No. 737,807. PATENTED SEPT. 1, 1903.

H. H. WESTINGHOUSE.

FEED WATER REGULATOR.

APPLICATION FILED JULY 1, 1901

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1

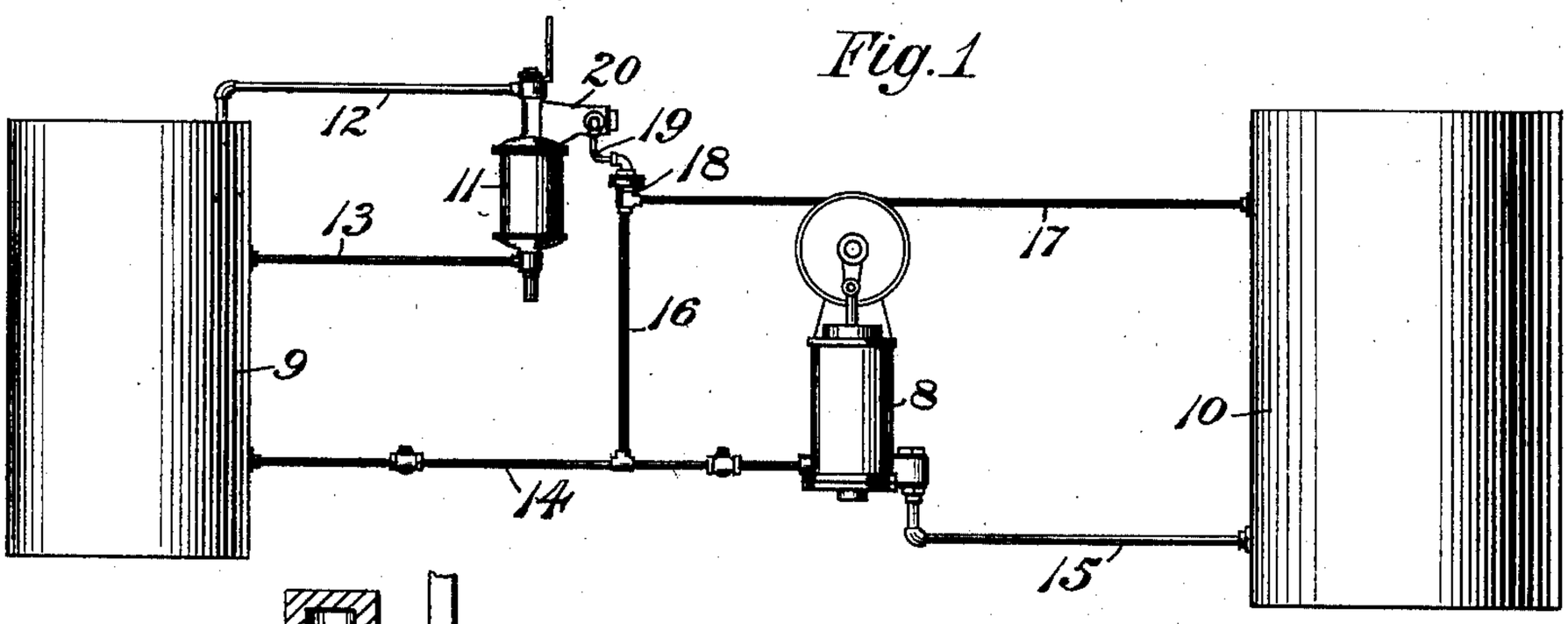


Fig. 2

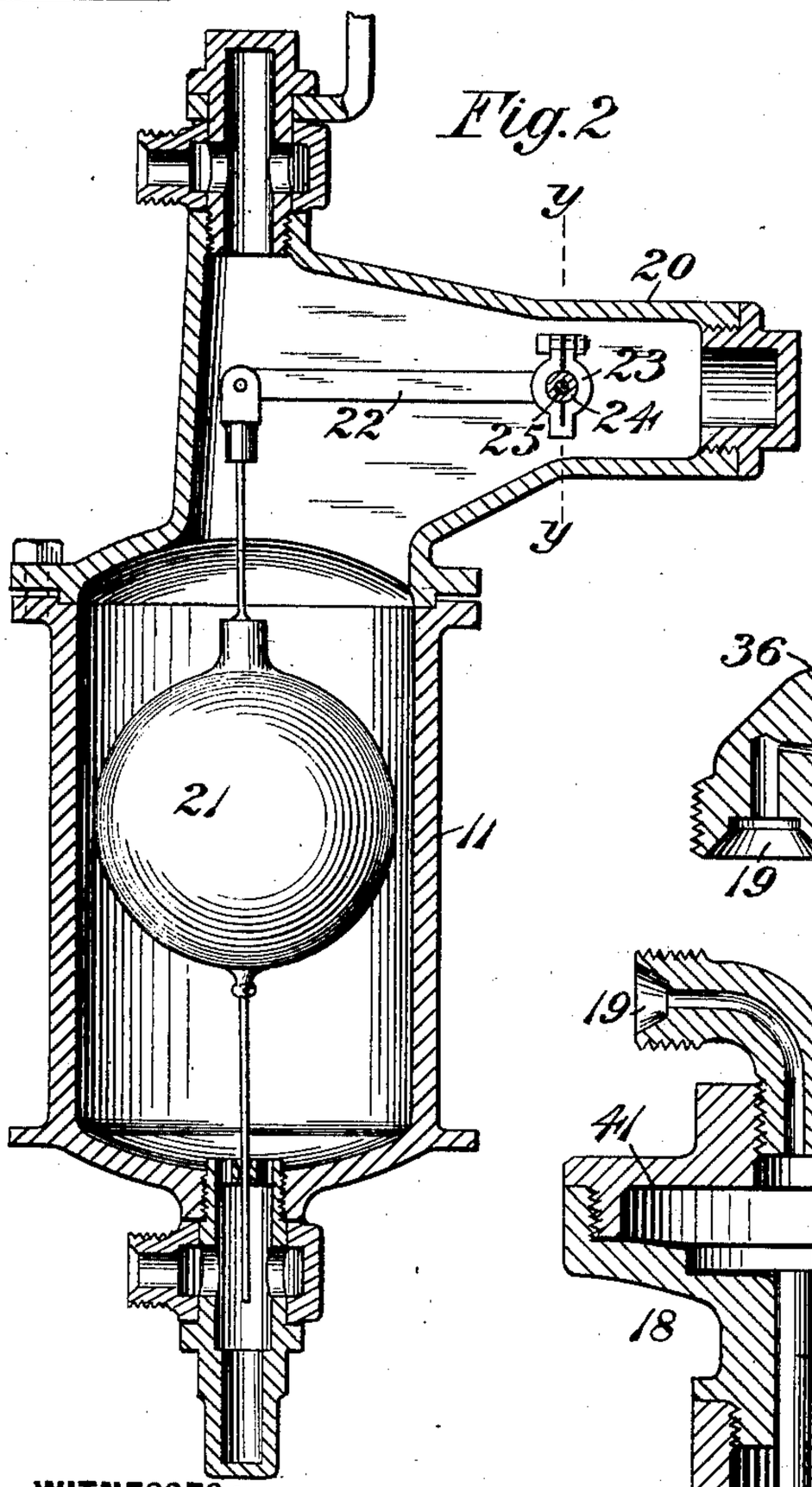


Fig. 6

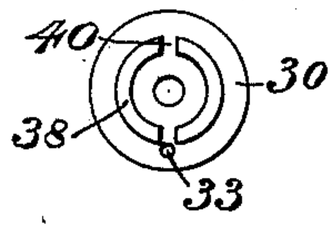


Fig. 3

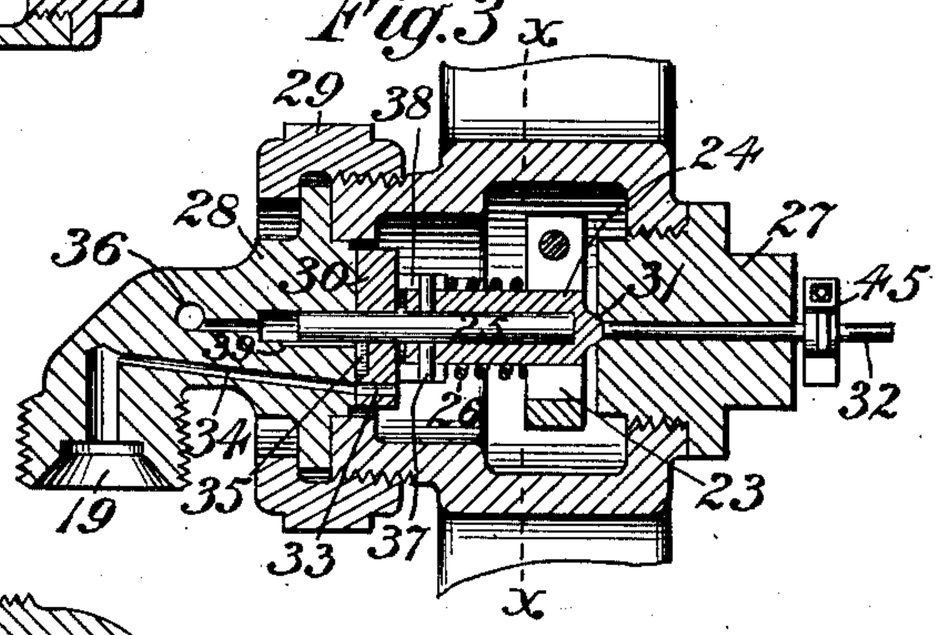


Fig. 4

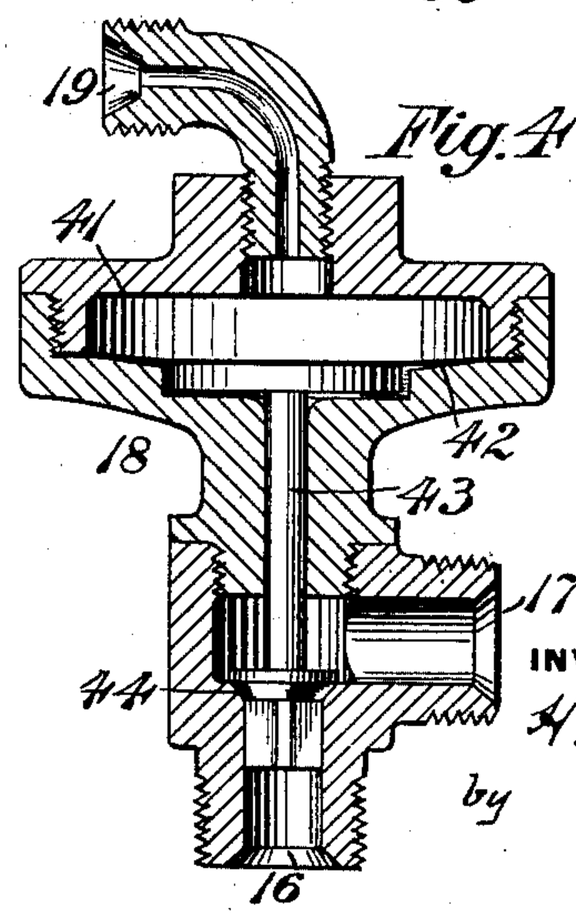
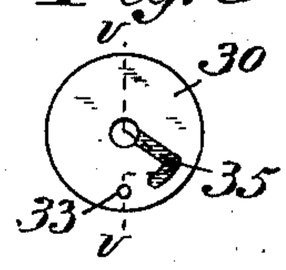


Fig. 5



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No. 737,807. PATENTED SEPT. 1, 1903.

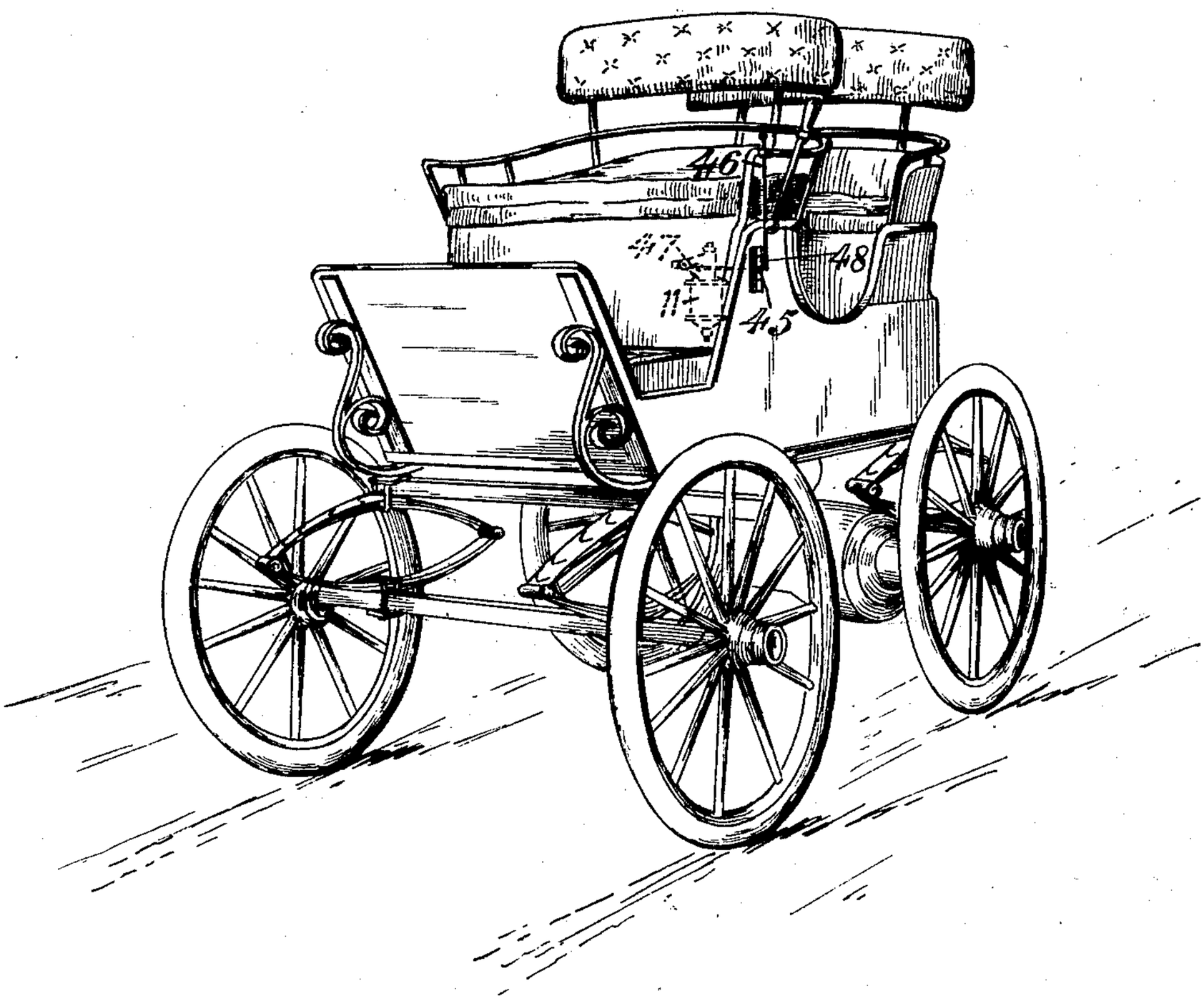
H. H. WESTINGHOUSE.

FEED WATER REGULATOR.

APPLICATION FILED JULY 1, 1901

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 7



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No. 737,807. Patented September 1, 1903.

UNITED STATES PATENT OFFICE.

HENRY H. WESTINGHOUSE, OF EDGEWOOD PARK, PENNSYLVANIA.

FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 737,807, dated September 1, 1903.

Application filed July 1, 1901. Serial No. 66,629. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. WESTINGHOUSE, a citizen of the United States, residing at Edgewood Park, county of Allegheny, State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Feed-Water Regulators, of which improvement the following is a specification.

My invention relates to feed-water regulators for boilers, and more particularly to that class of feed-water regulators in which a small auxiliary valve operated by a float or other means actuated by variations in the water-level is employed to control the supply of pressure to the main regulating-valve for operating the same.

My invention consists in an improved form of auxiliary valve by means of which the operation of the device is rendered more certain and positive, all as hereinafter more fully set forth.

My invention is also adapted to be applied to automobiles or motor-carriages in which steam is used as the motive power, and comprises means connected to the float and within reach of the operator whereby he may at any time reciprocate the float and ascertain the height of the water in the boiler.

In the accompanying drawings, Figure 1 is a diagram showing the boiler, float-chamber, feed-pump, supply-tank, regulating-valve, and connecting-pipes. Fig. 2 is a longitudinal sectional view of the float-chamber, taken on the line $x\,x$ of Fig. 3. Fig. 3 is a detail sectional view taken on the line $y\,y$ of Fig. 2, the exhaust-cavity in the rotary valve being shown on the line $v\,v$ of Fig. 5. Fig. 4 is a central sectional view of the main regulating-valve. Fig. 5 is a face view of the auxiliary valve. Fig. 6 is a back view of the auxiliary valve; and Fig. 7 is a perspective view of a motor-carriage, showing my improvement applied thereto.

Referring to Fig. 1, I have shown my device applied in connection with a continuously-operated feed-pump 8, which normally draws water from the supply-tank 10 by the pipe 15 and forces it through pipe 14 into the boiler 9. In case my improvement is applied to a motor-vehicle the feed-pump may be driven from the engine or from an axle of the vehicle and operates at such times as the vehicle is in motion. A branch pipe 16 connects the feed-pipe 14 with the main regulating-valve 18, from which a waste or return pipe 17 leads back to the supply-tank 10. The float-chamber 11 is connected to the boiler by pipes 12 and 13 and contains the float 21, which operates the float-lever 22 in an extension 20 of the upper part of the float-chamber. In the sides of the float-chamber extension are arranged two opposite openings, one being closed by the nut 27 and the other by a casting 28, which is secured in place by the nut 29 and forms a seat for the rotary auxiliary valve 30. The rotary valve is slidably mounted on a stem 25, which has a bearing in the casting 28 and extends into the hollow shaft 24, with which it is rigidly secured. If desired, the shaft 24 and stem 25 may be cast in one integral piece; but I prefer the arrangement as shown in the drawings, for I find that it makes a stronger and more durable construction.

On the shaft 24 is clamped the split collar 23, which is operated by the float-lever 22 to rotate the shaft, the said shaft being provided with a conical bearing 31 in the nut 27 and having a stem 32 extending out through the central opening in the nut. The rotary valve has a through-port 33, adapted to register with the port 34 in the valve-seat, and in the face of the valve is the exhaust-cavity 35, adapted to connect the port 34 with the exhaust-port 36 when the valve is in a certain position. I have shown the exhaust-port 36 connected with the opening in the casting 28, which forms the bearing for the valve-shaft, and have provided a groove 39 in the bearing to give free communication from the exhaust-cavity in the valve to the exhaust-port; but a different arrangement of the exhaust-port may be used, if desired. The back of the rotary valve is provided with an annular flange 38, extending over the shaft 24, and has a slot 40 to receive the pin 37, which passes through the shaft 24 and stem 25. A spring 26 is located on the shaft 24 between the split collar 23 and the end of the annular flange 38 of the rotary valve. By means of this construction the valve is made to rotate with the shaft, and at the same time the spring 26 forces the valve against its seat and shaft 24 against its conical bearing 31 in the nut 27, maintaining

therein a tight joint and dispensing with the use of a stuffing-box. A pipe 19 connects the port 34 with the diaphragm-chamber 41 of the main regulating-valve casing 18, in which is secured the diaphragm 42, adapted to act against the back of the valve 44 by means of the stem 43 and hold the said valve seated when steam-pressure is admitted to the diaphgram-chamber. A sliding piston or other form of motor may be used in place of the diaphragm for actuating the valve, if desired.

The operation of the device is as follows: When the water becomes low in the boiler, the float descends and by means of the lever 22 rotates the shaft 24 and auxiliary valve 30, so that the port 33 registers with the port 34, thus supplying steam-pressure to the diaphragm-chamber 41 and holding the regulating-valve 44 seated to prevent water from returning to the tank through pipe 17. Water is then pumped into the boiler through pipe 14 until the water-level therein rises sufficiently to raise the float and turn the auxiliary valve to the position in which the exhaust-cavity 35 establishes communication between the port 34 and the exhaust 36. Then pressure being relieved from the diaphragm 42 the water-pressure in pipe 16 will open the valve 44, and the water from the pump will pass back to the tank through the pipe 17.

While I have shown the main regulating-valve located in a waste-pipe or return-pipe from the pump, it is to be understood that my invention is not limited to such location, since the regulating-valve may also be applied in various other positions, such as the water-supply pipe to the boiler or the suction-pipe of the pump or in the steam-supply pipe to the pump, or the diaphragm or motor may also be used to actuate a belt-shifter, circuit-breaker, or other device for controlling the supply of water to the boiler.

In the operation of steam-propelled vehicles it is often difficult for the operator to ascertain from the sight-glass alone the exact condition of the water in the boiler, and especially is this so when traveling at night and the glass cannot be seen. In order to overcome this difficulty, I have secured on the stem 32 an arm 45, which extends through an opening in the side of the body of the vehicle and may be provided with an operating-rod 46 within easy reach of the driver, as shown in Fig. 7. A graduated scale 48, having notches or stops, may be secured to the vehicle-body opposite the opening, and a counterweight 47 may be arranged on the opposite end of the arm 45. By means of this construction the driver may at any time positively rotate the auxiliary valve, so as to supply water to the boiler if the float should fail to operate or if for any reason it is desired to admit an additional supply of water to the boiler. The height of water may also be ascertained at any time by merely feeling with the hand the relative position of the arm with respect to the scale, or if there be any doubt as to whether the float is operating properly the parts may be positively reciprocated, noting by the hand when the float strikes the water.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a feed-water regulator, the combination with a main regulating-valve and its operating-motor, of an auxiliary rotary valve adapted to control the supply of steam to the motor, a rotatable shaft for the valve having a conical bearing, a spring for forcing the shaft against its conical bearing, and means controlled by the variations of the water-level in the boiler for operating said shaft.

2. In a feed-water regulator, the combination with a main regulating-valve and its operating-motor, of an auxiliary rotary valve for controlling the supply of steam to said motor, a rotatable shaft on which said valve is slidably mounted, said shaft having a conical bearing, a spring adapted to force the shaft into its conical bearing and the rotary valve against its seat, and a float for operating said shaft.

3. In a feed-water regulator, the combination with a main regulating-valve and a motor for actuating the same, of a float, a rotatable shaft operated by the float, an exhaust-port leading from the shaft-bearing, and an auxiliary valve mounted on the shaft, said valve having a port for supplying steam to the motor and an exhaust-cavity communicating with the shaft-bearing.

4. In a feed-water regulator, a main regulating device, an auxiliary rotary valve for controlling the supply of steam to the main regulating device, a rotatable shaft on which the valve is slidably mounted, a spring tending to force the valve and shaft in opposite directions, and a float for operating the shaft.

5. In a feed-water regulator, a main regulating device, an auxiliary rotary valve for controlling the supply of steam to the main regulating device, a rotatable shaft having a reduced stem portion on which the valve is mounted, the back of said valve being provided with an annular flange extending over the larger portion of said shaft, and a float for operating the shaft.

6. In a feed-water regulator for steam-propelled vehicles, the combination with a regulating-valve, a float and a rotatable shaft operated by the float, of an arm secured on the rotatable shaft and an operating-rod connected to the arm and extending within reach of the operator whereby the float may be positively operated by hand.

In testimony whereof I have hereunto set my hand.

HENRY H. WESTINGHOUSE.

Witnesses:
E. A. WRIGHT,
R. F. EMERY.