No. 627,880. Patented June 27, 1899.

T. M. ROBINSON.

FEED WATER HEATER FOR STEAM FIRE ENGINES.

(Application filed May 12, 1898.)

(No Model.) 2 Sheets—Sheet 1.

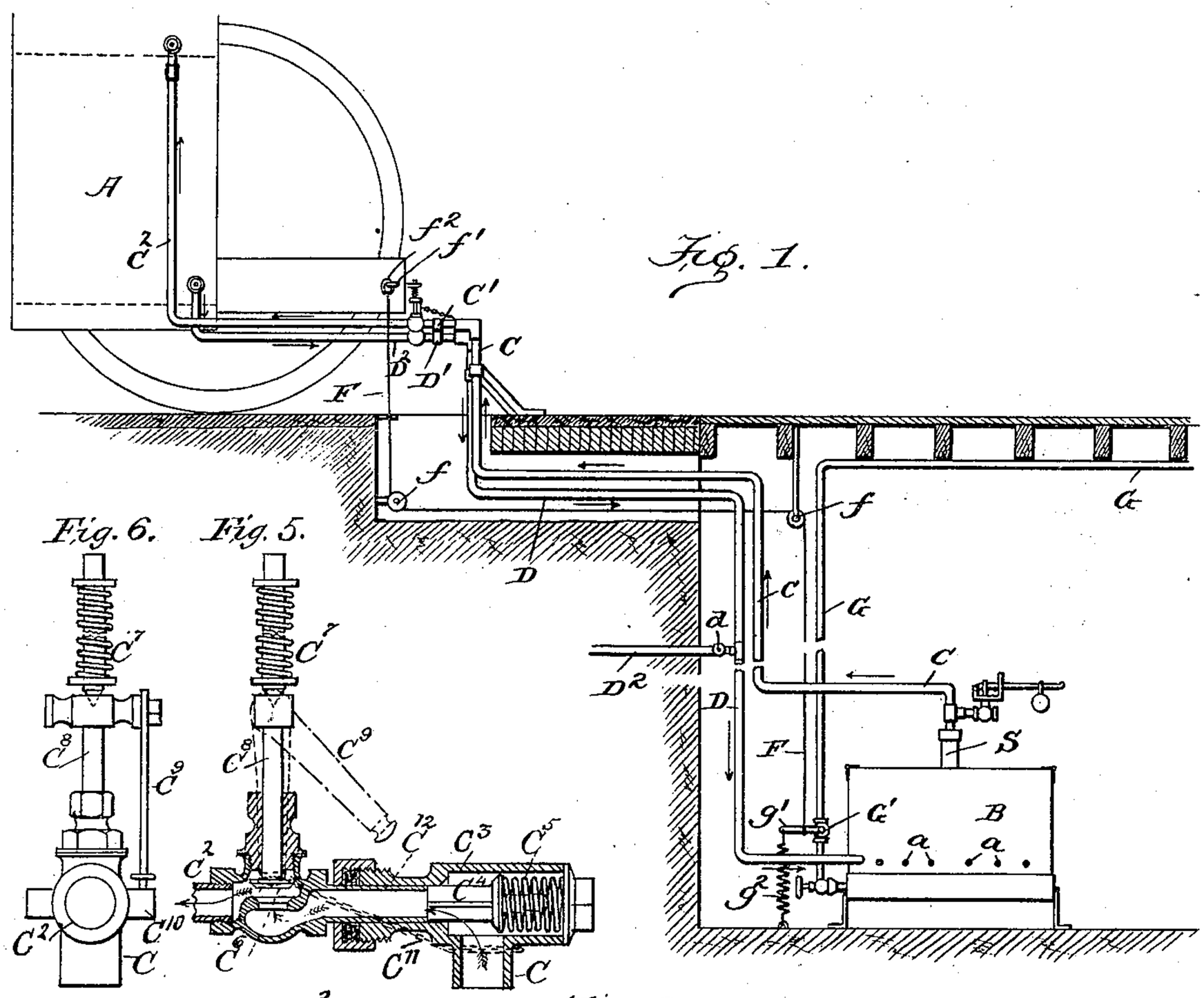
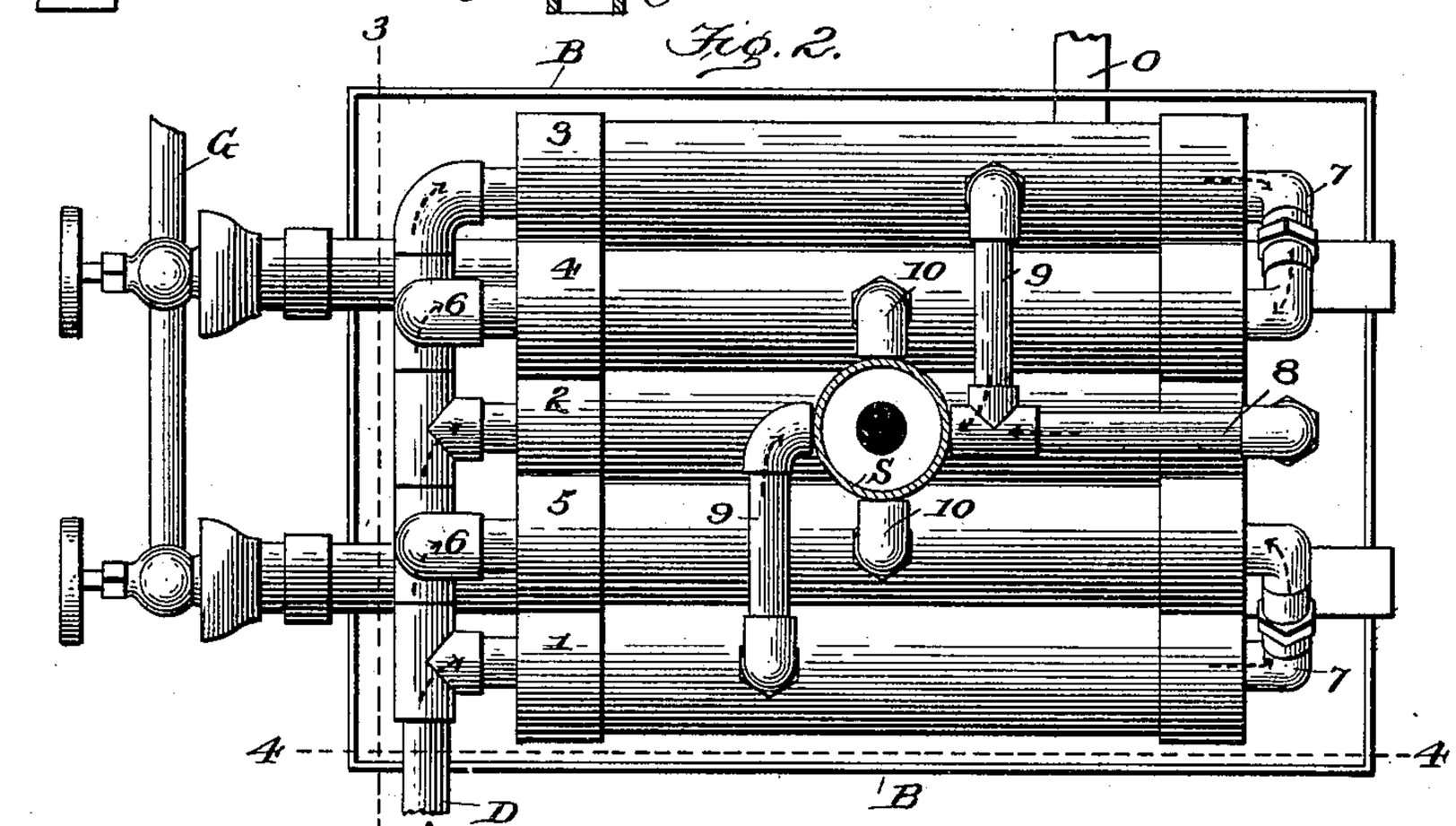


Fig. 1.

Fig. 6.

Fig. 5.

Fig. 2.



WITNESSES:

Harry L. Mark

"

INVENTOR

Thomas M. Robinson

BY

Johnson and Johnson

ATTORNEYS.

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Fig. 3.

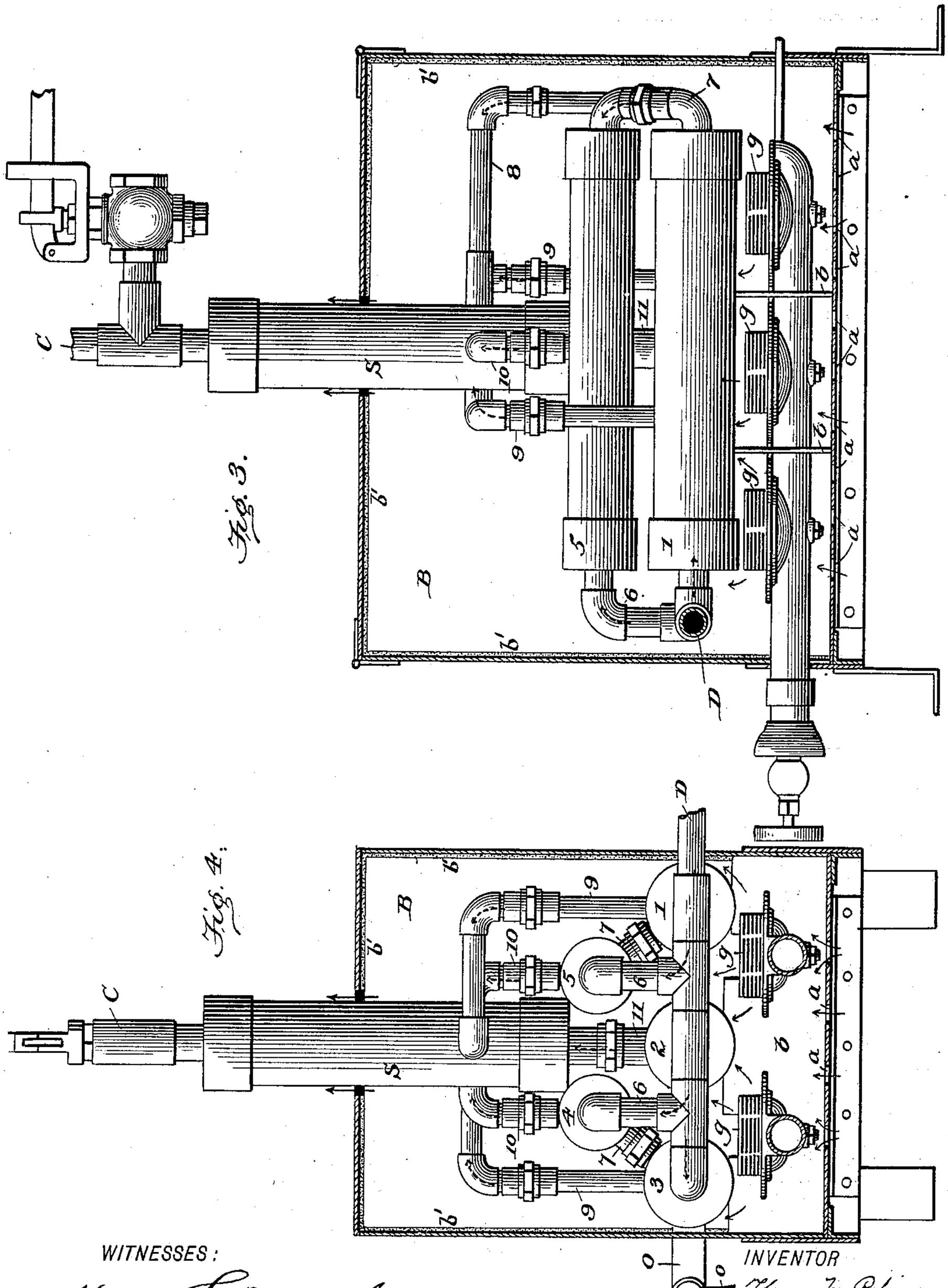

Fig. 4.

WITNESSES:

Harry L. Marsh.

Wm. F. Dearsley.

INVENTOR

Thomas M. Robinson

BY Johnson and Johnson

ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS M. ROBINSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

FEED-WATER HEATER FOR STEAM FIRE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 627,880, dated June 27, 1899.

Application filed May 12, 1898. Serial No. 680,488. (No model.)

To all whom it may concern:

Be it known that I, THOMAS M. ROBINSON, a citizen of the United States, residing at the city of Washington, in the District of Columbia, have invented certain new and useful Improvements in Feed-Water Heaters for Steam Fire-Engines, of which the following is a specification.

For keeping fire-engines in readiness for the quick generation of steam when called into service it is customary, when the engine is at rest within the engine-house, to connect its boiler with an independent subsidiary heater located within the cellar of the engine-house and wherein water is constantly maintained at or above a boiling temperature, so that when the engine is called into service and its fuel is lighted it will begin at once to make steam. Heretofore it has been customary to burn coal in the secondary heater, and when the engine is separated therefrom the small quantity of water left in the heater would soon burn out were it not that a supplemental tank of water is provided, which is automatically connected to the heater when the engine is disconnected and when so connected bears the same connected relation thereto as the engine did. It is by this supplemental tank that sufficient water is maintained in the heater to prevent the baring of the heater-tubes and their consequent burning out.

It is the object of my present improvement to dispense with the supplemental tank and to provide in its place means whereby the heat for the stationary heater is automatically shut off by the same act of taking out the engine which shuts off the water circulation with said heater, these two things being effected at the same time and by one and the same act of the engine.

Referring to the drawings, Figure 1 is an elevation showing the fire-engine operatively connected with its secondary heater. Fig. 2 is a plan view of my improved heater with top and side walls of the oven or closure removed. Fig. 3 is a side elevation of the group of boiler-tubes and stand-pipe, the oven being in section, taken on the line 4 4 of Fig. 2. Fig. 4 is a front end elevation of the same, the oven being in section, taken on the line 3 3 of Fig. 2. Figs. 5 and 6 are detail views of the valved slip-joint connection for cutting off the water circulation from the engine by its exit.

The water-heater B, which I have produced, constitutes in itself a multiple of boiler or generator tubes combined with a stand-pipe, into and through which the circulation of water is rendered effective from each one of the multiple of boiler-tubes into the boiler of the engine A at its water-line. The heater consists of a group of generator or boiler tubes, preferably arranged in tiers and separated to form passages for the heat. The boiler-tubes 1, 2, and 3 of the lower tier are connected at their front ends to the return-pipe D from the engine, while the boiler-tubes 4 and 5 of the upper tier are connected at their front ends to said return-pipe by a branch pipe 6. At their other ends the boiler-tubes are connected in pairs, the two outer lower tubes being connected to the upper tubes by pipes 7. Surmounting this heater is the stand-pipe S, into which all the boiler-tubes connect. The middle boiler-tube of the lower tier, at its rear end, connects with the stand-pipe by a pipe 8, while pipes 9 connect the outer lower boiler-tubes, the upper boiler-tubes in like manner connecting the stand-pipe by pipes 10. The stand-pipe is mainly supported upon the central lower boiler-tube by pipe 11, which connects it with the bottom of the stand-pipe. These pipe connections give a circulation through the group of boiler-tubes and from them into the stand-pipe, causing the hot water to flow into the stand-pipe at or near its lower portion, and from which it passes to the steam-chamber of the engine through the hot-water pipe C^2, thus utilizing to the fullest extent the heat of the water. The water passes from one boiler-tube into the other in a way to increase its temperature and finally flows into a part receiving the concentrated heat of the burners, and it is into this stand-pipe or receiving part which accumulates the water from all the generators that the water flows to the engine. In this circulation it is important to note that the circulation through the upper boiler-tubes is into each end thereof and the outflow is from the top thereof, so in like manner the lower boiler-tubes have an outflow into the stand-pipe. Hence it will be seen that the flow into

the stand-pipe is from opposite directions from the upper boiler-tubes, which is important in shortening the circuit. It is important also to note that each of the lower boiler-tubes has two outflows, one at the end and one at the top, and this also divides and shortens the circuit.

In the various figures of the drawings the flow of the water through the separate parts of the heater is indicated by the arrows.

The disposition of the circulating-pipe connections of the boiler-tubes and the stand-pipe serves to brace the latter and aid in sustaining its weight.

For replenishing the waste caused by the boiling away of the water I provide a suitable inlet-pipe D^2 from the street or other water connection, connected to the return-pipe D and provided with a cock *d*.

It is sometimes necessary or desirable to draw the water from the heater, and for this purpose I provide an outlet-pipe O, having cock *o* (shown in Figs. 2 and 3) and which, it will be noted, taps boiler-tube 3 of the lower tier.

Just above the stand-pipe and leading from the pipe C, I provide the well-known safety-valve for the usual purpose.

To retain the heat, I inclose the boiler-tubes and the lower portion of the stand-pipe within a box or oven, made, preferably, of sheet metal and having its inner sides and top lined with asbestos *b'*. The oven has an upper and a lower portion, the upper portion fitting down in the lower portion for convenience of separation for cleaning. Supports *b b*, extending from the bottom of the oven, form suitable seats for holding the boiler-tubes in place.

For convenience in opening the oven to ignite the burners the lid of the oven is formed of two equal parts hinged to the end walls.

The stand-pipe projects through an opening in the top of the oven, and this opening is large enough to form the chimney for the draft for the burners, and the heat from this opening will heat the projecting portion of the stand-pipe.

The oven is perforated in its bottom and along its lower sides by draft-holes *a a*, through which the air for the burners is drawn.

Suitably supported within the oven and beneath the group of boiler-tubes are gas-burners *g g*, the flame from which is directed upon the overlying generator-tubes. The gas-burners *g g* are supplied from gas-pipe G. Gas-pipe G is provided near the heater with cock G', to the handle of which is fastened the cord F, which holds said handle up against the tension of a spring g^2, fastened to the floor. Rope or cord F passes over pulleys *f* and has at its upper end a ring f^2, which slips over a pin *f'*, standing out horizontally from the back of the engine-tender. When rope F is pulled up and slipped over pin *f'*, the handle *g'* of the gas-cock G' is pulled up against the tension of the spring g^2 and opens the valve of gas-cock G' to allow the gas to flow through it to the heater-burners, while the automatic detachment of the cord from the engine allows the spring to close the valve to cut off such flow at the same moment the burners are cut off, and I utilize this connection to render the shutting off of the gas-supply automatic.

The operation of my device is as follows, the engine being at rest within the engine-house and the circulating-pipes C D and rope F properly connected to the engine: When the engine is called into service, it is separated from the heater-connecting pipes C D at the slip-joints C' D' in the usual manner. Well-known check-valves in each pipe and on each side of the slip-joints operate to automatically and in a well-known way cut off the flow at the separated slip-joints. At the same time the engine is separated the rope ring f^2 is dragged off pin *f'* and releases its connected gas-cock handle *g'*, which is then pulled down by the spring g^2 and the gas is cut off and extinguished. This automatic operation of extinguishing the gas constitutes one of the features of my invention, as it is a necessity arising from the stopping of the circulation of the water in the boiler-tubes, and it is important because it saves the expense of burning gas when the engine is disconnected from the heater.

Referring to the provision for shutting off automatically the steam and water circulation from the engine and from the stationary heater, I have shown in Figs. 5 and 6 such well-known means wherein the outflow circulation-pipe C from the heater is connected to the inflow circulation-pipe C^2, carried on the engine. These two pipe parts are connected by a tubular slip-joint, (see Fig. 5,) in which the engine-pipe part C^2 telescopes with the heater-pipe part C^3, so that the engine part connects by sliding in the fixed house part when housing the engine. These slip-joint parts easily separate by the outgoing of the engine, and this separation is the means of closing a valve in each slip-joint part. The fixed house-pipe part C^3 has a valve C^4, which is opened by the act of making the slip-joint connection for the water circulation and is closed by a spring C^5 when the tubular slip-joint is separated to close the pipe C, connecting the house-heater to shut off the water circulation. The valve C^4 in the fixed pipe part C^3 has a web, which, as seen in Fig. 5, abuts against the end of the engine telescoping-pipe part C^{12} to hold it open, so that in coupling these pipe parts the end of the telescoping-pipe part C^{12} strikes against the web end of the valve C^4 and pushing it back opens the heater-connecting circulation-pipe C and holds the valve open against the pressure of the spring C^5. On the separation of the pipe parts C^{12} C^3 the valve C^4 is closed upon its seat in the fixed pipe part C^3 at the time the valve C^6 is closed in the engine-pipe part. The engine-pipe part C^2 has a valve C^6, which

is closed on the separation of the slip-joint by a spring C^7 on the valve-stem C^8. When the tubular slip-joint is coupled, the valve C^6 is opened and kept open by a prop-arm C^9, carried on the valve-stem C^8 and propped on a lug C^{10} on the engine-pipe part C^2. From the lug C^{10} the prop is tripped by a chain C^{11}, which connects the fixed heater-pipe part C^3 with said prop-arm and is pulled to swing said prop from the lug by the engine leaving the house. In this valve-tripping the chain easily slips off the end of the prop and is again connected with it to open the valve when the engine is again housed.

In the combination, which embodies a tubular slip-joint connection of the engine and fixed heater and means for automatically shutting off the water circulation between a steam fire-engine and a fixed heater therefor, with means for automatically shutting off the heat from the fixed heater by one and the same act of the engine in separating the slip-joints it is important to note that the cord F is always taut when connected to the engine, and thereby holds the gas-supply valve open against the tension of its spring, and the advantage of this construction is that the act of connecting the cord with the engine opens the valve and holds it open against the direct pull of the spring to close it and effects its instant closing when the engine moves out.

The automatic controlling of the fire in the stationary heater is as important as the automatic controlling of the circulation of the water through the heater, for were it not for such control of the fire and the gas continue to burn when the circulation is stopped the heater would be unduly heated, the steam unnecessarily generated to a high pressure, and the heater finally be burned dry and very soon become destroyed. Moreover, were it not for such provision for automatically cutting off the heat simultaneously with cutting off the circulation it would be imperative to provide a supplemental tank for supplying water to the heater and the necessary three-way cocks and provision for automatically operating them to put this tank in communication with the fixed heater at the time the engine is answering the alarm. There is therefore a cooperating relation between the cut-off for the water circulation and the cut-off of the means whereby such circulation is produced. As the well-known automatic feature for cutting off the water circulation gives important advantages, so the automatic control of the heat whereby such circulation is produced is equally important to obtain like advantages at the moment the engine is starting to the fire. The one act, the outward movement of the engine on leaving the house, controls the functions of both cut-offs and at the same time, and the mechanisms whereby such control is effected are in direct connection with the engine, and this establishes their combinative relation to effect two necessary results, the one working in conjunction with the other to produce a complete result without manual attention.

Except for the purposes of the combination of devices hereinafter set forth in the claims, I do not in the Letters Patent to be issued on this application claim the herein-described stationary water-heater as an independent device comprising a group of tubes disposed in parallel relation, surmounted by a stand-pipe, and connected to the several tubes for the circulation of water effected by the generation of steam within said group of tubes, as such device will be made the subject of claim in a separate application.

I claim—

1. In a hot-water heater for steam fire-engines wherein a stationary heater supplies steam and water circulation for the engine when not in use and in combination with said fixed heater, a slip-joint connecting it with the engine, and means for automatically shutting off the water circulation at said slip-joint by the exit of the engine of means for automatically shutting off the heat from the stationary heater, consisting of burners, a gas-supply pipe therefor, a spring-controlled valve therein, and a cord drawn taut in connecting the engine and said gas-valve to open and to hold the valve against the tension of the spring, whereby the gas-valve is closed by the exit of the engine to prevent the generation of the steam in the fixed heater when the water circulation is cut off.

2. In a hot-water heater for steam fire-engines wherein a stationary heater supplies steam and water circulation for the engine when not in use, and in combination with said fixed heater, a slip-joint connecting it with the engine, and means for automatically shutting off the water circulation by the exit of the engine, of a pipe for supplying the heating medium for said heater, a spring-controlled valve for said pipe, and means connecting the said valve and the engine automatically controlled to close said valve by the exit of the engine for shutting off the heating medium and thereby avoid the necessity of supplying the heater with water when the engine is separated therefrom.

3. In a hot-water heater for steam fire-engines and in combination with a stationary heater for supplying water circulation and a slip-joint connection for the engine when not in use, of an outflow circulating-pipe C connecting an upper tubular part of the heater and a return circulation-pipe D connecting a lower tubular part of the heater, a gas-supply pipe G and burners *g* for the heater, a spring-controlled valve for the gas-pipe and a cord F connecting said valve and engine and holding the valve open by a constant pulling action thereon against the tension of the spring.

4. In a hot-water heater for steam fire-engines wherein a stationary heater supplies steam and water circulation for the engine when housed, and in combination with said

fixed heater, a slip-joint connecting the water-circulating pipes, and means for automatically shutting off the water circulation by the exit of the engine, of means for automatically shutting off the heat from the stationary heater by the exit of the engine, for the purpose stated.

In testimony whereof I have hereunto signed this specification in the presence of two witnesses.

THOMAS M. ROBINSON.

Witnesses:
A. E. H. JOHNSON,
A. ROLAND JOHNSON.