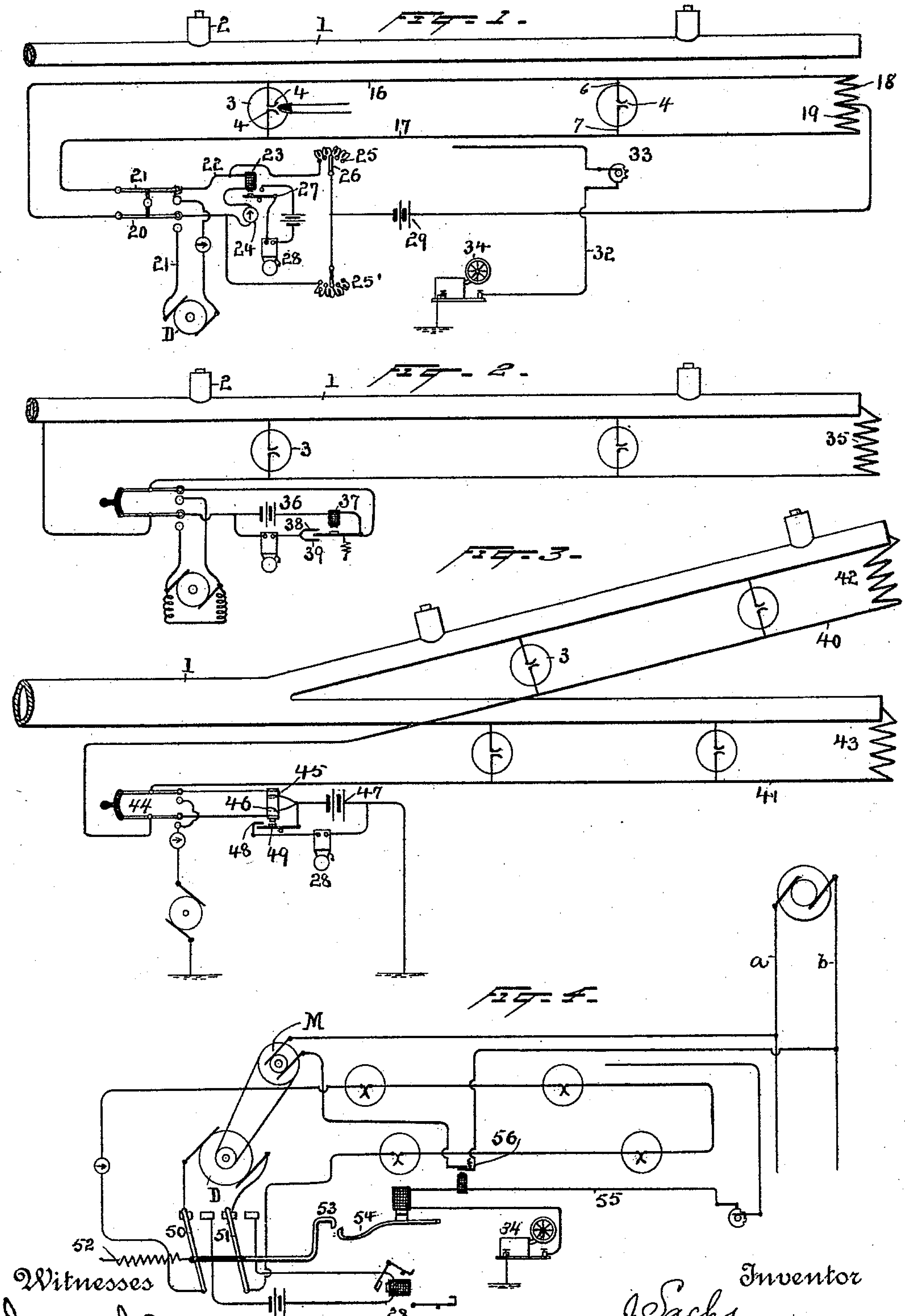
(No Model.) 2 Sheets—Sheet 1.

J. SACHS.

SYSTEM OF CONDUCTORS FOR ELECTRIC FIRE ENGINES.

No. 497,552. Patented May 16, 1893.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 7.

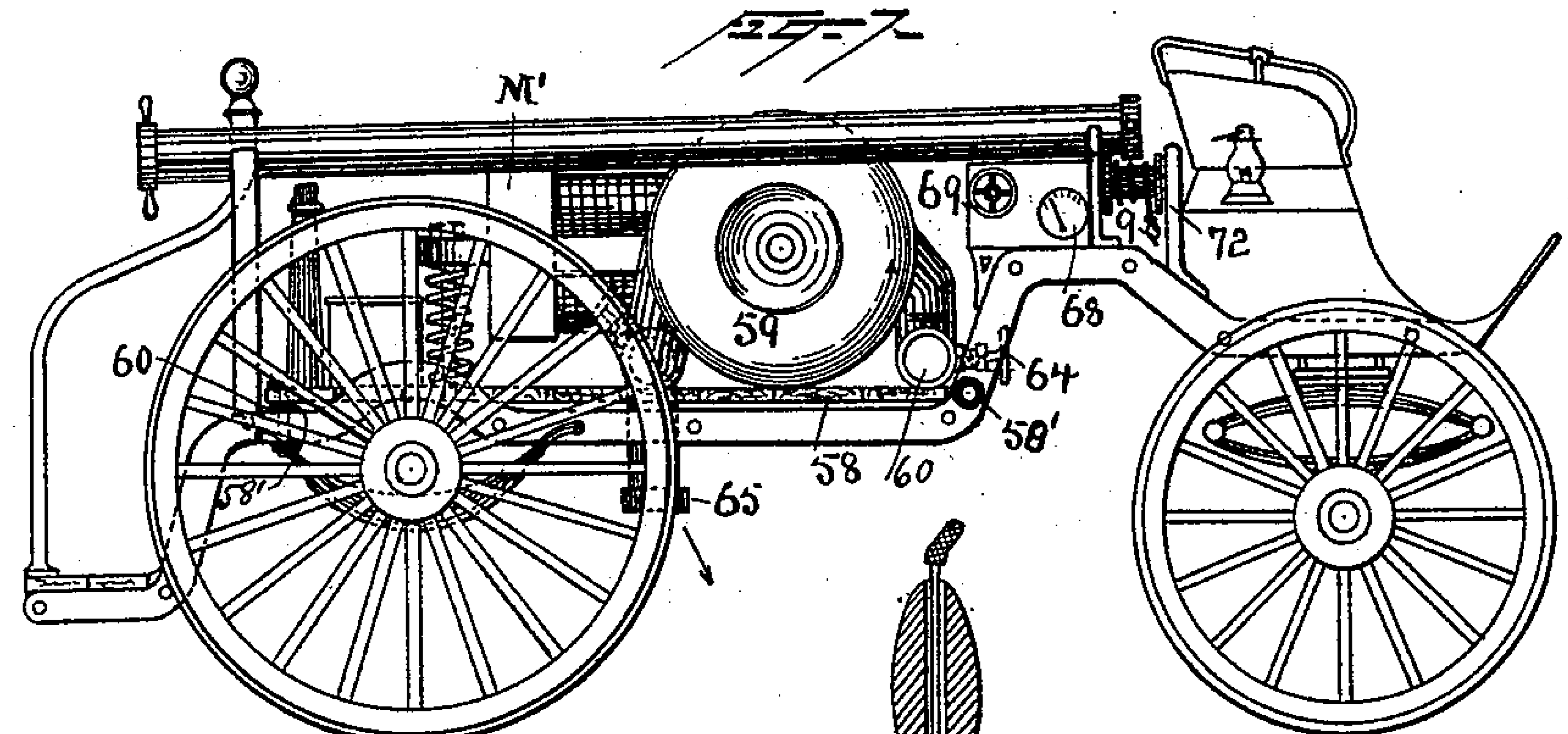


Fig. 5.

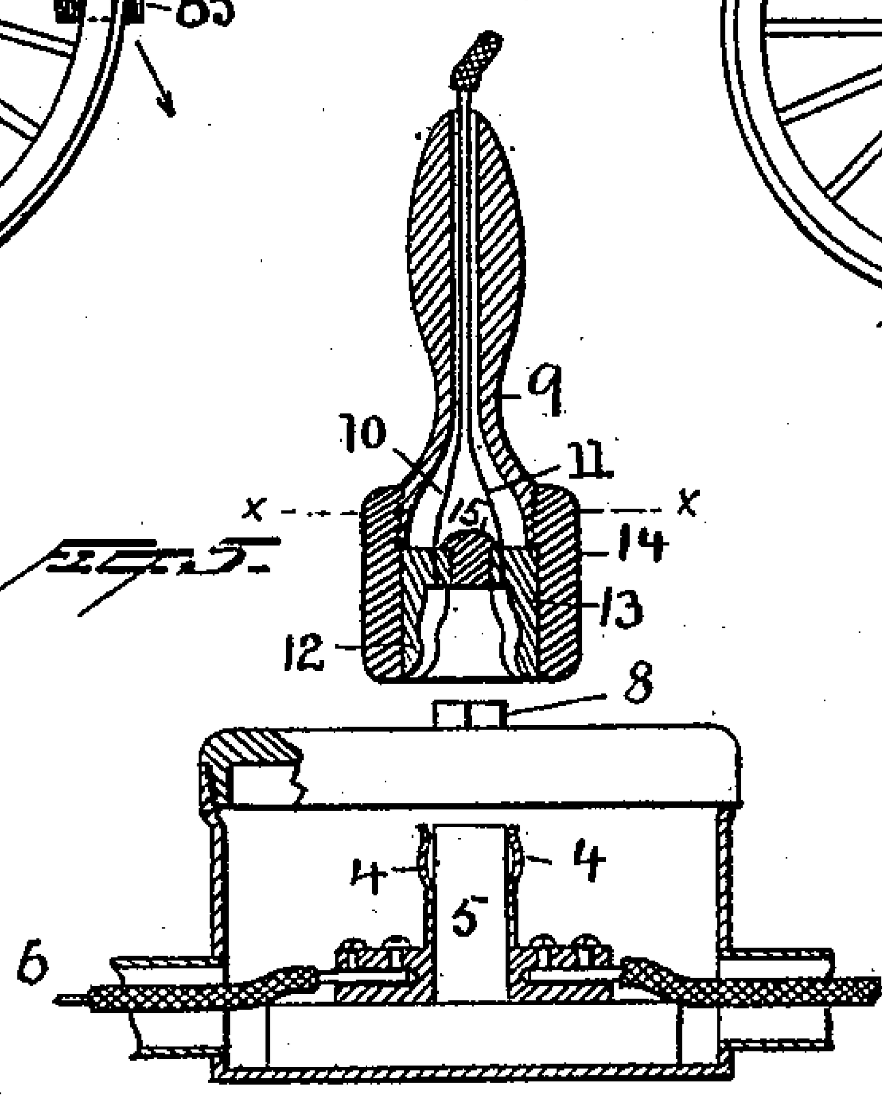


Fig. 6.

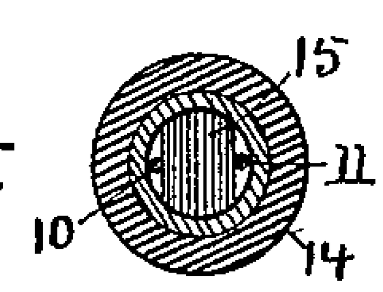


Fig. 8.

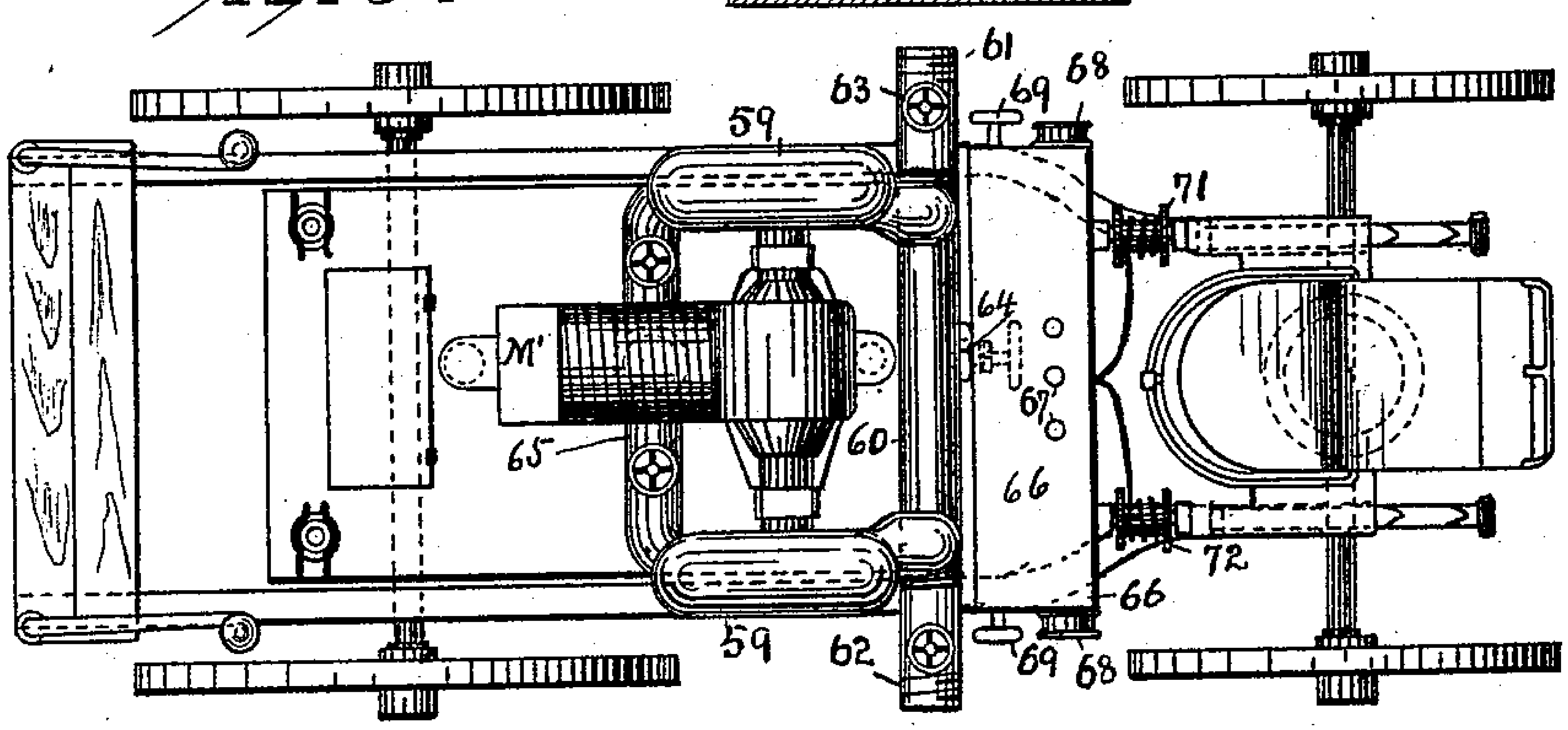
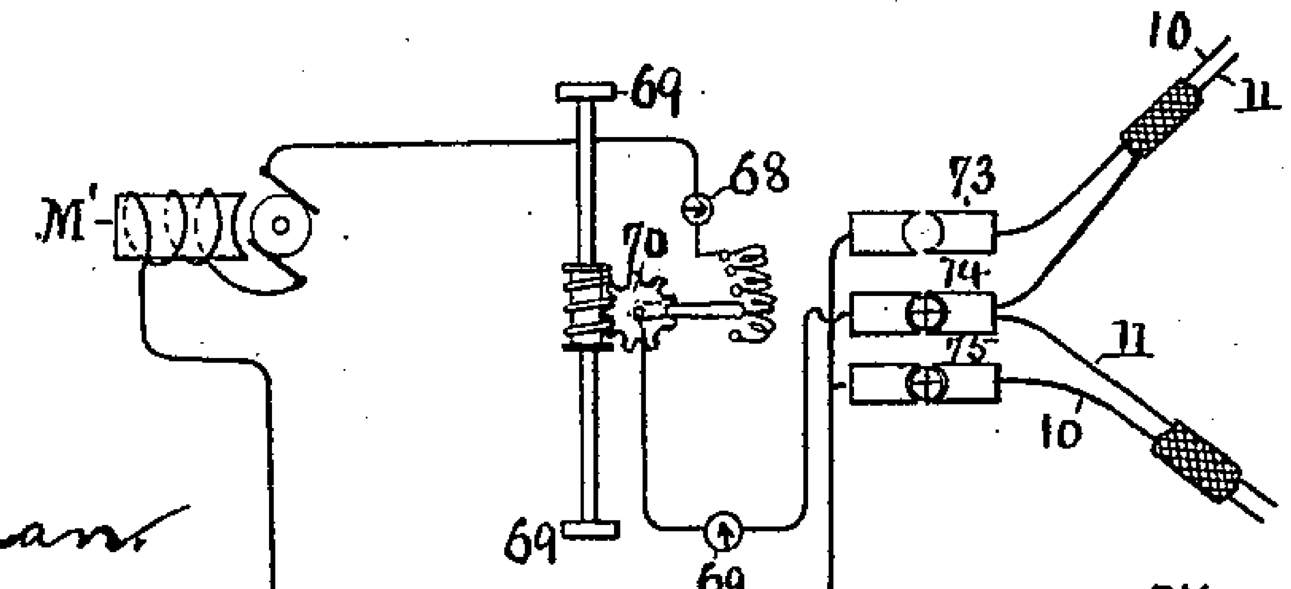


Fig. 9.



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SYSTEM OF CONDUCTORS FOR ELECTRIC FIRE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 497,552, dated May 16, 1893.

Application filed May 26, 1892. Serial No. 434,395. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH SACHS, a citizen of the United States, residing at New York city, in the county and State of New York, have invented a certain new and useful Improvement in Systems of Conductors for Electric Fire-Engines, &c., of which the following is a specification.

The object of the present invention is to provide an improved system for operating electric fire-engines and other electrical apparatus designed to be connected to supply circuits at any one of several points, and especially to increase the economy, safety and reliability of such systems.

The invention consists, mainly, in the method of using circuits hereinafter described; in the combination with a circuit having connecting devices at intervals for the ready connection of electrical fire-engine motors or other apparatus of devices for continuously testing the line.

The invention consists, further, in the combination with such a circuit of a test or signal instrument, and a working generator normally disconnected from the circuit, or otherwise rendered inoperative on the circuit, as by being at rest though connected to the circuit; and the invention consists also in several other combinations hereinafter more fully described and set forth in the claims.

In the accompanying drawings illustrating the invention, Figures 1 to 4, inclusive, show several systems embodying my improvements. Fig. 5 shows one of the connecting boxes interposed in the line and the plug employed. Fig. 6 is a section of the plug on line x—x of Fig. 5. Figs. 7 and 8 are side and plan views of a fire-engine which may be used; and Fig. 9 is a diagram of the circuits thereof.

It has heretofore been proposed to provide fire-engines with electrical means for throwing water, and to extend electrical circuits along the water supply pipes, with means in each hydrant for connecting the fire-engine to the circuit. Such systems have not been practically successful, because of their unreliability and because of the expense involved in maintaining them. I provide means for rendering my system perfectly reliable, and, at the same time, reduce the cost of maintaining it.

In the drawings, 1 indicates a water pipe or main extending for any desired distance and provided at suitable intervals with hydrants 2. Along the line of the pipe, or within easy reach thereof, is a circuit, preferably an underground circuit, having at intervals and near the hydrants connecting devices 3. These devices, when a multiple arc circuit is employed, as shown in Figs. 1, 2 and 3, consist of two normally separated terminals 4, connected, respectively, to the two wires of the circuit. These terminals are preferably supported in a normally closed chamber, as shown, for example, in Fig. 5, in which the springs 4, 4 are mounted on an insulating base and are separated by an insulating strip 5, the wires 6, 7 being connected, respectively, to the two springs. The cover of the chamber in which the springs are located is preferably provided with a device 8 requiring a key of special form to fit it in order to remove the cover. When the cover is removed, the plug 9 can be inserted, connecting the wire 6 to the wire 10, and the wire 7 to the wire 11, wires 10, 11 leading to the two terminals of a fire-engine motor or other electrical apparatus. The plug consists of two conducting blocks 12, 13 of the form shown in Fig. 5 connected to the wires 10, 11, and a screw-threaded insulating ring 14 in which said blocks are partially embedded, said ring engaging the screw-threaded end of the handle, as shown. The ring 14 is preferably formed with a cross-bar 15 of the same material, which serves to prevent danger of arcing between the blocks 12, 13. The wires 6, 7 above referred to are, in Fig. 1, connected, respectively, to the two wires 16, 17 of a metallic circuit, which wires at one end are connected through the high resistances 18, 19. At the station where the system is controlled the wires of this supply circuit are connected to any suitable switch apparatus, for example, to the levers 20, 21, there being four contact points with which the movable ends of the switch levers can make contact. In the position shown in Fig. 1, the switch stands on contacts connected by wire 22 through a high resistance magnet 23 and a current indicating device 24. From one side of the magnet, a wire extends to an adjustable resistance 25, and from the opposite side a similar wire extends to a second resistance 25′, each resistance having a handle 26 or similar device, which can be adjusted at will. The armature 27 of the magnet is, in this system, normally not attracted, but when attracted it closes the circuit of the alarm bell 28, or other test or alarm instrument. From a point between the switches 26 a wire extends to battery 29 and thence to the point between resistances 18, 19. From the two remaining contacts of the switch 20, 21 wires extend to the dynamo or other generator D, a current indicating device being preferably included in the circuit.

Normally the levers 20, 21 of the switch at the station stand on the contacts as shown in Fig. 1, thus entirely disconnecting the main or working source of current from the circuit (which may therefore be called a dead circuit) and connecting said circuit to the wires 22 forming a part of the test or signal circuit. By tracing out the connections above described, it will be found that the circuits constitute an arrangement similar to a Wheatstone bridge, 23 being the bridge conductor, and since the system is normally balanced there will be no current from the battey 29 in this bridge and the armature 27 will not be attracted. If any accident occurs whereby wire 16 or wire 17 is interrupted or whereby either of the resistances 18, 19 is cut out, current will pass through the bridge magnet, attracting the armature 27, closing the circuit of the alarm or test instrument, and the extent of the trouble in the circuit 16, 17 will be indicated by the ammeter or other instrument 24. When an indication is thus given, suitable steps can be taken to locate and mend the fault in the circuit.

The system above described will preferably be used in connection with a fire telegraph signal system, as indicated by the line 32, in which 33 is a fire telegraph signal wheel and 34 is a recorder. When a signal is received on this line, indicating that a fire has occurred in a certain district, the switch-arms 20, 21 will be at once moved by the attendant to the dynamo contacts, thus changing the circuit from its normal condition, with no current on it except the weak testing current, to the condition suitable to operate the motors or apparatus to be connected thereto. It will be seen that the circuit, being normally without a heavy current, is not dangerous whatever position it may be in, and is not subject to leaks which result in waste of current, and the testing of the circuit is positive and continuous.

The system shown in Fig. 2 utilizes the water main 1 as one limb of the circuit. A single high resistance coil 35 is used instead of two, as above described. The battery 36, which is normally connected to the circuit is strong enough to energize the magnet 37 to raise its armature against its retracting spring to the position shown in the drawings midway between the contacts 38, 39. If anything happens to the line to decrease the amount of current flowing through magnet 37, the armature at once drops against contact 39, closing the local circuit of the bell. If, on the other hand, anything occurs to increase the current, for example, if a short-circuit of the resistance occurs, the armature is drawn up against contact 38, thus also closing the local circuit. In this figure no circuit is shown for giving fire alarm signals, although in practice one would preferably be employed.

In Fig. 3 the water main 1 is branched and a circuit 40, 41 is led along each branch, being connected thereto through resistances 42, 43. The wires 40, 41 are connected, respectively, to the two levers of the switch 44, and thence, in the normal condition of the system, through the differential coils 45, 46 to the battery 47 and to ground. A bell or other signal instrument 28 is connected to the ground wire and to the open contact 48, as shown. The differential coils normally balance each other and the armature 49 is in its lower position, but when the balance is disturbed by any accident or by design, the armature is raised and the alarm operated, thus showing that the line is out of order, or that the circuit has been closed at one of the boxes in which contacts 4 are placed, thereby short-circuiting the resistance 42 or 43. This balanced test circuit is simple and efficient.

In Fig. 4 a series circuit, instead of a multiple arc circuit, is shown, the dynamo D being connected to the circuit as it would be connected when the system is in use, and the signal device 28 being in an open circuit. An automatic switch is shown for connecting the dynamo to the circuit. The switch levers 50, 51 in the position shown are drawn to the left by a spring 52. In the normal condition of the system, the switch is moved toward the right and the hook 53 engaged by the hook 54 controlled by a magnet in the fire alarm or fire telegraph circuit 55, which is supposed to be a normally closed circuit. As soon as the fire alarm is sent in, opening the circuit, the armature 54 drops and the spring 52 draws the switch to the position shown in Fig. 4, thus putting the circuit in operative condition. In this system it is necessary that the dynamo should be continuously running or that it should be automatically started when it is thrown into circuit, and in Fig. 4 means for thus starting the dynamo are shown, and consist of the electric driving motor M connected thereto by a belt or otherwise and a circuit-closer 56 in the motor circuit, said circuit-closer being operated simultaneously with the releasing device 54. The motor circuit may be a branch from an electric lighting or distribution system, indicated by the wires *a*, *b*. Other means for rendering the generator normally inoperative, so far as the main circuit is concerned, may be employed, and it is evident that when the generator is normally at rest it is unnecessary to disconnect it from the circuit; and it would be within the scope of my improvement to generate a current sufficient for testing purposes by the main generator itself, but in this case the current would not be sufficient to constitute the working current.

It will be seen that the arrangements described make it possible to provide a system in which the fire-engine motors can be connected at will to a supply circuit at either of several points with perfect reliability and very small expense, since the circuit is continuously under test and no current is normally being used or supplied to the line except the small battery current required to operate the signal.

I do not confine myself to the use of a particular form of fire-engine, although one having the features shown in Figs. 7, 8 and 9 is preferred. Upon a suitable carriage having a spring supported body I provide a platform 58 supported on rubber or other elastic insulating blocks or bushings 58′, and on this platform is a spring supported motor M′ which is adapted to operate one or more pumps 59, which may be ordinary centrifugal or rotary pumps, and which need not be shown in detail. The pumps have an inlet pipe 60 furnished at each end with a screw-threaded end 61, 62, with valves 63, and having also a central valve 64.

65 is the outlet or delivery pipe of the pump or pumps.

66 is a box inclosing an adjustable resistance, a switch, reached through the plug holes 67, and supporting current indicating devices 68, one at each end of the box.

The resistance can be varied by handles 69 extending to both ends of the box and having a worm gearing with wheel 70, on the shaft of which is a switch-arm movable over the resistance.

Each engine is provided with two cables, containing conductors 10, 11, one cable being coiled on each of the two reels 71, 72, the wires being connected to blocks 73, 74, 75 as shown in Fig. 9, these blocks being so placed that plugs in the holes 67 will make contact with them. The other switch blocks are connected to the motor and resistance switch arm.

With the construction described, the engine can be used with equal facility whichever side faces a hydrant, the hose connecting the pump and hydrant being connected at 61 or 62 as most convenient, and the valve 63 at the opposite side being closed. If it is only desired to use one pump, the valve 64 and one of the valves in the outlet pipe will be closed. If the connecting device 3 to be used is on one side of the engine, the cable will be unreeled from reel 71, but if on the opposite side from reel 72. In the first case plugs will be inserted at 73, 74, and in the latter at 74, 75. Both cables may be simultaneously used by inserting plugs in the three holes. By making the parts so that the engine can be worked from either side, much inconvenience and delay are avoided.

It is evident that one of the pumps could be omitted without taking from the engine the capacity of being used from either side.

I do not confine myself to the use of the test circuits and apparatus described in connection with a fire-engine system, since they may be used in connection with other circuits. So far as I am aware it is new to employ a test instrument normally rendered inoperative by a resistance at the extremity of the line, and operated in the manner indicated by any change of the line; and it is also believed to be new to employ a test instrument or controlling device therefor normally balanced and held from operation by the combined effect of the two limbs of the circuit, but operated by any accident to either limb, as set forth. Evidently some of the devices shown in any one of the figures 1 to 4 may be applied with advantage to the systems of the other figures; for example, the battery 29 and the test device, with a third wire leading to the extremity of the working circuit, of Fig. 1, can be applied to the series circuit of Fig. 4, in which case the third wire would be connected to the center of the series circuit, and the test instrument would be connected as in Fig. 1.

My test differs from similar tests heretofore proposed in that it is maintained while the translating devices or working electrical apparatus (the fire engines) are entirely disconnected, while in prior test systems the working apparatus, for example fire alarm boxes, have normally been included in the circuit tested.

What I claim is—

1. The method of using continually closed electric circuits which consists in disconnecting the translating devices or working apparatus from such circuit, maintaining a test current on such circuit while the working apparatus is thus disconnected, discontinuing said test, and connecting working apparatus to the circuit, substantially as described.

2. The method of using electric circuits which consists in rendering the working generator normally inoperative—so far as its capacity to operate the working electrical apparatus or translating devices is concerned—on such circuit, maintaining a test current on such circuit while it is out of use, discontinuing the test and rendering the working generator operative—as to capacity to operate the working electrical devices—when it is desired to use the translating devices, and connecting such devices to the circuit, substantially as described.

3. The method of using electric circuits which consists in normally disconnecting the translating devices therefrom, rendering the working generator inoperative on such circuit, maintaining a test of the circuit while it

is out of use, and the translating devices are disconnected, and rendering the working generator operative on the circuit when it is desired to use the translating devices, substantially as described.

4. The combination with a circuit to which electrical apparatus may be connected, but from which such apparatus is normally disconnected of safety testing or signaling devices normally showing the condition of said circuit, and a generator for said circuit normally not furnishing a working current (that is, a current adapted to operate said electrical apparatus) to said circuit, substantially as described.

5. The combination with a circuit having means at intervals for connecting in electrical apparatus but normally not containing such apparatus, of safety testing or signaling devices in circuit when the electrical apparatus is out of circuit showing the condition of said circuit, substantially as described.

6. The combination with a circuit having means at intervals for connecting in electrical apparatus but normally not containing such apparatus, of safety testing or signaling devices normally showing the condition of said circuit and responsive to both increase and decrease of current, substantially as described.

7. The combination with a circuit, of a generator adapted to operate electrical motors or other apparatus, said generator being normally inoperative on the circuit, means connected to said circuit for testing or showing its condition, an automatic switch for throwing said testing means out of and the generator into operation, and a magnet in an alarm or other suitable circuit controlling said switch, substantially as described.

8. The combination of a circuit to which electrical apparatus may be connected, means for maintaining a test of said circuit, a working generator normally at rest, an electrically operated motor for driving it, and a magnet in a suitable alarm or other circuit controlling the circuit of said motor, substantially as described.

9. The combination of a working circuit normally not including its translating devices or working apparatus on which is a test current when the circuit is out of use, and said translating devices are disconnected a resistance at the outer end of the circuit when the circuit is out of use, that is, when the working apparatus is disconnected, and a test instrument connected to said circuit and responsive to changes which vary the resistance in the line, substantially as described.

10. The combination of a multiple arc working circuit, a resistance at the outer end thereof maintaining the circuit continuously closed, a testing generator, and a test instrument responsive to changes in either limb of the circuit, substantially as described.

11. The combination of a working circuit, normally not including its translating devices, a balanced test apparatus connected to the two limbs thereof and responsive to changes of resistance in either limb, whereby a change of resistance in either limb gives a signal, substantially as described.

12. The combination with a working circuit having direct and return limbs, of a third conductor connected to said limbs at their outer ends, a source of current for testing in said conductor, and testing devices adapted to be operated thereby, substantially as described.

This specification signed and witnessed this 19th day of May, 1892.

JOSEPH SACHS.

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