May 17, 1927. 1,629,043

H. MOREAU

APPARATUS FOR CENTRAL HEATING

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Fig.1.

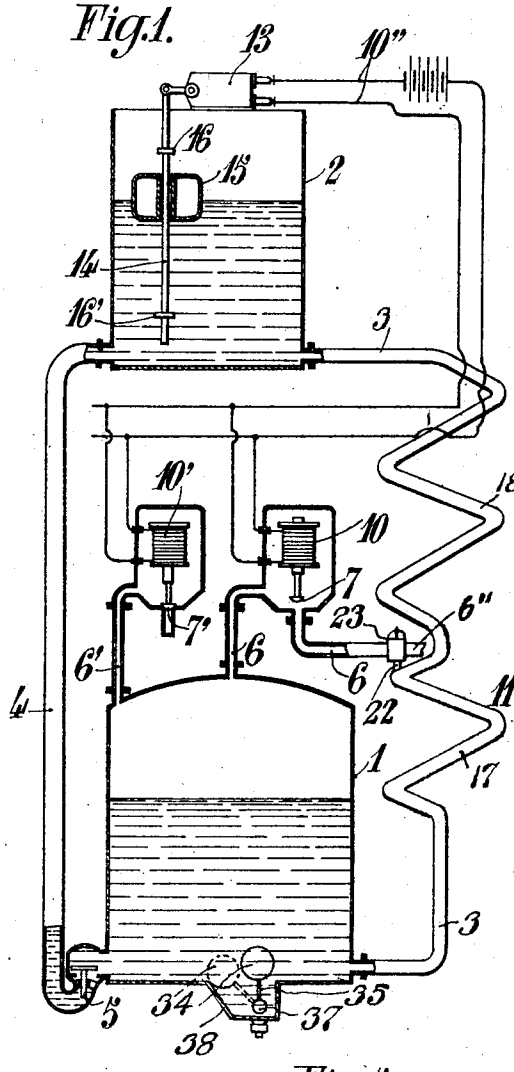


Fig.2.

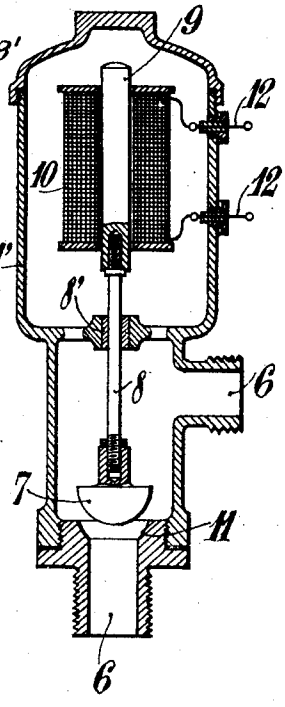
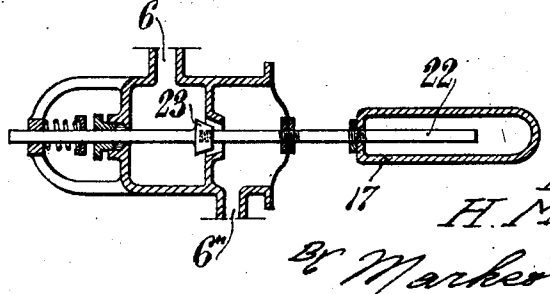


Fig.5.



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Fig. 3

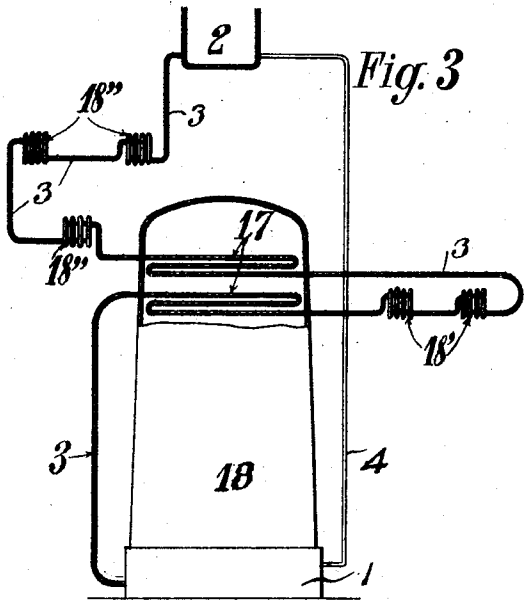


Fig. 4

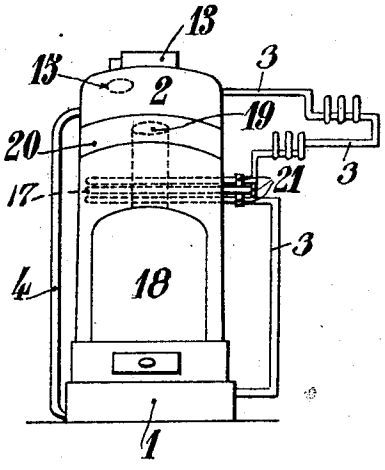
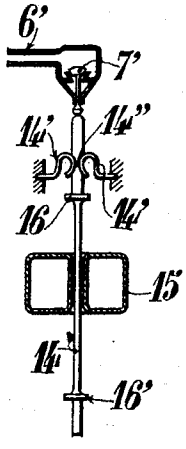


Fig. 6



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Fig. 7

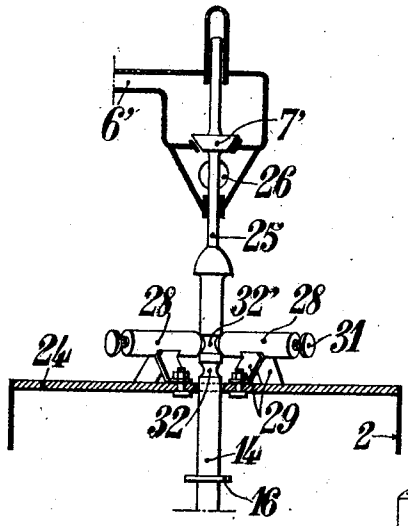


Fig. 8

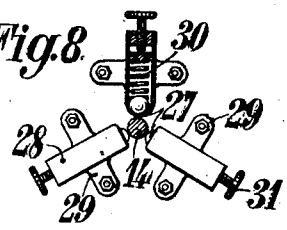


Fig. 9

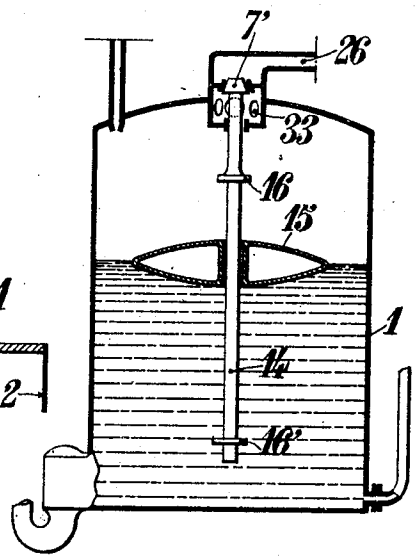
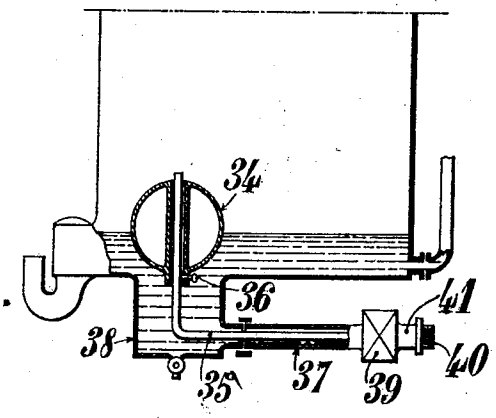


Fig. 10



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1,629,043

UNITED STATES PATENT OFFICE.

HENRI MOREAU, OF PARIS, FRANCE.

APPARATUS FOR CENTRAL HEATING.

Application filed November 16, 1922, Serial No. 601,363, and in France November 18, 1921.

In the systems of central heating already known, the circulation of the hot water is ensured either by thermo-siphon or by the so-called accelerated circulation method.

The method by thermo-siphon requires piping of very large diameter passing necessarily under the floors. The accelerated circulation allows the use of piping having more reduced cross sections.

But these two methods rely either on the principle of emulsion by bubbling of steam in a hot water column, or on the use of a partial vacuum produced in a vessel creating a suction by condensation of the water vapour which previously filled it.

Water at a high temperature must therefore necessarily circulate in the pipe-lines and the energy available for moving the hot water is always reduced. It results therefrom that in a system of central heating in which use is made of one or the other of the two above-mentioned methods, the pipe-line must not retard the circulation of water and, for that purpose, must have large cross sections; loops and the like where air pockets may be formed must be, moreover, carefully avoided.

The present invention overcomes the above inconveniences; it relates to a method of central heating characterized in that the circulation of the hot water is ensured at the desired speed by means of compressed air or of a suction by vacuum.

The present invention offers the following advantages:

1. Circulation of the water at any desired temperature,

2. The pipe-lines may have an extremely reduced diameter,

3. The arrangement of the pipe-lines is effected without necessity of taking the slopes or loops into account;

4. The pipe-lines may be constituted by tubes of soft metals, their rigidity being immaterial;

5. The boiler may be arranged at any point below the pipe-line and even at a great distance from the latter.

The accompanying drawing illustrates various forms of construction of heating plants and of their accessories, enabling the carrying out of the invention.

Fig. 1 is a diagrammatic view showing a form of plant operating by means of compressed air.

Fig. 2 is a detail sectional view on an enlarged scale, of the automatic valve for admission of compressed air.

Fig. 3 is a diagrammatic view of the device for reheating the circulation water.

Fig. 4 is an outer view of the apparatus operating according to the diagrammatic views of Figs. 1 and 3.

Fig. 5 is a vertical section of an automatic governor for the admission of compressed air.

Fig. 6 diagrammatically illustrates a modification of the device for the distribution of compressed air, applicable to small plants.

Fig. 7 diagrammatically illustrates in elevation with parts in vertical section a constructional modification of the mechanical control device of the air exhaust valve by means of a float in the vessel elevated relatively to the boiler and open to the atmosphere.

Fig. 8 is a plan view, partly in horizontal section, showing a part of Fig. 7.

Fig. 9 shows in vertical section a constructional modification of the mechanical control device of the air exhaust valve, by means of a float operated by the water in the pulsating vessel.

Fig. 10 is a detail vertical section diagrammatically illustrating an automatic cold water feeding device.

Referring in detail to the drawing and more particularly to Figures 1 to 6 wherein like reference characters indicate corresponding parts, the plant comprises a fluid tight tank 1 freely communicating with tank 2 elevated with respect to the tank 1 and open to the atmosphere. The tanks 1 and 2 are connected through pipe sections 3 in which are interposed the liquid heating tubes 17 and the radiators 18′. The heating tubes 17 are, as will be understood as the description proceeds, arranged contiguous to a suitable source of heat, not shown in Figure 1 and the radiators 18′ are suitably located in the rooms or apartments to be heated.

The tanks 1 and 2 also are in communication through the conduit pipe 4 which has a large cross section and is controlled by the valve 5 opening in the direction of the tank 1.

The admission of compressed air to the tank 1 is effected through the conduit 6

controlled by a valve 7 which is itself automatically controlled; the communication between the tank 1 and the atmosphere is effected through the conduit 6′ controlled by the valve 7′ which is also automatically controlled.

Both valves 7 and 7′ are alternately and automatically controlled in the following manner:

The rod 8 (Fig. 2) is connected to a plunger core of soft iron 9 forming the movable armature of an electro-magnet coil 10; the direction of the current passing through the winding of the same is such that when the said coil is energized, the valve 7 is pressed upon its spherical bearing seat 11, thus closing communication between the source of compressed air and the reservoir 1; when the coil 10 is de-energized the compressed air lifts the valve 7 and enters the tank 1.

The valve 7′ is constructed in an identical manner, but it is automatically closed by the pressure of the compressed air contained in the tank 1 and the closing of the circuit of the coil 10′ effects the opening of the said valve, the coils 10 and 10′ being connected in parallel in the single circuit 10″. Each of the valves is enclosed in a fluid-tight casing 11′ having the inlets and outlets 12 of the electric circuit leading to the electro-magnet coils. The rod 8 is guided at 8′ and the casing 11′ does not contain any stuffing box likely to result in leakage

The operation of the valves 7 and 7′ is effected by the closing or opening of the circuit feeding the coils 10 and 10′. A switch 13 is controlled by the rod 14 along which moves the float 15 which, according to the water level in the tank 2, acts upon the abutment 16 or the abutment 16′. When the level rises in the tank 2, the float engages with the abutment 16 for closing the circuit of the coil 10 and, consequently, cutting off communication between the source of compressed air and the tank 1; at the same time the circuit of the coil 10′ is closed and the valve 7′ opens tending to establish equilibrium of pressure between the tank 1 and the atmosphere.

For a certain value of this pressure, depending on the difference between the respective levels of the water in the tanks 2 and 1, the valve 5 rises and the tank 2 empties and fills the tank 1 until the float 15, acting on the abutment 16′ actuates the switch 13, opening the circuit to the coils 10 and 10′ for opening the valve 7 and closing the valve 7′. The compressed air enters the tank 1, the valve 5 closes again and the filling of the tank 2 or, in other words, the transfer of the water from the tank 1 into the tank 2, through the pipe connections 3, tubes 17 and radiator 18′, takes place until the float 15 reaches the abutment 16 whereupon the operation above described is repeated.

The speed of circulation of the water in the connections 3 is determined by the pressure of the compressed air; and for varying the air pressure it is merely necessary to mount an adjustable expansion or reducing valve on the branch 6″ of the main pipe supplying the compressed air.

In the case of small plants in which a small quantity of water is in circulation, the device illustrated in Fig. 6 can be used. The tank 1 is in permanent communication with the source of compressed air, through an orifice of very small cross section. The valve 7′ for the exhaust to the atmosphere is arranged above the rod 14 controlled by the float 15 in the tank 2. When this float lifts the rod 14, the valve 7 opens and the rod 14 is retained during the descent of the float by means of two springs 14′ which fit in a reduced part 14″, the valve 7′ is held open until the float, acting by its weight on the abutment 16′, releases the rod and brings it back to its initial position.

The valve 7 controlling the communication between the source of compressed air and the tank 1 is thus dispensed with. The air inlet orifice, permanently open, being very small relatively to the orifice for exhaust in the atmosphere, the operation of the apparatus is repeated automatically, as previously explained.

Fig. 3 diagrammatically illustrates the application of the device which has just been described to a central heating plant.

The calorific source, which may be a boiler of any known type, is illustrated at 18. The connections 3 communicating with the tank 1 convey the water to be heated to the tubes or coils 17 or to any tubular device having a large heating surface placed among the flames or hot gases of the source 18; the hot water passes from the tubes 17 through the connections 3 to radiators 18′ arranged in a first series of flats or apartments, is reheated in the boiler 18 and after passing through the radiators 18″ enters the tank 2. The reheating can be repeated as many times as desired without increasing the amount of compressed air used.

In practice, the whole of the furnace and the tanks 1 and 2 are arranged in one and the same frame (Fig. 4); the tank 1 is placed at the lower part under the ash-pit, thus effecting a reheating of the compressed air and, consequently, an economy of this fluid. The conduit 19 for the evacuation of the smoke from the furnace, leads to a smoke box 20 above which is arranged the tank 2 provided with the float 15. The outlet or return orifices for the pipe connections 3 can be formed on one of the sides of the frame at 21, for instance. It will be seen that with this arrangement the heat gener-

ated by the furnace 18 is used to the maximum.

Fig. 5 diagrammatically illustrates a form of expansion governor; the rod 22 is immersed in the water of one of the tubes 17 arranged in the furnace 18 and, at a determined temperature, it lengthens sufficiently to lift the valve 23 ensuring the communication of the conduit 6 with the conduit 6''.

If the fire of the boiler goes out, the valve 23 cuts off the admission of compressed air and the circulation of water ceases, taking place again as soon as the temperature of the water reaches a value determined by the initial position of the rod 22 relatively to the valve 23.

If compressed air is not momentarily available, the boiler can feed the radiators by thermo-siphon circulation.

The control of the valves can be entirely mechanical (Figs. 7 to 9).

In Fig. 7, the air exhaust valve 7' is controlled by the float (not shown in Fig. 7) in the vessel elevated relatively to the boiler. The rod 14 along which slides the said float passes through the cover 24 of the vessel 2 and terminates at its upper part in a rod 25 integral with the valve 7', arranged in any suitable casing provided with a conduit 6' connecting it with the air chamber of the pulsating vessel and with orifices 26 for the exhaust of the air to the atmosphere. The rod 14 moves longitudinally between three balls 27 arranged at the end of barrels 28 secured by lugs 29 on the cover 24 and enclosing springs 30 acting for driving the balls 27 towards the axis of the rod 14; the tension of the springs 30 is adjusted by means of screws 31 and the ends of the barrels or tubes 28 are slightly restricted so as to form a stop limiting the extreme position of the balls 27.

Normally, the three balls 27 are pressed on the rod 14 which holds them slightly within the tubes 28. In this position, although subjected to this triple thrust, the rod encounters but a small resistance to sliding movement as the balls can roll between the rod and their springs 30. If a circular groove provided on the rod is presented at the level of the horizontal plane containing the three balls, these latter, subjected to the action of their springs, enter this groove and lock the rod.

The rod 14 has two grooves 32 and 32' one of which corresponds to the opening position of the valve 7' and the other to its closing position.

The valve 7' (Fig. 7) being in closed position, the groove 32' is in engagement with the balls 27; when the float rises at the same time as the level of the water in the tank 2, it acts upon the upper abutment 16 of the rod 14 which it cannot lift, as the tension of the springs 30 has been suitably adjusted for that purpose; the float is therefore progressively submerged by the water the level of which continues to rise until the hydraulic thrust which urges it upwardly can overcome the total stress represented by the thrust of the air on the valve 7' and the tension of the three springs 30; at this moment, the rod 14 is suddenly lifted, because as soon as the groove 32' disengages the balls, these latter no longer prevent the sliding of the rod 14 which unseats the valve 7' and lifts it until the balls enter the lower groove 32 which again locks the rod. The flow of the water from the tank 2 to the pulsating vessel takes place and the float descends until it comes in contact with the lower abutment of the rod 14 on which it rests and which it suddenly urges downwardly when the level of the water has sufficiently lowered for causing it to act by its own weight and to reclose the valve 7' by bringing the groove 32' into engagement with the balls 27.

It will be seen that with this arrangement the valve opens and closes with a snap action, rendering impossible any position of equilibrium of this valve in which the orifice for exhaust of the air to the atmosphere would not present an outflow distinctly greater than that of the source feeding the pulsating vessel.

Fig. 9 shows a control device for the valve 7' by means of a float contained in the pulsating vessel 1. In this case, the valve 7' opens downwardly, it is held closed by the thrust of the air under pressure in the vessel 1, entering the casing through orifices 33. The opening is suddenly effected when the float 15 presses upon the abutment 16' which retains it until the level lowers sufficiently for causing it to act by its own weight to unseat the valve 7'. The closing occurs when the float acts upon the abutment 16.

A float operated cock is provided for controlling the automatic feeding of water to the pulsating vessel in order to compensate the losses and includes the float 34 which is mounted on a bent rod 35 on which it is held by means of the locking screw 36; the horizontal branch of this rod 35 is arranged in a tube 37 reaching to the bottom of the well 38 placed at the lower part of the pulsating vessel 1 away from the eddies produced in the liquid mass at the time of the pulsations. The float 34 rocks about the axis of the horizontal branch of the rod 35 and the latter controls a cock 39, Fig. 10, of any suitable type; the water in the pressure conduit arrives at 40 and the non-return valve is arranged for instance at 41. Owing to the difference in density between the coldest water and the hot water and to the precautions taken against the agitation due to the eddies, the valve 41 is always in contact with sufficiently cold water for operating normally.

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

1. In a central heating plant for heating by circulation of hot water, the combination of a pulsating tank and an elevated tank arranged at different levels, and means connecting the lower portions of the tanks, said means including water heating means and radiators, and a second means also connecting said tanks and including a non-return valve, and means for automatically and periodically causing in the pulsating tank a pressure of compressed air and atmospheric pressure.

2. In a central heating plant for heating by circulation of hot water, the combination of a pulsating tank and an elevated tank arranged at different levels and connected at their lower portions on the one hand by means of connections including water heating means and radiators, and on the other hand by a return passage provided with a non-return valve, means for controlling the pressure in the pulsating tank, said means including a valve admitting compressed air, a valve controlling communication of the pulsating tank with the atmosphere, and means for controlling said valves.

3. A plant as claimed in claim 2 characterized by the provision of a float actuated valve controlling admission of water to the plant.

In testimony whereof I affix my signature.

HENRI MOREAU.