

April 30, 1929

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1,711,274

SOAKING-PIT FURNACE

Filed Nov. 17, 1927

2 Sheets-Sheet 1

Fig. 1.

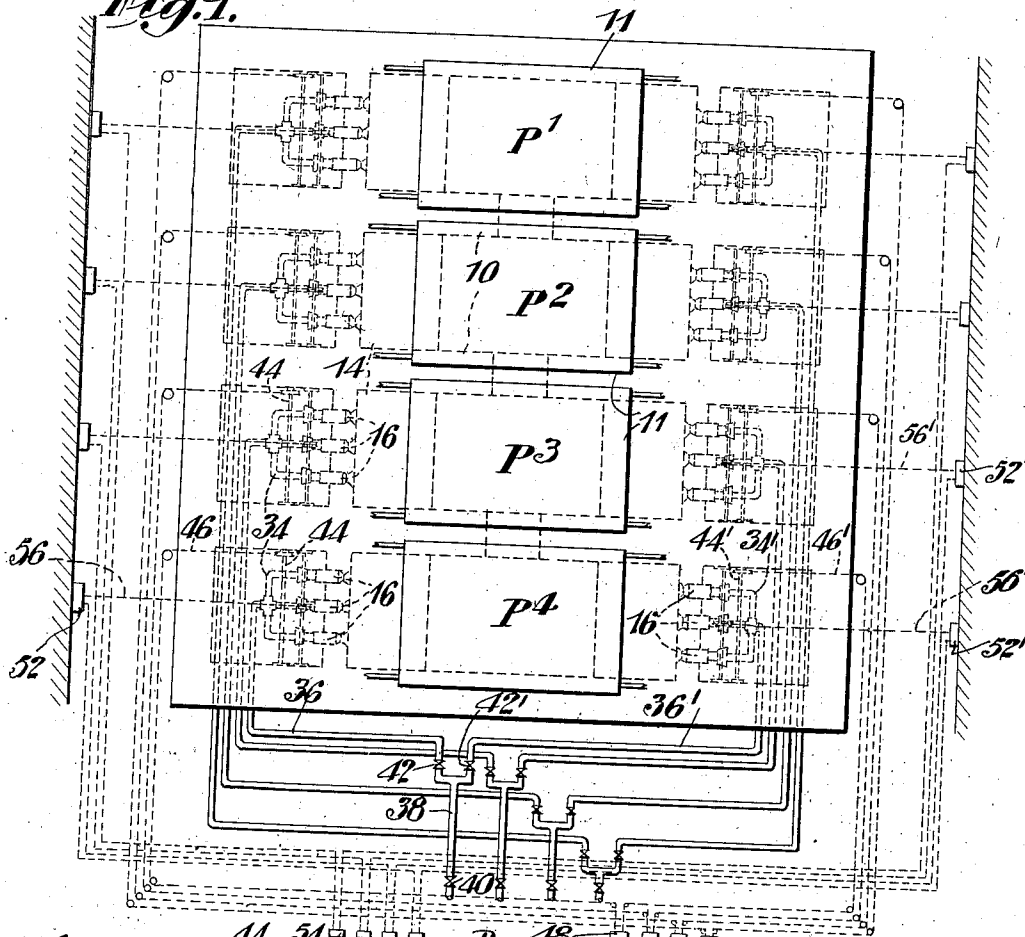
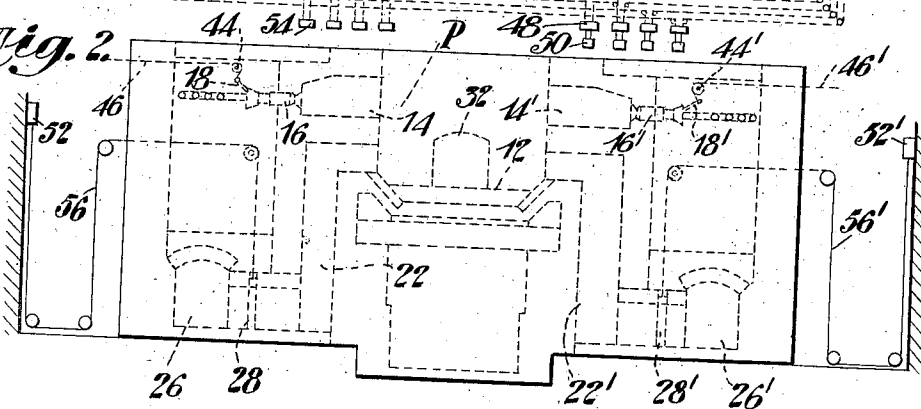


Fig. 2.



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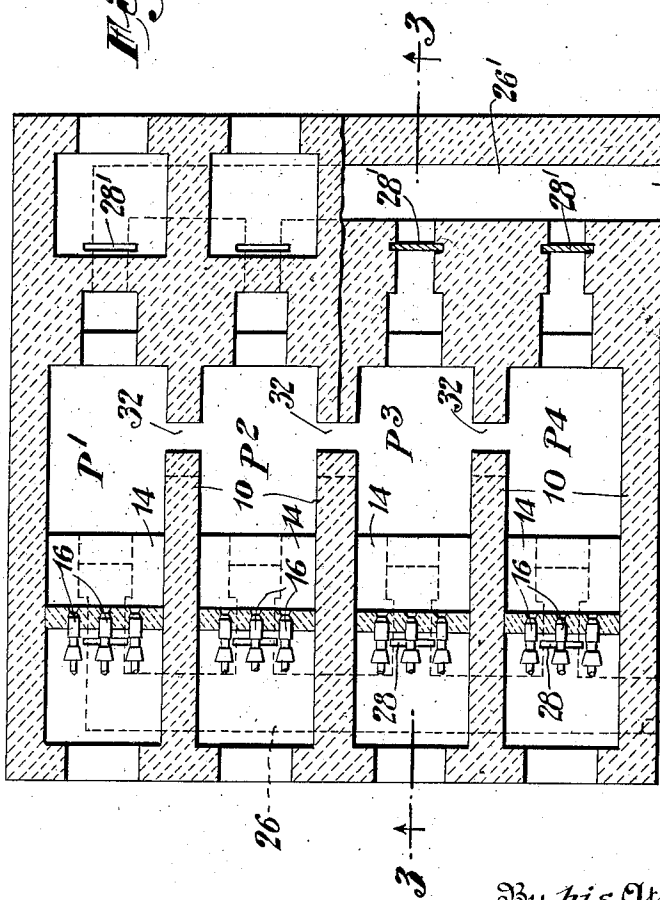
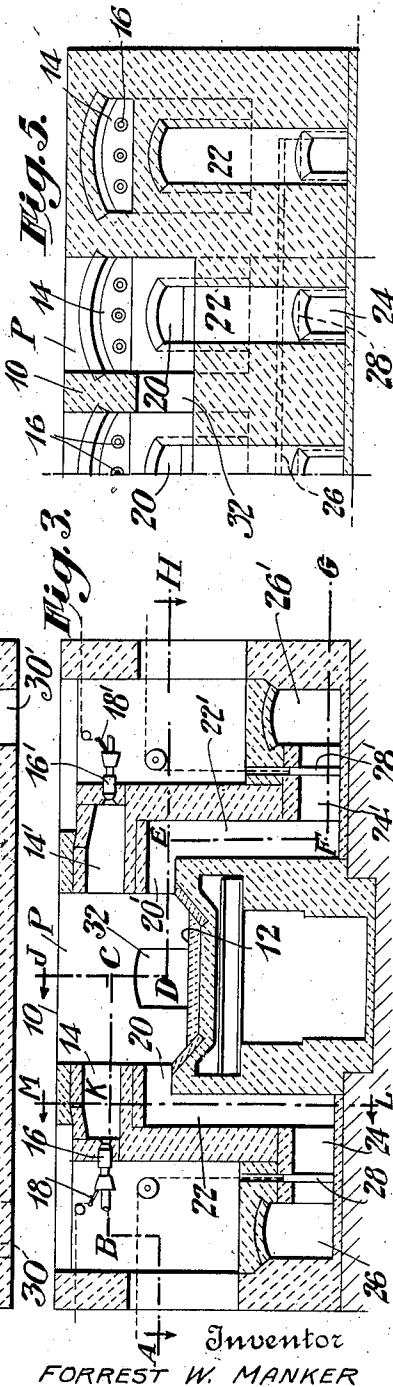
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Fig. 4.



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UNITED STATES PATENT OFFICE.

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SOAKING-PIT FURNACE.

Application filed November 17, 1927. Serial No. 233,851.

This invention relates to soaking pit furnaces and has among its objects to provide a soaking pit furnace of such construction that the hot gases generated in one or more pits by burning gaseous fuel therein may be passed through other pits of the series to preliminarily heat the ingots contained therein; to provide a firing arrangement for the individual pits such that uniform heating of the entire ingot may be had in the minimum amount of time; and to provide other improvements in soaking pit furnaces as will more fully appear hereinafter.

Referring to the drawings wherein the preferred constructional form of the furnace is shown,

Fig. 1 represents the furnace in plan with various parts associated therewith more or less diagrammatically indicated in dotted lines.

Fig. 2 represents a side elevation of the furnace, some of the interior construction being indicated in dotted lines.

Fig. 3 is a vertical sectional view of the furnace on line 3—3 of Fig. 4.

Fig. 4 is a horizontal cross section of the furnace on lines A—B—C—D—E—F—G and A—B—C—D—E—H respectively of Fig. 3, the upper half of Fig. 3 being taken on the last named lines.

Fig. 5 is a vertical section taken on the lines J—K—L and M—K—L respectively of Fig. 3, the left hand side of the view being taken on the first named lines.

For the purpose of illustrating the nature of the invention a soaking pit furnace having four pits has been shown but as will become more evident as the description proceeds a greater or lesser number of pits may be employed without departing from the spirit of the invention. The pits are generally indicated by letter P, the prime numbers being employed to simplify the description.

Referring now more particularly to Figs. 3, 4 and 5, it will be seen that the pits are separated from each other by dividing walls 10 through each of which extends a passage 32 the purpose of which will more fully appear hereinafter and each pit is provided with the conventional cover 11. (See Fig. 1.)

Each pit is provided with its own firing

means, the firing means for one pit being duplicated in the others. Opening on a side wall of each pit is a combustion chamber 14 which is relatively long and which increases in cross-sectional area from its closed end, where the combustible gases are admitted, towards its opening on the pit. Combustible gases are delivered to the combustion chamber by a plurality of burners 16 connected with a suitable source of supply of gas. These burners have been shown as of the air-gas mixing type, the primary air entering the individual burners through a suitable shutter at the back of the burners, one element of the means for regulating the shutters being indicated at 18. Opening on the pit below the combustion chamber 14 and adjacent the pit hearth 12 is a flue or exhaust passage 20 through which the products of combustion may flow out of the pit. This passage continues downwardly as indicated at 22 and then laterally as at 24 and opens on a flue 26 between which and said lateral passage is positioned a damper 28. Said flue 26 is common to all of the pits and exhausts the products of combustion received from the pits into a stack not shown, the outlet from the flue being indicated at 30 (Fig. 4).

Opening on the side wall of the pit opposite to that on which the combustion chamber 14 opens is another combustion chamber 14' similar in all respect to the first described combustion chamber. The other appurtenances such as burners, the exhaust passage, the damper and flue are also duplicated in connection with the combustion chamber 14' as has been indicated by priming the base reference numerals indicating the already described construction.

By providing opposed combustion chambers for the pits and firing them simultaneously, the flames coming from the combustion chambers meet each other at the center of the pit and intermingle and circulate more completely around the ingots in the pits than is possible of attainment where but a single combustion chamber opening on a side wall of the pit is employed. More uniform heating of the ingots is therefore obtained. Furthermore by withdrawing the products of combustion from the pit through oppositely positioned exhaust passages 20, 20' arranged

adjacent the hearth of the pit it will be readily appreciated that the lower part of the pit will be just as completely heated by the circulating gases as the upper part of the pit with consequent uniform heating of the entire length of the ingots therein.

As previously stated each combustion chamber is constructed to increase in cross-sectional area from its closed end outwardly towards the pit. By providing an expanding combustion chamber the burning gases expand within the combustion chamber and flow into the pit under relatively low velocity with the result that localized or spot heating of the ingots is effectually prevented.

It will now be appreciated that, from one point in view, the pits are independent units susceptible of individual control and yet they are so coordinated that they may be operated in combination to obtain certain desirable results. By opening all of the dampers 28 (28'), all of the pits exhaust into the common collecting flue 26 (26') and very little if any combustion gases pass from one pit to the next adjacent pit through connecting passage 32. Suppose it is desired to turn all of the combustion gases through pit P³. All of the dampers 28 (28') are then closed except those controlling the exhaust from P³. P¹ then vents into P², the latter into P³ and P⁴ into P³. It may also be noted that by partially opening the dampers 28, (28') some of the combustion gases from the pit controlled by such dampers may discharge its combustion gases partly into the adjacent pit or pits and partly into the common collecting fluid 26 (26'), thus enabling great flexibility of control to be had.

As already indicated each pit is provided with firing means at its opposite side walls both of which means are adapted for simultaneous operation. In Fig. 1 I have shown how I prefer to control the individual firing units and also a controlling system for the various dampers. Inasmuch as the controlling means are the same for each pit the description will be confined to the controlling means associated with pit P⁴. Each group of burners 16 and 16' has its own manifold 34 and 34', respectively. Leading from each manifold is a gas pipe 36 and 36' respectively, the pipes connecting with a common pipe 38 provided with a valve 40, the pipes 36 and 36' each also having a valve 42 and 42' respectively. For regulating the admission of air to the burners each burner has its individual shutter, an operating element of which is indicated at 18 (18'). In order to operate said shutters simultaneously there is provided a shaft 44 (44') on which are mounted suitable means for operating the shutter-operating means 18 (18'). Leading from the two shafts 44 and 44' are cables 46 and 46', respectively, which lead to a motor 48 adapted to be controlled by a switch or other power-

controlling means 50. It will now be readily appreciated that joint control of both sets of burners is had both to the gas and air supply and that as regards the gas supply the valves 42 and 42' permit individual control of each set of burners. Individual as well as joint control of the burners obviously give desirable flexibility in the firing system.

Joint control is also had on the two dampers associated with each pit. As shown there is provided a motor 52 (52') for each damper, this motor being set into operation by a suitable controlling means 54, the motor being operatively connected to its damper in any suitable manner as by a cable 56 (56').

It will now be seen that the present invention provides a soaking-pit furnace which in addition to other desirable features of construction allows recovery of waste heat from one or more of the pits in a simple and practical manner without the use of complicated flue construction and which is devoid of the complicated reversing flues and dampers ordinarily employed in connection with soaking pit furnaces.

What is claimed is:

1. In combination, a furnace having soaking pits arranged side by side, independent firing means for each pit, independent exhausting means for each pit, and a passage between adjacent pits through which the combustion products may be passed from one pit to another.

2. In a furnace having soaking pits arranged side by side, the combination of a passage between adjacent pits through which combustion products may pass from one pit to another, means individual to each pit adapted to fire thereinto simultaneously from opposite directions, exhaust passages leading from the respective pits adjacent the bottom thereof, and dampers in said passages for regulating the volume of combustion products which may be passed from one pit to another.

3. In a furnace having soaking pits arranged side by side, the combination of a passage between adjacent pits through which products of combustion may pass from one pit to another, exhaust passages leading out of the individual pits from opposite sides thereof, means for introducing hot gases into the pits, and dampers in said exhaust passages for indirectly controlling the volume of combustion products which may pass from one pit to another through the communicating passage therebetween.

4. A method of firing a series of soaking pits which are adapted to be fired by introducing combustible gases thereinto comprising introducing such gases into less than the whole number of pits, passing the resultant hot combustion products towards the pit last charged by way of the pits intervening between said last charged pit and the pit most

remote therefrom and exhausting such combustion products from the said last charged pit.

5 5. A method of firing a series of soaking pits which are adapted to be fired by introducing combustible gases therein comprising introducing such gases into less than the

whole number of said pits and venting the combustion products from the directly fired pits through the last charged pit by flow paths which include intermediate pits.

In testimony whereof I affix my signature.

FORREST W. MANKER.