Aug. 1, 1939. W. B. MARSHALL 2,168,264

CLARIFYING APPARATUS

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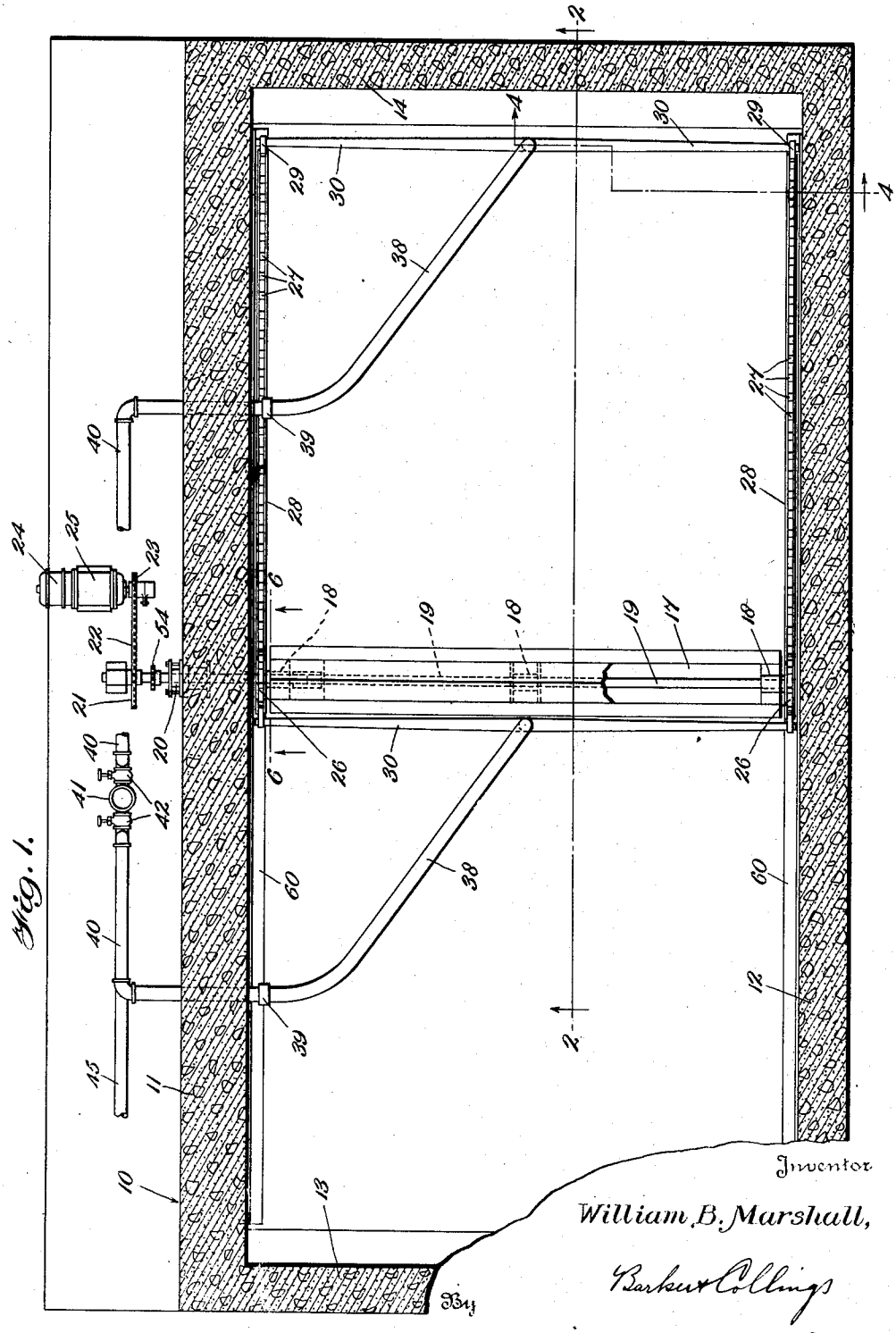

Fig. 1.

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Fig. 3.

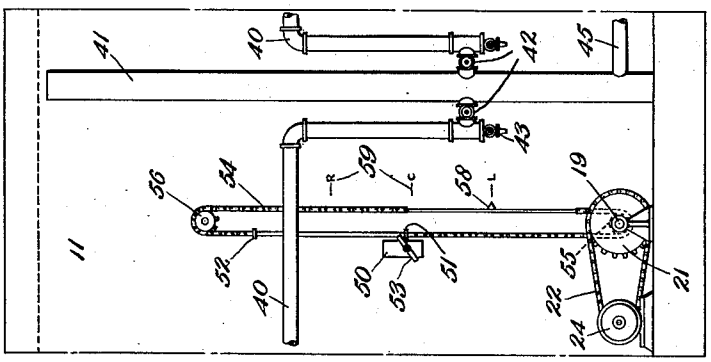
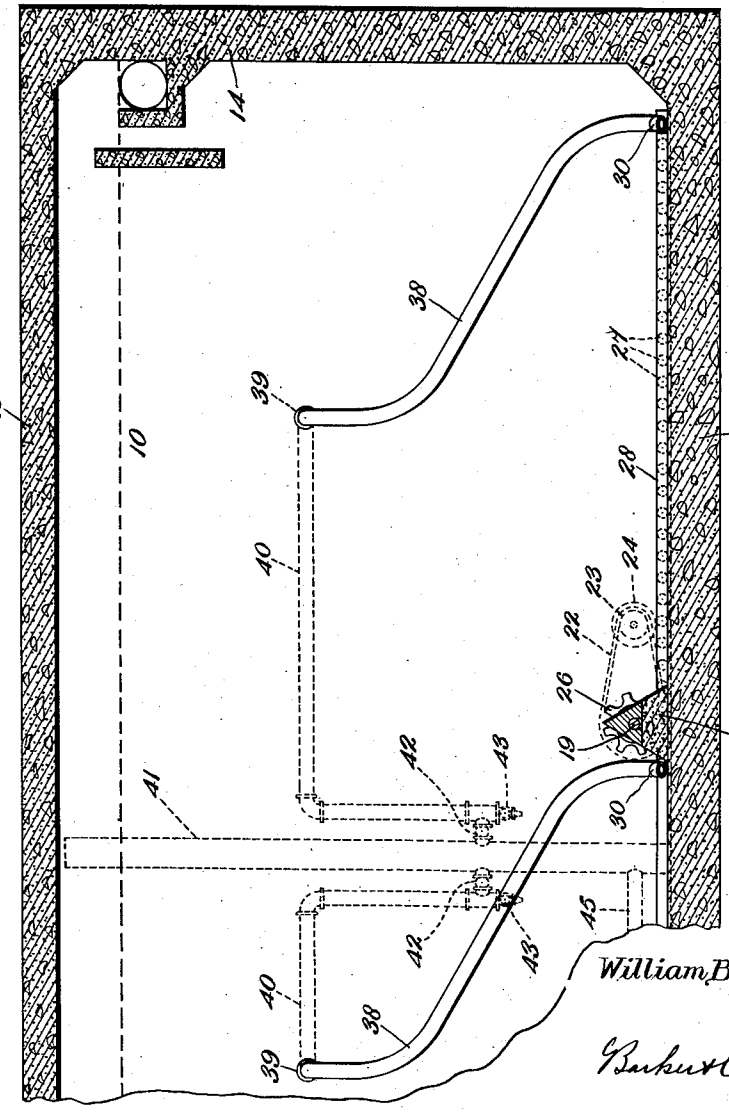


Fig. 2.



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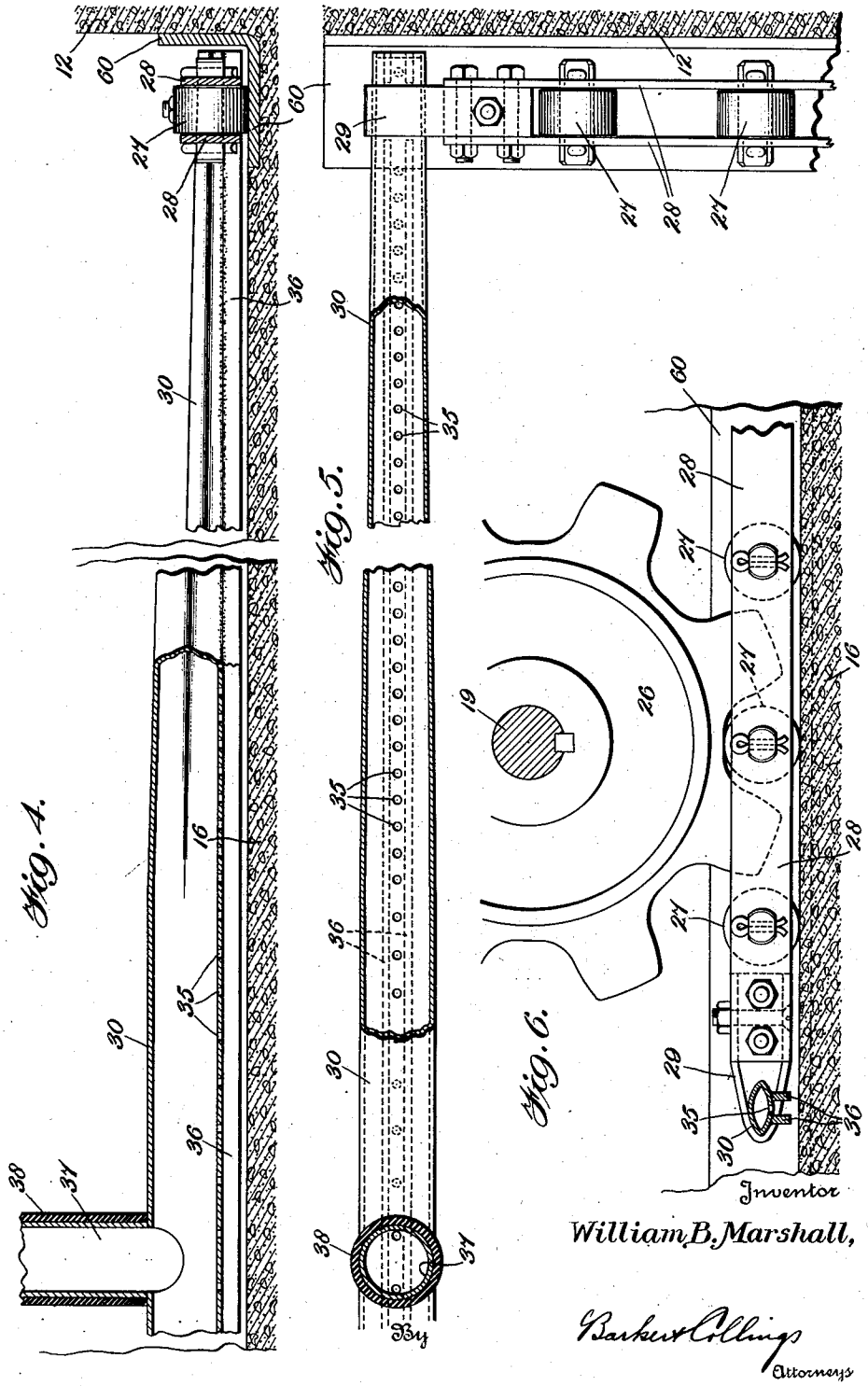

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UNITED STATES PATENT OFFICE

2,168,264

CLARIFYING APPARATUS

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Application December 1, 1936, Serial No. 113,670

8 Claims. (Cl. 210—55)

The invention relates to clarifying apparatus, and more particularly to mechanism for removing settled solids from the floors of sedimentation chambers, and has for one of its objects to provide apparatus of this character which will be simple in construction, comparatively inexpensive to manufacture, install and maintain, and which while primarily designed for the recovery of paper pulp from "white water" in paper manufacture, is well adapted for other similar industrial uses, and to sewage disposal work.

With the above and other objects in view which will appear as the description proceeds the invention consists in the novel details of construction and combinations and arrangements of parts more fully hereinafter disclosed, and particularly pointed out in the appended claims.

Referring to the accompanying drawings forming a part of this specification in which like reference characters designate like parts in all the views:

Figure 1 is a sectional plan view of a typical clarifying chamber equipped with solids removing mechanism constructed and arranged in accordance with the present invention;

Fig. 2 is a vertical longitudinal sectional view, taken approximately on the plane indicated by the line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a partial side elevational view, illustrating the driving mechanism, the automatic control therefor, and a means for indicating the position of the solids removing apparatus within the settling chamber;

Fig. 4 is an enlarged sectional elevational view, taken approximately on the plane indicated by the line 4—4 in Fig. 1, looking in the direction of the arrows;

Fig. 5 is a plan view, partly in section, of the parts shown in Fig. 4; and

Fig. 6 is an enlarged sectional elevational view, taken approximately on the plane indicated by the line 6—6 in Fig. 1.

Referring more particularly to the said drawings, 10 indicates generally a clarifying or settling chamber into which the solids-carrying liquid may be introduced in any suitable manner, and having the longitudinal side walls 11 and 12, the end walls 13 and 14, the top wall 15 and the floor 16, all of which are or may be constructed of concrete. Substantially mid-way between the end walls 13 and 14 the floor 16 is provided with a raised transverse pedestal 17 upon which is mounted in suitable bearings 18 the transversely extending shaft 19. The said shaft extends through the side wall 11, a suitable gland or stuffing box 20 being provided to form a liquid-tight joint, and outside of the chamber 10 the said shaft is provided with a sprocket 21 about which passes a chain 22 which also engages a sprocket 23 driven by means of a suitable motor 24 and speed reducing mechanism 25.

Within the chamber the said shaft 19 carries adjacent each of the side walls 11 and 12 a sprocket 26, the teeth of which sprockets engage with rollers 27 suitably journalled between a pair of longitudinally extending bars 28 best shown in Figs. 4, 5 and 6. At each end of each of the pair of bars 28 there is provided the straps 29 which embrace and are rigidly secured to the ends of the transversely arranged suction headers 30. The said headers are thus disposed in tandem relationship one to either side of the pedastal 17 and transverse shaft 19, and the bars 28 are of such length that when the left-hand header 30 is adjacent the pedastal 17 the right-hand header 30 is adjacent the end wall 14, as illustrated in Figs. 1 and 2. As will be readily understood the headers are adapted to be moved over the respective floor areas between the pedastal 17 and the end walls 13 and 14, first in one direction and then in the other, by means of the sprockets 26 which transmit their motion to the rollers 27 and longitudinal side bars 28, as will be readily understood.

The suction headers 30 are hollow as clearly shown in Figs. 4, 5 and 6, and preferably taper from a substantially circular cross section adjacent their mid portions to a reduced elliptical cross section at their ends. Each header is provided in its bottom with a series of holes or apertures 35 affording communication with its interior, and each header is also preferably provided with the pair of spaced longitudinally extending bracing ribs or members 36 brazed, welded or otherwise rigidly secured in substantially parallel spaced relationship to its under face.

At their mid portions the headers 30 are provided with the outlet nipples 37 which receive one end of a flexible conduit or hose 38 which extends upwardly to the swivel connections 39 provided upon the ends of the pipes 40 which project through the side wall 11 from the exterior to the interior of the chamber. The said pipes 40 communicate with the vertical stand pipe 41, suitable valves 42 being provided to control the flow of material from the pipes 40 thereto. Sampling valves 43 may also be provided in each pipe 40 to permit of samples of the material being drawn off for examination. The vertical pipe 41 communicates with a suction pipe 45 which is con-

nected with the suction side of any suitable pump, not shown, by means of which the pressure within the lines 40 and 38 and the headers 30 may be reduced so as to suck the settled solids therethrough, as will be readily apparent.

The driving motor 24 is preferably of the reversible type, and is controlled by means of a suitable reversing switch 50 mounted outside of the chamber, see Fig. 3. The said switch in turn is controlled by means of suitable stops 51 and 52 adapted to engage the arm 53 of the switch as they move in opposite directions, the said stops being carried by a chain or belt 54 which passes around sprockets 55 and 56, the former of which is carried by the drive shaft 19. The parts are so constructed and arranged that the chain or belt 54 moves in timed relationship to the reciprocations of the suction headers 30 so that as they approach their limits of travel within the chamber, the stops or collars 51 and 52 will be alternately brought into engagement with the switch arm 53 to produce reversal in the direction of rotation of the driving motor 24 and consequent reversal of the direction of travel of the suction headers.

The chain or belt 54 is also preferably provided with an indicator 58, which, in conjunction with suitable marks or indicia 59 upon the outer face of the side wall 11, will indicate the location of the headers within the chamber at all times.

Each lower longitudinal corner of the chamber is preferably provided with a metallic angle member 60 which serves as a track for the rollers 27, as will be readily apparent from the drawings.

The clearance between the surface of floor 16 and the under surfaces of the spaced header ribs 36 is such that the latter in conjunction with the headers in effect constitute suction boxes into which the hydrostatic pressure of the liquid tends to force the sludge, from whence it is drawn into the headers 30 through the apertures 35. By reason of the withdrawal of the sludge by suction applied relatively close to the chamber floor, eddy currents such as are created by collectors of the well known scraper type, and which tend to throw low density sediments back into suspension, are avoided. As a result the present apparatus is particularly adaptable to the recovery of sediments having a density only slightly in excess of that of water, and when in use will withdraw sludge having a higher concentration than has been possible with the scraper type of apparatus heretofore commonly employed.

While one form of the invention has been illustrated and described it is obvious that those skilled in the art may vary the details of construction as well as the precise arrangement of parts without departing from the spirit of the invention, and therefore it is not wished to be limited to the above disclosure except as may be required by the claims.

What is claimed is:

1. In clarifying apparatus for solids-carrying liquids, a settling chamber; a plurality of tandem arranged suction heads extending transversely of the chamber substantially from wall to wall thereof and disposed for travel over adjacent longitudinal areas of the floor of said chamber to withdraw settled solids therefrom; members connected to the ends of said heads for maintaining them in spaced relation and supporting them for said travel in proximity to the floor surface; a suction line connected to said heads; and means engaging said spacing members for moving said heads back and forth over said floor areas.

2. In clarifying apparatus for solids-carrying liquids, a settling chamber; a plurality of transverse tandem arranged suction heads extending from wall to wall of said chamber and disposed for travel over longitudinally adjacent areas of the floor of said chamber to withdraw settled solids therefrom; longitudinally extending rigid bar members disposed adjacent said floor and connected to said heads for maintaining them in spaced relation, said members having floor-engaging supporting rolls; a suction line connected to said heads; and drive means engaging said rolls for moving said spacing members and heads back and forth over said floor areas.

3. In clarifying apparatus for solids-carrying liquids, a settling chamber; a plurality of transversely extending tandem arranged suction heads disposed for travel over adjacent areas of the floor of said chamber to withdraw settled solids therefrom; longitudinally extending members connected to the ends of said heads for maintaining them in spaced relation, said members having floor-engaging supporting rolls; a suction line connected to said heads; a drive shaft extending transversely of said chamber intermediate said heads; and sprockets carried by said shaft engaging said rolls for moving said spacing members and heads.

4. In clarifying apparatus for solids-carrying liquids, a rectangular settling chamber; a plurality of suction heads extending substantially from wall to wall of said chamber and disposed for travel over separate adjacent areas of its floor to withdraw settled solids therefrom; means for maintaining said heads in tandem relationship; a suction line having portions extending through a wall of said chamber; flexible conduits connecting said portions with said heads; and a driving wheel mounted in the chamber and directly engaging with the tandem-maintaining means to reciprocate the heads in unison over said floor areas.

5. Solids removing mechanism for clarifying chambers, comprising a plurality of suction heads adapted to be transversely disposed in the chammer for longitudinal reciprocation over adjacent floor areas thereof; members connected to said heads for maintaining them in longitudinally spaced relation, said members comprising spaced longitudinal bars having supporting rolls journalled between them; and flexible conduits leading from said heads, arranged for connection with fixed suction conduits extending outside the chamber.

6. In clarifying apparatus for solids-carrying liquids, a settling chamber; a suction head disposed for travel over the chamber floor to withdraw settled solids therefrom; means for supporting said head in spaced relation to said chamber floor, comprising members secured to the end of the suction head, provided with a series of floor engaging rolls; a suction line connected to said suction head; and means for moving said suction head over the chamber floor, including sprockets mounted in said chamber with their teeth directly engaging and driving said floor engaging rolls.

7. In clarifying apparatus for liquids carrying low-density solids in suspension, a settling chamber; an elongated sediment receiving header having rigid rack-like means including floor-engaging rolls at its ends supporting it for travel over the floor of said chamber in proximity

thereto, whereby settled solids may be transferred to said header by pressure substantially without the creation of eddy currents which would tend to resuspend said solids in the liquid; a sprocket in said chamber adjacent its floor engaging said rack-like supporting means for moving the header over said chamber floor; and means connected with said header for conducting the solids therefrom to the exterior of the chamber.

8. In clarifying apparatus for liquids carrying low-density solids in suspension, a settling chamber; an elongated sediment receiving header in said chamber having an apertured wall and longitudinally extending spaced ribs disposed to either side of the apertures and extending in proximity to the chamber floor to constitute a suction box; means for moving said header over the chamber floor; and a suction conduit connected to said header, whereby settled solids may be drawn into said suction box and header, and transferred to a point outside said chamber.

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