

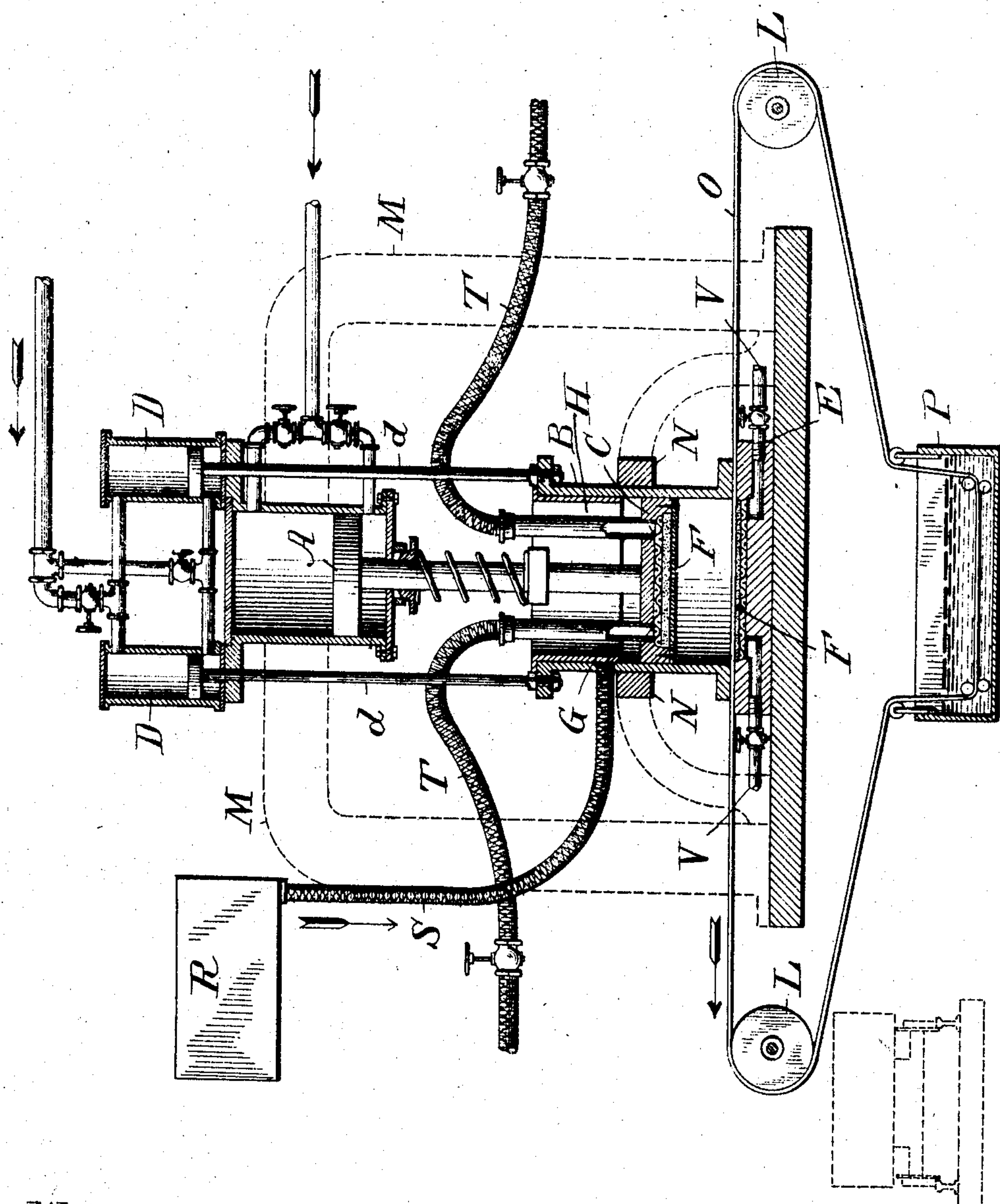
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J. W. NEILL.  
FILTER PRESS.

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NO MODEL.



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# UNITED STATES PATENT OFFICE.

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## FILTER-PRESS.

SPECIFICATION forming part of Letters Patent No. 772,472, dated October 18, 1904.

Application filed September 13, 1902. Serial No. 123,272. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES W. NEILL, a citizen of the United States, and a resident of Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Filter-Presses, of which the following is a specification.

My invention relates to filter-presses designed to separate the liquid from a mass of liquid and solid material, which may be termed the "pulp."

The invention is designed more particularly for the purpose of providing a reliable, economical, and readily-operated filter-press adapted for use in metallurgical operations, although it is also valuable for use in other arts wherein filtering operations are conducted.

Filter-presses as ordinarily constructed consist of a bundle or stack of plates made up into a series in which the solid plates covered with filtering-cloths or other filtering medium alternate with open spaces which are to hold the solid portion of the material, while the liquid portion passes through the filtering-cloth and out of the press through suitably-located openings. In this construction the bundle of plates is alternately filled and emptied and each plate has to be moved twice and more often four times in the operation. Hence there is much manual labor and time lost. Moreover, the presses are very heavy for their capacity and do not give clean products, nor do they always permit of washing the material in the press as well as they should.

My present invention consists in the novel construction of filter-press comprising, substantially, a cylinder which receives the material to be filtered and fitted with a suitable plunger, combined with a base-plate or platen which is adapted to close the open end of the cylinder and with reference to which the cylinder is capable of being reciprocated, as hereinafter described, to permit the removal of the press-cake formed by the action of the plunger, all as hereinafter more particularly set forth and then specified in the claims.

My invention consists also in the novel combinations of devices designed to facilitate the operation of the apparatus, as hereinafter set forth and claimed.

The accompanying drawing shows in vertical central section a form of apparatus embodying my invention.

B indicates a suitable cylinder containing a plunger C and preferably arranged in upright position, as shown, and adapted to reciprocate vertically in a suitable guide or frame N.

E is a suitable base-plate which closes the lower end of the cylinder during the operation of expelling the liquid from the pulp. The lower edge of the cylinder is preferably provided or constructed with a wide flat surface adapted to form a good liquid-tight joint between said edge and the plate E or the material clamped between them.

In the preferred manner of carrying out my invention the lower face of the plunger C and the upper face of the plate E are both fitted with a suitable filter plate or medium, (indicated at F.) The filter-plate F in both instances may be composed of perforated metal and a woven or felted material of any desired degree of fineness and made of one or more layers combined, as well understood in the art. Preferably a part of each of said plates consists of a plate of metal having a large number of perforations and adapted to afford stiffness and a suitable bearing for the fibrous material. As well understood in the art, wire-gauze may be used in this part of the apparatus.

The filter-plate for the plunger C is preferably detachably secured to the lower face thereof by means of an outer plate of metal, perforated, as indicated, and fastened by screws or otherwise near the edge of the plunger.

The plate F in the base E may rest in a depression therein, as shown, and the floor beneath the plate F is provided with any number of perforations or channels terminating in pipes V, provided, preferably, with suitable valves. Through the pipe or pipes V the filtered liquid may be carried away or wash-water introduced.

The plunger C is also provided with one or more channels or openings communicating at the rear of the plunger with tubes to which are connected suitable flexible pipes T, made flexible so that the plunger may reciprocate



without interference from the pipe connections. These pipes may also be provided with suitable valves, as indicated.

In the preferred construction of apparatus 5 both the plunger and the base-plate are furnished with the filter-plate F and channels or connections for carrying off the filtrate. It would be, however, within my invention to furnish one of them alone with such channels 10 and connections.

The plunger C may be reciprocated by any desired means, preferably by a piston A, connected to the plunger-rod and working in a cylinder to which fluid under pressure may 15 be supplied through a pipe or pipes, and valves for the purpose of lifting the plunger and, if desired, assisting the retrograde action of the same under the influence of a spring or weight and in obvious manner. The cylinder B may 20 be reciprocated in a similar manner by one or more pistons D, connected with said cylinder by rods d.

The pipes T serve to withdraw the filtrate or to withdraw or introduce the wash-water 25 or might even be used for introducing the material to be filtered. Ordinarily it is preferred to introduce the material into the cylinder through one or more ports G, in the side thereof, which communicate with flexible pipe 30 S, one or more, adapted to permit free movement of the cylinder, said pipes leading from a suitable tank R, containing the pulp or material to be filtered.

The passage of the material through pipe S 35 is preferably controlled by means of an automatic valve actuated by the piston C when the latter is raised to the proper point. Preferably the valve for this purpose works on the inside of the cylinder and closes and opens 40 the port G. Preferably, also, said valve consists of an interior cylinder or sleeve H, fitting the inside of cylinder B and adapted to uncover the port or ports G when it is actuated by the plunger C in any desired manner. For 45 this purpose the sleeve H may be caused to move vertically through engagement of the plunger C with the lower edge of the sleeve. Normally the sleeve is supported by a flange at its upper edge, which engages the upper 50 edge of cylinder B when said sleeve is permitted by the plunger to drop under the action of gravity or a spring. It is obvious that the valve might be actuated by the plunger in other ways or be given a movement of a 55 different kind in order to uncover the port G without departing from the invention.

It will be assumed in describing the operation of the apparatus that the pistons A and D are operated by air-pressure, although, as 60 will be obvious, any liquid or fluid pressure might be employed. It will also be obvious that other mechanisms or devices might be employed for reciprocating plunger C and cylinder B and that the reciprocation of the 65 cylinder B with reference to the base E for

the purpose of permitting the press-cake to be readily removed might be accomplished by moving either or both of them in the line parallel to the axis of the cylinder B.

O indicates a traveling belt or carrier comprising or embodying a filtering medium— 70 such, for instance, as cloth. This belt is not necessary to the operation of the devices already described; but it is preferred to employ it, since it aids in moving the press-cake to 75 one side and may also assist when made of proper material in forming a good liquid-tight joint between the lower edge of cylinder B and the base E.

Belt O is preferably an endless belt of some 80 woven fabric and travels beneath the open end of cylinder B and between the same and the base E.

When the belt O is used, it is obvious that the filter-plate F may be so constructed as to 85 have only or mainly the function of sustaining the filter-cloth, while at the same time allowing the liquid to pass.

Belt O passes by preference over suitable drums L, by which it may be operated, and 90 through a wash-tank P, by which it may be cleansed, so as to always present a new clean section for each operation of the press.

Belt O may obviously serve as a carrier to convey the press-cakes to a suitable car or 95 hopper, as indicated, by which they may be removed to any desired place.

The operation of the apparatus is as follows: The pistons are at about the bottom of their stroke, and the space between piston C 100 and the base is supposed to be filled by a cake of pressed material from which the liquid has been expelled and allowed to pass off through either the pipes at the bottom of the press in the base or through one or both of the pipes 105 in the plunger, or both. If it is desired to wash the press-cake, clear water can be introduced through one of the pipes in the base and one in the plunger, or either or both. The plunger can be raised at the same time and this water 110 expelled through the cake, or the plunger can be allowed to remain stationary and the washing effected by merely circulating the water, or both methods can be used. In this case one 115 of the pipes leading from the plunger and base or one section of the several pipes so connected would be so arranged that it only conveys the wash-waters either to or from the press and does not carry the solutions at any time. This is readily arranged. In the cycle of op- 120 erations therefore, the cake now being washed, the next thing is to get the pressed cake out of the press. To this end the outside cylinder, in which the plunger operates, is now moved vertically within the guides N N by 125 the air admitted to the cylinders containing pistons D D, so as to raise the cylinder from the base and relieve the pressure from the filtering-cloth belt, on which it has heretofore rested and with which (being under pressure 130



from the air on the upper side of the pistons D D) it has made a water-tight joint. This leaves the sides of the press-cake exposed; but it is still held in place by the plunger, which still rests on it. This is therefore also lifted, so as to leave the press-cake entirely free. The cloth is then readily loosened from the base, so that it will slip along without tearing, and it is then moved along the distance occupied by one press-cake or so far as to allow the cylinder to be replaced on the cloth in position for a fresh charge. In the cycle of operations this movement of the belt filter-cloth will bring the press-cakes over the end of the base and allow these cakes to fall into cars or other suitable conveyers which will remove them, and the belt passing farther in its travel will pass through a box or trough containing water and, if needed or advisable, also brushes which will scrub the belt-surface. Thus when it again comes to the filter-press it will have a clean fresh surface capable of the best filtering speed and likely to give the clearest solutions from the next move of the press. Further, the face of the plunger being exposed at each stroke the filtering medium can also be carefully watched and any repairs or cleaning needed can at once be carried out, thus always preserving the filtering capacity of the press. The press having been left with both the plungers raised slightly to allow the forward passage of the press-cake and the cylinder also raised for the same purpose, the next move of the cycle will be to place the press in position for the receipt of the next charge and for its pressing. The cylinder is first carefully lowered, getting a smooth tight joint around the edge onto the filtering-cloth belt. This, if needed, can be tightened by pressure on the upper side of the pistons D D. The plunger is then slowly raised by air-pressure on its lower side. As soon as the top of the plunger touches the sleeve-ring valve H H, this being movable with the plunger, rises with it and soon opens wide the holes in the side of the press G G, which are connected by the rubber hose to the supply tank or tanks. Through these holes the cylinder is promptly and quickly filled as soon as the plunger clears the port. The air is then turned off from the bottom of the air-cylinder (or the motion of the toggle-joint press is reversed) and the cylinder starts to descend of its own weight. This may be accelerated by turning air on the top of the air-piston. So long as the loose sleeve-cylinder valve H H is above the bottom of the holes G G there will be no pressure on the material beyond that of the pressure from the tanks; but all surplus material or pulp admitted to the cylinder will be pressed out again into the pipe and tank whence it came. As soon as the plunger is lowered sufficiently to close the holes G G the pressure on the filtering-cloths will commence to increase and the liquids must

flow out through the cloth, thence through the channels provided for it in either the plunger or the base-plates, or both, as preferred. The reëtrance of the pressed-out liquid into the press will be prevented by suitable check-valves in the plunger-head or in the pipes, or both. With the end of the stroke of the plunger a new press-cake has been made, which is again to be washed, as before, and then discharged. The cycle of operation is then to be reproduced. It is obvious that this operation is very simple, that the necessary operations of the machine may be regulated by the valves conveniently set at the hand of one operator, and that, further, one man should be able to fill, press, wash, discharge, and reset the press without leaving his first position. This operation may be rapidly carried out, and the press will have large capacity with small weight and small space occupied.

The operation will be cheaper, cleaner, and better than as now carried on, and coarse materials which now will not pass the openings into the multitude of plates constituting an ordinary filter-press will drop through the large openings G G of this press without hindrance and be mixed with the pulp and slimes of the cake without trouble or friction. In this way it will be possible to filter-press sands and slimes together, and thus make possible the washing of materials which cannot now be washed at all. For instance, it is now the practice in the metallurgy of many ores to separate the sand from the slime after the crushing operation, then to treat the sands which may readily be washed by some simple method, while the slimes are pressed into cakes and an attempt to wash them in the press is made. With this new press it will be possible and beneficial to the whole operation of the process to handle the whole mass together, as by this means the sands will make the press-cakes more permeable to the washing medium and the resulting cakes will be cleaner than possible by any other method.

What I claim as my invention is—

1. In a filter-press, the combination of a cylinder adapted to contain the material to be filtered, a plunger working therein, means for reciprocating the plunger, means for reciprocating the cylinder, a valve controlling the passage of the material to be filtered to the interior of the cylinder and means actuated by the plunger for opening and closing said valve.

2. In a filter-press, the combination with a cylinder provided with an opening in its side for forming a port through which the material to be filtered is delivered, means for reciprocating the cylinder, a slide-valve working within the cylinder and adapted to control said port, a plunger working in the cylinder and actuating said valve, and means for reciprocating the said plunger.

3. In a filter-press, the combination with a cylinder having an opening in its side consti-



tuting a port for admission of the material to be filtered, means for reciprocating the cylinder, a plunger reciprocating in said cylinder, means for reciprocating the said plunger, and  
5 an axially-reciprocating slide-valve controlling said port and actuated by said plunger.

4. In a filter-press, the combination with the press-cylinder, of a plunger working in said cylinder, means for reciprocating the plunger,  
10 means for reciprocating the cylinder, a cylindrical valve fitting into the top of the press-cylinder, and a port in the side of said cylinder normally closed by said valve but adapted to be opened when the plunger on its back  
15 stroke operates said valve.

5. In a filter-press, the combination of a press-cylinder having an opening in its side for introduction of fluid material, a base adapted to close the end of said cylinder and to form  
20 also a support for a filtering plate or medium, means for reciprocating the cylinder axially, a perforated plunger working in said cylinder, and communicating at its rear with suitable flexible pipes T, means for reciprocating the  
25 plunger and a filtering plate or medium borne by said plunger.

6. In a filter-press, the combination with a base-plate, of a cylinder, a plunger working

therein, a piston connected with said plunger, one or more pistons connected to the cylinder, 30 and means for applying fluid-pressure to said pistons to reciprocate the plunger and cylinder independently of one another.

7. In a filter-press, the combination of a plunger provided with one or more channels 35 or openings through which liquid may pass, a cylinder having an opening in its side, a channeled base-plate adapted to support the press-cake and provided with a seat which receives the edge of the cylinder to form a tight 40 joint about the perimeter thereof, means for reciprocating said plunger, a filter-plate carried by the plunger, a valve controlling the passage of liquid or fluid through the opening in the side of the cylinder to the space be- 45 neath the plunger, and pipes connecting with the channels in the base-plate and with the openings at the rear of the plunger, as and for the purpose described.

Signed at Salt Lake City, in the county of 50 Salt Lake and State of Utah, this 23d day of August, A. D. 1902.

JAMES W. NEILL.

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