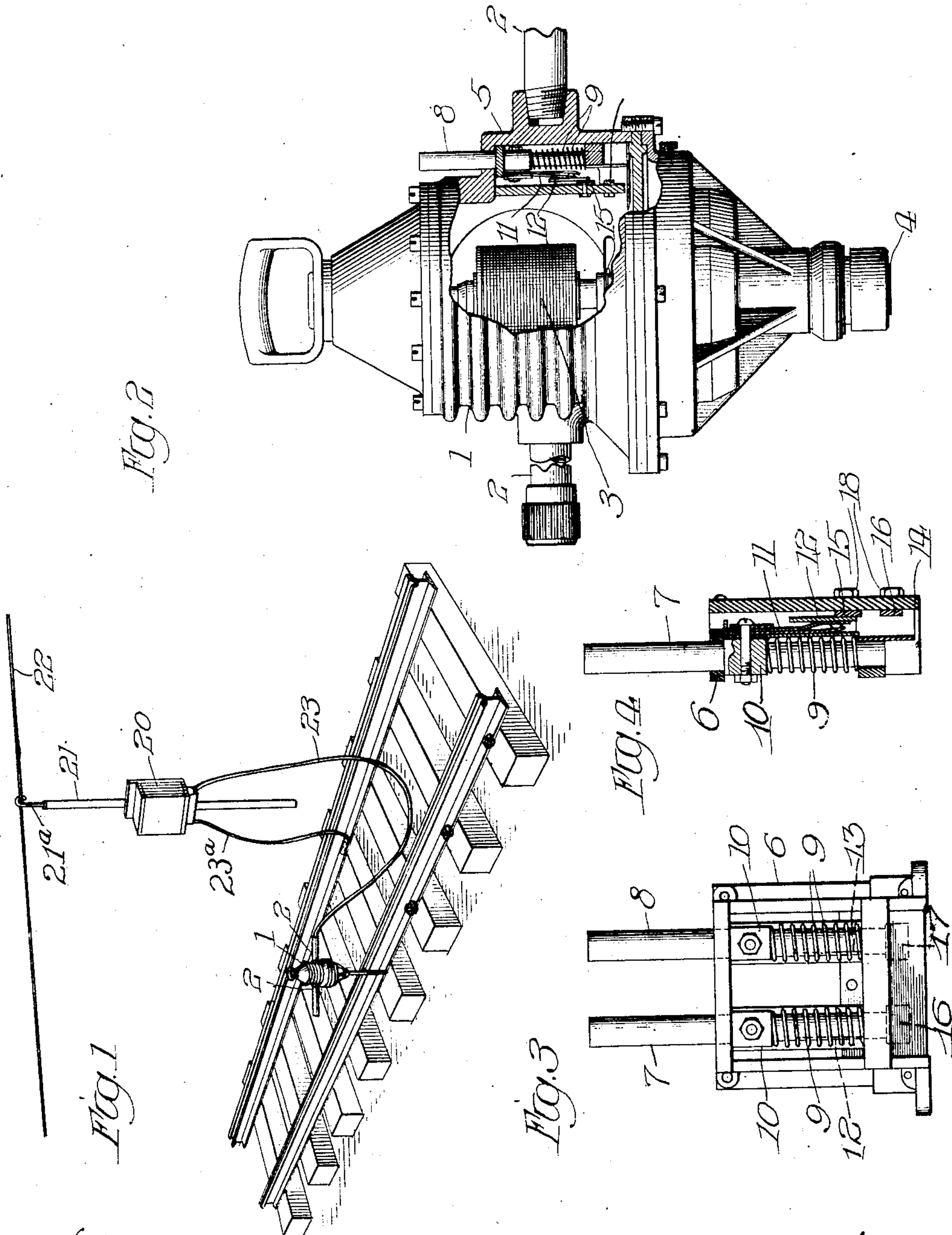


C. B. COATES.
ELECTRIC TOOL.
APPLICATION FILED JULY 20, 1908.

996,833.

Patented July 4, 1911.

2 SHEETS—SHEET 1.



Witnesses:
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Inventor:
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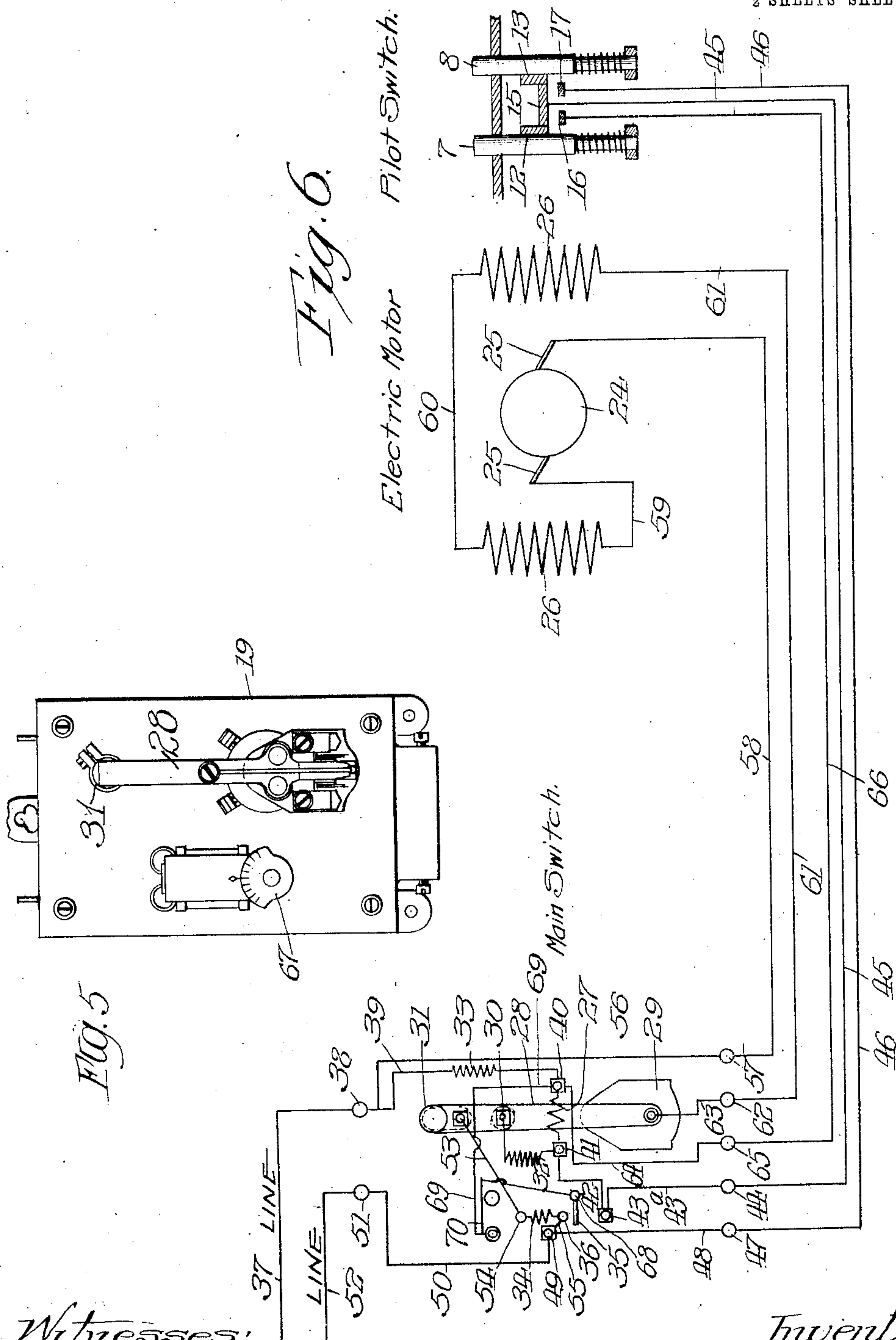
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UNITED STATES PATENT OFFICE.

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ELECTRIC TOOL.

996,833.

Specification of Letters Patent.

Patented July 4, 1911.

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To all whom it may concern:

Be it known that I, CHARLES B. COATES, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Electric Tools, of which the following is a specification.

My invention relates to tools of the portable type actuated by electricity and intended for various kinds of work wherever a rotary working tool is to be operated and the object of such invention, broadly speaking, is to provide novel and efficient means for controlling the current of electricity for such tools.

Heretofore electric tools of this character have been provided with switch mechanism designed for the normal amount of current, but in practice when the actuating or other working tool becomes stuck in the work or is heavily over-loaded, due to heavy feeding, the operator invariably opens the switch, with resultant heavy and destructive arcing at the contacts. To overcome this difficulty in a simple manner and without increasing the weight of the tool is one of the main objects of my invention, and to this end I arrange in or on the tool a pilot switch under the control of the operator and within convenient reach of one of his hands which grasps the tool and adapted to control a main switch located elsewhere than on the tool and of such size or massive character that would preclude its employment in the electric tool which, being portable, as stated, must be made as light as possible.

Another object of my invention is to provide means for automatically opening the circuit at a predetermined load on the tool, thereby providing for a definite point of release or stopping of the electric tool when several exactly similar operations are to be performed, such as the driving of lag screws, rolling of boiler flues, etc., resulting in absolute uniformity in the work. Thus, at the completion of the work the tool is automatically stopped. At the same time the operator is enabled to stop the tool at will and at any stage of the work by operating the so-called pilot switch and may start the tool again by operating another button or actuating member of such switch.

My invention is particularly useful in railroad or street railway construction in connection with the driving of lag screws,

which are now taking the place of the usual spikes for holding the rails to the ties, and while, for the purpose of a clear description of my invention, I have chosen to describe the same in that particular connection, yet it will be understood that my electric tool so provided with this system of switches is capable of a variety of uses and I contemplate using my invention wherever applicable and in different environments.

Referring to the accompanying drawings, Figure 1 is a perspective showing the electric tool in place for the driving of lag screws in street railway construction work, the main switch being located elsewhere or separate from the tool and here shown suspended from the usual trolley wire from which the current is obtained; Fig. 2 an elevation of the electric drill with a portion thereof broken away and illustrating the pilot switch in section; Fig. 3 a side elevation of the pilot switch alone; Fig. 4 a section taken on the line 4—4 of Fig. 3; Fig. 5 an elevation of the main switch; and Fig. 6 a diagram illustrating the electrical circuits, etc.

Referring to the present embodiment of my invention and to the particular use thereof as illustrated in the drawings, the electric motor is provided with a casing having at opposite sides the usual grasping handles 2 and containing an electric motor indicated at 3, which motor is operatively connected in suitable manner to the chuck 4 into which the cutting or other working tool is inserted. A comparatively small and light switch, which I will hereinafter term the pilot switch, is associated with the electric drill and forms one of the component parts thereof. This pilot switch is adapted to be located in or on the electric drill, but in the present instance it is shown as located within the casing with its buttons or operating members projecting upwardly through the top wall of an extension plate 5 having a boss into which one of the handles 2 is screwed or otherwise secured, as clearly indicated in Fig. 2. This pilot switch does not directly control the current to the electric tool, but acts upon or controls the main switch, which is automatically controlled as to stopping by the amount of current admitted to or passing through the motor. In order to properly take care of the current, the main switch is made of considerable size

and weight and located elsewhere than in the tool but in the same electrical circuits therewith. In the particular character of use shown in the drawings, said switch is

5 for convenience suspended from the usual trolley wire.

The pilot switch may be of any suitable construction whereby either one of two con-

10 tacts may be connected with a third contact at the will of the operator and, inasmuch as the particular switch herein shown is suitable and efficient for this purpose, I will now describe the same without intending to limit myself to its particular construction. This

15 switch is provided with a frame 6 secured in suitable manner within the extension casing 5, hereinbefore described, and having at its upper end openings through which pass plungers or push buttons 7 and 8, one for

20 starting the motor and the other for stopping it. These push buttons pass through the extension casing 5 and are in such position relative to one of the grasping handles that the operator is enabled to conveniently

25 depress one or the other of the push buttons without releasing his grasp upon the grasping handle. These push buttons are upwardly spring-pressed by means of coiled springs 9 encircling the lower end thereof

30 and pressing downwardly against the frame and upwardly against the blocks 10 secured to or forming a part of said push buttons. To their inner faces these blocks are provided with spring plates 11, to whose lower

35 ends are secured the shoes 12 and 13.

Upon an insulating block 14 secured to the frame 6 is secured a transverse contact 15 which is common to both of said shoes and normally in contact with both of them.

40 This insulating block is also provided with the separate contacts 16 and 17 which are connected with the circuits hereinafter described in connection with the diagram. It will be understood that contact is made between the common contact and one or the

45 other of the separate contacts, according to whichever one of these push buttons is depressed and it will also be understood that in practice it is intended that one or the other

50 push buttons should be momentarily depressed by the operator and then released and not be held down for any period of time. The common contact and the two separate contacts are provided with suitable binding

55 posts 18.

Referring next to the main switch, which is controlled by the pilot switch, the same is a magnetically operated switch indicated in general by the reference character 19 and

60 according to the particular use now being described the same is inclosed in a box or housing 20 and suspended from a rod or supporting pole 21 having a conducting wire

65 21^a whose upper end is crooked for suspension from the trolley wire 22. The connec-

tions between this main switch and the pilot switch are carried through a cable 23, indicated in Fig. 1 and another cable 23^a is provided to run to ground. In practice, in the particular character of work specified, the

70 ground wires are connected with the rails. This main switch is provided with a series of contacts, electromagnets, and with a movable arm which will be understood from the following description of the electrical cir-

75 cuits: In the diagram, Fig. 6, the essential parts of the motor are represented, the armature at 24, the brushes at 25 and the fields at 26. As shown, the motor is series-connected but it is obvious that either shunt or com-

80 pound windings may be used. The main switch consists essentially of a coil 27 which, when energized by the passage of the current, causes a lever arm 28 fulcrumed upon the plate 29 to make contact at 30 and 31,

85 placing these three points 29, 30 and 31 at the same potential. This main switch is also provided with two resistance coils 32 and 33 and also a magnet coil 34 adapted to energize a core of magnetic material and at-

90 tract the lever 35 making contact at 36. In the diagram the pilot switch is for convenience shown as having the shoes 12 and 13 secured to the sides of the push buttons 7 and 8 respectively and are adapted to be de-

95 pressed to place the main or common contact 15 in contact with either one of the two separate contacts 16 and 17. The line wires and the connecting wires between the various instrumentalities described will be ex-

100 plained in connection with the operation of the tool.

When the push button 8, which in the present instance may be termed the starting

105 button, is operated, contact is made between points or contacts 15 and 17 and a circuit is thereupon established through the line 37 to the binding post 38, through wire 39, through the resistance coil 33, post or connection 40, magnet coil 27, post or connection 41, wire

110 42, post or connection 43, post 44, wire 45, contacts 15, 13 and 17, thence through wire 46, binding post 47, wire 48 to post or connection 49, wire 50 to binding post 51 and thence to the return line 52. It will be seen

115 that a current will flow through the magnet coil 27 with the result that the switch arm 28 will be drawn up or attracted so as to make contact at 30 and 31. This now establishes another circuit as follows: from the

120 line 37 through post 38, resistance coil 33, post or connection 40, magnet coil 27, post or connection 41, resistance coil 32, contact 30, through the switch arm 28 to contact 31, wire 53 to point 54, magnet coil 34, point 36,

125 post or connection 49 through the wire 55, wire 50 and post 51 to the return line 52. Consequently, the coil 27 is now energized through a circuit independent of the push button 8, which can now be released and the

130

circuit still be maintained. The main circuit through the motor is now as follows: from the line 37 to post 38, wire 56 to binding post 57, wire 58 to the brushes 25 and armature 24, wire 59 to one of the fields 26 through the wire 60 to the other field 26, wire 61 to the binding post 62, wire 63 to plate 29, through the switch arm 28 to the contact 31, through wire 53, point 54, magnet coil 34, connection 49, wire 50 and binding post 51 to the return line 52 to the other side of the line. Thus the motor will start up and operate on the line current. It is to be observed that the coil 27, with the resistance coils 32 and 33, are in series with each other but in shunt across the line, while the coil 34 carries the main current and will fluctuate with the load on the motor.

Assuming that the motor circuit is thus established, and the motor is running and it is now desired to stop the motor, this is done by depressing the other push button 7, with the result that a circuit is established as follows: from the line 37, post 38, wire 39, resistance 33, post 40, wire 64, binding post 65, wire 66, contacts 16, 12 and 15, wire 45, binding post 44, through wire 43^a to post 43, wire 42, post or connection 41, resistance 32, contact 30, through the switch arm to contact 31, wire 53, point or post 54, magnet coil 34, point 36, wire 55, post or connection 49, wire 50 and binding post 51 to the return line 52. Thus the path for the current has been made around the magnet 27, thereby causing the latter to lose its magnetism, and the switch arm to fall by gravity, whereupon the opening of the circuit at 31 causes the motor to stop. The main switch is adapted to automatically stop the motor at the completion of the work or when any predetermined load is reached, and to this end an adjusting device 67 on the main switch controls the position of the lever 35 which is fulcrumed at 68 and itself controls the amount of the air gap between the free end of such lever and the magnet core of the coil 34. This adjustable device having been set for a predetermined amount, when the current through the motor reaches that amount this coil 34 produces the requisite amount of magnetic energy to attract the lever 35 so as to make contact at the point 36. A circuit is then established as follows: from the line 37 and binding post 38, wire 39, resistance 33, post or connection 40, wire 69, wire 70 to point 68, lever 35, contact or point 36, post 49, wire 50 and binding post 51 to the return line 52. Thus a circuit has been established around the shunt magnet 27, thereby taking nearly all of the current out of this magnet and causing its core to lose its magnetism and thereby releasing the switch arm 28, which then falls by gravity, opening the main circuit at the point 31 and causing the motor to stop. It will be under-

stood that the switch can be so arranged and the motor stopped at an over-load or a predetermined load. By the use of my invention I am enabled to provide an electric tool which is portable in character but yet provided with coöperating switch mechanism capable of taking care of all conditions of current encountered in actual practice. The switch mechanism is under the control of the operator and the same is moreover automatic and independent of the operator when it comes to the matter of the completion of the work, it being understood that the switch mechanism may be so set as to automatically stop the motor upon the completion of the work. This is a particularly desirable feature where a series of similar operations, such as driving of lag screws for railroad or street construction work, are to be performed by the electric tool, thereby securing absolute uniformity of work without any particular skill or attention on the part of the operator.

It will be understood that the particular location of the main switch is not material so long as it is in the immediate neighborhood of the portable tool which in practice is carried from point to point within the range of its cables, and so long as such switch is interposed in the electrical circuits. The illustrated practical use of my invention shown in Fig. 1 of the drawings pertains to street railway construction where electric current is readily available from the trolley wire, but in railroad construction work or in railroad repair work a section gang may be provided with an outfit comprising an electric tool, switches and connections, and suitable means for generating electricity. In an outfit of this character a special hand car may be provided driven by a gas engine, which may be adapted to also drive an electric generator for generating the current for operating the electric drill. With such outfits lag screws, as substitutes for ordinary railroad spikes, may be readily, economically and properly driven.

After this disclosure of my invention, many other advantageous uses thereof become obvious.

I claim:

1. In combination with a portable electric tool, a pilot switch, and a main switch mounted independently of the tool governed by the pilot switch and adapted to interrupt the flow of current to the tool upon the accomplishment of the desired work; substantially as described.

2. In a portable electric tool, in combination with such tool, a pilot switch mounted thereon and adapted to be arranged in an electrical circuit, and a main switch located elsewhere than the electric tool but also adapted to be arranged in said circuit, said main switch being adapted to interrupt the

flow of current to the tool upon the accomplishment of the desired work; substantially as described.

3. In a portable electric tool, in combination with such tool, a pilot switch mounted thereon and a main switch governed by the pilot switch for controlling the admission or interruption of electric current to the tool, said main switch being adjustable for causing interruption of the current when a predetermined load is reached; substantially as described.

4. In a portable electric tool, in combination with such tool, a pilot switch mounted thereon, a main switch for controlling the admission or interruption of electric current to the tool and adapted to interrupt such current upon the accomplishment of the desired work, and a cable electrically connecting the pilot switch and the main switch; substantially as described.

5. In a portable electric tool, in combination with such tool, a pilot switch mounted thereon, a magnetically operated switch located elsewhere than the tool but connected electrically with the pilot switch, said last named switch being adapted to interrupt the current to the tool upon the accomplishment of the desired work; substantially as described.

6. In a portable electric tool, in combination with such tool, a pilot switch mounted thereon, and having separate starting and stopping push-buttons arranged to be de-

pressed, and a main switch governed by the pilot switch and adapted to control the admission and interruption of electric current to the tool, and to interrupt such current upon the accomplishment of the desired work; substantially as described.

7. In a portable electric tool, in combination with such tool, a pilot switch mounted thereon, a main switch for controlling the admission or interruption of electric current to the tool, a cable electrically connecting the pilot switch and the main switch, and a pole on which the main switch is mounted, and which is provided with conducting suspending means in electrical connection with the main switch for suspending the switch from a trolley wire; substantially as described.

8. A portable electric tool including an electric motor, a main switch supported independently of the electric motor and a pilot switch mounted on the motor for controlling the main switch.

9. In a device of the class described a portable electric tool including a motor, a portable main switch provided with means for suspending it from an electrical conductor and in electrical contact therewith, and a pilot switch mounted upon the electric motor and controlling the main switch.

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Witnesses:

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