No. 780,754. PATENTED JAN. 24, 1905.

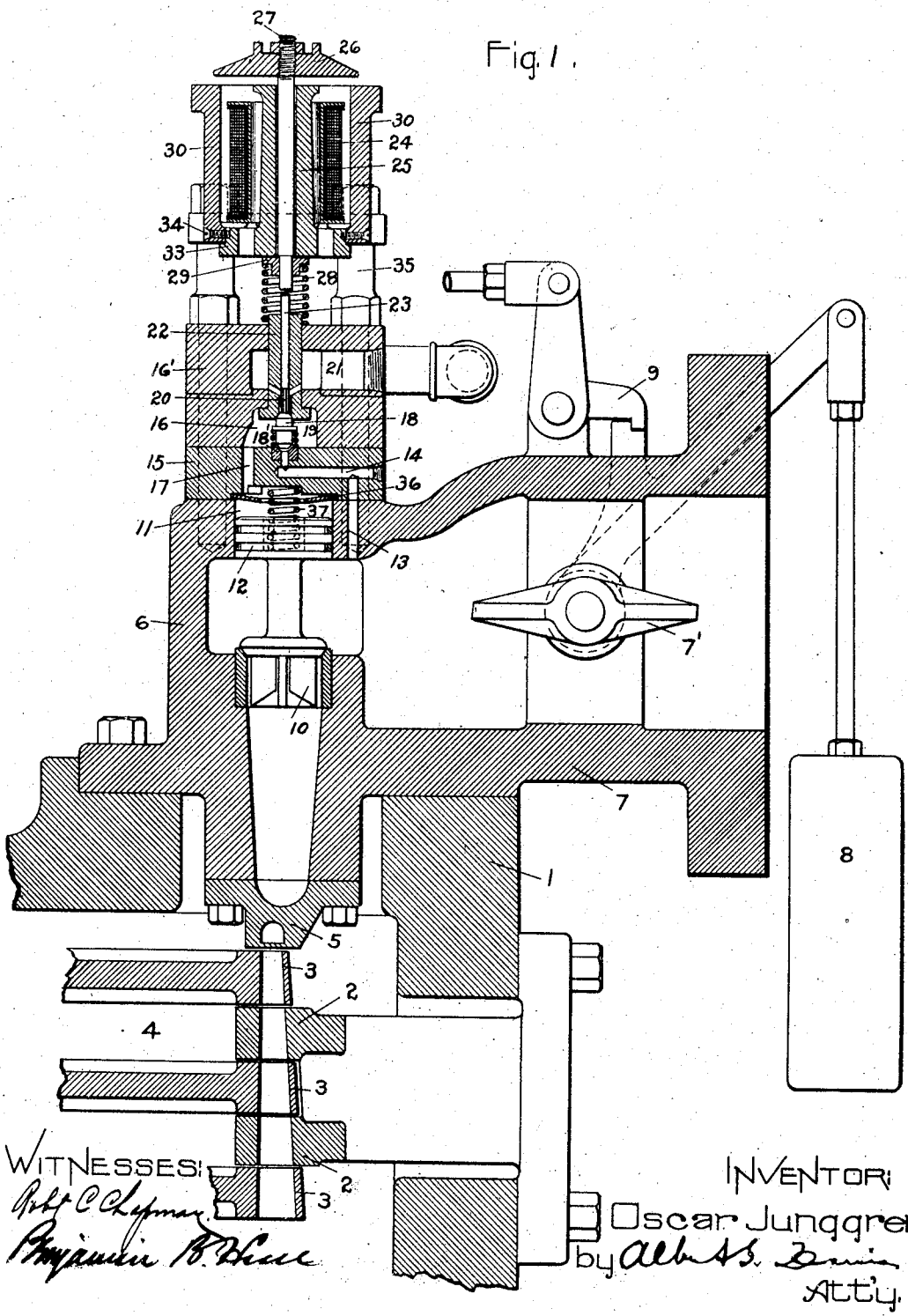
O. JUNGGREN.

ELECTRICALLY OPERATED VALVE.

APPLICATION FILED AUG. 24, 1903.

2 SHEETS—SHEET 1.

Fig. 1.



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INVENTOR:

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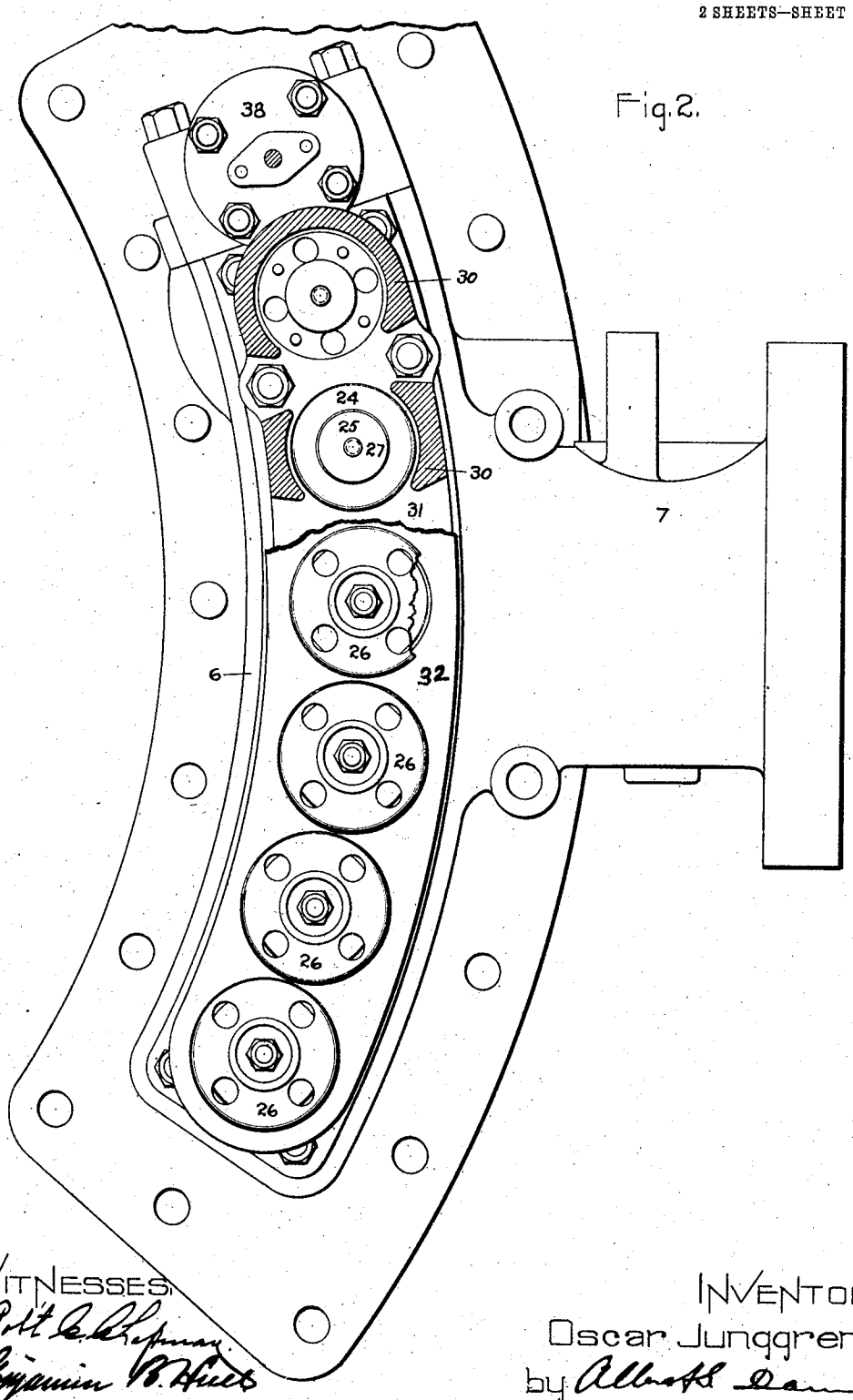
O. JUNGGREN.

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2 SHEETS—SHEET 2.

Fig. 2.



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PHOTO-LITHOGRAPHED BY SACKETT & WILHELMS LITHO. & PTG. CO. NEW YORK.

No. 780,754. Patented January 24, 1905.

UNITED STATES PATENT OFFICE.

OSCAR JUNGGREN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRICALLY-OPERATED VALVE.

SPECIFICATION forming part of Letters Patent No. 780,754, dated January 24, 1905.

Application filed August 24, 1903. Serial No. 170,559.

To all whom it may concern:

Be it known that I, OSCAR JUNGGREN, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Electrically-Operated Valves, of which the following is a specification.

This invention relates to electrically-operated valves, and it finds especial application in connection with steam-turbine engines which have a plurality of steam-nozzles each controlled by a valve, the speed and torque depending on the number of nozzles which are open. By my invention the valves can be easily and readily operated by a governor controlling the circuits of the electromagnets, which in turn control the valves. In a previous application of W. L. R. Emmet and myself, Serial No. 156,142, there are shown valves of the same general construction; but the present application sets forth certain improvements on the subject-matter of that application.

The nozzle-valve, auxiliary valve, and electromagnet are arranged vertically one above the other in a simple and compact manner. The passages for conveying steam to the tops of the valve-pistons are drilled in a thick plate, which forms the top of the cylinders in which the pistons work. The steam-chamber and exhaust-chamber are cast in a heavy bar which rests on the plate just mentioned. The electromagnets are housed in a box-like frame which stands on posts rising from the top of the bar, the frame forming a closed magnetic circuit outside of the coils.

Other features are hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional elevation of a portion of a steam-turbine equipped with my improved valve; and Fig. 2 is a top plan view, partly in section, of a set of six valves for controlling a corresponding number of nozzles.

In Fig. 1 is shown a portion of the stationary casing 1 of the turbine, on the inside of which are supported the stationary buckets 2, which are intermediate of the buckets 3 on the rotating wheel 4. Through the top of the casing in line with the buckets projects the set of nozzles 5, to which steam is supplied from a steam-chest 6, taking steam through a main 7, controlled by a butterfly-valve 7'. This valve will be closed automatically by the weight 8 when the catch 9 is tripped by a governor. (Not shown.) The passage from the steam-chest to each nozzle is controlled by a puppet-valve 10, seating downwardly. Above the valve is provided a cylinder 11 of larger diameter than the valve. A piston 12 fits in said cylinder and is attached to the stem of the valve, which is positively closed by steam-pressure acting on the top of the piston and admitted thereto by suitable passages, preferably arranged as follows: A small passage 13 in the wall of the steam-chest communicates with a passage 14 in the plate 15, which serves as a top to the several cylinders. The passage 14 opens into a valve-chest or steam-chamber 16, cast in the under side of a bar 16' and from which a passage 17 runs to the cylinder. In the valve-chest is an auxiliary valve 18, which controls the passage 14, being held normally away from its seat 18' in the plate by a spring 19. The bar may be made in two parts, as shown. The auxiliary valve is double-ended, its upper end controlling and normally closing a passage 20, leading to an exhaust-chamber 21, cored out in the bar 16'. The passage 20 is preferably formed in a tube 22, which passes up through the exhaust-chamber and serves as a guide for the valve-stem 23. The stem projects above the top of the bar 16', so that it can be actuated by an electromagnet which is arranged to give a hammer-blow to said stem in order to overcome any tendency of the auxiliary valve to stick. The magnet has preferably a single coil 24 surrounding a tubular core 25, whose axis is in line with the stem 23. The armature 26 is carried above the coil by a plunger 27, which is guided in the tubular core and is supported by a helical spring 28, abutting between the top of the bar

16′ and a collar 29 on said plunger. There is normally a small space between the adjacent ends of the stem and plunger. The magnetic circuit of the coil is completed through the upright portions 30 of a box-like frame in which the coils are housed. The frame has a bottom plate 31 and a top plate 32, preferably integral with the uprights 30. In the said plates are circular holes in line with each other. The cores 25 have circular flanges 33 at their lower ends fitting snugly into the holes in the bottom plate 31 and secured by screws 34. The coils are dropped through the holes in the top plate and rest on portions of said flanges, which, together with the armatures, are perforated to give good ventilation for the coils. The posts 35, on which the frame is supported at a suitable distance above the bar 16′ to permit observation of the plunger and stem, have screw-threaded shanks passing down through the bar and the plate 15 into the top of the steam-chest, thus clamping all these parts firmly.

The operation of my invention is as follows: When the circuit of any one of the coils is closed by the governor, the plunger 27 is pulled downward against the tension of the spring 28 and strikes a quick hammer-blow on the end of the auxiliary valve-stem, pushing it downward. This closes the steam-passage 14 and opens the exhaust-passage 20. The pressure being thus removed from the top of the piston, the unbalanced pressure on its under side lifts it and opens the nozzle-valve. The upward movement of the piston is cushioned by an arched resilient washer 36 in the cylinder 11, the edges of said plate being clamped between the steam-chest and the plate 15. When the magnet is deënergized, the plunger 27 is lifted by the spring 28 and the auxiliary valve is raised by the spring 19, closing the exhaust and opening the steam-passage. The pressure on the piston being thus balanced, the spring 37 quickly closes the nozzle-valve.

Bolted to one end of the steam-chest is a throttle-valve 38, which controls the flow of steam between the successive operations of the several nozzle-valves in order to compensate for minor variations in load, as fully set forth in the application above referred to.

In accordance with the patent statutes I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination with a valve, of a balanced piston connected therewith, passages supplying fluid-pressure to one side of said piston through a steam-chamber, an exhaust-chamber, a tube passing through the exhaust-chamber and communicating with both of said chambers, an auxiliary valve controlling the supply and exhaust and having a stem passing through said tube, and an electromagnet arranged to actuate a plunger in line with said stem.

2. The combination with a valve, of a balanced piston connected therewith, passages supplying fluid-pressure to one side of said piston through a steam-chamber, an exhaust-chamber, a tube passing through the exhaust-chamber and communicating with both of said chambers, an auxiliary valve controlling the supply and exhaust and having a stem passing through said tube, an electromagnet arranged to actuate a plunger in line with said stem, and a spring keeping said plunger normally out of contact with said stem.

3. In combination, a valve-chest, a plurality of valves located therein, electromagnets for operating the valves, and a frame supporting and inclosing the magnets comprising top and bottom plates and standards on each side of each magnet and formed integral with said plates.

4. In combination, a valve-chest, a plurality of valves located therein, a number of electromagnets, a frame supporting and housing the magnets, comprising top and bottom plates having registering holes, and upright portions integral with said plates and adjacent to said holes.

5. In combination, a valve-chest, a plurality of valves located therein, a number of magnets, and a frame for the magnets comprising top and bottom plates having registering circular holes, upright portions joining said plates, and upright cores for the magnets concentric with said holes.

6. In combination, a valve-chest, a plurality of valves located therein, a number of magnet-coils, a frame for the coils comprising top and bottom plates, having registering circular holes, upright portions joining said plates, and upright cores passing through the coils and concentric with said holes, and provided with flanges which are secured to the bottom plate.

7. In combination, a valve-chest, a plurality of valves mounted therein, a number of magnet-coils, and a frame for the magnets comprising top and bottom plates having registering circular holes and upright portions joining said plates, upright cores concentric with said holes and provided with perforated flanges fitting into the holes in one of said plates.

8. The combination with a steam-chest containing a plurality of valves and having a plurality of cylinders in its top, of a plate covering said cylinders and containing steam-passages and a valve-seat, and a bar laid on said plate and containing a longitudinal chamber.

9. The combination with a steam-chest, of a plurality of electrically-controlled valves therein, and a throttle-valve bolted to the end of said steam-chest.

10. The combination with a valve, of a piston connected therewith, a cylinder for said piston, means for balancing and unbalancing fluid-pressure on said piston, and an arched resilient washer in said cylinder to cushion the unbalanced movement of said piston.

In witness whereof I have hereunto set my hand this 20th day of August, 1903.

OSCAR JUNGGREN.

Witnesses:

BENJAMIN B. HULL,

GEORGE RUSS.