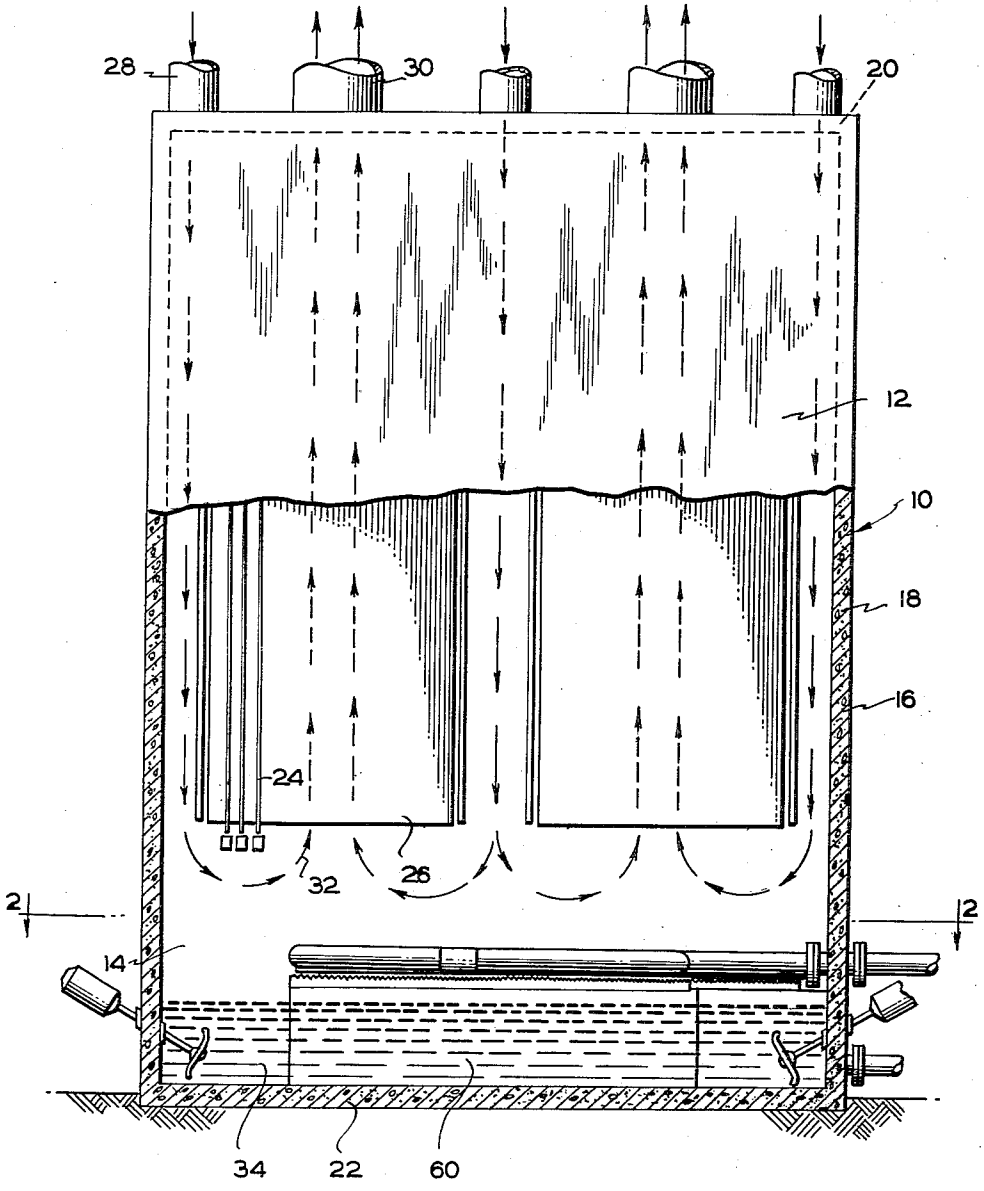
July 1, 1958 J. W. LENEHAN 2,841,238

ELECTRICAL PRECIPITATOR

Filed March 18, 1955 2 Sheets-Sheet 1

Fig 1.



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ELECTRICAL PRECIPITATOR

Filed March 18, 1955 2 Sheets-Sheet 2

Fig 2.

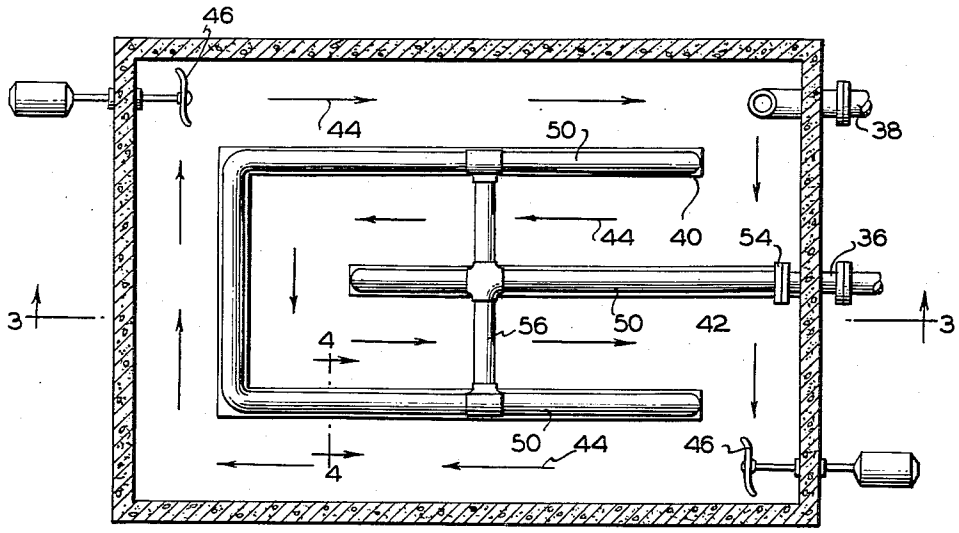


Fig 3.

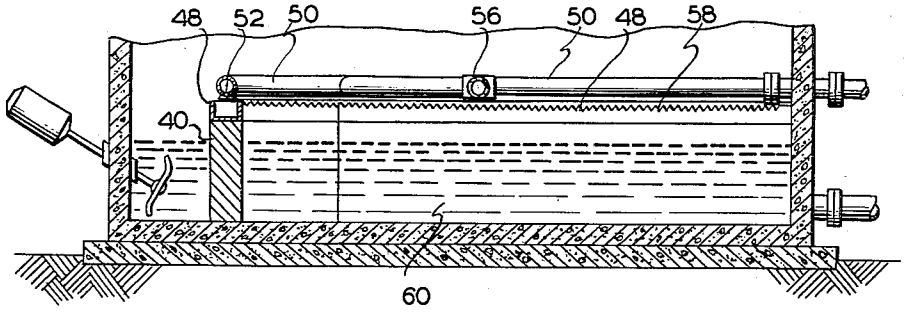


Fig 4.

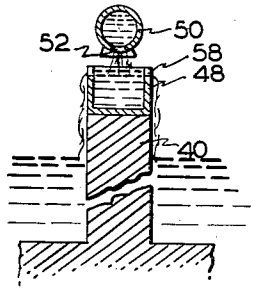
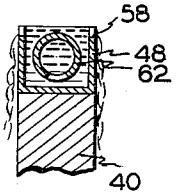


Fig 5.



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ELECTRICAL PRECIPITATOR

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Application March 18, 1955, Serial No. 495,200

3 Claims. (Cl. 183—7)

The present invention relates to an apparatus for recovering gas-suspended liquid-soluble material, and more particularly to a wet bottom precipitator.

By way of illustration, the present invention is hereinafter disclosed in embodiments particularly adapted to the recovery of sulphate ash from the exhaust gases of paper pulp waste liquor recovery furnaces.

A primary problem arising in the operation of prior wet bottom precipitators has been the excessive build-up of salt cake and falling ash deposits in the precipitator sump which results in arc-overs between the electrodes and the precipitator shell thereby greatly reducing the precipitator efficiency.

The basic concepts and principles of wet bottom precipitator operation, for the aforementioned purpose, include the provision of a pool of weak black liquor in a sump located beneath the electrodes of the precipitator wherein the ash precipitated by the electrodes falls into the black liquor in the precipitator sump. The precipitated ash is dissolved in the weak black liquor and as the liquor reaches the desired concentration, it is drawn off to a suitable storage tank while the sump is replenished with a weak liquor supply to maintain the sump pool at substantially a constant level.

It has been a practice to constantly agitate or stir the liquor pool in the precipitator sump to increase the rate of dissolution of the ash in the liquor and to attempt to maintain some circulation of the liquor in the sump to avoid the build-up of deposits about the wall of the pool caused by falling ash and by the separation of salt cake ash from the black liquor. However, in the operation of all prior constructions there is a tendency to collect falling ash on certain of the apparatus within the sump and to permit build-up salt cake in certain areas surrounding the sump where the circulation of the liquor is at a minimum.

It is, therefore, a primary object of the present invention to provide a substantially improved wet bottom precipitator construction wherein the feed and flow of black liquor into and through the precipitator sump is so controlled as to substantially eliminate falling ash deposits and salt cake build-up at all points within the precipitator.

It is another object of this invention to provide an improved wet bottom precipitator construction in which the liquor sump is provided with a series of flow baffles and associated liquor agitators and circulators wherein the baffles define a continuous tortuous path through which the liquor is circulated in a guided pattern to assure complete coverage and sweepage of all corners and areas of the sump pool whereby to eliminate salt cake build-up in the sump.

A further object of this invention is the provision in a wet bottom precipitator of new and improved liquor feed structure associated with the aforedescribed baffles in the precipitator sump whereby the incoming liquor will continuously wash the tops and sides of the baffles and the feed system thereby preventing falling ash deposits and salt cake build-up on the baffles and the feed system.

A further object of this invention is the provision of a wet bottom precipitator construction wherein agitator and circulator members are provided for the sump liquor which are lightweight and compact in construction and which are so mounted and located as to be readily removable and which permit the precipitator bottom to be placed on the ground thereby eliminating the supporting structures heretofore necessary for the precipitator shells.

It is another object of this invention to provide a system of wet bottom precipitator operation which embodies black liquor feed and circulation through the precipitator sump which eliminates salt cake build-up and increases efficiency of precipitator operation and ash recovery.

Still other objects and advantages will be readily apparent from the following general statement and detailed description of the present invention.

The nature of the present invention may be stated in general terms as comprising apparatus for recovering materials suspended in a gas stream comprising a casing having a sump for holding liquid in the casing bottom, discharge and collecting electrodes mounted in the casing above said sump, gas inlet and outlet means in the casing for directing a stream of gas between said electrodes, baffle means in said sump defining a continuous tortuous path for the flow of liquid in the sump, liquid circulating means in said sump to maintain a liquid flow through said tortuous path, means supplying liquid to the sump preferably having outlets along the upper surfaces of the baffle means, and outlet means for withdrawing liquid from the sump.

Referring now to the accompanying drawings in which like numerals designate similar parts throughout the several views:

Fig. 1 is a vertical elevation partially broken away illustrating the improved precipitator construction;

Fig. 2 is a horizontal section taken on line 2—2 of Fig. 1;

Fig. 3 is a vertical section taken on line 3—3 of Fig. 2;

Fig. 4 is an enlarged fragmentary vertical section illustrating the baffle and liquid feed apparatus; and

Fig. 5 is a view similar to Fig. 4 of a modified form of the baffle and liquid feed apparatus.

Referring now to the accompanying drawings, **10** generally designates an electrical precipitator having a precipitator portion **12** and a sump portion **14**. The precipitator and sump portions are enclosed as a unit within a casing **16** including side walls **18**, a horizontal roof portion **20** and a bottom wall or floor **22**. The precipitator portion in conformity with usual construction includes complementary discharge electrodes **24** and extended surface collecting electrodes **26**, with gas passages defined between the complementary electrodes through which the gases to be cleaned pass and wherein the suspended material in the gases is precipitated upon the extended surface collecting electrodes **26** in the form of a dry ash deposit. Usual gas inlets **28** and outlets **30** are connected through the roof of the casing in general axial communication with the gas passages within the casing and between the electrodes so that the gas to be cleaned flows in defined patterns, as illustrated by arrows **32**, through the precipitator portion of the casing. Rapping means, not shown, may be provided to effect a more complete removal of deposited material from the collecting electrodes.

As is best illustrated in Fig. 1, the lower extremities of the complementary electrodes **24** and **26** terminate at a substantial spaced distance above the floor **22** of the casing thereby defining within the lower end of the casing

a liquid sump adapted to contain a pool 34 of liquid to be fortified by the ash precipitated on the collecting electrodes which fall by gravity to the bottom of the casing.

As is more clearly illustrated in Fig. 2 of the drawings the bottom sump portion of the casing is generally rectangular in cross section and is provided centrally of one end wall with a liquid inlet connection 36, and adjacent one side of the casing in the same end wall with an overflow type drain connection 38.

Substantially centrally located within the sump is a vertical baffle 40 of U-shaped configuration in plan view which is secured to and extends above the floor 22 of the casing. A second straight baffle section 42 extends centrally from the end wall of the casing opposed to the open end of the U-shaped baffle 40 centrally into the open end of the U-shaped baffle to terminate at a spaced distance from the closed end thereof. The baffle members 40 and 42 thereby divide the sump laterally into four substantially equal passes defined between the legs of the U-shaped baffle and the side walls of the casing and between the legs of the U-shaped baffle and the straight baffle extending in parallel centrally therebetween. At the same time equal passes are defined longitudinally of the baffles between the closed end of the U-shaped baffle and the casing, the closed end of the U-shaped baffle and the extremity of the straight baffle 42, and between the extremities of the legs of the U-shaped baffle and the adjacent end wall of the sump.

As is indicated by arrows 44 (Fig. 2) the aforedescribed passes defined by the U-shaped baffle 40 and the straight baffle 42 provides for a continuous tortuous path completely about and through the sump portion of the casing. By locating circulating agitators 46, of suitable propeller, paddlewheel or like construction, at suitable positions within the precipitator sump the liquid in the sump pool may be caused to circulate continuously through the tortuous path formed by the interconnected passes defined between the baffles and the walls of the sump. By way of illustration, two such agitators 46 are shown to extend angularly through the end walls of the casing downwardly into the sump pool in such positions as to impel the liquid of the sump pool longitudinally of the two outermost passes of the continuous path in the sump.

By utilizing compact circulators of the type illustrated, which are removably supported in the sides of the sump casing, it is possible to support the floor 22 of the precipitator directly on a ground or floor bed thereby eliminating the support frames which have been heretofore necessary to provide clearance for prior circulator and feed system structures.

As is best illustrated in Figs. 2 through 4 of the drawings, each of the vertical baffle members is provided continuously throughout its length with a U-shaped trough 48 supported on the upper edge of each baffle, the troughs being of such dimensions that their side portions form a vertical continuation of the side walls of the baffle.

Associated with the troughs 48 are continuous liquid supply pipes 50 which are supported longitudinally above the troughs and which are provided at spaced points throughout their length with discharge outlets 52 in their lower portion by which liquid is introduced from the supply pipes into the troughs. The supply pipe 50 extending longitudinally above the trough 48 on the straight baffle section 42 is connected as at 54 to the liquid inlet fitting 36 extending through the end wall of the sump, and cross-over pipe connections 56 are provided between the pipe 50 on the straight baffle 42 and intermediate points along the length of the supply pipes 50 extending above the troughs on the side leg portions of the U-shaped baffle 40. By this construction liquid supplied through the liquid inlet 36 is evenly distributed throughout the lengths of the troughs 48 on all baffle portions within the sump.

It is additionally contemplated that the upper longitudinal edges of the troughs 48 be serrated as at 58 throughout their length to provide for a uniform overflow of the liquid collected in the troughs 48 to run down the trough and baffle sides into the sump pool.

In operation of the improved precipitator construction described above the delivery of liquid from a supply system to the sump pool 60 accumulated within the precipitator casing is accomplished in a new and improved manner which will provide for a continuous washing-down of the sides of the baffles throughout their length thereby retarding the build-up of salt cake deposits on the sides of the baffles in the areas immediately above and below the normal pool level within the sump.

At the same time the provision of a continuous tortuous path within the sump for the flow of the sump pool liquid through the sump provides for a liquid flow which will insure complete washing contact and sweepage of all of the corner and straight area portions of the sump casing, and of the baffles located within the sump defining the tortuous path, thereby inhibiting any falling ash or salt cake build-up within any portion of the sump to the ultimate aim of maintaining maximum efficiency of operation of the precipitator unit.

Referring to Fig. 5 there is illustrated a modified structure for the liquid supply system of the pecipitator wherein a liquid supply pipe 62, similarly connected in system arrangement to the previously described supply pipes 50, is positioned wholly within the baffle-supported troughs 48 so that the uppermost surface of the pipe 62 is disposed below the tops of the sides of the trough so that the pipe is at all times completely submerged within the liquid in the trough. By this construction the possibility of falling ash build-up along the lengths of the supply pipes constituting the liquid feed system is eliminated due to the fact that the pipe is completely submerged and continuously washed by the liquid supplied to the troughs through the pipes which is allowed to overflow into the sump pool.

From the foregoing description it will be seen that the present invention provides a substantially improved wet bottom precipitator construction by which a greatly improved method of sump liquid control is obtained and which results in substantial new and improved advantages of function and operation in the wet bottom precipitator art. It is, of course, contemplated that variations may be desirable in the number and location of circulating agitators, in the particular sizes and configurations of parts, and in the particular controls (automatic or manual) which may be associated with the feeding and withdrawing of liquid from the precipitator sump.

I claim:

1. Apparatus for recovering material suspended in a gas stream comprising a casing providing a sump for holding liquid in the bottom of the casing, complementary discharge and collecting electrodes mounted in the casing at a spaced distance above the sump, gas inlet and gas outlet means in the casing for directing a stream of gas between the complementary electrodes, vertical baffle means disposed in the sump including a U-shaped baffle located centrally within the sump bottom and a straight baffle extending from one wall of the casing centrally into the open end of the U-shaped baffle to extend for a spaced distance between the parallel legs thereof, said baffle means defining a continuous tortuous path for the flow of liquid in said sump, liquid circulating means in the sump to maintain a flow of liquid therein through the tortuous path, means supplying liquid to the sump having outlets distributed along the upper edges of said baffle means, and outlet means for withdrawing liquid from the sump.

2. Apparatus as defined in claim 1 wherein each of said baffle means is provided with a continuous trough mounted on the upper edge thereof, a liquid supply pipe extends through the casing longitudinally of the trough mounted on the straight baffle and has connection perpendicularly therefrom in each direction with a liquid supply pipe extending continuously of the trough mounted above the upper edge of the U-shaped baffle member supplying liquid to the trough members of the baffles to overflow into the sump.

3. Apparatus as defined in claim 1 wherein each of said baffle means is provided with a continuous trough mounted on the upper edge thereof, a liquid supply pipe extends through the casing longitudinally within and below the top side edges of the trough supported on the straight baffle section, a liquid supply pipe extending

through and below the top edges of the trough mounted on the top edge of the U-shaped baffle section, cross-over feed lines interconnecting the supply pipe in the trough of the straight baffle section with the supply pipe in each leg of the U-shaped baffle section intermediate its length supplying liquid to the baffle trough members from which it overflows into the sump.

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