J. A. HICKS.

AIR CONTROL STEAM VALVE.

APPLICATION FILED SEPT. 15, 1908.

936,535. Patented Oct. 12, 1909.

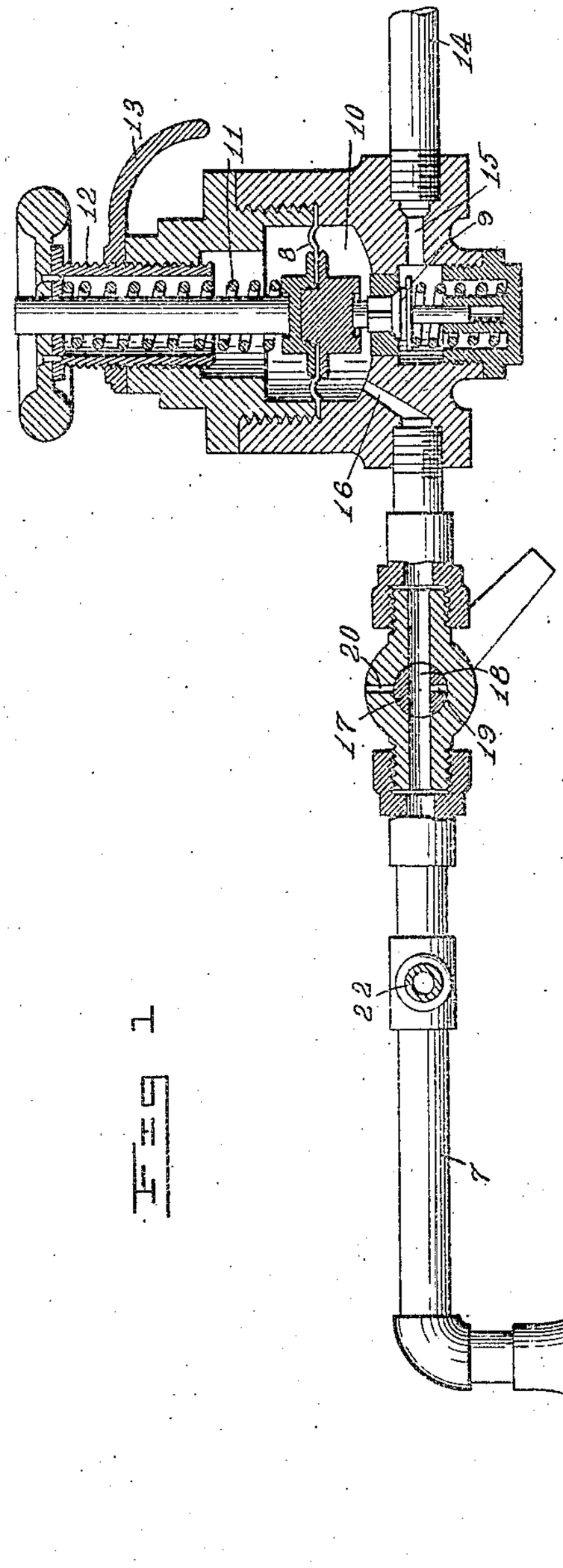


Fig 1.

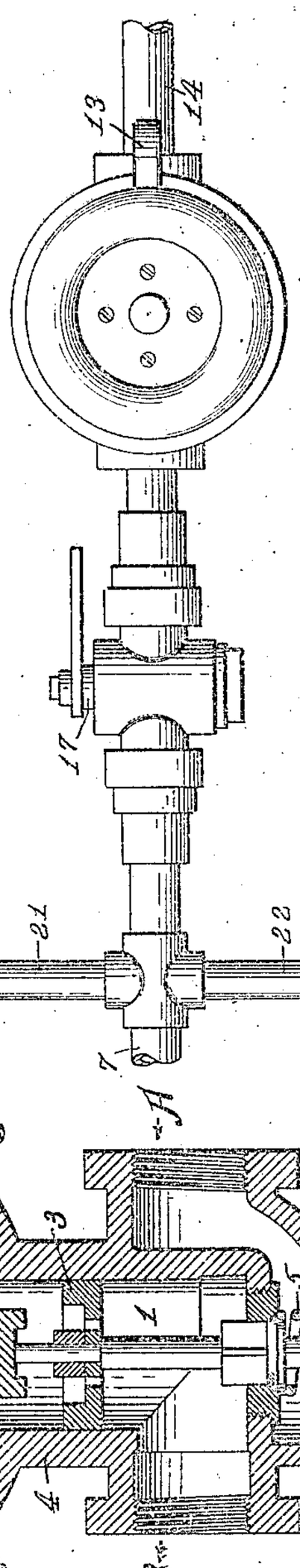


Fig 2.

Witnesses

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## AIR-CONTROL STEAM-VALVE.

936,535.

Specification of Letters Patent. Patented Oct. 12, 1909.

Application filed September 15, 1908. Serial No. 453,165.

*To all whom it may concern:*

Be it known that I, JAMES A. HICKS, citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Air-Control Steam-Valves, of which the following is a specification.

The present invention relates to fluid pressure controlling apparatus and in its present application is shown as adapted to steam heating appliances, particularly those used in connection with steam heating systems for railroad cars, although obviously not of necessity confined to that particular use as it may be adapted to other heating demands, and to other apparatus where an automatic and effective control of fluid pressure is desired.

Briefly stated, my invention in its present expression discloses the automatic control of the steam valve of a heating system, this automatic control being effected by air pressure, preferably derived from the train line, so that, as long as air pressure is maintained, although not necessarily confined to this source, as the air pressure might come from any suitable source, the steam valve will be kept in open position, but should the air pressure fall for any reason, as for example, by breaking of train line or other source of air-pressure, due to accident or other abnormal conditions, the steam valve will automatically close and all danger of filling the cars with scalding steam from the radiating system will be eliminated.

Furthermore, my system of air pressure control is of such construction as to permit a very close and accurate regulation of the amount of steam delivered to the radiating system from the boiler; this regulation of steam pressure, after such pressure has been once determined, being automatically controlled by the apparatus.

Another feature of the system is the provision of a manual valve controlling the air-pressure for the automatic steam valve, so that such steam valve may, if desired, be cut off from air-pressure.

In order that the invention may be understood by those skilled in the art, I have illustrated in the drawings herewith, one embodiment of my invention, and in said drawings; Figure 1 is a view, partly in section, of my invention. Fig. 2 is a plan view of the governor to illustrate the pipe connections.

Referring to the drawings by numerals and letters, like characters indicating like parts in the several views, 1 denotes the steam valve, which seats upon a suitable valve-seat in the valve-casing, which casing communicates on one side of the valve with the radiating system of the train and on the other side of the valve with the boiler, the inlet side of the valve casing being at A and the outlet side at B as clearly shown in Fig. 1 of the drawings. This valve casing is surmounted by a diaphragm chamber which communicates with said valve casing and in which is placed a diaphragm 2, which bears loosely upon the stem of the valve 1, said valve stem carrying a perforated collar or spider 3 which moves with a sliding fit in the neck 4 of the valve casing, so as to steady the movements of the valve. Beneath the valve 1 a light spring 5 is preferably placed, surrounding the tail of the valve, and of sufficient power to counter-balance and elevate the valve, and hold it normally against its seat, although such spring is not absolutely essential, as the valve 1 will operate under the varying and opposed pressures without this spring.

The upper part of the diaphragm chamber, above the diaphragm 2, is connected by means of a passage 6, and pipe 7, with an air-governor, which is coupled into the train line or the signal line, said governor comprising an outlet-pressure-controlled diaphragm 8, which bears against the stem of an air-inlet check valve 9, which controls the port leading to the chamber 10 beneath the diaphragm. The said diaphragm 8 is normally forced downwardly in position to open the check valve 9, by means of a spring 11 surrounding the diaphragm stem and compressed between the head of the diaphragm 8 and an abutment formed by an adjustable sleeve 12, preferably screw-threaded into the top of the air governor casing, and the tension of the spring 11 may be varied by turning the sleeve 12 down or up, so as to exert greater or less force, as the case may be, upon the diaphragm 8;

a suitable lock nut 13 being provided by means of which the sleeve 12, after adjustment, may be locked in position. The said governor is provided with a pipe 14 which forms a connection with the train line or other source of air pressure, and from pipe 14 air pressure is led by a passage 15 to the port controlled by the spring check valve 9, which delivers to the chamber 10 beneath the diaphragm 8, and thence by passage 16, pipe 7, and passage 6, to the chamber above the diaphragm 2. With this construction it will be seen that the pressure upon the diaphragm 2 may be varied by means of the automatic regulating diaphragm 8, so as to exert any desired number of pounds, from zero to maximum, upon the upper side of the diaphragm 2. It will be obvious that the diaphragm 2 being open on the one side to air pressure and on the other side to steam pressure, will be balanced or equalized between these two pressures and that the steam valve 1, will be correspondingly controlled. For example, if the automatic air governor be set at 5 pounds, the train line will give up 5 pounds pressure, and this, exerted upon the diaphragm 1, will force said diaphragm downwardly and open up the steam valve 1 until the steam pressure passing said valve 1 from the boiler to the train heating system equalizes diaphragm pressure, and so long as the air pressure is maintained on the diaphragm 2, the steam pressure in the radiating system will be accurately controlled and regulated. Should the pressure above the diaphragm 2 be reduced for any reason, either accidentally or intentionally, the steam valve 1 will at once close under steam pressure, and steam shut off from the radiating system of the train.

It will be seen that the operation of this controlling device for the heating medium is dependent upon the train line pressure or signal line pressure (for it may be connected with either line) being maintained, and that the moment the train line is reduced or destroyed by breaking the pipe connection on either side of the air governor, the automatic operation of the steam valve is effected.

I am aware that it has been proposed to control a diaphragm-operated steam valve from a source of air pressure, and I am aware also that it has been proposed to operate a steam valve by the opposed actions of train line pressure and a spring, but so far as I am aware I am the first to disclose a regulating valve which is balanced by opposed steam and air pressures with the air pressure supply under the control of an air governor, whereby a constant direct air pressure is exerted on the diaphragm in opposition to the steam pressure, and with the elements so combined and arranged as that failure of the air supply will instantly relieve pressure on the other side of the diaphragm and effect the closing of the steam valve under the opposing steam pressure.

This construction gives a balanced condition and absolutely automatic action of the valve without the intervention of any intermediate devices to effect the operation of the valve, so that the action of the regulator is uniform under working conditions and direct and instantaneous upon failure of air pressure.

In the passage 7, between the pressure governor and the automatic valve, I place a cut-out and bleeder 17, which has a through passage 18 which is normally open, as shown in full lines, and a bleeder passage 9, which, when the cut-out is turned to block the passage 7, will open the chamber above diaphragm 2 to atmosphere through port 20 and relieve pressure. By the use of this cut-out and bleeder 17 I secure a manual control of the valve 1, for air pressure may be manually intermitted on the diaphragm 2 by turning the bleeder valve 17 to release position, the valve 17 when in this position relieving pressure above diaphragm 2, which will then be lifted by steam pressure on the outlet side of the valve 1, and said valve 1 will close, cutting off the flow of steam from the inlet side. At the same time the air pressure coming from the governor will be cut off by the valve 17 so that air pressure in the train line or other source of pressure will not bleed away. Preferably the usual gage and pop-valve connections 21 and 22 will be provided in the passage 7, as conventionally indicated.

In order that the water of condensation may be automatically cared for, I place in the cap nut 23 a valve 24 normally upheld by a spring 25, so as to be open and permit the water cupped below valve 1 to bleed away through passages 26 in the skirt 27 and passages 28 below the valve. It will be seen that by providing this valve 24 on the inlet side of the steam valve 1 all water of condensation will be effectively drained from the valve casing, and at the same time the valve 24 is so disposed relative to the steam passages that steam pressure cannot escape by way of such bleeder valve, for the construction gives a valve which is absolutely free from water or mud pockets so that sediment from impure water and steam supply are effectively cared for and no fouling of the apparatus can occur. The said valve 24 is so placed with respect to the steam valve 1 that when the steam valve opens the drainage valve 24 is seated by the thrust of the stem 29.

While I have shown a particular embodiment of my invention, it will be understood that the construction may be widely varied without departing from the principles in-

volved, and I do not, therefore, limit myself to the details shown and described, except so far as I am limited by the prior art to which this invention belongs.

Having fully disclosed my invention, I claim:

1. Pressure controlling apparatus comprising, in combination, a steam valve casing, an automatic controlling valve in said casing, a source of air pressure, a pressure motor subject on one side to steam pressure in said casing to effect closing of said controller valve, a pressure connection from said source of air pressure delivering to the other side of said pressure motor and normally exerting a constant valve-opening pressure thereon, and a pressure governor in said air pressure connection; the parts being so disposed that breaking of said pressure connection on either side of said pressure governor will relieve air pressure on said motor and permit said controlling valve to close under steam pressure.

2. Pressure controlling apparatus, comprising, in combination, a steam valve casing, an automatic controlling-valve in said casing, a fluid pressure pipe, a valve-operating diaphragm subject on one side to steam pressure to effect closing of said controlling valve, an air pressure connection from said fluid pressure pipe to the other side of said diaphragm to normally exert a constant valve-opening pressure thereon, an air governor in said air pressure connection, and manually operable means in said pressure connection to release air pressure on said diaphragm and maintain pressure in said pressure connection and fluid pressure pipe.

3. Pressure regulating apparatus comprising, in combination, a valve casing having steam inlet and outlet ports, a valve seat the upper surface of which is substantially in line with the outlet port to eliminate water pockets on the outlet side of the valve seat, an automatic controlling-valve on said seat, a source of air pressure, a valve-operating motor subject on one side to steam pressure to permit said controlling valve to close, and on the other side to valve-opening air pressure, and a valve-controlled drainage chamber on the inlet side of said valve seat.

4. Pressure regulating apparatus, comprising, in combination, a steam valve casing, an automatic controlling valve in said casing, a source of air pressure, a valve-operating diaphragm subject on its underside to steam pressure and on the other side to air pressure, and a drainage valve on the inlet side of said steam valve which is closed when said steam valve is opened.

5. Pressure controlling apparatus comprising, in combination, a steam valve casing, an automatic controlling valve in said casing, a source of air pressure, a valve-operating diaphragm subject on one side to steam pressure and on the other side to air pressure, a normally open drainage valve on the inlet side of said steam valve, and connections between said steam valve and said drainage valve which operate to close said drainage valve when the steam valve is opened.

6. Pressure controlling apparatus comprising, in combination, a steam valve casing, an automatic controlling valve in said casing, a source of air pressure, a valve-operating diaphragm subject on one side to steam pressure and on the other side to air pressure, a chambered drainage cap below said steam valve, a normally open drainage valve in said cap, and a valve stem extending from said steam valve and bearing against said drainage valve to close the drainage valve when said steam valve is opened.

7. Pressure controlling apparatus comprising, in combination, a train line pipe, a steam valve casing, a controlling valve in said casing, valve-operating means located above said valve to prevent drainage thereto and subject to steam pressure from the outlet side of said valve casing to effect closing of said controlling valve, and a train line pressure connection normally delivering a constant valve-opening pressure to the opposite side of said valve-operating means.

8. Pressure controlling apparatus comprising, in combination, a train line pipe, a steam valve casing, a controlling valve in said casing, a diaphragm chamber above said controlling valve in open communication with said valve casing on the outlet side of said valve, a diaphragm in such chamber subject on its under side to steam-outlet-pressure from said valve casing to effect closing of said controlling valve, a train line pressure connection normally exerting a constant valve-opening pressure against the other side of said diaphragm, and an air governor in said connection between said diaphragm and train line.

9. Pressure regulating apparatus comprising, in combination, a steam valve casing having inlet and outlet ports, a valve in said casing, a diaphragm chamber open to said valve casing on the outlet side of the valve, a diaphragm in said chamber subject to steam-outlet-pressure on one side to effect closing of said controlling valve, a source of air pressure, an air pressure connection delivering valve-opening pressure to the other side of said diaphragm, and an air governor in said connection which automatically relieves said diaphragm upon failure of air pressure in said connection.

10. Pressure regulating apparatus comprising, in combination, a steam valve casing having inlet and outlet ports, a valve in said casing, a source of air pressure; and

valve-operating means comprising a diaphragm subject on one side to steam-outlet-pressure to effect closing of said controlling valve, an air pressure connection normally exerting a constant valve-opening pressure on the other side of said diaphragm, and an air governor to automatically maintain a constant pressure on said valve-regulating means under normal conditions and automatically operable to relieve pressure on said regulating means upon failure of air supply in said connection.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES A. HICKS.

Witnesses:
F. H. HILL,
R. S. OFFUTT.