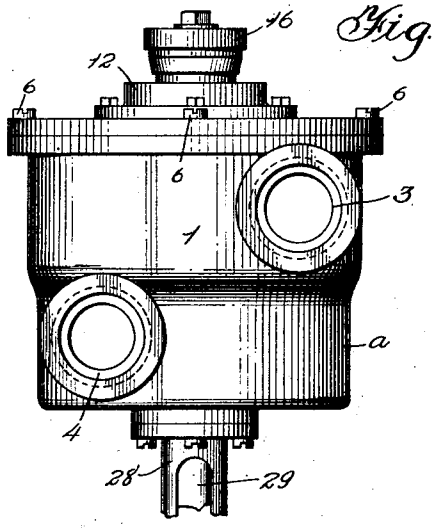
Jan. 12, 1926. 1,569,312

C. F. H. BOHNHARDT

THERMOSTATIC CONTROL DEVICE

Filed July 7, 1923

Fig. 1.



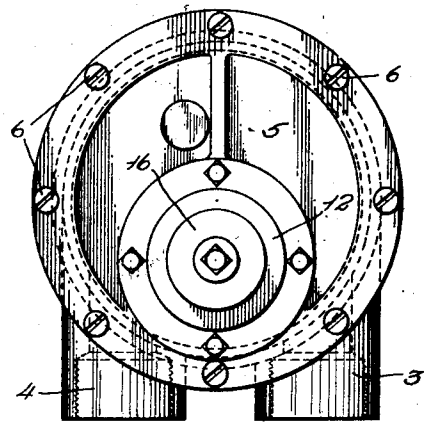
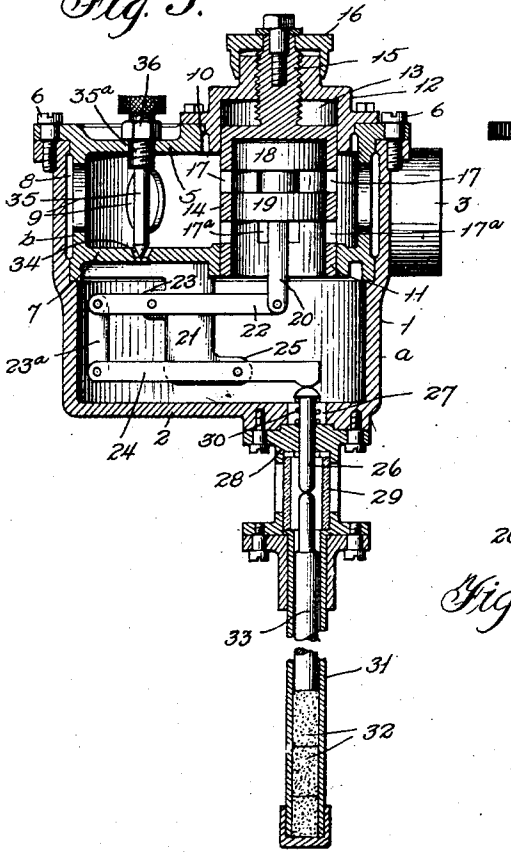


Fig. 2.

Fig. 3.



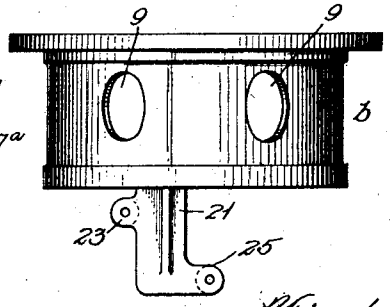


Fig. 4.

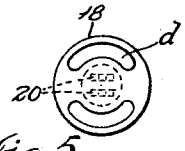


Fig. 5.

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Patented Jan. 12, 1926. 1,569,312

UNITED STATES PATENT OFFICE.

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THERMOSTATIC CONTROL DEVICE.

Application filed July 7, 1923. Serial No. 650,118.

To all whom it may concern:

Be it known that I, CHARLES F. H. BOHNHARDT, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Thermostatic Control Devices, of which the following is a specification.

This invention relates to thermostatic control devices for controlling the flow of gas to metal melting furnaces, so as to cut down or stop the gas flow when the metal is heated to the desired temperature.

In carrying out the invention, I provide an outer casing or shell of substantially cylindrical form, open at the top and closed at the bottom, and having in its side wall inlet and outlet openings arranged one above the other. As the gas may flow in either direction through the device, either opening may be considered the inlet or outlet opening. Within this casing I arrange a removable drum which closes the top of the casing, and the lower wall of the drum forms a partition in the casing between the inlet and outlet openings. The drum is provided with openings in its side walls to establish communication between one of the openings in the casing and the interior of the drum, and an adjustable valve cylinder extends transversely through the drum and is provided with ports for permitting the gas to flow from the interior of the drum through the valve casing and into the space or compartment below the drum, and thence through one of the openings in the casing to the burners of the furnace. The valve is movable in this valve casing by a system of multiplying levers, all of which are supported on a bracket depending from the lower side of the drum. Thus, the drum, valve and levers are all associated together as a unit which may be readily placed in or removed from the casing. When placed within the casing, one of these levers rests upon a member in the bottom of the casing which is actuated by an expansion device which extends into the molten metal. As the temperature of the metal rises, the expansion device moves downward, allowing the levers to move under the weight of the valve and the latter gradually closes the ports and cuts off the flow of gas. In order to provide a small flow of gas to keep the burners lighted, after the main flow has been cut off, I provide in the lower wall of the drum a small port which is controlled by a hand valve which is also mounted on the drum.

The arrangement of the valves and movable parts upon the drum facilitates assembling and cheapens the cost of manufacture.

In the accompanying drawing,

Fig. 1 is a side elevation of the manometer;

Fig. 2 is a top plan view of the same;

Fig. 3 is a central section on the line 3—3 of Fig. 2;

Fig. 4 is a side elevation of the drum; and,

Fig. 5 is a plan view of the piston valve.

Referring to the drawing, *a* represents the outer casing or shell of the manometer comprising a substantially cylindrical side wall 1 and a bottom wall 2. This casing has in its upper portion, an inlet opening 3, and in its lower portion an outlet opening 4. A drum *b* fits into the upper portion of the casing and the wall 5 of the drum has flanges which project over the side wall of the casing. Screws 6, passing through said flanges, secure the drum and casing together. The lower wall 7 of the drum extends across the central portion of the casing and forms a partition which separates the inlet opening 3 from the outlet opening 4. The side wall of the drum fits snugly within the casing at the top and bottom of said wall, but the intermediate portion of the drum is spaced from the side wall to form an annular channel 8, between the drum and casing. This intermediate portion of the side wall of the drum is provided with a plurality of ports 9, through which gas may flow from the channel 8, which latter channel is connected with the inlet port 3. The upper head of the drum is formed with a cylindrical opening 10 and the lower head 7 of the drum is provided with an opening 11 of smaller diameter than the opening 10 and in axial alinement therewith. A cap 12 closes the opening 10 and has a cylindrical portion 13 which forms a guide for a cylindrical valve casing 14, which casing extends through the drum and into the opening 11. A threaded stem 15 extends from the upper end of the valve casing through a threaded opening in the cap 12, and to this stem is connected a

nut 16, by which the stem of the valve may be turned to adjust the valve casing upwardly or downwardly with respect to the drum. The valve casing is provided with ports 17 and 17ª which communicate with the interior of the drum so that gas may flow from the opening 3 through the channel 8 and ports 9 into the drum and thence through the ports 17 and 17ª into the valve casing. Within the valve casing is arranged a valve comprising a piston 18, adapted to open and close ports 17, and a piston 19 adapted to open and close the ports 17ª, these pistons being connected together by a rod or stem 20 on which they are mounted. These pistons are formed with openings *d* through them to permit the gas which enters the casing to flow through the pistons and into the lower part of the casing below the partition 7, and from said lower part of the casing the gas may flow through the outlet 4.

A bracket or support 21 extends downwardly from the lower wall 7 of the drum and this bracket serves as a support for a system of levers which actuate the valve 18—19. Thus, a lever 22 is pivoted to an ear 23 on the bracket and the longer arm of the lever is pivotally connected to the valve stem 20. A link 23ª connects the shorter arm of this lever with the longer arm of a lever 24, the latter being pivoted upon a projection 25 on the bracket and the shorter arm of the lever 24 is adapted to rest upon a pin 26 which projects through an opening 27 in the lower wall of the casing. This pin is slidable in a sight gage fitting 28, which is secured to the bottom of the casing, and the lower end of the pin is visible through the glass tube 29 of the gage. The pin is normally pressed upward by a light spring 30 arranged between the fitting 28 and the head shown on the upper end of the pin. This spring performs no other function than to support the pin and keep it in constant contact with the lever 24. Attached to the lower end of the sight gage is an expansion tube 31, which is adapted to extend down into the metal which is to be melted. This tube contains in its lower part pieces of carbon 32, and a metal rod 33 rests upon the carbon and extends upwardly into the sight gage and abuts against the pin 26. The pieces of carbon and the rod 33 are loosely held within the expansion tube and do not expand sufficiently with the heat to affect the operation of the apparatus. The expansion tube 31 expands when heated and this permits the carbon pieces and rod 33 to move downward and lower the pin 26. When the expansion tube becomes cool, it contracts and lifts the rod 33 and pin 26. The details of the expansion tube are not a feature of my invention.

In Fig. 3 of the drawing, the valves are shown in the position which they occupy when the expansion tube is cold. In this position, the rod 33 and pin 26 support the shorter arm of the lever 24, and through the link 23ª and lever 22, the valves are supported above the ports 17 and 17ª. In this position of the valves, gas may pass freely through the inlet port 3 to the chamber within the drum, and thence through the ports 17 into the lower chamber below the drum, and thence outward through the outlet opening 4 to the burners of the furnace. The expansion tube 31 extends into the metal which is to be melted and, as the temperature rises, this tube expands downwardly, thereby permitting the rod 33 and pin 26 to descend, and the pistons 18 and 19 also are permitted to descend by gravity, thus gradually closing the ports 17, 17ª, and when the metal is at the desired temperature, these pistons will entirely close the ports and cut off the flow of gas. The apparatus is adjusted so that when the pistons entirely close the ports 17, 17ª, the downward movement of the pin will be stopped by the engagement of its head with the fitting 28 and the rod 33 will move away from the pin and this separation of the rod and pin, which is visible through the gage glass, will indicate to the operator that the piston valves are in their closed positions and that the apparatus is working as intended. By adjusting the valve casing 14, by means of the nut 16, the positions of the ports with respect to the pistons may be adjusted so that the valves will close sooner or later, according to the degree of heat which it is desirable or necessary to apply to the metal. The ports *d* in the pistons are provided so that the pressures will be equalized on opposite sides of the pistons.

In order to maintain a small supply of gas to the burners to keep them lighted after the main supply has been cut off, I provide means for passing a small flow of gas from the chamber within the drum to the chamber below the drum, without passing through the ports 17, 17ª. Thus, in the lower wall of the drum is shown a small opening 34, through which the gas may pass, and a needle valve 35, extending through the upper wall of the drum, is adapted to fit into this opening to close the same or to permit any desirable amount of gas to flow through. As shown, the needle valve has a threaded portion 35ª fitting into a threaded opening in the top of the drum, and the valve may be locked in any desired position of adjustment by means of a nut 36.

What I claim is:

1. A thermostatic control device comprising an outer casing, closed at one end and open at the other end and having upper and lower gas openings, a drum removably

secured within the upper part of said casing and communicating with one of said openings, a valve casing within the drum and opening into the lower part of said outer casing, said valve casing having a port within the drum, a piston valve, fitting within the valve casing, for opening and closing said port, said valve having a port extending through it, a bracket depending from the lower wall of the drum, a system of movement multiplying levers supported by said bracket and connected to the valve, and an expansion device for moving said levers.

2. A thermostatic control device comprising an outer casing, closed at one end and open at the other end and having upper and lower gas openings, a drum removably secured within the upper part of said casing and communicating with one of said openings, a valve casing extending through the drum and slidably mounted in its upper and lower walls, said valve casing having a port within the drum, means for adjusting the said valve casing longitudinally, a piston valve fitting within the valve casing, for opening and closing said port, said valve having a port extending through it, a system of movement multiplying levers supported by said drum and connected to the valve, and an expansion device for moving said levers.

3. A thermostatic control device comprising an outer casing, closed at one end and open at the other end and having upper and lower gas openings, a drum removably secured within the upper part of said casing and communicating with one of said openings, a valve casing within the drum and opening into the lower part of said outer casing, said valve casing having a port within the drum, a piston valve, fitting within the valve casing, for opening and closing said port, said valve having a port extending through it, a bracket depending from the lower wall of the drum, a system of movement multiplying levers supported by said bracket and conected to the valve, an expansion device for moving said levers, a port extending through the lower wall of the drum, and a manually adjustable valve for varying the effective size of said latter port.

4. In a thermostatic control device, an outer casing, closed at its lower end and open at its upper end and having inlet and outlet ports arranged one above the other in its side wall, a drum fitting within and closing the open end of the casing, the lower wall of said drum forming a partition between said openings in the outer casing, said wall having an opening, a valve carried by the drum for controlling the flow of gas through said latter opening, a system of multiplying levers carried by the drum and connected to said valve, and an expansion device external to the casing and connected to the same for causing the actuation of the levers and valve.

In testimony whereof I hereunto affix my signature.

CHARLES F. H. BOHNHARDT.