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MEANS FOR OBVIATING THE VIBRATIONS OF MAIN PRESSURE ACTUATED VALVES.

APPLICATION FILED SEPT. 15, 1909.

1,046,236.

Patented Dec. 3, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

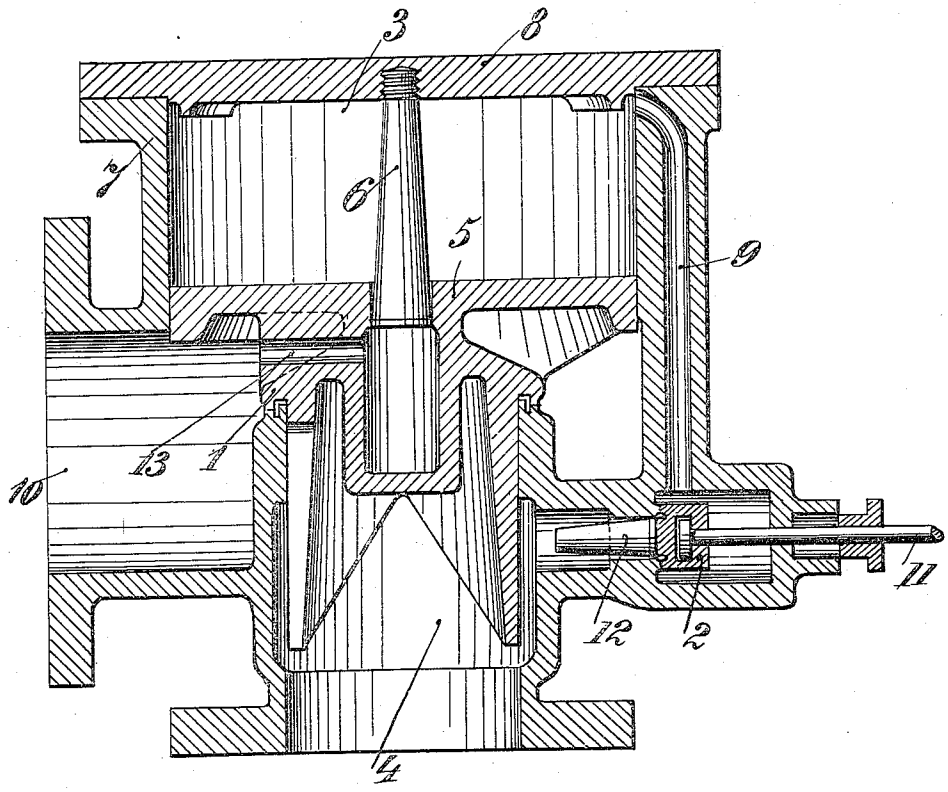

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Fig. 2.

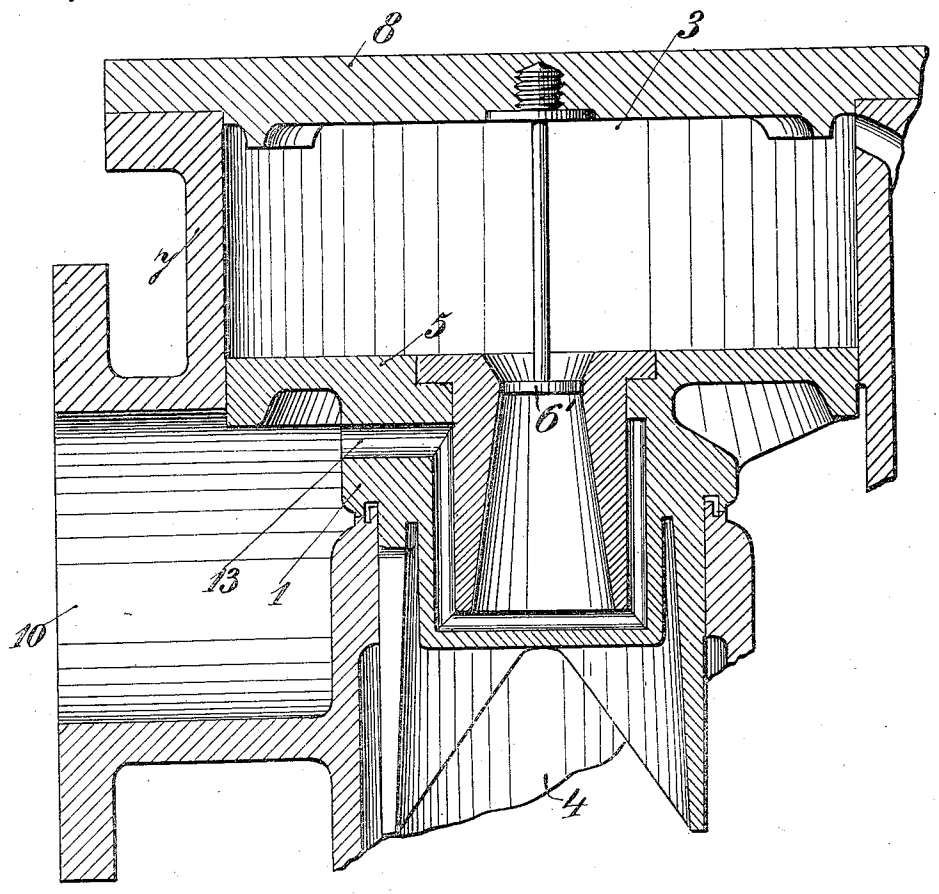

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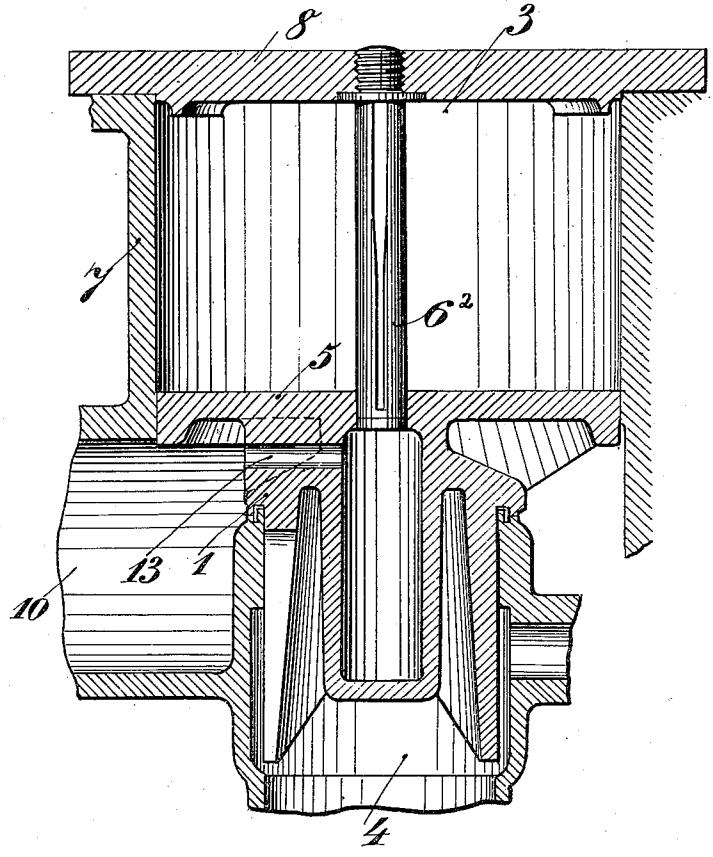
Fig. 3



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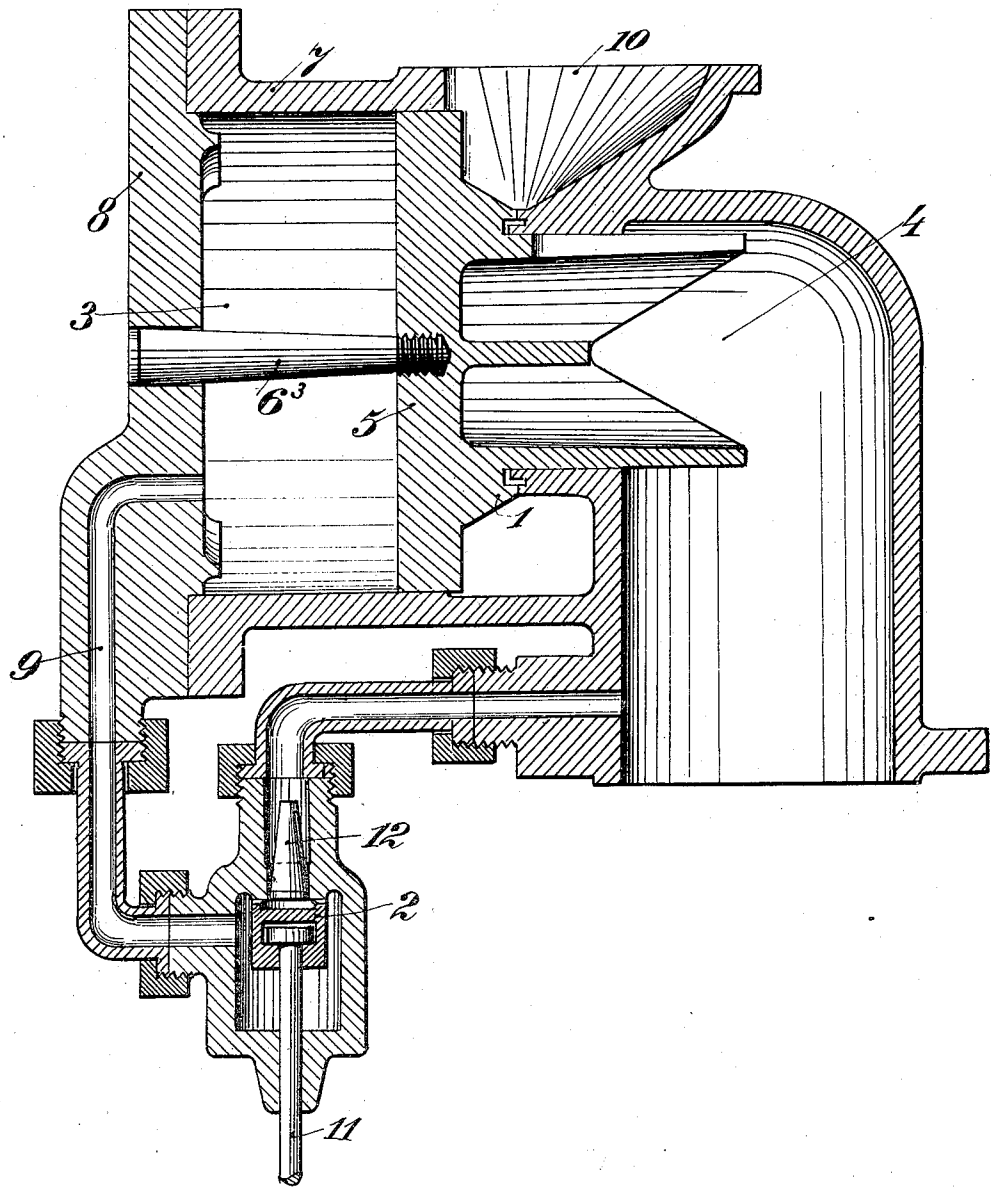
4 SHEETS—SHEET 4.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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MEANS FOR OBVIATING THE VIBRATIONS OF MAIN PRESSURE-ACTUATED VALVES.

1,046,236. Specification of Letters Patent. Patented Dec. 3, 1912.

Application filed September 15, 1909. Serial No. 517,923.

To all whom it may concern:

Be it known that I, FRITZ WAGNER, a subject of the German Emperor, and resident of 20 Ferdinandstrasse, Gross-Lichterfelde, near Berlin, Germany, have invented certain new and useful Improvements in Means for Obviating the Vibrations of Main Pressure-Actuated Valves, of which the following is a specification.

In my United States Patent application Serial No. 459665, filed Oct. 26, 1908, means have been described, which obviate the vibrations of valves actuated by pressure-fluid. In these valves, the main valve is provided with a piston, which, in conjunction with the casing, forms a special chamber, called equilibrium chamber, which latter is filled with pressure fluid by the pressure generating chamber through an invariable opening. In the connection from the equilibrium chamber to the outlet side of the main valve, an auxiliary valve has been arranged, which is in constant communication with a throttling member of gradually increasing opening section. If, in valves of this class, the auxiliary valve be removed from its seat, the throttling member, which is moved simultaneously therewith, will produce a gradually increasing opening for the passage of pressure-fluid from the equilibrium-chamber to the outlet side of the main valve. If then, the quantity of pressure-fluid, flowing from the equilibrium chamber into the outlet side of the main valve be greater than that flowing from the pressure generating chamber into the equilibrium chamber, the excess pressure, which has thereby been produced on the other side of the piston, will open the main valve. The latter is opened under the action of the excess pressure, until the inflow and outflow from the equilibrium chamber are the same in consequence of the gradual throttling produced simultaneously during said movement on the outflow from the equilibrium chamber. Every additional movement of the auxiliary valve will naturally produce a new disturbance of the equilibrium of the forces acting on the main valve, and according to the direction of this movement the main valve will be closed or opened, until, in cooperation with the throttling member, it has again made the outflow from the equilibrium chamber equivalent to the inflow and has thereby reëstablished the equilibrium.

The present invention relates likewise to means for obviating the oscillations of valves of the same class. Thus, a disturbance of the equilibrium of forces acting on the main valve will here likewise produce a movement of the main-valve in the opening or closing direction, which continues until the forces are balanced. While in the former means, the disturbance and the consequent reëstablishment of the equilibrium of the forces acting on the main valve, have been effected by a throttling member, which was connected with the auxiliary valve and moved simultaneously therewith, the present invention provides a second throttling member arranged separately from the auxiliary valve fitted between the equilibrium chamber and the outlet side of the main valve. Thus, a movement of the auxiliary valve does not result in a simultaneous and equally great movement of the second throttling member; nor does this throttling member project into the room underneath the main valve, but is so arranged that it in conjunction with the main valve regulates the inflow from the generating chamber into the equilibrium chamber. If, according to the present invention, a disturbance of the equilibrium has been produced between the forces acting on the main valve by the opening of the auxiliary valve and the resulting more or less large communication between the equilibrium chamber and the outlet side of the main valve, the main valve will be opened, until, in coöperation with the second throttling member, it has reëstablished the equilibrium by making the inflow into the equilibrium chamber equal to the outflow permitted by the auxiliary valve. The corresponding opening degree of the main valve according to the present invention is, therefore, no longer equivalent to the movement, requisite to make the outflow from the equilibrium chamber equal to the inflow, but it is equivalent to the movement, which is required to make the inflow into the equilibrium chamber equal to the outflow permitted by the auxiliary valve.

The invention is illustrated in the accompanying drawings, which show several forms of construction by way of example.

Figure 1 is a vertical section of a valve having a slightly tapered plug arranged on the cover of the equilibrium chamber. Fig. 2 shows a vertical section of a valve according to this invention with a tapering throt-

tling passage in the main valve piston. Fig. 3 is a vertical section of a valve fitted with a sliding throttle. Fig. 4 is a vertical section of a valve showing the arrangement of the slightly tapered plug on the main valve piston.

Referring to Fig. 1, the casing 7 contains the main valve 1, the piston 5 of which, in connection with the casing, forms the equilibrium chamber 3. An auxiliary valve 2, which is provided with a slow tapering plug 12, so as to insure a better regulation of the outflow from the chamber 3, but which may also be replaced for example by a cock or any thing else, is arranged in the pipe 9 connecting the equilibrium chamber 3 with the outlet side 4 of the main valve or the atmosphere. The throttling member 6 in the cover 8 of the casing has the shape of a slightly tapered plug and is so fixed as to project with its larger end into a cylindrical bore of the piston 5, which bore connects the generating chamber 10 with the equilibrium chamber 3 by means of the channel 13. Owing to the leakiness between the piston and the casing and the cone, the pressure existing in the chamber 3 is the same as in the generating chamber 10, as long as the auxiliary valve remains closed. However, if the auxiliary valve 2 is opened by means of the spindle 11, the pressure existing in the chamber 3 will sink, so that on the lower side of the piston an excess pressure will result, which, on sufficiently opening the auxiliary valve, will lift the main valve from its seat. As soon as this takes place, the pressure-fluid will, naturally, act on the surface of the main valve, which was previously closed, and drive the same upward with a force corresponding to this surface-pressure. The farther the main valve is opened, however, the greater will be the clearance between the main valve and the tapered plug 6 and the more pressure-fluid will flow from the chamber 10 into the chamber 3. Moreover, as the pressure-fluid, which has existed in the chamber 3, is being compressed in proportion to the stroke of the main valve, it is clear that the movement of the main valve will produce a counter-pressure in the equilibrium chamber, which will increase gradually and finally stop the movement of the main valve. The latter has then moved into a position with regard to the tapered-plug 6 that the resulting inflow into the chamber 3 is equivalent to the outflow caused by the auxiliary valve. The main valve will remain in this position of equilibrium, as long as the position of the auxiliary valve remains unaltered. However, if the auxiliary valve is still farther opened or closed, the main valve will follow this movement and will be opened or closed until the inflow into the equilibrium chamber has become equivalent to its outflow. In order to obtain these results, a cylinder 6′ projecting into the conical bore of the main valve, as is illustrated by Fig. 2, may also be used as a throttling member, instead of a slow tapering plug. Fig. 3 gives an example that a slide-valve 6^2 may likewise be used. The latter regulates the passage of the pressure fluid into the chamber 3 during the movement of the main valve in the same manner as the slow tapering plug according to the foregoing description.

Fig. 4 gives an illustration of the invention for valves of this class, arranged in the steam chamber of the boiler itself, as for instance in the case of the locomotive-regulator, and in which the slow tapering plug 6^3 may be fixed in the main valve and project with its larger end into a bore in the cover of the casing.

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

1. In a main valve, the combination of a valve-casing, a main-piston valve, an equilibrium chamber formed between said piston and casing, an inlet-passage from the pressure-generating space to said equilibrium chamber, an auxiliary valve extraneous of said main valve, a throttling member connected with said auxiliary valve and adapted to insure a gradual alteration of the outlet opening of said equilibrium chamber, and a second throttling member arranged in said equilibrium chamber and extending into said inlet-passage and adapted to gradually equalize in co-action with said main valve, the inflow into said equilibrium chamber to the outflow therefrom controlled by the first said throttling member, substantially as set forth.

2. In a valve, the combination of a valve-casing, a main piston-valve, an equilibrium chamber formed by said main piston-valve and said casing, an inlet-passage from the pressure generating space to said equilibrium chamber, an auxiliary valve extraneous of said main valve, a slow tapering cone connected with said auxiliary valve and adapted for gradual alteration of the outlet opening of said equilibrium chamber, and a throttling member arranged in said equilibrium chamber and extending into said inlet-passage and adapted to gradually equalize in co-action with said main valve the inflow into said equilibrium chamber to the outflow therefrom controlled by said slow-tapering cone, substantially as set forth.

3. In a main valve, the combination of a valve-casing, a main-piston valve, an equilibrium chamber formed between said piston and casing, an inlet-passage from the pressure-generating space to said equilibrium chamber, a conduit leading from the latter to the outflow-space beyond the main-valve, an auxiliary valve arranged

in said conduit, a throttling member connected with said auxiliary valve and adapted to insure a gradual alteration of the outlet opening of said equilibrium chamber, and a second throttling member arranged in said equilibrium chamber and extending into said inlet-passage and adapted to gradually equalize in co-action with said main-valve, the inflow into said equilibrium chamber to the outflow therefrom controlled by the first said throttling member, substantially as set forth.

In testimony whereof I have hereunto signed my name this 4th day of September 1909, in the presence of two subscribing witnesses.

FRITZ WAGNER.

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.