No. 765,765. PATENTED JULY 26, 1904.

J. BUTCHER.

AUTOMATIC FIRE EXTINGUISHER.

APPLICATION FILED NOV. 15, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

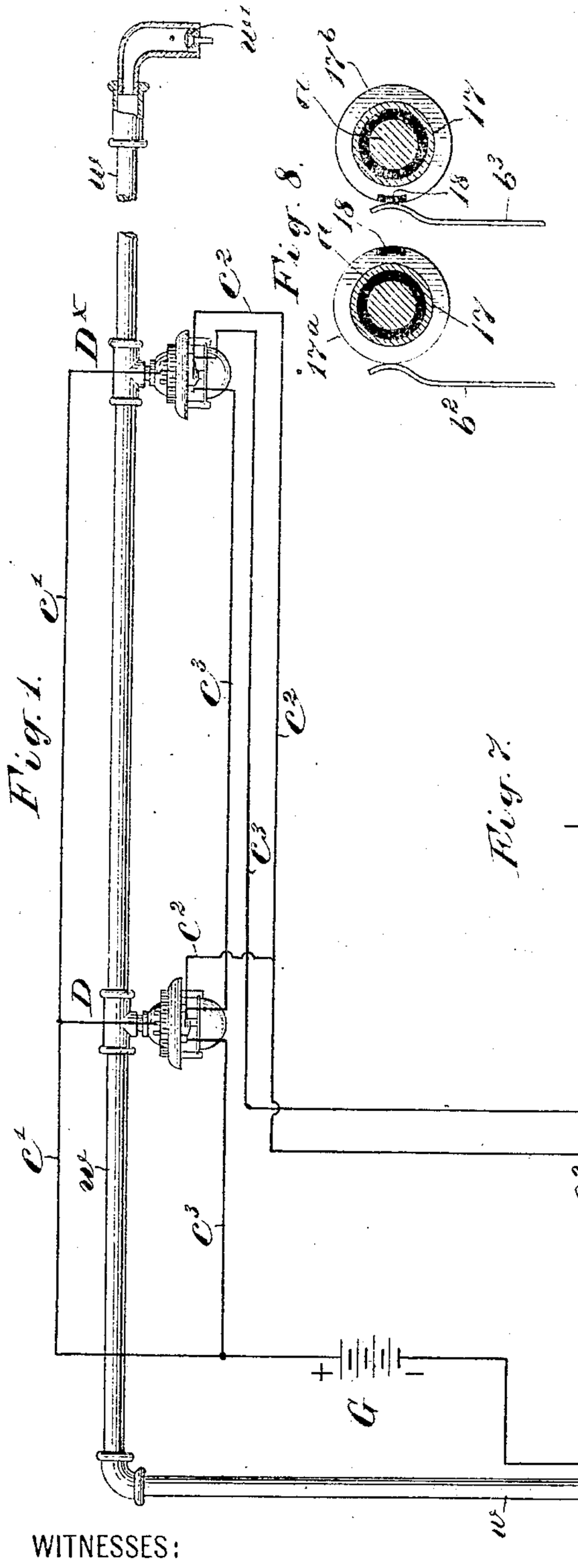

Fig. 2.

Fig. 3.

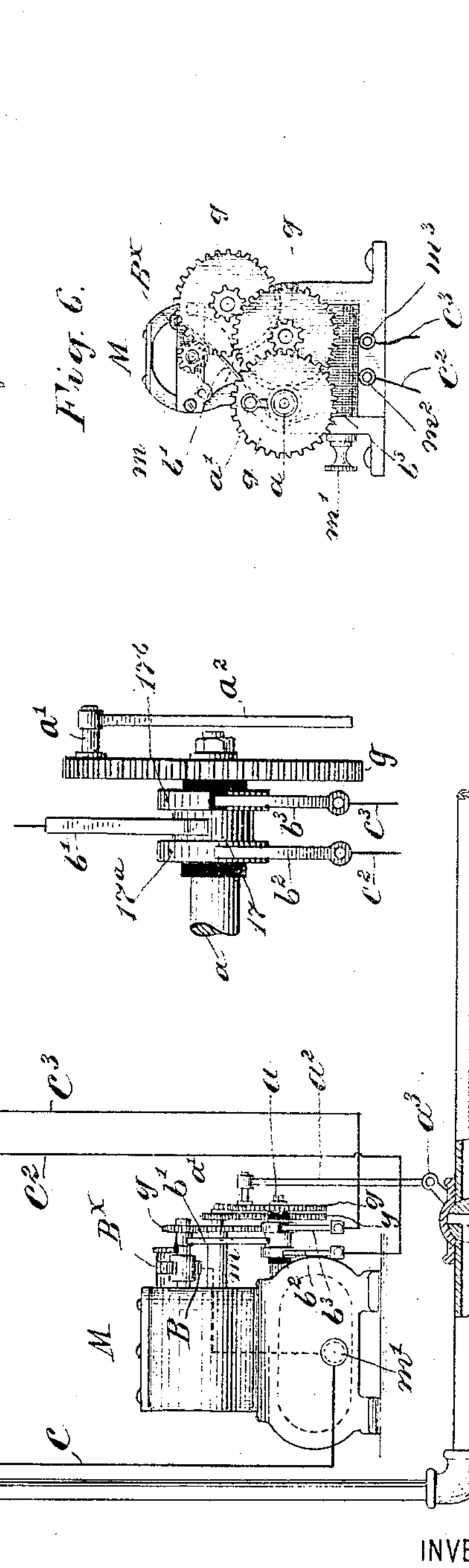

Fig. 4.

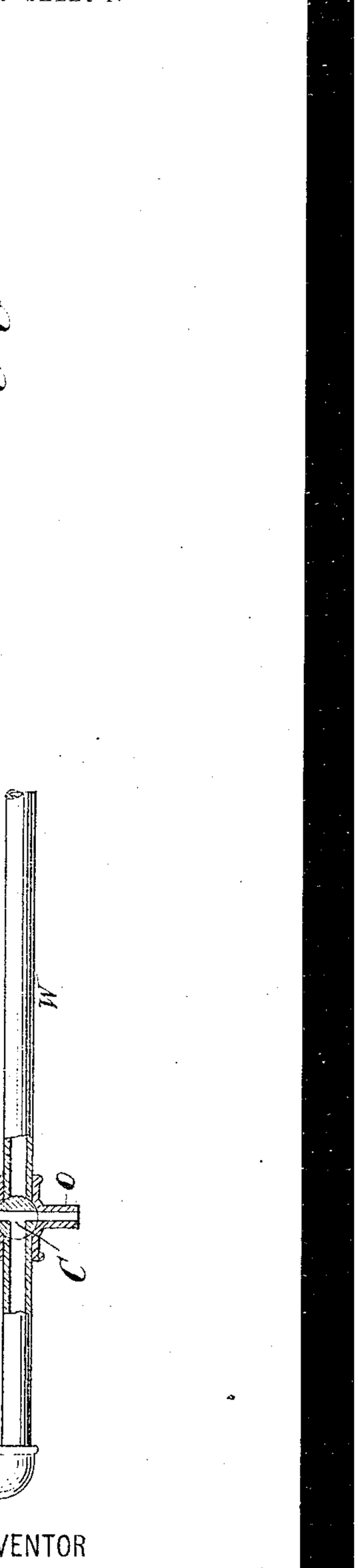

Fig. 5.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

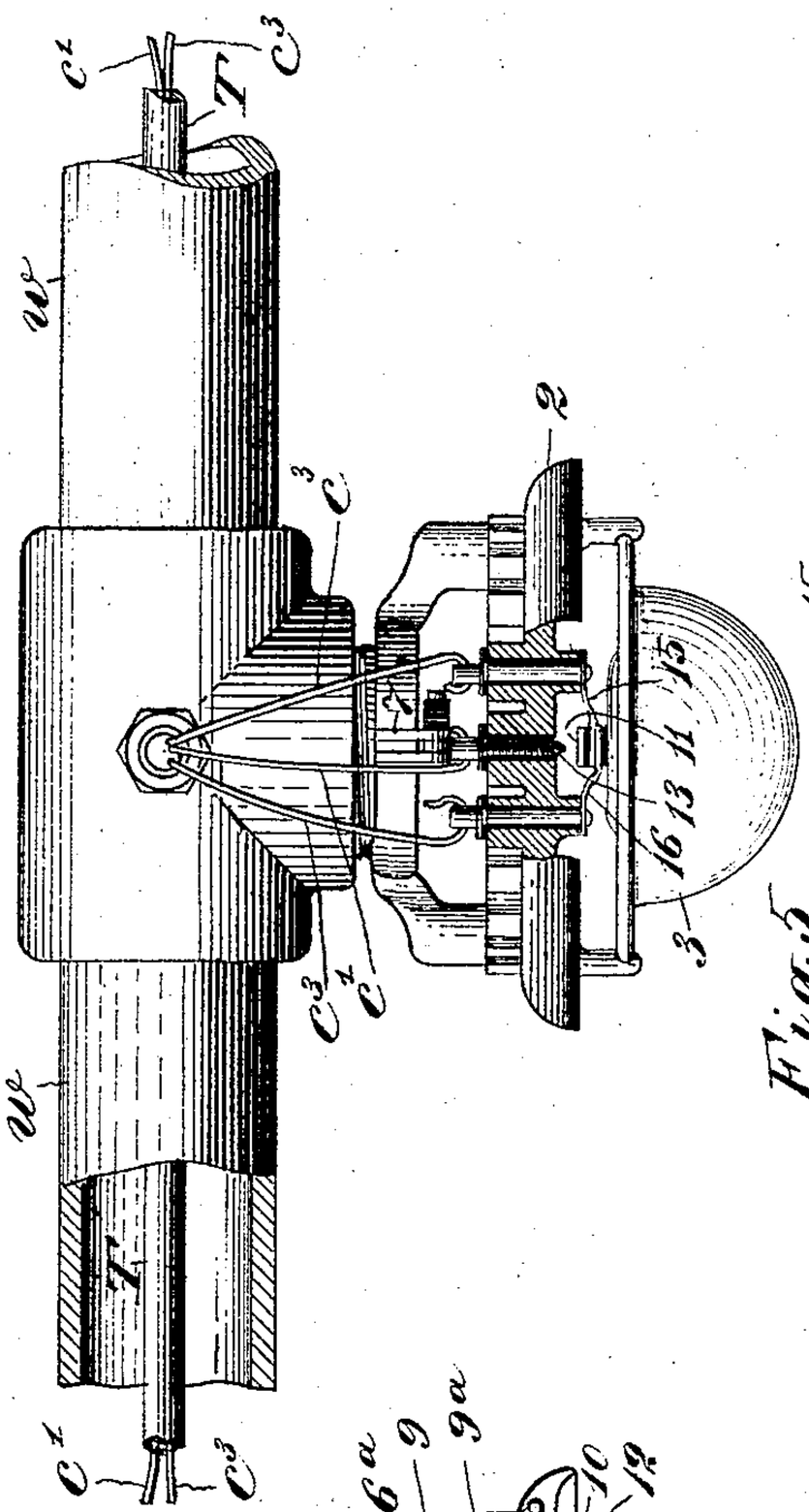


Fig. 5.

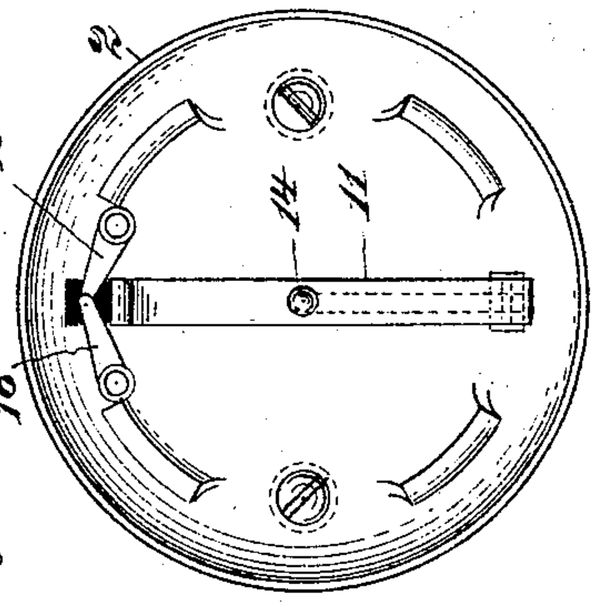


Fig. 2.

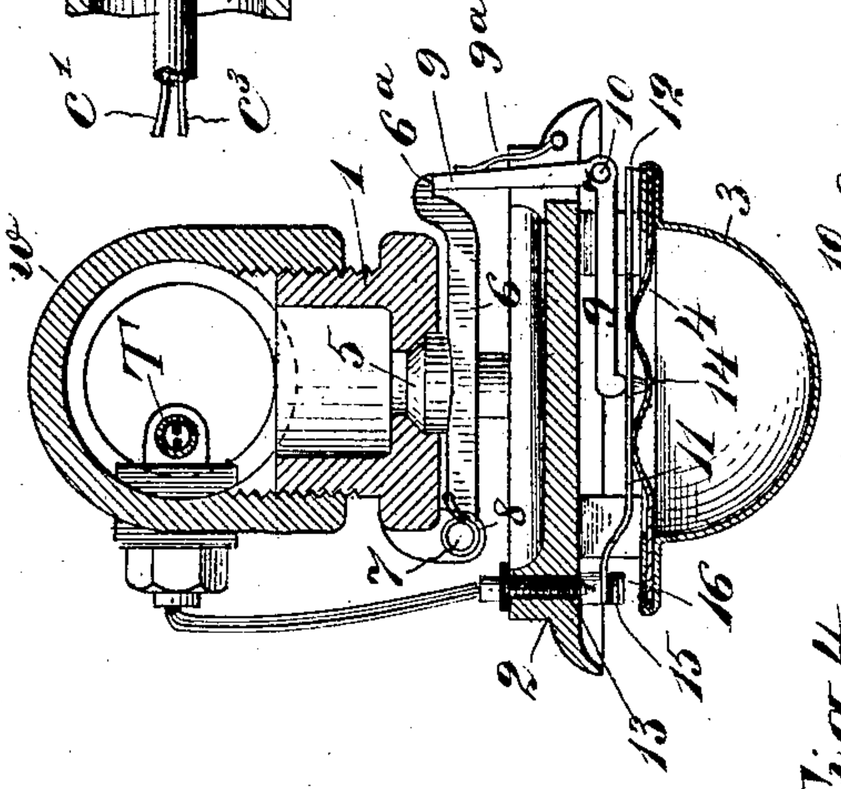
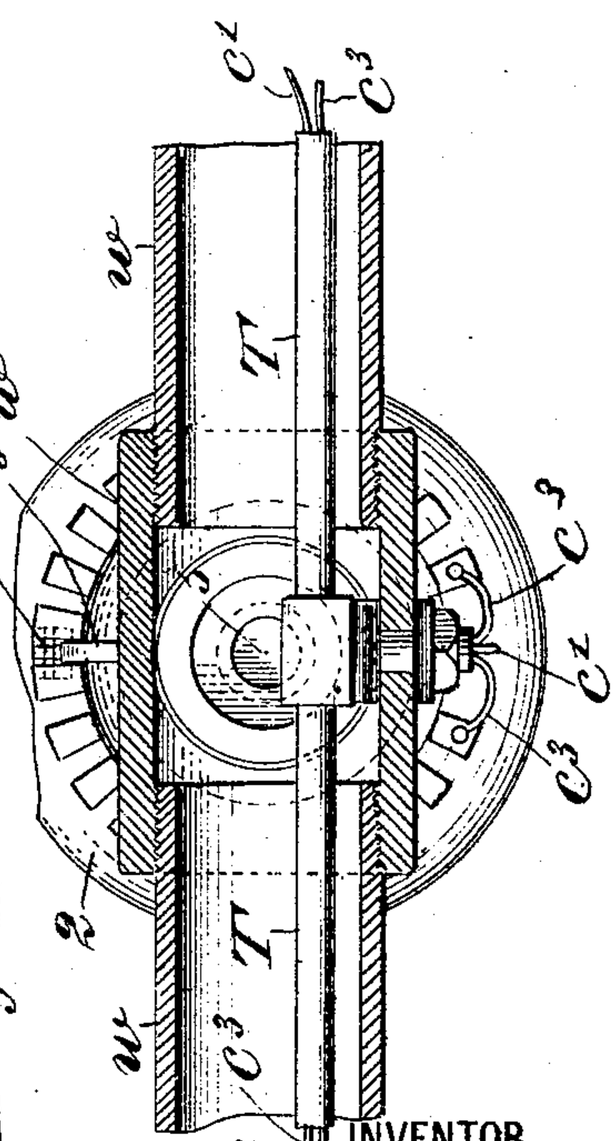


Fig. 4.



WITNESSES:

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No. 765,765. Patented July 26, 1904.

UNITED STATES PATENT OFFICE.

JOSEPH BUTCHER, OF NEW YORK, N. Y.

AUTOMATIC FIRE-EXTINGUISHER.

SPECIFICATION forming part of Letters Patent No. 765,765, dated July 26, 1904.

Application filed November 15, 1901. Serial No. 82,366. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH BUTCHER, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Automatic Fire-Extinguishers, of which the following is a specification.

This invention relates to means for turning on the water for putting out a fire in a room when the temperature therein shall have risen above a predetermined degree, a thermostat being provided which when the temperature has reached the predetermined maximum acts to close an electric circuit through a motor of a known kind. This motor opens a cock in the water-service pipe and allows the water to flow to the discharging-point. At the same time the thermostat releases the valve at the discharging-point and allows said valve to open, so that the water may flow from the outlet. When the temperature falls low enough at the thermostat, the "opening" branch of the circuit will be broken and the "closing" branch of the circuit closed, whereby the electric motor will be set in motion to close the cock in the service-pipe, so as to cut off the supply of water and to open the pipe carrying the extinguishing-nozzles, so as to drain said pipe.

In my United States Patent No. 637,332, of November 21, 1899, I have shown an automatic fire-extinguisher having some features in common with the present case, and this patent may be referred to for information on some of the points herein described. In the present case, however, no electromagnets are employed and some of the conductors are inclosed in a protecting-tube which extends through the water-pipe. In the present case also the water-pipe itself or the protecting-tube serves as one of the conductors. This construction cheapens and simplifies the apparatus and avoids the display of wires for conducting the current.

In the accompanying drawings, which serve to illustrate the invention, Figure 1 is a general and somewhat diagrammatic view showing the installation with two discharging outlets or sprinklers, a motor, a generator, and the circuits. Fig. 2 is a transverse section of the water-pipe and sprinkler secured thereto. Fig. 3 is a side elevation of the water-pipe and sprinkler on the same scale as Fig. 2. Fig. 4 is a sectional plan of the pipe at the sprinkler. Fig. 5 is an under side view of the sprinkler, the thermostat being omitted. Fig. 6 is a front view of the motor as seen from the right in Fig. 1. Fig. 7 shows a side elevation, and Fig. 8 two cross-sections, of the circuit maker and breaker of the motor.

Referring first to Fig. 1, W represents the main water-service pipe of a building, and *w* is a branch therefrom, leading, for example, to a suit of rooms in the building. In the pipe W or in the pipe *w* at its lowest part is a two-way cock C, adapted to be opened and closed by an electric motor M. This cock is seen in section in Fig. 1 and is shown as normally closed, so that water from the pipe W may not pass it, and open for drainage of the pipe *w* at an outlet *o*. As the electric motor shown is of a known form, it will be only necessary to say at this point that on a shaft *a*, driven from its armature-arbor *m* by a train of gears *g*, is a crank *a'*, which is coupled by a connecting-rod a^2 with a crank-arm a^3 on the plug of the cock C. A half-turn of the crank *a'* opens the cock and a second half-turn closes it again.

Two like sprinklers or discharging devices D and $D^{\times}$ are represented in Fig. 1 as connected with the pipe *w*. There may be any number of these sprinklers situated at the respective discharging-points, but two will serve to illustrate the invention fully. Each device D (see Figs. 2 and 3) comprises a nozzle 1, coupled to the pipe *w* and carrying a platform 2. This platform has secured to its under side a thermostat comprising a hemispherical casing 3 and a thin diaphragm 4 over the top of said casing. This casing 3 may contain any fluid which is expansible with heat—as air, for example—and the effect of the expansion will be to elevate or press outward the center of the diaphragm 4. At the outlet of the nozzle 1 is formed a valve-seat, into which fits a coned valve 5, which opens outward. This valve is carried by a lever 6, hinged at 7 and provided with a light spring

8 at the hinge, which serves to overcome the weight of the valve and lever and keep the valve up normally to its seat. At its outer end the lever has or may have a shouldered recess at 6^a, and at this point the upright arm of an L-shaped locking-lever 9 takes under the valve-lever, the other arm of the lever 9 extending in toward the center of the diaphragm 4. This lever 9 is fulcrumed at 10. When the center of the diaphragm 4 is elevated, it raises the horizontal arm of the lever 9 and rocks the latter, so that its upright arm is moved out from under the end of the valve-lever, thus permitting the valve to be opened by the water under a head admitted to the pipe *w*. In order to operate the cock C and admit water to the pipe *w* as soon as the heat elevates the diaphragm 4, the electrical means now to be described are employed.

Extending transversely over and across the diaphragm 4 is a thin metal spring-terminal 11. This terminal is fixed at one end to the metal of the sprinkler at 12, and its free end is situated adjacent to a terminal screw or point 13, set in the metal of the sprinkler, but insulated therefrom. The terminal 11 at the point where it traverses the center of the diaphragm 4 has a projection or knob 14, which bears on the diaphragm, and at this point the end or tip of the horizontal arm of the elbow-lever 9 rests on the terminal 11. The parts 11 and 13 constitute terminals at a break in the opening branch of the controlling-circuit, and this break is normally open; but when the heat expands the fluid in the casing of the thermostat the terminal 11 is moved into contact with the terminal 13 and closes said break. The closing branch of the controlling-circuit has also a break adjacent to the free end of the terminal 11, where are situated two overlapping spring-terminals 15 and 16. These terminals are insulated from the metal of the sprinkler and tend to spring apart, so as to break the circuit; but the end of the terminal 11 bears on one of said terminals 15, as here shown, and presses them into contact, so as to close the break normally in the closing branch. The bearing-point of the terminal 11 is insulated from the terminal 15, on which it presses.

The circuit-conductors are illustrated diagrammatically in Fig. 1. A conductor *c* leads from one pole (the negative) of a generator G to the brush B of the motor M, and from the other motor-brush $B^\times$ the current flows by a brush *b'* to the sleeve 17 of a circuit maker and breaker. (Seen best in Fig. 7.) This is a metal sleeve of cylindrical form and is fixed on but insulated from the shaft *a*, and the brush *b'* is always in electrical contact with the metal of this sleeve. A conductor *c'* leads from the other (or positive) pole of the generator G to the contact-terminals 13 of the two sprinklers D and $D^\times$. On the sleeve 17 and forming a part thereof are two elevated circular flanges 17^a and 17^b, Figs. 7 and 8, and set in these flanges oppositely disposed are insulating-blocks 18, which break the continuity of the metal surfaces of the flanges at diametrically opposite points. A brush b^2 bears on the flange 17^a and a brush b^3 on the flange 17^b. A conductor c^2 leads from the brush b^2 by branches to the spring-terminals 11 of the respective sprinklers D and $D^\times$, and a conductor c^3 leads from the brush b^3 to the terminal 15 of the sprinkler $D^\times$, thence from the terminal 16 of the sprinkler $D^\times$ to the terminal 15 of the sprinkler D, and thence from the terminal 16 of the sprinkler D to the conductor *c'* or to that pole of the generator with which the conductor *c'* is connected. The letter c^3 is here used to designate the entire conductor from the brush b^3 to the positive pole of the generator, and normally the breaks therein at the sprinklers will be closed. The breaks at the respective sprinklers between the contacts 11 and 13 will be normally open. The brush *b'* is common to both the "cock-opening" and "cock-closing" branches of the circuit, and it is always in electrical connection with one or the other of the brushes b^2 and b^3. Normally the cock-opening branch of the circuit is broken between the contacts 11 and 13, but closed at the sleeve 17, as the insulation 18 in 17^a is then opposite to the brush b^2; but the cock-closing branch is normally closed between the contacts 15 and 16 and open at the sleeve 17, for the reason that the brush b^3 is resting on the insulating-block 18 in 12^b. This is the position of the parts in Figs. 1, 7, and 8 when the pipe *w* is closed to the pipe W by the cock C. Now if the temperature rises, say, at the sprinkler D to the operative maximum or point the diaphragm 4 will rise, set free the valve 5, and simultaneously move the free end of the terminal spring 11 into electrical contact with the screw-contact 13. In rising the terminal spring 11 will allow the terminals 15 and 16 to spring apart. The current will now flow from the positive pole of the generator to conductor *c'*, thence by contact 13 and terminal 11 to c^2, thence to brush b^2, thence to brush *b'*, thence to motor-brush $B^\times$, thence through the motor M to brush B, and thence by conductor *c* to the other or negative pole of the generator. The motor will thus be set in motion to open the cock C, which will be effected when the shaft *a* shall have made a half-rotation and brought the insulating-block 18 in the flange 17^a under the brush b^2, when the cock-opening circuit will be broken and the motor will cease to rotate. When the motor ceases to rotate, however, brush b^3 will be found in electrical contact with the flange 17^b; but there is a break in the cock-closing circuit between contacts 15 and 16 at sprinkler D. When the temperature falls at the sprinkler D, the thermostat will permit the termi-

nal spring 11 thereat to again descend, thus breaking its contact with 13 and pressing together the contact-terminals 15 and 16 at D. This completes the cock-closing circuit through the motor M. The current flows from the positive pole of the generator by way of conductor c^3 to brush b^3, thence to brush b', thence to brush $B^\times$ of the motor, thence through the motor to brush B, and thence to the negative pole of the generator by conductor c. The motor is thus set in motion and in making one-half a rotation of the shaft a closes the cock C against the further supply of water from W to w and opens a way for emptying the pipe w at o. When the shaft a shall have made this half-rotation, the insulating-block 18 in the flange 17^b will come under the brush b^3, thus breaking the cock-closing circuit and again stopping the motor. The ports will then be again in the positions seen in the drawings.

The sprinklers are so connected up in wiring that each operates independently, being controlled only by its thermostat.

As before stated, Fig. 1 for convenience of illustration shows the circuit-conductors diagrammatically. In practice these conductors are arranged as seen in Figs. 2, 3, and 4—that is to say, the metal of the sprinkler and the water-pipe w forms the conductor c^2, the terminal 11 being connected electrically with the metal parts at 12. The conductors c' and c^3 are insulated wires inclosed in a tube T, which is in turn inclosed in the pipe w.

The discharge device D has been called herein a "sprinkler" merely for convenience of description. Usually these devices do discharge the water in the form of a shower or spray.

The conductor c does not in practice go directly to the brush B, but, as shown in Fig. 1, it is coupled to a binding-post m', which is connected electrically with said brush. The same is also true of the conductors c^2 and c^3. These latter are in practice led to binding-posts m^2 and m^3, respectively. (Seen in Fig. 6.) These posts are in electrical connection with brushes b^2 and b^3.

In order that the water may drain properly from the pipe w when the cock C is opened for drainage to the outlet o, Fig. 1, the said pipe is provided at some point with an air-inlet valve w'. This may be any form of simple valve which opens inwardly to prevent the escape of water thereat. This air-inlet is essential to the proper drainage of the pipe w.

As herein shown, the sprinklers are represented as pendent from the pipe w; but this is not at all important to my invention. They may be directed outward or upward as well, and the lever 9 may have a light spring 9^a, Fig. 2, to keep its horizontal arm in contact with the diaphragm 4.

Having thus described my invention, I claim—

1. The combination with a water-service pipe having an outlet for the discharge of water for extinguishing fires, a two-way cut-off cock in said service-pipe, and a valve closing said discharge-outlet, of an electric motor adapted to operate said two-way cock, a locking device which holds the valve at the discharge-outlet normally closed, an electric circuit including a generator and said motor and having a branch "opening" circuit and a branch "closing" circuit, and a thermostat at the discharging-point which operates mechanically, when the temperature rises to a predetermined point, to release the said discharge-valve, to break the closing circuit, and to close the opening circuit, whereby the motor is adapted to operate the cut-off cock to discharge automatically when the thermostat completes the closing circuit.

2. The combination with the nozzle, and an electric motor for turning on and off the water which supplies said nozzle, of the valve of the nozzle and its locking means, the thermostat mounted on the sprinkler and adapted to operate the said locking means by direct mechanical action when expanded, and thus set free the nozzle-valve, electrical means whereby the thermostat also controls the movements of the said motor, means whereby said motor controls the flow of water to said nozzle, and automatic means for closing the nozzle-valve and setting the locking device thereof when the flow of water is arrested.

3. The combination with the nozzle, means for supplying water to same, and an electric motor which controls said supply, of the valve of the nozzle, the locking means for said valve, the thermostat carried by the sprinkler having a diaphragm so disposed as to act mechanically and directly on the said nozzle-locking means when the thermostat is heated, electrical means between the thermostat and motor and controlled by the former, whereby the thermostat sets free the valve of the nozzle and sets the motor in operation at substantially the same time, and automatic means for closing the nozzle-valve and setting the locking device thereof when the flow of water is arrested.

In witness whereof I have hereunto signed my name, this 12th day of November, 1901, in the presence of two subscribing witnesses.

JOSEPH BUTCHER.

Witnesses:
HENRY CONNETT,
PETER A. ROSS.