J. DRAGE.

FILTERING MACHINE.

APPLICATION FILED JAN. 6, 1911. RENEWED JAN. 10, 1914.

1,087,647.

Patented Feb. 17, 1914.

3 SHEETS—SHEET 1.

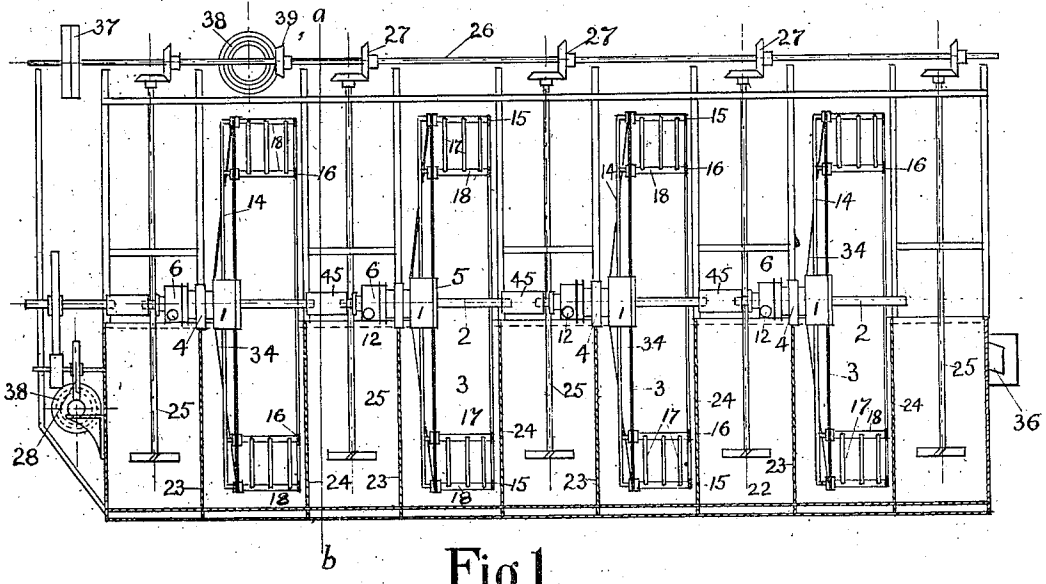


Fig 1.

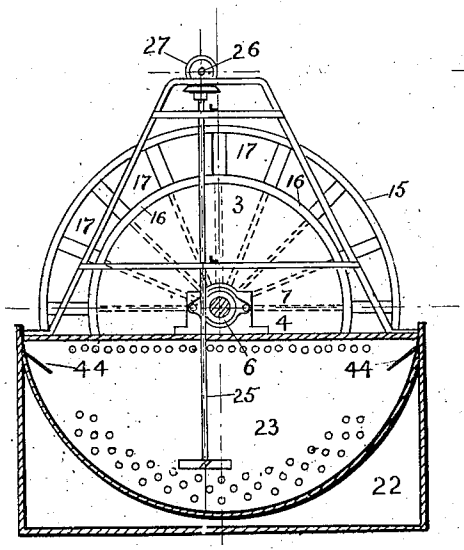


Fig 2.

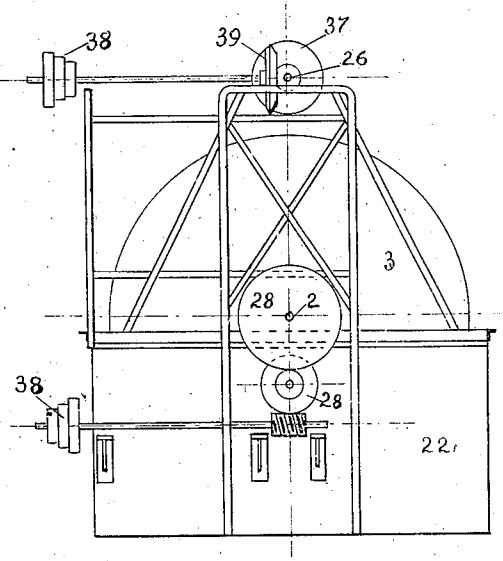


Fig 3.

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3 SHEETS—SHEET 2.

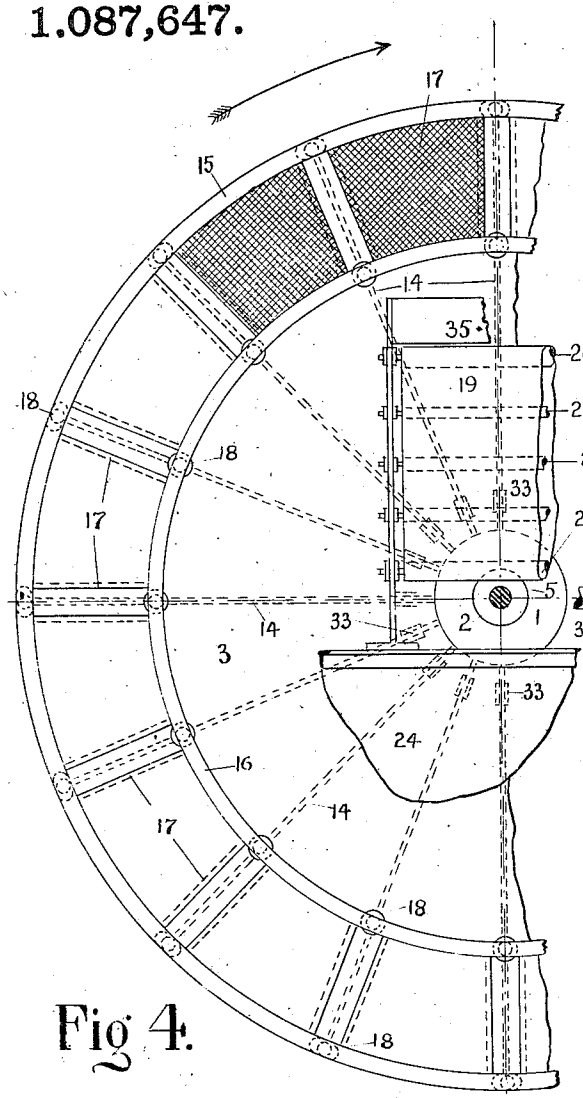


Fig 4.

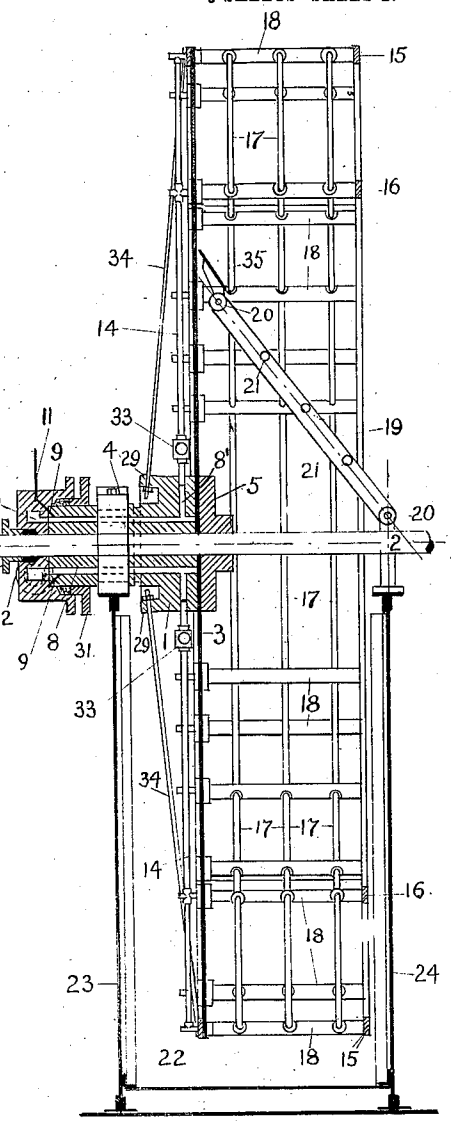


Fig 5.

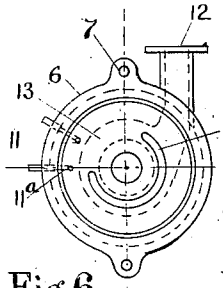


Fig 6.

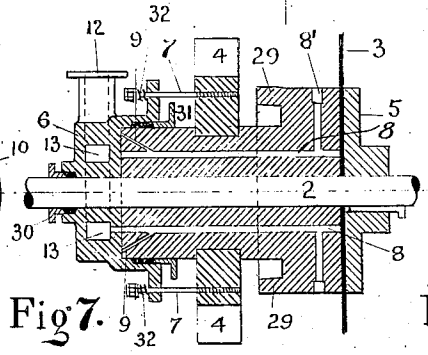


Fig 7.

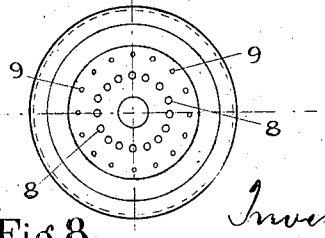


Fig 8.

Witnesses:
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3 SHEETS—SHEET 3.

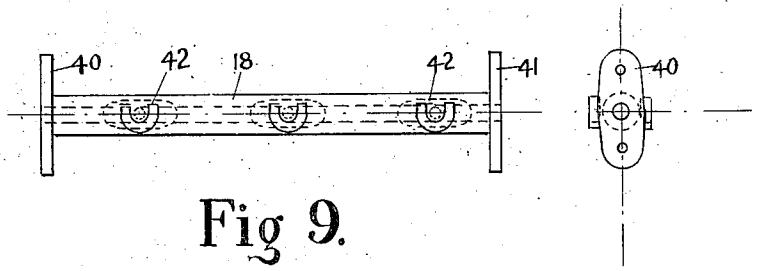


Fig 9.

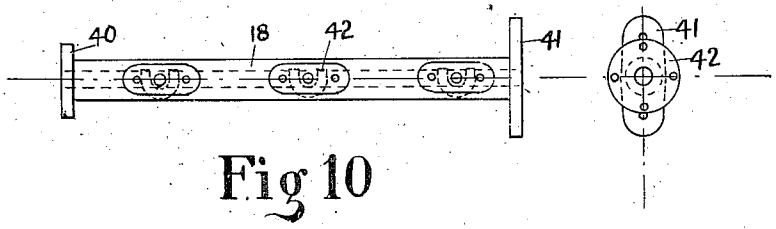


Fig 10

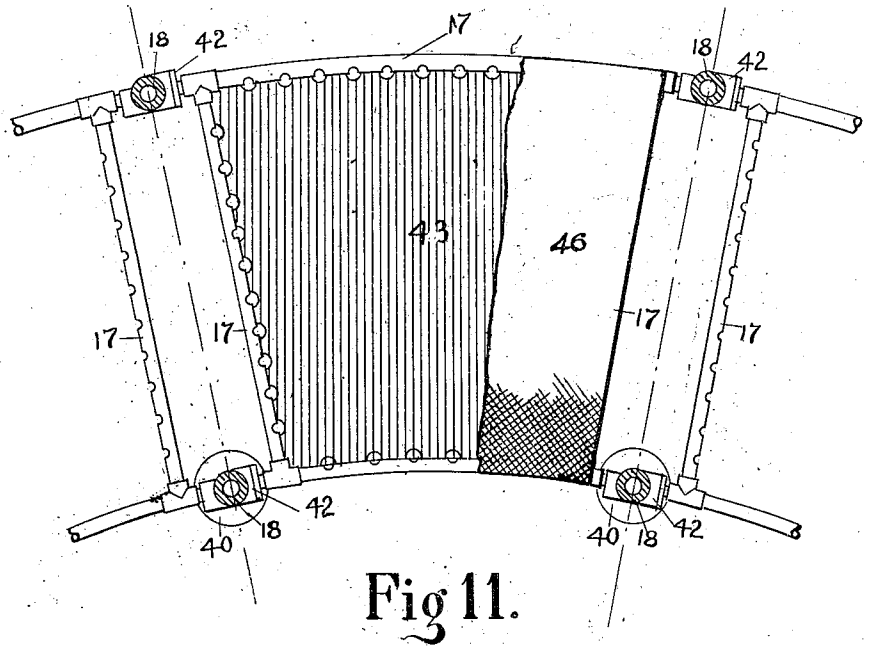


Fig 11.

Witnesses
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UNITED STATES PATENT OFFICE.

JAMES DRAGE, OF BOULDER, WESTERN AUSTRALIA, AUSTRALIA.

FILTERING-MACHINE.

1,087,647. Specification of Letters Patent. Patented Feb. 17, 1914.

Application filed January 6, 1911, Serial No. 601,144. Renewed January 10, 1914. Serial No. 811,496.

To all whom it may concern:

Be it known that I, JAMES DRAGE, a subject of the King of Great Britain, residing at Boulder, in the State of Western Australia, Commonwealth of Australia, have invented new and useful Improvements in Filtering-Machines, of which the following is a specification.

This invention has been devised for the purpose of providing an improved filtering machine for the treatment of pulp, by extracting, firstly the metal solution, secondly a weak solution wash and thirdly, a clean water wash. The whole providing a treatment machine capable of treating a large quantity of material in a cheap and efficient manner.

In order that my invention may be clearly understood both as to its construction and the method of operation, I shall describe the same by the aid of the accompanying illustrations in which;—

Figure 1. is a longitudinal section of a complete series of my machines. Fig. 2. is a section through line *a. b.* showing the perforated partition. Fig. 3. is an end elevation from the driving end. Fig. 4. is a front elevation of half of the wheel on a larger scale. Fig. 5. is a vertical section of the wheel and valve boss. Fig. 6. is a face view of the valve cap. Fig. 7. is a section of the valve boss and cap. Fig. 8. is a face view of the valve boss. Fig. 9 is a detail of the outer carrying pipe for filter frames. Fig. 10. is a detail of the inner carrying pipe for filter frames. Fig. 11. is an enlarged view of a filter frame.

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

For the purpose of my invention I construct a wheel boss 1, to which a filter wheel is attached by means of a body plate 3, the same being attached by means of the flange clamp 5. This boss is provided with a stay flange 29, and a circle of port holes having axial portion 8 and radial portions 8′, for the vacuum connections and a circle of port holes 9, for the admission of compressed air or steam. These latter port holes 9, connect at an angle to the port holes 8. This boss is carried in a bearing 4, and revolves with the filter wheel. I fit a valve cap 6, to the end of this boss, the faces of both being fitted together with a good air tight joint. This cap 6, is also fitted with two packing glands 30, and 31, to make them air tight, and a connecting pipe 12, for the vacuum and a chamber 13, having an arc shaped outlet or port 10, in the face of the valve cap 6. There are also port holes 11 and 11ª, which are used for the admission of air, steam or lubricant. The ports 11 and 11ª are the same distance from the axis of rotation of the filter frames and therefore register with the circle of holes 9 in the boss 1, and are used for air pressure to remove the cake or for steam or water pressure to locate leaks in the filter frames. As the wheel revolves, the ports 9 successively register with ports 11ª and then with port 11. Port 11ª is in connection with a source of air under pressure so that when ports 9 are in registry with port 11ª compressed air passes into the corresponding filtering device which is in a discharging position causing distention of the filtering cloth and thus shaking off the adhering cakes. Ports 9 then register with port 11, and a volume of steam or water under pressure is allowed to pass into the filtering element which has the purpose of cleaning the filtering cloth and assuring its successful action when again immersed into the solution. This cap 6, is held to the bearing 4, by means of tension bolts 7, having buffer springs 32, which keep the faces of the cap 6, and boss 1, in working contact. I place couplings 45, on the shaft 2, that permits a space in the shaft by means of which the valve cap 6, may be removed or repaired.

For the support of the machine I preferably use a plate disk as 3, to which are fitted the filter frame pipes 18, which are attached to the disk 3, by means of flanges 40, and bolts, and are supported at their other ends by means of rings 15, and 16, attached to the flanges 41. These filter frame pipes 18, have connections 42, to attach the filter frames 17, at their four corners.

At the back of the disk 3, and communicating with the filter frame pipes 18, are attached the connecting pipes 14, which radiate from the vacuum ports 8, in the boss 4, and in these connecting pipes 14, I place sight glasses 33, by means of which the state of the solution passing may be observed. These sight glasses consist of a box having

transparent faces on two sides. I strengthen the wheel with stay rods 34, connected from the periphery of the disk 3, to the stay flange 29, on the boss 4.

The filter frames 17, consist of perforated pipes as shown in Fig. 11, the space being filled with a fluted board 43, and the whole covered with canvas 46 or the like, as a filtering medium and having connecting couplings or unions at two of their corners so that the vacuum or pressure is communicated to them through the vacuum pipes 14, and 18. These filter frames 17, are made in the form of portion of a circle, and are placed parallel to the disk plate and in series of parallel circles.

For the purpose of delivering the pulp from the machine I may use a chute inclined from the inner surface of the disk plate 3, to the center outside of the filter frames but I preferably use a belt 19, of some suitable material carried on terminal rollers 20, and supporting idlers or rollers 21, so constructed and set in the machine that the weight of the pulp adhering to the belt 19, will cause it to move downward around the rollers 20, and deposit the pulp into the adjoining compartment of the machine. I fit an apron 35, above this conveyer 19, which is attached to the frame of the conveyer, and rests close to the disk 3, to insure the pulp falling on the conveyer 19.

The filtering wheels are arranged in series as shown in Fig. 1, and are set in tanks 22, divided into compartments alternately agitating and filtering compartments. In the agitating compartments I fit agitating blades as 25, operated from the driving shaft 26, by means of the miter gear 27, and baffle plates 44, to prevent the overflow of the agitated pulp.

The partitions between the agitating and filtering tanks are either perforated as 23, shown in Fig. 2, or are fitted with screens or perforated metal and the next partition, as 24, is solid and so arranged that the agitating blades 5, force the pulp downward through the lower rows of holes into the adjoining filtering compartment then upward around the filtering frames 17, and back into the agitating tank, through the upper row of holes. The agitator in the last compartment simply keeps the pulp fluid while it overflows through the chute 36, and is conveyed per launder or pipe to the residue dump or the like. (If required to remove the residue in a partially dry state such as by truck or belt conveyer this last compartment is unnecessary.)

Motion is communicated to the machine from any convenient source of power by the pulleys 37, which operate the driving shaft 26, and agitator gears 27, gear 39, and step pulleys 38, communicate the motion to the main shaft 2 through the gear 28. The suction of a wet vacuum pump is connected by means of pipes of hose to the vacuum chambers 13, in the boss 4, by the connecting pipe 12. Air or steam or both, are connected to the valve cap 6, by the inlets 11.

The method of operation of my invention is as follows:—The tanks 22, are filled with the pulp to be filtered and the machine set in motion, the vacuum and air or steam connections being complete, the agitators revolving rapidly keep the pulp in circulation and the filter wheels revolve slowly, thus alternately immersing the filter devices or frames 17, in the pulp. It will be understood that the wheel boss 4, revolves with the wheel while the valve cap 6, remains stationary and is so adjusted that the arc shaped port 10, in the valve cap establishes communication between the vacuum chamber 13, and all the ports 8, in the boss that are temporarily opposite to it, thus placing all the filter frames 17, that are immersed in the pulp and those requiring to be denuded of moisture after passing through the pulp and collecting a cake, under the action of the vacuum. When these ports 8, in the boss 4, reach the end of the arc shaped port 13, the vacuum is cut off and the air holes 9, in the boss arrive opposite the air hole 11. When compressed air or live steam is admitted and passes up into the filter frame, the cake of pulp from the filtering surfaces is removed. This is arranged to take place when the filtering frame is at or near its highest point and above the chute or conveyer 19, and the liberated cake drops on to the chute or conveyer 19, and is passed into the second compartment where sufficient water or weak solution is added to replace that removed in the former operation, and the operations repeated on the second wheel, and so on through as many wheels as are necessary to remove the values from the pulp.

Pulp is continuously added to the first compartment of the tank 22, to replenish the amount treated, the process thus being continuous, and weak solution or water is added to each compartment to replace the solution extracted by the vacuum pump.

I am aware that the method of filtering pulp by means of vacuum is in general use and I do not claim this particular feature as a part of my invention.

What I do claim as my invention and desire to secure by Letters Patent is:—

1. A filtering apparatus comprising in combination, a filtering tank and an agitating tank and lower and upper means effecting communication with said tanks, a filtering device in said filtering tank, and agitating means for causing circulation from said agitator to said filtering tank through said lower means and back through said upper means, substantially as and for the purposes set forth.

2. A filtering apparatus comprising in combination, a series of tank structures each comprising an agitator and a filtering tank, communicating means, and return communicating means between the agitator and the tank, a filtering wheel in each filtering tank, and means for discharging the cake from the filtering wheel of one tank structure to the agitating tank of the next structure successively throughout the series, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES DRAGE.

Witnesses:
WILLIAM GEORGE MANNERS,
R. J. BRIMBLECOMBE.