'blowing out.' as it is mainly owing to the fine slime which fill all crevices and packs there that a press keeps tight. The more rapidly a press is filled the greater the wear on the cloths, especially near the exit ports, and the greater the chance of dirty solutions. The time occupied in filling is about fifteen minutes.

WASHING.—Is performed in much the same manner as filling, a separate monteju holding the required amount of wash being used. When turning on the wash, the cock at end of the press on channel (A) should be opened to allow any air to escape.

The wash may be allowed to leave the press either by the channel (B) in which case all the taps on the plates are closed, or the taps on the low pressure plates may be left open and the solution allowed to escape that way. The latter method necessitates the closing of only half the taps (those on the high pressure plates) and gives practically as good results as the former.

The amount of wash may be five or six tons for each press, and take about twenty minutes to pass through.

BLOWING BACK.—This is performed as soon as the wash is all through, the object being to blow all the sludge left in the filling channel back into the monteju, leaving it clear, otherwise, when emptying the press, dirt would be liable to get between plates and frames causing leakage.

A piece of rubber hose connects the back end of the sludge channel with the air supply, and on opening the valves a blast of air is driven through the sludge channel, blowing everything back into the slime monteju. This should be done as soon as possible to prevent the slime drying and setting in the channel, but should not be done before the wash is through, since, especially in old presses, it causes leakage along the channel between plates and frames as soon as the wash is turned on. For this reason also, in filling, the slime should not be allowed to 'blow out' of the monteju and air be blown into the press, as this will cause leakage all over the press in washing.

DRYING.—After washing is finished and the press has been blown back, the air is allowed to blow through for 5 or 10 minutes, after which the press is ready to be unscrewed and emptied.

The percentage of moisture left in the cakes, when air is used for drying may be as low as 10 per cent., but is generally about 14 or 15 per cent.

REMOVAL OF RESIDUES.—This may be by trucks which are generally side-tipping and hold half a ton of dry slime, or by belt conveyor.

(B) In this system a geared plunger pump, generally fitted with a large air chamber, is used for forcing the slime into the press.

ADVANTAGES.—(i) Less first cost and consumption of power.

(ii.) Less manipulation.

(iii.) A higher pressure can more readily be used for washing, the benefit of which has been explained above.

(iv.) Less subsequent cleaning of the press is necessary, since the cakes leave the frames cleaner and do not fly about so when they are comparatively wet..

DISADVANTAGES.—(i.) The pressure in filling is apt to become excessive and cause damage to presses, though this can be avoided to some extent by the use of automatic relief valves.

(ii.) The cakes cannot be dried, therefore higher values are left in the residues, and there is a greater loss of solution.

(iii.) Another disadvantage put forward is that the extraction suffers on account of the absence of the aeration received by the sludge when air is used, especially when the sludge is kept agitated in the monteju by a current of air. This, however, is more or less conjecture, the higher residues probably being solely due to the higher percentage of solution left in the cakes.

FILLING AND WASHING.—These are performed in much the same manner as when air is used, except that since the pump delivers the same amount of sludge during the initial and final stages of filling, and less and less can be taken by the press, a bye pass or relief balve has to be manipulated to keep the pressure down to its proper limit.

BLOWING BACK.—This cannot of course be performed, but the same result can be arrived at by pumping solution through the sludge channel back into one of the agitators. The only drying that can be performed consists in allowing the press to drain for a minute or two with the cock on channel (A) open to admit air and allow solution behind the cloths to escape.

The moisture contents will be about 25 to 30 per cent.

REMOVAL OF RESIDUES.—If the cakes are very wet a belt conveyor cannot be used and trucking must be resorted to.

These two systems, A and B, may be advantageously combined as on the Great Boulder Perseverance, where the presses are filled and dried by means of air, and washed by pumps, though a better plan would be to fill with pumps also.

GENERAL CONSIDERATIONS.

I. LEAKS OUT OF PRESSES may be caused by: (i.) Dirt left between plates and frames preventing their fitting closely. This generally washes out before long and the leak 'takes up.'

(ii.) The strips of baize or packing on the faces of the plates underneath the cloth may be damaged or missing, being often blown out in places while washing and drying.

(iii.) The rubber rings around the holes forming the various channels may be damaged or missing. Leaks of this description can generally be stopped or lessened by driving a piece of tin, covered with cloth, between the plate and frame where the leakage is, especially at the corners.

(iv.) If air be allowed to blow through the press, i.e., when the sludge in the monteju 'blows out,' there will be considerable leakage when filling is re-commenced.

The solution from leaks of any kind outside the press are returned to the plant in two ways. First, flat or corrugated iron trays are placed under the presses delivering the solution into launders; or second, the trucking floor may be made of concrete with a slope towards a sump from which the solution is pumped back to one of the agitators.

II. Leaks Inside the Press Through Cloths.—These may be caused by: (i.) Holes in the cloths, remedied by placing a piece of cotton waste in the hole or a patch on the back of the cloth.

(ii.) A cloth may be turned back, or be crooked so as to expose filtering surface of plate.

(iii.) From various causes a plate may break, in which case the cloth on it is also broken or torn.

In all these cases the effect is to render the filtered solution cloudy or even muddy, according to the extent of the trouble, and the press is said to 'run dirty.' The defective cloths can be located before actually finding the hole itself by the fact that the tap on the plate concerned runs dirty, and when this occurs that tap is shut off and the trouble remedied when the press is next opened. When a very bad leak occurs, the cake next to the cloth concerned is only partially formed, or in any case is wetter than the other cakes. If a number of taps run very dirty along the press there is probably a plate broken, the sludge getting into channels A and B, and finding its way out through the other taps.

When the press is provided with channels for exit solutions instead of taps, the location of defective cloths is more difficult, but after a little experience a very good idea as to their whereabouts can be formed; by observing which channel runs dirty the trouble can be relegated to either a high or low pressure plate, and by further noticing whether the channel runs dirty at the beginning and clears towards the end of filling or washing, and vice versa, the probable position of the defective cloth is made more certain.

III. Breakages.—(i.) Of plates. This may be caused by too high a pressure in filling or washing. The plates may only be cracked or strained, and may last for some time afterwards, and a second cloth placed over the old one and well sewn will very often lengthen the life of a cracked plate.

Dirt or sand left between plates and frames may cause breakages when screwing the press up.

Should the port from the sludge channel into a frame become blocked up, when the press is being filled, there is a pressure of, say, 60lbs. per square inch on the plates on either side of it, tending to force the plates in towards the hollow frame since there is no pressure in the latter, and when this occurs one or both of the plates may have its centre, or their centres, blown right into the empty frame.

The breakage of a plate is always accompanied by dirty solutions, although when only cracked a second cloth placed on it will often keep the solutions clear and help to hold it together.

(ii.) Stripping of threads of capstan nuts, caused by wear or by excessive pressure in filling or washing.

(iii.) Taps are made of cast iron, and the various salts in solution cause them to become stiff if not well greased and otherwise looked after. When easing them they are easily broken.

IV.—Use of Taps.—Taps usually cost from 8s to 10s 6d each, though cheaper kinds costing about 5s are now made. They are continually causing trouble by getting stiff, breaking, etc., so a practice coming into favour now is to use taps on the high pressure plates only, the wash finding its way out through the low pressure exit ports, which are permenently left open. If, through a defective cloth, a plate runs dirty, the exit can be plugged. Carrying this idea further, no taps need be used at all, the exit ports on the high pressure plates being permanently closed, and the solution during filling finding its way out through channel A in case of high pressure plates, and through the exit ports on low pressure plates which are left open as before. The high pressure ports cannot, of course, be left open because during washing the solution would find its way out there instead of passing the cakes.

V.—Cleaning.—After a press has been 'dropped' it is more or less 'cleaned' by running a wooden or iron knife or scrape around the frames, sweeping off any adhering dirt, etc. In the case of new and well-preserved presses it is sufficient to do this as the press is being emptied, each frame being cleaned as the cake from it is dropped; but in old presses it is sometimes necessary to pull each frame and plate back separately after the whole press has been dropped, and clean each, this means a serious loss of time. Any large lumps of dirt adhering to the cloths are also detached; but is not a good plan to scrape the cloths, as this tends to displace them, and where sharp steel knives are used they may easily be cut.

VI—Cloths.—There is a general tendency now, especially on large plants, to renew the cloths at frequent intervals, whether they are worn or not. The object of this is to lessen the risk of dirty solutions, and to ensure quick filling and washing, also more thorough washing. By the accumulation of certain salts, etc., cloths become harder and more impermeable the longer they are used; this means slower filtration, and greater risk of the wash channeling or taking the path of least resistance, instead of penetrating the cake uniformly. The cloth of ordinary quality used costs 1/8 per yard, or say £10 per press, and on small plants this item is worth consideration; hence it is good practice to renew cloths only when necessary, and to render their lives as long as possible.

The life of cloths depends on:—

(i.) The description of material pressed; sandy stuff cuts them quickly.

(ii.) The pressure used, especially in washing, and the cloths on the high pressure plates wear out sooner than those on the low pressure plates.

(iii.) The care exercised in cleaning; holes may be cut in cloths when steel scrapers are carelessly used.

(iv.) The care exercised in putting the cloths on; if not stretched fairly tightly they are apt to crease, and when a crease comes between the surfaces of contact of plates and frames, the cloth is cut through at that place long before any legitimate wear takes place.

(v.) The life of cloths can be greatly lengthened by patching them, altering their position on the plates, etc., etc.

VII. CLARIFYING.—No matter how carefully the press work may be done, a press will run dirty now and again, and when cleaning a press lumps of dirt cannot be prevented from falling into the launders under the taps, which convey the solutions to the zinc boxes. Unless intercepted this dirt gets into the boxes, causing great trouble at clean-up time and preventing good precipitation. On this account some method of separation, either the use of settling vats of large area, or clarifying presses, or sometimes both, is resorted to. The press for this purpose may be of the ordinary type, the solution being pumped through it, or of much lighter wooden construction, the solution passing through by gravitation. These are emptied from time to time as necessary, and simply act as filters.

VIII. LABOR.—Filterpress hands get 11s 8d per shift of 8 hours, generally putting through eight presses (say 40 tons) in this time. For every press over eight they usually get 10d, thus for 10 presses per shift a press-man earns 13s 4d, but they cannot be got to do more than 10, and this is about the limit as to time except in special cases. These men (two to each press) simply empty, clean and screw up; the filling, washing, etc., being done by a 'tapman,' who generally receives 12s 6d per shift. Truckers receive 10s, except when the trucks have to be hoisted, when as braceman and platmen they get 11s 8d.

Taking the small re-treatment plant, as before, where one press is filled at a time, it could be run by five men on the presses. Besides these there would be a man shovelling into the mixer and, unless one of the pressmen did this work, an engine driver.

1 Filler or tapman, at 12s 6d.
2 Cleaners or pressemen, at 11s 8d.
2 Truckers, at 10s.

This number could be cut down to four if one of the pressmen did the filling at say, 15s per shift.

If both presses were filled at once, a plant like this could be run by three men; two pressmen, one of whom does the filling, and one trucker.

2 Pressmen at 13s 4d.
1 Trucker at 11s 8d.

When both presses are full and washed they are emptied and closed again. One of the pressmen then helps the trucker tip the rake of trucks while the other pressman fills and washes the presses again.

It is doubtful, however, whether it is good policy to cut down labour in this way, as when the filling and washing are left to pressmen, it is safe to assume that washing is imperfect, and although a sample has to be taken from each press for assay purposes, it is an easy matter to wash one press properly and take the 8 or 10 necessary samples from it alone.

IX. Cost.—This naturally varies greatly, but the total cost per ton with a plant of this description would probably be in the neighbourhood of 5s, an extraction of 2dwt. per ton thus giving a profit. The actual pressing may be put at 1s 6d per ton.

A plant as described above could be erected for £5000.

Recent Improvements in Presses and Pressing.—(i.) The latest Dehne presses are made with right and left-handed screws on the bars clamping the press together, so that in screwing up a press, both men work downwards instead of the one on the right hand side having to lift his lever as in the older presses.

(ii.) The capstan nuts are split, so that should their threads strip, they can be removed and new ones put in their places without the necessity of removing the end standard to screw them off the ends of the bars.

(iii.) Capstan nuts are fitted at the feet of the intermediate standards, which support the bars, and through them the plates and frames. Usually, when through the shrinkage of woodwork these standards get out of line perpendicularly, thus allowing the press to sag in places, they have to be chocked or wedged up again, but with this arrangement they can be lengthened or shortened as required.

(iv.) Another labour and time-saving device enables the press to be closed by hydraulic pressure. This operation by hand takes about ten minutes, and is the most severe part of the work, especially the final tightening with the angle levers.

Patents have also been taken out for a method of sluicing the solid matter out of presses by a current of water without opening the press, and a system of which the main idea is the formation of wedge-shaped cakes thicker at the bottom than at the top, causing them to fall out of the press when doors are opened below.

The former of these schemes does away with one of the main functions of a press, viz.: to leave the residue in a fit state to be easily handled and as dry as possible, while the latter would seem to allow of all the wash going through the upper part of the cake, decreasing to a minimum at the bottom, though, as these presses are said to be at work satisfactorily in South Africa, this may not be so.