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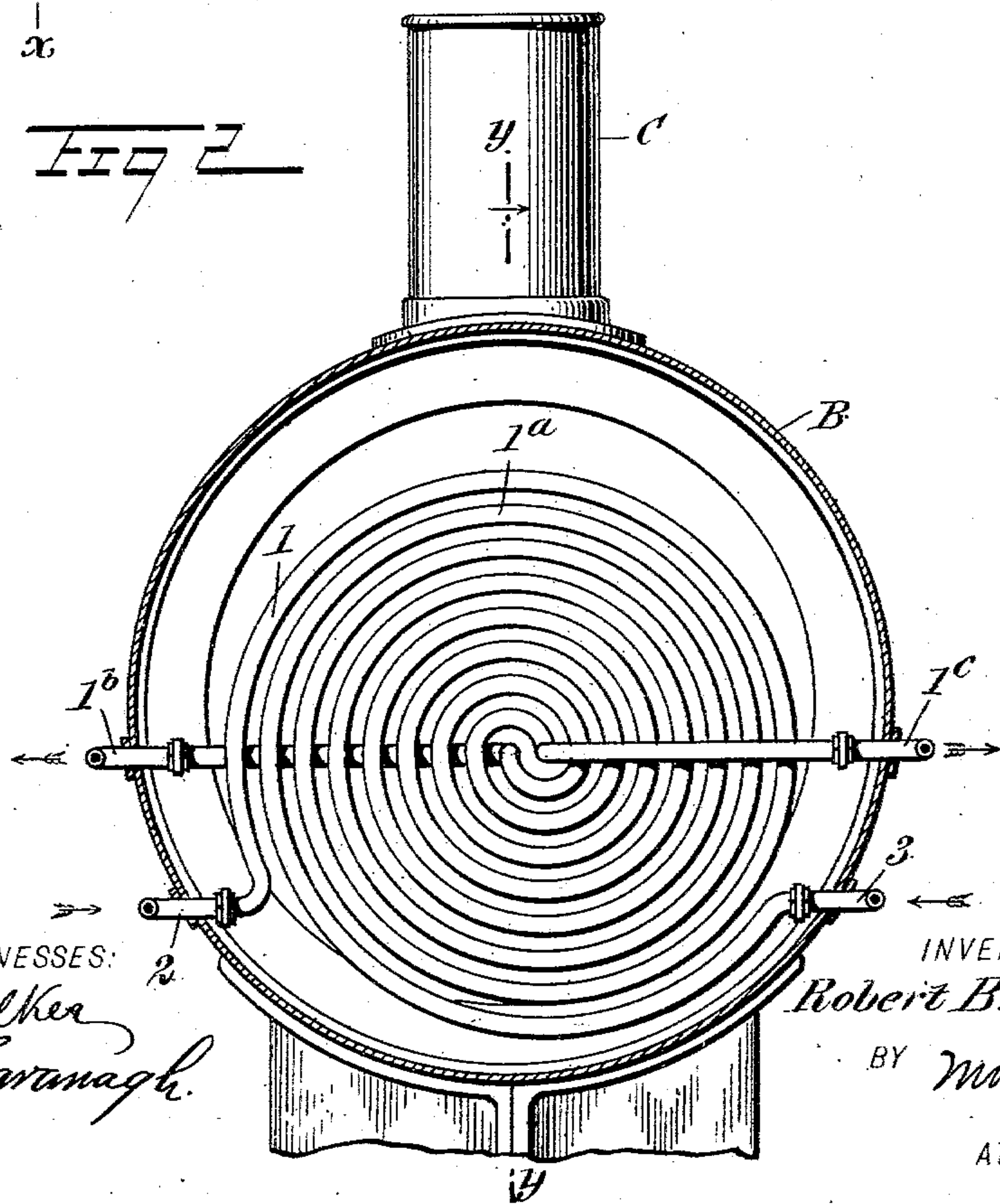
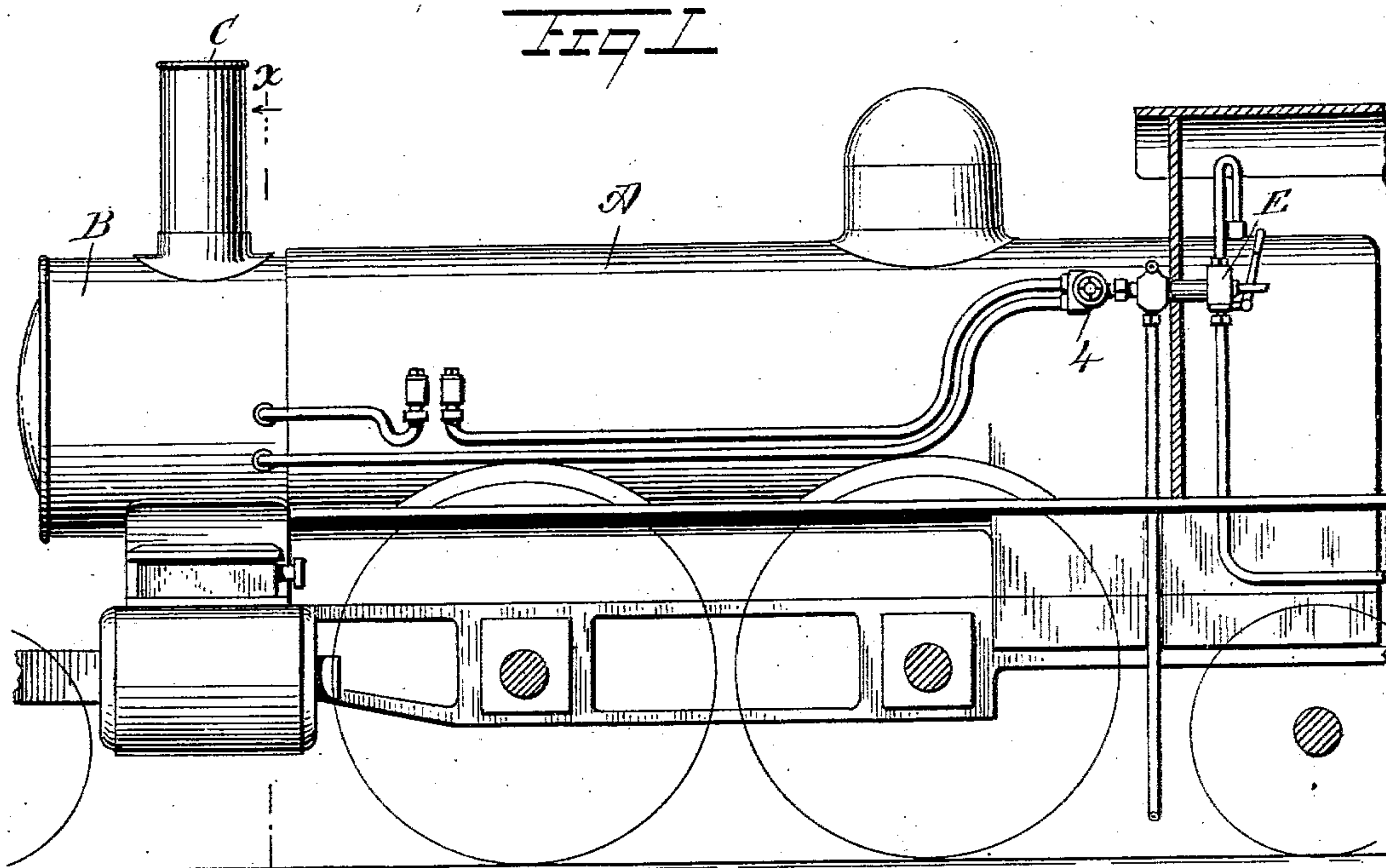
PATENTED NOV. 10, 1903.

R. B. BENHAM, JR.
FEED WATER HEATER.

APPLICATION FILED FEB. 26, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES:

H. Walker
R. B. Carrnagh.

INVENTOR

Robert B. Bernham, Jr.

BY

ATTORNEYS.

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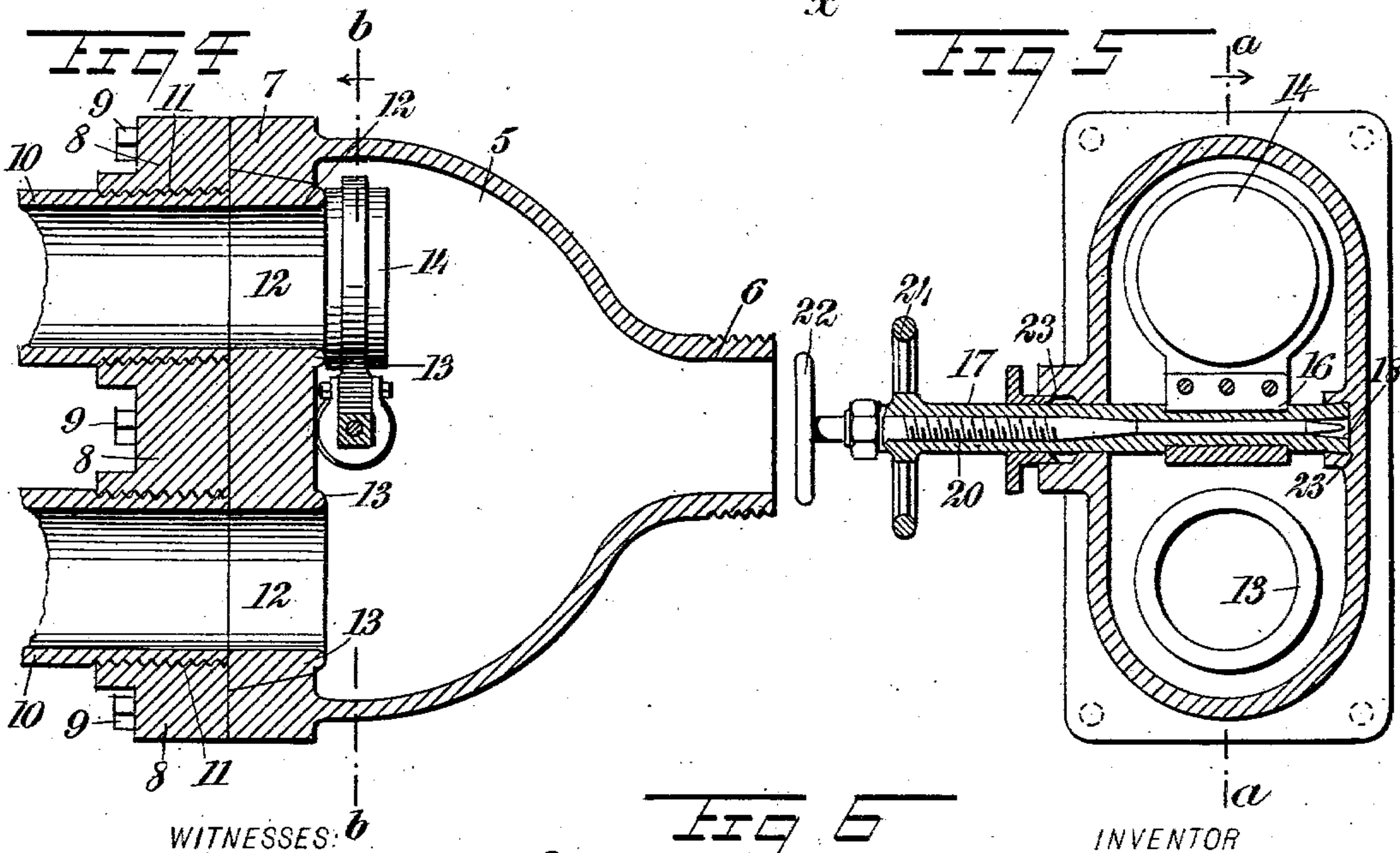
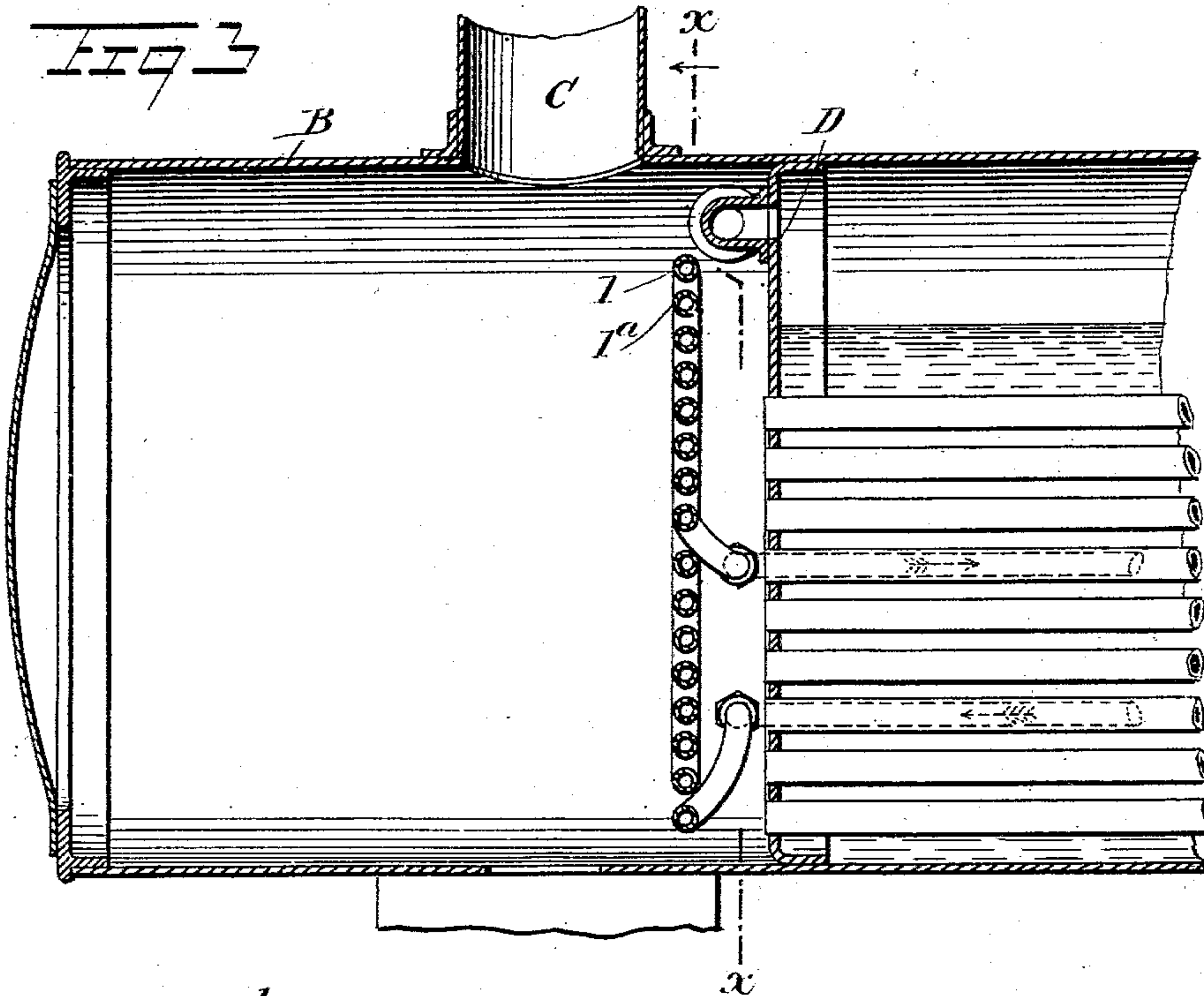
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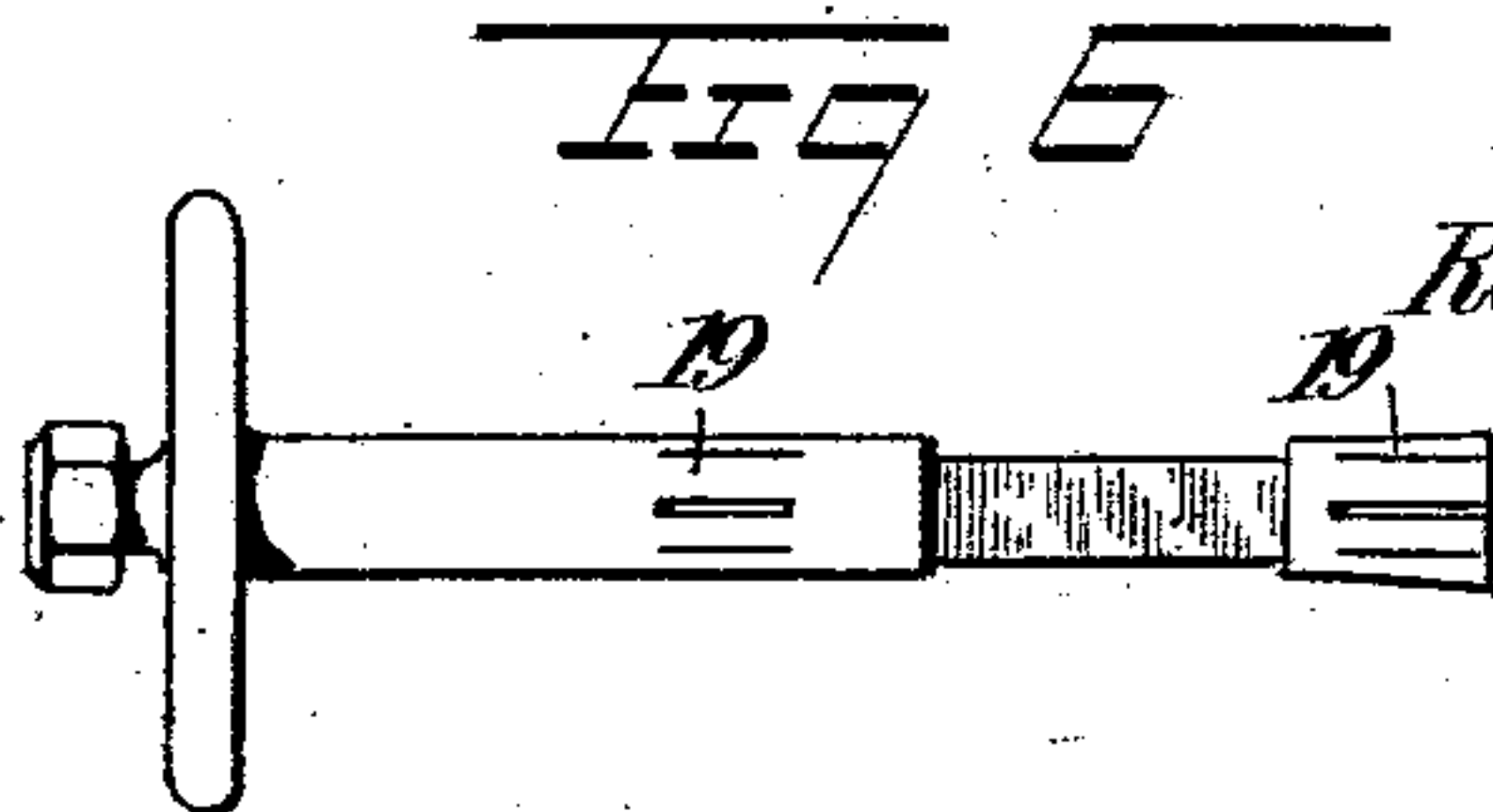
NO MODEL.

2 SHEETS—SHEET 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

ROBERT BRUCE BENHAM, JR., OF BLAND, TERRITORY OF NEW MEXICO.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 743,809, dated November 10, 1903.

Application filed February 26, 1903. Serial No. 145,135. (No model.)

To all whom it may concern:

Be it known that I, ROBERT BRUCE BENHAM, Jr., a citizen of the United States, and a resident of Bland, in the county of Bernalillo and Territory of New Mexico, have invented new and useful Improvements in Locomotive Feed-Water Heaters and Valves, of which the following is a full, clear, and exact description.

10 This invention relates to certain new and useful improvements in locomotive-boilers, and has particular application to a feed-water heater and valve therefor.

In carrying out the present invention I have particularly in view arranging or placing a coil or coils of pipes forming a feed-water heater in the front end of a locomotive-boiler a short distance from the flue-sheet, thereby allowing the hot air and gas from the fire-box to pass around the coils before escaping out through the stack, thereby heating the water in the coils before such water passes into the boiler.

25 A further object of my invention is to install an improved valve between the injector and the heater, which valve may be employed to check the flow of fluid when it is not desired to use the heater, as when the engine is in the roundhouse.

30 To the accomplishment of the hereinbefore-recited objects and others of a similar nature my invention consists in the construction, combination, and arrangement of parts, as is described in this specification, delineated in the accompanying drawings, and set forth in the appended claims.

40 Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

45 Figure 1 is a view in side elevation of a locomotive having my improvement applied thereto, the valve being shown as installed between the injector and the heater. Fig. 2 is a transverse vertical sectional view taken through the smoke-box on the lines *x x* of Figs. 1 and 3. Fig. 3 is a longitudinal vertical sectional view of a portion of the boiler and smoke-box, taken on the line *y y* of Fig. 2. Fig. 4 is a longitudinal vertical sectional view of my improved valve and its adjoining parts, taken on substantially the line *a a* of

Fig. 5. Fig. 5 is a similar view taken on the line *b b* of Fig. 4, and Fig. 6 is a detail view of the valve-stem employed with my improved valve.

Referring now to the accompanying drawings, A designates a locomotive of an ordinary type. Within the smoke-box B, at the front thereof, I have arranged two circular coils of pipes 1 and 1^a, which are intertwined in such manner that both coils lie in the same vertical plane. Through these coils is adapted to be forced the fluid, the object being to heat the fluid in its passage through such coils by means of the hot air and gases escaping from the smoke-box out through the stack C of the engine, thus causing the water to enter the boiler from the coils in a heated or partially-heated state. In the present instance the water is forced from the injector on the engineer's side at 2 into the coil in the smoke-box B, while from the injector on the fireman's or opposite side the water is forced in at the point 3. It will also be noted that the fluid enters at the largest coil of the series and finds an outlet at the smallest coil, as is seen at 1^b and 1^c. A check-valve may be placed at any suitable or desired point, either in the smoke-box or at the point 4 on the outside of the boiler, the heating-coil being preferably placed about eight or ten inches from the flue-sheet D.

In order to provide a means for checking or shutting off the flow of the water from the injector to the heating-coils when it is not desired to make use of the primary heating of the water by the coils—as, for instance, when the engine is in the roundhouse—I employ a valve such as is shown in Figs. 4, 5, and 6, said valve being interposed between the injector E, near the cab, and the injector feed-pipe. The valve, positioned as it is, may be used to direct the fluid to the boiler through the heating-coils, or when the coils are not to be used will check the flow through the pipe leading to such coils. When the valve is in position of shutting off the flow to the heating-coils, the injector will send the fluid directly to the boiler. This valve, as will be seen by reference to the above-mentioned figures, comprises a semi-union coupling 5, adapted to be connected, as at 6, with the injector, the front plate 7 of said coup-

ling being connected with the bearing-plate 8 through the medium of suitable bolts 9. As will be observed, the pipes or conducting-tubes 10 10 are screw-threaded into the plate 5 8 at 11 11 and register or aline with the passage-ways 12 12, leading into the interior of the coupling, each passage-way having an annular shoulder 13 formed around the same, which shoulder forms a seat for the valve 14.

10 As will be seen, the latter is in the form of a flap-valve and is hinged at 16 upon the transversely-extending revolving stem 17, which stem is hollow throughout its entire length, as at 18, and is provided with a number of 15 longitudinally-extending slots or openings 19. The walls forming the hollow portions in the valve-stem are screw-threaded a portion of their distance to receive the corresponding threaded portion 20 of the locking- 20 needle 21, said needle 21 having a hand-wheel 22, through which it is adapted to be forced into the stem, thereby spreading or expanding the same at the slotted portions, the construction being such that the stem will be 25 tightened in the bearing-boxes 23 23, the valve being thereby locked against movement. When it is desired to release or unlock the valve, the locking-needle is turned so as to move outward, and the pressure on the slot- 30 ted portions of the stem is released, thereby permitting the stem to contract and turn freely in the bearing-box and actuate the same. The valve-stem is also provided with a suitable hand-wheel, as at 24.

35 A valve such as herein described possesses many advantages over those now in use, as the inflow from the injector to the heating-coils or to the boiler direct may be positively checked and directed by the use of said valve.

40 It will further be noted that the locking-needle in its coöperative position with the valve-stem will securely lock said stem, and consequently the valve, against any accidental movement.

45 While I have shown and herein described one particular embodiment of my invention, it is of course to be understood that I do not limit myself to the precise details of the construction shown herein, as there may be 50 modifications and variations in some respects without departing from the essential features of the invention or sacrificing any of the advantages thereof.

Having thus described my invention, I claim as new and desire to secure by Letters 55 Patent—

1. The combination of a locomotive, a plurality of intertwined heating-coils arranged in the smoke-box of the locomotive, an injector for forcing fluid into the coils, an outlet 60 for the fluid leading from the coils into the locomotive-boiler, and a valve located between the injector and the heating-coils.

2. The combination of a locomotive, a vertically-arranged heater formed of two intertwined coils lying in the same vertical plane 65 arranged therein, means for injecting the fluid to the largest of said coils, an outlet for the fluid being formed at the smallest coils, and valve mechanism for checking the inflow of fluid to the coils, substantially as set 70 forth.

3. The combination of a locomotive having a heating-coil in the smoke-box thereof, means for forcing a fluid into said coil, a valve 75 mechanism for checking said fluid, interposed between the injecting means and the heater, said valve mechanism comprising a valve-casing, a flap-valve seated therein, and means for locking the flap-valve against movement, 80 substantially as set forth.

4. The combination of a locomotive having a heating-coil in the smoke-box thereof, means for injecting a fluid into said coil, a valve mechanism for checking said fluid, interposed 85 between the injecting means and the heater, said valve mechanism comprising a coupling connecting the feed-pipe with the injector, a valve-seat in said coupling, a rotatable valve-stem having a bore extending 90 centrally therethrough said stem having slots formed at intervals along its surface, a screw-threaded needle lying in said bore and adapted to be rotated to expand the valve-stem and lock the same against movement in its bearing, 95 and a flap-valve carried by said stem, and adapted to be locked on said seat, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of 100 two subscribing witnesses.

ROBERT BRUCE BENHAM, JR.

Witnesses:

T. C. WILLIAMS,
E. W. CALLANDER.