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AUTOMATIC CONTROL

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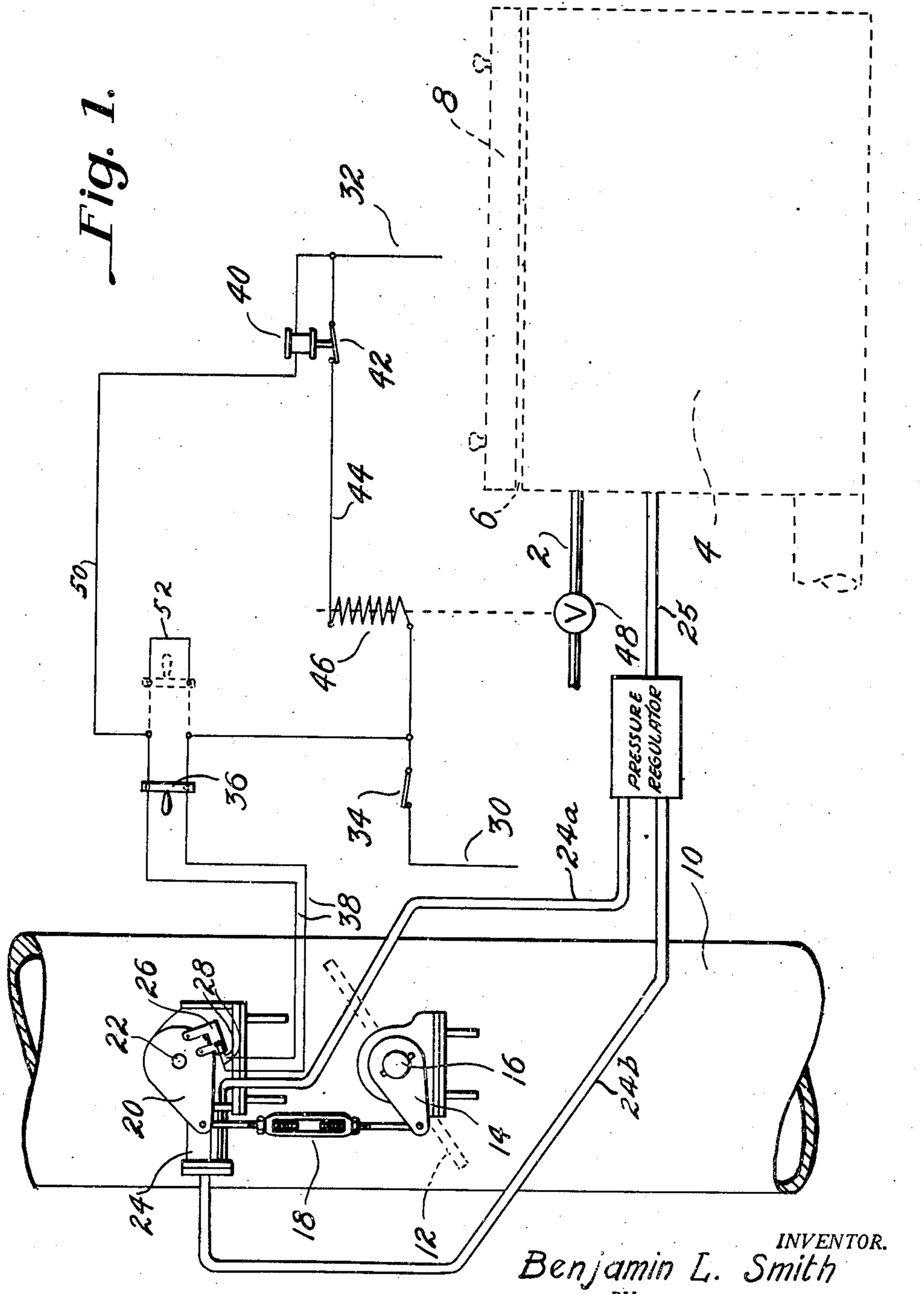
Fig. 1.



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AUTOMATIC CONTROL

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1

This invention relates to an automatic control and more particularly to a control for automatically closing the fuel valve of a soaking pit when the pit cover is being lifted and opening the fuel valve when the pit cover is placed over the pit opening. As is well known, ingots are charged into the combustion chamber of a soaking pit when the pit cover is not in place and after the ingots are charged into the pit the cover is replaced. During the normal operation of the furnace the pit cover is in place and the gas pressure in the pit is kept constant by means of an automatic control operated by the pit pressure which changes the position of the stack damper as the pressure varies. In other words, if the pressure in the pit tends to rise, the stack damper automatically opens, and if the pressure decreases, the stack damper automatically closes until the pressure becomes normal. When it is desired to remove the charge from the furnace, the cover is lifted and the gas is turned off manually. This arrangement is unsatsifactory since there is no direct communication between the operator turning off the gas manually at the control panel and the cover crane operator. If the cover is lifted off before the gas is shut off, a heavy sheet of flames shoots high up into the air all around the cover causing damage to equipment and endangering the lives of men working around the pits. Various attempts have been made to overcome this objectionable feature, but none have proved to be entirely satisfactory.

An object of this invention is to provide means for shutting off the fuel gas the moment the pit pressure drops to zero.

Another object is to provide a device which will positively shut off the gas as soon as the pit cover is lifted off the pit.

These and other objects will be more apparent after referring to the following specification and attached drawings, in which:

The single figure shows a schematic wiring diagram hooked up to the stack damper.

Referring more particularly to the drawing, the reference numeral 2 indicates the fuel supply line leading to the combustion chamber 4 of a soaking pit or other article heating furnace. The pit is provided with an opening 6 and a cover 8 for closing the opening. A stack 10 leads from the furnace and is provided with a stack damper 12 for controlling the flow of flue gas therefrom. A lever 14 attached to the damper shaft 16 is connected by means of an adjustable link 18 to a lever 20 mounted on the shaft 22 which is rotated by means of a hydraulic cylinder 24 which is part of the furnace pressure control. As shown in the drawing, the pressure regulator is actuated by the pit pressure through the conduit 25 to deliver fluid through either line 24*a* or 24*b* to the cylinder 24 to move the damper 12 one way or the

2

other depending upon whether the pit pressure is above or below the pressure desired. The equipment so far described is not part of my invention, but is the usual equipment used in heating ingots.

Mounted on the lever 20 is a standard mercoid switch 26 which consists of two contacts 28 inserted in a small glass tube which is closed at one end and contains a drop of mercury. The two contacts are mounted in a stopper made of insulating material fitted into the opening end of a glass tube and projected a short distance into the tube.

The drawing shows the position of the damper and control during normal operation of the furnace. In this position the mercury in the switch 26 flows against the contacts 28 and completes a circuit through the switch. The control circuit receives its power from the lines 30, 32. In the line 30 is a normally closed control switch 34 and a double pole double throw switch 36. In the full line position shown in the drawing, switch 36 completes a circuit to the mercoid switch 26 through the lines 38. Lines 30, 32 and 38 complete a circuit to a relay coil 40 which operates the relay switch 42 located in the line 44. Also located in the line 44 is a solenoid 46 for controlling the operation of a gas valve 48 located in the fuel line 2.

The operation of the device is as follows:

With the furnace operating normally the mercoid switch 26 will be in such position that the contacts 28 will be closed. This completes the circuit to the relay coil 40 through line 30, switch 34, double throw switch 36, line 38, mercoid switch 26, line 50 and line 32. This energizes relay coil 40 causing relay switch 42 to close, thus completing a circuit from line 30 to line 32 through solenoid 46, line 44 and switch 42. This energizes solenoid 46, causing gas valve 48 to open. When the cover is lifted from the furnace, the pressure therein drops to zero, thus causing the furnace pressure control to close damper 12. As the lever 20 rotates to close damper 12, the drop of mercury in the switch 26 flows away from the contacts breaking the circuit to coil 40. This opens the switch 42, deenergizing solenoid 46 and closing valve 48. When the cover is placed over the pit opening, the pressure immediately increases, thus opening the stack damper and tilting the mercoid switch 26 to cause the mercury to flow toward the contacts. This completes the circuit to relay coil 40 and causes the valve 48 to open as hereinbefore described. If the mercoid switch should break or fail to function for any reason it is advisable that the valve 48 should be manually controlled since otherwise the charge would be overheated or otherwise damaged. In order to accomplish this, the double pole double throw switch 36 is moved to the dotted line position and the circuit is completed to the relay coil

40 through the line 52. The opening and closing of valve 48 is then controlled by means of the switch 34.

While one embodiment of my invention has been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. In an article heating furnace having a combustion chamber, means for delivering a fluid fuel to said chamber, said chamber having an opening therein for charging articles thereto, means for closing said opening, a stack leading from said chamber, a damper in said stack for controlling the flow of flue gas therefrom, and means for opening and closing said damper, the improvement comprising a switch operable by movement of said damper, a valve for controlling the flow of said fuel to the combustion chamber, and an electric circuit including said switch for opening said valve when the damper is open, the movement of said damper to its closed position changing the position of said switch to open said circuit and move said valve to closed position.

2. In an article heating furnace having a combustion chamber, means for delivering a fluid fuel to said chamber, said chamber having an opening therein for charging articles thereto, means for closing said opening, a stack leading from said chamber, a damper in said stack for controlling the flow of flue gas therefrom, and means for opening and closing said damper, the improvement comprising a switch operable by movement of said damper, said switch being closed during normal operation of said furnace, a valve for controlling the flow of said fuel to the combustion chamber, and an electric circuit including said switch for opening said valve when the damper is open, the movement of said damper to its closed position opening said switch to open said circuit and move said valve to closed position.

3. In an article heating furnace having a combustion chamber, means for delivering a fluid fuel to said chamber, said chamber having an opening therein for charging articles thereto, means for closing said opening, a stack leading from said chamber, a damper in said stack for controlling the flow of flue gas therefrom, and means for opening and closing said damper, the improvement comprising a switch operable by movement of said damper, a valve for controlling the flow of said fuel to the combustion chamber, an electric circuit including said switch for opening said valve when the damper is open, the movement of said damper to its closed position changing the position of said switch to open said circuit and move said valve to closed position, and a double throw switch in said circuit normally positioned to complete the circuit through the first named switch, said double throw switch being movable to by-pass the first named switch to permit manual control of said valve.

4. In an article heating furnace having a combustion chamber, means for delivering a fluid fuel to said chamber, said chamber having an opening therein for charging articles thereto, means for closing said opening, a stack leading from said chamber, a damper in said stack for controlling the flow of flue gas therefrom, and means for opening and closing said damper, the improvement comprising a switch operable by movement of said damper, said switch being closed during normal operation of said furnace, a valve for controlling the flow of said fuel to the combustion chamber, an electric circuit including said switch for opening said valve when the damper is open, the movement of said damper to its closed position opening said switch to open said circuit and move said valve to closed position, and a double throw switch in said circuit normally positioned to complete the circuit through the first named switch, said double throw switch being movable to by-pass the first named switch to permit manual control of said valve.

5. In an article heating furnace having a combustion chamber, means for delivering a fluid fuel to said chamber, said chamber having an opening therein for charging articles thereto, means for closing said opening, a stack leading from said chamber, a damper in said stack for controlling the flow of flue gas therefrom, and means for opening and closing said damper, the improvement comprising a solenoid controlled valve for controlling the flow of the fuel to the combustion chamber, an electric circuit for energizing said solenoid to open said valve when the damper is open, and a mercury switch in said circuit operable by movement of said damper, said switch being closed during normal operation of said furnace, the movement of said damper to its closed position opening said switch to open said circuit and move said valve to closed position.

6. In an article heating furnace having a combustion chamber, means for delivering a fluid fuel to said chamber, said chamber having an opening therein for charging articles thereto, means for closing said opening, a stack leading from said chamber, a damper in said stack for controlling the flow of flue gas therefrom, and means for opening and closing said damper, the improvement comprising a solenoid controlled valve for controlling the flow of the fuel to the combustion chamber, an electric circuit for energizing said solenoid to open said valve when the damper is open, a mercury switch in said circuit operable by movement of said damper, said switch being closed during normal operation of said furnace, the movement of said damper to its closed position opening said switch to open said circuit and move said valve to closed position, and a double throw switch in said circuit normally positioned to complete the circuit through the first named switch, said double throw switch being movable to by-pass the first named switch to permit manual control of said valve.

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