

May 28, 1935.

C. E. ARMSTRONG

2,002,761

AUTOMATICALLY CONTROLLED MULTIPLE VALVE FOR STEAM LINES

Filed June 21, 1933

2 Sheets-Sheet 1

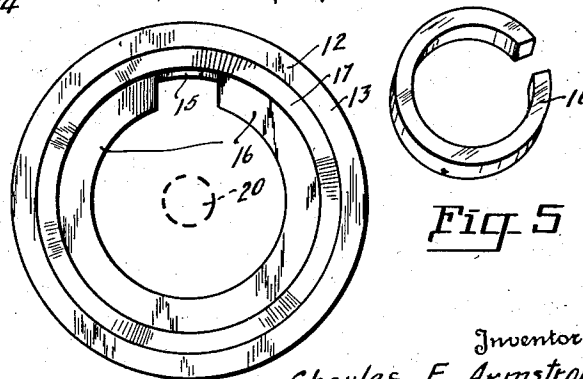
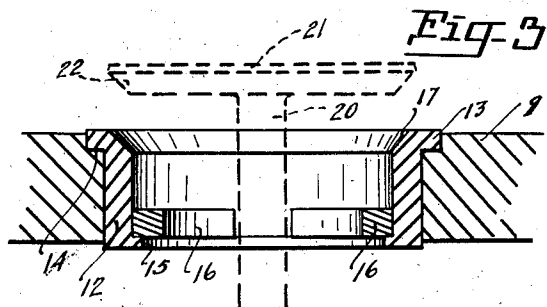
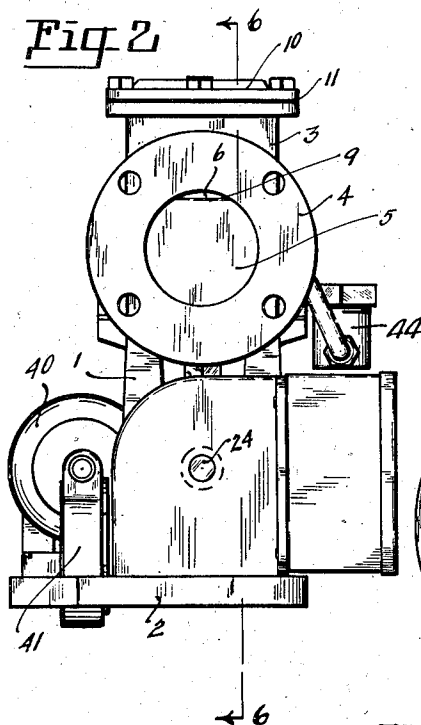
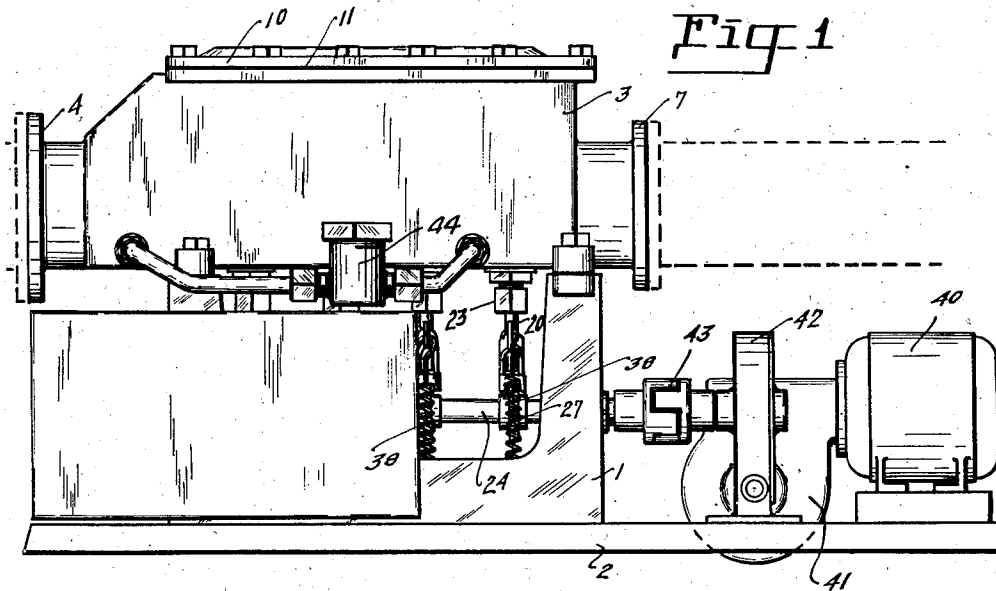


Fig 4

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2 Sheets-Sheet 2

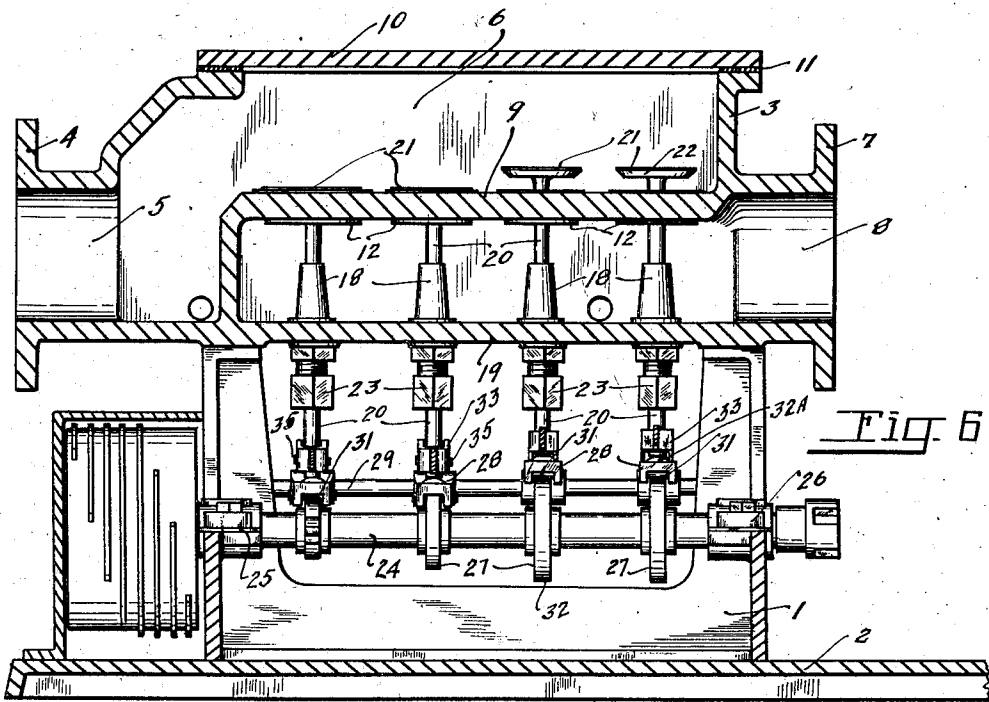


Fig. 6

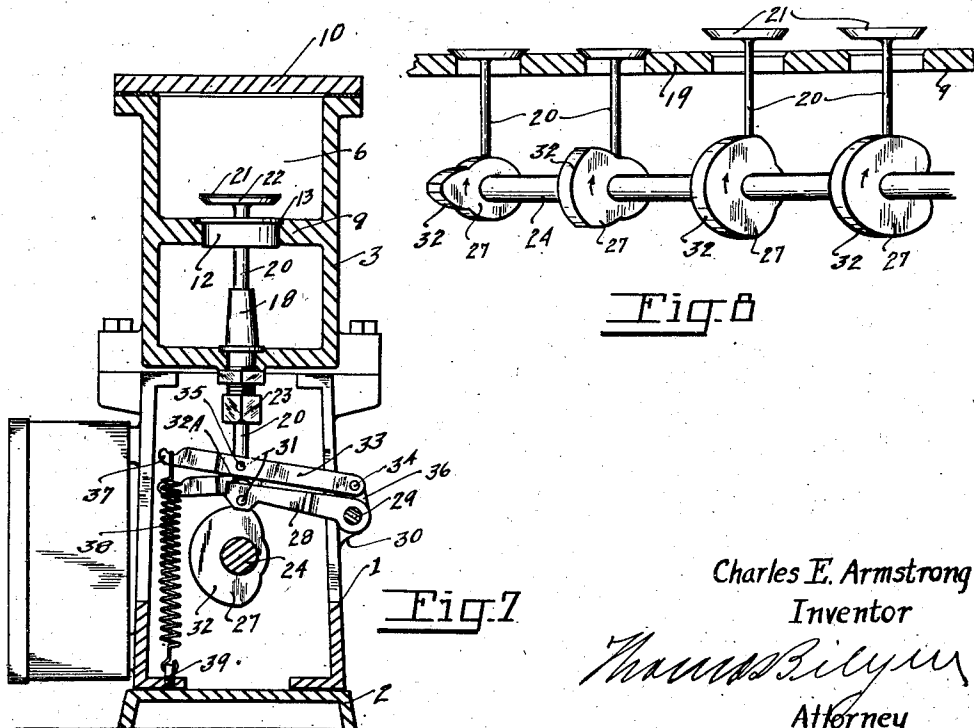


Fig. 7

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UNITED STATES PATENT OFFICE

2,002,761

AUTOMATICALLY CONTROLLED MULTIPLE
VALVE FOR STEAM LINESCharles E. Armstrong, Corvallis, Oreg., assignor
to Armstrong Heat Control Corporation, Cor-
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Application June 21, 1933, Serial No. 676,884

3 Claims. (Cl. 137—145)

This invention relates to my United States patent applications filed concurrently herewith as follows:

Automatic time controlling devices Serial No. 676,886, filed June 21, 1933; Improvement in thermostat controls Serial No. 676,882, filed June 21, 1933; and Improvements in electromechanical timers Serial No. 676,885, filed June 21, 1933.

My invention is intended for use where a uniform temperature is to be maintained within a building and especially where steam is being used as the heat supplying medium.

This present invention is comprised of a base having superposed thereupon a body element and a steam chest. The base is longer than the body element and the steam chest and outwardly extends therefrom at one end. A cam shaft extends longitudinally of the body element and is journaled relative thereto.

A prime mover and speed reducers rest upon the outer end of the base and the same coacts together to drive the cam shaft at a greatly reduced speed. A plurality of spaced cams are disposed upon the cam shaft. A valve lifter is associated with each of the cams and is actuated thereby. A contact bar is superposed over each of the valve lifters and the same coacts with and lifts the valve stem. A reacting element removably secured to the free end of the contact bar maintains contact between the valve lifter and the valve stem.

The steam chest is partitioned by a diaphragm and a plurality of valves and valve seats are disposed within the diaphragm and the valves are in registerable alignment with the cams and are adapted for being actuated indirectly by the cams.

An inlet port is disposed at one end of the chest and communicates with the interior of the chest and at one side of the diaphragm and an outlet port is disposed at the opposite end of the steam chest and communicates with the interior of the chest and at the opposite side of the diaphragm. Flanged connections are disposed upon the outside of the chest and at each of the ports. The flanged connections have a common center line. A cap is removably secured to the top side of the chest.

The primary object of my invention is to provide a device for regulating and controlling the steam passing therethrough.

A further object of my invention consists in providing a device, when used in conjunction with the other inventions filed concurrently herewith for regulating the temperature in a building by regulating and predetermining the

amount of steam that passes through the device.

A further object of my present invention consists in providing a device having a plurality of ported valves disposed therein in which the orifice of the valve may be changed from time to time.

A further object of my invention consists in providing a device that may be regulated and controlled from a remote controlling station.

A further object of my invention consists in providing a device having flanged connections disposed upon its oppositely disposed ends and having a common center line in order that the flanged connections may be directly attached to a steam line already placed in position.

A still further object of my invention consists in so constructing the device that it may be made to actuate valves into open or closed position. Either or any one of the valves may be actuated in either direction as is required and from a remote control station that will predetermine the amount of steam to be passed through the device.

My invention consists in so constructing the device that it may be comprised of a minimum number of parts and one that will be free from mechanical operating annoyances.

And a still further object of my invention consists in so constructing and assembling the device that it may be placed in a steam line with a minimum of mechanical effort and preparation.

With these and incidental objects in view, the invention consists in certain novel features of construction and combination of parts, the essential elements of which are set forth in the appended claims, and a preferred form of embodiment of which is hereinafter shown with reference to the drawings which accompany and form a part of this specification.

In the drawings:

Fig. 1 is a side view of the assembled device.

Fig. 2 is an end view of the assembled device.

Fig. 3 is a fragmentary sectional side view of the separating diaphragm upon which the multiple valves are seated. In this view is shown one of the valves with an orifice changing ring disposed therein for suitably determining the size of the opening through which the operating fluid passes.

Fig. 4 is a top plan view of the valve bushing and of the orifice controlling ring disposed therein.

Fig. 5 is a perspective plan view of the orifice controlling ring shown removed from the bushing.

Fig. 6 is a sectional side view of the body of the multiple valve.

Fig. 7 is a sectional end view of the multiple valve.

Fig. 8 is diagrammatic and shows a fragmentary sectional side view of the diaphragm and a perspective end view of the cam shaft and cams and illustrates the manner in which the shape of the cams tends to hold the opened valves open while the others are being opened consecutively and how they are closed consecutively.

Like reference characters refer to like parts throughout the several views.

This invention is comprised of a cast metal body element 1 having a base 2 upon which the same stands, and a steam chest casting 3. An inlet flange 4 facilitates the fastening of the steam chest to a steam line, not here shown, and a port 5 conducts the live steam into the steam chest compartment 6. A flange 7 is disposed at the oppositely disposed end of the chest and is secured to the chest. A port 8 conducts the steam from the steam chest to a distributing pipe line secured to the flange 7. The ports 5 and 8 are coaxial with each other to facilitate the placing of the device within a steam line. It is particularly advantageous to have these center lines coaxial where the device is to be placed in a steam line that is already in place and erected.

A diaphragm 9 is disposed within the steam chest and partitions the chest into an inlet chamber and an outlet chamber with the port 5 directly communicating with the inlet chamber and the port 8 communicating with the exhaust chamber. A plurality of ports are disposed within the diaphragm. The ports are preferably of different diameters and are spaced apart and the same preferably have a common center line. A cap 10 is removably secured to the top of the chest and is secured thereto by the usual fastening means, as engine bolts. A gasket 11 is disposed between the cap and the top of the chest. Each of the valves is made substantially as illustrated in Fig. 3 in which a valve bushing 12 is placed within the diaphragm. An annular flange 13 outwardly extends from the upper periphery of the bushing and the under side of the flange rests upon a shoulder 14 that is formed integral with the diaphragm. An annular ledge 15 inwardly extends from the base of the bushing and the same acts as a support for an orifice controlling ring 16 that is removably disposed thereupon. A valve seat 17 is disposed upon the inner upper surface of the bushing and the slope at the valve seat is made to best meet the requirements of the steam pressure upon which the same is to operate.

Valve stem guides 18 are disposed in registry alignment with the port openings disposed within the diaphragm and the same are machined to precisely fit the base 19 of the steam chest casting. These bushings are made relatively long in order that a precise alignment may be maintained upon the valve stem 20. The valve stem 20 has a valve head 21 disposed upon its upper end and the same is fashioned to the slope of the valve seat 17 upon its under surface as illustrated at 22. A stuffing gland 23 is disposed upon the under side of the valve guide 18 and the same maintains a steam tight joint about each of the valve stems.

A cam shaft 24 runs longitudinally of the body element 1 and is journaled relative thereto by any suitable journal bearings 25 and 26. A plurality of cams 27 are positioned upon the cam shaft; one each of these cams is provided for each of the valves and valve stems and coacts with the

valve stems for actuating the same. A valve lifter 28 is hingedly secured to the body element by a journal shaft 29 that runs longitudinally of the outside wall of the body element and is journaled within any suitable journal bearing 30. A cam roller 31 is journaled within the free end of the valve lifter 28, and it rests directly upon the outer surface 32 of the cam. The free end of the valve stem engages the convex surface 32a of the cam lifter and rests directly upon the outer surface 32 of the cam. The purpose of the convex surface of the cam lifter is to provide a free and easy movement between the valve stem and lifter due to radius action.

A contactor bar 33 is hinged about a journal pin 34 and a pin 35 is disposed within the valve stem for raising and lowering the valve. The contactor bar terminates upon its free end in a spring receiving hook 37 and a reacting element, as a coil spring 38 is secured upon its one end to the hook 37 and is secured upon its oppositely disposed end to a screw eye 39. The purpose of the contactor bar 33 and the spring 38 is to keep the valve stem in contact with the valve lifter 28 and the cam 27, thereby seating the valve.

A link 36 allows the perpendicular movement of the valve pin 35 so that the valve stem will remain in alignment.

A prime mover, as an electric motor 40 rests directly upon the base 2 and a speed reducer 41 is associated with the armature shaft of the prime mover. In order to further reduce the speed of the prime mover, a second speed reducer 42 is driven from the shaft of the speed reducer 41. A clutch 43 connects the driven shaft of the speed reducer 42 with the cam shaft 24. Each energization of the prime mover rotates the cam shaft for one cycle of operation which cycle is to open or close one of the valves.

I have here shown four valves as being disposed within the device and four cams disposed upon the common cam shaft. The cams are so arranged that all of the valves may be completely open at one time or all of the valves completely closed at one time, or so that one or more of the valves may be completely opened or one or more of the valves be completely closed at each actuation of the same by the prime mover. I do not wish, however, to be limited to four valves only, as a greater or lesser number may be required upon different classes of devices.

Condensation occurs in devices of this kind and it is highly desirable that the condensate be not retained within the device itself. To eliminate the condensate that develops within the device, I provide a thermal release valve 44 and pipe the same to the respective chambers.

While the form of mechanism herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the embodiment herein shown and described, as it is susceptible of embodiment in various forms, all coming within the scope of the claims which follow.

What I claim is:

1. In a device of the class described, the combination of a base, a mechanism supporting frame superposed on the base, a steam chest superposed on the frame, a diaphragm disposed within the chest, valves disposed in the diaphragm, the stems extending downwardly therefrom, a cam shaft journaled relative to the frame and extending longitudinally thereof, a prime mover disposed upon the base, a speed reducer interposed

between the prime mover and the cam shaft and adapted for driving the cam shaft at a reduced speed, a plurality of cams spaced apart and disposed upon the cam shaft, a valve lifter hinged 5 relative to the frame, the valve lifter being adapted for riding the camming surface of the cam, and engaging the lower end of the valve stem for coacting with the depending valve stem to operate the valve, a floating linkage member 10 linked to the body element and pivotally secured to the valve stem and provided at its free end with spring anchorage means and a reactance member secured at its one end to the free end of the floating linkage member and at its other end to 15 the frame.

2. In a device of the class described, the combination of a base, a mechanism supporting frame, a steam chest, valves within the steam chest, a cam shaft having spaced cams disposed 20 thereupon extending longitudinally of the frame and journaled relative thereto, power means for driving the cam shaft, a valve lifter hingedly mounted relative to the body element and adapted for riding the cam, a valve stem, a pin carried

by the valve stem, a contactor bar hingedly mounted relative to the body element and adapted for coacting with the pin of the valve stem, and a reacting element secured to the free end of the contactor bar. 5

3. In a device of the class described, the combination of a base, a prime mover and a coacting speed reducer mounted upon the base, a mechanism supporting frame, a chest, a cam shaft disposed longitudinally of the body element and 10 journaled relative thereto and adapted for being driven by the prime mover through the speed reducer, a plurality of cams spaced apart and mounted upon the cam shaft, a plurality of valves 15 disposed within the chest and in registry with the cams of the cam shaft and adapted for being actuated thereby, a valve lifter disposed between the cam and the valve stem, a contactor bar hinged to the body element and coacting with 20 the valve stem, and means for normally maintaining the contactor bar, the valve stem and the valve lifter repressed.

CHARLES E. ARMSTRONG.