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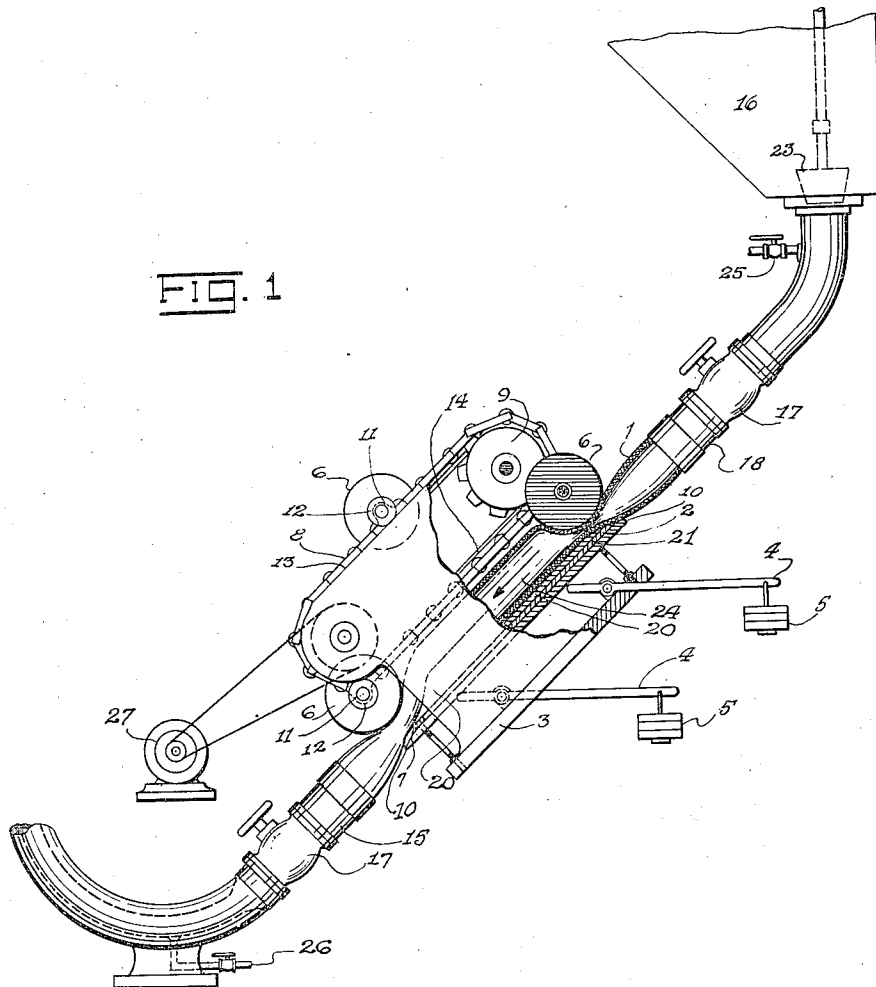
2,466,618

PUMP SUITABLE FOR MOVING SLUDGES AND THE LIKE

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2 Sheets-Sheet 1

FIG. 1



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2 Sheets-Sheet 2

FIG. 2.

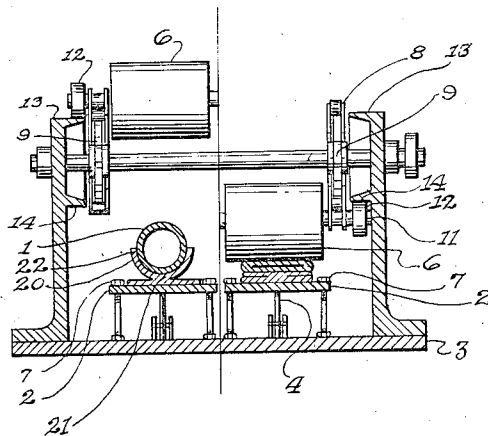
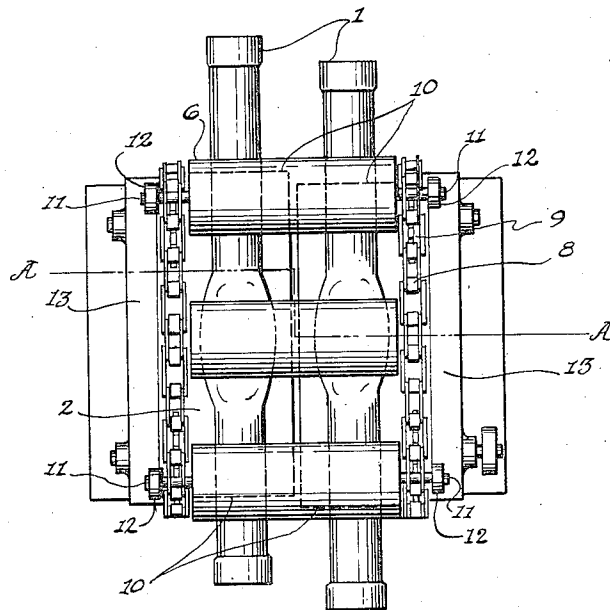


FIG. 3



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AND THE LIKERonald Kingsley Stocks, Johannesburg,
Transvaal, Union of South AfricaApplication August 14, 1946, Serial No. 690,395
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9 Claims. (Cl. 103—149)

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This invention relates to pumps which are particularly suitable for use in moving sludges, slimes, and other fluids carrying a large amount of solids.

The object of this invention is to provide a pump in which the pressure chamber is collapsed progressively, and continuously in the direction of the flow of the material being pumped. A further object is to provide a structure in which a portion of the pipe line conveying the material to be pumped is flattened by means of a chain of rollers travelling in the direction of the desired flow through the pump. Further objects of the invention are to provide in the structure for the regulation of the flattening of the pressure chamber; for anchoring said chamber against creep while allowing it to be turned to even out wear; and for the clearing of or the lubrication of the pressure chamber and the pipe line associated therewith.

According to this invention the pumping action is performed by squeezing progressively and continuously successive portions of the material to be pumped through a limited length of the pipe line. In a structure providing such action the portion of the pipe adapted to be collapsed and forming the pressure chamber for this pump may be carried so as to lie in the path of one or more rotating arms or rollers carried by a suitable mechanism and adapted to squeeze or collapse the pipe. Alternatively and preferably the pressure chamber of the pump consists of a length of tubing made of flexible and elastic material such as reinforced rubber which may be flattened under pressure by a roller and will tend to recover its tubular shape once the roller has passed. Thus there may be provided a series of rollers mounted on an endless chain and confined to a path during the passage of which said rollers are made to flatten the tube which is suitably mounted on a support capable of resisting the pressure of the rollers.

A plurality of tubes and rollers working in parallel and mutually connected may be provided so that any tube or tubes may be cut out or replaced in case of necessity without stopping the fluid supply moved by the pump.

An embodiment of the invention is illustrated in the accompanying drawings in which:

Fig. I shows the pump and a part of the pipe line in elevation with parts broken away.

Fig. II is a sectional elevation on the line A—A in Fig. III, but with the position of the rollers varied on the right and left side.

Fig. III is a plan view of the pump mechanism.

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In the drawings the pressure chamber of the pump consists of the resiliently deformable tube or pipe 1 supported on a platform 2. The platform 2 is as shown carried on a base 3 by means of levers 4 carrying weights 5, so that pipe 1 is held up to and supported against the pressure of the operating rollers 6 hereafter described. It is obvious that the levers 4 and the weights 5 may be replaced by other suitable means such as hydraulic jacks or springs, but for the purpose of illustration the simple construction with levers 4 have been used. The upward lift of platform 2 is, however, limited to limit in turn the flattening of the pipe 1, and for this purpose in the construction shown, adjustable stops 7 are provided (Fig. II) which limit the movement of levers 4 to press up platform 2. Said stops also serve to anchor platform 2 to base 3. 8 are endless chains driven through sprockets 9. The chain illustrated carries three rollers 6 placed at equal distances, on the chain 8, so that the distance between them is equal to the distance on the pipe 1, through which they travel to deform the latter.

To avoid shock the ends 10 of the platform 2 are bevelled so that the rollers 6, compress and release the pipe 1 gradually. In Fig. III it will be seen also that the ends 10 of the platform 2 for each pipe 1 are not in line, but are staggered so that the working and the discharge of the pump with a plurality of pressure chambers will be more even. The spindles 11 of the rollers 6 carry wheels 12 which run on fixed tracks 13, so that the chains 8 and the rollers 6 are confined to a predetermined path. A portion 14 of track 13 makes the rollers 6 travel parallel with the axis of pipe 1 and forces them to deform the pipe 1 as shown. It should be noted, however, and as clearly indicated in Fig. I, that the length of platform 2 in relation to the pitch of the rollers 6 is such that the pipe 1 is never completely flattened or closed by two rollers 6 at the same time. This provision is found to be advisable to avoid excessive pulsations in the passage of the fluid through the pump.

It will be understood that this deformation or squeezing action of the rollers on the pipe 1 travels along it in the direction of the passage of the rollers 6 that is in the direction of the arrow Fig. I. The fluid in the pipe 1 is squeezed forward in the pressure chamber continuously by a succession of rollers 6. By the time one roller 6 releases the pipe 1 at the end of platform 2 another roller 6 in the series on the chain 8 has started to deform pipe 1 and starts to squeeze before it the fluid therein. By regular and continuous movement of the chain 8 a continuous

stream of fluid is squeezed through the pipe 1 to be discharged into the outlet pipe 15 to which it is attached.

16 is the fluid supply for the pump. Usually it is advisable to place this above part 14 so that the pump is fed by gravity and does not require to rely on check valves. Shut-off cocks 17 at the inlet and outlet of pipe 1 may be inserted so as to cut off the fluid in case it is necessary to remove or repair pipe 1.

Pipe 1 is retained in position longitudinally in relation to platform 2 by its attachment to the inlet 18 and outlet 15 of the pump. Further it may be more securely anchored to platform 2 in any suitable manner. A convenient method for doing this is to provide the pipes 1 with saddle pieces 20, each having a flat base 21 fastened to platform 2 and having also the upper portion in the form of a trough 22 as shown in the left-hand portion of Fig. II. The saddle is made of resilient rubber-like material so that it will flatten out to conform to the shape of the pipe 1 when it passes beneath the roller 6 as shown in the right of Fig. II. The outer surface of the pipe 1 and the surface of the trough 22 may be left rough or specially made rough so that there will be sufficient frictional contact between them to resist the tendency of the pipe 1 to creep under the passage of the rollers 6.

In operation the fluid in supply sump 16 is allowed to pass to the pump chamber 1 by opening the plug 23, Fig. I, cocks 17 being open. The chain sprockets 9 are rotated by a motor 27 or other source of power and the rollers 6 move along pipe 1 in the direction of the arrow Fig. I. The fluid in the pipe follows up roller 6 and when the latter approaches the end of its travel along part 14 of guide 13 that is in the lower straight part of its path, the tube 1 over platform 2 is filled with fluid which has flowed into position partly by gravity and partly by the reduction of pressure left in the cavity in pipe 1 behind the roller 6 as pipe 1 reforms to its circular section. The second roller 6 of the series now approaches the top end of platform 2 and pipe 1, while the roller 6 in front of it leaves the bottom end of platform 2. Continued movement of chain 8 brings the rollers 6 into the position shown in Fig. I and the fluid moves forward in part 24 of pipe 1 between the two rollers 6. Further movement of the chain 8 carries the bottom roller 6 up and completely out of contact with pipe 1 and the fluid in part 24 is forced forward in pipe 1 by the flattening action of the following roller 6 of the series.

In this manner the fluid which may be material such as brewers mash, slimes in an ore treatment plant, and similar fluidized solids is pumped from the inlet 16 to the outlet 15. If it is desirable to increase the velocity of the fluid in the outlet portion of the pipe line to prevent settlement or otherwise the outlet pipe 15 may have a smaller bore than pipe 1 as shown in Fig. I. It will be noted from Fig. I that the pump is set at an angle to the horizontal so that heavy or viscous material to be pumped will be fed by gravity thereto. However, there is no reason why in moving most fluids containing solids the pump should not be set horizontal. It is however, very desirable to have inlet 16 raised so that the pump is fed by gravity.

25 is an inlet for liquid or air under pressure which may be used to assist in moving stoppages or for lubricating the passage of the material through pipe 1 when necessary or for filling the

pump with clear fluid in case of a stoppage. 26 is a plug used for the removal of stoppages or for draining the pump and outlet in case of a shut down.

The pump is a continuous displacement pump due to the continuous and progressive collapsing of its pressure chamber. The momentum of the fluid through the pump is unidirectional and continuous, the flow is practically steady since it is never completely checked by a roller and there are no valves required in the working of the pump.

What I claim as new and desire to secure by Letters Patent is:

1. A pump for moving fluids consisting of a pressure chamber which is collapsed progressively and continuously, comprising a resilient deformable tube, a series of rollers traversing the tube longitudinally to compress it radially, a resiliently mounted platform carrying the deformable tube, a stop limiting the movement of the platform towards said rollers, a continuous chain carrying the series of rollers, guides for controlling the path of said rollers, a portion of said guides fixed parallel to the axis of the deformable tube, the pitch between the rollers on the chain being equal between each pair of rollers and greater than the part of the resiliently mounted platform parallel to the axis of the tube and connections joining the tube to the source of fluid supply and to the outlet of the pump.

2. A pump for moving fluids consisting of a pressure chamber which is collapsed progressively and continuously, comprising a resilient deformable tube, a member traversing the tube longitudinally to compress it radially, a resiliently mounted platform below the deformable tube, mountings for the platform holding the platform in position against the member compressing the tube, deformable rubber-like saddle pieces between the deformable tube and the resiliently mounted platform, and connections joining the tube to the source of fluid supply and to the outlet of the pump.

3. A pump for moving fluids consisting of a pressure chamber which is collapsed progressively and continuously, comprising a resilient deformable tube, a series of rollers traversing the tube longitudinally to compress it radially, a resiliently mounted platform carrying the deformable tube, a stop limiting the movement of the platform towards said rollers, a continuous chain carrying the series of rollers, guides for controlling the path of said rollers, a portion of said guides fixed parallel to the axis of the deformable tube, the pitch between the rollers on the chain being sufficiently long to prevent any two consecutive rollers fully flattening the deformable tube at the same time, and connections joining the tube to the source of fluid supply and to the outlet of the pump.

4. A pump for moving fluids consisting of a pressure chamber which is collapsed progressively and continuously as claimed in claim 1 in which the series of rollers consists of three individual rollers.

5. A pump for moving fluids consisting of a pressure chamber which is collapsed progressively and continuously, comprising a resilient deformable tube, a member traversing the tube longitudinally to compress it radially, a resiliently mounted platform below the deformable tube, loaded pivoted levers for the platform pressing it towards the member compressing the tube and connections joining the tube to the

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source of fluid supply and to the outlet of the pump.

6. A pump for moving fluids consisting of a pressure chamber which is collapsed progressively and continuously, comprising a resilient deformable tube, a member traversing the tube longitudinally to compress it radially, connections joining the tube to the source of fluid supply and to the outlet of the pump, and connections at the inlet and outlet ends of the tube for admitting cleaning fluid to the pump chamber.

7. A pump for moving fluids carrying solids consisting of a pressure chamber which is collapsed progressively and continuously, comprising a resilient deformable tube, a series of rollers traversing the tube longitudinally to compress it radially, a resiliently mounted platform carrying the deformable tube, a stop limiting the movement of the platform towards said rollers, a continuous chain carrying the series of rollers, guides for controlling the path of said rollers, a portion of said guides fixed parallel to the axis of the deformable tube, the pitch between the rollers on the chain being sufficiently long to prevent any two consecutive rollers fully flattening the deformable tube at the same time, an inlet for the deformable tube, a source of fluid supply at a higher level than the pump, a connection joining the inlet to the fluid supply, and an outlet for the deformable tube positioned at a lower level than its inlet said outlet being smaller in diameter than the inlet.

8. A pump for moving fluids consisting of a pressure chamber which is collapsed progressively and continuously, comprising a resilient deformable tube, a series of rollers traversing the tube longitudinally to compress it radially, a platform carrying the deformable tube while being traversed by said rollers, a continuous chain carrying the series of rollers, guides for controlling the path of said rollers, a portion of said guides

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fixed parallel to the axis of the deformable tube, the pitch between the rollers on the chain being equal between each pair of rollers and greater than the part of the platform parallel to the axis of the tube and connections joining the tube to the source of fluid supply and to the outlet of the pump.

9. A pump for moving fluids carrying solids consisting of a pressure chamber which is collapsed progressively and continuously, comprising a resilient deformable tube, a series of rollers traversing the tube longitudinally and in a straight path to compress it radially, a platform supporting the deformable tube while being traversed by said rollers and at an angle to the horizontal, a continuous chain carrying the series of rollers, guides for controlling the path of said rollers, a portion of said guides fixed parallel to the axis of the deformable tube, the pitch between the rollers on the chain being sufficiently long to prevent any two consecutive rollers fully flattening the deformable tube at the same time, an inlet for the deformable tube, a source of fluid supply at a higher level than the pump, a connection joining the inlet to the fluid supply, and an outlet for the deformable tube positioned at a lower level than its inlet said outlet being smaller in diameter than the inlet.

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