, and an engine signal apparatus adapted to be actuated upon the failure of said main circuit to close, substantially as described.

6. In an electric block signal system, a main circuit established within each block and including movable elements within itself and within the main circuits of the adjacent blocks, a plurality of supplemental circuits within each block and adapted to be completed by a train within a block to arrange said elements to close the main circuit of the block and open the main circuits of adjacent blocks, and an engine circuit including signals, adapted to be actuated upon the failure of said main circuit to close, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EMORY P. COOK.

Witnesses:

J. W. MESSERSMITH,

MARK MUMMER.