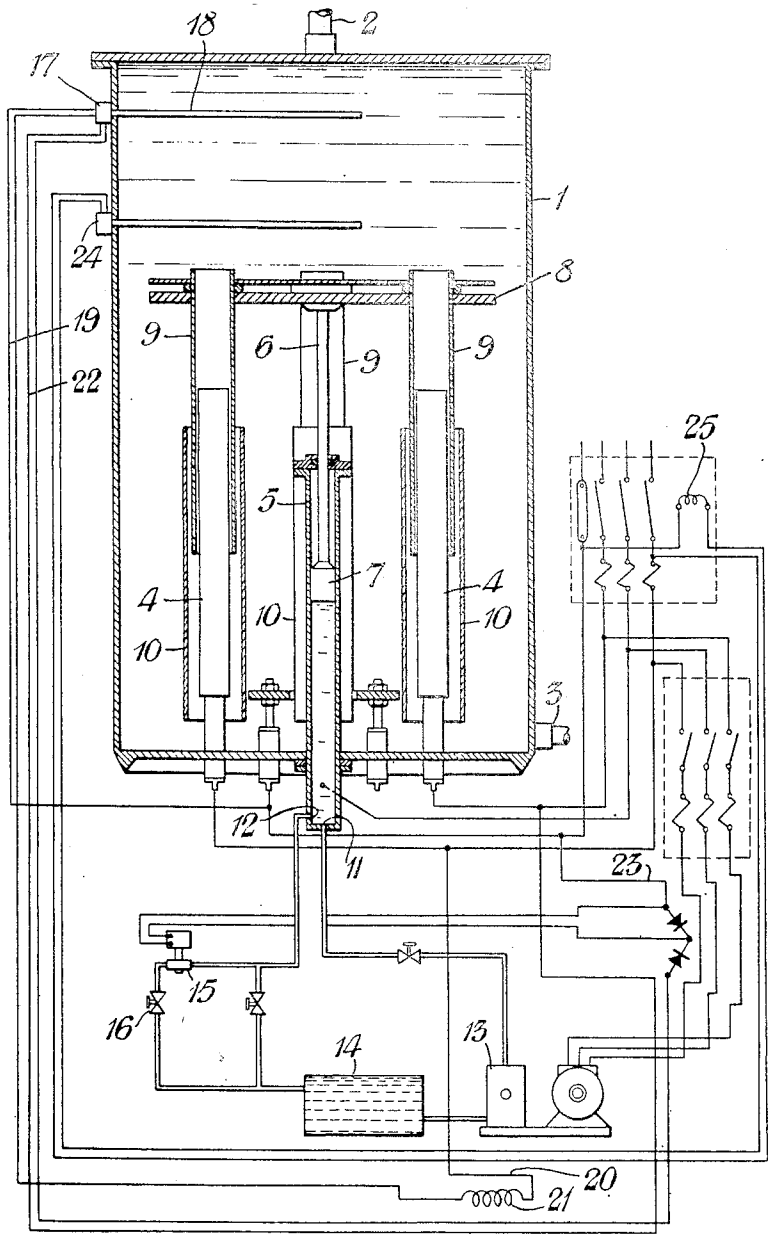
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TEMPERATURE CONTROL APPARATUS FOR ELECTRODE TYPE BOILERS

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TEMPERATURE CONTROL APPARATUS FOR ELECTRODE TYPE BOILERS

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3 Claims. (Cl. 219—40)

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This invention relates to temperature control apparatus for electrode type water boilers.

The invention is directed to the provision of apparatus which will automatically adjust the loading of such boilers to maintain the water temperature between two values.

According to the invention means is provided for adjusting insulating shields between the electrodes of a boiler and their respective neutrals to vary the boiler load, such means including an hydraulic motor supplied by a pump for exposing a greater length of electrode, a magnetically operated valve for reducing the exposure of the electrodes and thermo-sensitive switches exposed to boiler temperature to control the operation of the pump and the valve.

From another aspect the invention provides temperature control apparatus for electrode type water boilers comprising means including an hydraulic motor, a pump and a magnetically operated valve for shifting insulating shields between the electrodes and their neutrals to expose a greater length of electrodes as the water temperature falls below a value set by a thermo-sensitive switch, to reduce the electrode exposure slowly as the temperature rises above a value set by a second thermo-sensitive switch and to maintain the reduced electrode exposure at the length to which it is momentarily set as the water temperature falls once more below the value set by the second switch.

In a convenient form of apparatus according to the invention the insulating shields are carried by a relatively heavy member attached to the piston of the hydraulic motor above the electrodes so that the shields are biassed towards their electrode shielding position, and the arrangement is such that the operation of the pump raises the shields and opening of the magnetic valve allows the shields to fall.

The above and other parts of the invention are embodied in a preferred form of apparatus which will now be described in some detail by way of example with reference to the accompanying drawing which is a diagrammatic representation of a boiler and its associated control gear.

The boiler shell 1, which may be cylindrical, has a cold water inlet 3 near the bottom and an outlet 2 for hot water in the top.

The electrodes 4 are supported from the bottom of the boiler shell and an hydraulic cylinder 5 extends up between them.

The extended rod 6 of a piston 7 which works in the cylinder carries a heavy plate 8 at its upper

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end and this plate carries insulating shields 9 adapted to screen more or less of the length of the electrodes from surrounding neutral shrouds 10 as the piston 7 rises or falls in the cylinder 5.

Two ports 11 and 12 are provided in the lower end of the cylinder. Port 11 is connected to the discharge of an electrically driven pump 13 which takes its suction from a liquid reservoir 14 and the other port 12 is an exhaust port connected to the reservoir through a magnetically operated valve 15 and an adjustable restriction valve 16.

A dual switch thermostat 17 having one pair of contacts set to open at a lower temperature than the other pair is attached to the side of the boiler shell with its operating member 18 exposed to the water temperature therein.

The switch set to open at the lower temperature is connected in the circuit 19, 20 of the starter contactor coil 21 of the electric pump 13 so that the pump will be stopped whenever the water temperature rises above the value set therein.

The switch set to open at the higher temperature is arranged in the supply circuit 22, 23 of the magnetic valve 15 so that the valve will be opened whenever the water temperature exceeds the temperature set therein.

A "policeman" thermostat switch 24 is also fitted to the boiler shell 1 and is set to open at a substantially higher temperature than either of the other switches.

It is connected to the breaker coil 25 so as to break the main supply circuit to the boiler in the event of possible failure of the regulating gear.

The operation of the apparatus is as follows: Assume that the boiler is required to maintain an average water temperature of 180° F. Then the lower set thermo-sensitive switch is set at, say 175° F. and the higher set thermo-sensitive switch is set at say 185° F.

Now assume the boiler to be in operation and the temperature of the water to be rising to 175° F.: As the water temperature reaches 175° F. the electric pump supplying pressure to the hydraulic cylinder is stopped by the action of the lower set switch breaking the starter circuit. The effect of this is that no further exposure of electrode can take place notwithstanding the demand of any pre-set load setting regulator which may be fitted.

As and if the water temperature rises further with the extant electrode exposure to above 185° F. the higher set switch opens allowing fluid to feed back slowly from the hydraulic cylinder

to the reservoir through the magnetic valve and the restriction valve. This allows the piston to descend in the cylinder carrying with it the insulating shields which reduce the exposed length of the electrodes and thus the boiler rating.

As this rating is reduced, naturally the water temperature will be reduced. As soon as it falls below 185° F. the magnetic valve will close and prevent any further reduction of the rating. If, by any chance, the rating is now insufficient to maintain the temperature of the water required, the temperature will continue to fall. When it reaches 175° F. the pump will again work and lift the shrouds, increasing the rating, and the sequence of operation with the top temperature and magnetic valve will be repeated. The boiler rating will oscillate thus until the medium setting of about 185° F. is reached.

Now if the boiler is connected in a closed thermal circuit it will continue to run at the adjusted rating until such time as the return water temperature at the inlet rises, this in turn will cause the outgoing water at the top of the boiler to increase in temperature and the rating adjustment operation will commence once more, continuing until a new and lower rating sufficient to maintain the desired temperature is attained.

In the event the return water should become cooler of course the rating adjustment operation will be reversed and a higher rating will be set.

In this way an average boiler rating is achieved as a more or less steady load, instead of by the usual method of interrupting a higher load.

I claim:

1. Temperature control apparatus for electrode type water boilers comprising insulating shields interposed between the boiler electrodes and their neutrals, means including an hydraulic motor connected to an electrically driven pump and a magnetically operated valve for shifting the position of the insulating shields to alter the exposure of said electrodes, a first thermo-sensitive switch set at a predetermined value and arranged in the pump driving circuit to break that circuit when the preset value is exceeded and a second thermo-sensitive switch set at a predetermined higher value and arranged in the energizing circuit of the magnetic valve to open that valve when the said higher value is exceeded, whereby electrode exposure is increased only when the boiler temperature falls below that set on the said first thermo-sensitive switch and is decreased only when the boiler temperature rises above that set on the said second thermo-sensitive switch.

2. Temperature control apparatus according to claim 1 including a thermo-sensitive switch set to open at a higher temperature value than the values of those controlling the pump and magnetic valve and connected so as to break the main supply circuit to the boiler on opening.

3. Temperature control apparatus according to claim 1 including a liquid reservoir from which the pump takes its suction and to which liquid is returned through the magnetically operated valve.

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