

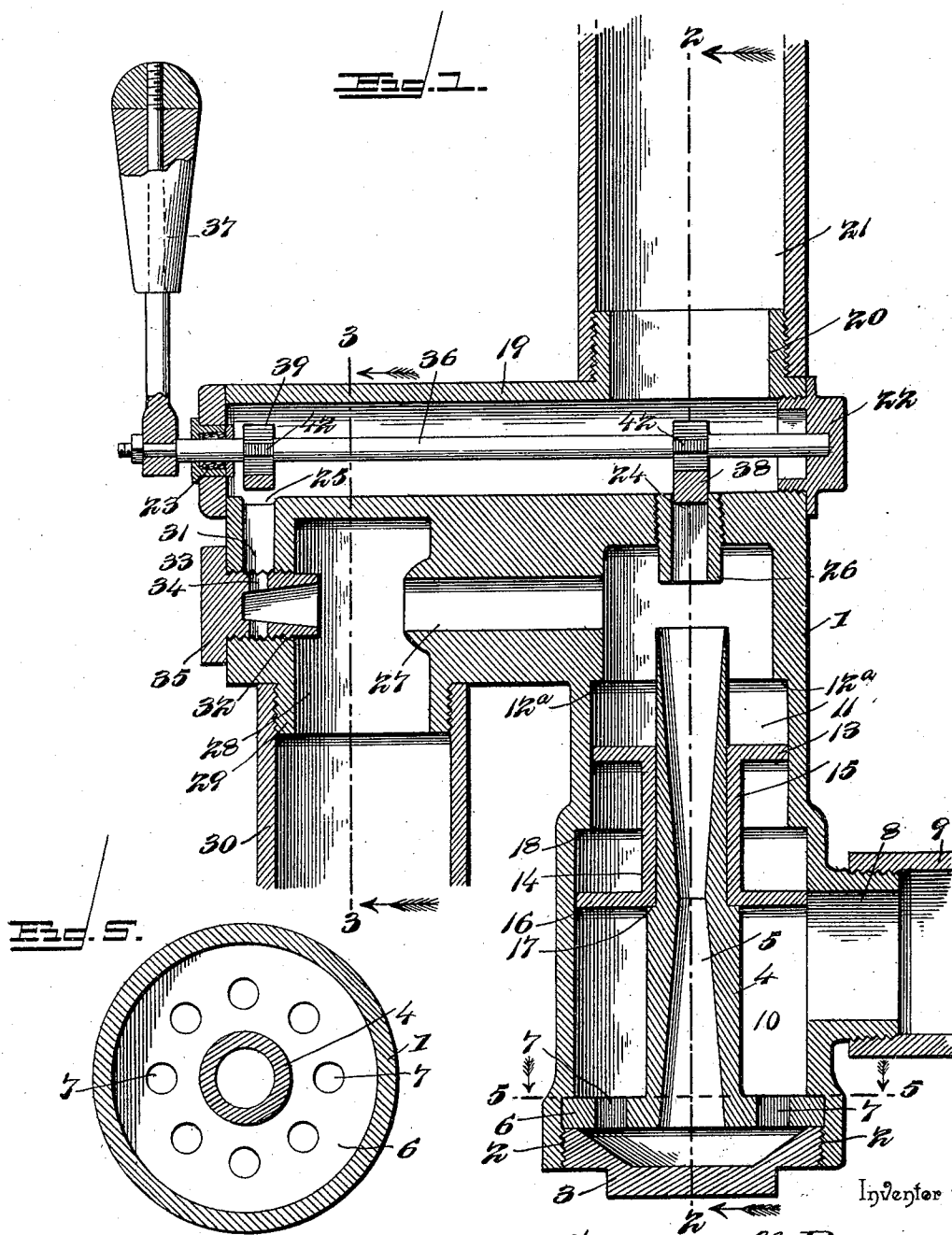
(No Model.)

2 Sheets—Sheet 1.

G. M. ROSS.
INJECTOR.

No. 581,371.

Patented Apr. 27, 1897.



George M. Ross

Witnesses

E. H. Stewart
S. C. Johnson

By *his* Attorneys,

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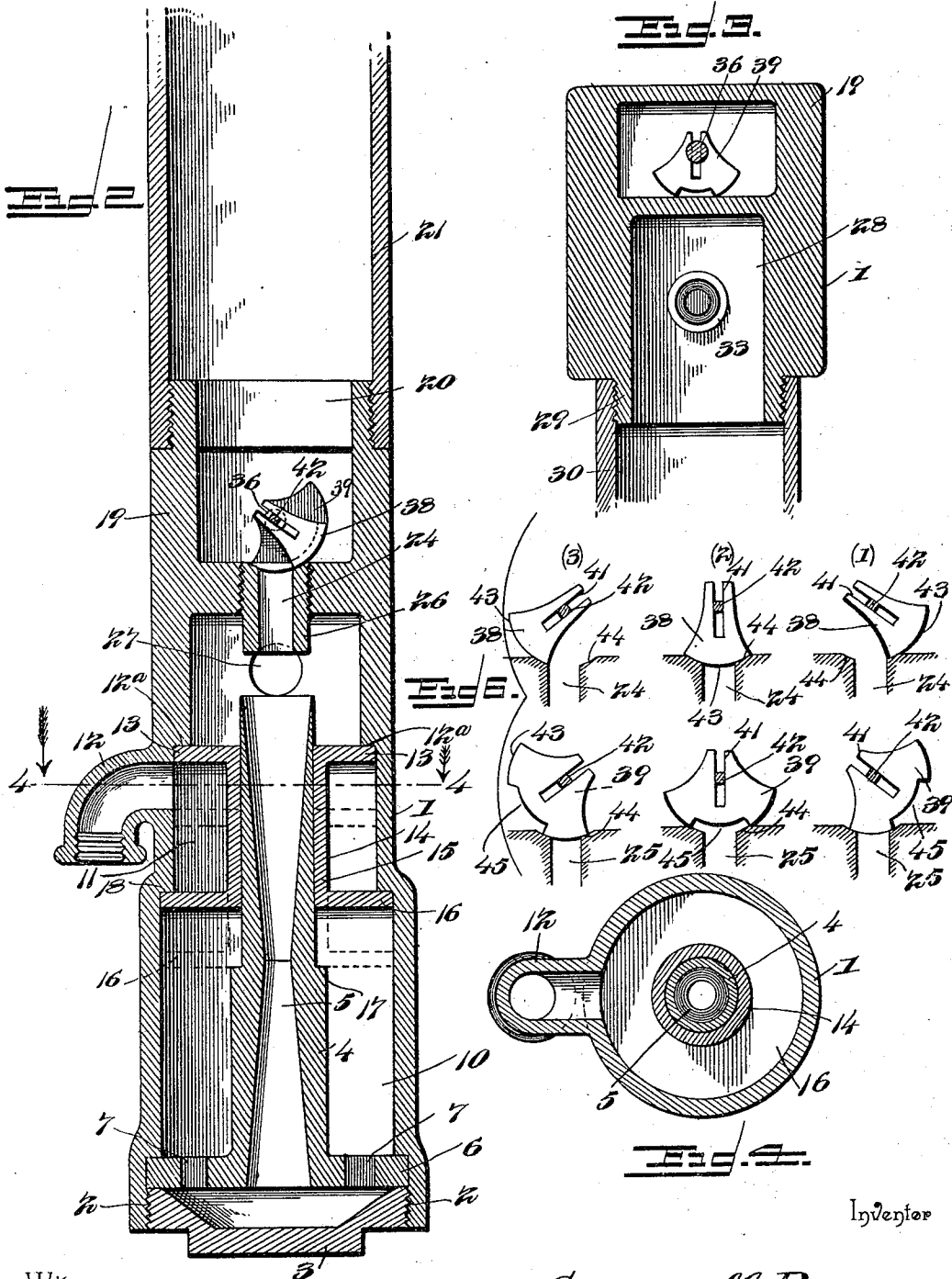
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L. P. Thompson

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UNITED STATES PATENT OFFICE.

GEORGE M. ROSS, OF AUBURN, NEW YORK.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 581,371, dated April 27, 1897.

Application filed April 28, 1896. Serial No. 589,455. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. ROSS, a citizen of the United States, residing at Auburn, in the county of Cayuga and State of New York, have invented a new and useful Injector, of which the following is a specification.

This invention relates to injectors; and it has for its object to provide certain new and useful improvements in injectors for steam-boilers whereby the same shall be rendered more efficient in operation to exert a powerful lifting and forcing action for introducing water into a steam-boiler.

To this end the main and primary object of the invention is to construct an injector with as few working parts as possible, but which parts shall be so arranged and combined as to provide a positive and powerful operation, while at the same time providing an injector easily controlled, repaired, and cleaned.

With this and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a longitudinal sectional view of an injector constructed in accordance with this invention. Fig. 2 is a longitudinal sectional view on the line 2 2 of Fig. 1. Fig. 3 is a detail sectional view on the line 3 3 of Fig. 1. Fig. 4 is a cross-sectional view on the line 4 4 of Fig. 2. Fig. 5 is a similar view on the line 5 5 of Fig. 1. Fig. 6 is a series of elevations showing the different relative positions of the valves in the steam-chest in different adjusted positions of said valves.

Referring to the accompanying drawings, the numeral 1 designates the main tubular casing of the injector provided with an interiorly-threaded open lower end 2, which detachably receives the hollow exteriorly-threaded cap-plug 3, which provides for detachably supporting within the tubular casing 1 the elongated combined lifting and combining tube 4. The combined lifting and combining tube 4 extends nearly the entire length of the casing 1 and is provided with a double conical bore 5, which subserves the usual function of contracting the steam within a sufficiently small compass to provide the nec-

essary suction for lifting the water and forcing the same out of the tube 4 through the check-valve and into the boiler. The said lifting and combining tube 4 is materially less in diameter than the diameter of the casing 1 and is provided at its lower end with a partition plate or flange 6, the edges of which plate or flange 6 are received within the open lower end 2 of the casing and are clamped against the shoulder within such lower end of the casing by means of the cap-plug 3, thereby providing simple means for positively and detachably positioning the tube 4 within the casing of the injector. The partition plate or flange 6 at the lower end of the tube 4 is provided therein with a series of circulating-openings 7, preferably arranged in a circular series and providing communication between the interior of the casing 1, above the plate or disk 6, and the space between said plate or flange and the hollow cap-plug 3, so that the water forced out of the tube 4 will find a ready escape into the lower part of the casing. Directly above the partition plate or flange 6, at the lower end of the tube 4, the casing 1 of the injector is provided with a delivery-port 8, having a pipe connection 9 therewith, which leads to the ordinary check-valve and the boiler in the usual manner, and the said delivery-port 8 communicates with the delivery or discharge chamber 10 of the casing, which is formed therein directly above or at one side of the plate or flange 6.

Above or at the side of the delivery or discharge chamber 10, opposite the plate or flange 6, the casing 1 is slightly reduced in diameter to form an overflow-chamber 11, with which communicates the overflow-nipple 12, fitted in one side of the casing 1, and at one side of the plane of the connection of the nipple 12 with the casing 1 the latter is provided with an interior valve-seat-shoulder 12^a, against which is designed to work the valve-disk 13 of the double piston-valve 14. The double piston-valve 14 essentially comprises a sleeve 15, slidably mounted on the exterior of the tube 4, the valve-disk 13 at the upper end of said sleeve, and the piston-disk 16 at the lower end of the sleeve. The double piston-valve 14 is normally supported in its open position on the exterior supporting-shoulder 17, formed exteriorly on the lifting

and combining tube 4, intermediate of the ends of such tube, and the said valve 14 is arranged to have the valve-disk 13 thereof to work within the overflow-chamber 11 of the casing, while the piston-disk 16 works within the delivery or discharge chamber 10 of the casing and against a second interior valve-seat shoulder 18, formed within the casing 1, concentric with the valve-seat shoulder 12^a and directly at one side of the delivery-port 8.

The tubular casing 1 of the injector supports at one end an elongated steam-chest 19, having a steam-inlet 20, provided with a suitable pipe connection 21, leading to the source of steam-supply, and said casing is preferably inclosed at one end by a detachable cap-plug 22 and is provided in the opposite end with an ordinary stuffing-box 23, the function of which will be presently referred to. The elongated steam-chest is provided in one side thereof with separate steam-ports 24 and 25, located, respectively, near opposite ends of the chest, and the port 24 is located substantially in a line with the steam-inlet 20 and has detachably fitted therein a steam-jet nozzle 26, which projects inwardly within one end of the casing 1, in direct alignment with the tube 4, and spaced a short distance from the end of such tube opposite the said partition plate or flange 6. The adjacent ends of the tube 4 and the jet-nozzle 26 are disposed substantially opposite a lateral water-inlet passage 27, formed in the body of the casing 1 at one side and end thereof, and the outer end of said water-inlet passage 27 communicates with a water-inlet chamber 28, formed at one side of and parallel with the main body of the casing and having a coupling-neck 29, with which coupling-neck a pipe connection 30 is made, said pipe connection leading to the source of water-supply. The water-inlet chamber 28 of the casing is provided in one side thereof with a steam-passage 31, communicating with the steam-port 25, near one end of the steam-chest 19, and intersecting with the passage 31 is an opening 32, in which is detachably fitted the steam-jet nozzle 33, the inner end of which nozzle projects into the water-inlet chamber 28, directly opposite and in line with the inner end of the water-inlet passage 27. The steam-jet nozzle 33 is provided between its ends with steam-openings 34, communicating with the interior of the passage 31, and at its outer end the said nozzle is provided with a head 35, adapted to be engaged by a suitable wrench, whereby the said nozzle may be readily removed and properly inserted in position.

Arranged to work within the elongated steam-chest 19 is a valve-stem 36, one end of which stem is supported in the cap-plug 22, while the other end thereof is loosely extended through the stuffing-box 23 at the opposite end of the steam-chest. The end of the valve-stem extended through the stuffing-box 23 has fitted thereto an adjusting-lever 37, which is manipulated for the purpose of moving the

valve-stem 36 and adjusting the positions of the valves 38 and 39, respectively connected with the valve-stem near its opposite ends and respectively working over the separate steam-ports 24 and 25, formed in one side of the said steam-chest.

The valves 38 and 39 are loosely connected with the stem 36, so that the pressure of steam working against said valves will provide for holding the same tightly on their seats surrounding the ports 24 and 25, and said valves are so arranged that an adjustment of the lever 37 would provide for uncovering the port 25 for priming purposes without uncovering the port 24, and also for partially or entirely re-covering the port 25 when the port 24 is uncovered and the injector is in full operation.

In starting the injector the adjusting-lever 37 is manipulated so as to carry the valve 39 from over the port 25, thereby admitting steam into the steam-passage 31 and the steam-jet nozzle 33. The steam is jetted from the nozzle 33 across the chamber 28 into the water-inlet passage 27 and creates a sufficient suction to lift the water through the pipe connection 30 into the water-inlet chamber 28 and through the passage 27 into the casing 1, thereby providing for priming the injector. With the jet-nozzle 33 in operation the water is not lifted with sufficient force to pass through the tube 4, and thence into the boiler, but passes into the overflow-chamber 11 and out through the overflow-nipple 12. After thus priming the injector the valve-adjusting lever is again manipulated to uncover the port 24, so that the steam will pass directly into the main steam-jet nozzle 26 opposite the steam-inlet 20 and in direct alignment with the tube 4. The steam from the nozzle 26 is forced into the lifting and combining tube 4 and creates a powerful suction that will lift the water through the chamber 28 and the passage 27 and will force the same under considerable pressure through the bore of the tube 4. The usual combining action occurs in the tube 4, and the water passes out of said tube through the circulating-openings 7 into the delivery-chamber 10 of the casing, and from thence through the pipe connections into the boiler. The pressure of water within the delivery-chamber 10 during the operation of the injector exerts its force against the piston-disk 16 of the piston-valve 14 and moves such disk against the interior valve-seat 18, thereby cutting off communication between the delivery and overflow chamber of the casing. This adjustment of the piston-valve moves the valve-disk 13 against the valve-seat 12^a and closes communication with the nipple 12 and compels all the water lifted by the suction of the injector to pass into and through the lifting and combining tube 4.

Reference has already been made to the necessary disposition of the valves 38 and 39 to secure the results described, but at this

point more particular attention will be directed to the specific manner of mounting and disposing these valves. To provide for the loose connection of the said valves with the stems 36, the same are provided with elongated slots 41, loosely taking over reduced squared portions 42 of the stem 36, which squared portions of the stem prevent the valves from turning independently of the stem. The valves 38 and 39 are preferably of a segmental shape and are provided with curved contact-faces 43, that are adapted to work on the curved valve-seats 44 at the mouth of the steam-ports 24 and 25, and the valve 39 is further provided in the curved contact-face thereof with a steam-cavity 45, which spans the steam-port 25 to admit steam thereto during the priming of the injector. The said valves, constructed as described, are preferably arranged somewhat out of alinement, so that the adjustment of the lever 17 will provide for uncovering the port 25 for priming without covering the port 24, and also for re-covering the port 25 when the port 24 is uncovered during the working of the injector. These positions of the valves are plainly illustrated in Fig. 6 of the drawings, and by reference to position 1 in Fig. 6 it will be noted that when the port 25 is covered by the portion of the valve 39 at one side of the steam-cavity 45 the steam-port 24 may be uncovered, while in the position 2 with the cavity 45 of the valve 39 spanning the port 25 to allow steam to enter said port, the valve 48 completely covers the port 24 and cuts off access of steam thereto. A continued adjustment of the lever will move the valve 39 to entirely cover the port 25, as in position 3 of Fig. 6, while the valve 38 will be moved at one side of the port 24 to uncover the same.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described injector will be readily apparent to those skilled in the art without further description, and it will be understood that various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In an injector, the casing provided with a delivery-port near one end, a steam-inlet port at the opposite end, and a lateral water-inlet passage adjacent to the steam-port, and a lifting and combining tube arranged longitudinally within the casing and in alinement with the steam-port, said tube being provided at one end with an integral perforate partition plate or flange detachably clamped within one end of the casing at one side of the delivery-port, substantially as set forth.

2. In an injector, the casing provided with a delivery-port near one end, a steam-inlet port at the opposite end, a water-inlet pas-

sage adjacent to the steam-port, and an overflow-chamber between said inlet-passage and the delivery-port, a lifting and combining tube arranged longitudinally within the casing and in alinement with the steam-port, and provided at one end with a perforate partition plate or flange detachably clamped within one end of the casing at one side of the delivery-port, and a pressure-operated valve slidably mounted on said tube and working within said overflow-chamber and adapted to cut off communication between said chamber and the other parts of the casing, substantially as set forth.

3. In an injector, the casing provided near one end with a delivery-port, a steam-inlet port at its opposite end, a water-inlet passage adjacent to the steam-port, an intermediately-located overflow-chamber, and separate concentrically-arranged interior valve-seat shoulders, a steam-jet nozzle fitted in said steam-inlet port, a lifting and combining tube arranged within the casing in alinement with said nozzle and provided at the end opposite said nozzle with a perforate partition plate or flange detachably clamped within the casing at one side of the delivery-port, said tube being provided intermediate of its ends with an exterior shoulder, and a pressure-operated piston-valve slidably mounted on the tube at one side of the shoulder thereof and provided at one end with a valve-disk working within the overflow-chamber and against one of the interior valve-seat shoulders, and at the end opposite said valve-disk with a piston-disk working within the delivery-chamber of the casing and against the other of said interior valve-seat shoulders, substantially as set forth.

4. In an injector, the combination of the casing having lifting and combining devices, a steam-inlet port at one end, an offset water-inlet chamber at the same end as said steam-inlet port, and a lateral water-inlet passage leading from said offset-chamber to the interior of the casing, a steam-jet nozzle fitted in one side of said water-inlet chamber in line with said water-inlet passage, a steam-chest supported at one end of the casing and provided in one side with separate steam-ports respectively communicating with one end of the casing and with said steam-jet nozzle, and a lever-controlled valve-stem mounted in said steam-chest and carrying separate valves respectively working over said separate steam-ports, substantially as set forth.

5. In an injector, the casing having lifting and combining devices, an offset water-inlet chamber at one end, and a water-inlet passage leading from said chamber to the interior of the casing, said chamber being provided in one side with a steam-passage, a steam-jet nozzle detachably fitted in one side of the water-inlet chamber in line with said water-passage and communicating with said steam-passage, a steam-chest supported at one end of the casing and provided with sep-

arate steam-ports respectively communicating with said steam-passage and with one end of the casing, and a pair of simultaneously-controlled valves arranged to work in said
5 steam-chest respectively over said separate steam-ports, substantially as set forth.

6. In an injector, the casing having lifting, combining and priming devices, a steam-chest supported at one end of the casing and provided with separate steam-ports respectively
10 communicating with the priming and the lifting and combining devices, a lever-controlled valve-stem mounted in the steam-chest, and a pair of valves slidably connected with said
15 stem and arranged to work in the steam-chest

respectively over said separate steam-ports, said valves being segmental in shape and one of the same being provided in its curved contact-face with a steam-cavity adapted to span the port over which said valve works when
20 the other valve is in a position to cover its port, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

GEORGE M. ROSS.

Witnesses:

HELEN M. WENDOVER,
S. J. WESTFALL.