No. 714,096. Patented Nov. 18, 1902.

C. CAILLE.

APPARATUS FOR FORCING LIQUIDS ADAPTED FOR FEEDING STEAM BOILERS.

(Application filed Sept. 6, 1901.)

(No Model.)

Fig. 2.

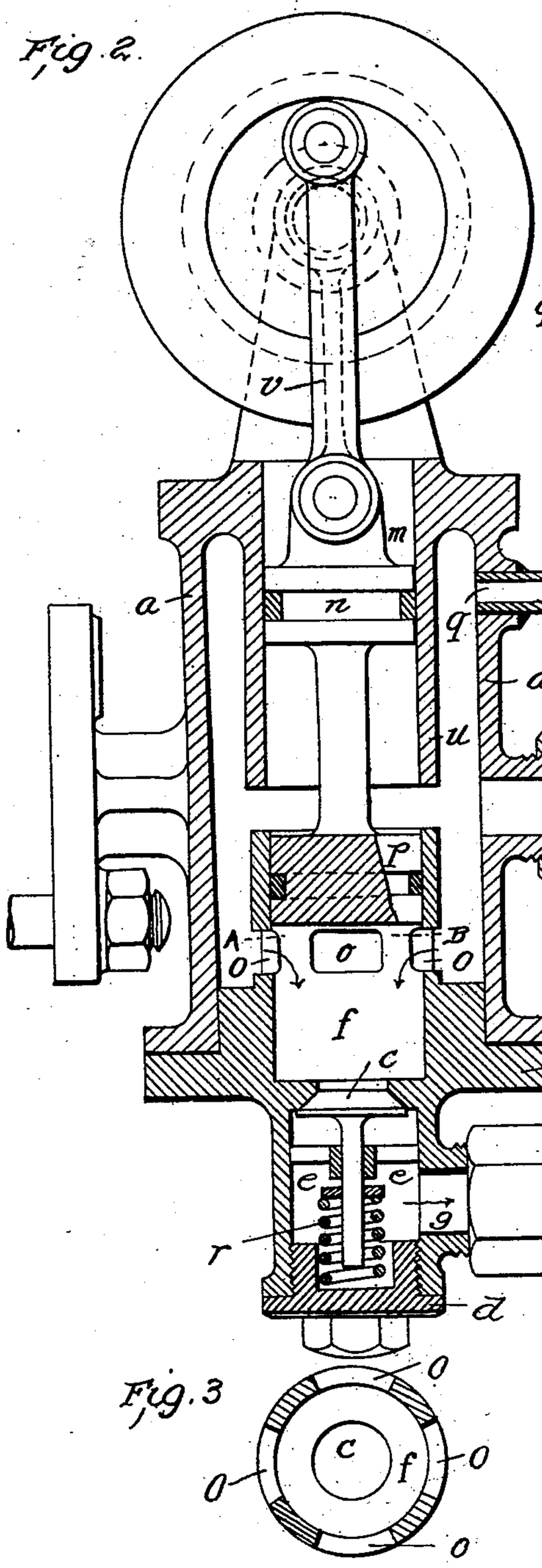

Fig. 1.

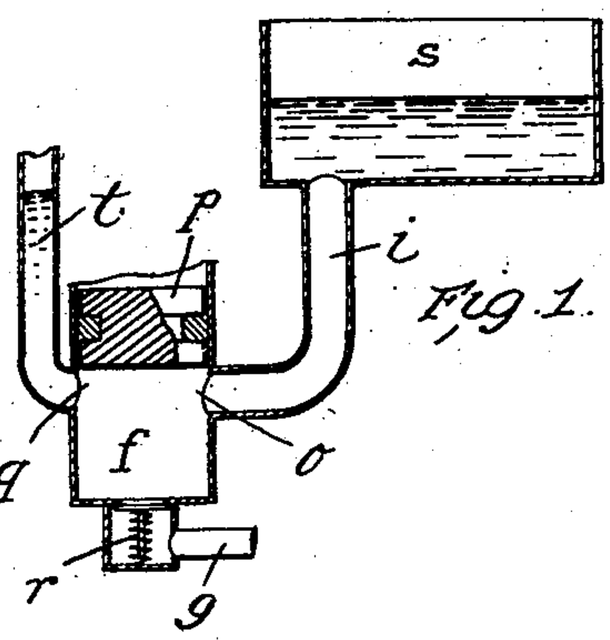

Fig. 3

Attest:

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UNITED STATES PATENT OFFICE.

CHARLES CAILLE, OF BRY-SUR-MARNE, FRANCE.

APPARATUS FOR FORCING LIQUIDS ADAPTED FOR FEEDING STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 714,096, dated November 18, 1902.

Application filed September 6, 1901. Serial No. 74,506. (No model.)

To all whom it may concern:

Be it known that I, CHARLES CAILLE, engineer, of 31 Rue de la Pépinière, Bry-sur-Marne, Seine, in the Republic of France, (whose post-office address is the same,) have invented certain new and useful Apparatus for Forcing Liquids Particularly Applicable for the Feeding of Steam-Generators; 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 invention which is the subject of the present demand for a patent refers to an apparatus for forcing liquids which is particularly applicable for the feeding of steam-generators.

The apparatus I have invented is suitable for the feeding of any receiver—such as a boiler, for example—whatever be the pressure in this latter or the temperature of the feed liquid.

Figure 1 is a diagrammatic view of the apparatus. Figs. 2 and 3 represent one method of construction. Fig. 2 is a sectional elevation through the axis, and Fig. 3 a horizontal section through A B of Fig. 2.

The apparatus consists in principle of a special pump-cylinder *f*, having at its lower end a pipe *g*, which communicates with the receiver to be fed and is provided with a non-return valve *c*. The cylinder of the pump (in which a piston *p* works and in which the filling is done automatically by means of simple descent through the pipe *i* and through the one or more orifices of admission *o* of a liquid subjected to a head due to that in the reservoir *s* during the upward or return stroke of the piston without suction by this latter) is characterized by a pipe *t*, open to the atmosphere and which is in communication with the cylinder of the pump during the time the inlet to the cylinder is open and the water is flowing into the same from the tank and in which also the communication with the cylinder is cut off as soon as the piston begins its working stroke and begins to force the water. This pipe is always full of water at the same level as in the reservoir *s* and opens into the atmosphere at a higher point than this level. The vapors which form in the cylinder of the pump *f* escape through this pipe *t* and condense in the water which it contains. The cylinder of the pump *f* can thus be completely filled with liquid at any temperature whatever.

If we take the piston in the position which it occupies in Fig. 1—that is to say, at the commencement of its working stroke—the liquid from the receiver *s* descends freely by its own weight into the cylinder of the pump *f* and entirely fills it. The air or the vapors escape from the liquid by difference of density and rise through an orifice *q* into the pipe *t*. When the piston *p* descends, it closes in its passage the orifices *o* and *q*, and immediately it has passed the lower edge of the orifices *o* it forces before it the liquid which has just accumulated automatically. The valve *c* opens and the fluid is forced through *g* into the receiver which is to be fed. When the piston ascends, the valve *c* closes under the action of a counteracting spring *r* and under the influence of the pressure in the receiver. Immediately the piston has returned to the position in Fig. 1 and as soon as it has uncovered the lower edge of the orifices *o* the automatic filling of the cylinder *f* occurs by simple descent of the liquid, following the principle of communicating vessels, without its being necessary for the pump to form a vacuum to insure this taking place. The air and vapors escape through pipe *t*, and the vapors condense in the water this contains. The apparatus thus works very systematically without any back pressure on the piston *p*, and the cylinder of the pump *f* is always entirely filled.

In practice the pipe *t* should be of much less diameter than that of the pipe *i* for the admission of the water to prevent any tendency of the air and vapors to escape through this latter and to insure that this escape should take place entirely and regularly through the pipe *t* being placed for that purpose, in order that water may flow into the cylinder of the pump without hindrance.

In the method of construction as represented in Figs. 2 and 3 the cylinder of the pump *f*, pierced with orifices *o* and provided at its lower end with a valve *c*, subject to the action of a spring *r*, carried in a plug *d*, is surmount-

ed by a cylinder *a*, secured upon the flange *b*. The pipe *i* for the admission of the feeding liquid opens into the cylinder *a* as well as the pipe *t*, through which the air and vapors escape from *f* and which opens for this purpose into the atmosphere at a higher level than that of the liquid in the feeding-reservoir *s*, which is not shown in these figures. A sleeve *u*, formed in one with the cylinder *a*, serves to guide the piston *p*. The piston-rod head immediately below its point of connection with the connecting-rod *v* has an expansion *n* formed in one with the piston and constituting a compensating piston. The head, properly speaking, of the piston is guided by a sleeve *u*, which is virtually a prolongation of the cylinder of the pump *f*. The compensating arrangement is to prevent during the strokes of the piston all oscillation in the pipes *i* and *t* as well as in the cylinder *a* itself. The cylinder *a*, as well as serving to guide the piston and to carry the pipes *i* and *t*, is at the same time a vessel full of water, which facilitates the filling of the cylinder *f*, which can thus be done more rapidly than by a simple admission-pipe.

The section and number of the orifices *o* can be increased if necessary.

I have said that the piston-rod head *n* constitutes a compensating arrangement for preventing the movements of oscillation in the pipes. For example, when the piston *p* descends it tends to produce by its lower portion suction in the pipes *i* and *t;* but the upper portion *n*, on the contrary, tends to produce an equivalent forcing action, since the surfaces of these two pistons are equal. The same effect of compensating is conversely produced when the pistons ascend.

The apparatus described can be used to compress or distribute water or any other liquid at any temperature into a receiver at any pressure—for example, for feeding boilers or to circulate cooling water in internal-combustion engines.

I claim—

1. An apparatus for forcing liquids comprising a cylinder and piston, a pressure-supply, means of communication between the said cylinder and pressure-supply comprising an inlet-pipe whereby the cylinder will fill automatically under the head of water during the upward or return stroke of the piston, a pipe also in communication with the interior of the cylinder for the escape of air therefrom during the filling operation, said pipe being arranged to communicate with the cylinder during the filling thereof and said communication being automatically cut off from said cylinder when the piston begins its working stroke, the said escape-pipe and inlet-pipe being independent and the said piston acting to cut off communication between the interior of said cylinder and the said pipes, substantially as described.

2. In combination, a cylinder *f*, a piston *p* working therein, a cylinder *a* surrounding the cylinder *f*, a sleeve *u* within the cylinder *a* and in line with the cylinder *f*, a piston *n* in the cylinder *u* working in unison with the piston *p* and connected therewith and pipes *t* and *i* connected with the cylinder *a*, the said pipe *i* supplying water under pressure to the cylinder *a* and the pipe *t* communicating with the cylinder *a* and with the atmosphere, said cylinder *a* communicating with the forcing-cylinder *f* through a port *o* in the latter and communicating also with the space in the sleeve *u*, the said pipes *i* and *t* being independent of each other and the said piston *p* acting to cut off the inlet of water to the forcing-cylinder and also communication between said cylinder and the escape-pipe *t*, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CHARLES CAILLE.

Witnesses:

EMILE BERT,

EDWARD P. MACLEAN,