

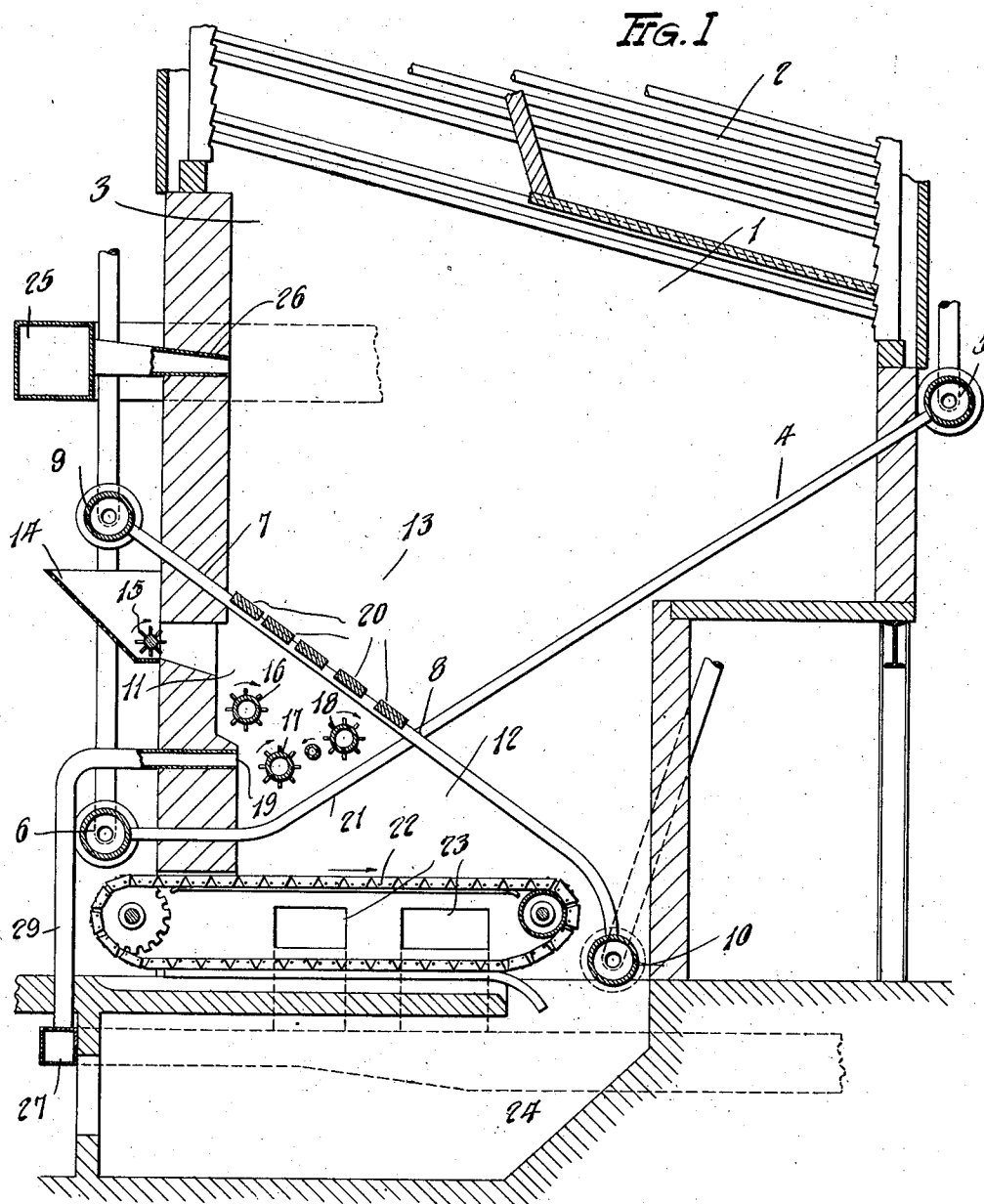
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ACID SLUDGE BURNER

1,780,653

Filed May 26. 1927

2 Sheets-Sheet 1



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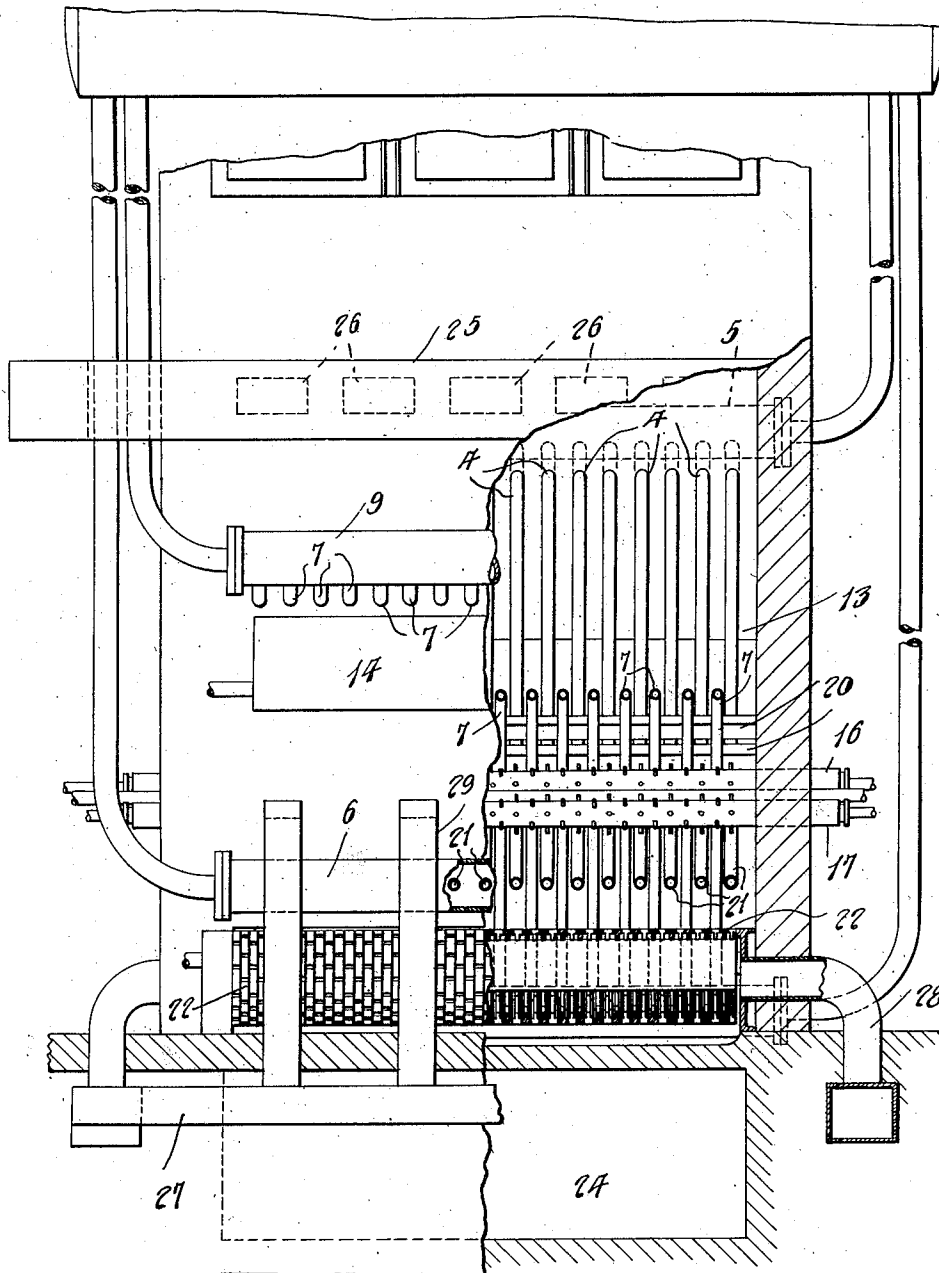


FIG. II.

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ACID-SLUDGE BURNER

Application filed May 26, 1927. Serial No. 194,499.

This invention relates to acid sludge burning furnaces.

The primary object of the invention is to provide a multiplicity of chambers or zones within the confines of the furnace for distilling the sludge, feeding the resultant coke or carbonaceous material to a carbon zone where combustion of the carbon and coke takes place, and in providing another zone or combustion chamber wherein final or complete combustion of the gases evolved from the combustion and distillation zones takes place.

Another object of the invention comprehends the provision of means for thoroughly mixing, in the final zone, rich gases obtained from the distillation zone and the relatively poor or lean gases evolved from the aforesaid combustion zone.

Another object of the invention is to provide means for affording protection from the heat to the lowermost chambers wherein distillation and combustion, respectively, takes place.

More specifically, the invention comprehends the idea of arranging protecting tubes which are preferably attached to the headers of the boiler system, in such a manner that they are diagonally disposed and interlaced, thereby to define a lower combustion chamber, a superposed distillation chamber and an uppermost gas combustion chamber for the evolved gases.

Still another object of the invention is to provide agitators positioned within the distillation chamber and designed to be rotated or oscillated to prevent caking of the sludge.

Numerous other objects of the invention will be apparent from the reading of the following specification when read in conjunction with the drawings attached hereto and forming a part hereof, in which—

Figure 1 represents a longitudinal sectional view of the furnace, and

Figure 2 a front view partly in section, exposing some of the apparatus for carrying out the operation.

Referring now more specifically to the drawings, wherein like reference characters

represent like parts, 1 designates a furnace generally, having the conventional water tubes 2 and the customary lower combustion space 3. Within the interior of this furnace space I provide a multiplicity of diagonally arranged water tubes 4 connected to the headers 5 and 6 respectively, and a second series of water tubes 7 crossing the first series of such tubes as at 8, and interlaced therewith, which secondary series of tubes are connected with the headers 9 and 10 respectively. These two series of crossed water tubes assist in defining a distillation zone or chamber 11, a lower carbon combustion chamber 12 and a gas combustion chamber 13, which latter chamber receives the rich and relatively lean evolved gases from the distillation and combustion chambers. Acid sludge is introduced by the hopper designated by the reference numeral 14, having a rotating feeder 15 for discharging the acid sludge within the confines of the chamber 11. This chamber is preferably provided with a series of agitators 16, 17 and 18 respectively, preferably water cooled, designed to constantly agitate the sludge during the distillation operation without permitting the coking thereof. To assist the distillation operation I preferably introduce heated air through a series of ducts 19, which air will preferably have a static pressure of approximately 1" water gauge and will be preheated to a temperature of approximately 400° F.

The distillation within the chamber 11 will drive off the volatile matter which arises through spaces provided between the tile slabs 20 supported by the tubes 8. This evolved gas is very rich, consisting mostly of hydrocarbons.

After the volatile matter has been driven off in the distillation chamber the coke which is left drops through the lower protecting tubes 21 onto the chain grate stoker 22 traveling in the direction shown by the arrow where further combustion takes place within the said carbon combustion chamber 12. It is very essential that the protecting tubes be so arranged as to protect the stoker from the intense heat within the combustion cham-

ber 13. Inasmuch as very little ash is left within the coke it is necessary to employ excess air for the combustion thereof. This air, preferably in a heated condition, and from the supply fed through the duct 19, aforesaid, is admitted through ducts 23. This air, as above stated, is under pressure and temperature.

The conveyor 22 delivers the ashes to the pit 24 positioned below the same.

It is highly important that the heat derived from the combustion of the gases within the chamber 13 be prevented from substantially affecting the lower chambers comprising the distillation zone for the sludge and the carbon combustion zone. To this end the diagonally arranged tubes are closely positioned and moreover transverse tile slabs are provided as at 20 to afford an adequate protection against heat for the distillation chamber while at the same time such slabs are spaced sufficiently to permit the evolved gases to escape from within the distillation chamber into the gas combustion chamber 13.

It will be apparent that the gases evolved from the distillation chamber will be quite rich consisting essentially in hydrocarbons and these gases will pass to the forward part or front of the furnace. On the other hand the gases obtained from the distillation of the carbonaceous substance is of relatively lean character and will tend to accumulate within the rear portion of the furnace. It is quite essential that these gases be mixed and a proper amount of air supplied for complete combustion and to this end I provide a conduit 25 having inlet ducts 26 communicating therewith and discharging into the front of the furnace whereby both the lean and rich gases are blown to the rear of the furnace where they are thoroughly mixed and complete combustion takes place. The products of this combustion then, of course, rise through the heating surface of the boiler attached to the top of the furnace and designated by reference numeral 2.

By reference to Figure 2, it will be noted that the conduits for supplying the air comprise a transverse tubular element 27 having a connection 28 for discharging the heated air within the carbonaceous combustion chamber at the point indicated by reference numeral 23. To this same source of air supply the vertically extending connections 29 are attached which terminate in the front wall of the furnace as shown by reference numeral 19.

Briefly the operation of the acid sludge furnace is as follows:

The acid sludge is introduced by hopper 14 into the distillation chamber 11 wherein it is thoroughly agitated to prevent caking thereof. The agitator 16 is of tubular formation and connected with the boiler system.

The carbonaceous material deposits itself upon the conveyor 23 within the confines of the lower primary combustion chamber and the evolved gases escape upwardly therefrom. The resultant ashes are deposited within the ash pit 22. By virtue of the arrangement of the water tubes the different chambers herein referred to are formed and these water tubes are likewise connected with the boiler system. To protect the lower chambers from the intense heat of the gas combustion chamber 13 I provide tiles. As hereinbefore stated, the feature of thoroughly mixing the relative poor and rich gases evolved from the distillation and carbon combustion chambers respectively is quite important.

It will be apparent to those skilled in the art that many changes in the construction and arrangement of parts may be made without departing from the spirit of the invention as expressed in the following claims.

I claim:

1. A furnace for burning acid sludge comprising an enclosure having walls, a series of tubes arranged diagonally with respect to walls of said enclosure and connected with the boiler system of the furnace, and a secondary series of tubes diagonally arranged with respect to the walls of said enclosure but oppositely positioned with respect to the first-mentioned tubes, the first mentioned and second mentioned tubes crossing each other intermediate their ends to define a plurality of walls of a distillation chamber, a carbon combustion chamber and a gas combustion chamber, and means for feeding acid sludge to the distillation chamber.
2. A furnace for burning acid sludge comprising an enclosure having walls, a series of tubes arranged diagonally with respect to walls of said enclosure and connected with the boiler system of the furnace, and a secondary series of tubes diagonally arranged with respect to the walls of said enclosure but oppositely positioned with respect to the first-mentioned tubes, said tubes crossing each other intermediate their ends to define a plurality of walls of a distillation chamber, a carbon combustion chamber and a gas combustion chamber, and means for feeding acid sludge to the distillation chamber, and rotating water tubes connected with the water system for agitating the sludge undergoing distillation within said distillation chamber.
3. A furnace for burning acid sludge comprising an enclosure having walls, two series of oppositely extending water tubes connected with the boiling system of the furnace and interlaced with each other and associated with walls of said enclosure to provide a plurality of side walls of a distillation chamber, a carbon combustion chamber, and a gas combustion chamber, means for feeding acid sludge to the distillation chamber, means for feeding heated air to said distillation chamber, said

carbon combustion chamber being adapted to receive carbonaceous material from said distillation chamber, said gas combustion chamber being adapted to receive the relatively rich and lean gases evolved from the distillation and carbon combustion chambers respectively.

4. A furnace for burning acid sludge comprising an enclosure having walls, two series of oppositely extending water tubes connected with the boiling system of the furnace and interlaced with each other and associated with walls of said enclosure to provide a plurality of side walls of a distillation chamber, a carbon combustion chamber, and a gas combustion chamber, means for feeding acid sludge to the distillation chamber, means for feeding heated air to said distillation chamber, said carbon combustion chamber being adapted to receive carbonaceous material from said distillation chamber, said gas combustion chamber being adapted to receive the relatively rich and lean gases evolved from the distillation and carbon combustion chambers respectively, and means for supplying heated air to said gas combustion chamber.

5. A furnace for burning acid sludge comprising an enclosure having walls, two series of oppositely extending water tubes connected with the boiling system of the furnace and interlaced with each other and associated with walls of said enclosure to provide a plurality of side walls of a distillation chamber, a carbon combustion chamber, and a gas combustion chamber, means for feeding acid sludge to the distillation chamber, means for feeding heated air to said distillation chamber, said carbon combustion chamber being adapted to receive carbonaceous material from said distillation chamber, said gas combustion chamber being adapted to receive the relatively rich and lean gases evolved from the distillation and carbon combustion chambers respectively, and means for protecting the distillation chamber from the heat of the gas combustion chamber.

6. A furnace for burning acid sludge comprising an enclosure having walls, two series of oppositely extending water tubes connected with the boiling system of the furnace and interlaced with each other and associated with said enclosure to provide a plurality of side walls of a distillation chamber, a carbon combustion chamber, and a gas combustion chamber, means for feeding acid sludge to the distillation chamber, means for feeding heated air to said distillation chamber, said carbon combustion chamber being adapted to receive carbonaceous material from said distillation chamber, said gas combustion chamber being adapted to receive the relatively rich and lean gases evolved from the distillation and carbon combustion chambers respectively, and means for protecting the distillation chamber from the heat of the gas combustion chamber,

said means comprising a series of spaced tiles mounted on a portion of said water tubes.

7. An acid sludge burning furnace comprising an enclosure having walls, a distillation chamber having its upper and lower walls formed by two series of closely arranged water tubes connected with the boiler system of said furnace and associated with a wall of the enclosure to produce said distillation chamber, a gas combustion chamber located thereabove, means for feeding acid sludge to the distillation chamber wherein gases are evolved and ascend into the combustion chamber, a series of tile slabs associated with said water tubes to prevent a substantial amount of the heat from the gas combustion chamber from entering the distillation chamber.

In testimony that I claim the foregoing I hereunto affix my signature.

FRANK J. McDEVITT.