No. 612,105. Patented Oct. 11, 1898.

E. E. HENDRICK.

FILTER PRESS.

(Application filed Aug. 31, 1895.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

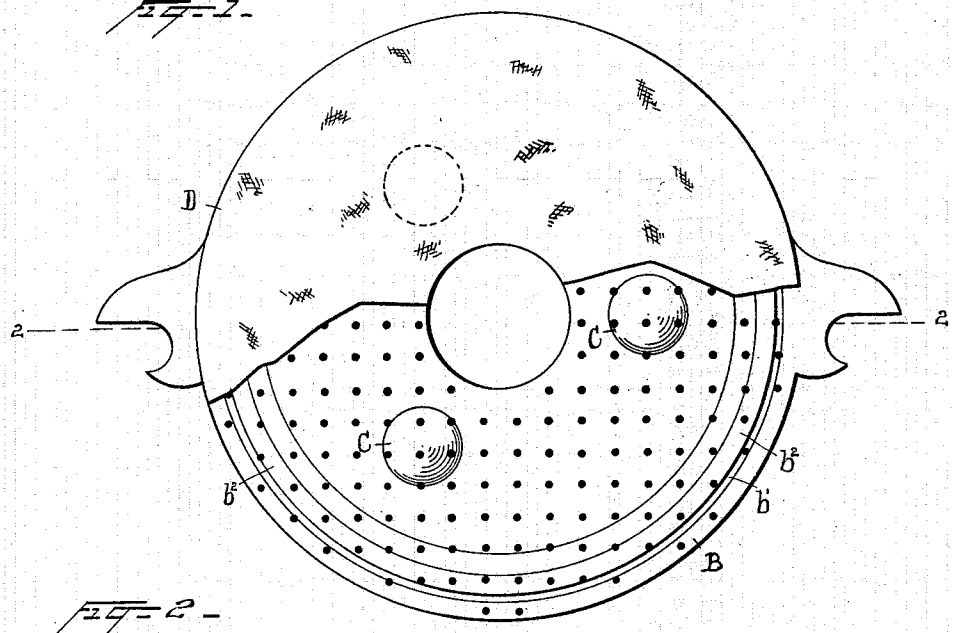


Fig. 2.

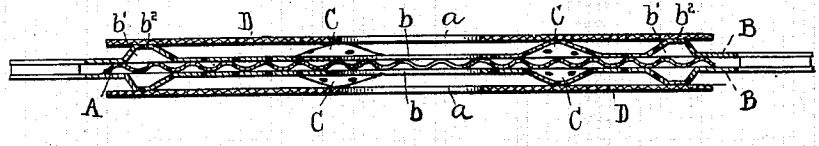
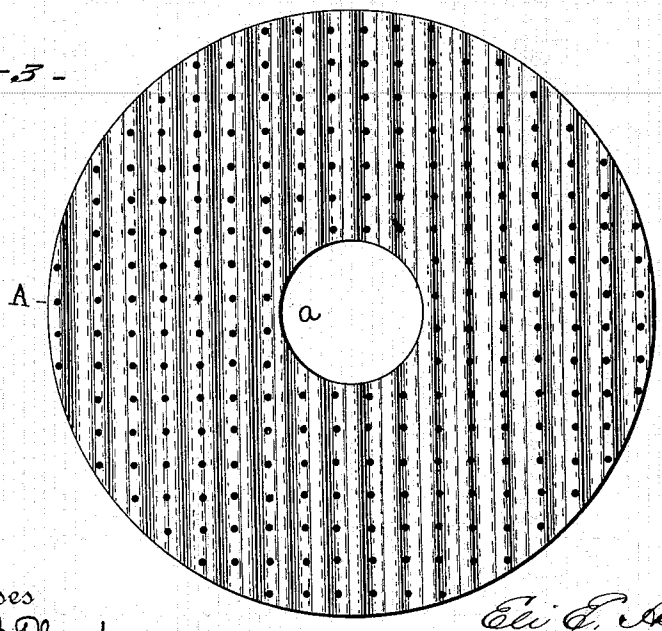


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 4.

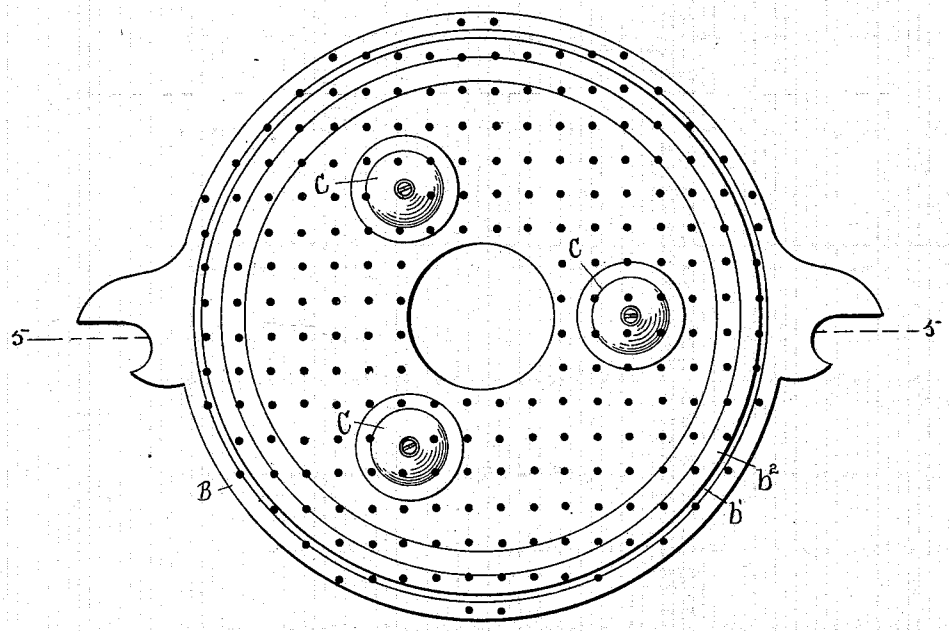


Fig. 5.

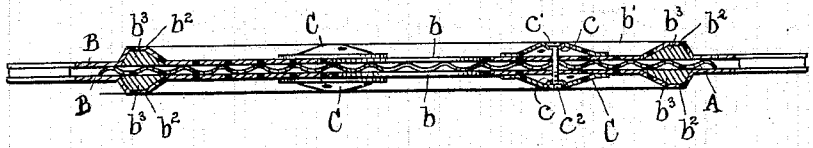


Fig. 6.

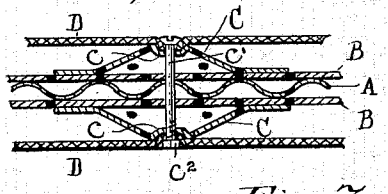
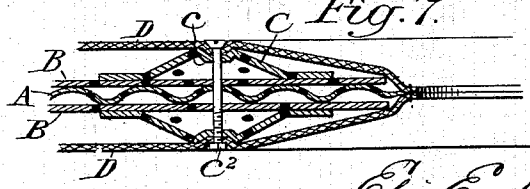


Fig. 7.



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UNITED STATES PATENT OFFICE.

ELI E. HENDRICK, OF CARBONDALE, PENNSYLVANIA.

FILTER-PRESS.

SPECIFICATION forming part of Letters Patent No. 612,105, dated October 11, 1898.

Application filed August 31, 1895. Serial No. 561,067. (No model.)

To all whom it may concern:

Be it known that I, ELI E. HENDRICK, a citizen of the United States, residing at Carbondale, in the county of Lackawanna and State of Pennsylvania, have invented a certain new and useful Improvement in Filter-Presses, of which the following is a specification.

My invention relates to filter-presses adapted for use in the preparation of liquids and the separation of elements therefrom.

Although capable of other uses, I contemplate employing the invention in connection with apparatus for filtering oil, by means of which the liquid is purified and paraffin obtained.

In filter-presses heretofore in use the liquid has been forced through filtering media consisting of a series of disks, some of perforated metal, preferably steel, and some of canvas or other fabric. It has been the practice to employ an imperforate disk having bearings to permit it and its attached parts to be mounted in the press, and to secure upon each side of such imperforate disk perforated sheet-metal disks, the outer faces of which have been provided with annular rims or extensions consisting of several thicknesses of fabric placed in each case at or near the periphery of the plate and pads of the same material secured upon such faces at points intermediate of the center and periphery. The sheets or disks of canvas or cotton-duck, commonly termed "blankets," have been placed adjacent to such perforated disks and maintained in the proper relation thereto by reason of the flexible rims and pads. It has been the practice to use blankets greater in diameter than the perforated disks and to secure two adjacent blankets together by stitching or other fastening at their peripheries. In this type of filter-presses it has been the practice to secure a large number of these disks of perforate and imperforate metal and fabric together and to force the liquid through a central perforation therein, whereby the oil has been purified and the paraffin has been deposited both in the smaller perforations and upon the canvas disks and removed therefrom in suitable manner.

In apparatus of the kind mentioned it is an important desideratum that the plates of which the press is composed should be of the greatest capacity, as light as possible consistently with strength, and inexpensive of manufacture.

One part of the present invention is directed to the construction of the perforated metal plates and the provision of means thereon for maintaining the parts in their proper relation. In carrying out this feature I employ an integral plate or disk of perforated sheet metal, and instead of building up thereon an outwardly-projecting rim of several thicknesses of fabric I provide the same with an annular flange adjacent to the periphery of the plate, the perforations in the plate being preferably carried out to the extreme periphery, whereby the whole of the plate is operative for the filtering operation and none of the perforations are covered. Intermediate of the center and periphery of each plate I provide outwardly-extending spurs. These are also formed in the perforated portion of the plate, and may be drawn or stamped, or they may consist of cup-shaped disks, preferably of perforate metal, secured upon the plate by suitable means. These spurs project outwardly from the surface of the plate to about the same extent as does the annular flange, and by this means the disk of fabric adapted to be placed adjacent to each plate is maintained at a proper distance therefrom to facilitate the filtering operation.

Another part of the invention concerns means for separating and maintaining in such separated position two of the perforate metallic disks. For this purpose I employ a disk of perforated metal, preferably sheet-steel, provided with corrugations. This is of about the same size as the plane perforated disks, and one of the disks last named is secured upon either side of such corrugated disk, whereby the former are kept in the desired separated relation.

Another part of the invention concerns improved mechanism for maintaining each series of elements in position and for strengthening the whole where under abnormal strains increased strength is desired. In carrying out this feature I employ screws or bolts passing, preferably, through the spurs upon the surface of one plate, through the corrugated perforate plate adjacent thereto, and through

the spur upon the plane perforate plate on the other side of such corrugated plate. If desired, in order to secure the blanket in position the bolt may be passed through the blanket upon each side of a series of elements. The head and nut of each bolt are preferably received in countersunk portions of the spurs in order that they shall not project out of the level of each series of elements.

In the event that increased strength is desired I may provide a solid annulus conforming to the internal contour of the annular flange upon each perforated disk, this annulus being placed under such flange to resist the collapse of the same under abnormal pressure. This annulus will preferably be made of wood, which is both light and inexpensive.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side view of one of the press elements, the fabric disk or blanket being partly broken away. Fig. 2 is a central section on the line 2 2, Fig. 1. Fig. 3 is a side view of the corrugated perforated plate forming part of each element. Fig. 4 is a side view, and Fig. 5 a section on the line 5 5 thereof, both illustrating means for securing the plates together and the annulus for strengthening the flanges of the perforate members. Fig. 6 is an enlarged detail view illustrating the means for securing all the elements together. Fig. 7 is an enlarged detail view illustrating a preferred method of securing the fabric disks or blankets together at the central opening in the press element.

The press consists of a number of members secured together in a manner well known, and therefore not illustrated as a whole, and as each member consists of the same elements but a single member has been shown in the drawings and will be described in detail.

Referring to the drawings, in which similar letters of reference define corresponding parts, A designates the central corrugated perforate plate, provided with a central opening *a* for the passage of the liquid. This plate A, as well as the other members of each element hereinafter to be described, are preferably made in the form of disks to facilitate their mounting. It is not essential, however, that they be made in this form, as the same end may be attained by the use of plates of square, oblong, or other forms.

B designates plates or disks of perforated metal, preferably sheet-steel. Each plate is provided with a central opening *b*, coincident in size with the opening *a* in the corrugated plate A. Each plate B is provided with an outwardly-projecting annular flange *b'*, preferably located adjacent to the periphery of the plate and formed in the perforated surface thereof. This flange is preferably constructed with a flat bearing-surface b^2, the purpose of which will be hereinafter described. If it is desired to strengthen the flanges *b'* to prevent their collapse when the press is being used under greater than normal pressure, this object may be attained by the use, in connection with each plate, of an annulus b^3, one side of which is preferably flat, while the remaining faces conform to the internal shape of the annular flanges *b'*.

Each plate B is provided at a point intermediate of its center and periphery with a spur or outwardly-extending projection C, the purpose of which, being the same as that of the flattened exterior flanges *b'*, will be hereinafter referred to. These spurs may be formed during the construction of the plates by stamping or drawing portions thereof outwardly and to about the same distance from the face of the plate B as the flanges *b'*. They are also formed in the perforate portion of each plate. It is not essential, however, that these spurs be integral with the perforate plate B, as I may, if desired, form them separate therefrom, but also of perforate sheet-steel, so as to increase the capacity of the plate. If formed separable, as aforesaid, they may be mounted upon the plates B at suitable points and secured thereto by means of rivets or screws, or, if desired, each separable spur may be provided with a central perforation and countersunk bearing-surface, as at *c*, for the head and nut of a bolt *c'*, and such bolt may extend not only through such perforation but also through similar perforations in each plate B and the corrugated perforated plate A, its end projecting through a corresponding perforation in the spur C upon the opposite face of the adjacent plate B, where it may be secured by means of the nut c^2.

D designates a disk of fabric centrally perforated, as shown. This is preferably of canvas or cotton-duck and is designed to act as a strainer for the liquid passing through the press. Heretofore these disks of fabric have been made of greater size than the adjacent metallic disks and secured together by stitching at or near their peripheries. In the present invention I contemplate securing them by means of the bolts *c'*, passing through the spurs *c* upon the perforate plates B. Should, however, the spurs employed be formed integral with the plates B, the fabric disks may be secured by rivets to the flattened portions of the flanges *b'*. Again, I may, if desired, form sharp teeth struck up from the flanges of the perforate plates B for the purpose of retaining the fabric disks in position when the elements are combined in the press and facilitating their removal therefrom when it is desired to obtain the paraffin or other material filtered from liquid passing through the apparatus.

The blankets covering each of the press elements or members are preferably stitched or otherwise secured together at or adjacent to the central perforation or opening, as shown in detail in Fig. 7.

An important advantage obtained by the

construction described is that no portion of the perforated surface is inoperative, as in the types of presses heretofore in use. In the latter a considerable portion of the perforate surface has been covered by reason of the means employed for maintaining the parts in their proper relation, and such portions of the surfaces have of course been inoperative for the purpose of filtration.

A further advantage is that the filtering process is greatly facilitated by reason of the corrugated perforate plate intermediate of the plane perforate plates. Again, the plates are precluded from being forced so close together as to prevent the passage of the material therethrough.

A further advantage and one of great importance in this type of apparatus is that the elements as a whole are both light and cheap of manufacture. The plates are given their peculiar curvatures by means of well-known apparatus. Both the central plate A and the adjacent plates B are perforated before being given the curvatures heretofore described. The plate A may then be corrugated in any suitable manner—such, for instance, as by stamping or by passing the same through corrugating-rollers. The plates B are given their curvatures, preferably, by stamping, and where separable spurs are used these are also stamped from perforated sheet metal.

The construction as a whole is simple and compact and in addition is very durable in operation.

It is not essential that the corrugations of the plate A be of the exact form illustrated in the drawings, as such form may be varied, if desired, without departing from the spirit of the invention.

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

1. A filter-press of the character described, having in combination three plates with coincident central openings in close proximity, each having substantially a uniform thickness throughout, the middle plate being a sheet of corrugated metal, and the outer plates being perforate and each having an outwardly-projecting annular flange near its periphery and blankets covering said plates, substantially as set forth and described.

2. A filter-press of the character described, having in combination three plates with coincident central openings in close proximity, each having substantially a uniform thickness throughout, the middle plate being a sheet of corrugated metal, and the outer plates being perforate and each having an outwardly-projecting annular flange near its periphery, and outwardly-extending projections intermediate of the center and periphery of said plate and blankets covering said perforate plates, substantially as set forth.

3. A filter-press of the character described, having in combination three plates with coincident central openings in close proximity, each having substantially a uniform thickness throughout, the middle plate being a sheet of corrugated metal, and the outer plates being perforate and having outwardly-projecting annular flanges near their peripheries, blankets covering said plates, and means for attaching said plates and said blankets to each other, substantially as set forth.

4. In a filter-press of the character described, the combination of a plate of corrugated metal, perforate plates each of a substantially uniform thickness and having outwardly-projecting annular flanges near their peripheries, said plates being held together on each side of said corrugated plate, and a blanket over the outer face of each of said perforate plates, whereby the liquid when forced under pressure through a central opening in the plates and blankets filters through the latter and said perforate plates, and escapes at the periphery of the said corrugated plate, substantially as set forth.

5. In a filter-press of the character described, the combination of two perforate plates, each having an annular flange stamped therein, with a passage between said plates, said plates having coincident central openings, and a blanket held against the outer face of each of said plates and coöperating therewith, whereby the liquid upon being introduced into said central openings under pressure, will pass through said blankets and perforations, and will escape to the peripheries of said plates through the passage between the plates, substantially as set forth.

6. In a filter-press of the character described, the combination of two perforate plates, each having an annular flange stamped therein and projections intermediate of said flange and the center of the plate, with a passage between said plates, said plates having coincident central openings, and a blanket held against the outer face of each of said plates and coöperating therewith, whereby the liquid upon being introduced into said central openings under pressure will pass through said blankets and perforations and will escape to the periphery of said plates through the passage between the plates, substantially as set forth.

7. A filter-press comprising a plate of perforate metal having metallic hollow cup-shaped spurs, said spurs also being perforated substantially as set forth.

8. A filter-press element comprising a central corrugated perforate plate having a central opening, a perforate plate on each side of said corrugated plate and each provided with a central opening, with an integral annular flange and with integral perforated projections intermediate of said flange and the central opening, and blankets resting upon said perforate plates and supported by the projections and the flange of each plate, substantially as set forth.

9. In a filter-press, the combination with a

corrugated plate, of a perforate plate upon either side thereof, said perforate plates having outward projections for supporting sheets or disks of textile fabric, and outwardly-extending teeth upon said outward projections for attaching said sheets or disks to said perforate plates, substantially as set forth.

This specification signed and witnessed this 22d day of August, 1895.

ELI E. HENDRICK.

Witnesses:
S. O. EDMONDS,
JOHN R. TAYLOR.