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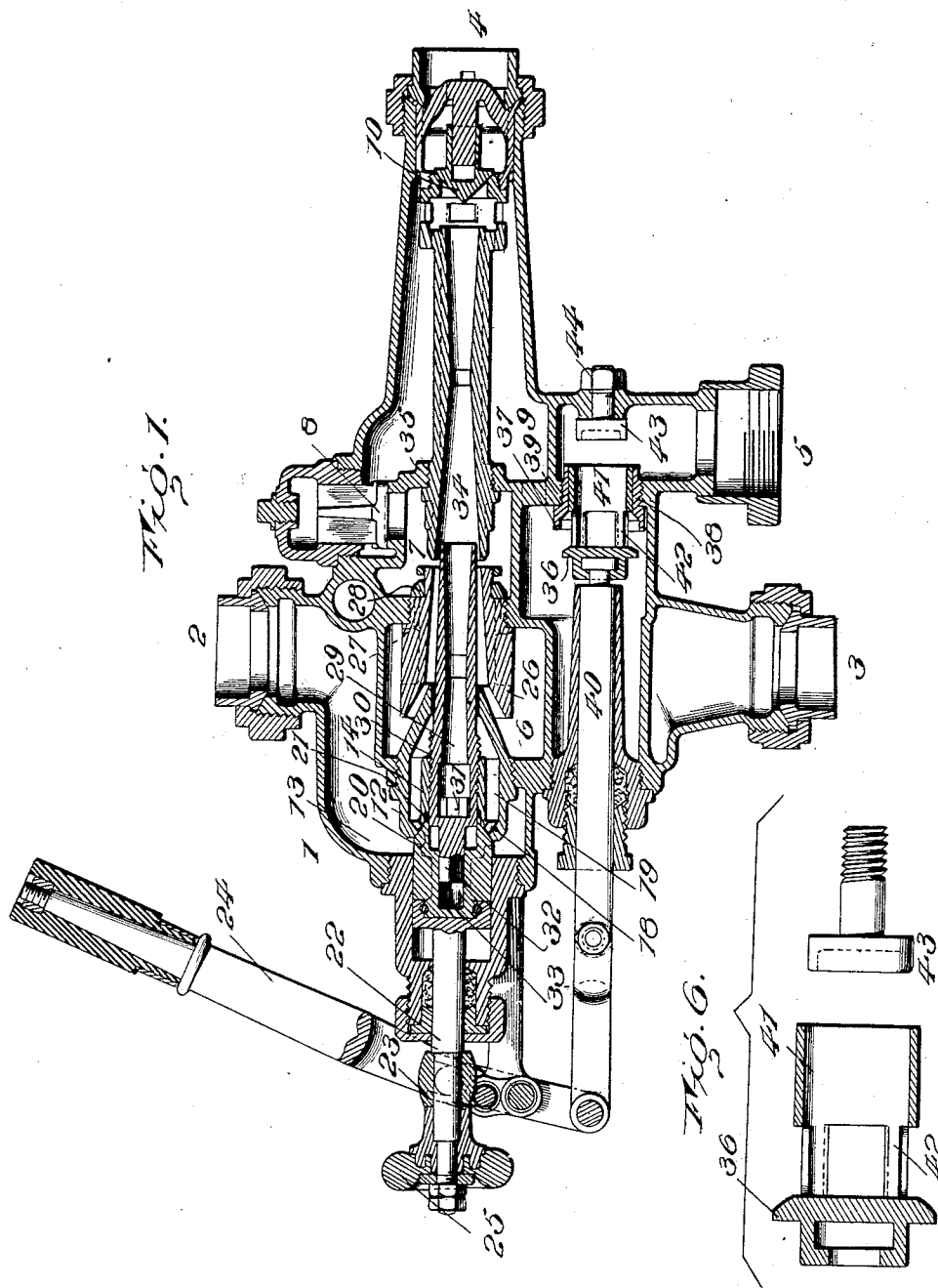
PATENTED JULY 7, 1903.

J. DESMOND.
STEAM INJECTOR.

APPLICATION FILED NOV. 29, 1902.

NO MODEL

2 SHEETS—SHEET 1.



WITNESSES:

John M. ...
Francis S. Maguire

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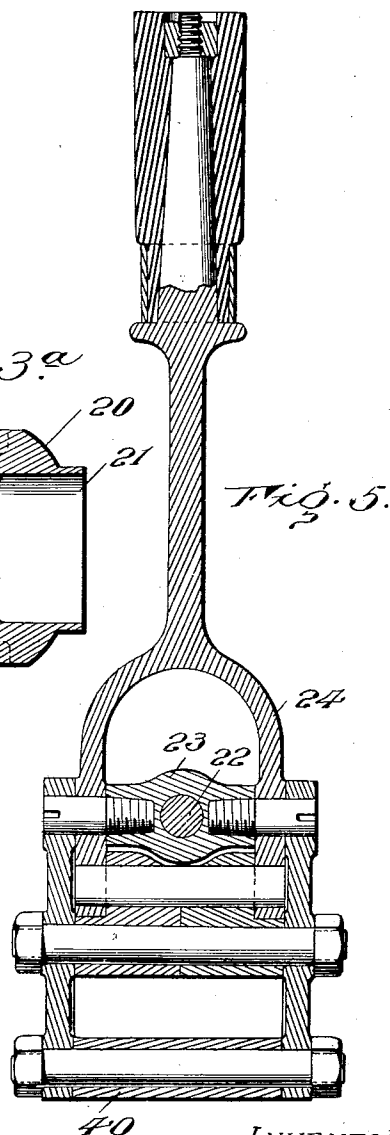
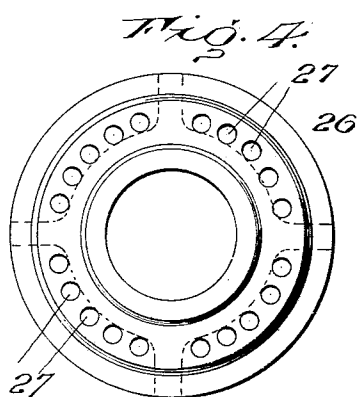
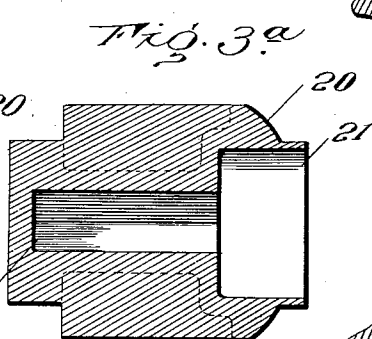
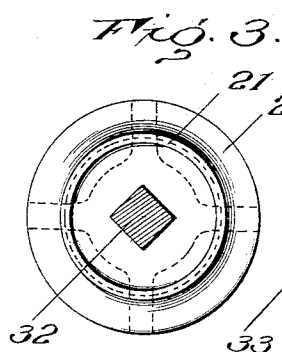
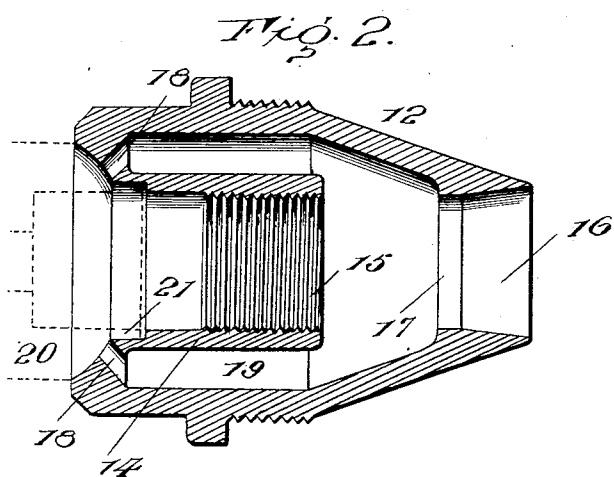
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2 SHEETS—SHEET 2.



WITNESSES:

pro Amicus.
Francis S. Maguire

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UNITED STATES PATENT OFFICE.

JOHN DESMOND, OF CINCINNATI, OHIO, ASSIGNOR TO THE WM. POWELL COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

STEAM-INJECTOR.

SPECIFICATION forming part of Letters Patent No. 733,168, dated July 7, 1903.

Application filed November 29, 1902. Serial No. 133,178. (No model.)

To all whom it may concern:

Be it known that I, JOHN DESMOND, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Steam-Injectors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The objects of this invention are, first, to avoid the difficulties heretofore experienced in locomotive-injectors from cinders and fine coal lodging in the seat of the overflow-valve, causing leakage and waste of water while the injector is working; second, to remove all danger of the jet or column being broken upon cutting off the overflow and rendering unnecessary the exercise of great caution in the seating of the overflow-valve; third, to reduce to a minimum the amount of over-pressure required after the overflow-valve is seated; fourth, to insure the proper alinement of the steam-tube of the forcer without the exceedingly accurate and expensive work heretofore necessary; fifth, to produce a locomotive-injector wherein the resistance is uniform, rendering unnecessary the exercise of skill in starting the machine; sixth, to utilize the vacuum usually present in the condensing-chamber of the forcer, and thereby reduce the area of the forcing-steam to a degree just sufficient to resist the boiler-pressure; seventh, to maintain the injector-casing surrounding the water and condensing chambers at about the same temperature as the water in the supply-tank, thereby avoiding all danger of precipitation of lime, and, finally, to so proportion the seat-opening of the boiler-outlet check-valve to the delivery-tube that when the injector is working the velocity of the water is such that it reduces the pressure on the injector side of the check and overflow valves to about one-half of the boiler-pressure.

The invention will be hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view. Fig. 2 is an enlarged sectional view of the huddler

or lifter steam-tube. Fig. 3 is an end view of the steam-inlet valve with a portion of the forcer steam-tube in cross-section. Fig. 3^a is a longitudinal sectional view of the steam-inlet valve. Fig. 4 is an end view of the lifter combining-tube. Fig. 5 is a section through the controlling-lever and its adjuncts. Fig. 6 shows the parts of the overflow-valve.

Referring to the drawings, 1 designates the casing; 2, the steam-inlet; 3, the water-inlet; 4, the boiler-outlet; 5, the overflow-outlet; 6, the water-chamber; 7, the condensing and primary overflow chamber; 8, the valve controlling the outlet therefrom; 9, the main overflow-chamber, and 10 the check-valve controlling the outlet to the boiler.

12 is what I term the "huddler" or "lifter" steam-tube mounted in the wall separating the water-chamber 6 from the steam-chamber 13. Within this tube 12 is a central cylindrical shell 14, internally threaded at 15, and in line therewith is the tapered outlet-opening 16, reduced in diameter at 17, as clearly shown in Fig. 2. Between the front end of this shell and the beveled end of the tube 12 is a passage-way 18, which opens into the lifting steam-space 19, surrounding such shell.

A steam-valve 20 has its seat against the beveled end of tube 12 to close passage-way 18. It is formed with a reduced extension 21, designed to extend within shell 14, and thereby control the admission of steam to the latter even when the valve is unseated sufficiently to admit steam to the space 19. To this valve is secured a stem 22, which is passed outwardly through a suitable stuffing-box, and a reduced portion thereof is extended through a block 23 of a controlling-lever 24. A hand-wheel 25 is secured on the outer end of this stem to permit the valve to be turned axially without affecting the position of the controlling-lever.

The combining-tube 26 of the lifter is mounted in the wall separating water-chamber 6 from the condensing and primary overflow chamber 7. In the lateral flange of this tube 26 are formed ports 27, through which communication is established between the water-chamber and the condensing-chamber. As the injector is started the creation of a vacu-

um in chamber 6 will draw a valve 28 to its seat over these ports 27, the flow of air and the steam used in lifting acting against this valve to force it to its seat. When the injector has primed and the controlling-lever is drawn to working position, this valve 28 is drawn away from its seat by the strong vacuum created in the condensing-chamber, the water then passing through these ports into such chamber at a high speed. In all other injectors not utilizing this vacuum in the condensing-chamber at the mouth of the combining-tube it is necessary to give sufficient steam not only to resist the boiler-pressure, but also to resist such vacuum. In my injector I reduce the vacuum to zero by the direct communication between the two chambers, enabling me to reduce the area of the steam in the forcing-jets down sufficiently to resist boiler-pressure. Furthermore, the cold water passing directly from the water-chamber to the condensing-chamber keeps the casing surrounding these two chambers as cool as the water in the tank, overcoming all danger of lime precipitation. This is a very important feature in steam-injectors.

29 is the forcer steam-tube, which is exteriorly threaded at 30 to engage and work in the thread 15. At its receiving end it is formed with openings 31, arranged longitudinally, and a stem 32, preferably square in cross-section and extended into a correspondingly-shaped opening 33, formed centrally in the body of valve 20. Hence by turning this valve axially the forcer steam-tube may be adjusted longitudinally, working on thread 15, so that when it is screwed inward as far as it can go the steam-space between this tube and the reduced end of the huddler or lifter steam-tube 12 is reduced to one-half its area, thereby reducing the water-supply to the injector to one-half or less. The valve-seat, the huddler or lifter steam-tube, and the guide for the forcer steam-tube being made in one piece insure a perfect alinement of the forcer steam-tube through the huddler without the exceedingly accurate and expensive work heretofore necessary. This is of vital importance, since even a very slight difference in diameter of the space through which the steam passes makes considerable increase or decrease in the volume of water, and if the alinements be not perfect the standard of efficiency of the machine is materially lowered. Another advantage lies in the fact that the means for thus regulating the steam and water are located within the injector, whereby I am enabled to make the machine several inches shorter than if such mechanism were arranged on the outside.

The combining and delivery tube 34 of the forcer is of the ordinary construction, being mounted in the wall 35 of the primary overflow-chamber.

36 is the main overflow-valve, whose seat 37 is formed by the inner end of sleeve 38, set in the wall 39, separating the overflow-

chamber from the overflow-outlet. This valve is mounted on the inner end of a stem 40, extended longitudinally of the casing in line with the valve-seat and being passed through an ordinary stuffing-box is connected to the controlling-lever 24, so that as the latter is moved to open or close the steam-inlet valve the overflow-valve will be moved toward or away from its seat.

Movable with the overflow-valve is an open-ended cylinder 41, being connected to the valve by a lantern-like portion 42. This cylinder fits snug within the sleeve 38, wherein it is designed to move in the seating and unseating of the valve. As the latter is being moved to its seat the cylinder telescopes and incloses a stationary piston 43, mounted in line therewith, such piston being located within the overflow-outlet. It is shown as having its stem extended through the wall of such outlet and permanently secured by a nut 44. The cylinder forms the passage-way between the overflow-chamber and the overflow-outlet. Hence upon reaching the piston and being closed thereby the overflow is cut off. This occurs before the valve reaches its seat, with the result that such valve is then evenly balanced, being gradually subjected to boiler-pressure on both sides. This makes it necessary for the engineer to exert only a slight pressure on the controlling-lever to force the valve to its seat, instead, as heretofore, of having to exercise much skill and force to keep it from being seated violently, as occurs where the valve is subjected to boiler-pressure on one side only. In all locomotive-injectors as heretofore constructed just as the overflow-valve approaches its seat the pressure thereon is such as to force it suddenly on account of the play and spring in the controlling mechanism, with the result that the jet or column is usually broken unless great care has been exercised in starting; but by gradually putting boiler-pressure on both sides of the valve before it reaches its seat this difficulty is overcome. Another advantage lies in the fact that cinders and fine coal which naturally find their way into the tanks and through the suction-pipe into the injectors instead of lodging in the overflow-valve opening or seat, as frequently occurs, will gravitate to the lowest portion of the casing once the overflow-outlet is cut off, thereby leaving the valve-seat free of obstruction. Furthermore, heretofore it has been necessary to give this class of injectors considerable overpressure in order to overcome the constant rise in pressure caused by the premature seating of the overflow-valve; but by throwing this valve in balance before seating I am enabled to so proportion my jets or tubes as to reduce overpressure to a minimum, thereby also reducing the amount of steam consumed proportionately to the amount of water delivered, thus very materially adding to the efficiency of the injector and promoting its longevity. The only overpressure neces-

sary in my injector is enough to overcome any slight resistance that may come from friction in the discharge-pipes plus resistance of boiler-pressure.

5 The delivery-tube of the forcer opens into a casing 45, having a bell-shaped opening 46, forming a seat for the check-valve 10. This opening is so proportioned to the delivery-tube that the force of the discharge from the
10 latter reduces the pressure on the injector side of the check and overflow valves to about one-half. Heretofore these valves have had to maintain the maximum boiler-pressure, and when they wear, even to a slight extent,
15 leakage will follow.

In operation the steam-valve 20 is unseated only sufficient to allow steam to enter through passage-way 18 into steam-space 19 of the huddler or lifter steam-tube and passing between the reduced end thereof and the forcer steam-tube will upon reaching the atmosphere empty the water-chamber of air, and water being lifted and entering the lifter combining-tube 26 the column will soon be established, whereupon the steam-valve is fully
25 unseated, allowing steam to pass into the forcer steam-tube and force the column through the combining and delivery tube 34, and so on to the boiler. As the steam-valve is being unseated the overflow-valve is forced to its seat. The flow of water being first cut off, throwing the overflow-valve in balance, the seating thereof is a matter of great ease, only a slight pressure being required. The
35 water-supply is controlled by the longitudinal adjustment of the forcer steam-tube, the inward movement of which cuts off the quantity of steam passing from the reduced end of the huddler, while a reverse movement of
40 such tube allows of an increased supply.

I claim as my invention—

1. In a steam-injector, an overflow-valve, and means for throwing such valve in balance before being seated, as set forth.

45 2. In a steam-injector, a main overflow-valve, means for positively operating the same, and means for throwing such valve in balance while being moved to its seat by such operating means, as set forth.

50 3. In a steam-injector, a main overflow-valve, and means for cutting off the flow of water through the overflow-outlet before such valve is seated, as set forth.

55 4. In a steam-injector having an overflow-opening, a valve for closing such opening, and means movable with such valve for closing the passage through such opening before the valve reaches its seat.

60 5. A steam-injector having an overflow-opening, a valve designed to close such opening, a cylinder carried by such valve forming a passage-way through such opening, and means with which such cylinder is designed to coact for cutting off the passage of water
65 therethrough prior to the seating of such valve, as set forth.

6. A steam-injector having an overflow-

opening, a valve designed to close such opening, a cylinder carried by such valve forming a passage-way through such opening, and a
70 stationary piston in line with such cylinder designed to be telescoped thereby, such piston cutting off the passage-way through the cylinder in advance of the seating of the valve, as set forth.

75 7. A steam-injector having an opening into its overflow-outlet, a sleeve in said opening, a stationary piston in said outlet in line with such opening, an overflow-valve designed to be seated against one end of such sleeve, and
80 a cylinder carried by such valve and movable in said sleeve and designed to be closed by said piston when moved thereover, as set forth.

85 8. A steam-injector having a main steam-valve, a controlling-lever to which such valve is connected, an overflow-valve also connected to such lever, and means for throwing such overflow-valve in balance when said steam-
90 valve is unseated and before the overflow-valve reaches its seat, as set forth.

9. A steam-injector having a huddler or lifter steam-tube, a cylindrical shell within such huddler, a steam passage-way being formed between the huddler and the shell,
95 the forcer steam-tube mounted in such shell having openings, and a valve extended over said passage-way and between the shell and forcer steam-tube, for successively admitting steam to the passage-way and to the tube, as
100 set forth.

10. A steam-injector having a huddler or lifter steam-tube with a reduced outlet-opening, a shell located centrally within such huddler, a steam passage-way being formed between the huddler and the shell, a forcer
105 steam-tube mounted in such shell and extended through the reduced end of the huddler, such forcer steam-tube having openings therein, a valve extended between the huddler and the forcer steam-tube for successively controlling the admission of steam to the huddler and to the forcer steam-tube, and means
110 for adjusting the latter longitudinally within the shell for regulating the operation of the machine, substantially as set forth.

11. A steam-injector having a huddler or lifter steam-tube formed with a reduced outlet-opening, a shell mounted centrally within such huddler interiorly threaded and surrounded by a steam-space, the forcer steam-
120 tube exteriorly threaded and fitted within said shell and having steam-inlet openings at one end, and means for successively controlling the admission of steam to said steam-space and to the inlet-openings of the forcer-tube, as set forth.

12. A steam-injector having a huddler or lifter steam-tube formed with a steam-space and a passage-way leading thereinto, an interiorly-threaded shell within such huddler,
130 a forcer steam-tube exteriorly threaded and mounted in said shell, said steam-tube projecting through the outlet-opening of the hudd-

dler and having at its receiving end a series of openings and a projection at such end, a steam-valve designed to be seated over said passage-way and having an extension movable between said shell and said forcer steam-tube and also a central opening to accommodate said projection, a controlling-lever to which the stem of such valve is connected, and means for axially rotating such stem and valve for effecting the longitudinal adjustment of the forcer steam-tube.

13. The combination with the series of lifting, combining and delivery tubes, of the casing having a bell-mouth opening forming

a valve-seat in line with the delivery-tube, and the check-valve designed to fit against such seat, said opening being so proportioned to the opening of the delivery-tube as to reduce the pressure on the injector side of the valve, substantially as set forth.

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

JOHN DESMOND.

Witnesses:

R. W. TAYLOR,
WM. H. SCHWEIKERT.