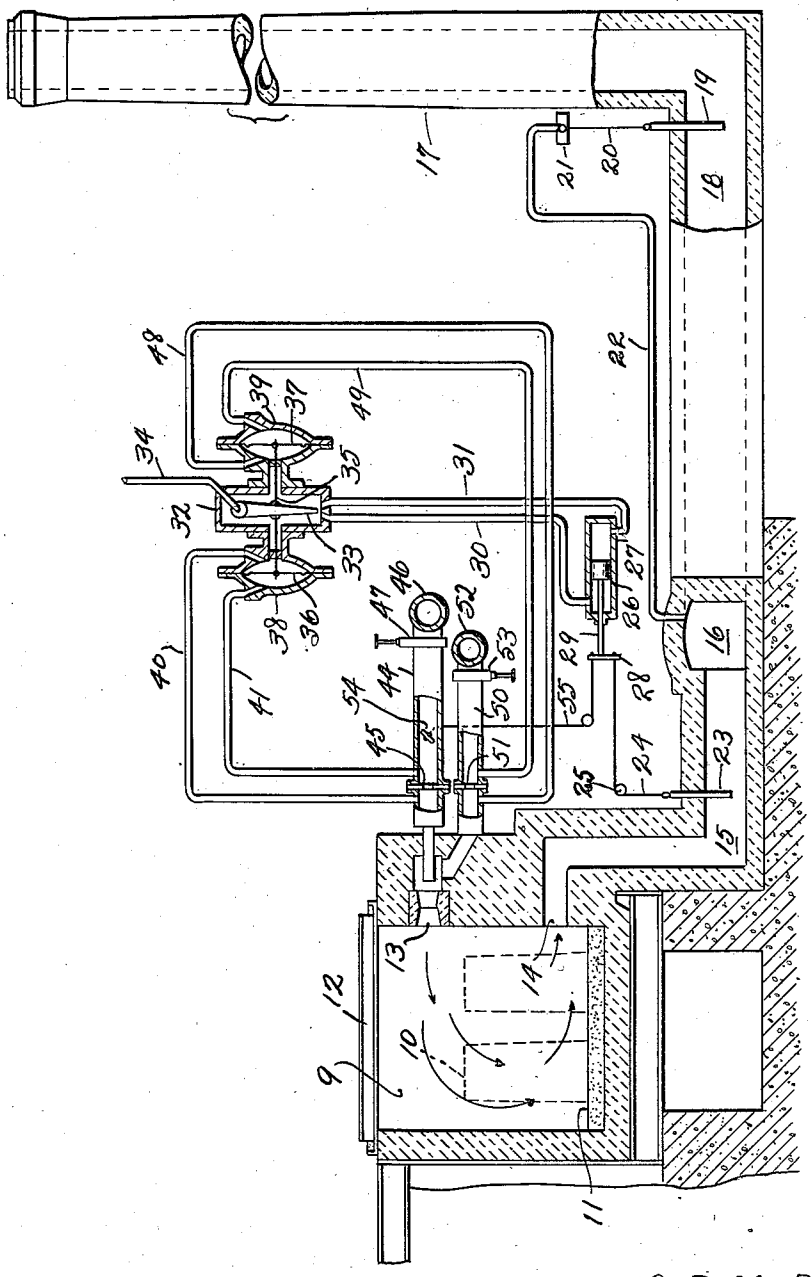
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SOAKING PIT FIRING CONTROL

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SOAKING PIT FIRING CONTROL

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1 Claim. (Cl. 263—43)

The heating of steel ingots to a temperature necessary for forging or rolling is usually accomplished by standing the ingots on end in a direct-fired pit which has a waste gas port in connection with a source of draft such as a stack, there usually being a battery of such pits all served by one stack. Inasmuch as the pits are independently fired, some may be on high firing rates and others on low rates. The same stack draft on all of the pits is therefore not conductive to proper heat distribution in a pit which is being fired at a rate different from the other pits. Attempts have been made to overcome this difficulty by providing a waste gas damper for each pit, the position of the damper being controlled by the waste gas pressure prevailing between the pit and damper. This arrangement, however, has not proven entirely satisfactory particularly on low firing rates and it is therefore the object of the present invention to provide an improved arrangement for controlling the heat distribution in the pit.

In accordance with the present invention, each pit is provided with a waste gas damper but instead of controlling the position of this damper as above mentioned its position is controlled by means responsive to a change in the rate of fuel supply to the pit. This manner of controlling the position of the damper gives superior flame distribution in the pit and especially in a pit where the flame travels in a more or less U-shape path between the firing port and the exhaust port.

The preferred mechanism for controlling the position of the pit damper in accordance with the present invention can best be explained in connection with the accompanying drawing wherein the single figure is a more or less diagrammatic representation of a soaking pit furnace with the present invention applied thereto.

In the drawing, 9 indicates a pit wherein ingots 10 (shown in broken lines) are adapted to be placed in upright position on the floor or hearth 11 of the pit. The pit has the usual cover 12 adapted to be moved to one side for the insertion and removal of the ingots. 13 indicates the firing port for the pit and 14 the waste gas outlet port. The flame in travelling from the burner port to the exhaust port normally tends to flow in a more or less U-shape path as indicated by the arrows. A flue 15 leads from the outlet 14 to a waste gas manifold 16 which delivers to a stack 17 by way of a connecting flue passage 18. It will be understood that the manifold 16 is common to a battery of pits 9.

A stack damper is indicated at 19, the same being shown as suspended by a cable 20 whose upper end is secured to an operating device 21 for raising and lowering the damper, this device being connected by a tube 22 to the manifold 16, whereby draft pressure in the manifold is effective on the operating device 21, it being understood that the device 21 will operate the damper 19 in a manner to maintain a substantially constant draft pressure in the manifold 16. This arrangement eliminates variations in stack draft and represents nothing novel.

Fuel and combustion-supporting air are delivered to the firing port by conduits 50 and 44 leading from pressure supply mains 52 and 46 respectively. 47 and 53 indicate conventional shut-off valves in the air and gas conduits. In the waste gas passage 15 is a damper 23 and it is the object of the invention to provide a simple and practical system for controlling the position of this damper to increase or decrease the effective discharge area of said passage in accordance as the fuel supply to the furnace is increased or decreased. It is common practice in fuel fired furnaces to provide means for maintaining the relative proportions of fuel and combustion-supporting air supplied to the furnace, and in the drawing I have shown a well known means for that purpose and have also shown how a movable element of said means may be utilized to control the position of the damper 23 to attain the object of the present invention.

In the proportioning system shown there is a metering orifice 51 in the gas supply conduit and a similar orifice 45 in the air supply conduit, the latter also being provided with a throttle valve 54 whose position is controlled by means responsive to a relative change in flow in the two conduits 44 and 50. If, for example, the gas valve 53 is adjusted to increase or decrease the supply of fuel to the furnace, the control means would automatically adjust the position of the throttle valve 54 to make corresponding adjustment in the air supply in order to maintain the fuel-air ratio constant. The control means comprises two diaphragms 36 and 37 each in its own case 38 and 39 respectively,—the diaphragms being interconnected by a tie rod 35 so that they must move as a unit. Pipes 40 and 41 lead from the opposite sides of the metering orifice 45 to opposite sides of the diaphragm 36 and pipes 48 and 49 lead from opposite sides of the metering orifice 51 to opposite sides of the diaphragm 37. If there is any relative change in flow in the two conduits 44 and 50 the diaphragms will move towards the right or left as the case may be as will be readily understood. The throttle valve 54 is connected

by suitable linkage to a piston 26 in a cylinder 27, the said linkage being shown as comprising the piston rod 29, a cross head 28 and a cable 55. Operating fluid is delivered to one end or the other of the cylinder by pipes 30 and 31 leading from a housing 32 which serves to support the diaphragm cases 38 and 39. Operating fluid is supplied to one or the other of the pipes 30 and 31 by a pressure nozzle 33 connected to the tie rod 35 for movement therewith. Fluid under pressure is supplied to the nozzle by a supply pipe 34. It will be understood that when the nozzle 33 is midway between the inlets of the pipes 30 and 31 the piston 26 will not be moved.

In view of the fact that the gas-air ratio control system above described embodies a metering orifice 51 in the fuel supply conduit and embodies a movable element in the form of piston 26 for adjusting the position of the throttle valve 54 to compensate for a change in flow through the fuel supply conduit. I have found it convenient and practical to employ the piston 26 for adjusting the position of the damper 23 to attain the object of the present invention. As I show, the operating connection between the damper and the piston may consist of a cable 24 leading from the crosshead 28 and over a pulley 25 to the damper. The invention, however, is not limited to the use of the particular gas-air ratio control system disclosed. The important thing is the use of means responsive to a change in the amount of fuel supplied to the furnace for adjusting the position of the damper 23, for the purpose described.

The orifices 45 and 51 in the air and fuel lines respectively cause a differential pressure to be established in the lines, i. e., there will be a relatively high pressure on the intake side of the orifices and a relatively low pressure on the discharge side of orifices. The lines 40, 41, and 48, 49 are taken from the fuel and air lines in those high and low pressure zones and impose them on the diaphragms 36 and 37 which in turn control the motion of motor 27 and ultimately the position of damper 23 and throttle 54. It is apparent therefore that a change in the rate of flow in either of lines 44 and 50 will cause a variation in the pressure differential at the several orifices. While the disclosure shows a differential in both lines the control of damper 23 may be determined by a differential pressure in either line.

What I claim is:

A soaking pit comprising in combination, a chamber wherein ingots are placed for heating by a flame in said chamber, means including a metering orifice for supplying fuel to said chamber to produce said flame, an exhaust passage leading from said chamber, a damper in said passage, means responsive to a change in differential pressure at said orifice for adjusting said damper to vary the effective discharge area of said passage, a waste gas manifold to which said passage delivers, and means for maintaining a substantially constant gas pressure in said manifold.

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