June 21, 1932. F. B. ALLEN 1,864,009

APPARATUS FOR HANDLING SOLIDS

Filed June 6, 1929 4 Sheets-Sheet 1

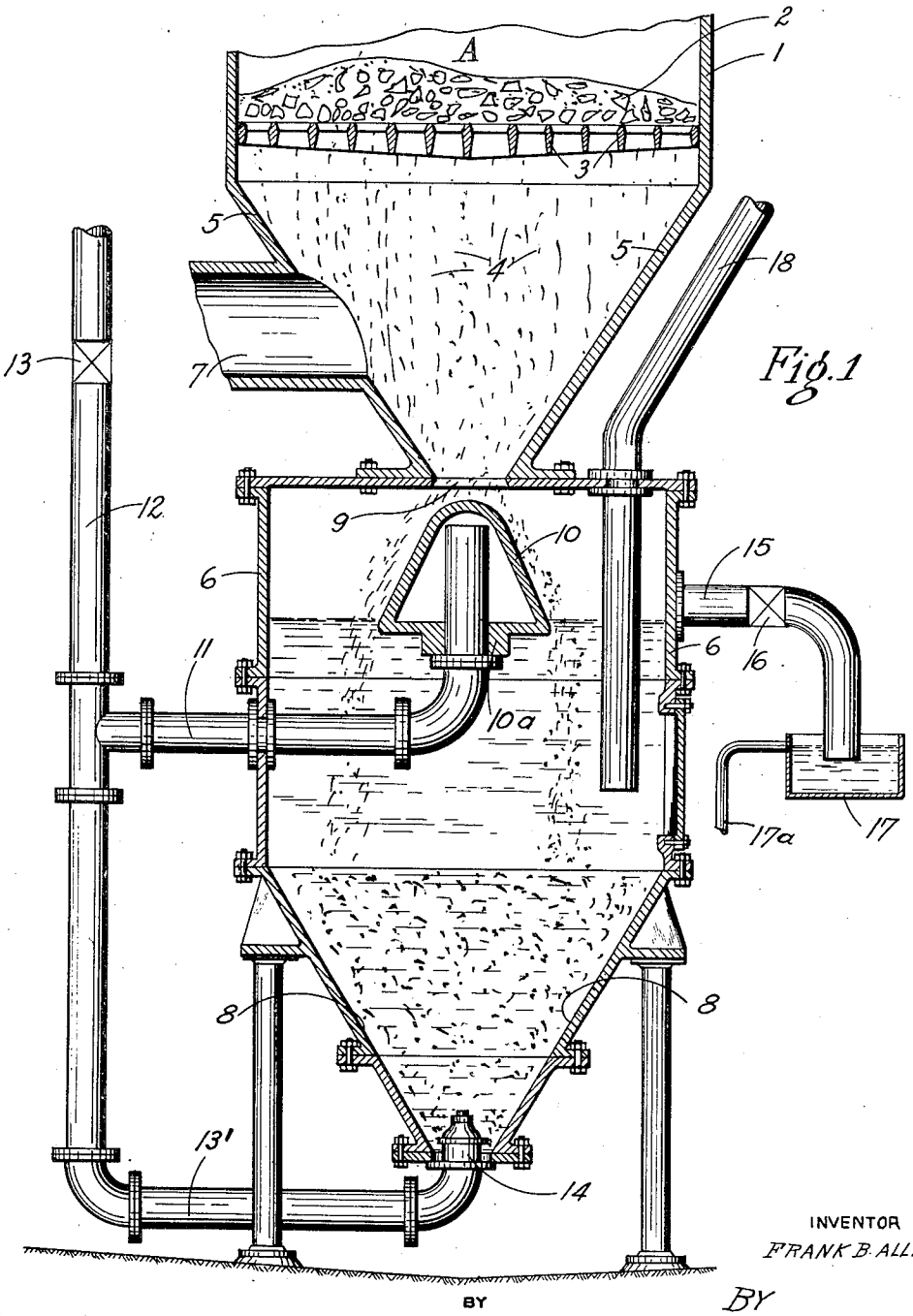


Fig. 1

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APPARATUS FOR HANDLING SOLIDS

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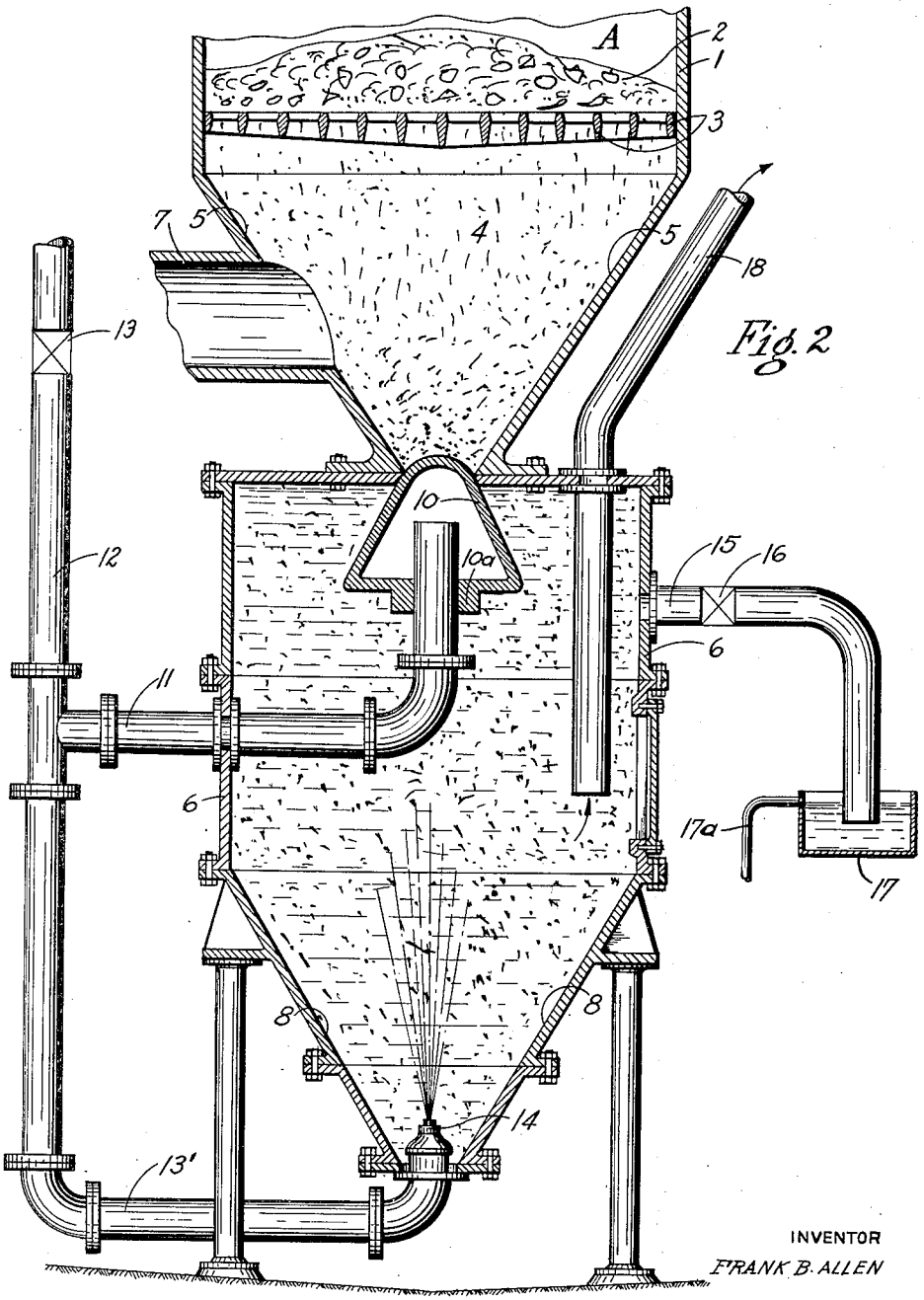


Fig. 2

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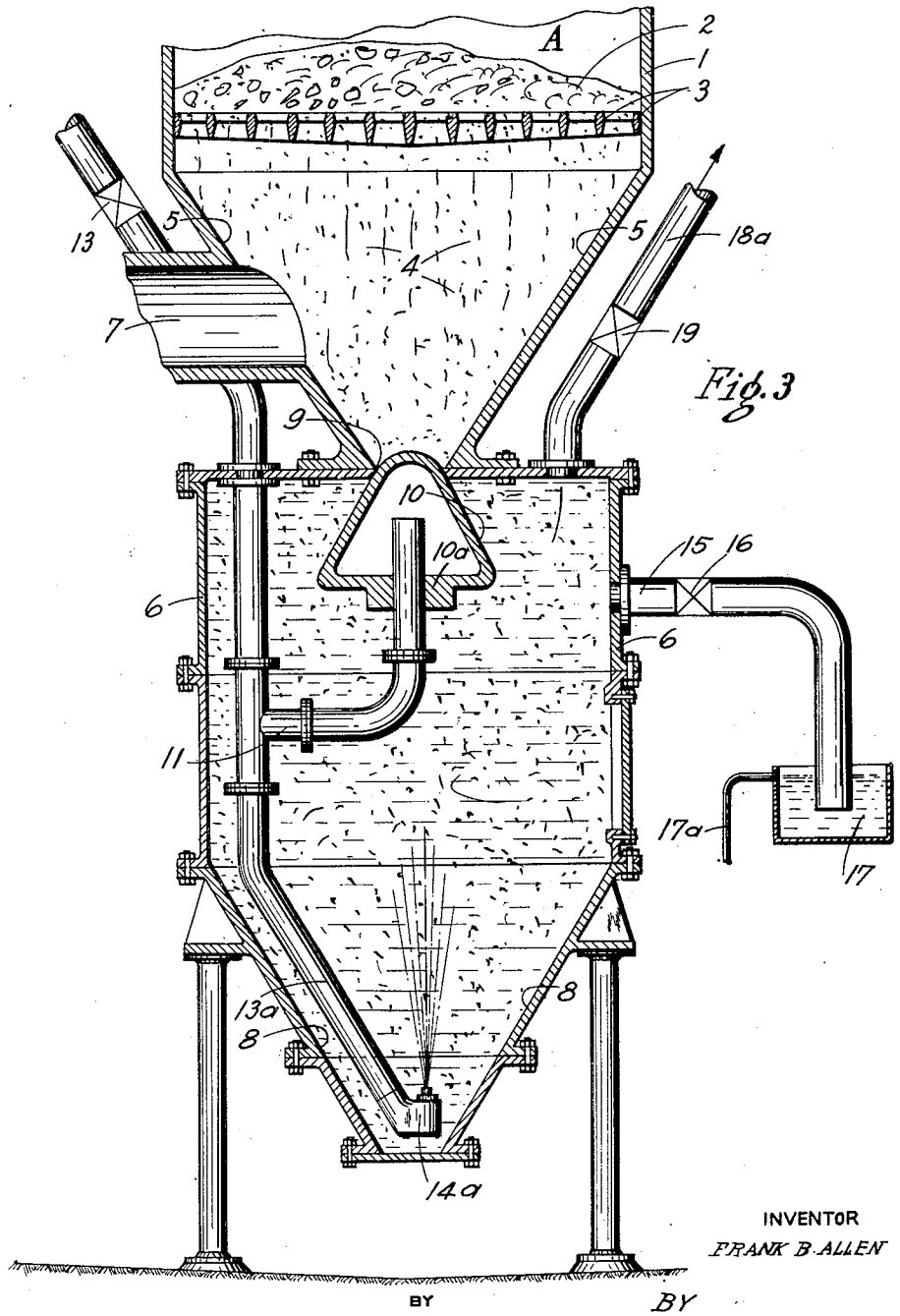


Fig. 3

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APPARATUS FOR HANDLING SOLIDS

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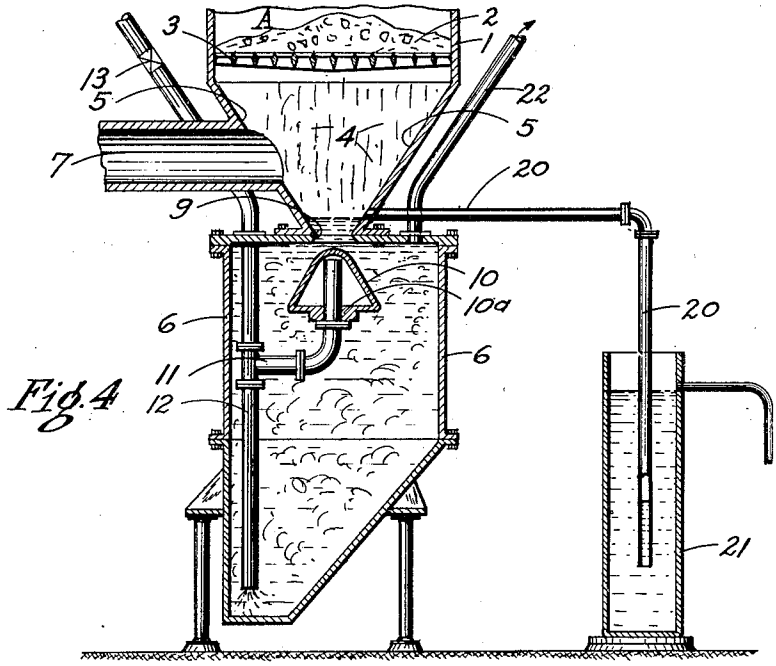


Fig. 4

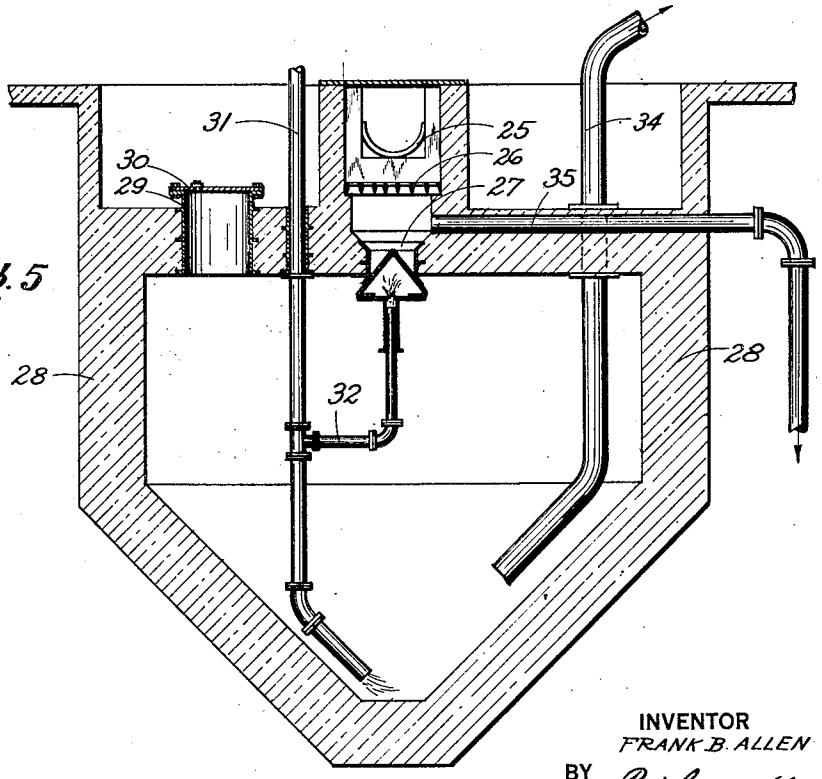


Fig. 5

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UNITED STATES PATENT OFFICE

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APPARATUS FOR HANDLING SOLIDS

Application filed June 6, 1929. Serial No. 368,992.

This invention relates to the art of handling solids and more especially to a pressure method and means for so doing while preventing escape of gases.

Heretofore considerable difficulty has been experienced in handling waste solids particularly in the presence of poisonous gases. For example, in removing ash from a water gas generator, so far as I am aware, it has been necessary heretofore to shut down the gas generator and then exhaust poisonous gases therefrom before attempting to remove the ash, otherwise the gases would escape into the basement or other space frequented by workmen with serious or fatal results. This, of course, was not only a costly mode of operation of the furnace or machine but was conducive to inconvenience or actual danger to the workmen.

According to the present invention I am enabled to operate a furnace or gas machine continuously and to remove solids therefrom at any time with no inconvenience or danger to the workmen from gases in the furnace.

In addition to providing a device for satisfactorily handling solids in the presence of gas I find that my invention has a wide range of uses one of which is in connection with a sump of a power plant sluiceway where it displaces the mechanical appliances such as buckets or pumps heretofore used to remove ash from such sumps.

In this specification I have, for purposes of illustration, described methods of accomplishing these results and in the drawings have shown different forms of apparatus embodying my present invention, in which

Fig. 1 is a vertical longitudinal cross sectional view showing the actuated parts in one position;

Fig. 2 is a view similar to Fig. 1 but showing the parts in another position; and

Fig. 3 is a view corresponding to Fig. 2 but showing a modified form of apparatus;

Fig. 4 shows a modification of the apparatus in which the pressure chamber is always filled with liquid; and

Fig. 5 shows the adaptation of my invention to a sluiceway.

Referring now to the drawings in which like reference character designated like parts, 1 designates the upright walls of a combustion chamber A in which fuel 2 may burn on any suitable grates 3 and from which the incombustible solid residues may fall under the force of gravity as indicated by the line 4. Walls 5 disposed beneath the walls 1 provide a gas tight connection between the combustion chamber and a pressure tank 6. Means for admitting an air blast into the space confined by the walls 5 whence the air may pass through the grate 3 is provided by a conduit 7 of suitable size.

The tank 6, as herein shown, is substantially circular with a bottom portion formed by downwardly converging walls 8. In the upper portion of the tank 6 is provided an inlet opening 9 through which solids may pass into the tank from the combustion chamber thereabove. This opening 9 is provided with a movable closure 10, in the present instance, in a form of a hollow cone adapted when in the position shown in Figure 2 to close the opening 9 against the escape of gas therethrough. When the closure 10 is in open position as in Fig. 1 ash from the combustion chamber may fall under the force of gravity through the opening 9 and collect in the bottom of the tank 6 as indicated in Fig. 1.

The closure 10 is slidably mounted on a conduit 11 which is connected to a high pressure water supply line 12 which is controlled by a shut-off valve 13 and which line 12 is also in communication with the bottom portion of the tank 6. In Figs. 1 and 2 the line 12 communicates with a line 13′ which opens in the bottom of the tank 6 as through nozzle 14. An overflow conduit 15 is provided in the upper portion of tank 6 to control the level of liquid in the tank while solids are

passing into the tank. The conduit 15 is provided with a shut-off valve 16 and at the end of the conduit a water seal 17 may be provided. This seal 17 may be connected to a sewer, as by a suitable connection 17*a*, and contains enough liquid above the outlet end of conduit 15 to prevent escape of gases therethrough due to pressure in the tank 6.

A conduit 18 leading from the interior of tank 6 serves as a means for escape of solids and liquid from the interior of the tank to a place of disposal of such material.

In the modification shown in Figure 3 the tank 6 is connected to any desired furnace or gas producer 1 after the manner described for the apparatus of Figures 1 and 2, has an overflow 15 with valve 16 and liquid seal 17 as in Figures 1 and 2, and has a closure 10 for opening 9 like that shown in Figures 1 and 2. In this modification the conduit 11 leading to the interior of closure 10 is connected to a high pressure water line 12 inside the tank 6, the line 12 having the valve 13 as in Figures 1 and 2, but the conduit 12 has an extension 13*a* which continues on down into the lower portion of the tank 6 and is provided with a suitable nozzle or exit opening 14*a*.

In Figure 3, the tank 6 has an exit conduit 18*a* leading out from the top portion of tank 6 and preferably provided with a valve 19.

In the operation of the device shown in Figures 1 and 2 the valve 13 is closed and valve 16 opened after the liquid seal 17 has been provided. The closure 10 is then located substantially in the position shown in Figure 1. Liquid is introduced into the tank 6 until it rises above the inlet end of conduit 18 and preferably to a level to overflow through conduit 15. With fuel burning on the grate 3 air may be introduced to conduit 7 to force the burning of the fuel or in such quantities as to give the desired composition of gas. The ash may be discharged in any suitable manner from the grate and falls from force of gravity through the chamber defined by walls 5 and enters the tank 6 through openings 9, accumulating in the bottom of the tank as shown in Figure 1. When the solids are to be removed from the tank 6, the valve 16 is closed and liquid is admitted through valve 13 into conduits 11, 12 and 13′. The liquid which passes through conduit 11 into closure 10 forces the closure up into gas sealing contact with the opening 9. The liquid which enters the tank 6 through conduit 13′ and nozzle 14 stirs up and thoroughly agitates the accumulated solids in the tank and forces these solids mixed with liquid out of the tank through conduit 18. When the solids have been removed to the desired extent from tank 6 the valve 13 is closed and valve 16 opened whereupon the closure 10 returns to the position shown in Fig. 1 as the liquid pressure in closure 10 is released by flow of liquid from the closure between the portion 10A of the closure and the conduit 11.

In the operation of the device shown in Figure 3 substantially the same operations are performed and in substantially the same order. The main differences are that since the exit conduits 18*a* open into a gas space above the overflow level of liquid in the tank 6 it is desirable to keep the valve 19 closed except during the operation of discharging solids and liquids through the conduit 18*a*.

The device of Figure 3 possesses the advantage that the tank 6 can be substantially filled with liquid whereas in the device of Figures 1 and 2 a quantity of gas may remain in compressed form in the upper portion of the tank 6.

It will be obvious that by my invention all danger of escape of gas from a combustion chamber into a basement or other space in which workmen are employed in handling the solids from the combustion chamber has been prevented and moreover that solids may be removed from the tank at any time regardless of whether or not the furnace or gas producers are in operation. Moreover, it is an easy matter to remove any dirt or other obstructions which would tend to prevent a gas sealing contact of closure 10 with passage 9 by so manipulating the valve 13 that the closure 10 is repeatedly forced up against the confining walls of passage 9 which constitutes a seat for the closure 10 and by such repeated action, the obstruction can be removed and a gas sealing contact assured.

In Fig. 4 I have shown a device similar to the devices of Figs. 1 to 3 and in which like characters designate like parts. This device differs from that of Fig. 3 in certain major respects. The overflow conduit 20 opens out of the chamber formed by walls 5 and at a level somewhat higher than the seal formed by closure 10 in opening 9. This conduit 20 leads into a standpipe 21 or the like where a liquid seal is formed for the conduit. The liquid level in standpipe 21 is maintained sufficiently high to prevent any gas passing through conduit 20 by reason of the gas pressure which may exist in the chamber below grate 3.

Since tank 6 is thus maintained full of liquid at all times to above the inlet end of the conduit 22, no valve is needed in that conduit and no gas can escape through it.

When closure 10 is open the liquid level will be that of the inlet end of conduit 20 with liquid sealing and standing in both conduits 20 and 22. When solids are to be ejected from tank 6 liquid under pressure is admitted to conduit 12 to move closure 10 to close opening 9. Sufficient liquid will escape about closure 10 to maintain the normal liquid in the chamber formed by wall 5. so that no gas can escape while the solid material is being removed from tank 6.

In Fig. 5 I have shown my invention embodied in a sump for a boiler house where it displaces the various mechanical devices heretofore used such as clam shell buckets, pumps and the like, for removing solids from a sluiceway sump.

In this figure a sluiceway 25 which may be gas tight if desired empties through a grid or screen 26 and through an opening 27 into a concrete tank 28. This tank is provided with a manhole 29 which has a tightly fitting cover 30. A high pressure liquid carrying conduit 31 extends into and near to the bottom of tank 28 and has a branch line 32 leading into the interior of closure 33 which closure resembles closures 10 of the foregoing figures. A conduit 34 is provided for removal of material from tank 28 while conduit 35 which leads off from below grid 26 and above opening 27 acts as an overflow pipe so that liquid may be maintained above closure 33 at all times.

In case any poisonous gases are present in sluiceway 25 or in case it is desired to prevent entry of air into the sluiceway and thence to the furnaces, the outlet end of conduit 35 may be liquid sealed as shown in Figs. 3 or 4 but otherwise it may open directly into a sewer or other suitable place.

Having thus described my invention so that those skilled in the art may be enabled to practice the same what I desire to secure by Letters Patent is defined in what is claimed, it being understood that the foregoing detailed description has been made for purposes of illustration only and not with the intent of limiting the invention thereto.

I claim:

1. In apparatus of the class described, a tank having a top inlet opening for solids and an outlet opening for mixtures of liquids and solids, an overflow conduit leading from said tank, a liquid seal disposed at the discharge end of said overflow conduit and adapted to prevent the escape of gas from said tank, a liquid conducting conduit extending to the bottom portion of said tank and having a nozzle positioned to direct liquid upwardly into said tank, a branch conduit leading from said liquid conducting conduit and extending to a point below said solids inlet opening, a closure member slidably mounted on said branch conduit below said solids inlet opening and valve means for controlling the flow of liquid through said liquid conducting conduit to said branch conduit and said nozzle.

2. In apparatus of the class described, a tank having a top inlet opening for solids and an outlet opening for mixtures of liquids and solids, an overflow conduit leading from said tank, a liquid seal disposed at the discharge end of said overflow conduit and adapted to prevent the escape of gas from said tank, a shut-off valve in said overflow conduit between said tank and said liquid seal, a liquid conducting conduit extending to the bottom portion of said tank and having a nozzle positioned to direct liquid upwardly into said tank, a branch conduit leading from said liquid conducting conduit and extending to a point below said solids inlet opening, a closure member slidably mounted on said branch conduit below said solids inlet opening and valve means for controlling the flow of liquid through said liquid conducting conduit to said branch conduit and said nozzle.

In testimony whereof I hereunto affix my signature this 27th day of May, 1929.

FRANK B. ALLEN.