Dec. 29, 1931. M. FRISCH ET AL 1,838,667

SLAGGING FURNACE

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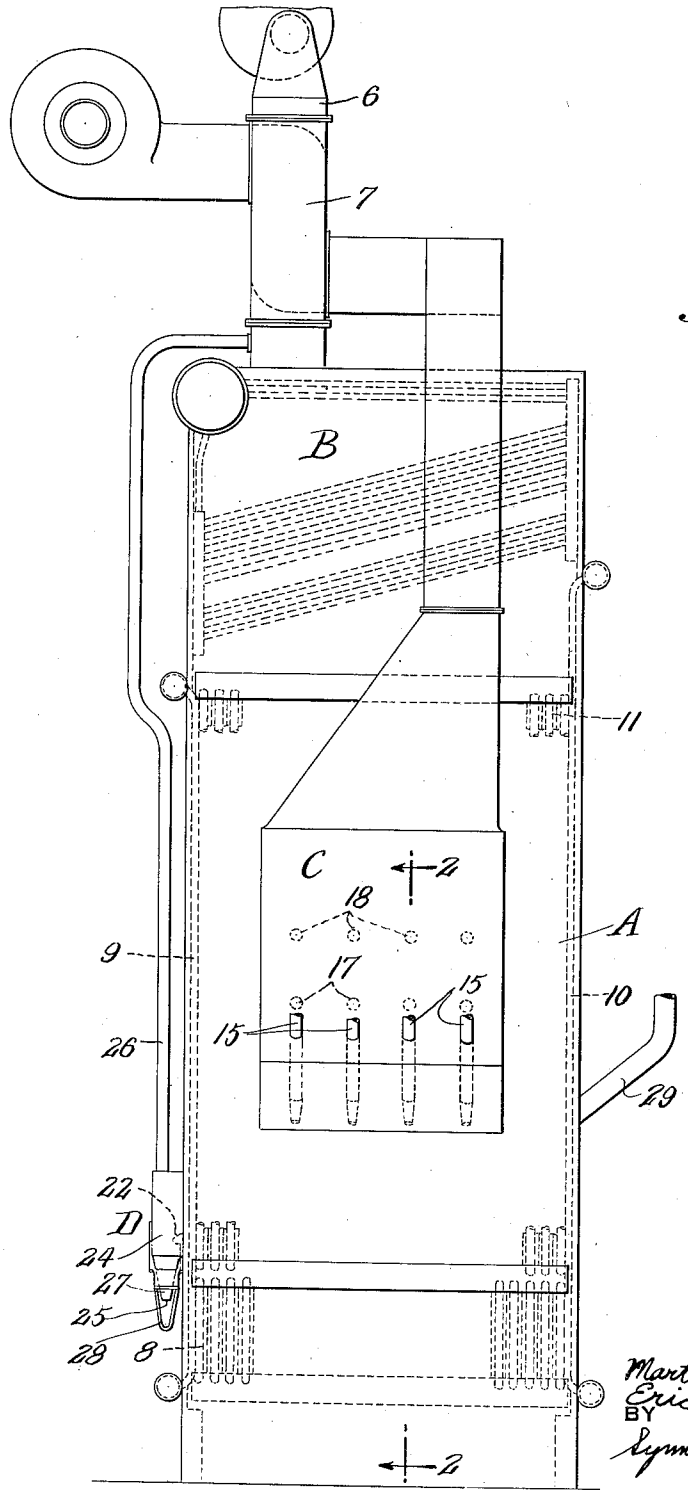



Fig: 1.

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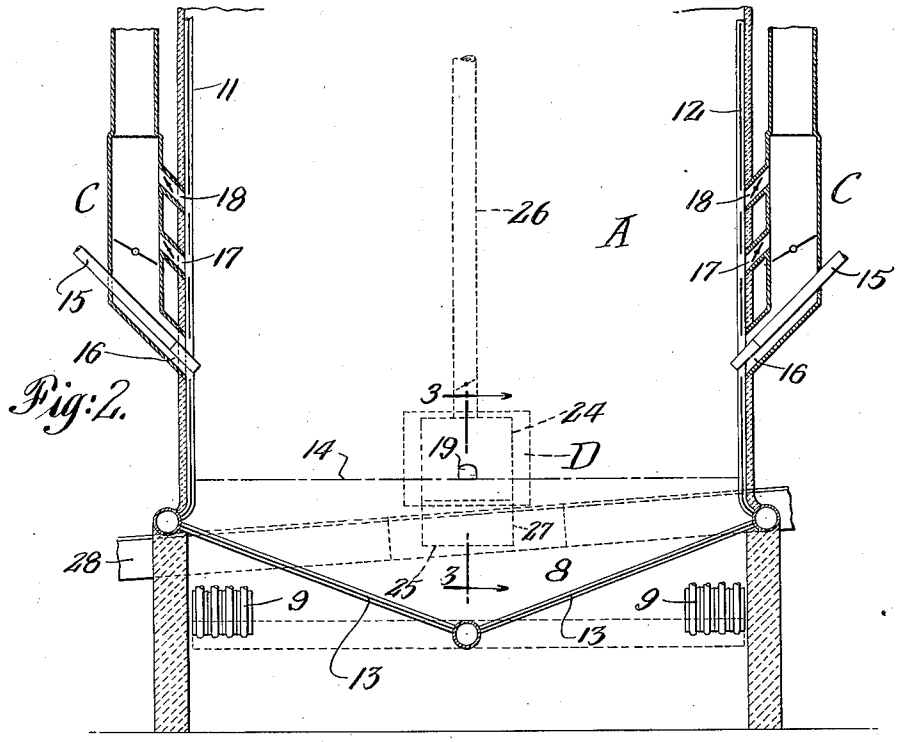



Fig: 2.

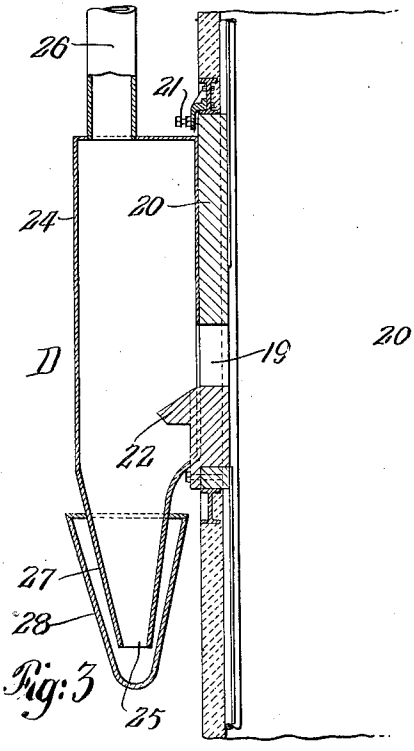



Fig: 3

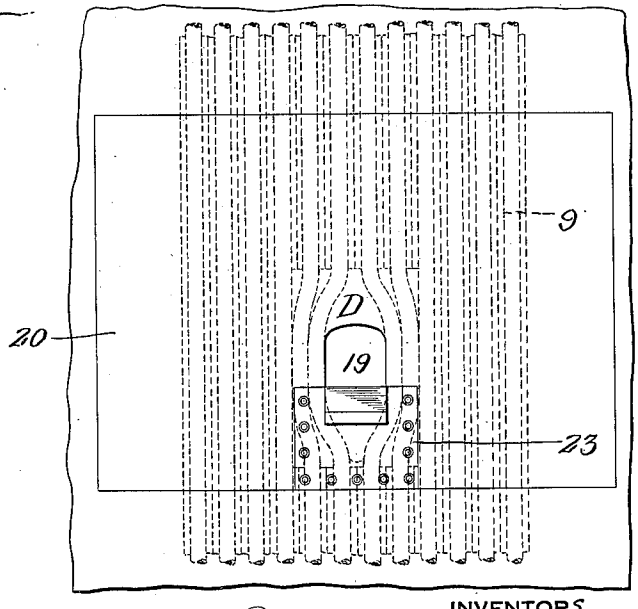



Fig: 4.

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Fig: 5.

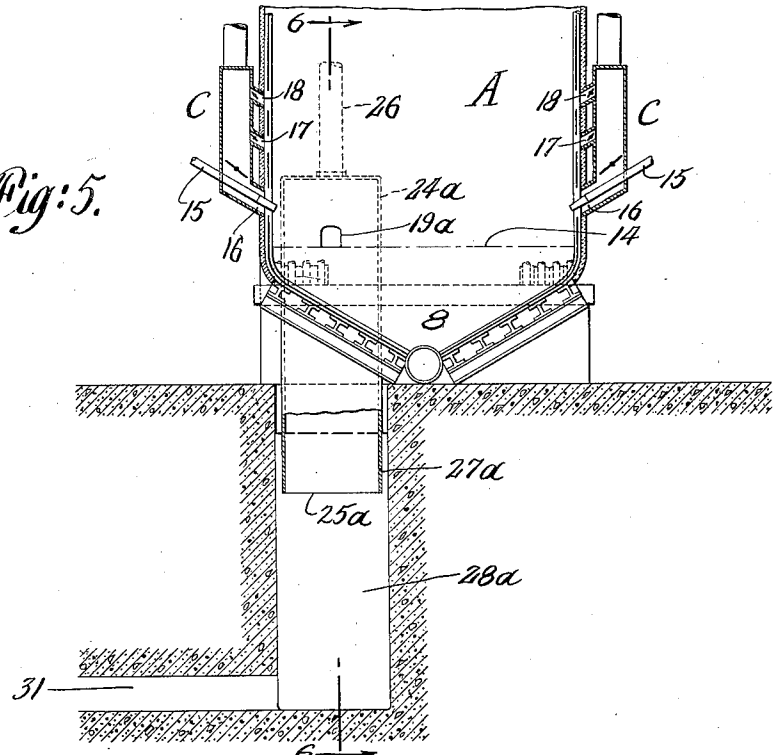
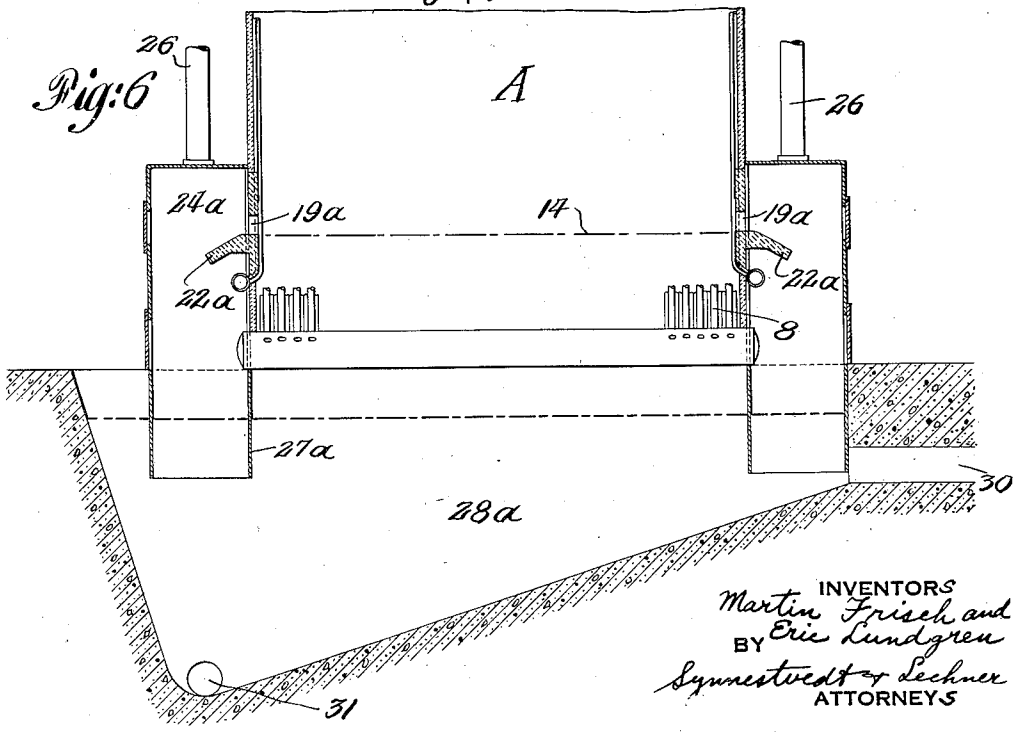



Fig: 6




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# UNITED STATES PATENT OFFICE

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## SLAGGING FURNACE

Application filed February 5, 1929. Serial No. 337,595.

This invention relates to improvements in slagging furnaces, i. e., furnaces which are adapted to be operated with a bed of slag maintained in the bottom portion thereof.

One of the primary objects of our invention is the provision of means for removing slag from furnaces of the character described without encountering difficulties from freezing of the slag.

Another object of the invention is to provide sufficient heat at the point where the slag is being removed to prevent its freezing.

A further object of the invention is to provide a slag overflow arrangement for slagging furnace installations in which heat is drawn from the combustion chamber of the furnace in a manner to keep the slag liquid at the overflow and in which heat so withdrawn is returned to the installation to perform work.

How the foregoing, together with such other objects and advantages as may hereinafter appear, or are incident to our invention, are realized is illustrated in preferred form in the accompanying drawings, wherein—

Fig. 1 is a front elevation of a slagging furnace installation embodying our improvements.

Fig. 2 is a fragmentary vertical section taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged cross section through the overflow means and associated parts, the section being taken on the line 3—3 of Fig. 2.

Fig. 4 is an enlarged face view of the overflow means shown in Figs. 1, 2 and 3.

Fig. 5 is a cross section through the lower portion of a furnace and overflow device of modified form.

Fig. 6 is a section taken on the line 6—6 of Fig. 5.

Referring now particularly to Figs. 1 to 4 inclusive, the form of our invention illustrated therein comprises in general, a furnace A, a boiler B located thereabove, burner means C for introducing finely divided fuel and air into the combustion chamber of the furnace, an offtake 6 for the boiler, a heat recovery device located in the offtake 6, such, for example, as an air heater 7, a slag retaining bottom 8 for the furnace, and a slag overflow device indicated as a whole by the reference letter D.

The furnace walls are lined by rows of upright steam evaporating tubes 9, 10, 11 and 12, which are connected with the boiler in any suitable manner so as to receive water therefrom and deliver steam thereto.

The slag retaining bottom 8 is formed of a plurality of closely spaced water tubes 13 preferably arranged in hopper form as clearly shown in Fig. 2.

The burners C in this instance are located in opposite walls of the combustion chamber and are of such form as to direct their fuel and flame streams in a downward direction toward the bed of slag 14 to cause the flames to impinge directly on the surface of the bed, and thereby maintain a pool of liquid slag at the upper portion of the slag bed. The pulverized fuel is admitted through a plurality of nozzles 15 and air, preferably preheated air under pressure, is admitted through a plurality of damper controlled air nozzles 16, 17 and 18. The arrangement of the air nozzles is such that they act to spread the flame over the surface of the slag bed and to keep the flame in contact with the bed.

The particular burner arrangement and the particular form of slag retaining bottom just described are not claimed in the present application, as they form part of the subject matter of our copending application Serial No. 330,017, filed January 3, 1929.

In the operation of the furnace, ash or slag builds up in the bottom 8 to form the relatively thick bed of slag 14, and this bed is preferably kept at a constant level by continuously tapping off molten or liquid slag through the overflow opening or outlet 19. We prefer to locate the opening 19 in a detachable plate 20 which may be readily replaced with little expense when necessary. The plate may be secured in place in any suitable manner, as, for example, by means of clamp screws 21. A spout or weir 22 is provided at the overflow opening 19. The spout or weir 22 may be formed integrally with the plate 20, or it may be made in the form of

a detachable member 23 as indicated in Figs. 3 and 4.

A chamber 24 is associated with the overflow outlet, and is shown best in Fig. 3. The arrangement is such that the opening communicates with the interior of the chamber and the chamber is in the form of a box having an open bottom 25 and a pipe 26 leading off from the top thereof. The sides and top of the box are tight to the atmosphere. The bottom portion 27 extends into a trough or sluice 28 in which a water level is maintained at all times, the level being above the level of the open bottom 25 so as to maintain a water seal for the bottom and thus prevent air from entering to the interior of the chamber 24.

The overflowing molten or liquid slag drops from the spout 22 through the open bottom 25 of the chamber into the water in the trough and is carried away with the moving water, it being preferable to incline the trough to assist in this discharge of the slag.

In order to prevent the slag from freezing at the overflow opening, we propose to create a suction in the chamber 24 sufficiently high to cause a constant but small amount of flame to be drawn from the combustion chamber into the chamber 24 through the overflow opening 19 with the discharging or overflowing slag. The flame thus withdrawn will maintain the overflowing slag at a temperature sufficiently high to keep the slag fluid and consequently difficulties from freezing at the overflow are avoided.

The suction just mentioned may be created in any suitable manner, it being preferable, however, to create it by means of the pipe 26 which leads to the offtake 6 of the installation where relatively high suction is present. We have shown the pipe 26 connected into the offtake at a point between the boiler B and the air heater 7 for the reason that by so doing, any heat which is recoverable from the chamber 24 is mixed with the gases leaving the boiler before they pass through the heat recovery device or devices located in the stack, and, therefore, the heat is used for a useful purpose and not wasted.

We also contemplate leading the pipe 26 to one of the boiler passes so that the hot gases from the chamber 24 will be mixed with the gases in the boiler pass.

It is pointed out that the amount of flame or extremely hot gas which is drawn into the chamber 24 in the manner above set forth is relatively small and sufficiently cooled by the vapor given off when the slag hits the water in the trough so that the chamber walls are not heated to such an excessive temperature as would destroy them.

In Fig. 1 we have illustrated a pipe or duct 29 leading into the combustion chamber of the furnace for the purpose of spouting or discharging flue dust, collected in hoppers, dust catchers, or the like, of the installation, into the molten slag in the bottom of the furnace, where it is liquefied. Any combustibles in the dust may be consumed.

Referring now to the modification illustrated in Figs. 5 and 6, it will be seen that the chamber 24*a* with which the overflow opening 19*a* communicates has an open bottom 25*a*, and that the lower portion 27*a* of the chamber or casing extends into a sump 28*a* to a point below the water level in the sump, and thus a water seal is provided for the chamber. A water inlet 30 and a water outlet 31 are provided for the sump, and the water is circulated through the sump from the inlet through the outlet by means of a water pump (not shown). In the form just described we have shown an overflow opening and associated chamber at the two opposite sides of the furnace.

The overflowing slag discharges from the spouts or weirs 22*a* into the sump and is carried out through the outlet 31 with the moving water.

We claim:—

1. In a furnace adapted to be operated with a bed of slag maintained in its lower portion, the combination of means for maintaining the bed of slag including a slag retaining bottom for the furnace, overflow means in a wall of the furnace, said means having a spout located at the level at which the slag bed is to be maintained, an air sealed chamber associated with the spout to receive overflowing slag therefrom, means for removing overflowing slag from said chamber, and means for creating a suction in said chamber effective to deflect flame and hot gases from the furnace toward the overflow spout.

2. In a furnace adapted to be operated with a bed of slag maintained in its lower portion, the combination of means for maintaining the bed of slag including a slag retaining bottom for the furnace, overflow means in a wall of the furnace, said means having a spout located at the level at which the slag bed is to be maintained, an air sealed chamber associated with the spout to receive overflowing slag therefrom, means for removing overflowing slag from said chamber, and means establishing communication between said chamber and a suction portion of the furnace whereby to create suction in said chamber in a direction to deflect flame and hot-gases from the furnace toward the overflow spout.

3. In a furnace adapted to be operated with a bed of slag maintained in its lower portion, the combination of means for maintaining the bed of slag including a slag retaining bottom for the furnace, overflow means in a wall of the furnace, said means having a spout located at the level at which

the slag bed is to be maintained, an air sealed chamber associated with the spout to receive overflowing slag therefrom, means for removing overflowing slag from said chamber, and a conduit establishing communication between said chamber and a gas outlet passage of said furnace.

4. A boiler installation comprising, in combination; a boiler; a furnace therefor, said furnace having a slag retaining bottom; an offtake for the furnace adapted to discharge products of combustion; a heat recovery device located in the offtake; overflow means in a wall of the furnace, said means having a spout located at the level at which the bed of slag is to be maintained in the furnace, an air sealed discharge chamber associated with the spout to receive overflowing slag therefrom, and a conduit establishing communication between said chamber and the offtake.

5. In a furnace adapted to be operated with a bed of slag maintained in its bottom portion, the combination of means for maintaining the bed of slag, an opening in a wall of the furnace for the discharge of slag, a chamber communicably associated with said opening, said chamber having a water sealed bottom, means associated with the water seal for the discharge of the overflowing slag, and means for creating a suction in said chamber effective to deflect flame and hot gases from the furnace toward the first mentioned discharge opening.

6. In a furnace adapted to be operated with a bed of slag maintained in its bottom portion, the combination of means for maintaining the bed of slag, an opening in a wall of the furnace for the discharge of slag, a chamber communicably associated with said opening, said chamber having an open bottom, a water trough for leading off the overflowing slag, said trough and chamber being so relatively located that the open bottom of the chamber extends into the water in the trough to provide a water seal for the open bottom, and means for creating a suction in said chamber effective to deflect flame and hot gases from the furnace toward the discharge opening.

7. In a furnace adapted to be operated with a bed of slag maintained in its lower portion, the combination of means for maintaining the bed of slag including a slag retaining bottom for the furnace, overflow means in a wall of the furnace, said means having a spout located at the level at which the slag bed is to be maintained, an air sealed chamber surrounding said spout and receiving the overflow therefrom, and a pipe leading from said chamber to a gas outlet passage of the furnace whereby suction is created in the chamber to draw flame and hot gases from the interior of the furnace to the overflow spout.

8. In a furnace adapted to be operated with a bed of slag maintained in its lower portion, the combination of means for maintaining the bed of slag including a slag retaining bottom for the furnace, overflow means located in the furnace at the level at which the slag bed is to be maintained, an air sealed chamber communicably associated with the overflow means, and a pipe leading from said chamber to a gas outlet passage of the furnace whereby suction is created in the chamber to draw flame and hot gases from the interior of the furnace to the overflow means.

In testimony whereof we have hereunto signed our names.

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