

R. LEMMON & R. P. HOLMES.
AUTOMATIC FILTER PRESS.

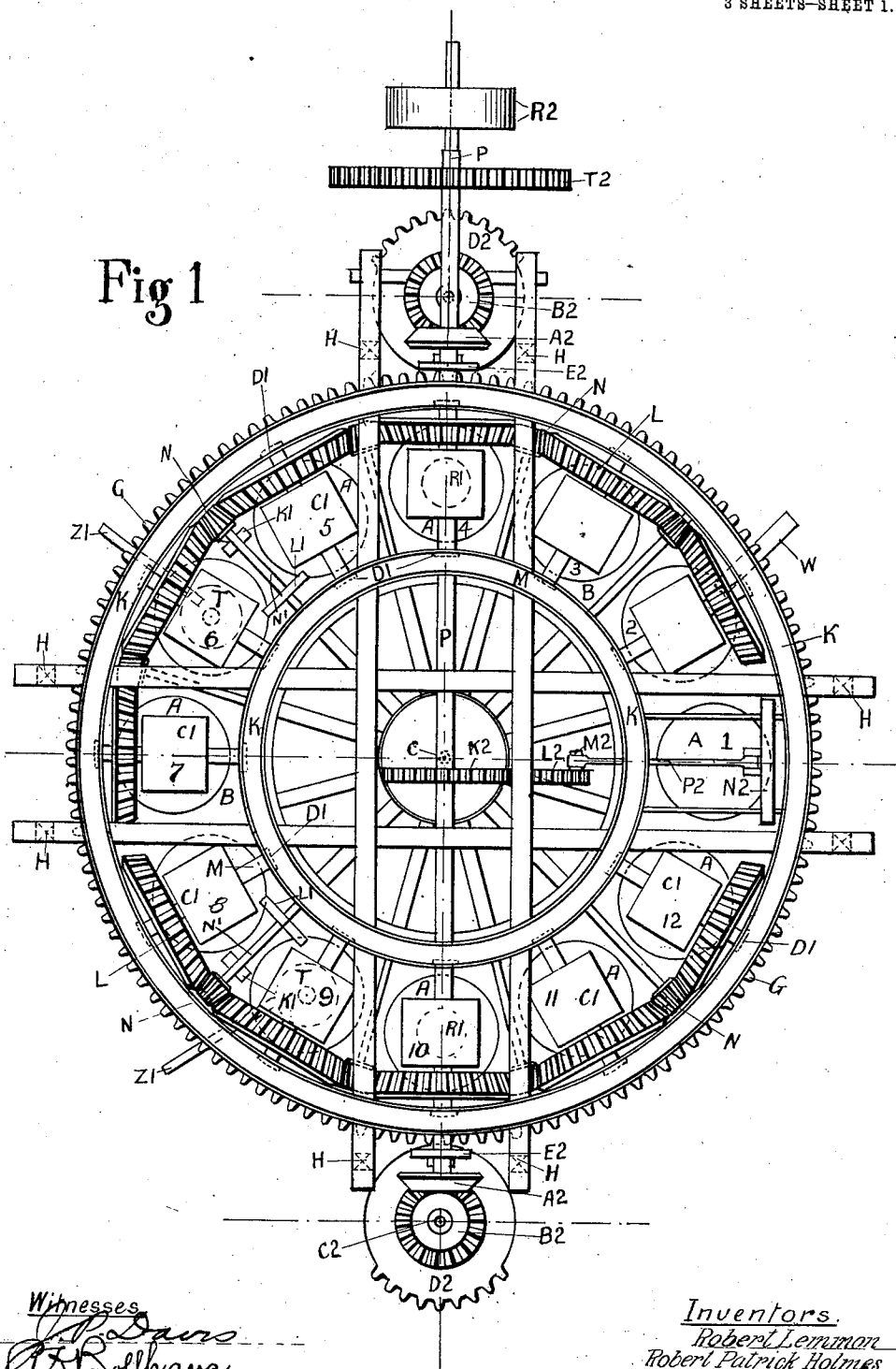
APPLICATION FILED OCT. 9, 1909. RENEWED NOV. 1, 1912.

1,047,093.

Patented Dec. 10, 1912.

3 SHEETS—SHEET 1.

Fig 1



Witnesses
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3 SHEETS—SHEET 2.

Fig 2

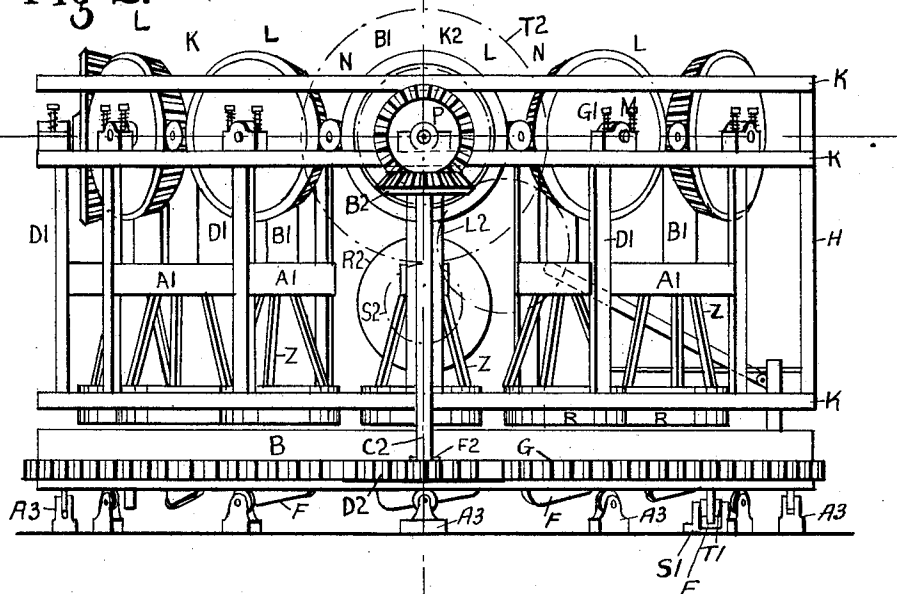


Fig 5.

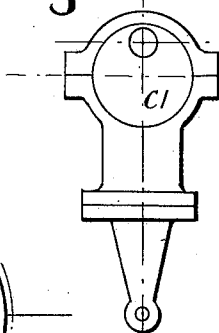


Fig 3.

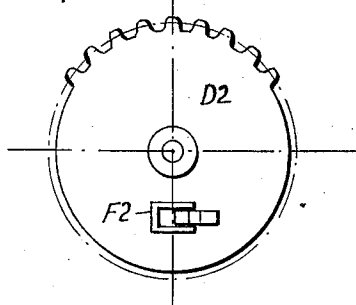
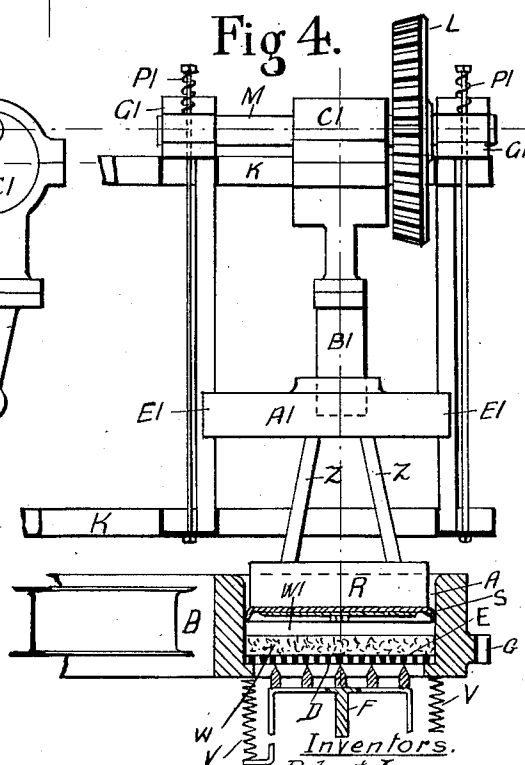


Fig 4.



Witnesses.

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3 SHEETS-SHEET 3.

Fig 6.

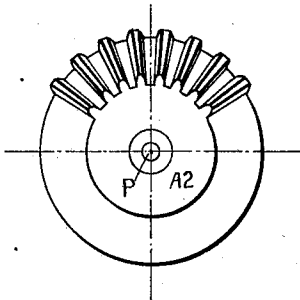


Fig 7.

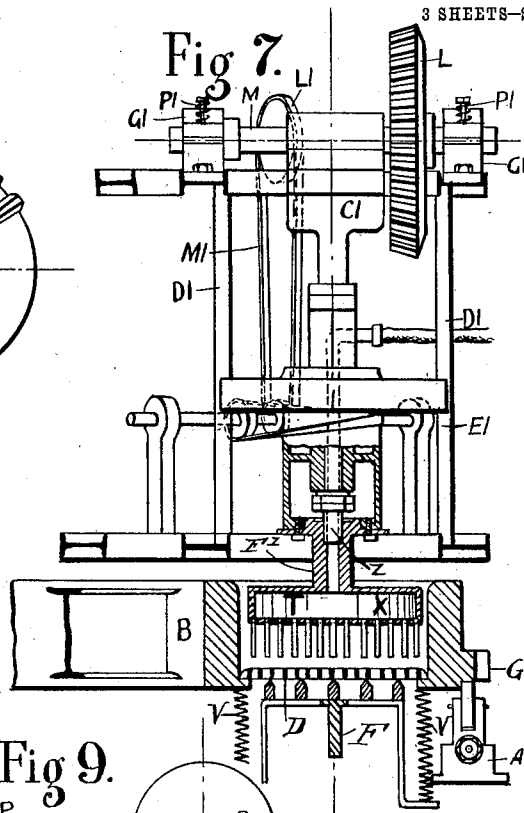


Fig 8.

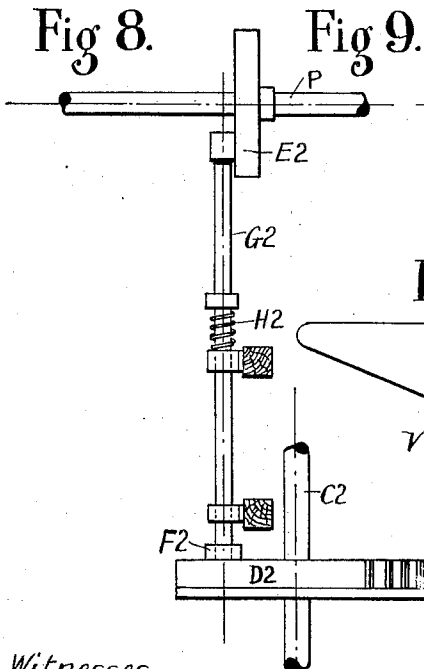


Fig 9.

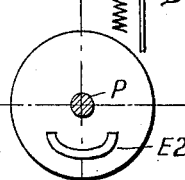


Fig 11.

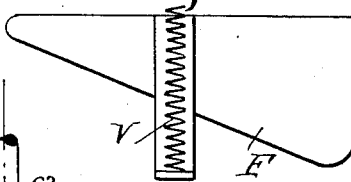
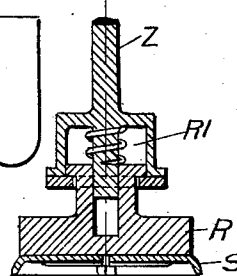


Fig 10.



Witnesses.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC FILTER-PRESS.

1,047,093.

Specification of Letters Patent.

Patented Dec. 10, 1912.

Application filed October 9, 1909, Serial No. 521,957. Renewed November 1, 1912. Serial No. 729,128.

To all whom it may concern:

Be it known that we, ROBERT LEMMON and ROBERT PATRICK HOLMES, subjects of the King of Great Britain, and residents of Boulder City, Western Australia, Australia, have invented a new and useful Improvement in Automatic Filter-Presses, of which the following is a full, clear, and exact description.

This invention consists of a machine for separating the liquid from the solid portion of liquid pulp by means of pressure and compressed air, and is particularly applicable to the treatment of ores in a fine state of division commonly known as slimes, in which the gold or silver is dissolved and taken into solution by means of chemical solvents.

In order that our invention may be clearly understood both as to construction and method of operation we will describe the same by the aid of the accompanying three sheets of drawings, in which:—

Figure 1 is a plan of the filter press. Fig. 2 is an elevation of the same. Fig. 3 is a detail of segment gear wheel (D^2). Fig. 4 is a detail of the filtering cylinder and plunger gear. Fig. 5 is a detail of the eccentric as in Fig. 4. Fig. 6 is a detail of the segment bevel wheel (A^2). Fig. 7 is a detail of the agitating plunger. Fig. 8 is a detail of the cam and steady rod gear. Fig. 9 is a plan of the cam as in Fig. 8. Fig. 10 is a detail of the cushion gear on the main shaft plungers. Fig. 11 is a detail view of the shoe for raising the filter bottom, the view being on an enlarged scale.

Similar characters are used throughout the drawings to represent corresponding parts wherever they occur.

For the purpose of our invention a number of filtering chambers A are employed, preferably cylindrical in shape, and constructed in a disk or table B mounted to revolve in a horizontal plane about a pivot or spindle C. During the revolution of the disk or table the filtering chambers are each moved successively to different positions 1 to 12, as indicated on the drawing, and near the outer edge of the table B under the positions 1 to 12 are located rollers on which the bed or table is supported. We have shown

12 filtering chambers in our drawings and will refer to this number only in order to make our meaning clear.

The filtering chambers A are fitted with grating or perforated plates D and covered with filter cloths E forming filtering bottoms to the chambers. The filtering bottoms are fitted to slide in the chambers A and are provided with shoes or the like as F. The disk or table B is encircled by tooth gear or segments of tooth gear G, by means of which the disk or table B is revolved. Around the disk B is a framework preferably consisting of standards H and circular concentric girders K, these are so constructed and arranged as to carry the gear and plungers hereinafter described. Bevel gear wheels L are located above all the filtering chambers except the one in the position indicated at 1, which is the position for discharging the pulp. The bevel gear wheels L are attached to spindles M, the latter being above the centers of the filtering chambers A, and carried radially by bearings G^1 on the circular girders K. These bevel gear wheels L are coupled together by means of intermediate pinions N. Two of these bevel wheels L are fitted on the main driving shaft P, one of them being loosely mounted on said shaft.

Above eight of the positions of the filtering chambers A, namely those numbered 3, 4, 5, 7, 8, 10, 11, 12 are arranged compressing plungers R which are fitted with rubber or some similar packing S to make them fit air tight into the filtering chambers. Above two of the positions of the filtering chambers A namely those marked 6 and 9 are arranged hollow agitating plungers T which are fitted with hollow fingers X by means of which water may be discharged. All these plungers R and T are connected to the spindles M or main shaft P by means of plunger rods z , cross heads A^1 , eccentric rods B^1 and eccentric sheaves and straps C^1 by means of which a vertical reciprocating motion is communicated to the plungers R and T. We may use cranks in place of the eccentrics C^1 if preferred. Guide bars D^1 are fitted to the circular girders K to guide the slippers E^1 of the cross heads A^1 .

The agitating plungers T are made to revolve on the plunger rod Z by means of a sleeve F¹ extending from the plunger and mounted to turn on the plunger rod. A pulley G¹, is attached to the sleeve F¹ and is made wide to accommodate a belt which passes around the pulley and is driven by pulleys H¹, K¹, and L¹, and belt M¹, as shown in Fig. 7. The pulley L¹ is fitted to the spindle N¹ of the intermediate gear wheels N. The plunger, plunger rod and the agitating fingers or points are made hollow so that water is admitted and passed down and out of the points thus thoroughly mixing the pulp. The water may be introduced by means of a hose connected with the hollow plunger rod, as shown in Fig. 7, and arranged to allow of the reciprocating motion. The bearing caps of the spindles M are provided with compression or buffer springs P¹ to form a cushion in the event of any incompressible matter getting into the filtering chamber A and the plungers connected to the main shaft P are provided with spring or buffer boxes as R¹, Fig. 10 to effect this same purpose without displacing the shaft. Underneath the position of the discharging chamber marked 1 is arranged a bracket S¹ with a bridge or roller T¹ which engages the filter bottom shoe F as it arrives at that point and raises the filter bottom to the surface of the filtering table B, the filter bottom being returned to its normal position after it passes this point by the spring V. On the main shaft P are two mutilated bevel gear wheels A² shown in Fig. 6 which gear with ordinary bevel wheels B² fitted to vertical spindles C². To the lower portion of these spindles C² are fitted pinions D² having teeth on a portion only of their periphery. The pinions D² engage and gear with the spur wheel G on the filtering disk or wheel B, and on the top side of each pinion D² is formed a socket, as F². On the main shaft P are fitted the cam gears E² which actuate rods G² pressing them into the sockets F² when required, the rods when released from the cams E² being returned by means of the springs H². A gear wheel K² is fitted to the shaft P and meshes with a gear wheel L² mounted to turn and carrying a crank pin M² operating the scraper or rake N² through the connecting rod P².

The machine is driven by any convenient motive power through the pulleys R², pinion S² and spur wheel T². The pulp is admitted by means of a pipe or launder W and wash water by means of the pipes Z¹.

The method of operation of our machine is as follows:—Rotary motion is given to the main shaft P which motion is communicated to the chain of wheels L and N giving a vertical reciprocating motion to the plungers R and T likewise a rotary motion to

the plungers T, the plungers passing into and out of the filtering chambers A. The gear wheels A², B², and D² are so set, that, while the plungers are on the up stroke and thus out of the filtering chambers, the teeth of the gear wheels are in action and the filtering disk or table B is moved one twelfth of a revolution so that the chamber marked 1 moves to the place previously occupied by that marked 2 and 2 to 3 and so on. As each filtering chamber arrives at the position marked 1, the roller T¹ engages the shoe F and pushes the filter bottom up. When this point is reached the teeth of the wheels A² and D² have passed out of gear and the filtering disk B remains stationary. The cams E² now come into action and press the rods G² into the sockets F² and hold the pinion D² steady, and the plungers R and T are lowered by their eccentrics C¹ into the filtering chambers A, while the scraper N² is pushed forward by the crank pin M² and removes the cake of pulp from the surface. This action is continuously repeated until the pulp which is fed into the chamber, then in the position marked 2, through the pipe or launder W has been pressed respectively in chambers Nos. 3, 4, and 5 agitated with water in chamber No. 6 again pressed in 7 and 8 agitated with more water in 9 again pressed in 10, 11 and 12 and finally forced to the surface by the shoe action under No. 1 and shoved off into a chute by the scraper N². It will thus be seen that one chamber is always being filled with the pulp, while the pulp is simultaneously pressed in eight chambers, simultaneously agitated and washed in two chambers, and is being discharged from one chamber. It must be noted that the plunger is not brought into direct contact with the pulp but the pressure is obtained by the inclosed air. Referring to Fig. 4, the pulp is shown at V¹ and the air space at W¹ this air acting on the contained water forces it through the filter cloth E and some of the air follows, thus displacing the water and drying the cake. On the return of the plunger a suction action takes place which cracks the cake and lifts it off its bed, thus rendering it free for dislodgment by the scraper N².

We thus have a continuous filter press capable of pressing, filtering, washing, and discharging its pulp in a succession of operations.

What we do claim as our invention, and desire to secure by Letters Patent, is:—

1. In an automatic filter press, a disk or table mounted to turn and having gear teeth on its periphery, means for intermittently rotating the same including a mutilated gear adapted to engage the teeth on said disk, filter chambers on said disk or table for containing the pulp to be filtered, the

said filter chambers each having a movable filtering bed, plungers constructed to fit air tight in said chambers, means for reciprocating said plungers vertically to move the same into and out of said chambers to compress air and force it through the pulp to displace the liquid portion of the pulp through the filtering bed, and to produce a suction action to lift the cake of pulp off the filter bed, hollow plungers mounted to reciprocate vertically and to revolve in a horizontal plane and adapted to enter said filter chambers, the said plungers having hollow agitating fingers adapted to discharge water, mechanism for raising the filtered cake of pulp to the surface of the filtering table, and mechanism for holding the said mutilated gear steady when its teeth are out of mesh with the teeth of the disk and the latter is stationary.

2. In an automatic filter press, the combination with a series of filtering chambers, mounted to revolve, and means for moving the series of chambers intermittently, the said chambers being provided with movable filtering bottoms, and adapted to contain pulp to be filtered, of air-tight fitting plungers, means for reciprocating the plungers to cause them to alternately enter the said filtering chambers to compress air therein to displace the liquid from the pulp through the filtering medium, hollow plungers mounted to reciprocate and revolve and constructed to receive and discharge wash solutions to mix with and dilute the pulp, means for actuating the hollow plungers, shoes on the filtering bottoms, a step for engaging the shoes to lift the filtering bottom and the filtered cake of pulp carried thereby, a scraper, and means for reciprocating the scraper to discharge the cake of pulp.

3. In an automatic filter press, filtering chambers for the material to be filtered, the said chambers having movable filtering bottoms, a table containing the filtering chambers, pressing plungers, and agitating plungers operating successively in the said filtering chambers, a gear for intermittently rotating the table, cam mechanism for holding the rotating gear steady when the table is stationary, means for raising the filtering bottoms, and mechanism for removing the filtered cake of pulp from the machine.

4. In an automatic filter press, the combination with filter chambers, means for delivering charges of pulp to said chambers, and means for moving the filter chambers intermittently of pressing plungers adapted to fit air-tight in the filter chambers for subjecting the pulp in said chambers to air pressure to filter the same, agitating plungers for agitating the pulp in said chambers and arranged to discharge water into the pulp to wash the same, means for

conducting water to said agitating plungers, pressing plungers for subjecting the agitated and washed pulp to air pressure to remove the liquid therefrom, and means for discharging the solid portion of the pulp.

5. In an automatic filter press, filtering chambers for receiving the pulp to be filtered, the said chambers being provided with a filtering medium, means for compressing air in said chambers to displace the liquid portion of the pulp, and producing a suction in said chambers to lift the cake of pulp off the filtering medium, means for agitating and washing the pulp, means for raising the finished cake of pulp out of the filtering chamber, and means for removing it from the machine.

6. In an automatic filter press, filtering chambers for receiving the pulp, means for pressing the pulp in said chambers to filter the same, means for agitating and washing the pulp, means for pressing the pulp after the action of the agitating and washing means to remove the liquid therefrom, means for raising the dry or filtered cake of pulp out of the filtering chambers, and means for removing it from the machine.

7. In an automatic filter press, the combination with a table mounted to revolve, means for intermittently moving said table, and filtering chambers arranged in a circle on said table, of means for delivering the pulp successively to said filtering chambers, a series of reciprocating pressing plungers for operating on the pulp to be pressed in said chambers to filter the same, the said plungers being adapted to fit air-tight in said chambers, a second series of similar pressing plungers spaced from the first series, and a third series of similar pressing plungers spaced from the second series, means for reciprocating the pressing plungers to move them into and out of said chambers, a hollow agitating plunger arranged in the space between the first and second series of pressing plungers, a second agitating plunger arranged in the space between the second and third series of pressing plungers, the said agitating plungers being arranged to operate in said filter chambers and being mounted to turn and to reciprocate and having means for introducing water into the pulp in the chambers, means for actuating the agitating plungers, and means for removing the pulp from the apparatus after the pulp is acted upon by the last series of pressing plungers.

8. In an automatic filter press, the combination with a frame, of a table mounted to rotate and provided with filtering chambers having movable filter bottoms, rollers for supporting said table, a main driving shaft journaled in the frame, gearing for moving the table intermittently from said shaft, plungers operating successively in said fil-

tering chambers, the said plungers comprising pressing plungers and agitating plungers, means for actuating the plungers from the main shaft, a shoe carried on each filter
5 bottom, a device for engaging each shoe to raise the filter bottom, a spring for returning the filter bottom to normal position, a scraper, and means for actuating the scraper from the main shaft to discharge the pulp

from the apparatus when the filter bottom is 10 raised.

In testimony whereof we affix our signatures in presence of two witnesses.

ROBERT LEMMON.

ROBERT PATRICK HOLMES.

Witnesses:

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ALEX. E. MARSHALL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
