(Model.)

P. SCHNEIDER, H. TRENKAMP & N. FLAMMANG.

INJECTOR.

No. 301,395. Patented July 1, 1884.

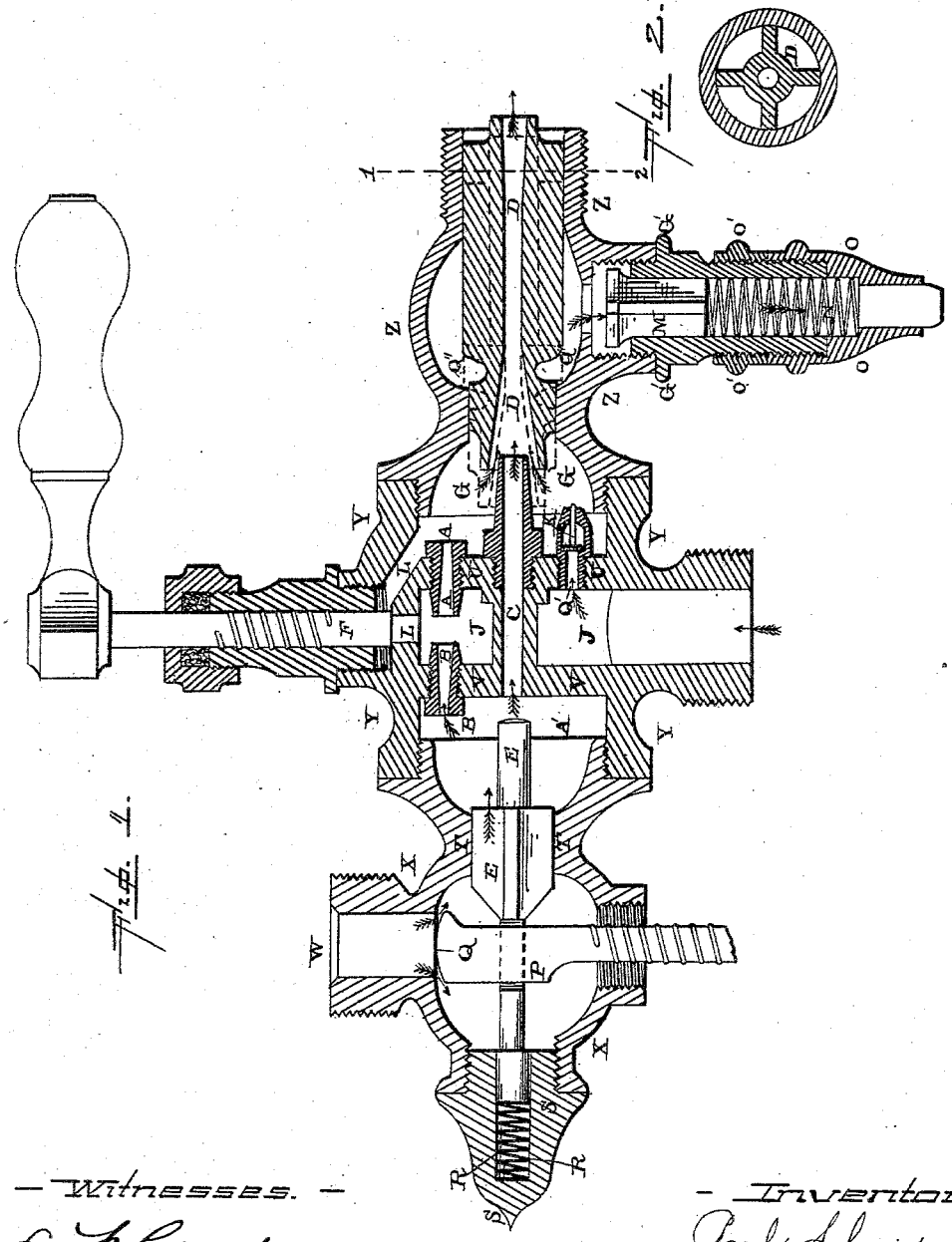

Fig. 1.

Fig. 2.

Witnesses.

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INJECTOR.

SPECIFICATION forming part of Letters Patent No. 301,395, dated July 1, 1884.

Application filed May 19, 1884. (Model.)

To all whom it may concern:

Be it known that we, PAUL SCHNEIDER, HENRY TRENKAMP, and NICOLAS FLAMMANG, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Injectors; and we 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 pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to an improvement in injectors; and it consists, first, in the combination of the steam-valve, which has its stem so formed as to operate a spring-actuated steam-valve, which controls the passage of the steam through the force-tubes, with the spring-valve; second, in the method of reducing the amount of water forced into the boiler by forming a return water way or passage, by means of which the water is drawn back into the lift-chamber, instead of being forced into the boiler; third, in the combination of the lift-chamber, a passage-way between the lift-chamber and the reservoir, and a valve for controlling the flow of water between the two; fourth, in the combination of the reservoir, the lifting-chamber, and the force-tubes with the relief-valve which is placed between the reservoir and the lifting-chamber; fifth, in a movable force-tube, which is forced backward from its seat to allow a free escape of the overflow, but which is drawn back to its seat when the water is being forced into the boiler; sixth, in the spring-supported automatically-closing stop check-valve for regulating the overflow, all of which will be more fully described hereinafter.

Figure 1 represents a longitudinal vertical section of an injector embodying our invention. Fig. 2 is a vertical cross-section of Fig. 1, taken on the line 1 2.

The body of the injector consists of three parts, X Y Z, which are united by means of screw-threads, as shown. To the part X is connected the steam-pipe at W, and the passage of the steam through this pipe is controlled by the plug-valve Q. The stem P of this valve Q is shaped as shown, for the purpose of operating the slotted steam-valve E. This valve E passes horizontally through the part X, and is held forced forward, when left free to move, by means of the coil-spring R, which is placed in the cap S. The inner end of this valve E is made in the form of a plug, and is intended to control the passage of the steam through the force-tube C. That portion of the valve E which passes through the contracted portion T of the part X is provided with ribs, so as not to interfere with the free passage of the steam at this point. The central portion, Y, of the body is provided with the two partitions U V, and through the center of both of these partitions is formed the force-tube C. Through each of the partitions, to one side of the force-tube C, are formed the two lift-tubes A B, through which steam is forced when the force-tube is closed, for the purpose of first lifting the water into the chamber J when getting the injector ready for use. These two lift-tubes A B are made removable, as shown, so that they can be removed and replaced by others at any time. Also, formed through the partition U is an opening, Q′, in which is placed a valve, K, which may be made spring-actuated or not, as may be preferred. This valve is for the purpose of allowing the water to pass through the lift-chamber J into the reservoir-chamber G, for the purpose of preventing a vacuum from being formed in the reservoir while the steam is passing through the force-tubes C D, for the purpose of forcing the water into the boiler.

Between the parts Y Z is formed the chamber G, which forms a reservoir, into which the water is first forced by the lifting-tubes A B. Passing horizontally through the part Z is the endwise-moving force-tube D, which is made ribbed along its sides, and which is provided with a seat, Q″, for the purpose of shutting off all of the flow of water around the sides of the part D. This force-tube D is forced endwise when the water is being forced into the reservoir G by the tubes A B, so as to allow the water to pass freely around the end of the tube D toward the overflow. When, however, the steam is being forced through the force-tubes C D, the force-tube D is drawn backward to its seat both by more or less of a suction from the reservoir G and by a pressure from the boiler. The overflow consists of the tube G′, in which is placed the valve M, which is held against its seat by spring N. The pressure of this spring N against the

valve is controlled by the thumb-nut O, which nut is held in the place to which it is adjusted by the jam-nut O'. By means of the thumb-nut the pressure of the spring N against the under side of the valve M is controlled at will. When the overflow does not overcome the pressure at which the valve M is adjusted, it flows freely around the valve.

When the steam is being forced through the force-tubes C D beyond a certain pressure, a vacuum is liable to be formed in the reservoir G, and this vacuum greatly interferes with the proper working of the injector. In order to prevent this, way Q' is made between the lifting-chamber J and the reservoir G, and this passage is controlled by means of the relief-valve K. When it is desired to regulate the amount of water which shall be fed to the boiler, the plug-valve F is opened to any desired extent, and then, in proportion to the extent that this valve is opened, a portion of the water which has been forced into the reservoir will pass through the passages L L back into the lift-chamber J again, instead of being forced into the boiler.

The operation of the injector is as follows: The valve F must first be closed. The valve Q is given a quarter-turn, which allows enough steam to pass into the chamber A' and to pass through the lift-tubes A B to raise the water into the lift-chamber J and force it into the reservoir G. This water passes around and between the flanges or ribs on the outside of the movable force-tube D, and forces it away from its seat. When the pressure of this water is sufficiently great to overcome the pressure of the spring-valve M, the overflow passes freely away. The quarter-turn which has been given to the valve Q does not affect the valve E which closes the force-tube C, and hence no water is being forced through the tubes C D, although the injector is lifting to its full capacity and discharging a cold overflow. When the water is to be forced into the boiler, the valve Q is given another quarter-turn, when the cam of the stem P forces the valve E backward against the pressure of the spring R, when the steam passes through the force-tubes C D, as well as through the small tubes A B. The forcible passage of the steam through the force-tube C into the tube D creates a vacuum in the reservoir G, and thus draws the movable tube D back, so as to shut off the cold or first overflow, and the water then passes through the tube D into the boiler. When the tube D is drawn endwise by the vacuum in the chamber G, all of the overflow is prevented around its inner end; but the overflow around the valve M continues, because the water can pass toward the overflow from the tube around the outer end. When the pressure exceeds from three to five pounds, the spring N allows the valve M to sink downward, and thus shut off all further flow of water around it. The water is then forced into the boiler at the full capacity of the machine. When it is desired to grade or reduce the quantity of water which is fed to the boiler, the valve F is opened, when the lifting-tubes A B will draw water from the reservoir G through the passages L L in proportion to the extent the valve F has been opened. By this means the supply to the boiler can be reduced fully one-half its full capacity. To meet and remedy the evils arising from varying steam-pressures, the relief-valve K is used. The variation in the steam-pressure causes the machine to discharge faster than the capacity of the lifting-tubes to supply, and especially when the machine happens to be working with the valve F partially open. This relief-valve opens automatically by water-pressure in the lifting-chamber J, and supplies any deficiency of the water in the reservoir G, and thus automatically adjusts all differences caused by varying steam-pressures between the lift and the force of any injector.

Having thus described our invention, we claim—

1. In an injector, the combination of the valve Q, provided with a suitably-shaped stem, with the spring-actuated valve E, the central force-tube, and the lifting-tubes, substantially as shown.

2. The method described of regulating the amount of water fed to the boiler, consisting in forcing a portion of the water from the reservoir located between the lifting-chamber and the overflow back into the lifting-chamber, substantially as described.

3. In an injector, the combination of the lift-tubes, the lift-chamber J, the reservoir G, water-passages between the reservoir and the lift-chamber, and the valve for controlling the flow of water through these passages, substantially as set forth.

4. In an injector, an endwise-movable force-tube, D, which is made to automatically cut off the overflow by the vacuum formed in the reservoir, substantially as shown.

5. In an injector, the combination of the force-tubes C D and a spring-actuated relief-valve, the tube D being made movable endwise, substantially as set forth.

6. In an injector, the combination of the steam-valves Q E, force-tubes C D, the tube D being made movable endwise, the lifting-tubes, the relief-valve, and the spring-actuated overflow-valve, substantially as described.

7. The combination of the lift-chamber J, the reservoir G, the force-tubes, the water-passages between the reservoir and the lift-chamber, and the valve for controlling these passages, substantially as shown.

In testimony whereof we affix our signatures in presence of two witnesses.

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HENRY TRENKAMP.
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Witnesses:
ERNST C. SCHWAU,
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