

(No Model.)

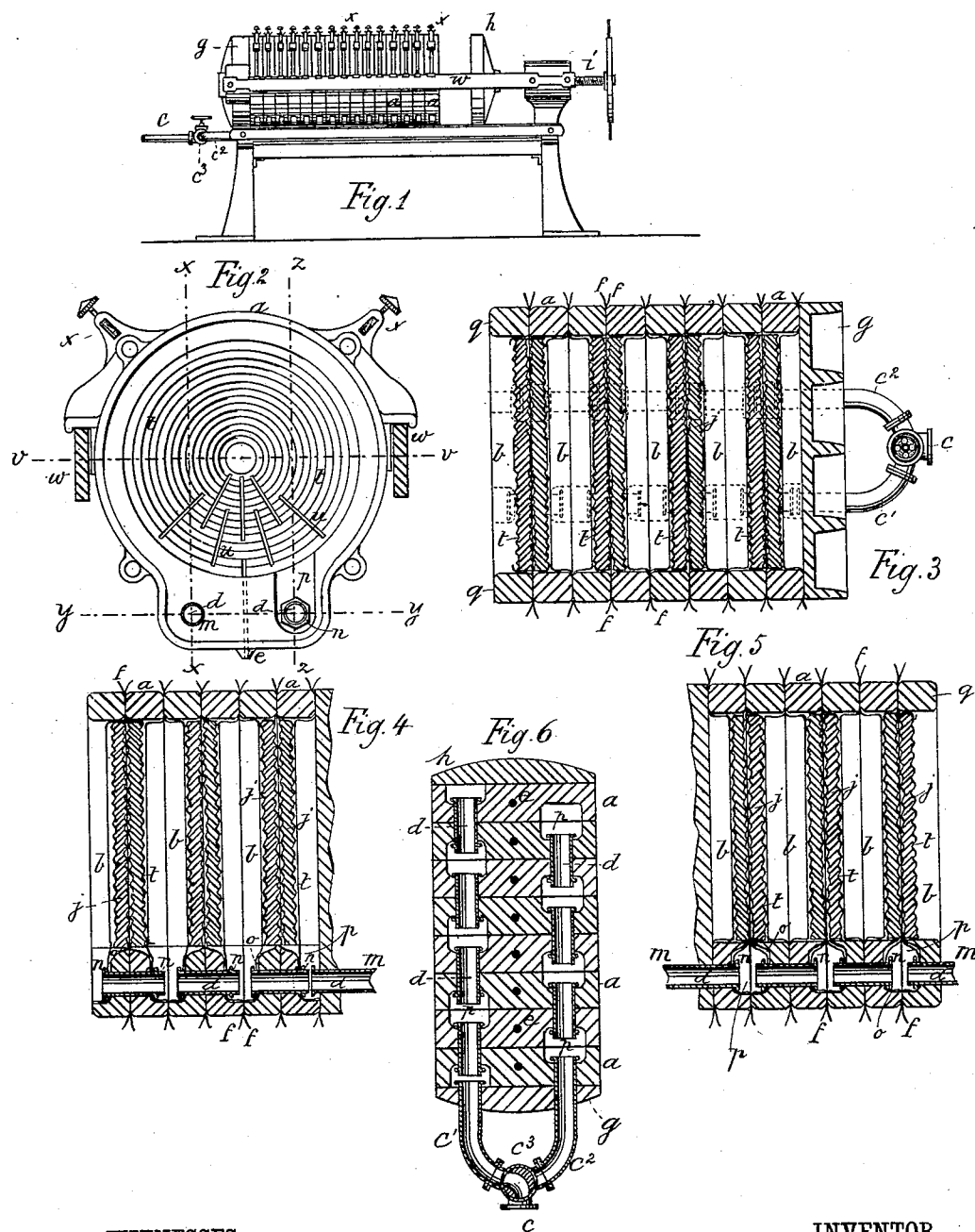
2 Sheets—Sheet 1.

J. JOHNSON.

HIGH PRESSURE FILTER PRESS.

No. 270,807.

Patented Jan. 16, 1883.



WITNESSES:

Wm. A. Lowe
Chas. Morgan

INVENTOR

John Johnson

BY A. O. Meyer

ATTORNEY

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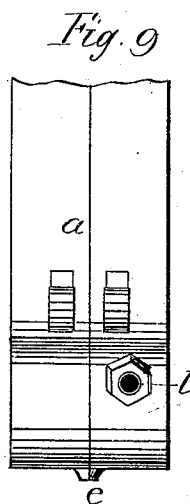
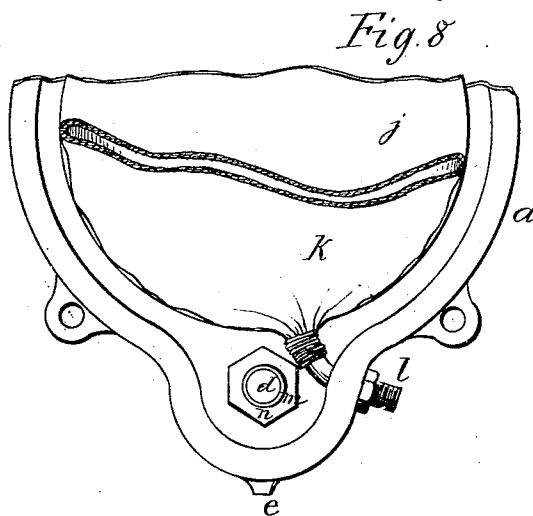
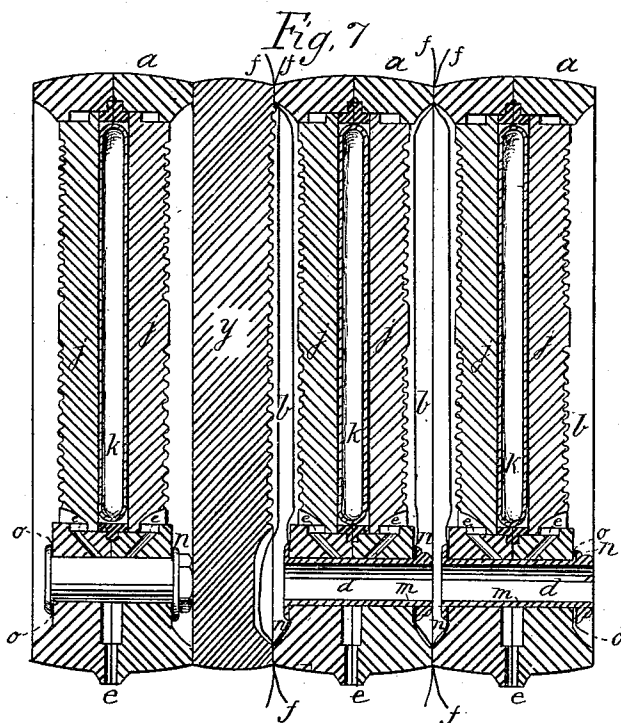
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UNITED STATES PATENT OFFICE.

JOHN JOHNSON, OF BROOKLYN, NEW YORK.

HIGH-PRESSURE FILTER-PRESS.

SPECIFICATION forming part of Letters Patent No. 270,807, dated January 16, 1883.

Application filed October 24, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN JOHNSON, a citizen of Great Britain, and residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in High-Pressure Filter-Presses, of which the following is a specification.

The object of my invention is to combine the principles of the filter-press and hydraulic press in one machine for the complete separation of solid from liquid matters, and in which to obviate the defects and supply the deficiencies of the ordinary filter-presses.

It has been found that when filter-pressing some materials, when it was desired to obtain a hard and comparatively dry cake, it was not practicable to prolong the operation of forcing such materials into the filter-press until the cakes were formed hard to the center, as the continued addition of the liquids forced in tended to prevent their solidifying within a reasonable period, especially if the substance treated was of a greasy, gummy, or glutinous nature. I have therefore contrived a press in which, after first forcing in the liquids in the usual way, I subject the partially-formed cakes to further hydraulic pressure by contractile cells, the side walls of which are made to be pressed in by pressure applied to each cell independently and alike, instead of the telescopic or other contrivance in which the pressure is transmitted from one cell to another, whereby a considerable economy of friction is effected and the cakes are pressed more uniformly. For applying the hydraulic pressure I propose to employ either expansible sacks placed between the walls of adjacent cells, and made to expand by water or other fluid forced into them, or an alternate arrangement of the cells, whereby the liquid to be filter-pressed may be utilized to apply the power, as hereinafter described, reference being made to the accompanying drawings, in which—

Figure 1 is a side elevation of a filter-press of the kind to which my improvements apply, the same being for filtering liquids and pressing by high pressure the residuum collected in its filtering-chambers. Fig. 2 is a transverse section of the press and a side elevation of one of the cell-plates of which the chambers are formed. Fig. 3 is a horizontal section of a portion of a press constructed according to the

arrangement which I propose for applying the pressure to the partially-formed cakes in alternate cells by the liquid forced into the other cells to be filter-pressed, the section being taken on the line *vv* of Fig. 2. Fig. 4 is a vertical section of Fig. 1 on line *xx*. Fig. 5 is a vertical section of Fig. 2 on line *zz*. Fig. 6 is a horizontal section of Fig. 2 on line *yy*. Fig. 7 is a longitudinal sectional elevation of a portion of a press contrived for the use of the flexible bags to apply the hydraulic pressure. Fig. 8 is a partial transverse section of the press of Fig. 7, and Fig. 9 is a detail of the press in side elevation.

The body of the press is made of a series of sections, *a*, in which cells *b* are formed, in which to filter-press the liquid substances, which has commonly been done by forcing the liquid into them by a pump connected to the pipe *c*, connecting with the passages *d*, lined with bushings *m*, forming communication with the respective cells, the operation being continued under great pressure until, by the escape of the filtrate through passages *e*, the residuum collects on the cloth linings *f* of the cells and forms dense cakes, the sections *a* being firmly clamped together between the heads *g* and *h* by a clamp-screw, *i*, which, being slackened up, allows of the sections of the press being taken apart for the removal of the cakes.

The filter-plates as heretofore constructed in the older well-known form of filter-press have been made with central corrugated disks formed solid with the exterior frames; but I propose to make the disks or filtering plates *j*, which support the cloth or filtering medium *f*, separate from the frame, and fit them to slide forward and backward in the said frames to enable a high pressure to be applied exteriorly to the cells *b*, containing the partially-formed cakes produced by forcing the liquid directly into them, and in some cases I employ flexible sacks *k*, arranged between the disks *j* or walls of the cells, having suitable connections, *l*, for coupling to a hydraulic or pneumatic pump, to be expanded thereby with great power and force the walls of the cells or disks *j* in opposite directions upon the cakes, thus pressing out all the liquid portion and obtaining comparatively dry cakes—a result that has been found impracticable with the ordinary filter-press, where the continued addition of the liquid

material tended to prevent the rapid solidification of the cakes. Each of the filtering-plates is covered with cloth *f*, as in the ordinary filter-press, completely covering them, the cloths having holes cut in them at the point of inlet to each chamber to allow the bush *m* to pass through it, the bush having a flanged head and nut *n*, which clip the cloths firmly at *o* round the inlet-hole, to prevent the material from passing to the back of the cloth unfiltered. The sections or frames are truly surfaced at their rims *g*, Fig. 3, so that when brought together in the press-frame and clamped tightly between the stationary head *g*, Fig. 1, and the follower *h* by the screw *i*, the filter-cloths *f*, passing through the joints, pack said joints, and also form the cloth lining of the chambers *b*. I propose to so modify the press that this method of applying the pressure exteriorly to the chambers can be carried out without the use of the flexible bags, and so that the chambers occupied by them may also be used for filter-pressing, and also so that the pressure first employed in forcing the material to be pressed into the chambers may be utilized for the secondary operation of exterior pressure upon chambers adjoining those into which the material is being pressed. To this end I arrange the press, as represented in Figs. 2, 3, 4, 5, and 6, with filtering-chambers only, dispensing with the flexible bags, and connecting the chambers in two series with independent branches *c'* and *c''* of the supply and distributing pipes *c*, the chambers of each series being alternately arranged with the chambers of the other series. By this arrangement the matters to be filter-pressed, being forced into one series of chambers, will press the walls of the other chambers together by the same pressure that it is subject to, thus applying exterior pressure to the matters therein after the supply has been shut off therefrom by cock *c*³.

The manner in which the pressing is carried out is as follows: Having the press clothed and screwed up tightly, as above described, the liquid material containing the solid matter to be pressed is pumped, under pressure, through the inlet-pipe *c*, Fig. 1, and is distributed to the filtering-chambers *b* by passing through the connecting-channels *d* or bushes *m*. The filtrate is forced through the cloth, and runs in the grooves *t u*, by which it is conducted to the exit-passage *E*, the solid portion accumulating in the chambers. The operator continues to force in the material until the residuum collected on the surfaces of the cloths in the chambers *b* becomes so dense and the filtrate runs away so slowly that it becomes impracticable to pursue it further in this way. At this stage of the operation my improvements are brought into action as follows: When the flexible bags are used the inlet-cock *c*³ to the filtering-cells is closed, and a hydraulic, pneumatic, or other pressure is then applied internally to the flexible bags *k*, through connection *l*, to expand and force the movable

disks *j* in opposite directions, to contract the cells and still further compress the cakes, and when the arrangement of alternate cells, Figs. 2 to 6, is used, the material to be pressed is forced into one series of cells until the accumulation of residuum on the cloths obstructs the escape of the filtrate. The flow of liquid under operation is then shut off from the first series of chambers in connection with the inlet-pipe *c'*, Fig. 6, by the cock *c*³, which is a three-way device, and directs the flow of liquid into the second series of adjoining empty chambers, where it exerts its pressure against the side walls or movable disks *j*, forcing them apart, and thus compressing the residuum collected in the first series. The liquid pressed therefrom passes away through the cloth into the grooves on the filtering-disks *j*, and passes away to the filtrate-exit *E*. The material continues to flow into the second series of cells until the accumulated residuum obstructs the flow of filtrate, as before. The flow of liquid material is then shut off from this series and allowed to enter the first series of cells again, which now contain a dry pressed cake of residuum. The pressure of the liquid matter entering forces the filtering-disks away from the cake, the cloths part from the hard cake clean and in the best condition possible to receive the liquid now running into the chamber to be filtered. This operation of changing from one series of alternate chambers to the other is continued until the press is filled. The press is then opened by running back the screw *i*. The sections *a*, forming the chambers, are then separated in the press-frame and the residuum removed in hard dry cakes.

This filter-press can be manipulated the same as the ordinary filter-press, it having all the advantages thereof, besides that of applying the pressure to the outsides of the cloth-lined cells. For instance, the adjustment of the cloths being the same, the blank or dummy plate *y*, Fig. 7, can be used to cut off any number of the filtering-chambers when working on small quantities of material.

I consider it an important improvement in presses of this character to apply the power to the several filtering-cells separately, thereby causing a balance or equilibrium of pressure, each chamber supporting its neighbor and overcoming the great amount of friction caused by transmitting the pressure from end of the press through the several chambers to the other end of the press. By the direct method which I propose the exterior portion of the filtering-cells is stationary during the whole operation, thus avoiding any damage to the cloths.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A filter-press consisting of a series of contractile cells or chambers constructed for the application of pressure to the exterior side walls, and thus decreasing the depth of said

chambers, the arrangement being such that the pressure is applied directly and alike to each chamber, substantially as and for the purpose described.

5 2. The sections forming the cells or chambers of a filter-press, having the walls of the cells or chambers which support the cloths made movable in opposite directions by exerting a hydraulic, pneumatic, or other suitable
10 pressure between the chambers for the purpose of decreasing the depth of the filtering-cells at will, substantially as and for the purpose described.

15 3. The combination of a flexible bag with the chambers of a filter-press to be expanded by the internal application of hydraulic, pneumatic, or other suitable pressure for applying the pressure to said chamber, substantially as and for the purpose described.

4. A filter-press in which the chambers or 20 cells are connected by the supply and distributing pipes in two series, the chambers or cells of each series being alternate to each other; substantially as described.

5. The method of filter-pressing in alternate 25 chambers, whereby the pressure of the material being forced into one series of chambers applies exterior pressure to the material in the other series, substantially as described.

In witness whereof I have hereunto signed 30 my name in the presence of two subscribing witnesses.

JOHN JOHNSON.

Witnesses:

W. J. MORGAN,
A. P. THAYER.