A. SCHOLL.

APPARATUS FOR WITHDRAWING THE AIR FROM STEAM HEATING INSTALLATIONS.

APPLICATION FILED NOV. 29, 1907.

910,588. Patented Jan. 26, 1909.

Fig. 1.

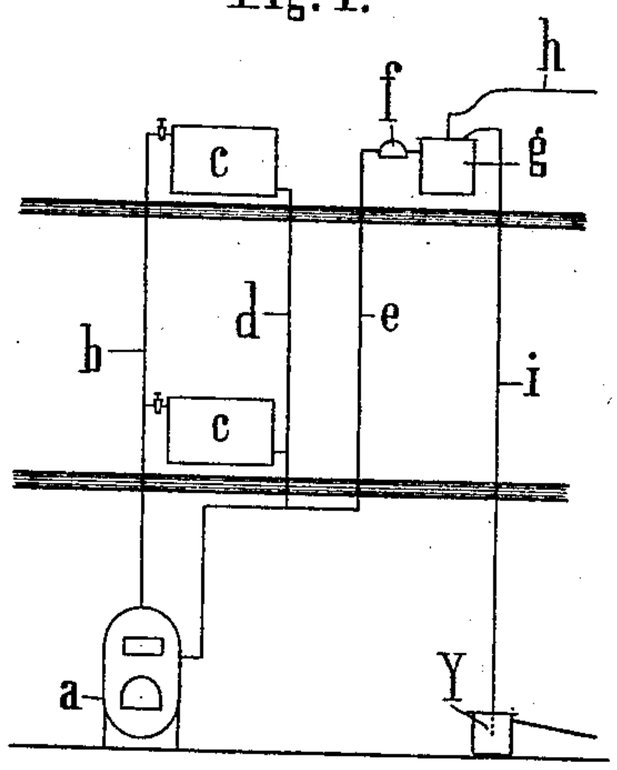


Fig. 2.

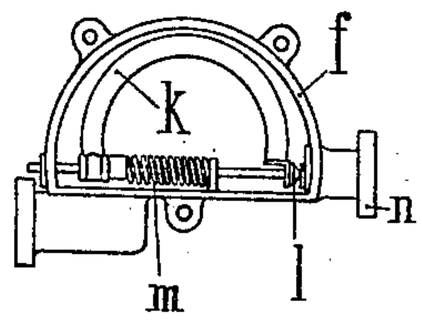
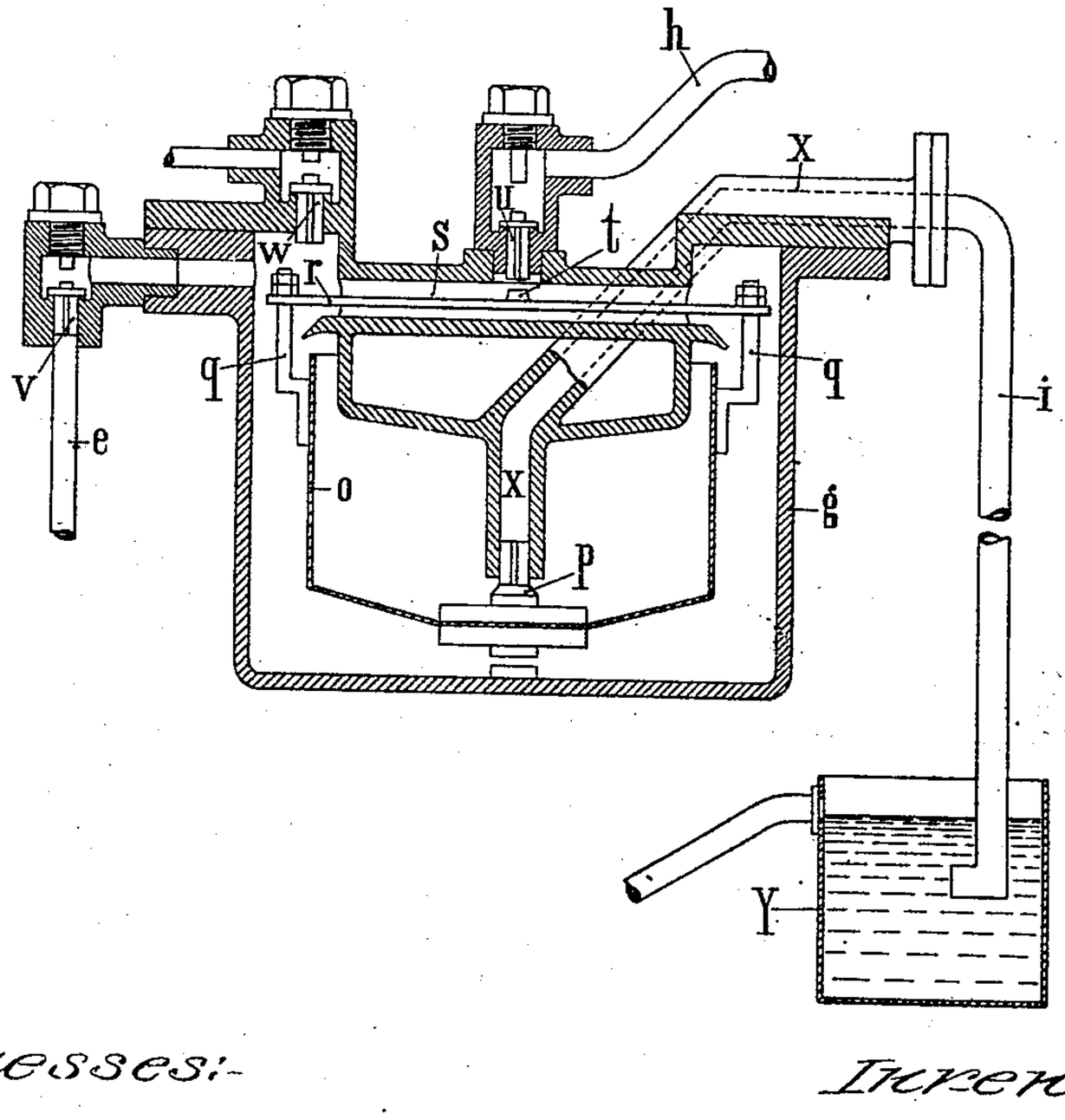


Fig. 3.



Witnesses:-

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APPARATUS FOR WITHDRAWING THE AIR FROM STEAM-HEATING INSTALLATIONS.

No. 910,588. Specification of Letters Patent. Patented Jan. 26, 1909.

Application filed November 29, 1907. Serial No. 404,407.

To all whom it may concern:

Be it known that I, ALBERT SCHOLL, a subject of the German Emperor, and residing at 3 Friedrich-Karlstrasse, Mannheim, in the Empire of Germany, have invented an Improved Apparatus for Withdrawing the Air from Steam-Heating Installations, of which the following is a specification.

In working steam heating installations having radiators, it is usual to withdraw the air therefrom for the purpose of obtaining a heating effect with the same low temperature of the radiators as in the case with hot water heating installations. This has been done hitherto by means of power driven air pumps.

Now according to this invention, the withdrawal of the air is effected automatically by means of apparatus worked by water under pressure. Such automatic apparatus are not only much cheaper as regards first cost and working than the air pumps above referred to, but also they do not require the constant attention necessitated by those.

For the purpose of preventing an apparatus of this kind from also withdrawing steam from the installation, a valve of any suitable known construction operated by a difference in temperature may be inserted in front of the apparatus.

In the accompanying drawings, Figure 1 illustrates diagrammatically a steam heating installation comprising a valve of the kind above referred to, and an automatic apparatus for withdrawing the air from said installation. Figs. 2 and 3 are vertical sections showing respectively by way of example, practical forms of the valve and the air-withdrawing apparatus.

In the steam heating installation shown in Fig. 1, *a* indicates the steam boiler, *b* the steam supply pipe, and *c* two radiators, *d* is the pipe for carrying off the water of condensation, *e* is the pipe for withdrawing the air; *f* is the valve; *g* is the apparatus for withdrawing the air; *h* is the pipe supplying water under pressure; and *i* is the waste water pipe.

The valve *f*, (Fig. 2) consists of a casing containing a small semicircular spring tube *k*, which is filled with a liquid of low boiling point. This tube is fixed at one end to the casing, and its other free end carries a plug valve, *l*. When steam enters the casing, the tube *k*, expands with the heat and thereby causes the valve, *l*, to close the outlet, *n*, of the casing. If however, instead of steam, air (which is colder) enters the casing, the tube, *k*, will contract and thereby allow the valve, *l*, to be drawn by the spring *m*, away from the outlet, *n*, which is thus opened.

The air-withdrawing apparatus comprises a cistern *g* (Fig. 3) containing an open topped float, *o*, which carries on its bottom a valve, *p*, and at the top by means of two arms *q*, a horizontal bar, *r*. This bar extends through a passage, *s*, in the cistern cover and is provided in its middle with a projection *t*, over which is situated an inlet valve, *u*, of the pressure water supply.

v is an air suction valve, and *w* is an air delivery valve.

e is the pipe (shown in Fig. 1) for withdrawing the air from the steam heating installation.

h is the pressure water supply pipe, and *i* is the waste water pipe.

x is a siphon tube cast in one piece with the cover of the cistern, *g;* it extends down to near the bottom of the float, *o*, where its lower end is formed as a seat for the valve, *p*. The pipe, *i*, is connected at its upper end to the siphon tube *x*, and it dips at its lower end in a water tank, *y*, wherein it is kept immersed always below the level of the water for the purpose of preventing the entrance of air. If the pressure of the air which is to be withdrawn is equal to, or less than the pressure of the atmosphere, the tank, *y*, must be situated on a lower level than the cistern *g*. But if the air pressure is greater than atmospheric pressure, then the tank *y*, may be situated on a higher level than the cistern, *g*.

The manner of operation of the improved apparatus is as follows;—It is assumed that the cistern, *g*, the float, *o*, the tube, *x*, the pipe, *i*, and the tank, *y*, are full of water. The float, *o*, and the valves, *p* and *u*, will then occupy the respective positions shown in Fig. 3. Air at atmospheric pressure is now to be withdrawn from the pipe, *e*. Since the tank, *y*, is on a lower level than the cistern, *g*, the water in the latter has a tendency to run off through the tube, *x*, and pipe, *i*, into the tank, *y*, and thus to suck in air through the valve, *v*, into the cistern, *g*. In the position of the float, *o*, as shown, there is left between the projection *t*, and the valve, *u*, a small space by means of which this valve can be kept down firmly upon its seat by the pressure of the water supply. But as soon as the water level inside the float, *o*, has fallen to

the point where its buoyancy is equal to its weight, the float will begin to rise and the projection, *t*, will come in contact with the valve, *u*. When the increasing buoyancy of the float is able to overcome the pressure acting to close the valve, *u*, the latter will open, and the outlet valve, *p*, will be closed. The water coming from the supply pipe, *h*, flows through the open valve, *u*, and through the passage *s*, into the annular space included between the cistern, *g*, and the float, *o*, (in which space the water level had sunk by reason of the ascent of the float) and thence into the interior of the float. In so doing the water fills first the space between the cistern and the float, and thereby increases the buoyancy of the float, *o*, and consequently also increases the force required for reversing the action of the apparatus. At the same time the air contained in the cistern, *g*, is compressed, and, when it has acquired the requisite pressure it opens and escapes through the valve, *w*, into the air escape pipe connected thereto.

At the commencement of the compression the valve *p*, is pressed against its seat by the buoyancy of the float, *o*. With increasing compression the buoyancy is replaced by the difference between the pressure of the atmosphere and the pressure in the cistern, *g*. The moment when so much water has entered the float, *o*, as will render the buoyancy of the latter equal to its weight, the weight of the float will begin to act in opposition to the difference between the pressure in the cistern *g*, and that of the atmosphere. Shortly before the float, *o*, becomes full of water and its buoyancy attains its minimum, the weight of the float will overcome the difference between the pressure in the cistern, *g*, and that of the atmosphere, and will open the valve, *p*, while the valve, *u*, will be closed by the pressure of the water supply. As the float, *o*, descends, the liquid which is displaced from the lower space between the cistern and the float, will flow over the upper edge of the float into the latter, and thereby further diminish the buoyancy of the float and increase the downwardly directed force acting to reverse the operation of the apparatus. The inflowing water will flow out through the tube, *x*, and the pipe, *i*, into the tank, *y*, whereupon the air which it is desired to withdraw, is now again able to pass through the valve, *v*, into the cistern, *g*, and the hereinbefore described sequence of operations will commence anew.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A hydraulic air exhauster comprising in combination, a casing provided with an air inlet and a non-return valve therefor and an air outlet provided with a non-return valve, an inlet for said casing communicating with a source of supply of liquid under pressure, a non-return valve for said liquid inlet, a siphon having one limb extending into said casing, a float in said casing into which said siphon limb projects, a valve for said float controlling said siphon, and an actuating member for said float controlling the non-return valve of said liquid inlet.

2. A hydraulic air exhauster for steam heating system comprising a casing provided with a non-return valve connection with the heating system, a non-return valve air outlet for said casing, a non-return valve inlet for said casing connected with a source of supply of liquid under pressure, a float for said casing provided with an actuating member for operating said liquid inlet valve, and a siphon having one limb projecting into said float, said float being provided with a valve controlling said siphon, and means controlling said exhauster to prevent the exhaust of steam from said system.

3. A hydraulic air exhauster for steam heating system comprising in combination, a casing provided with a valve connection with the heating system, an air outlet for said casing provided with a valve, a valve pressure liquid inlet for said casing, a float for said casing provided with an actuating member adapted to coöperate with the valve of said pressure liquid inlet, means acting normally to withdraw the contents from said float, said float being provided with a device for controlling said means, means associated with the heating system and said exhauster for preventing the latter from exhausting steam from said system.

4. An apparatus of the class described comprising in combination, a steam heating system, a hydraulic air exhauster for exhausting air from said system and including a liquid pressure supply, a withdrawing siphon, and a float controlling said liquid supply and siphon, and means associated with said system and exhauster and controlled by the temperature of the system and automatically starting and arresting the exhauster.

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

ALBERT SCHOLL.

Witnesses:

TERESA CATTURANI,

JOS. H. LEUTE.