

No. 619,101.

Patented Feb. 7, 1899.

W. A. TICHENOR.

WATER HEATER.

(Application filed Aug. 30, 1897.)

(No Model.)

3 Sheets—Sheet 1.

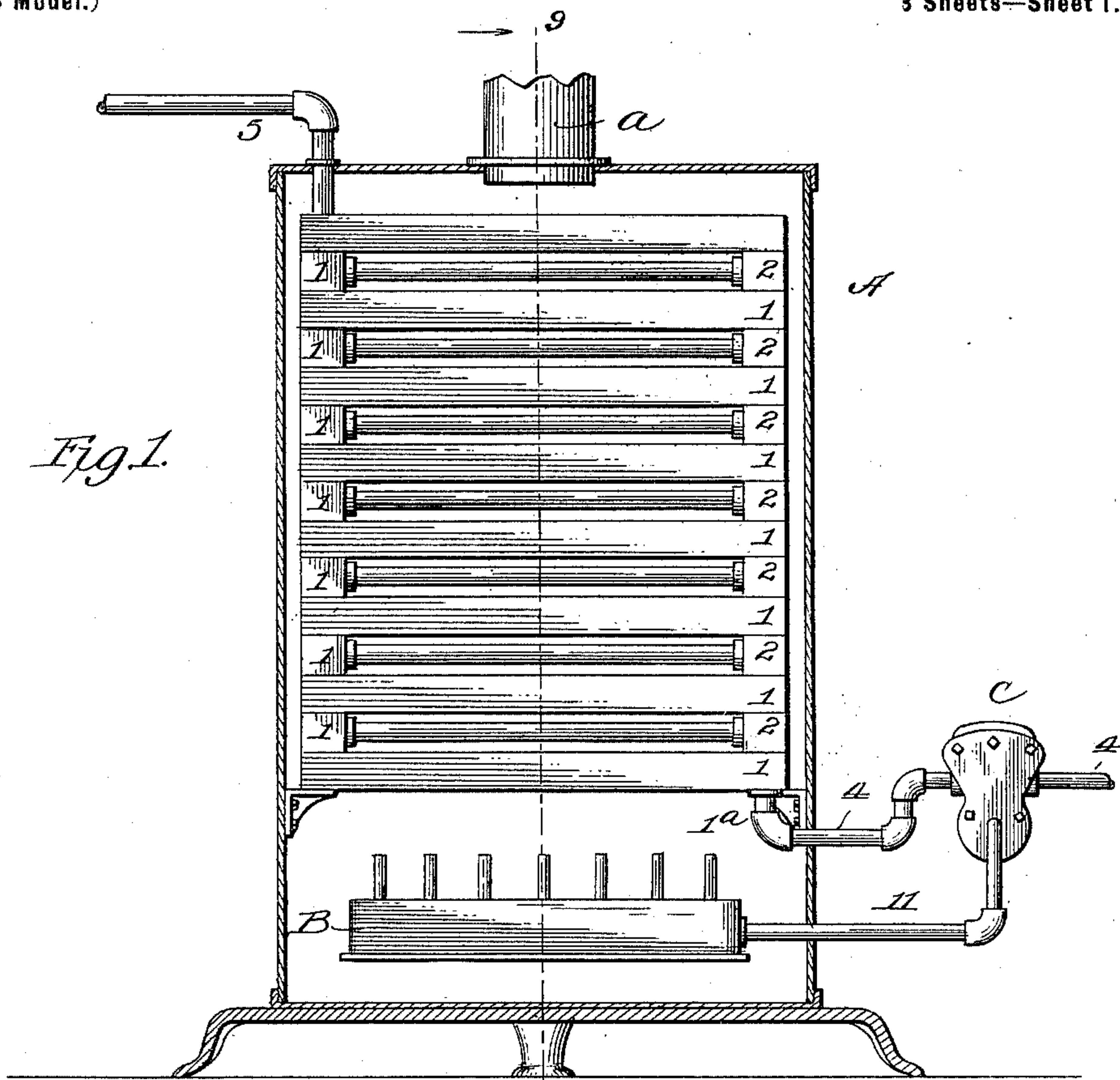
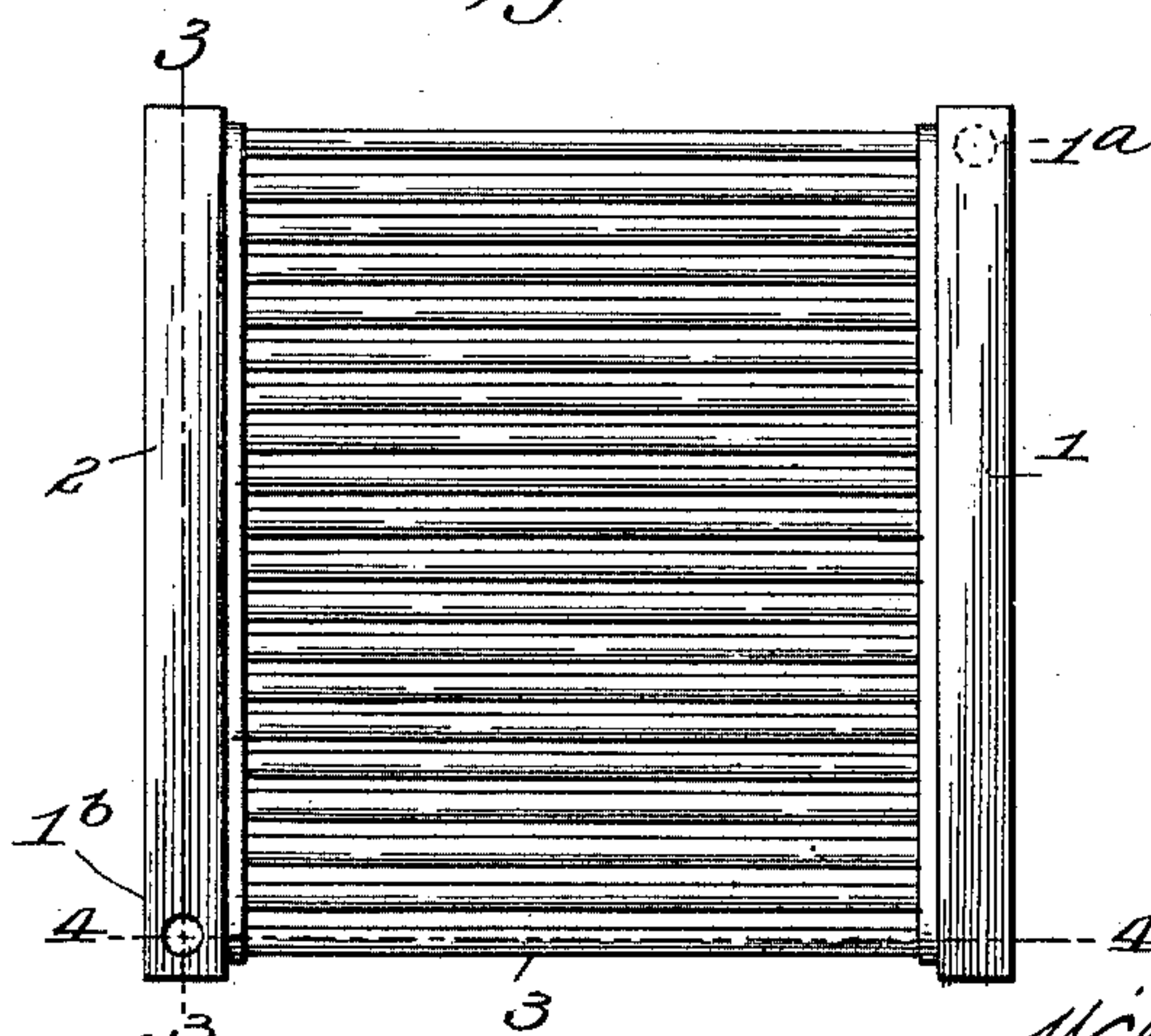


Fig. 2.



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Fig. 3.

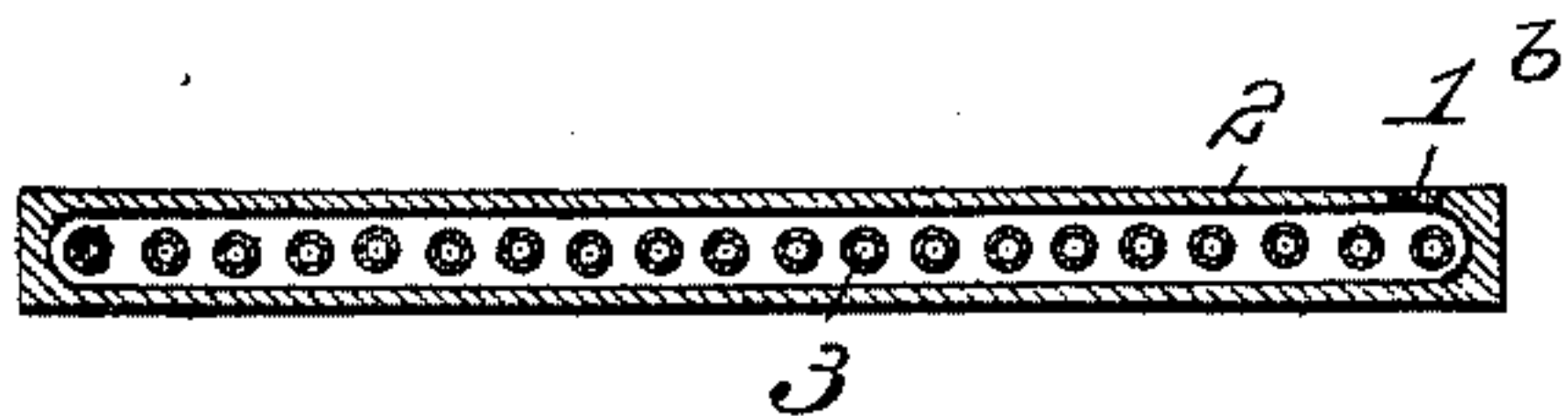


Fig. 4.

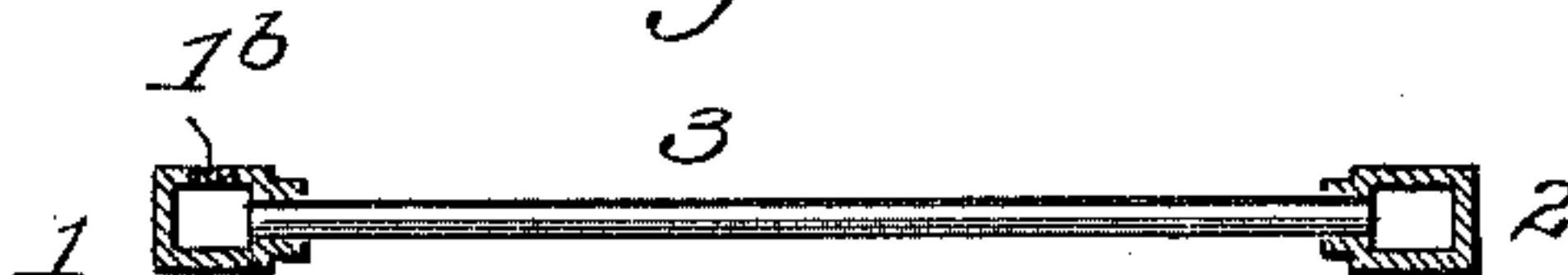


Fig. 5.

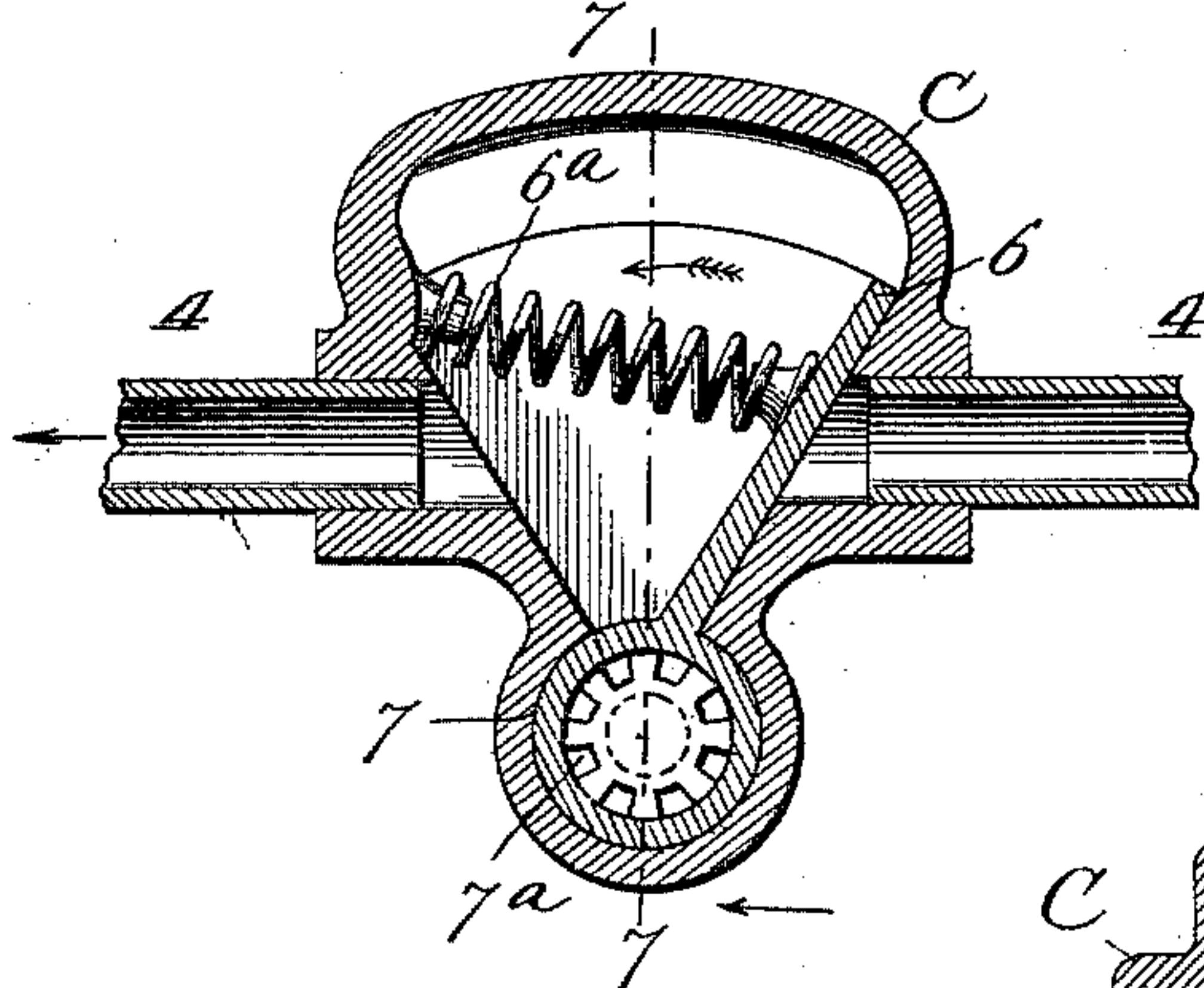


Fig. 6.

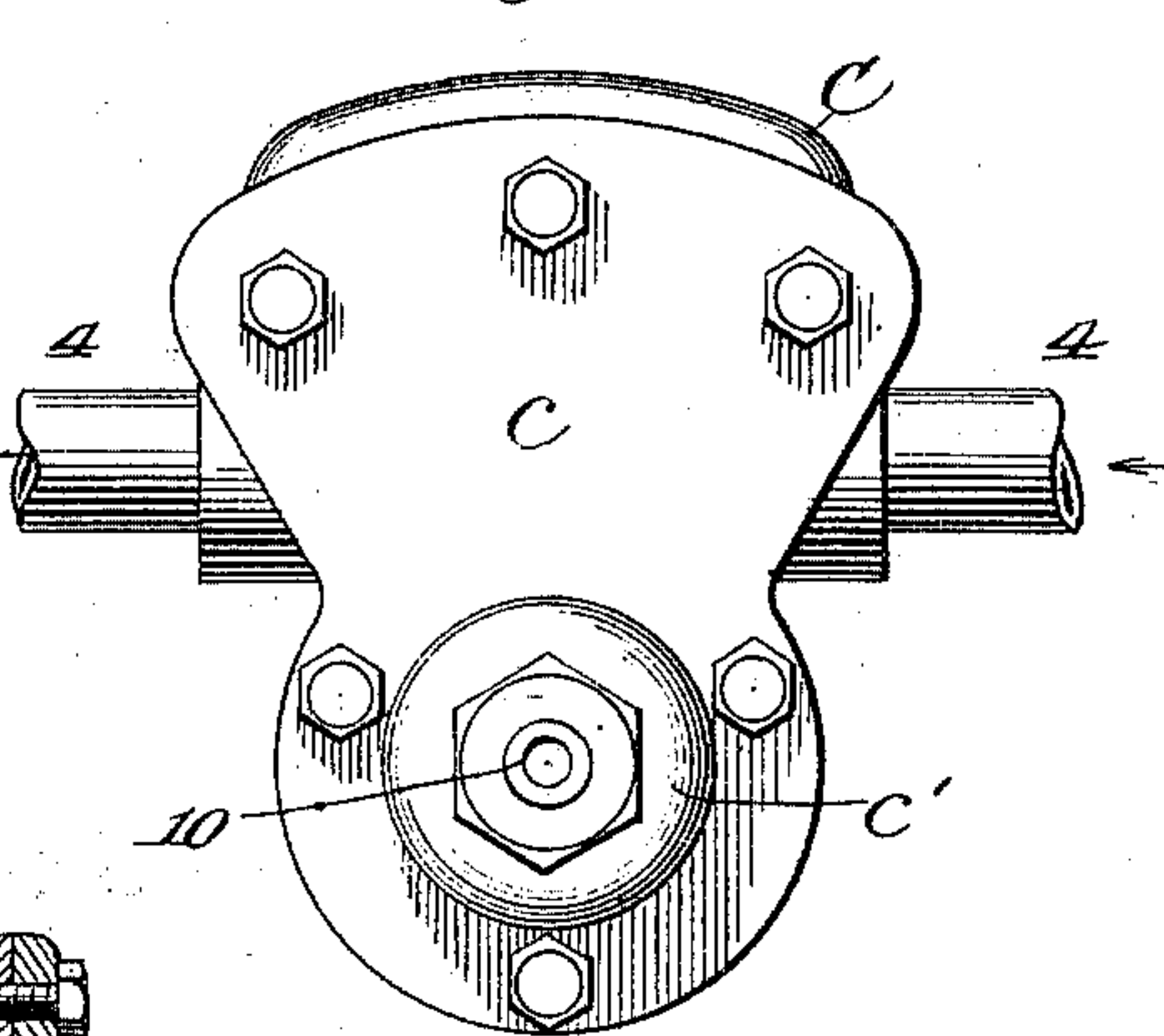


Fig. 7.

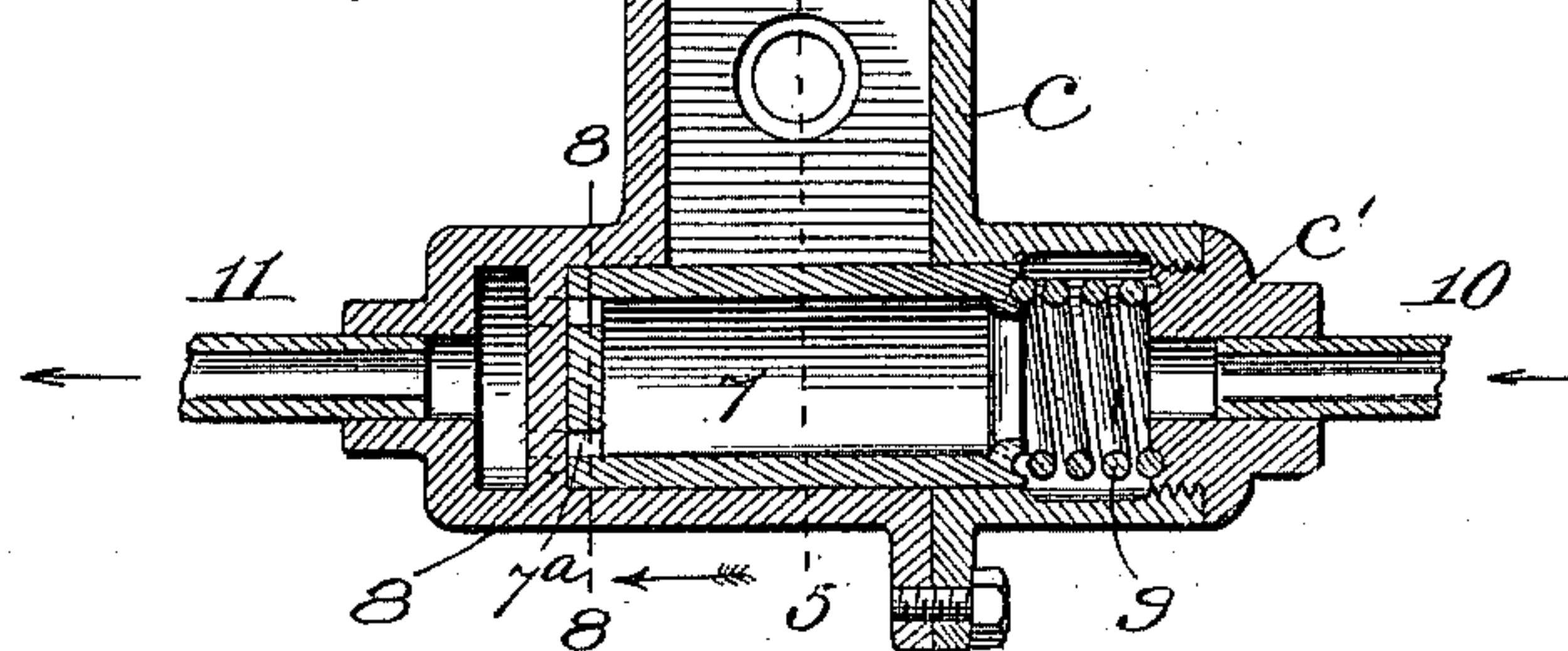
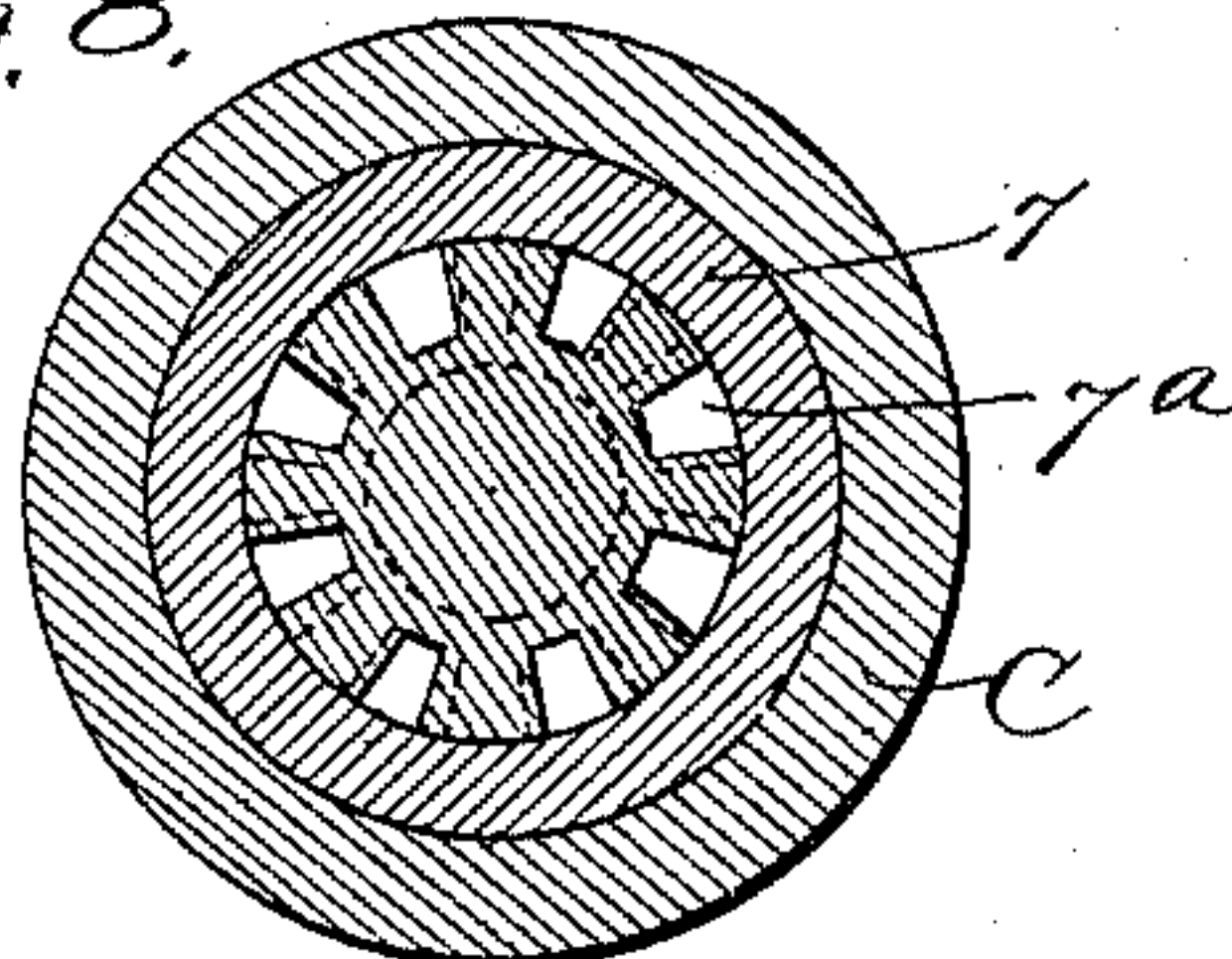


Fig. 8.



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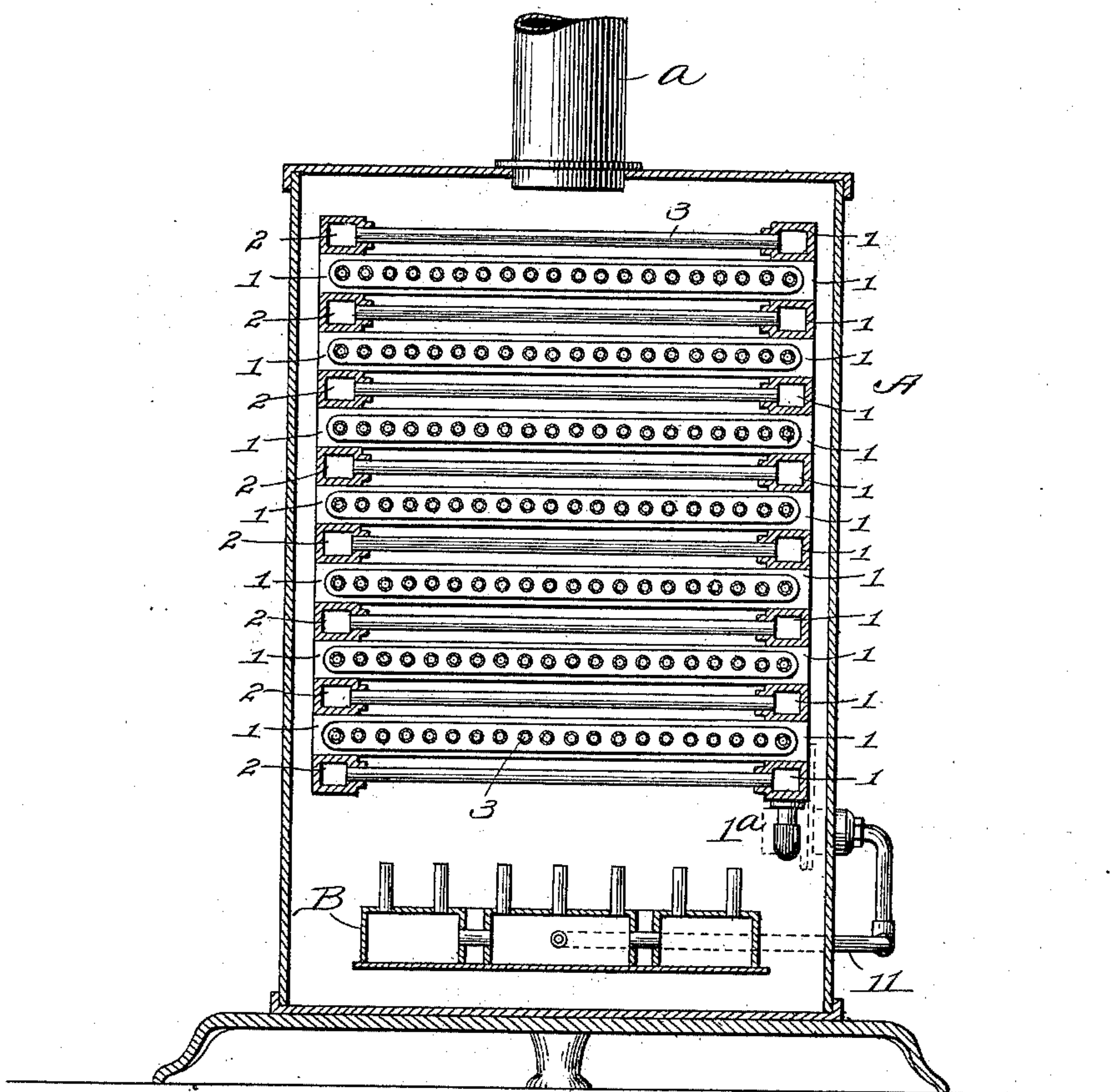
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Fig. 9.



Witnesses
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Inventor
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UNITED STATES PATENT OFFICE.

WILLIAM A. TICHENOR, OF CHICAGO, ILLINOIS.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 619,101, dated February 7, 1899.

Application filed August 30, 1897. Serial No. 650,028. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. TICHENOR, a citizen of the United States, residing at Chicago, in the county of Cook, State of Illinois, have invented certain new and useful Improvements in Water-Heaters; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a view of devices embodying my invention, the tubular water-chamber and the combined motor and gas valve being shown in elevation, the casing of the heater being in section. Fig. 2 is a plan view of one section of the tubular heater. Fig. 3 is a sectional view of the outlet-chamber of the tubular heater, taken on the line 3 3, Fig. 2. Fig. 4 is a sectional view of the tubular heater, taken on the line 4 4, Fig. 2, the inlet and outlet chambers being in transverse section and the cross or connecting tube in side elevation. Fig. 5 is an enlarged sectional view of the combined motor and gas valve on the line 5 5, Fig. 7. Fig. 6 is an enlarged view, in end elevation, of the casing of the combined motor and gas valve, the end shown being the opposite end from that shown in Fig. 1. Fig. 7 is an enlarged sectional view of the combined motor and gas valve on the line 7 7, Fig. 5, looking in the direction of the arrow. Fig. 8 is an enlarged sectional view of the casing and gas-valve, taken on the line 8 8, Fig. 7, looking in the direction of the arrow. Fig. 9 is a vertical central section of the water-heater, taken on the line 9 9, Fig. 1, looking in the direction of the arrow.

Like symbols refer to like parts wherever they occur.

My invention relates to that class of water-heaters, sometimes termed "instantaneous heaters," wherein the water is heated while flowing through the heater, the turning on and off of the water serving to set in operation and arrest the operation of the apparatus and the flow of the water serving to turn on the gas or like fuel supply. Such apparatus, generally considered, embrace, in combination, a boiler-coil or water-chamber, a water-inlet valve for the boiler or coil, a burner, and a valve for the gas-supply, said valve controlled by the movement of the water-in-

let valve and the water-inlet valve controlled by the valve of the discharge-pipe of the boiler or coil.

The object of my present invention is to simplify the construction and enhance the effectiveness of both the heater or boiler and the valves for controlling the flow thereto and to the burner.

To this end one feature of my invention embraces the combination, in an instantaneous water-heater, of a series of boiler-sections each having transverse inlet and outlet chambers connected by tubes, said sections successively connected up and the alternate sections so arranged that the tubes shall cross, whereby an extended tortuous passage is formed for the flow of the water, as well as a reticulated passage for the products of combustion, thereby utilizing fully the heat from the products of combustion before their escape from the jacket or casing which incloses the heater and minimizing the fuel required to heat a given volume of water to the required temperature.

Another feature of my invention embraces the combination, with a water-heating chamber, a gas-burner, and their supply-pipes, of a combined valve and valve-motor, the valve constituting the axis of the motor, whereby certainty of operation is insured, gas leakage avoided, and great compactness obtained.

There are other minor features of invention, all as will hereinafter appear.

I will now proceed to describe my invention more fully, so that others skilled in the art to which it appertains may apply the same.

In the drawings, A indicates a suitable outer casing, preferably provided with a flue *a*, leading therefrom and in which are located the water heater or boiler and a suitable burner B beneath the same.

The boiler or heater is of tubular form, composed of a series of like sections superposed one on the other to the desired number, said sections consecutively connected and with the tubes of the alternate sections at right angles, so as to form reticulated passages for the escape of the products of combustion. Each section (see Figs. 2, 3, and 4) is composed of a transverse inlet-chamber 1 and a transverse outlet-chamber 2, said chambers arranged parallel with each other and

having the respective inlet and outlet orifices or ports 1^a 1^b at diametrically opposite points, the inlet and outlet chambers being connected by a series of transverse tubes 3, of such
5 diameter as is required by the capacity of the inlet and outlet chambers and the number of transverse tubes 3 3, which connect said inlet and outlet chambers.

The inlet and outlet chambers may, if desired, be in the form of cored castings tapped for the reception of the transverse tubes 3 3, or the tubes may be brazed to the inlet and outlet chambers, while the transverse tubes 3 3 may be of copper or of any suitable material.
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The several tubular sections are so connected up—outlet-chamber to inlet-chamber, one with the other—as to form a continuous waterway from the water-supply pipe 4 to the
20 outlet-pipe 5, said waterway being repeatedly subdivided by the series of tubes 3 3, so as to retard the flow of the water and present it in a divided state or small streams to an extended heated surface.

In the supply-pipe 4, leading to the water-heater, is placed the casing C, provided with a flap or swinging leaf 6, controlled by a spring 6^a or equivalent means of seating the leaf against the inflow when the current through
30 the heater has been arrested by cutting off the flow of water from the outlet-pipe 5.

The pivot or axis of the swinging leaf 6 is a hollow cylinder and constitutes the rotary gas-valve 7, provided with suitable ports 7^a and held upon its seat 8 by a spring 9.
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The valve-seat 8 for the rotary valve is provided with ports so located that when the swinging leaf 6 occupies the position shown in Fig. 5—that is to say, the position it assumes when the flow of water through the heater is arrested—said ports will be closed and no gas can pass to the burner; but when the flow of water through the heater is started and the water-pressure in the supply-pipe
45 forces the leaf over to the left the rotation of the axis or cylinder 7 will cause its ports 7^a to register with those in the valve-seat and open the way for the passage of gas to the burner.

10 indicates the gas-inlet pipe, and 11 the gas-exit pipe leading from the valve to the burner. The valve-casing C (see Fig. 6) may have a detachable end plate c for the introduction of the leaf 6 and rotary (axis) valve 7 and a screw-plug c' therein for the introduction of the valve-spring 9, or other suitable means for a like purpose may be adopted in constructing the casing C.
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It is to be understood that in combination with main burner B a pilot-burner or other
60 well-known means of igniting the gaseous fuel from time to time will be employed.

The apparatus being constructed and combined substantially as hereinbefore pointed out will operate as follows: The outlet-pipe
65 5 leading from the boiler will of course be ex-

tended to the points where the hot water is desired and there provided with suitable faucets. When said faucets (or any of them) are opened to permit the flow of water, a current is established from the supply-pipe 4 through
70 the heaters, Figs. 1, 2, and 3, and the water-pressure back of flap or swinging leaf 6 forces it toward the heater or to the left from the position it occupies in Fig. 5 of the drawings, which movement of flap-valve 6 causes the rotation of its pivot or rotary valve 7, so that its ports 7^a register with the ports in valve-seat 8 and permit the flow of gas to burner B, which becoming ignited the flames and products of combustion rise through the re-
80 ticulated passages formed by the tubes 3 3 and in contact with the transverse tubes, thus effectively heating the current of water flowing through said tubes. When the faucets are closed to shut off the flow of water, back
85 pressure from the heater, assisted by the spring 6^a and the arrest of motion or flow of the current, causes the reverse movement of flap-valve 6, (back to the position shown in Fig. 5,) which causes the reverse rotation of the axis
90 or rotary valve 7, and thus cuts off the supply of gas to burner B until such time as one of the faucets above referred to is again turned to permit the flow of water through the heater, when the several steps hereinbefore re-
95 cited are repeated.

Among the advantages incident to my invention are simplicity of construction, certainty of operation of the motor and gas valve, and effectiveness as a heater, with the consumption of a comparatively small volume of gas.
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Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—
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1. The combination in a water-heater, of a series of superposed consecutively-connected sections each having an inlet and an outlet chamber connected by a series of transverse tubes, the alternate sections of the series arranged with the tubes at right angles, substantially as and for the purposes specified.
110

2. An apparatus for heating water, comprising a water-receptacle having a supply-pipe, a gas-burner adapted to heat said receptacle, a gas-supply pipe for said burner, a valve and motor casing arranged in and communicating with the water and gas supply pipes, and a vibrating flap or leaf arranged in the water-supply portion of the casing and having a hollow axis arranged in the gas-supply portion of the casing and constituting a gas-valve; substantially as and for the purposes specified.
115

In testimony whereof I affix my signature, in presence of two witnesses, this 28th day of
120 August, 1897.

WILLIAM A. TICHENOR.

Witnesses:

F. A. HOPKINS,

JNO. G. ELLIOTT.