March 4, 1930. W. H. MATHERS 1,749,080

HYDRAULIC FILTER PRESS

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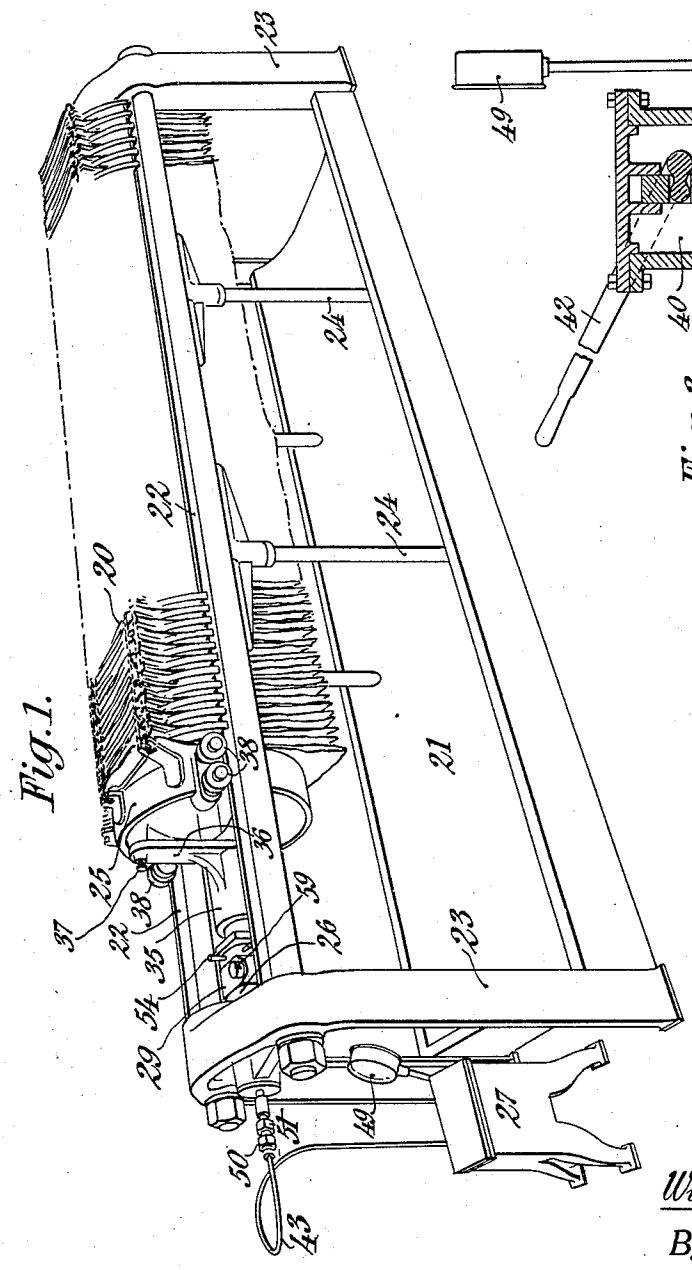


Fig. 1.

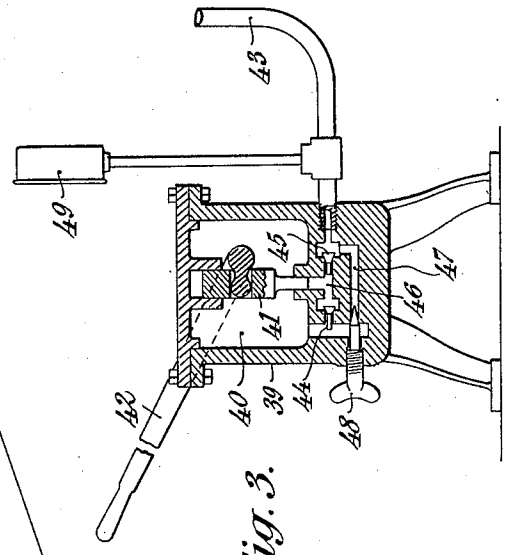


Fig. 3.

INVENTOR :
William H. Mathers,
By Attorneys,
Fraser, Myers & Manley.

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Fig. 2.

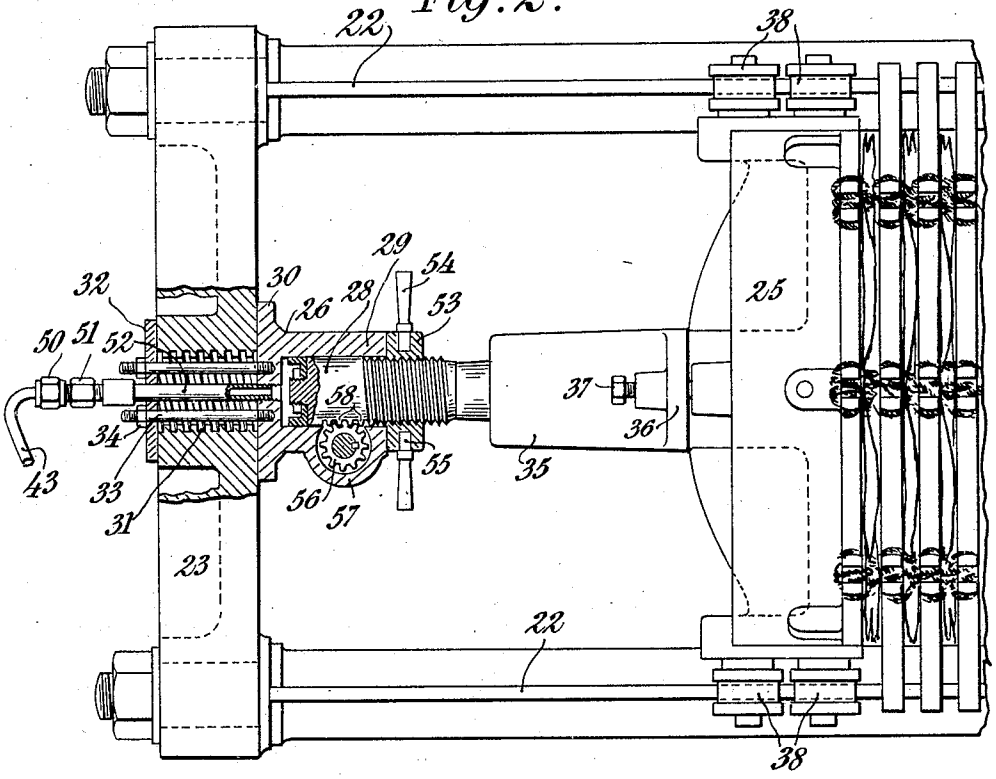
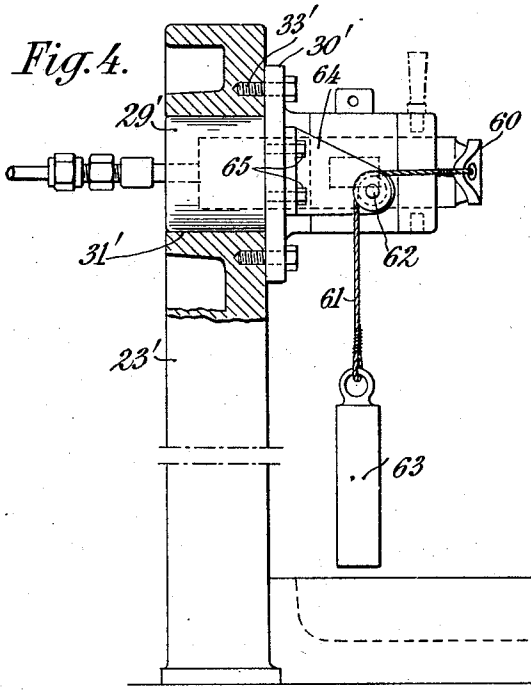


Fig. 4.



INVENTOR :
William H. Mathers,
By Attorneys,
Fraser, Myers & Manley

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UNITED STATES PATENT OFFICE

WILLIAM H. MATHERS, OF HOLLIS, NEW YORK, ASSIGNOR TO RICHARD DUDGEON, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

HYDRAULIC FILTER PRESS

Application filed March 25, 1927. Serial No. 178,373.

This invention relates to improvements in filter presses adapted for use in the filtering of clay and for analogous purposes.

Heretofore the power unit or compressing element of a filter press of the above-described character has comprised a screw jack mounted in one end of the supporting frame of the press, said jack being driven by suitable gearing.

It is a purpose of the present invention to materially increase the speed of operation of the press and at the same time reduce the manual labor involved. This has been effected by devising a simple means of substituting a hydraulic jack for the screw mechanism and providing the same with suitable operating mechanism whereby the ram may, if desired, be rapidly advanced by mechanical means prior to the application of hydraulic pressure and permanently maintained in advanced position, and whereby the ram may be returned either by manual operation or automatically.

In the accompanying drawing illustrating the invention,—

Figure 1 is a perspective view of a filter press adapted for the filtering of clay, in which the invention is embodied.

Fig. 2 is a top view of one end of the press, parts of which are shown in cross-section.

Fig. 3 is a conventional representation of the pumping element of the press, parts thereof being shown in cross-section.

Fig. 4 is a view of an end portion of a press, illustrating a modified form of the invention.

In Fig. 1 is disclosed a filter of a well-known type comprising filter elements 20 suspended over a trough 21 by means of spaced rails or bars 22 having end supports 23 and intermediate supports 24.

In filter presses of the above-described character, the filter units have heretofore been provided with compression mechanism comprising a screw (not shown), mounted in one of the end supports 23, having suitable gearing (not shown) whereby it may be caused to forcibly advance the platen 25 and subject the filter units to the desired degree of compression.

Presses constructed in accordance with the present invention differ from those of the prior art in that a hydraulic jack 26, provided with a suitable pumping device 27, is used as the compressing element, instead of the screw and gearing.

In Fig. 2 is illustrated a simple and practical means of applying a hydraulic jack to one of the presses of the prior art without modification other than the removal of the screw and gearing. When applied in this manner, the jack may comprise a ram 28 mounted in a cylinder 29 having its base 30 placed against the inner surface of the support 23 over the threaded opening 31 originally provided to receive the removed screw. A simple and practical, but ingenious, means whereby the jack may be secured to the end support, as disclosed in Fig. 2, may comprise a retaining plate or disk 32 placed against the outer surface of the end support 23 over the opposite end of the threaded opening 31, and the jack and plate may be firmly clamped together by means of appropriate fastening devices such, for example, as studs 33 each having one end in threaded engagement with the base of the cylinder 29 and having its other end passed through an opening in the plate 32 and secured by means of a nut 34.

Within the space between the end of the ram 28 and the platen 25 may be inserted a filler block 35, which may be suspended from the upper portion of the platen by means of a hanger 36 secured to the platen by any suitable fastening devices 37. The platen may be provided with end rollers 38 in the usual manner, whereby it may be supported upon and move along the bars or rails 22.

Liquid may be forced into the base of the cylinder behind the ram by any appropriate means such, for example, as a pumping device represented in conventional form in Fig. 3. Such a pumping device may comprise a liquid container 39 including a chamber or reservoir 40 from which liquid may be pumped by the plunger 41 when reciprocated by means of the lever 42 through the pipe 43 to the base of the cylinder 29 of the jack 26. The flow of liquid may be controlled by suit-

able means represented conventionally as comprising an inlet valve 44 and an outlet valve 45. These valves, when effective, permit liquid to be drawn from the reservoir 40 into the pump chamber 46 during the upward stroke of the lever 42, and from the pump chamber 46 into the piping 43 during the down stroke of the lever. These valves, when effective, prevent any return flow of the fluid either from the pipe 43 to the pump chamber 46 or from the chamber 46 to the reservoir 40.

To provide for the return of fluid from the cylinder of the jack to the reservoir 40 when the ram is returned toward the base of the cylinder, the pump may include a by-pass 47, thereby affording a free passage around the valve. This by-pass may be controlled by any appropriate means such, for example, as the needle valve 48. If desired, a pressure gage 49 may be connected with the pumping device at any suitable point between the valve 45 and the jack.

The conduit from the pumping device may be connected by suitable couplings 50, 51 with a nipple 52, which may be passed through an opening in the retaining plate 32 and have threaded engagement with the base 30 of the cylinder 29.

Means may, if desired, be provided whereby the ram may be positively maintained in any position to which it may be advanced by hydraulic pressure without maintaining such pressure for such purpose. As herein disclosed, this retaining means comprises a retaining nut 53 having threaded engagement with the exposed end of the ram. This nut may be provided with radial spokes 54 whereby it may be rotated, or, if preferred, it may be provided with openings 55 in its periphery in which the end of an operating tool may be inserted.

Means may also be provided whereby the ram may be rapidly advanced in the cylinder or returned when free. As herein disclosed, such operating means is indicated as comprising a pinion 56 rotatably mounted within a gear case 57 forming a part of the cylinder 29, said pinion having meshed engagement with a rack 58 cut into the adjacent surface portion of the ram. The end portion 59 (Fig. 1) of the shaft to which the pinion should be fixedly secured may be provided with a radial opening to receive an operating handle whereby the pinion may be rotated.

When it is desired to subject the filter elements to compression, the ram may be rapidly advanced by means of the rack and pinion 56, 58, until its end is brought in contact with the filler 35. To facilitate this rapid advancement of the ram, the valve 48 controlling the by-pass 47 of the pumping element (Fig. 3) should first be opened. The filter elements may then be subjected to the required degree of compression by closing the valve 48 of the pumping element and then reciprocating the lever 42, thereby forcing liquid under high pressure from the reservoir 40 into the base of the cylinder 29 (Fig. 2) until the ram has been advanced sufficiently to produce the desired degree of compression. The retaining nut 53 may then be rotated and thereby moved along the threaded end of the ram until its rear surface is brought in contact with the exposed end surface of the cylinder 29, thus maintaining the ram in its advanced position without maintaining the hydraulic pressure in the cylinder.

When it is desired to release the filter units from the pressure of the jack, the ram may be slightly advanced by imparting one or more strokes to the pumping mechanism, thereby freeing the retaining nut, which may then be advanced along the threaded end of the ram, after which the ram may be returned to its normal position by the rack and pinion after first opening the valve 48 controlling the by-pass in the pumping element.

After the ram has been withdrawn, the filler block 35 may be swung about the attaching element 37 to a position out of line with the jack, thereby permitting the platen 25 to be moved forwardly so as to provide working space needed in the removal of the contents of the filter and in preparing the filter elements for a subsequent charge of material.

In Fig. 4 is illustrated a modified form of the invention adapted for use when the jack is to be applied to a new installation. As herein disclosed, the end support 23′ is provided with an opening 31′ of sufficient diameter to receive the base portion of the cylinder 29′, and the flange 30′ is indicated as being disposed at some considerable distance from the base of the cylinder in order that the flange may rest against the inner surface of the end support 23′ when the end of the cylinder is substantially flush with the outer surface of the support 23′. This form of the invention dispenses with the necessity of making use of the retaining plate 32 and the studs and nuts 33, 34 used as a part of the form of the invention illustrated in Fig. 2. The form of the invention illustrated in Fig. 4 is also adapted for use when the hydraulic jack is to be substituted for a removed screw jack of the type in which the threaded element of the support which receives the screw is in the nature of a nut or bushing, the removal of which provides the opening 31′ to receive the base portion of the cylinder 29′.

If desired, either form of the invention herein disclosed may be provided with means whereby the ram at each forward movement may be automatically returned if free. As illustrated in Fig. 4, such automatic restoring means may comprise a cross-bar 60 secured in any appropriate manner to the end of the ram and connected by means of a flex-

ible cable 61 passing over pulleys 62 to a weight 63. The pulleys may be mounted in suitable brackets 64, which may be secured to any appropriate part of the jack by screws 65 or other suitable fastening devices.

In the form of the invention illustrated in Fig. 4, the jack may be secured to the end support by bolts 33′ passing through the flange 30′ and having threaded engagement with the end support.

The operation of the form of the device illustrated in Fig. 4 is identical with that of the form illustrated in Fig. 3.

It will be apparent that the rack and pinion of either form of the invention herein disclosed may be omitted, if desired, in which case the ram may be advanced solely by hydraulic means and may be restored by the weight and cable attachment.

The rack and pinion may be used without the weight, in which case the ram may be advanced by the rack and pinion to the point at which high pressure is needed, and may be restored to normal position by the rack and pinion after the pressure has been released. If the weight and cable attachment is used in association with the rack and pinion, the latter may be relied upon to advance the ram up to the point at which hydraulic pressure is to be applied, and the restoration of the ram may be automatically effected by the weight and cable attachment when the pressure has been released.

It will be apparent that the speed of operation of presses adapted for use in the filtering of clay, and for like purposes, may be materially enhanced when modified in accordance with the invention herein described, as compared with presses of the prior art dependent upon a simple screw and gearing as the pressure-effecting element. As clearly indicated in Fig. 3, this conversion of a filter press of the prior art into one embodying the present invention may be readily effected without resort to skilled labor and without making any alterations in the old type of press other than to remove the screw and gearing and fasten the hydraulic press in its place. On the other hand, if the hydraulic press is applied to a new installation, a material portion of the jack may be housed within the end support, thereby making it possible to either shorten the press to that extent or increase the capacity of the press by inserting additional filter units.

The invention is not intended to be limited to the specific forms thereof herein disclosed for purposes of illustration, but should be regarded as covering modifications and variations thereof within the scope of the appended claim.

What I claim is:

A filter press having a hydraulic jack mounted in its end support in place of a removed screw jack, said hydraulic jack having its base mounted against the inner surface of said support over the threaded opening originally provided to receive the screw, a retaining plate mounted against the outer surface of said support over the opposite end of said threaded opening, and fastening elements passing through said opening and connecting the base of said hydraulic jack with said retaining plate.

In witness whereof, I have hereunto signed my name.

WILLIAM H. MATHERS.