March 29, 1932. G. E. KEENE 1,851,186

SAND AND GRAVEL CLEANER

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Fig. 1.

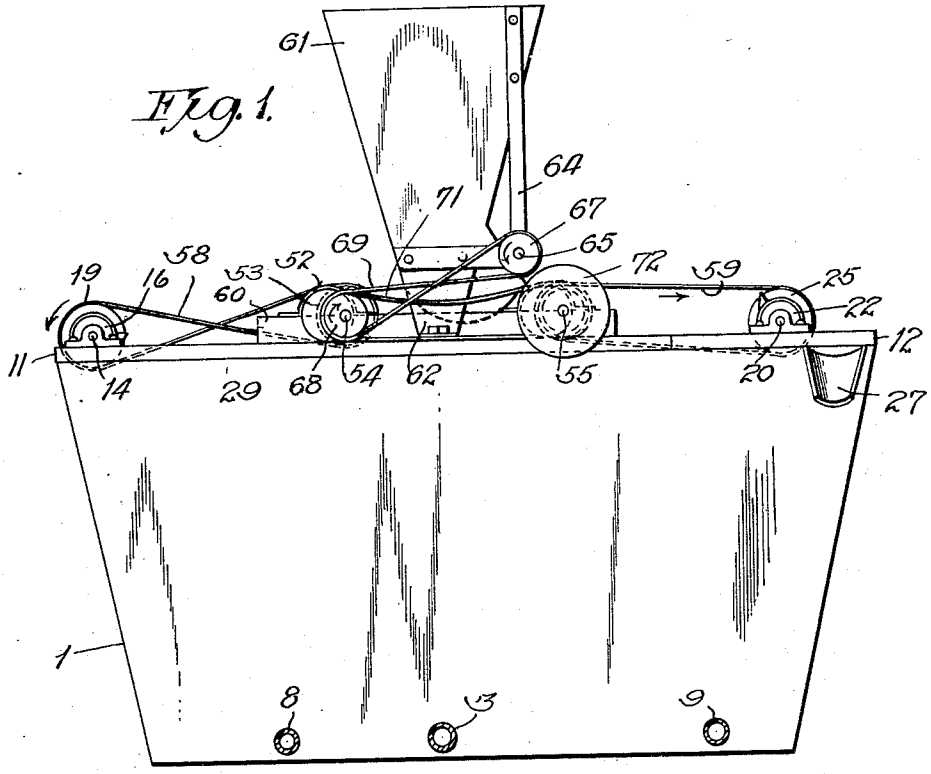
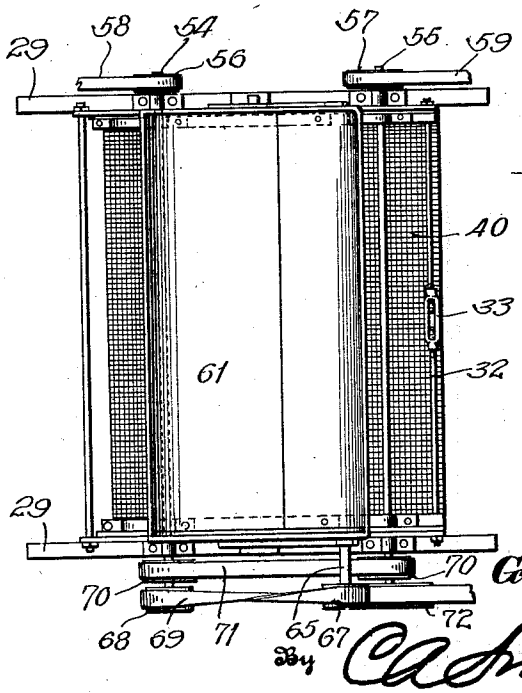


Fig. 2.



Inventor

G. E. Keene

By A. Snow & Co.

Attorney

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Fig. 3.

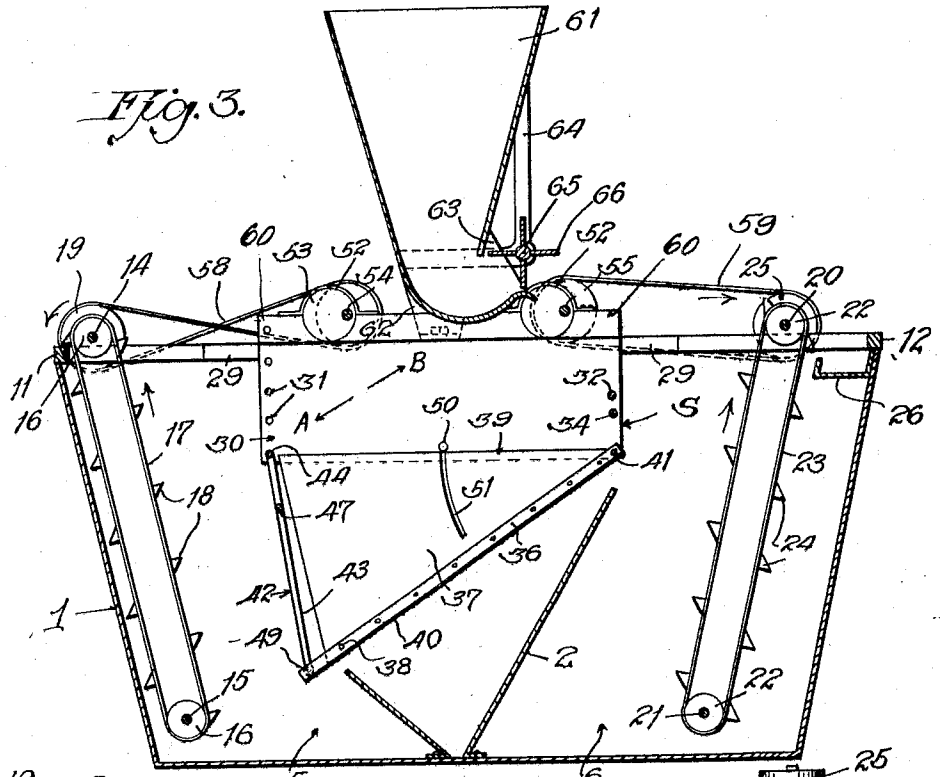

Fig. 4.

Inventor

G. E. Keene

By C. A. Snow & Co.

Attorneys.

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Fig. 5.

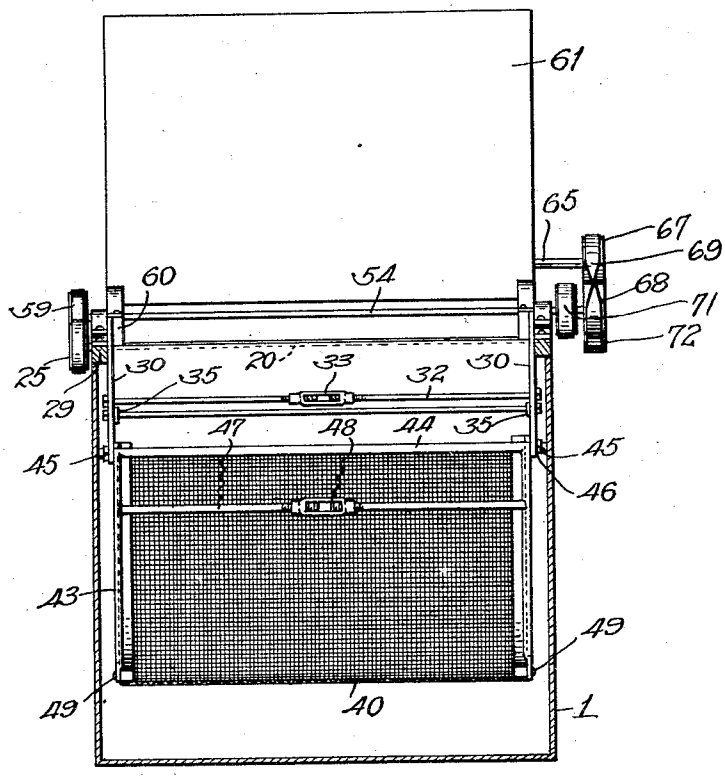
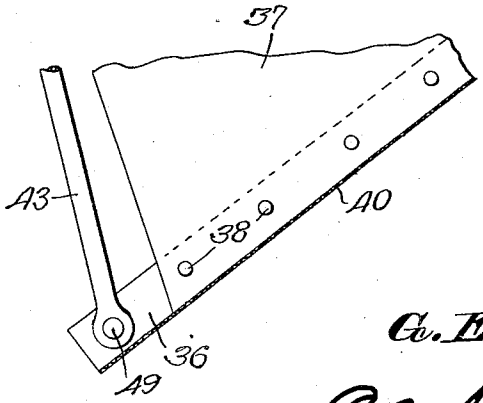


Fig. 6.



Inventor

G. E. Keene

By C. A. Snow & Co.

Attorneys.

Patented Mar. 29, 1932 1,851,186

UNITED STATES PATENT OFFICE

GEORGE E. KEENE, OF MANKATO, MINNESOTA

SAND AND GRAVEL CLEANER

Application filed November 9, 1928. Serial No. 318,200.

This invention aims to provide a novel means whereby materials having relatively different sinking characteristics, such as those of shale and gravel can be separated.

It is within the province of the disclosure to improve generally and to enhance the utility of devices of that type to which the invention appertains.

With the above and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that, within the scope of what is claimed, changes in the precise embodiment of the invention shown can be made without departing from the spirit of the invention.

In the accompanying drawings:—

Figure 1 shows in side elevation, a device constructed in accordance with the invention, parts being broken away;

Figure 2 is a top plan of the removable frame which carries the separator;

Figure 3 is a vertical longitudinal section;

Figure 4 is a top plan wherein the separator has been removed;

Figure 5 is a vertical transverse section;

Figure 6 is a detail showing a part of the separator.

In carrying out the invention, there is provided a liquid-containing tank 1, open at the top. A hopper 2 extends across the tank 1 from side to side. In one side of the tank 1 there is a pipe 3 which forms a flushing outlet for the hopper 2. A valve 4, under the control of an operator, is interposed in the pipe 3, and is located outside of the tank 1. The hopper 2 forms a compartment 5 at one end of the tank, and a compartment 6 at the opposite end of the tank, as shown in Figure 3 of the drawings. By this or/and equivalent means, the components of the material are separately collected as they pass over the opposite, free, discharge edges of the screen 40. Water or other liquid is admitted to the tank 1 through a pipe 7 at one side of the tank. The pipe 7 communicates with the compartment 5. A valve 8, under the control of an operator, is interposed in the pipe 7, and is located outside of the tank. A pipe 9 is mounted in the side of the tank 1 and communicates with the compartment 6. A valve 10, under the control of an operator, is mounted in the pipe 9, and is located outside of the tank 1. The pipe 9 is a flush pipe for the compartment 6.

On one end of the tank 1 a fixed frame 11 (Figure 4) is mounted, and on the opposite end of the tank 1 there is a fixed frame 12. A shaft 14 is supported for rotation on the frame 11. A shaft 15 is supported for rotation on the sides of the tank 1, the shaft 15 being disposed near to the bottom of the tank. The shafts 14 and 15 carry pulleys 16 about which are engaged conveyor belts 17 carrying buckets 18. It may be here remarked that wherever, throughout this specification, belts and pulleys are alluded to, it is permissible to substitute sprocket wheels and sprocket chains, this being a detail within the skill of any mechanic and calling for no specific illustration. The term "belt connection", therefore, is to be construed to include a chain and sprocket drive if the builder prefers to resort to that construction. On one end of the shaft 14 there is a pulley 19.

On the frame 12 a shaft 20 is supported for rotation. A shaft 21 is supported for rotation in the sides of the tank 1 and is disposed near the bottom of the tank. Pulleys 22 are mounted on the shafts 21 and 20. About the pulleys 22 are engaged conveyor belts 23 carrying buckets 24. On one end of the shaft 20 there is a pulley 25. The belt conveyor 24—23 discharges into a trough 26 at one end of the tank 1, the trough 26 having an outlet spout 27. The trough 26 is low enough at one side so that the water in the tank 1 can overflow into the trough and run out through the spout 27.

In the space 28 (Figure 4) between the frames 12 and 11, is located a removable frame including sills 29 (Figures 2 and 1) that rest on the upper edges of the tank 1. A pair of side plates 30 are secured to side bars 60, located inwardly of and above the sills 29, as shown in Figure 5. The plates 30, at one end, are provided with openings 31, disposed one above the other, as Figure

3 will show. The plates 30 have some resiliency, and they are connected at one end by a draw rod 32 in which a turnbuckle 33 is interposed. The side plates 30 are connected below the rod 32 by another rod 34 which has fulcrum shoulders 35 that engage the inner surfaces of the side plates 30.

The numeral 36 designates a pair of bars that form part of a screen support. Lower side plates 37 are secured at 38 to the bars 36. The upper edges of the lower side plates 37 overlap the lower edges of the upper side plates 30, as indicated at 39 in Figure 3 of the drawings. The bars 36 are connected by a fine mesh metal screen 40. The screen 40 is held at a substantially longitudinal inclination, less than the critical angle, that is, at the angle at which the material will move longitudinally of the screen, due to the weight of the material. The upper ends of the bars 36 swing for adjustment on pivot elements 41 that are mounted in the overlapped parts 39 of the side plates 30 and 37.

The numeral 42 designates, generally, a suspension frame including side pieces 43, connected by a top rod 44 terminating in studs 45 adapted to be mounted, for adjustment, in any of the openings 31 that are formed in the side plates 30. Nuts 46 are threaded on the studs 45 and engage the side plates 30 to hold the studs in place in the side plates. The side pieces 43 of the suspension frame 42 have inwardly extended arms 47 (Figure 5) connected by a turnbuckle 48. The lower ends of the side pieces 43 of the suspension frame 42 are pivotally mounted at 45 on the bars 36 that carry the screen 40. Clamping bolts 50 are mounted in the side plates 30 and are adjustable in arcuate slots 51 which are formed in the lower side plates 37. The side plates 37 and 30, together with parts associated therewith, constitute a rotary separator screen assembly S having a foraminous bottom, represented by the screen 40, it being possible to adjust the angle of the screen or bottom 40 by engaging the studs 45 of the suspension frame 42 in the openings 31 of Figure 3, in a way which will be described hereinafter. It will be noted that the screen 40 has an unobstructed surface, and free discharge edges at opposite ends.

It has been stated hereinbefore that the machine includes a rotary screen separator assembly, and the means for rotating the same will now be described.

Straps 52 are carried by the side bars 60, and eccentrics 53 turn within the straps 52. The eccentrics 53 are mounted on shafts 54 and 55 that are journaled for rotation on the sills 29. There is a pulley 56 on the shaft 54, and the shaft 55 carries a pulley 57. A belt 58 connects the pulley 56 with the pulley 19 on the shaft 14 of Figure 4. A belt 59 connects the pulley 57 with the pulley 25 on the shaft 20 of Figure 4. The belt 58 is a crossed belt.

A hopper 61 is supported at 62 on the sills 29. The hopper 61 has a side outlet 63, and bearing brackets 64 are carried by the hopper. In the brackets 64 is journaled a shaft 65, forming a part of a rotary feeder, including blades 66 carried by the shaft and operating in the outlet 63 of the hopper 61. There is a pulley 67 on the shaft 65, a pulley 68 being mounted on the shaft 54. A belt 69 is engaged about the pulleys 68 and 67. The shafts 54 and 55 carry pulleys 70 engaged by a belt 71. The numeral 72 marks a drive pulley on the shaft 55.

Suppose that the machine is handling gravel mixed with a lighter material, such as shale, and that it is desired to get rid of the shale. The mixture of gravel and shale is cast into the hopper 61. The rotary feeder 66—65 carries the mixture of gravel and shale out of the outlet 63 of the hopper 61, and the mixture of gravel and shale drops into the rotary screen separator assembly, which, for convenient identificaion, is marked generally by the letter S. The screen separator S has a compound movement, in that it moves vertically, and also forwardly, as indicated by the arrow A in Figure 3, and backwardly, as indicated by the arrow B in Figure 3. The tank 1 is filled with water, and the screen separator S moves in the water in the tank. When the screen separator moves upwardly the mixture of shale and gravel is carried upwardly in the water. The gravel is somewhat heavier than the shale and finds its way back on the screen 40 more quickly than does the shale. The heavy gravel gets back on the screen 40 as the screen is moving in the direction of the arrow A in Figure 3, and by the time that the lighter shale settles downward on the screen 40, the screen is moving in the direction of the arrow B in Figure 3. The result is that the gravel tends to move down the screen 40 into the compartment 5, and the lighter shale tends to move upward along the screen 40 into the compartment 6. The gravel, thus, is separated from the shale. The screen 40 has a full orbital bodily movement in a vertical plane longitudinally of the screen, and means is provided for holding the screen wholly below the liquid surface at all stages of movement.

The conveyors 17—18 take the gravel upwardly in the compartment 5 and deposit the gravel outside of the tank 1 at one end of the tank. The conveyors 23—24 take most of the shale and carry it over into the trough 26. Water is running into and out of the tank all of the time, a supply of water being furnished through the pipe 7, and as the water runs out of the trough 26, through the spout 27, most of the shale and refuse matter are washed away. Anything that happens to settle in the compartment 6, however, can be

flushed out of the pipe 9 by opening the valve 10. Any fine stuff that works downwardly through the screen 40 is caught in the hopper 2, and can be flushed out through the pipe 3 by opening the valve 4.

The general operation of the machine has been discussed, and it remains first to explain the drives, and then the adjustments.

As to the drive, rotation is imparted to the shaft 55 by way of the pulley 72. From the shaft 55, rotation is imparted to the shaft 54 by the pulley 70 and the belt 71. When the shafts 54 and 55 are rotated, the eccentrics 53 impart a rotary movement to the screen separator assembly S. From the shaft 54, rotation is imparted to the shaft 14 by the pulley 56, the belt 58, and the pulley 19. From the shaft 55, rotation is imparted to the shaft 20 by way of the pulley 57, the belt 59, and the pulley 55. The shaft 14 operates the pulleys 16, and thereby the belt conveyor 17—18 is operated. The shaft 20 turns the pulleys 22, and thereby the belt conveyor 23—24 is operated.

As to the adjustments, the studs 45 of the suspension frame 42 may be engaged in any of the openings 31 in the plates 30 (Figure 3), thereby to adjust the angle of the screen 40. During this adjustment, the bolts 50 move in the slots 51 of the side plates 37, and the bolts 50 may be tightened up to aid in holding the plates 37 and 30 together after the necessary adjustment has been made. At this point refer to Figure 5.

By rotating the turnbuckle 48, the side pieces 43 of the suspension frame may be sprung apart at their lower ends so as to stretch the screen 40 transversely, and render it taut. This takes place at the lower end of the screen 40. As to the operation at the upper end of the screen 40, the turnbuckle 33 may be rotated to spring the upper portions of the side plates 30 inwardly at their upper edges, the lower edges of the plates moving outwardly, because the plates fulcrum on the shoulders 35 of the rod 34. The amount of movement necessary to tighten the screen 40 is very slight, and the side pieces 43 of Figure 5 and the plates 30 have resiliency enough so that the tightening operations can be carried out.

I claim:—

1. In a machine for separating materials having relatively different sinking characteristics, such as those of shale and gravel, a liquid-containing tank, a screen in the tank, means for imparting full orbital bodily movement in a vertical plane longitudinally to the screen, and means for holding the screen wholly below the liquid surface at all stages of movement, at a substantially longitudinal inclination less than the critical angle, said screen having an unobstructed surface and free discharge edges at opposite ends, and means for separately collecting the components passing over the opposite edges.

2. In a machine for separating materials having relatively different sinking characteristics, such as those of shale and gravel, a liquid-containing tank, a screen in the tank, means for imparting full orbital bodily movement in a vertical plane longitudinally to the screen, means for holding the screen wholly below the liquid surface at all stages of movement, at a substantially longitudinal inclination less than the critical angle, said screen having an unobstructed surface and free discharge edges at opposite ends, means for adjusting the screen, and means for separately collecting the components passing over the opposite edges.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

GEORGE E. KEENE.