A. W. FRENCH.

APPARATUS FOR SEPARATING SOLID MATTER FROM LIQUIDS.

APPLICATION FILED NOV. 28, 1917.

1,308,943.

Patented July 8, 1919.

2 SHEETS—SHEET 1.

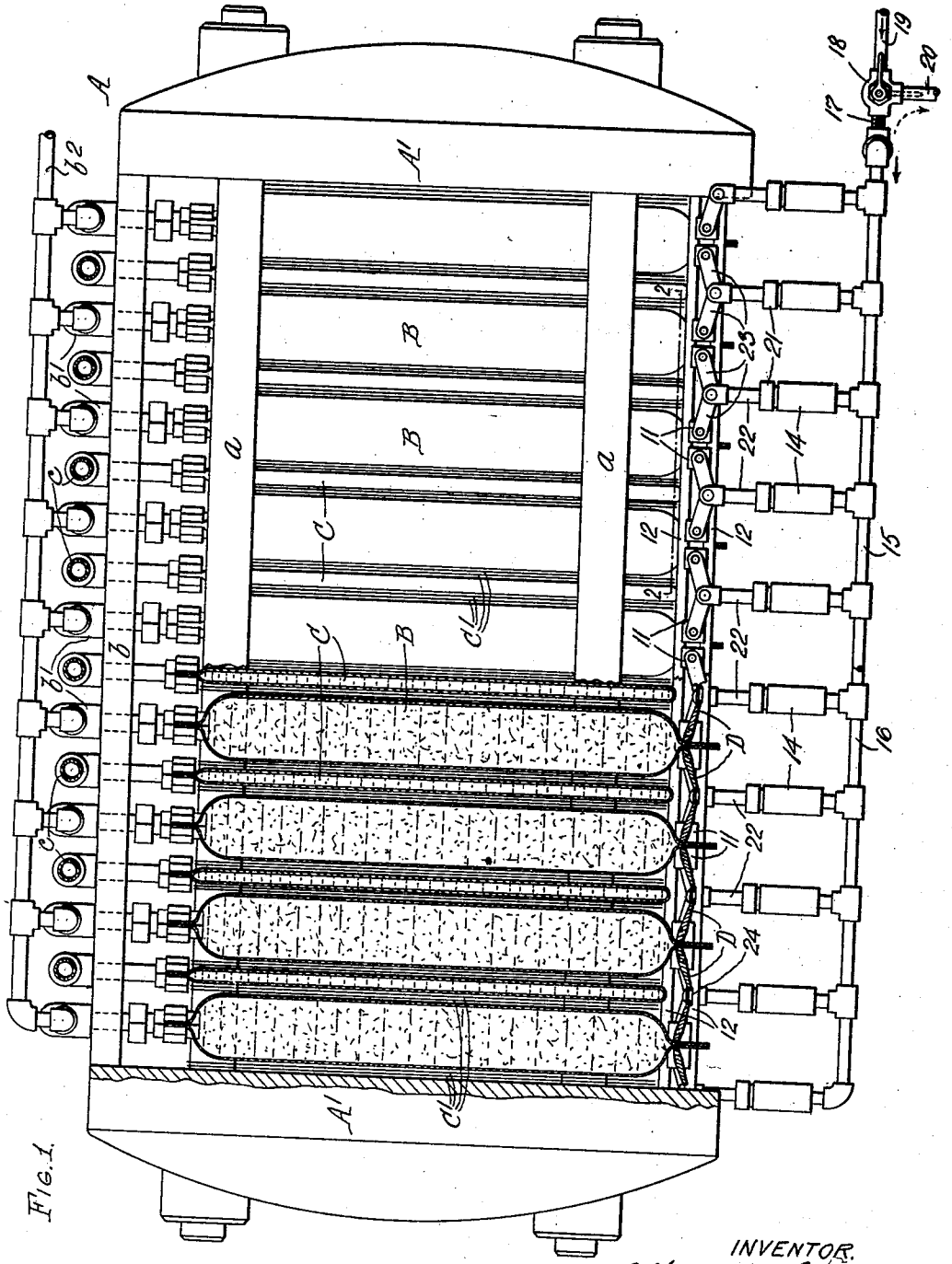


FIG. 1.

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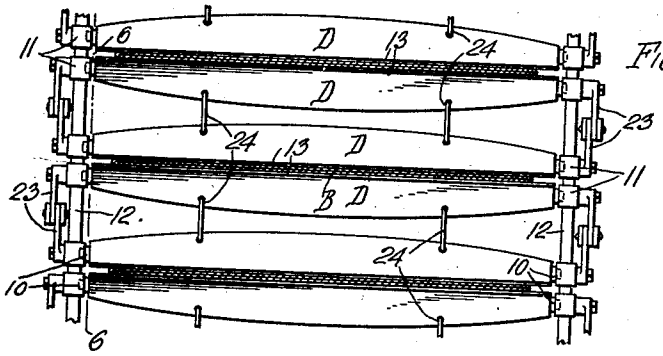


FIG. 2.

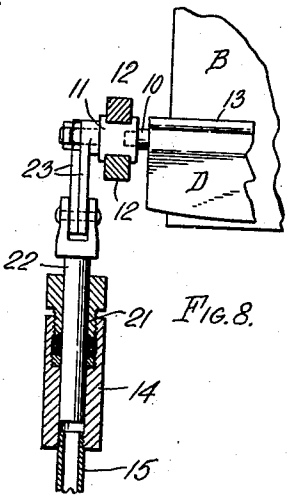


FIG. 8.

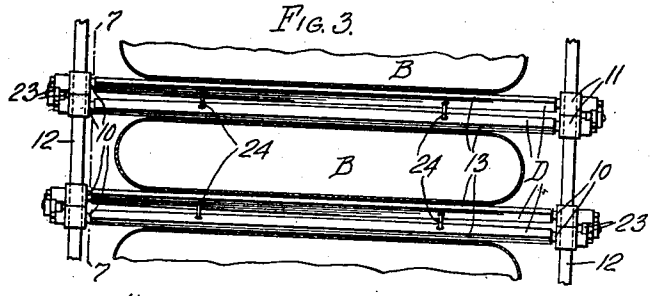


FIG. 3.

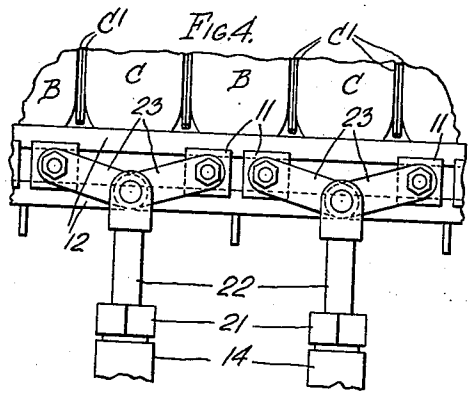


FIG. 4.

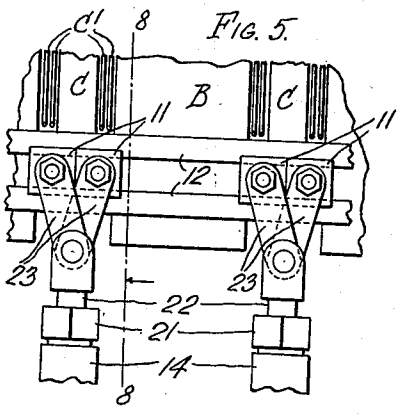


FIG. 5.

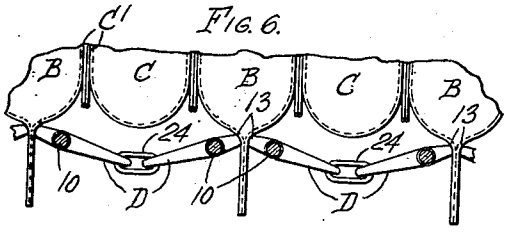


FIG. 6.

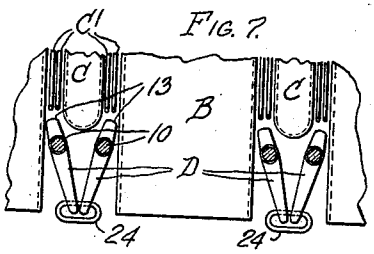


FIG. 7.

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APPARATUS FOR SEPARATING SOLID MATTER FROM LIQUIDS.

1,308,943. Specification of Letters Patent. Patented July 8, 1919.

Application filed November 28, 1917. Serial No. 204,445.

To all whom it may concern:

Be it known that I, ALFRED W. FRENCH, a citizen of the United States, residing at Piqua, in the county of Miami and State of Ohio, have invented a new and useful Improvement in Apparatus for Separating Solid Matter from Liquids, of which the following is a specification.

This invention relates to apparatus for separating the solid matter from sewage sludge or other liquids containing a comparatively small percentage of solid matter, in which the sludge or liquid is introduced into a plurality of compressible bags or containers made of pervious material, which are suspended or arranged in upright position with their open ends lowermost and are subjected to pressure for expressing the liquid, by compression bags or devices arranged between or alternating with the separating bags or containers. More particularly the invention relates to means which are operable for closing the lower ends of the separating bags or containers and for permitting the same to open to drop the solid matter out of the separating bags or containers after the liquid has been expressed from the sludge or material in the bags or containers.

One object of the invention is to provide efficient closing means for the lower ends of the separating containers which can be quickly and easily operated to close or seal the lower ends of the containers and to permit the same to open to freely discharge the solid matter from the containers. Other objects of the invention are to construct the closing means so that the clamping bars or members for the separating containers will move toward and from the containers in such way as not to drag on or conflict with either the separating containers or the compression devices and so that the compression devices can extend practically to the lower ends of the separating containers and insure the proper compression of the material in the lower portions of the containers without interfering with the operation of the closing means; also to construct the closing means so that they will insure the proper complete closing of the separating containers and will occupy little space between the containers when the latter are opened so as to leave ample room for the free discharge of the solid matter from the open lower ends of the containers; also to provide closing means for the containers which are operated by fluid pressure in such a way as to insure the quick and simultaneous opening and closing of the several separating containers; and also to improve the construction of closing means for the separating containers of apparatus of this nature in the other respects hereinafter described and set forth in the claims.

In the accompanying drawings:

Figure 1 is a side elevation, partly in section, of an apparatus for separating solid matter from liquids in which closing means for the separating containers are shown, embodying the invention.

Fig. 2 is a fragmentary horizontal section thereof on line 2—2, Fig. 1.

Fig. 3 is a similar view showing the various parts in a different position.

Fig. 4 is a fragmentary side elevation, on an enlarged scale, of the container closing means.

Fig. 5 is a similar view showing the position of the parts of the closing means when the containers are open.

Fig. 6 is a fragmentary vertical section on line 6—6, Fig. 2, on an enlarged scale.

Fig. 7 is a similar view on line 7—7, Fig. 3.

Fig. 8 is a fragmentary transverse vertical section on line 8—8, Fig. 5.

The separating apparatus shown in the drawings is constructed as follows:

A is a frame comprising opposite relatively fixed pressure resisting heads A′ A′ connected by tie rods *a*. B represents the separating bags or containers made of suitable pervious material, such as canvas, which are suspended transversely of the apparatus between the heads A′ A′ from a centrally disposed supporting bar *b*, with their open ends lowermost, by means of pipe connections or couplings *b′*, and C represents the compression devices, which preferably consist of bags made of impervious material and are suspended between the separating containers from the bar *b* by pipe connections *c*. The pipe connections *b′* connect with a supply pipe b^2 through which the sludge or liquid is introduced into the separating bags, and the connections *c* connect with a suitable pipe (not shown) whereby fluid under pressure is delivered to the compression bags C for compressing the separating bags to express the liquid from the contents thereof.

Suitable means C′, preferably in the form of screens or mats of wire mesh, are supported between the separating bags B and the compression bags C for giving free drainage for the liquid expressed from the material in the separating bags B.

The apparatus as above described, of itself, forms no part of this invention and may be constructed as shown or of any other suitable construction. In operation, after closing the lower ends of the separating bags B the sludge or liquid is pumped into these bags, preferably under sufficient pressure to force a considerable percentage of the liquid out through the pervious walls of the bags. Pressure is then admitted to the compression bags C, which are thus expanded and compress the separating bags and express more liquid from the contents of the latter. After relieving the pressure the lower ends of the separating bags are opened and the solid matter discharged therefrom.

The closing means for the open lower ends of the separating bags B, forming the subject matter of the present invention, preferably consists of a plurality of clamping bars or members D D extending transversely of the apparatus, adjacent to the lower ends of the separating bags, one pair of bars being provided for each bag. These bars or members D are pivoted by means of studs or pintles 10 in bearing members or blocks 11 arranged to slide in suitable horizontal guides 12 arranged at opposite sides of the apparatus. The clamping bars D may be of any suitable form but are preferably made of the truss shape shown, with their greatest width substantially midway between their ends, as shown in Fig. 2, thereby preventing the bars from springing or bending between their ends in operation and thus insuring the proper clamping and closing of the bags throughout their entire width. The bars are provided with straight gripping edges 13 adapted to engage the bags. The bars D are adapted to be moved toward and from each other and to be swung from the substantially vertical position, shown in Fig. 7, in which position the bottoms of the separating bags will be opened to their widest extent, into the substantially horizontal position, shown in Figs. 1, 2 and 6, in which position the lower end of each separating bag is clamped between the adjacent edges of the clamping bars on opposite sides of the bag. The means shown in the drawings for thus operating the clamping bars are constructed as follows:

14 represents a plurality of cylinders arranged at opposite sides of the apparatus and connected with pipes 15 and 16 which are connected to a common pipe line 17 leading from a three-way valve 18. The valve 18, in the position shown in Fig. 1, supplies fluid under pressure to the lower ends of the cylinders 14 from a supply line 19, and in its other position, shown in dotted lines, permits the discharge of the fluid from the cylinders 14 through a pipe 20. Each of the cylinders 14 may consist of a piece of pipe provided at its upper end with a packing gland 21 through which a piston or plunger 22 extends into the cylinder. Each plunger is provided at its upper end with a fork or member to which is pivoted a pair of toggle links 23. These toggles are connected at their outer or opposite ends to the slidable bearing blocks 11. The clamping bars D are shown as being loosely connected together in pairs between the lower ends of the separating bags B by links or shackles 24 for a purpose that will presently appear. When fluid pressure is applied to raise the pistons 22 from their lowermost position, shown in Fig. 5, to their uppermost position, shown in Fig. 4, the toggles connected to each of said pistons will be straightened and force the slide blocks 11 in opposite directions away from each other, thus forcing the clamping bars D which are located on opposite sides of each separating bag toward each other. As the bars D are connected by links 24 as explained, the bars when forced apart will swing on their pivots from a substantially vertical position to a substantially horizontal position, and will grip the lower ends of the separating bags securely between their cooperating edges 13 and hold the bags closed. The pivots of the clamping bars are preferably located on the ends of the bars near the inner or gripping edges 13. Consequently when the bars are operated to close the bags the edges 13 will swing downwardly against the sides of the bags, thus preventing any tendency on the part of the bags to wrinkle, and they will be evenly and securely closed across their entire width. But the swinging motion of the gripping edges of the bars is so slight on account of their proximity to the bar pivots that they will not pull on the separating bags enough to tear or injure them, and the bulging lower portions of the bags will not engage the bars and interfere with the opposite or opening movement thereof. On account of the described construction of the clamping bars D it is possible to make the compression bags C of substantially the same length as that part of the separating bags B which is filled with the material to be treated, thus insuring the proper compression of the material in the lower parts of the separating bags.

The truss or plate-like form of the clamping bars makes them very rigid in the direction of their greater width, and precludes them from springing between their ends and thus preventing a proper closure of the bags. Nevertheless, when the bars are in their released vertical positions they occupy little lateral space and permit the wide opening of

the lower ends of the separating bags and the free discharge of the solid matter from the bags.

The closing means constructed as described is very simple to manufacture, is strong and efficient in operation, and allows the separating bags to open quickly to their full extent to discharge the solid material.

Obviously clamping bars arranged to move toward and from each other and swing or rock from more or less vertical to more or less horizontal positions for the purpose described, could be mounted and actuated in various other ways without departing from the spirit of this invention.

I claim as my invention:

1. In an apparatus for separating solid matter from liquids, the combination with a plurality of compressible separating containers having open lower ends, and pressure devices alternating therewith, of members movable bodily laterally relatively to each other independently of said pressure devices for closing the lower open ends of said containers and permitting the opening of the same to allow the solid matter to discharge therefrom.

2. In an apparatus for separating solid matter from liquids, the combination with a plurality of separating containers having pervious walls and open lower ends, of members adjacent said lower ends of said containers, and movable bodily laterally toward and from each other for closing the lower ends of said containers and permitting the opening of the same to allow the solid matter to discharge therefrom.

3. In an apparatus for separating solid matter from liquids, the combination with upright separating containers for liquid material having open lower ends, and means for subjecting the contents of said containers to pressure for separating liquid therefrom, of members movable bodily toward and from each other independently of said pressure means for closing and permitting the opening of the lower ends of said separating containers.

4. In an apparatus for separating solid matter from liquids, the combination with a plurality of upright separating containers having open lower ends, of members movable bodily toward and from each other to close and permit the opening of the lower ends of said containers, said members being pivoted to occupy a substantially horizontal position when closing the open ends of said containers and to swing to a substantially vertical position to permit the opening between them of the ends of said containers to discharge the solid matter from the containers.

5. In an apparatus for separating solid matter from liquids, the combination with a plurality of separating containers having open lower ends, of relatively wide thin bars pivoted to swing from a substantially vertical position to a substantially horizontal position, and movable bodily toward and from each other for closing and permitting the opening of the lower ends of said containers.

6. In an apparatus for separating solid matter from liquids, the combination with a plurality of separating containers having open lower ends, of substantially flat bars, slides in which said bars are pivoted at their ends, said slides being movable toward and from each other, and means for moving said slides and said pivoted bars toward and from each other for closing and permitting the opening of the lower ends of said containers.

7. In an apparatus for separating solid matter from liquids, the combination with a plurality of separating containers having open lower ends, of substantially flat bars, slides in which said bars are pivoted at their ends, said slides being movable toward and from each other, toggles connected to said slides, and means for actuating said toggles to move said slides and said pivoted bars toward and from each other for closing and permitting the opening of the lower ends of said containers.

8. In an apparatus for separating solid matter from liquids, the combination with a plurality of separating containers having open lower ends, of substantially flat bars, slides in which said bars are pivoted at their ends, said slides being movable toward and from each other, toggles connected to said slides, means for actuating said toggles to move said slides and said pivoted bars toward and from each other for closing and permitting the opening of the lower ends of said containers, and links loosely connecting said pivoted bars between the ends of said separating containers to cause the bars to assume a substantially horizontal position when closing said containers and a substantially vertical position at the sides of said containers to allow said containers to open to their full extent.

9. In an apparatus for separating solid matter from liquids, the combination with a plurality of separating containers having open lower ends, of substantially flat bars, slides in which said bars are pivoted at their ends, said slides being movable toward and from each other, toggles connected to said slides, and fluid pressure operated means for actuating said toggles to move said slides and said pivoted bars toward and from each other for the purpose set forth.

10. In an apparatus for separating solid matter from liquids, the combination with a plurality of separating containers having open lower ends, of substantially flat bars, slides in which said bars are pivoted at their ends, said slides being movable toward and

from each other, toggles connected to said slides, and fluid pressure operated means for actuating said toggles to move said slides and said pivoted bars toward and from each other for the purpose set forth, said fluid pressure operated means consisting of a plurality of plungers connected to said toggles, a cylinder in which each of said plungers works, and means for supplying fluid pressure to said cylinders to actuate said plungers.

Witness my hand, this 23rd day of November, 1917.

ALFRED W. FRENCH.

Witnesses:
FRANCES McCOY,
R. M. DONOVAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."