

W. J. RICHARDS.
COMBINATION PUMP AND COMPRESSOR SYSTEM.
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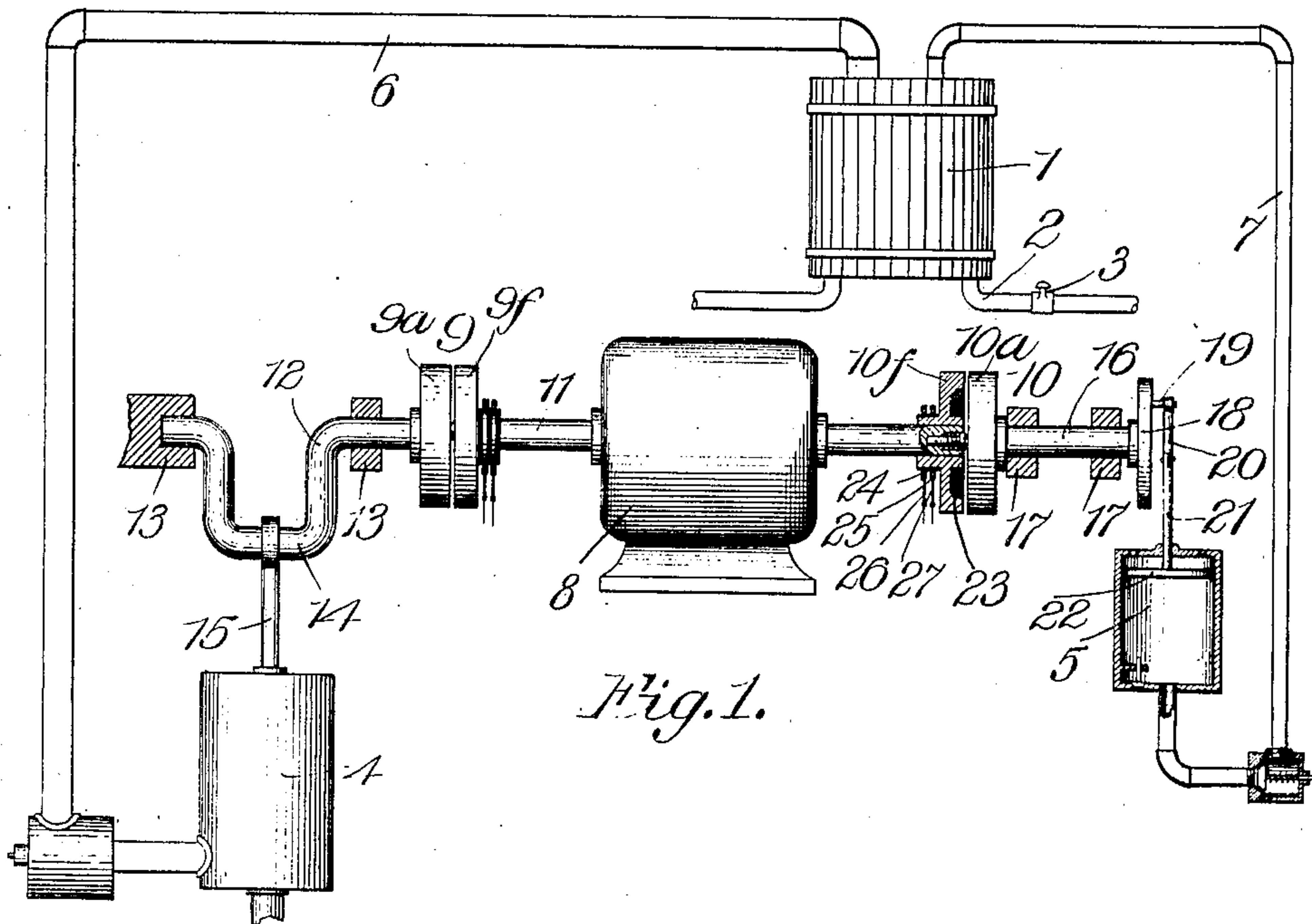


Fig. 1.

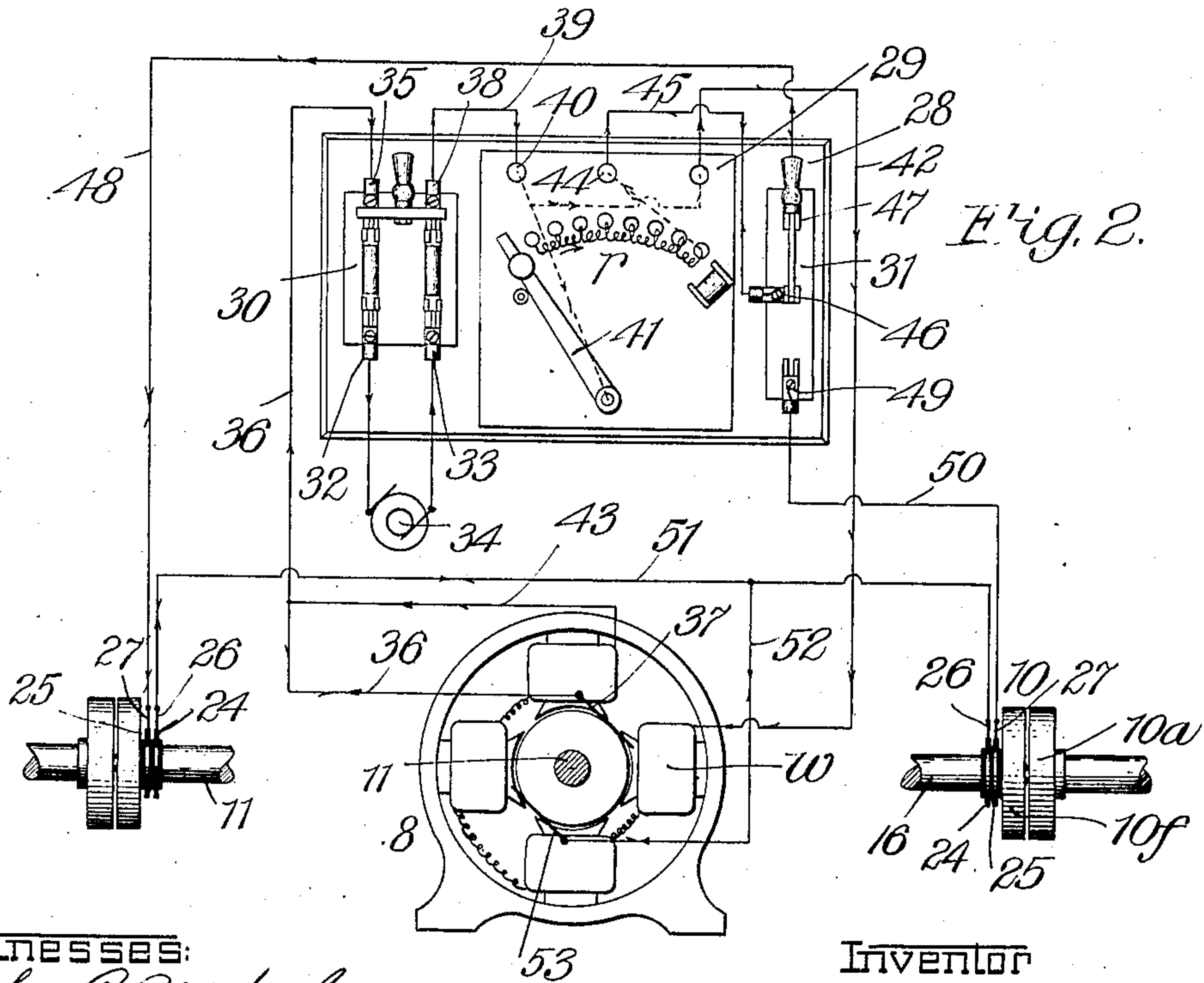


Fig. 2.

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UNITED STATES PATENT OFFICE.

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COMBINATION PUMP AND COMPRESSOR SYSTEM.

No. 906,659.

Specification of Letters Patent.

Patented Dec. 15, 1908.

Application filed July 9, 1908. Serial No. 442,659.

To all whom it may concern:

Be it known that I, WALTER J. RICHARDS, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in a Combination Pump and Compressor System, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to combination pump and compressor systems, having for its object an improved arrangement and operation of said systems.

My invention is of great utility in automatic sprinkler systems. In some of these systems a supply tank is provided into which water must be pumped and which must be kept under pressure in order that the water can be driven with sufficient force from the sprinkler system outlets. A water pump and an air compressor are therefore necessary, together with some driving means. In accordance with my invention I provide an electric motor as the common driving source and two magnetic clutch mechanisms are provided, one for connecting the motor with the pump and the other for connecting the motor with the compressor, the circuit arrangement and control of the clutches being such that either clutch may be independently cut into circuit for operation. A double-throw switch is provided which in one position energizes the one clutch to connect the motor into driving relation with the pump, and when the switch is moved to the other position, the other clutch mechanism is energized to connect the motor in driving relation with the compressor. I also combine the motor circuit and the clutch circuits in such manner that when the main switch is opened to interrupt the circuit to the motor and to the clutches, the motor will operate for an instant as a generator to send current through the connected-in clutch in reverse manner, this reverse current flow overcoming the residual magnetism of the clutches and unclutching is always assured so that the system is always in condition to have either one or the other of the clutches connected in for service upon closure of the double-throw switch.

In the accompanying drawing my inven-

tion is clearly illustrated as applied to a sprinkler system of the class described.

Figure 1 is a more or less diagrammatic view showing the various parts of the system and their arrangement, and Fig. 2 is a circuit diagram showing the circuit arrangement and connections which I employ in my system.

1 represents a tank, usually on the top of a building, which is connected through piping 2 with thermally controlled sprinkler nozzles 3. The tank is filled with water so that when any of the nozzles are opened by heat water will flow from the tank through the piping and from the opened nozzles. To insure more forcible flow from the nozzles it is desirable to have the water in the tank under pressure. The tank being usually at the top of the building, a pump is necessary to drive the water therein, and a compressor is employed to compress the air over the water. I have shown a pump 4 and a compressor 5, the pump being connected with the tank through piping 6 and the compressor being connected with the top of the tank through piping 7. As a common driving means for the pump and compressor I provide an electric motor 8 adapted for driving connection with the pump by means of the magnetic clutch 9 and for driving connection with the compressor by means of magnetic clutch 10. The clutch frame 9^f of the magnetic clutch 9 is secured to one end of the armature shaft 11, while the armature disk 9^a of the magnetic clutch is secured to the adjacent end of the crank shaft section 12 which is journaled in suitable bearings 13, and which has the crank section 14 connected with the connecting rod 15 which is connected with the pumping apparatus in a well-known manner.

The frame part 10^f for the magnetic clutch 10 is mounted at the other end of the armature shaft 11 and the armature disk 10^a is secured to the inner end of the shaft 16 journaled through the bearings 17. This shaft is shown as carrying a crank disk 18 at its other end, whose crank pin 19 connects through connecting rod 20 and piston rod 21 with piston 22 of the compressor 5. Each magnetic clutch frame carries a winding 23 and contact rings 24, 25, suitably connected with the winding terminals and engaged by brushes 26, 27.

In Fig. 2, 28 represents a switchboard upon

which are mounted a rheostat 29, a main switch 30, and a double throw switch 31. The terminals 32 and 33 of the main switch connect with the direct current source 34. 5 The terminal 35 of the main switch connects through the conductor 36 with the brush 37 of the motor, while terminal 38 of the main switch connects through the conductor 39 with the terminal 40 of the rheostat, which 10 terminal connects with the rheostat arm 41. This terminal 40 also connects through conductor 42 with terminal of the field winding W of the motor, whose other terminal connects through conductor 43 with conductor 15 36 and with main switch contact 35. The rheostat terminal 44 connects through conductor 45 with the common terminal 46 of the double-throw switch. The top terminal 47 of this switch connects through conductor 20 48 with the brush 25 of the magnetic clutch 9. The lower terminal 49 of the double-throw switch connects through conductor 50 with the brush 25 of clutch 10. The other brushes 24 of the clutches are connected together through conductor 51 and through 25 common conductor 52 with the other brush 53 of the motor. The motor is therefore connected in shunt with the main circuit, and the magnetic clutch windings are connected 30 in series with the armature.

If it is desired to operate the pump to refill the tank with water, the double-throw switch blade is in the upper position as shown. Current then flows from the generator 34 to contact 33 of the main switch, through the closed 35 main switch to conductor 39, to rheostat arm 41, through the starting resistance r , through conductor 45 to common terminal 46 of the double throw switch, through the switch 40 blade to conductor 48, through brush 25, winding 23 of clutch 9, through brush 24, through conductors 51 and 52 to motor brush 53, through the motor armature to the brush 37, through conductor 36 and through the 45 main switch back to generator 34. Current also flows from the generator 34, through conductors 39, 42, through the field winding of the motor, and through conductor 36 back to the generator. The magnetic frame of 50 clutch 9 being energized, the armature 9^a thereof will be magnetically locked to the frame 9^f and the pump clutched to the motor will be driven thereby. When the desired level of water has been reached, the main 55 switch is opened to open the motor circuit and the clutch circuit. If it were now desired to operate the compressor, the main switch would be closed and the double-throw switch blade thrown downwardly to engage 60 the contact 49 and the same circuit conditions would result only that magnetic clutch 10 would be connected for service and the compressor would operate to pump air into the tank over the water.

65 There is apt to be residual magnetism in

the clutch parts after the circuit is opened by the main switch, and if the members of one clutch were not separated before the other clutch were connected in for service, both clutches would operate. However, by hav- 70 ing the clutch windings connected serially in circuit with the armature separation of the clutch members is assured for the reason that after the main switch is opened the motor would run for a while under its own momen- 75 tum as a generator, exciting its shunt field. By the system of wiring employed, the shunt field current thus generated will pass through the connected-in clutch winding in the reverse direction, thereby overcoming the re- 80 sidual magnetism and readily allowing the clutch members to separate.

Supposing the clutch 9 is connected in circuit and the main switch opened, then we will have the following circuit through the 85 clutch winding through which current flows in a reverse direction: from the terminal of the field winding, through conductors 43 and 36 to brush 37, through the armature to brush 53, through conductors 52 and 51 to 90 brush 24 of the clutch 9, thence through the winding of said clutch to brush 25, through conductor 48, through switch contacts 47, 46, through conductor 45 to rheostat contact 44, through the resistance, through the rheo- 95 stat arm 41, through conductor 42 to the other field terminal. This reverse current flow is indicated by the half arrow heads and the current flow with the main switch closed is indicated by the full arrow heads. Any 100 residual magnetism in the clutch frames is therefore counteracted and the clutch members separated so that when the double-throw switch is open and the main switch closed, both clutches are out of service, and either 105 one may be selected for service by proper actuation of the double-throw switch.

I therefore provide a very flexible control for systems in which a pump or compressor are to be independently driven by a common 110 motor source. Magnetic clutches themselves form very elastic connecting mediums between the motor and the members to be driven. By means of the rheostat the current can be gradually applied to both the 115 motor and the clutch windings and the pump and compressor easily and gradually started.

I do not wish to be limited to the exact arrangement of the parts as I have shown them nor to the particular system to which I have 120 shown my invention applied.

I desire to secure the following claims by Letters Patent:

1. In combination, a common driving motor, mechanism to be driven, a magnetic 125 clutch for connecting said mechanism with the motor, additional mechanism to be driven, a second magnetic clutch for connecting said second mechanism with the motor, circuits for the motor and the magnetic 130

clutches, and a common controlling means for the motor and magnetic clutch circuits.

2. In combination, a common driving motor, a plurality of mechanisms to be driven, 5 a magnetic clutch for connecting each mechanism with the motor, circuits for the motor and for the magnetic clutches, and a common circuit controlling means for said circuits.

10 3. In combination, an electric motor, mechanism to be driven, a magnetic clutch for connecting said motor in driving relation with said mechanism, additional mechanism to be driven, a second magnetic clutch for 15 connecting said motor in driving relation with said additional mechanism, a supply circuit, means for connecting said motor with said supply circuit, means for connecting either one of the magnetic clutches with the 20 supply circuit, and rheostat means for the motor and clutch circuits.

4. In combination, an electric motor, a mechanism to be driven, a magnetic clutch for connecting the motor in driving relation 25 with said mechanism, additional mechanism to be driven, a second magnetic clutch for connecting said motor in driving relation with said additional mechanism, a supply circuit, a main switch for connecting said 30 motor with said supply circuit, a double throw switch for connecting either one of said magnetic clutches with the supply circuit, and a common rheostat for controlling the motor clutch circuits in common.

35 5. In combination, an electric motor, mechanism to be driven thereby, a magnetic clutch for connecting the motor in driving relation with the mechanism, a supply circuit, circuits for connecting the armature and 40 field windings of the motor with the supply circuit and in shunt relation, and switch mechanism for including said magnetic clutch serially in the armature circuit, the momentum of the armature after the arma- 45 ture and field windings have been disconnected from the supply circuit causing current flow through the magnetic clutch in reverse direction whereby the residual mag-

netism of the clutch is overcome and the clutch members parted. 50

6. In combination, an electric motor, mechanism to be driven by the motor, a magnetic clutch having one member connected with the motor and the other member connected with the mechanism to be driven, 55 an energizing winding for said clutch, an electrical supply circuit, switching mechanism for connecting the armature and field windings of the motor with the supply circuit and in shunt relation with each other, 60 switching mechanism for including the magnetic clutch winding serially in the armature branch, a rheostat for controlling the current flow through the armature circuits and the magnetic clutch circuit, the momentum of 65 the armature after the armature circuits have been disconnected from the supply circuit causing reverse current flow through the armature winding and magnetic clutch winding, whereby residual magnetism in the 70 clutch members is counteracted and the clutch members allowed to separate to disconnect the motor from the mechanism to be driven.

7. In combination, an electric motor, 75 mechanism to be driven, a magnetic clutch for connecting the motor in driving relation with the mechanism to be driven, an energizing winding for the magnetic clutch, a supply circuit, common controlling means for 80 connecting the motor windings and magnetic clutch winding with the supply circuit, and means whereby said motor may generate reverse current flow through the magnetic clutch winding upon disconnection of 85 the motor windings from the supply circuit whereby residual magnetism in the clutch will be counteracted and the motor disconnected from the mechanism driven thereby.

In witness whereof I have hereunto subscribed my name, this 30th day of June, 1908. 90

WALTER J. RICHARDS.

Witnesses:

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