

UNITED STATES PATENT OFFICE.

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FILTER-PRESS.

No. 813,121.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, SOREN THURSTENSEN, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Filter-Presses; of which the following is a specification.

The filter-press of the present invention is more especially intended to be used in connection with such material as brewers' grain and distillers' slops.

One object of this invention is to overcome certain difficulties and defects found in the use of filter-presses of the general type which involves the formation of cells for the liquid to be filtered between filter-plates—that is, plates having drainage-channels on their faces covered with filtering fabrics, the water or other liquid being forced through the fabrics and escaping through the drainage-channels, the solid material accumulating in the cells till they are filled, when it is removed in the form of cake or slabs and the filter recharged.

Another object is attained by constructing the ribs much deeper and narrower than those formerly used, thereby greatly increasing their number and enlarging the filtering-surface of the plate as a whole.

Another object of the invention is to insert a hole in the top of the plate instead of in the center, as formerly done, which strengthens rather than impairs or weakens the plate to any appreciable extent.

Another object of the invention is to construct the drainage-channels from the grooves on either side of the plate and to connect the same with a number of holes on the bottom thereof, so that the water or other liquid will immediately run and pass off; and the final object of this invention is to so construct the plate as a whole that it will be strong, durable, light, serviceable, and yet at the same time not weaken any of its component parts.

The invention consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is an axial section of the filter-press of the present invention; Fig. 2, a face view of one of the plates, a portion of the lower rim being broken away to show the drainage-channels and drain at the bottom; and Fig. 3, a longitudinal section of the filter-plate.

The filter-press of the present invention is firmly mounted upon upright supports A, at the top of which is secured an axle B, said axle having a sprocket-wheel *b* fastened thereon, the sprocket-wheel *b* being used for the purpose of feeding forward a worm-feed C. The worm-feed C passes through apertures *c*, located in the upper portion at a point near the edge in the filter-plate D'. I find by placing the aperture *c* at the top of the filter-plate D' rather than in the center, as formerly done, that the plate D' as a whole is given a considerable degree of strength, that the aperture *c* does not obstruct as much of the filtering-surface as if it were in the center and that it leaves no obstruction to the drainage through the grooves *d*² in the filter-plate, that with the aperture or hole *c* at the top it is much easier and more convenient to fill the filter-press with liquid, and that the agitator or feed-worm C is not liable to become impeded or get stuck in performing its function, because there is not a large body of material resting above or over the same, as would be the case if located at or near the center.

The filter-plate D' consists of a solid web *d*, having thereon numerous ribs or projections *d*¹, the ribs or projections of which form a series of grooves or channels *d*², located on the face of the plate D', said ribs or projections being narrower and deeper than those hitherto used and greatly increased in number, thus enabling the web *d* to be made thinner and the plate D' lighter and easier to handle and at the same time leaving the plate sufficiently strong and capable of withstanding all necessary pressure or strain. Although the drawings show but comparatively few ribs, the same being on a small scale, it will of course be understood that in actual use and operation they are greatly increased. On the face of the filter-plate D', on both sides thereof, is placed a filtering-mesh E, said mesh consisting of two portions, the lower portion *e* being preferably made of No. 18 quarter-mesh wire and the upper or outer portion *e*¹ being made of fine brass screen or canvas, both portions being clamped together in place by an iron ring F, which is firmly secured in place by bolts *f* to the flange of the filter-plate. It is also found in the use of such presses that the fabric which overlies the channeled filter-plates being exposed to

the pressure of the liquid with which the press is charged for filtering the same and being sunken somewhat into the channels by the pressure if the fabric is placed on the plates with their warp or woof threads parallel with the channels will develop openings between the adjacent threads at the margin of the channels. This arises from the fact that a warp-thread—for example, lying along the edge of the channel when the pressure is exerted upon the fabric—spanning the channel will be engaged by the edge of the channel and the next adjacent thread just over the edge will be crowded away from it by the pressure, the thread which extends transverse to the channel being slightly stretched and permitting the sagging of the fabric into the channel, the action being precisely as if a comb had been inserted through the fabric between the threads extending in one direction and the threads between which it was thus inserted were parted forcibly by the comb. Such opening permits the material to pass through without filtering and very soon fills the channels with the solid matter which ought to have been filtered out by the fabric and retained by the cells. I therefore place the filtering fabric E on the channeled face of the plates with both the threads of its web obliquely to the parallel channels, or, as it is commonly expressed, by applying it biaswise with respect to the channels. It will thus be obvious at once that when so applied the detention of one thread on the edge of the channel while the next thread is forced over the edge and a rift open between the two threads is rendered impossible, since there is no thread that lies along the edge of the channel, all the threads crossing the channel obliquely. At the bottom of said plate D' are drainage-channels G, said channels projecting through the rim J at the lower end thereof. These drainage-channels G are located at suitable points along the lower portion of the plate D' and in turn unite in holes H in the bottom of the plate, as usual; but instead of employing only one hole, as is commonly practiced, I locate one hole for about every two or three grooves, thus insuring a rapid and speedy drain of the filter-plate. A channel or groove I is cut in the ribs d' at the rim thereof and connects the various grooves with their respective holes. The outer rim J of the plate for the purpose of making it as light as possible is cored out, leaving ribs j at suitable points for strengthening purposes. At the top of the filter-plate D' are located similar holes and channels d³, said holes and channels being employed for the following threefold purposes: first, to expel the air freely when filling the filter-press; second, to expel steam and vapors arising from the heated matter when pressing hot liquids therein, and, third, to permit the holes and channels to be easily washed out by inserting

a hose within, thus cleaning out the grooves back of the screening and preventing the clogging up of the filtering-surface.

The plates are cast with two arms or lugs W W' located, as shown in Fig. 2, respectively, on either side of the plate for supporting the same on the bars a of the filter-press.

One of the arms W has on its under side a round grip w, having a curvature corresponding to the curvature of the bar a of the filter-press, said arm being adapted to grip one of the bars of the press. The under side of the other arm W' is preferably straight, as shown in Fig. 2. With the exception of the curvature in a portion of the arm W the bottom faces of both arms are V-shaped, as shown, instead of flat, for the purpose of enabling the plates to slide easier and line up better with the cell-rings.

In order to overcome any unusual pressure or strain upon any of the intermediate filter-plates, I provide abutments O—three for each plate. Within the filter-plate and cast integral therewith is a hub or lug M, having a passage m through its center and within which is adapted to be inserted a bolt N for the purpose of securing the outer faces of said filter-plate abutments O, said abutments being in turn secured in place by bolts N. The abutments O have an enlarged opening o at their outer end to permit a nut n to be countersunk therein and to hold said abutments securely in contact with the hub or lug M of the filter-plate, these abutments from the facing-surfaces of consecutive plates being adapted to meet midway in the depth of longitudinal extent of the cells, so that any excess of pressure in any one cell instead of tending to bulge the filtering-plate toward the adjacent cell, where there is less pressure, instead of having this effect, is transmitted through the abutment to the outer filter-heads D, which have sufficient rigidity to resist the entire pressure. By securing these abutments in the manner shown and securing opposite abutments on intermediate filter-plates by one and the same bolts extending also through the intervening plate and sinking the heads and nuts of the bolts in the heads of the abutments I prevent any possibility of leakage occurring through the fabric by reason of the hole made therein in securing the abutments and also insure the abutments being retained and not pulled off by the adhesion of the matter with which the cell is packed in and by the process of filtering, for, as shown, this adhesion is sufficient to tear off an abutment secured less fixedly than as described. By mounting the abutments on top of the fabric I also avoid a difficulty which would arise if the abutment were integral with or secured firmly to the filter-plate before the cloth is applied. In that case the cloth would have to be stretched over the knobs which the abutments would

form, and in addition to this strain upon the work it would be exposed to the direct pressure of the knobs upon each other, which would work holes through it in a short time.

5 In the inlet-pipe K is a T-fitting *k*, whose cross is in the line of the apertures of the filter-press, the supply-pipe being connected to the stem of the T-fitting and the valve L being located back of that connection. The end
10 of the cross of the T-fitting opposite that which is connected by the pipe K to the filter-plate is provided with a stuffing-box *k*², through which extends the shaft B of a worm-feed C, whose width is substantially the di-
5 ameter of the apertures in the filter-plates. Outside the stuffing-box and adjacent thereto is a sprocket-wheel *b*, secured to the shaft B, and affords the means for rotating the worm-feed at any desired speed. The worm-
10 feed C extends through all of the apertures in the filter-plates, terminating beyond the holes of the intermediate plates D'—that is to say, in the last cell next to the outer end filter-plate D. By keeping the worm-feed in con-
15 stant rotation while the material is being fed in under pressure through the apertures of the filter-plates into the cells these apertures are always kept clear, and all the cells will be filled simultaneously and equally.

20 From the foregoing description it will be seen that the filter-press of the present invention is one in which the filtered material can be readily and thoroughly filtered and that the construction as a whole is such that the
35 material to be filtered can be positively and evenly fed forward into the various filter-plates without being impeded or obstructed in any way and that the construction of the various parts is greatly improved, thus in-
40 suring a quicker and better operation.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a filter-press, a series of separated filter-plates having near their tops alining ap-
45 ertures adapted to have the material distributed therethrough, a rotatable worm-feed passing transversely through all of the alining apertures, the filter-surfaces of the filter-plates being provided with a plurality of
50 closely-adjoining ribs forming deep narrow channels, a filtering-screen for each of the filtering-surfaces, drains on each of the plates communicating with the channels therein and adapted to receive and discharge the liq-
55 uid therefrom, means for rotating the worm-feed to clear the apertures and distribute the material, alining hubs for each of the plates, said hubs being in contact with the inner face

of the filtering-screen, and abutments be-
60 tween the hubs, said hubs and abutments extending continuously from end to end of the filter-press and adapted to relieve the intermediate filter-plates from undue strain, substantially as described.

2. In a filter-press, a series of separated fil-
65 ter-plates having near their tops alining apertures adapted to have the material distributed therethrough, a rotatable worm-feed passing transversely through all of the alining apertures, the filter-surfaces of the filter-
70 plates being provided with a plurality of closely-adjoining ribs forming deep narrow channels, a filtering-screen for each of the filtering-surfaces, drains on each of the plates communicating with the channels therein
75 and adapted to receive and discharge the liquid therefrom, means for rotating the worm-feed to clear the apertures and distribute the material, alining hubs for each of the filter-plates outwardly extending to contact the in-
80 ner face of the filtering-screen, abutments outwardly extending from the hubs and adapted to clamp the filtering-screen between the hubs and the abutments, and a bolt for each of the filter-plates passing through the
85 hub and the clamping-abutments, the hubs and abutments extending continuously from end to end of the filter and adapted to distribute the pressure on the intermediate filter-plates to the end plates, substantially as
90 described.

3. In a filter-press, a series of filter-plates having alining apertures adapted to receive and distribute material, a rotatable clearing-
95 blade extending through said apertures and adapted to be rotated therein, each of the filter-plates having on its surface closely-positioned vertical ribs forming deep narrow channels between the ribs, a filtering-screen stretched over the surface of the ribs, a hub
100 for each of the plates outwardly projecting to contact the inner face of the filtering-screen, abutments for the plates secured to the hubs and adapted to clamp the filtering-screen be-
105 tween the abutments and the hubs, and bolts for securing the abutments to the hubs, the abutments and the hubs being in alinement with one another and extending from end to end of the filter-press for relieving the inter-
110 mediate filter-plates from undue pressure, substantially as described.

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Witnesses:

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