C. L. CORNE & D. P. J. BURGUIÈRES.

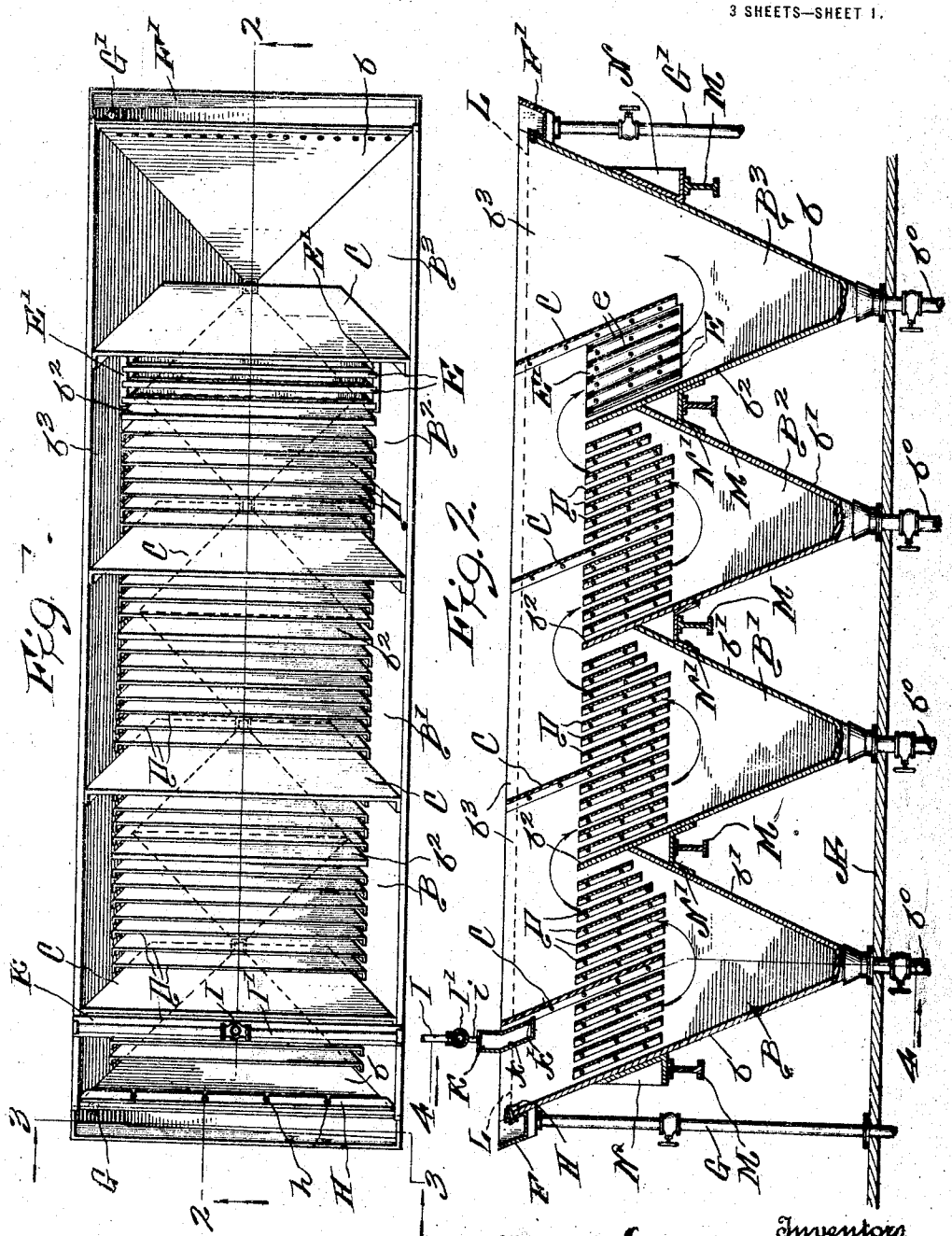
SETTLING TANK.

APPLICATION FILED JAN. 26, 1916.

1,190,863.

Patented July 11, 1916.

3 SHEETS—SHEET 1.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 3.

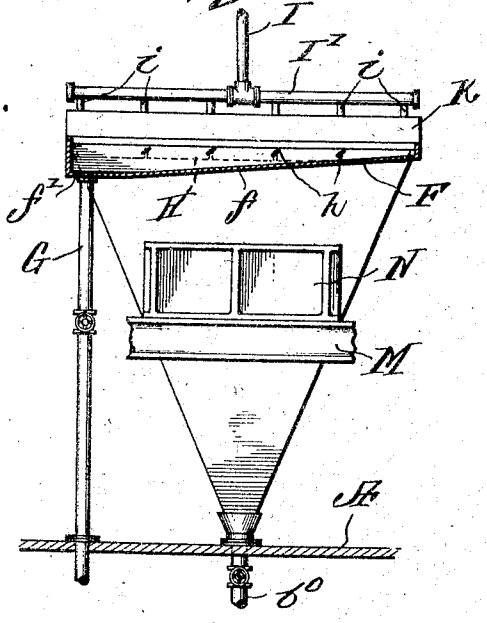


Fig. 4.

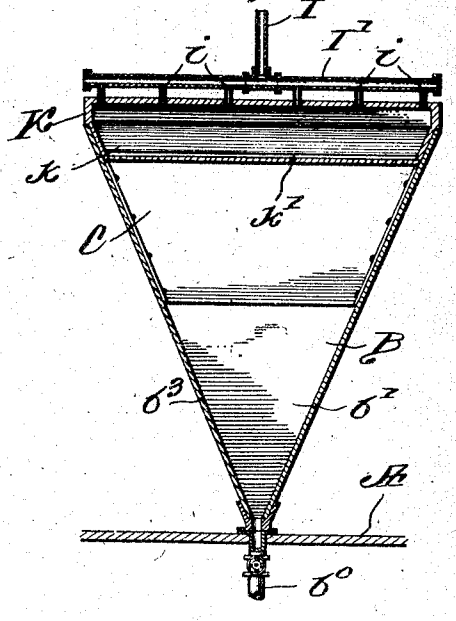


Fig. 5.

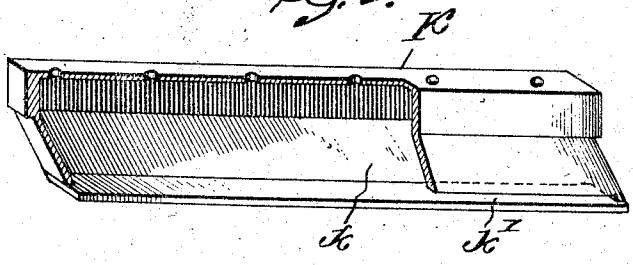


Fig. 7.

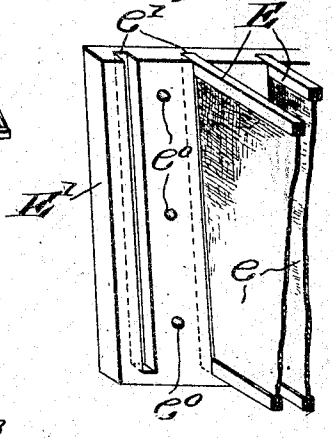


Fig. 6.

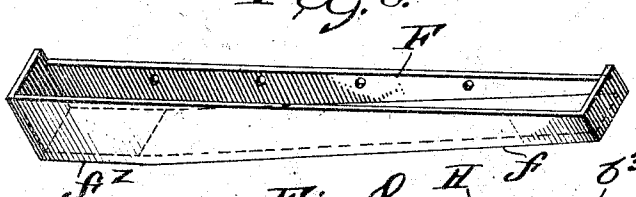
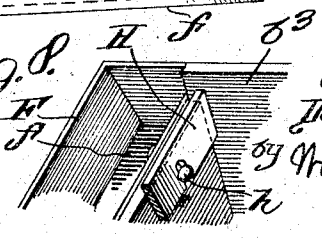


Fig. 8.



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3 SHEETS—SHEET 3.

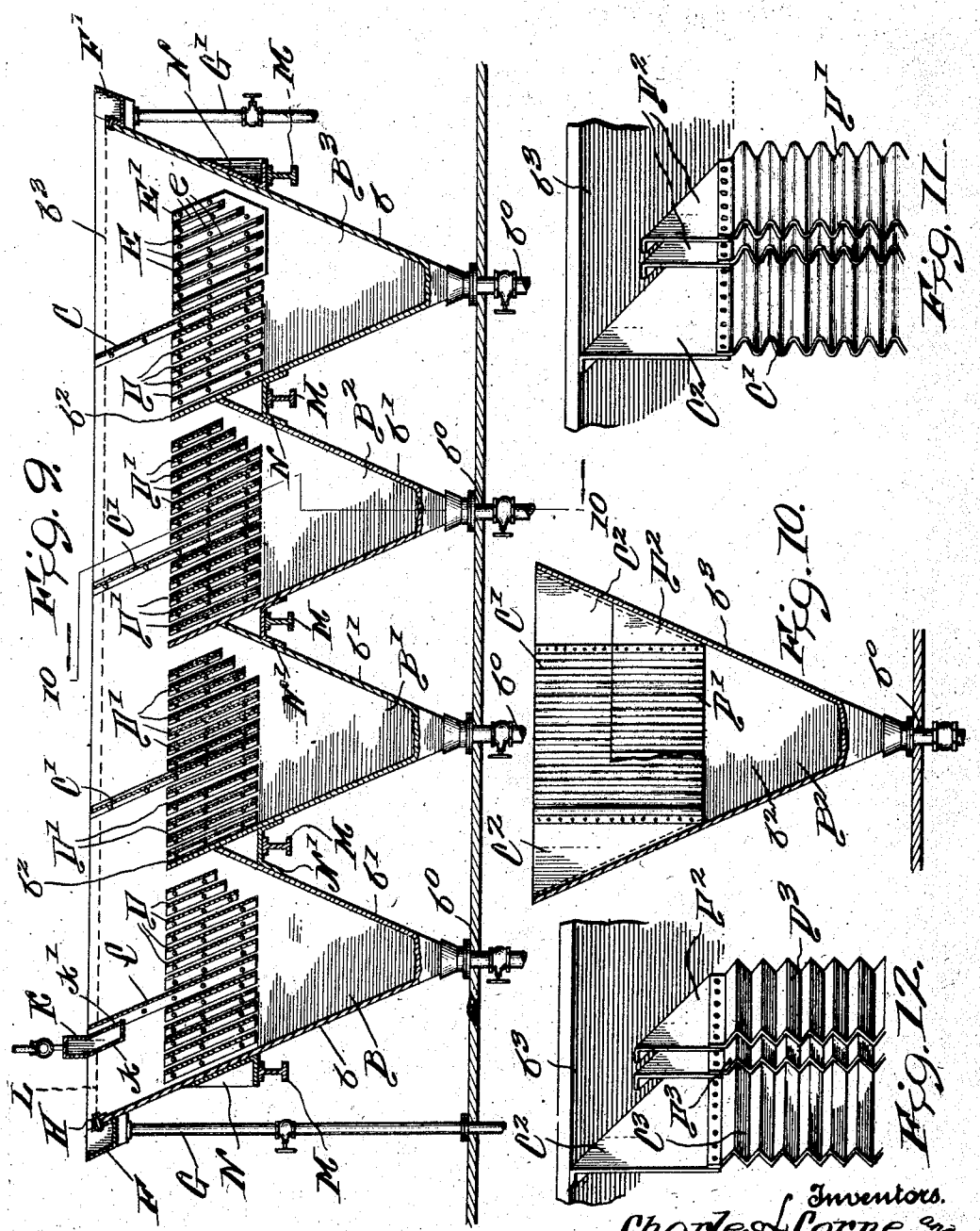

Fig. 9.

Fig. 11.

Fig. 10.

Fig. 12.

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UNITED STATES PATENT OFFICE.

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SETTLING-TANK.

1,190,863. Specification of Letters Patent. Patented July 11, 1916.

Application filed January 26, 1916. Serial No. 74,450.

To all whom it may concern:

Be it known that we, CHARLES LOUIS CORNE and DENIS P. J. BURGUIERES, citizens of the United States, residing at Louisa, in the parish of St. Mary and State of Louisiana, have invented certain new and useful Improvements in Settling-Tanks; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in settling tanks intended to separate solid particles from liquids, and more especially to separate the mud, scale, fine particles of bagasse, and other impurities from cane juice in the process of the manufacture of sugar.

Our invention is intended to provide an open continuously-acting settling tank through which the juice flows very slowly, but continuously, and from which the impurities are separated, as will be hereinafter more clearly described.

Our invention will be understood by reference to the accompanying drawings, in which the same parts are indicated by the same reference symbols throughout the several views.

Figure 1 is a plan view of the complete settling tank, with the supply pipe shown in section; Fig. 2 shows a vertical section along the line 2—2 of Fig. 1, and looking in the direction of the arrows; Fig. 3 is an end view, partly in section, along the line 3—3 of Fig. 1, and looking in the direction of the arrows; Fig. 4 shows a section along the line 4—4 of Fig. 2, and looking in the direction of the arrows; Fig. 5 is a detail showing a perspective view of the delivery trough, parts being broken away; Fig. 6 is a detail showing the trough for the scum as detached from the apparatus; Fig. 7 is a perspective view on a larger scale showing the detachable frames carrying the cloth deflectors; Fig. 8 is a perspective view on a larger scale showing the adjustable plate for regulating the overflow into the scum trough; Fig. 9 is a sectional view similar to Fig. 2, and shows certain of the diaphragms corrugated; Fig. 10 shows a section along the line 10—10 of Fig. 9, and looking in the direction of the arrows, parts being broken away; Fig. 11 is a plan view showing the arrangement of corrugated diaphragms of Figs. 9 and 10; and Fig. 12 shows a modification in which the corrugations in the diaphragms are V-shaped and not curved.

A represents any suitable platform or support on which the several settling tanks B, B′, B^2 and B^3 are mounted. These tanks are all pyramidal in shape and rectangular in horizontal cross-section, and the outer tanks B and B^3 have end walls, or end bottom plates b terminating slightly below the top of the side walls or side bottom plates b^3, as shown in Fig. 2.

The inner bottom plates b' are slightly shorter than the bottom plates b^2, as shown in Fig. 2, and parallel to these bottom plates b^2 we provide a series of diaphragms C, preferably in the form of metal plates, bolted to the sides b^3 of the various settling tanks. Secured in these various settling tanks, and parallel with these diaphragms C, are a series of short, inclined metal plates D bolted to the sides of the settling tanks B, B′ and B^2, as shown in Figs. 1 and 2. In the settling tank B^3 we provide, instead of the metal plates D, a series of removable frames E, each carrying cloth panels e, which frames slide in the grooves e' in the guide blocks E′, secured to the inside of the tank B^3, as shown in Figs. 1, 2 and 7. These blocks E′ are secured to the tanks in any convenient way, as by bolts passing through the bolt holes e°, see Fig. 7. At the receiving end of the system we provide an overflow through F, adapted to receive the scum and skimmings, which trough is preferably provided with an inclined bottom f, emptying at its lowest portion f' into the pipe G for carrying off the skimmings; and on the inside of this trough we provide an adjustable plate H (see Fig. 8), adjustably held in place by the clamp bolts h, so that the depth of the overflow may be regulated within the desired limits. At the opposite end of the system we provide a similar trough F′ to receive the clear liquid which is delivered to the pipe G′. The juice is supplied to the apparatus through the delivery main I, which is connected to the header I′, which header is connected by the small pipes i to the distributing trough K, having the slot k' above the bottom k, as shown most clearly in Figs. 2 and 5. Each of the settling tanks is provided at its bottom with a pipe b° to

carry off the settlings, and the various pipes used in the apparatus are controlled by suitable valves in the ordinary way. The various tanks B to B^3 are supported in any convenient way, as by means of the I-beams M and the braces N and N'.

In the modifications shown in Figs. 9, 10 and 11 the end partitions plates C are similar to those already described with reference to Figs. 1 and 2, as also are the diaphragms D in the tank B and in the tank B^3; but in the tanks B' and B^2 we provide the partition plates C' and diaphragms D' which are corrugated, as shown in Figs. 10 and 11. The corrugated portions do not extend entirely across the tanks, but are connected to plane metal plates C^2 and D^2, as shown in Fig. 11.

In Fig. 12 the corrugated portions C^3 of the partition plates and D^3 of the diaphragms are shown as V-shaped instead of slightly rounded at the bends, as shown in Fig. 11.

Now referring first to Figs. 1 and 2, the operation of the device is as follows:—The juice being supplied through the main I to the trough K flows gently through the slot k' near the bottom k of said trough, into the first tank B, and gradually rises in the system until it reaches the level indicated by the dotted line L—L in Fig. 2. As soon as all the tanks are filled to this level the continuous operation of the device begins. The juice, being distributed through the trough K in a wide stream, flows gently into the upper portion of the tank B, and passes down between the plates D at the left of the first partition C, and the mud tends to settle on the end plate b and gradually drops to the bottom of the first tank. The liquid flows through the system in the direction of the arrows, and as the liquid passes between the various partition plates D, the mud will tend to settle and accumulate on these plates and to drop off, falling toward the bottom of the tank.

We have found in practice that where a liquid containing solid impurities passes in a narrow stream between adjacent plates, the solid impurities tend to separate and to be distributed on said plates, and if these plates are inclined, as shown, the mud after being deposited and accumulated thereon will gradually drop back into the main tank and be carried off through the bottom pipe b^6.

As the liquid passes very slowly and progressively through the tanks B, B' and B^2, passing between the plates D, it will be progressively cleansed of solid impurities, and will be practically clear when it reaches the tank B^3; but it will carry along with it certain lighter particles, such as scale, small particles of bagasse, or the like, and these are separated out by the cloth or burlap panels e, which do not screen the liquid but merely the cloth catches the solid particles. Most of the mud and such other heavier solid particles as still remain in the system will drop down to the bottom of the tank B^3, and accumulating there may be drained off as required. The final result will be that the liquid, practically clear, will flow into the delivery trough F', and be carried off by the delivery pipe G'.

While the plates D may be permanently attached in the settling tanks, they may be washed at such times as the apparatus is washed. The frames E carrying the cloth panels e should be removed from time to time and cleaned, fresh frames being inserted while the soiled ones are being cleansed.

In the modification shown in Fig. 9, a still better precipitation of mud is secured, owing to the corrugated forms of the diaphragms D^2 and D^3 and of the separating plates C' and C^3. These diaphragms form tortuous passages, which form a plurality of laterally connecting troughs, and the mud tends to settle on the sides and finds its way to the bottom of each trough, and, flowing down the trough, falls in a thin stream to the bottom of the corresponding tank. There will be a series of such pencil-like streams of mud between which the cleansed liquid is free to move without being contaminated by the mud.

In operating this system, we depend upon the fact that solids will separate from liquids more rapidly on inclined surfaces than in the bottom of a settling tank having vertical walls, and by the inclined arrangement of deflectors D and E, and the inclined bottoms of the tanks, we secure a much more rapid deposit of the heavier particles of solid matter from the liquid than if tanks with vertical sides were used. Moreover, by changing the direction of the current of liquid on each side of the diaphragms C, as shown, the tendency of the liquid to deposit the heavier solids held in suspension is further increased.

It will be seen that in this system there is a very gentle flowing of liquid from one end of the apparatus to the other, and the velocity of which flow is practically uniform in all of the tanks, and at all portions of each tank, thus differing from any of the systems now in use; where the juice is pumped through a large pipe to one tank, thus agitating the entire contents of said tank, and then is pumped through another pipe into the second tank, where a similar agitation takes place, with the result that the mud is stirred up with the juice, and the flocculates are broken up, instead of being allowed to slowly settle from the juice.

By this system practically all of the mud and heavier particles are taken off in the earlier stages of the process of settling; while the lighter particles are caught in the

cloth and taken off near the end of the operation, the result being that an extremely clear liquid product is secured.

Since it may be desirable with certain qualities of juice to raise or lower the level of the partition between the first settling tank B and the trough F for the scum and skimmings, we provide the adjustable plate H which may be raised or lowered as desired.

Practically all of the scum will rise between the first plate C and the end *b* of the first tank B, and may be conveniently removed through the trough F and pipe G, where the scum may be filtered out, and the juice returned to the system in the usual way.

While we have shown four such tanks B, B′, B² and B³ it will be obvious that the number of these may be increased at will, and that more than one of said tanks may be provided with removable screens or partitions, either of cloth or metal, as desired.

While we have shown certain of the separating plates only as corrugated, it will be obvious that all may be corrugated, or all may be plane, if desired, and that the number of the diaphragms may be increased or decreased at will. It will also be seen that various modifications might be made in the herein described apparatus, and in the construction, combination and arrangement of parts which could be used without departing from the spirit of our invention.

Having thus described our invention what we claim and desire to secure by Letters Patent of the United States is:—

1. An apparatus for separating solid particles from liquids, comprising a series of settling tanks in the shape of inverted pyramids connected together by deep and wide overflow passages, with inclined baffle plates parallel to each other and mounted in said tanks, and spaced above the bottoms thereof, means for supplying the impure liquid at one end of the system, and means for carrying off the clear liquid at the other end of the system, with means for draining the bottom of each tank, substantially as described.

2. Apparatus for separating solid particles from liquids, comprising a series of settling tanks in the shape of inverted pyramids connected together by deep and wide overflow passages, with inclined baffle plates parallel to each other and mounted in said tanks, and spaced above the bottoms thereof, means for supplying the impure liquid in a finely divided stream at one end of the system, and means for carrying off the clear liquid at the other end of the system, with means for draining the bottom of each tank, substantially as described.

3. An apparatus for separating solid particles from liquids, comprising a series of settling tanks in the shape of inverted pyramids connected together by deep and wide overflow passages, with baffle plates mounted in said tanks and spaced above the bottoms thereof, means for suplying the impure liquid in a finely divided stream at one end of the system, a skimming trough provided at the receiving end of the system, an adjustable plate separating said trough from the first tank of the system, and means for carrying off the clear liquid at the other end of the system, with means for draining the bottom of each tank, substantially as described.

4. An apparatus for separating solid particles from liquids, comprising a series of settling tanks in the shape of inverted pyramids and connected together by deep and wide overflow passages, baffle plates mounted in said tanks and spaced above the bottoms thereof, with removable cloth panels mounted near the delivery end of the system, means for supplying the impure liquid in a finely divided stream at one end of the system, and means for carrying off the clear liquid at the other end of the system, with means for draining the bottom of each tank, substantially as described.

5. An apparatus for separating solid particles from liquids, comprising a series of settling tanks in the shape of inverted pyramids and connected together by deep and wide overflow passages, with baffle plates mounted in said tanks and spaced above the bottoms thereof, with removable cloth panels mounted near the delivery end of the system, means for supplying the impure liquid in a finely divided stream at one end of the system, a skimming trough provided at the receiving end of the system, an adjustable plate separating said trough from the first tank of the system, and means for carrying off the clear liquid at the other end of the system, with means for draining the bottom of each tank, substantially as described.

6. An apparatus for separating solid particles from liquids, comprising a series of settling tanks connected together by deep and wide overflow passages, and each provided with inclined bottom walls, with baffle plates mounted in said tanks and spaced above the bottoms thereof, with removable cloth panels mounted near the delivery end of the system, means for supplying the impure liquid at one end of the system, and means for carrying off the clear liquid at the other end of the system, with means for draining the bottom of each tank, substantially as described.

7. An apparatus for separating solid particles from liquids, comprising a series of settling tanks connected together, with inclined corrugated baffle plates parallel to each other and mounted in said tanks, and

spaced above the bottoms thereof, with removable cloth panels mounted near the delivery end of the system, means for supplying the impure liquid in a finely divided stream at one end of the system, and means for carrying off the clear liquid at the other end of the system, with means for draining the bottom of each tank, substantially as described.

8. An apparatus for separating solid particles from liquids, comprising a series of settling tanks connected together, with inclined corrugated baffle plates mounted in said tanks and spaced above the bottoms thereof, means for supplying the impure liquid in a finely divided stream at one end of the system, and means for carrying off the clear liquid at the other end of the system, with means for draining the bottom of each tank, substantially as described.

9. An apparatus for separating solid particles from liquids, comprising a series of settling tanks connected together, and each provided with inclined bottom walls, with inclined baffle plates mounted in said tanks and spaced above the bottoms thereof, the baffle plates in one or more of said tanks being in the form of plane plates, and the other baffle plates being corrugated, removable cloth panels mounted near the delivery end of the system, means for supplying the impure liquid at one end of the system, and means for carrying off the clear liquid at the other end of the system, substantially as described.

10. An apparatus for separating solid particles from liquids, comprising a series of settling tanks connected together, and each provided with inclined bottom walls, with inclined baffle plates mounted in said tanks and spaced above the bottoms thereof, the baffle plates in one or more of said tanks being in the form of plane plates, and the other baffle plates being corrugated, means for supplying the impure liquid at one end of the system, and means for carrying off the clear liquid at the other end of the system, substantially as described.

In testimony whereof, we affix our signatures.

CHARLES LOUIS CORNE.
DENIS P. J. BURGUIERES.