Dec. 16, 1930. L. REVEL 1,785,494

FILTER PRESS

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Fig. 1

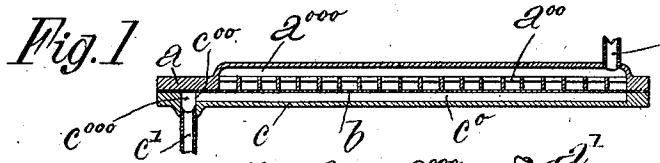


Fig. 2

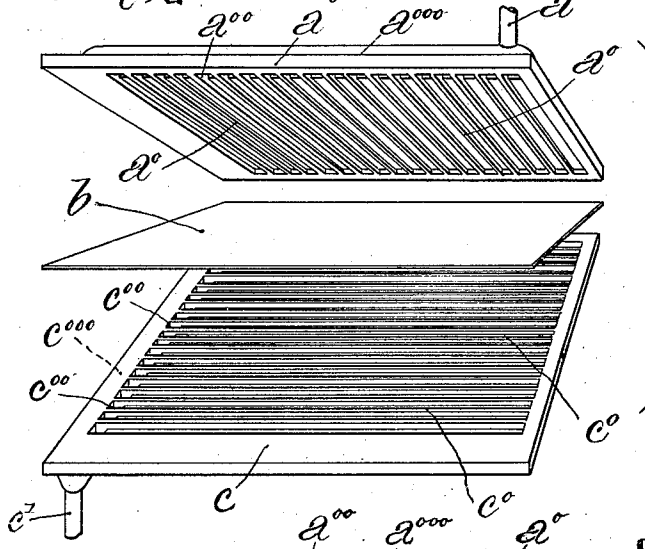


Fig. 3

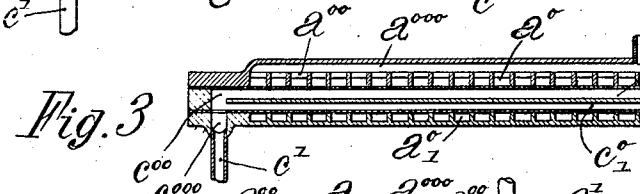
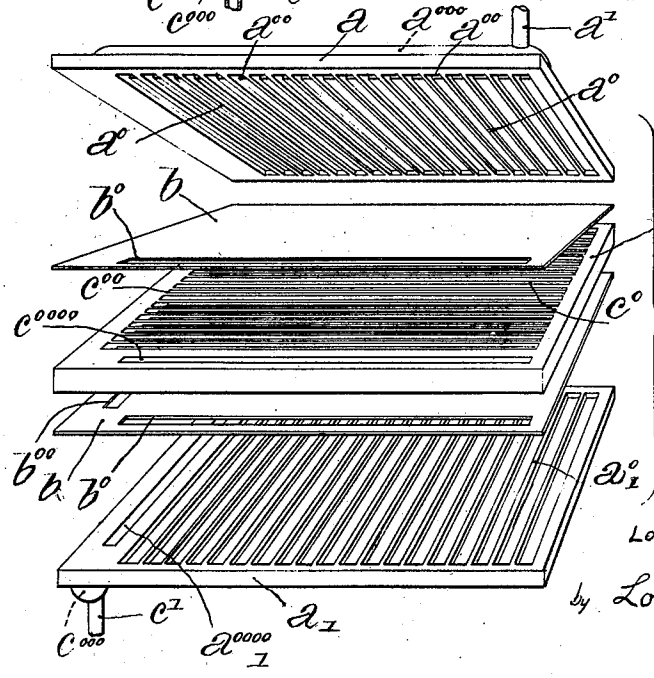


Fig. 4



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Fig. 5

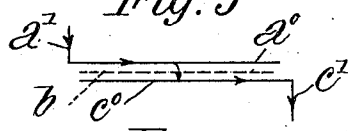


Fig. 6

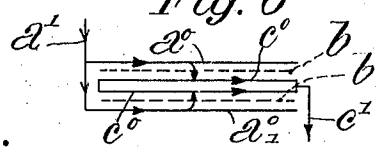


Fig. 7.

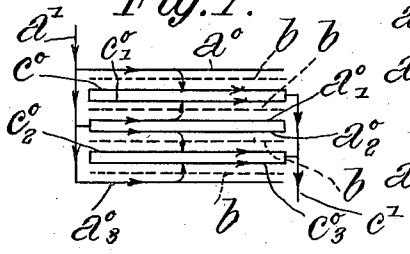


Fig. 8

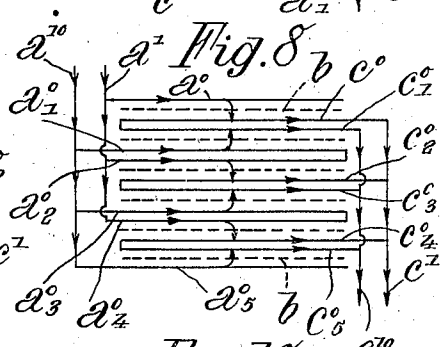


Fig. 9



Fig. 10



Fig. 11

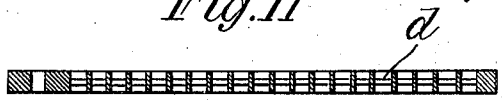
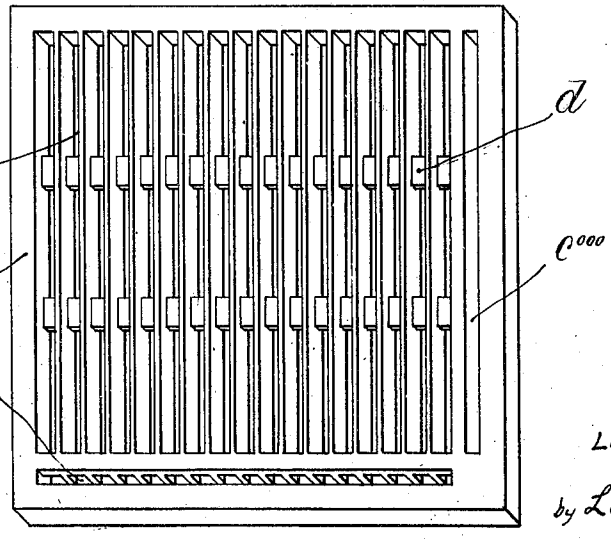


Fig. 12



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Fig. 13.

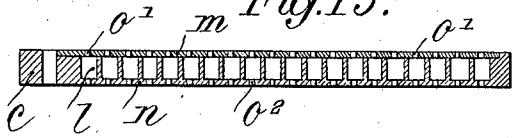


Fig. 14.

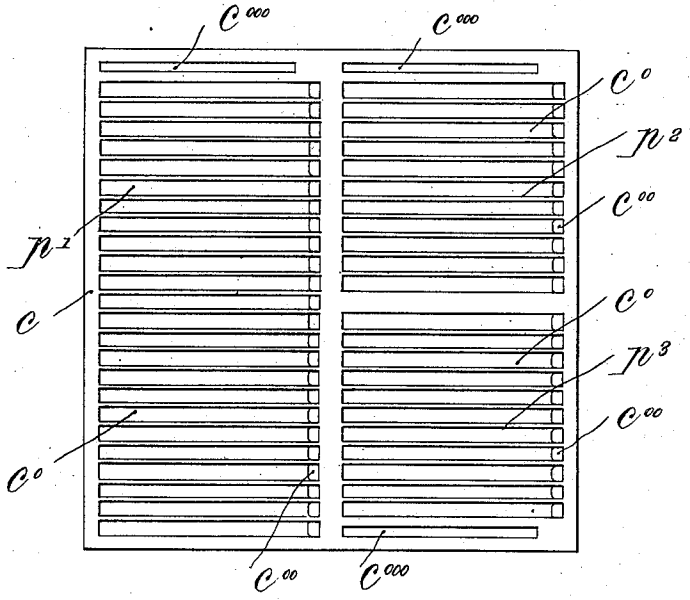


Fig. 15

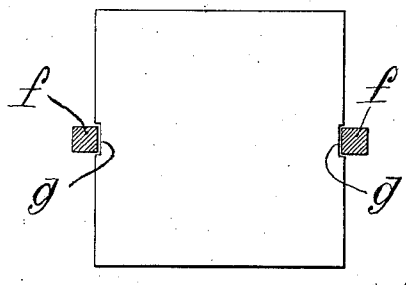
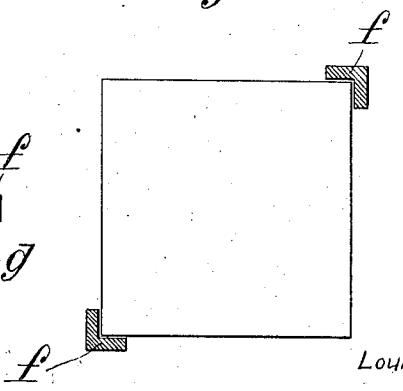


Fig. 16



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Patented Dec. 16, 1930 1,785,494

UNITED STATES PATENT OFFICE

LOUIS REVEL, OF LE VIGAN, FRANCE

FILTER PRESS

Application filed June 6, 1928, Serial No. 283,155, and in France June 14, 1927.

The present invention relates to filter-presses and, more particularly, to those of the type consisting of a series of plates separated by filter-cloths or papers and held in assembled relation by a mechanical or hydraulic press.

One of the objects of the invention is to provide a special form of filter-plate capable of increasing the capacity and speed of filtration of a filter-press.

Another object is to provide special means for supporting the filter-plates whereby the latter may be made up without any salient supporting portions.

Still another object is to provide a form of press adapted to simultaneously handle a plurality of liquid suspensions of dissimilar nature and composition.

A further object is to provide a press capable of subjecting a liquid to a series of sucsive filtrations.

Still further objects will appear in the course of the detailed description now to be given with reference to the accompanying drawings, in which:—

Fig. 1 is a section through one constructive embodiment of the invention consisting of an assembly of two plates;

Fig. 2 is a separated perspective of the assembly represented in Fig. 1;

Fig. 3 is a section through a 3-plate form of press;

Fig. 4 is a separated perspective of the press shown in Fig. 3;

Fig. 5 illustrates, diagrammatically, the course of the liquid being filtered in the press shown in Figs. 1 and 2.

Fig. 6 is a similar diagram of the liquid flow in the press represented in Figs. 3 and 4;

Fig. 7 shows, diagrammatically, an assembly similar to the one shown in Figs. 3, 4 and 7 but consisting of more than 3 plates;

Fig. 8 is a diagram of the liquid flow in a system arranged to simultaneously handle two different liquids;

Figs. 9 and 10, are sections of two forms of intermediate filter-plate adapted to replace those shown in Figs. 3 and 4;

Figs. 11 and 12 show respectively in section and in perspective, another form of intermediate plate;

Fig. 13 shows in section still another form of intermediate plate;

Fig. 14 represents, in plan, a special form of intermediate plate adapted for use in a special form of plate assembly;

Figs. 15 and 16 are sectional views to two different forms of plate supports adapted to be used with any of the plates shown in Figs. 1 to 4 and 9 to 14.

Referring to Figs. 1 and 2 of the drawings, there is shown a feed plate a having a series of parallel grooves a° formed therein which communicate through a series of passages $a^{\circ\circ}$ formed at one end of grooves a°, with a chamber $a^{\circ\circ\circ}$ adapted to receive liquid to be filtered from feed conduit a^1,—a filter cloth or paper b adapted to cover one face of plate a,—and a discharge plate c having a series of parallel grooves c° formed therein crossing the direction of grooves a° and which communicate, through a series of passages $c^{\circ\circ}$ formed at one end of grooves c°, with a chamber $c^{\circ\circ\circ}$ delivering liquid to a discharge conduit c^1. Plates a and c are maintained in contact by the usual mechanical or hydraulic devices and are supported in alignment by any of the structures now in use or in the special manner to be indicated further on and shown in Figs. 15 and 16.

The press functions as follows:—the liquid to be filtered enters, under pressure, through conduit a^1, fills chamber $a^{\circ\circ\circ}$, passes through passages $a^{\circ\circ}$, flows along grooves a°, moves through filter b, and is discharged via grooves c°, passages $c^{\circ\circ}$, chamber $c^{\circ\circ\circ}$ and conduit c^1. The material held in suspension in the liquid accumulates in and fills the grooves in feed plate a.

In the press represented in Figs. 3 and 4, two plates a and a_1 are positioned on opposite sides of a single intermediate plate c. Plates a and a_1 correspond, in structure to a, Fig. 1 and are each provided with grooves a° and $a^\circ{}_1$ arranged in parallel relation to one another. Plate c carries grooves c°, c° on both faces, which grooves are parallel to one another and cross the direction of grooves a°, $a^\circ{}_1$ at right angles or at any other angle

desired. As in the device already described, liquid enters at a^1 and is discharged at c^1. Liquid to be filtered is led to plates a, a_1 by providing passages $a^{\circ\circ}$ between chamber $a^{\circ\circ\circ}$ and grooves a°, and by providing a slot $c^{\circ\circ\circ\circ}$ in plate c just opposite the line of passages $a^{\circ\circ}$. Grooves c° and $c^\circ{}_1$ communicate with a chamber $c^{\circ\circ\circ}$ through passages $c^{\circ\circ}$ and slot $a_1{}^{\circ\circ\circ\circ}$. Filter cloths b are formed with slots b° and $b^{\circ\circ}$ positioned opposite chambers $a^{\circ\circ\circ}$ and $c^{\circ\circ\circ}$ and permit movement of liquid through said chambers.

This form of press functions as follows: Liquid enters, under pressure, through a^1 and $a^{\circ\circ\circ}$, passes through slots b° and $c^{\circ\circ\circ\circ}$, spreads over grooves a° and $a^\circ{}_1$ passes through filter-cloths b, collects in grooves c° and $c^\circ{}_1$ of plate c, and discharges via passages $c^{\circ\circ}$, slots $b^{\circ\circ}$ and $a_1{}^{\circ\circ\circ\circ}$, chamber $c^{\circ\circ\circ}$ and discharge conduit c^1.

From the foregoing, it will be evident that, by interposing alternate double-faced plates of the feed type a, a^1 and of the receiving type c (Fig. 3), a filter-press of any desired capacity may be obtained.

Figs. 5 to 7, are flow-sheets showing the manner in which the three press assemblies above mentioned function. Figs. 5 and 6 are self-explanatory. In Fig. 7, the inflowing liquid a^1 is distributed to opposite faces, a°, $a^\circ{}_1$, $a^\circ{}_2$, and $a^\circ{}_3$ of each feed plate, passes through filter-cloths b, and is discharged to the opposite faces $c^\circ{}_1$, $c^\circ{}_2$, $c^\circ{}_3$ of the discharge plates, whence it flows into discharge conduit c^1. In this form of device, a series of slots of the type $a_1{}^{\circ\circ\circ\circ}$ and $c^{\circ\circ\circ\circ}$ are formed in the feed and receiving plates, and slots of the type b° and $b^{\circ\circ}$, in the filter-cloths, to form chambers $a^{\circ\circ\circ}$ and $c^{\circ\circ\circ}$ respectively.

The grooves in the various plates may be rectangular as shown in Figs. 1 to 4 or may be of triangular section as represented in Figs. 9 and 10.

The intermediate discharge plates, type c, Fig. 3, may present a solid separating wall (Figs. 3, 9 and 10) or may be perforated at l in the manner illustrated in Figs. 11 and 12. If desired, and as shown on Fig. 13 a pair of parallel walls m and n with perforations o^1 and o^2 may be provided, one n of said walls being formed integrally with the filter-plate frame, while the other m is mounted detachably to permit cleaning of grooves l and repairs. Where perforated plates are employed, transverse reenforcing elements d (Fig. 12) should be provided.

In the various presses hereinbefore described, passages of the type $a^{\circ\circ}$ and $c^{\circ\circ}$ always communicate with corresponding chambers of the type $a^{\circ\circ\circ}$ and $c^{\circ\circ\circ}$. If desired, these passages may be arranged so as to communicate with an intermediate chamber e which communicates in turn with the chambers above mentioned in the manner represented in Fig. 12.

The grooves in adjoining plates have been shown at 90° to one another in Figs. 1 to 4. If some other angle than 90° is chosen, it is preferable to use plates having a continuous septum (Figs. 1 to 4, 9 and 10) and slots arranged in the manner of $a_1{}^{\circ\circ\circ\circ}$, (Fig. 4) near opposite edges of each feed plate, analogous slots $c^{\circ\circ\circ\circ}$, Fig. 4, being provided near opposite edges of each discharge plate. In such a case, all the grooves on one side of the septum communicate with one of said slots, while the grooves on the opposite side communicate with the other.

The assembly shown diagrammatically in Fig. 8 is especially designed for simultaneously filtering two liquid currents. Here, each filter is connected to two feed conduits a^1 and a^{10}. The fluid entering through a^1 spreads over faces a°, $a^\circ{}_2$, and $a^\circ{}_4$ of the feed plates, passes through filter-cloths b to faces c°, $c^\circ{}_2$ and $c^\circ{}_4$ of the discharge plates and flows away through conduit c^1. Fluid entering through a^{10} is fed to faces $a^\circ{}_1$, $a^\circ{}_3$ and $a^\circ{}_3$ of the feed plates, traverses the filter cloths and is discharged via faces $c^\circ{}_1$, $c^\circ{}_3$ and $c^\circ{}_5$ and conduit c^{10}. It is to be understood, of course, that each plate should be provided with two pairs of slots analogous to $a_1{}^{\circ\circ\circ\circ}$ and $c^{\circ\circ\circ\circ}$ in Fig. 4, and each filter-cloth with two pairs of slots analogous to b° and $b^{\circ\circ}$ of the same figure in order to form common chambers of the type $a^{\circ\circ\circ}$ and $c^{\circ\circ\circ}$ corresponding respectively to the separate currents circulating through the apparatus, each pair of slots being positioned side by side near one edge of the plate or adjacent two opposite edges.

Another possible arrangement for simultaneously handling two different liquids involves the use of feed and discharge plates c divided into two or more independent sections as p^1, p^2, p^3 as shown in Fig. 14, each section having independent slots c°, and feed and discharge conduits $c^{\circ\circ}$ and $c^{\circ\circ\circ}$.

Obviously, either of the foregoing devices for simultaneous filtration may be used to effect a double filtration of a single liquid, the discharge from the first filtration serving as feed for the second, successive filtrations being effected simultaneously in the same press.

In order to eliminate projecting suspension members from the plate structure, each of the latter may be provided with a groove g adapted to fit over guide bars f as shown in Fig. 15, or angular guides f may be positioned at opposite corners of the plate assembly in the manner represented in Fig. 16. Filter-plates of this type are lighter and easier to construct than those ordinarily used and are not only easier to keep in alignment, either horizontal or vertical, but permit a considerable saving in the cutting out of filter-cloths.

The invention is not to be taken as limited to the particular structures shown in the

drawings. Thus, the shape of the plates, the direction of the grooves and the position of the communicating slots may be altered in a variety of ways which will be obvious to those skilled in the art.

What I claim is:—

1. In a filter press assembly, a first feed plate having a plurality of depressions formed therein, conduit means communicating with said depressions, a discharge plate having a slot formed therethrough and positioned so that when said feed and discharge plates are in operative position, said slot crosses a plurality of said depressions, said discharge plate also having a plurality of grooves formed therein which are substantially co-directional with said slot, said grooves being separated from and independent of said slot, a discharge conduit system communicating with said grooves, and a second feed plate having a plurality of depressions formed therein positioned so that, in operating position, said slot crosses the direction of, and communicates with the depressions of said second feed plate, said second feed-plate having a slot formed therein separate from and independent of the depressions formed therein, said last named slot being positioned to communicate with, and form part of, the discharge conduit system.

2. In a filter-press assembly, a first plate having grooves on opposite faces thereof, each groove communicating by way of a passage formed through the plate with a groove on the opposite face of the latter, said plate also having a slot formed therein elongated in the direction of the length of said grooves and separated from, and independent of, said grooves,—and a second plate having a series of grooves formed on one face thereof, and a slot formed therethrough elongated in the direction of the length of said grooves and separated from, and independent of, said lastnamed grooves, said first and second plates being adapted to be assembled so that the slot in one plate overlies a plurality of grooves of the other plate.

In testimony whereof I have hereunto set my hand.

LOUIS REVEL.