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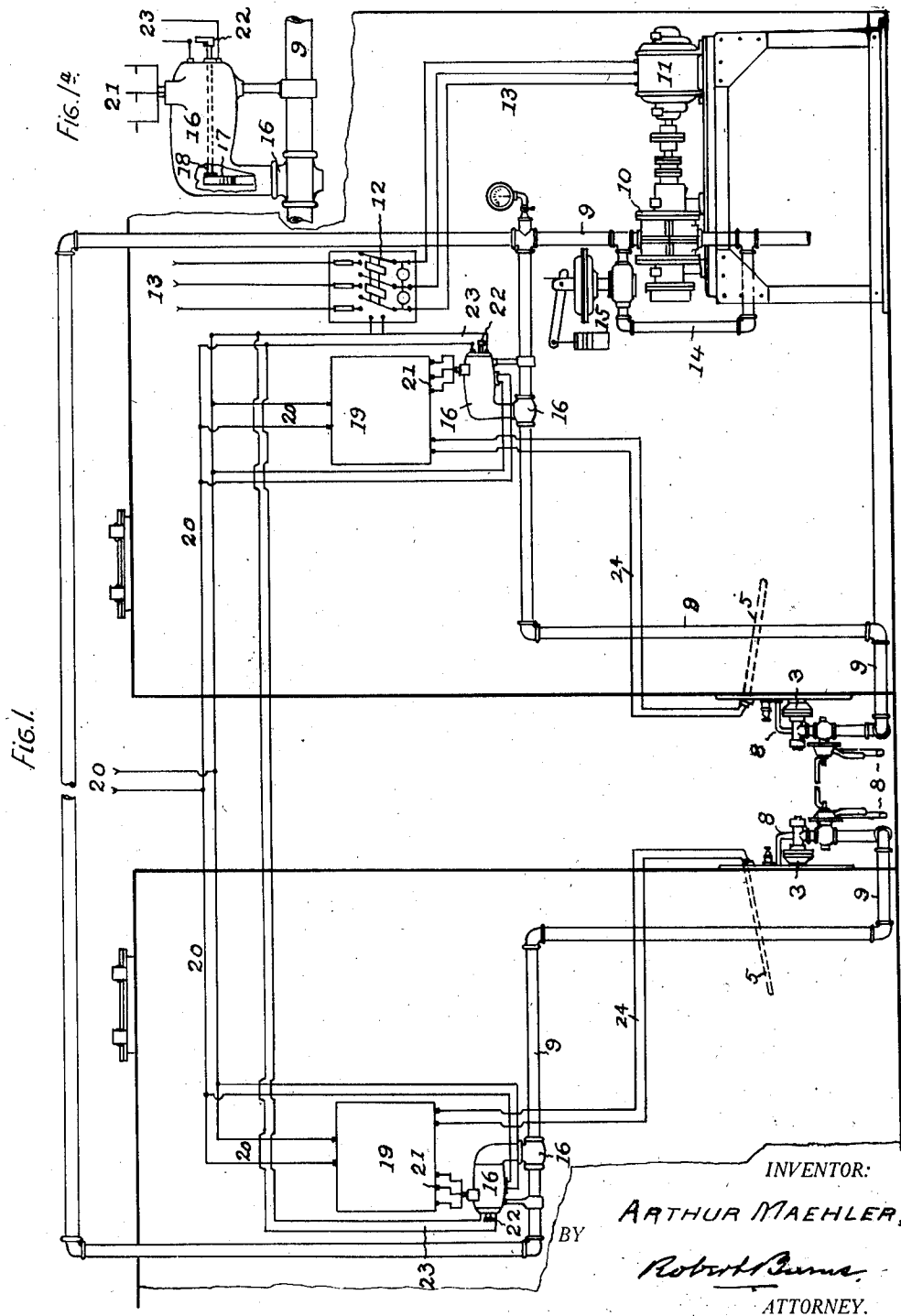
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1,636,140

DRYING AND ENAMELING OVEN CONTROL

Filed Aug. 5, 1926

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

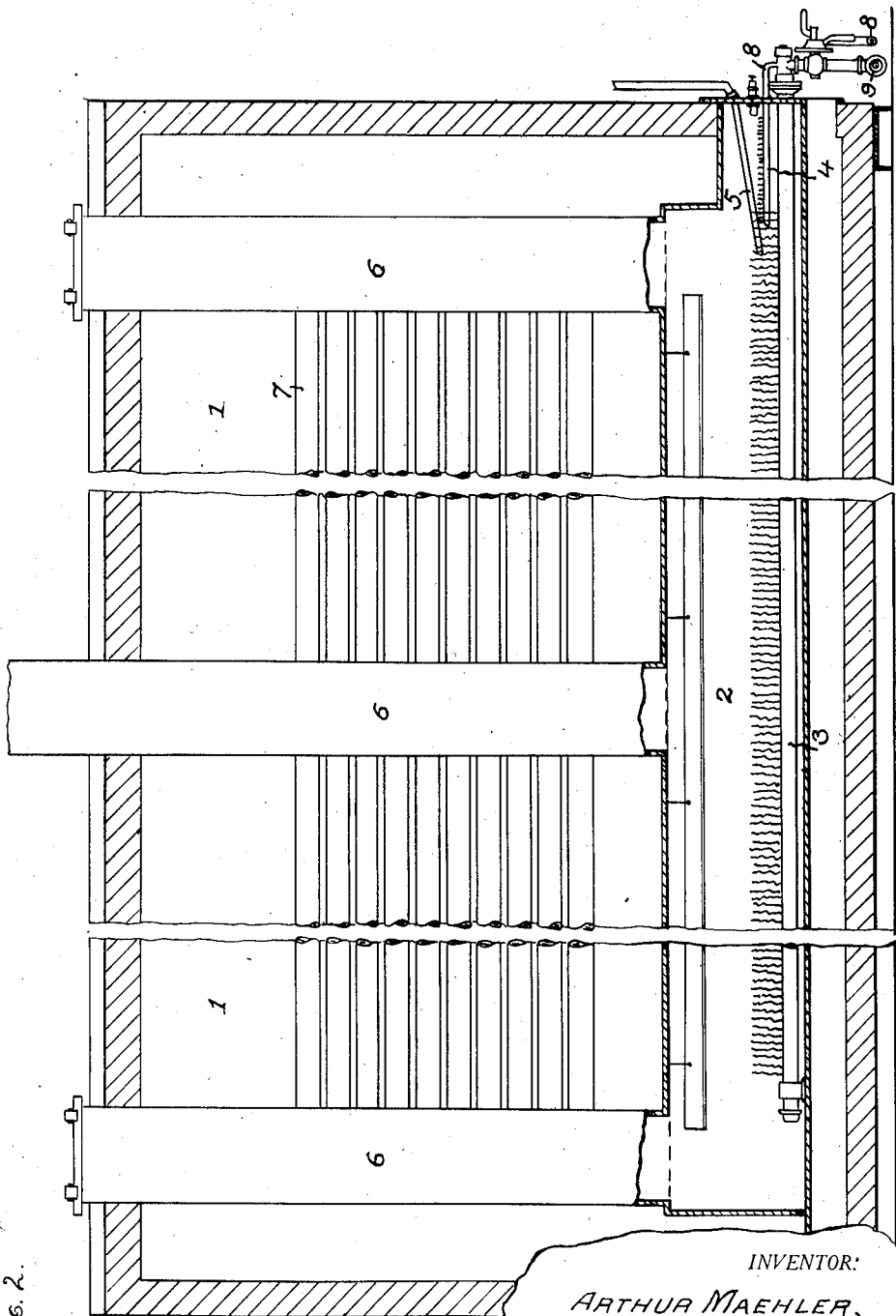


Fig. 2.

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DRYING AND ENAMELING OVEN CONTROL.

Application filed August 5, 1926. Serial No. 127,277.

This invention relates to an automatically operating safety system and means for that type of drying and enameling ovens which are indirectly heated by one or more enclosed gaseous fuel burners within the oven chamber, and the present improvements have as their object:

To provide an intercontrolled association of parts and mechanisms with the gaseous fuel supply to the oven burner or burners, by means of which, and on an accidental extinguishment of the pilot light of a burner in the oven chamber, said parts and mechanisms will automatically come into action to effect a closing of a shut-off valve in the pipe or duct supplying gaseous fuel under pressure to said burner or burners, and with a consequent stoppage of fuel supply to the burners, the escape and accumulation of unconsumed and explosive gaseous fuel in the oven chamber is prevented, and the danger to life and property due to an explosion of such accumulation of gaseous fuel is avoided.

Another object is to provide an interconnected control between the operating means of the shut-off valve in the supply pipe to the oven burners, and the motor of a pump by which gaseous fuel under pressure is forced into said supply pipe, whereby the starting and stopping of said motor is automatically effected in unison with the opening and the closing of said shut-off valve, all as will hereinafter more fully appear.

In the accompanying drawings:—

Fig. 1, is a side elevation, illustrating the operating mechanisms and circuits in the preferred form of the invention.

Fig. 1^a, is a detail elevation with parts in section of the motor operated shut-off valve of the invention.

Fig. 2, is a detail longitudinal section, illustrating the gaseous fuel burner, and accessories in the oven chamber.

Like reference numerals indicate like parts in the different views.

The preferred arrangement of the invention is shown in the accompanying drawings as applied to a pair of ovens of the indirectly heated type, and preferably of the double chamber type of drying and enameling ovens shown and described in detail in a companion application for Letters Patent, Ser. No. 127,276, with the heating means of the oven chamber consisting of one or more heating units arranged in close prox-

imity to the respective side walls of the oven structure 1, with each unit comprising a lower horizontal trunk 2, having its air inlet through a front wall of the oven structure, and with the chamber of said trunk containing the perforated horizontally arranged tubular gaseous fuel burner 3, its associated pilot light 4 and the hereinafter described thermo-couple unit 5 of the present construction. In addition said heating unit comprises a plurality of vertical mains or headers 6 extending up from the trunk 2 and connected together by a series of horizontal tubular members 7. In the construction shown in Fig. 2, the central one of the headers 6 extends up through the oven roof for connection with the usual outlet or uptake stack of the oven structure.

In the present construction the supply of gaseous fuel to its aforesaid pilot light or lights 4 is from a constant source of supply independent of the supply of gaseous fuel to the burner or burners 3 of the heating units aforesaid, and is supplied to such pilot lights by a pipe or conduit 8 extending from such source of supply to said pilot lights.

The gaseous fuel supply to the burners 3 of the aforesaid heating units, is preferably of the pressure feed type in which the gaseous fuel is forced into the supply pipe or main 9 of the burners 3 by a gas pump 10 preferably of the rotary class and operated by an electric motor 11 of the commercial three phase type, the operation of which is controlled by a switch 12 in the supply line 13, and in manner hereinafter described in detail.

The rotary fuel pump 10 above referred to will have the usual by-pass connection 14 between its inlet and outlet ends, with the connection 14 including a safety valve 15 as shown and for the purpose of preventing an over pressure in the supply pipe or main 9, as usual in this and allied arts.

In the present improvement a shut-off valve 16 is arranged in the supply pipe or main 9 between the pump 10 and the burner or burners 3 of the heating units of the oven structure. Said shut-off valve 16 is preferably of a generally used type of valve, in which the movable valve head or member tends to move to a closed position under the influence of a spring, while the opening movement of said valve head is effected by a revoluble eccentric or cam 17 in operative engagement with the stem of said valve head.

Rotary movement of the eccentric or cam 17, at the proper speed, is attained by a train of speed reducing gears arranged between the carrying shaft 18 of the eccentric or cam 17 and the armature shaft of driving motor associated with the shut-off valve 16, with said motor preferably of the single phase type. A motor actuated valve of the above described construction is now generally used in the heating art under the title of the "Dickson-Honeywell motor valve."

The single phase electric motor of the shut-off valve 16, above described, is controlled by a thermo-couple potentiometer 19 of any usual and suitable type, preferably a generally used instrument known to the trade as the "Leeds and Northup potentiometer," with electro-motive force supplied to the potentiometer by a supply line 20.

A thermo-couple potentiometer 19 of the type described, having circuit connections 24 with the thermo-couple units 5, and with said thermo-couple units 5 arranged in the heat zone of the pilot lighter, has its electrically actuated controlling mechanism connected by a three line circuit 21 with the like terminals of the operating electric motor of the shut-off valve 16 aforesaid, to automatically regulate the operation of said motor in accordance with the varying conditions of any one of the pilot lights 4 of the oven structure.

The carrying shaft 18 of an eccentric or cam 17 by which the opening and closing movements of the shut-off valve 16 is controlled, has fixedly attached to it the movable arm of a make and break switch 22 that is included in a branch circuit 23 of the supply line or circuit 20 of the potentiometer 19 aforesaid, and such branch line or circuit 23 includes the usual operating electro-magnetic coil of the relay switch mechanism 12 that controls the operation of the fuel supply pump 10 aforesaid. With the described arrangement of parts, the movable arm of the switch 22 will alternately break and make the circuit 23 of the operating electro-magnetic coil of the relay switch mechanism 12, to alternately move said switch mechanism 12 to a break and to a make condition of the supply line 13 to the motor 11 of the fuel pump 10, aforesaid, in unison with the alternate closing and opening of the aforesaid shut-off valve 16, of the fuel supply pipe or main 9 in a continued practical operation of the present automatic oven control system.

The operation of the system in detail is as follows:—

With the filling of the oven chamber or chambers and the closing of the oven doors, gaseous fuel is turned on to the pilot lights 4, of the indirect heating units of the oven structure, and said pilot lights ignited in any usual manner. Under the influence of the

heat from the pilot lights 4, the thermo-couple units 5 in the heat zones of said pilot lights, generate a thermo-electric current of a predetermined electro-motive force, and supplies said current through a circuit or line 24 to the mechanism of the potentiometer 19 to cause the same to automatically act and through the line or circuit 21, close the operating circuit of the electric motor of the shut-off valve 16, and by the action of said motor impart a turning movement to the eccentric or cam 17 to effect an opening movement of the shut-off valve 16, to afford a supply of gaseous fuel to the burners 3 of the oven.

With the shut-off valve mechanism 16 reaching its fully open condition, the potentiometer mechanism 19 reaches its neutral point and causes the motor of the shut-off valve to become inoperative.

Coincident with the opening of the shut-off valve 16, the movable arm of the make and break switch 22 carried on the shaft 18 of the operating eccentric aforesaid, moves to its circuit make or closed condition, to cause electro-motive force to flow through the line or circuit 23 to the operating electro-magnetic coil of the relay switch mechanism 12. Said coil then acts to move the movable contact elements of relay switch mechanism 12 into a circuit make or closed condition to cause electro-motive force to flow through the circuit or line 13 to the motor 11 of the fuel pump 10, so that with the operation of said motor the fuel pump 10 will force a continued supply of gaseous fuel into the supply pipe of the oven burners 3, which are then automatically lighted by their pilot lights 4. The actual drying or enameling operation of the oven then commences and continues until interrupted by accident or by the party in charge.

With the extinguishment, accidentally or otherwise, of any one pilot light 4 of the oven heating units, the thermo-couple 5 associated with said pilot light ceases to generate and supply the normal and required electric current to the potentiometer mechanism 19; through the aforesaid circuit or line 24, with the result that said potentiometer mechanism will automatically respond to such changed condition, and supply electro-motive force through circuit or line 21 to again close the operating circuit of the electric motor of the shut-off valve mechanism 16, and by the rotation of said motor impart further turning movement to the eccentric or cam 17 to release the movable head or member of said valve, and so that it may assume a closed condition under the influence of its operating spring and shut-off the supply of gaseous fuel through the supply pipe or trunk 9, to the burners 3 of the heating units of the oven structure.

Simultaneously with the described clos-

ing movement of the shut-off valve 16, and associated operating mechanism, the shaft 18 of said mechanism, carries the movable arm of the make and break switch 22 into a circuit make or closed condition, to in turn cause the relay switch mechanism 12 to open the circuit of the pump motor 11 to cause a stoppage of the same and of the fuel supply to the burners 3 of the oven heating units in the manner heretofore set forth.

With conditions established as just described, the drying or enameling operation of the oven structure ceases, and the same operations first above set forth must be repeated in order to re-establish the drying or enameling operation.

Having thus fully described my invention, what I claim and desire to secure by Letters Patent, is:—

1. In an automatic control for drying and enameling oven of the indirectly heated gaseous fuel type, the combination with the oven housing and indirect heating unit in same, of a gaseous fuel supply pipe connected to the burner of said heating unit, an electric motor-pump supplying gaseous fuel under pressure to said supply pipe, an automatic shut-off valve in said fuel supply pipe, a pilot light having a separate fuel supply to that of the aforesaid burner, a thermo-couple potentiometer having its thermo-couple arranged in the heat zone of the pilot light and having controlling connection with the automatic mechanism of shut-off valve aforesaid, an electric switch operatively associated with the mechanism of the shut-off valve and adapted to effect a closing and opening of the electric supply to the motor of the fuel pump in unison with the opening and closing movements of said shut-off valves.

2. In an automatic control for drying and enameling oven of the indirectly heated gaseous fuel type, the combination with the oven housing and indirect heating unit in same,

of a gaseous fuel supply pipe connected to the burner of said heating unit, an electric motor pump supplying gaseous fuel under pressure to said supply pipe, a shut-off valve mechanism of the electric motor actuated type connected in said fuel supply pipe, a pilot light having a separate fuel supply to that of the aforesaid burner, a thermo-couple potentiometer having its thermo-couple arranged in the heat zone of the pilot light and having controlling connection with the operating motor of the shut-off valve, an electric switch operatively associated with the motor of the shut-off valve and adapted to effect a closing and opening of the electric supply to the motor of the fuel pump in unison with the opening and closing movements of said valve.

3. In an automatic control for drying and enameling oven of the indirectly heated gaseous fuel type, the combination with the oven housing and indirect heating unit in same, of a gaseous fuel supply pipe connected to the burner of said heating unit, an electric motor pump supplying gaseous fuel under pressure to said supply pipe, a shut-off valve mechanism of the electric motor actuated type, connected in said fuel supply pipe, a pilot light having a separate fuel supply to that of the aforesaid burner, a thermo-couple potentiometer having its thermo-couple arranged in the heat zone of the pilot light and having controlling connection with the operating motor of the shut-off valve, a relay switch controlling the electric supply to the motor of the aforesaid fuel pump, an electric switch operatively connected with the motor mechanism of the shut-off valve and controlling the operating circuit of the relay switch to cause the same to open and close the same in unison with the opening and closing of the shut-off valve.

Signed at Chicago, Illinois July, 1926.

ARTHUR MAEHLER.