Oct. 28, 1941. J. J. BROWN 2,260,293

HYDRAULIC SUCTION DREDGE

Filed May 22, 1940 3 Sheets-Sheet 1

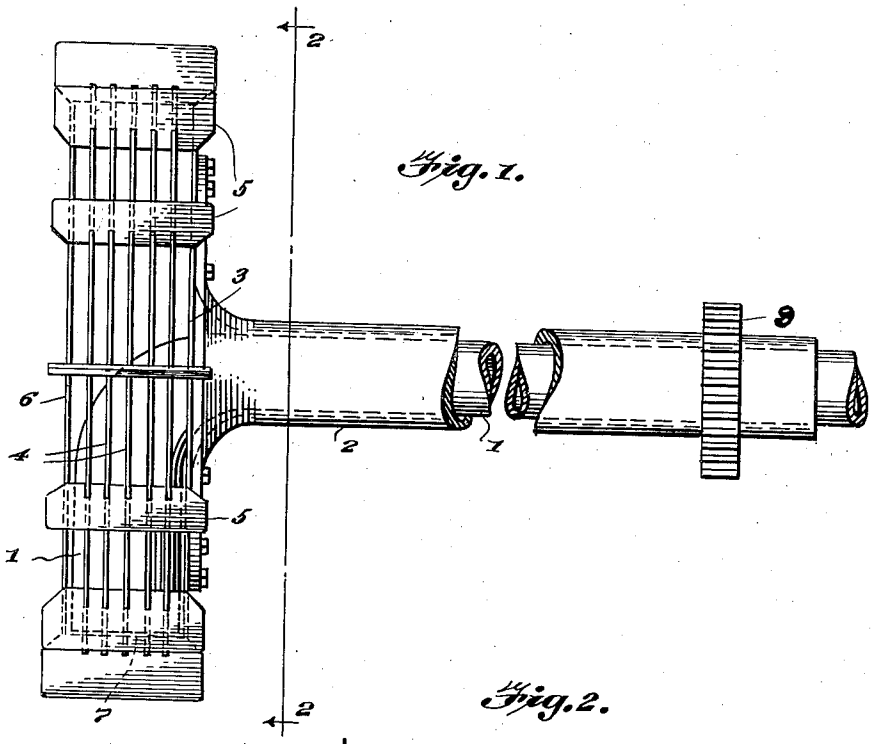
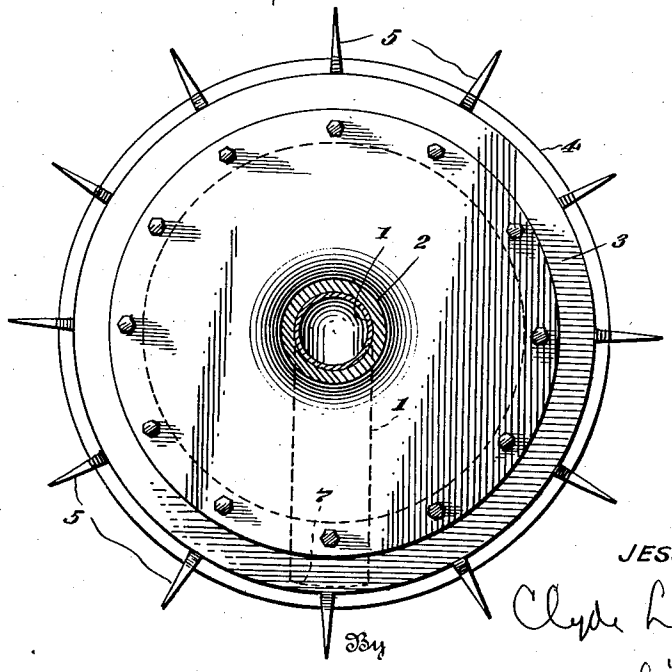


Fig. 1.

Fig. 2.



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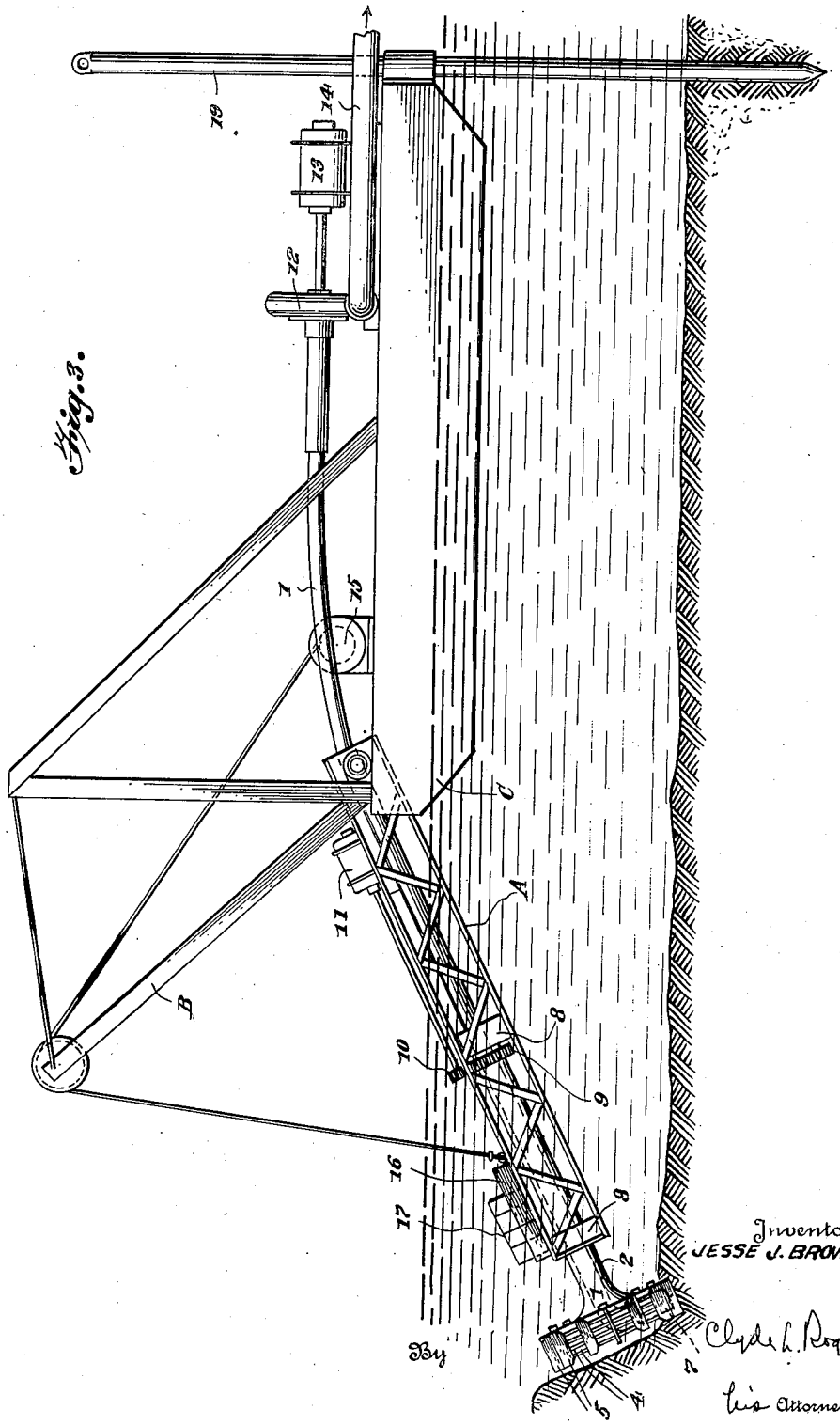


Fig. 3.

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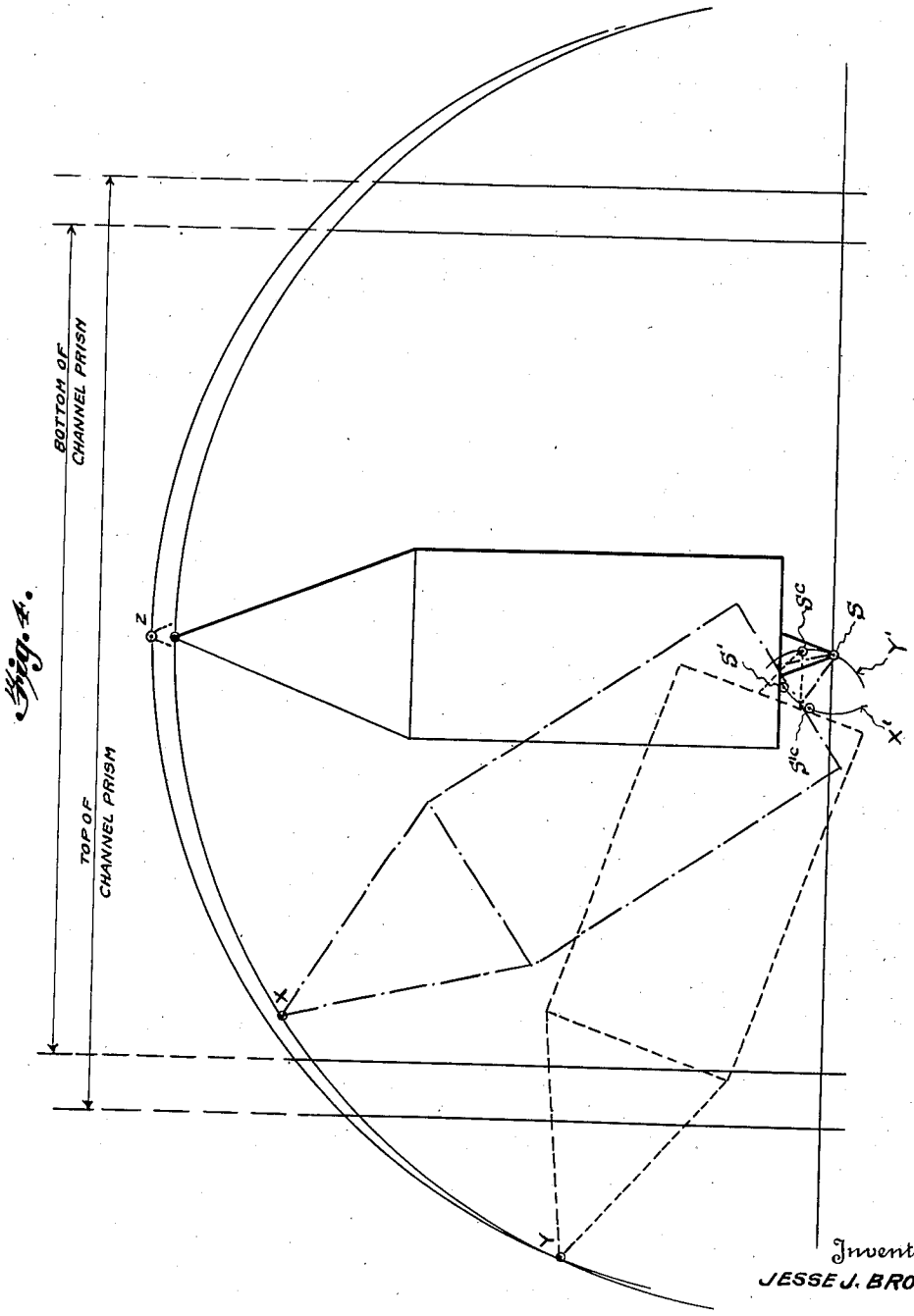


Fig. 4.

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HYDRAULIC SUCTION DREDGE

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13 Claims. (Cl. 37—57)

This invention relates to improvements in hydraulic pipe-line suction dredges, and its prime object is to increase the percentage of the total hours of operation during which the dredge is actually handling material, by eliminating the necessity for stopping to move up the swinging lines and anchors.

To this end the invention comprises a power driven reversible tractor-wheel borne at the outer end of the suction ladder to pull the suction end of the dredge from side to side with the spud on the other end of the dredge acting as a pivot; in a preferred and more comprehensive embodiment and as herein shown, such tractor-wheel also combines in itself the function of a rotary digger or cutter-head to loosen soil and material for pick-up by the suction nozzle.

Another object is to further utilize the periphery of the combined tractor-wheel and digger by providing a screen thereon and positioning the suction nozzle inside the tractor-wheel so as to limit the size of pieces of solid material that may be picked up by the suction. Since this acts, in effect, as a traveling screen, permanently associated with the suction nozzle, it will greatly reduce the tendency of the suction line to clog.

Another object is to provide swinging means for the dredge which will permit swinging the suction nozzle in a longer arc than is feasible with the usual lines and anchors; 180 degrees— or more if desired—can be had at the will of the operator.

Still another object is to eliminate interference with water traffic by having no swinging lines in the fairway.

The foregoing and other objects and advantages of the invention will be better understood from the following detailed description taken in connection with the accompanying drawings and the distinctive features of novelty will be thereafter pointed out in the appended claims.

Referring to the drawings:

Figure 1 is a side elevation of the tractor-wheel showing the suction nozzle located inside, and with the suction nozzle and hollow shaft broken away;

Figure 2 is an elevation of the inboard end of the same tractor-wheel;

Figure 3 is a side elevation of a complete dredge equipped with a combined rotary tractor and digger swinging device; and

Figure 4 is a plan diagram of one method of moving up such a dredge.

While it is obvious that when using the combination tractor-wheel and digger of this invention, the suction nozzle may be located in any one of various locations relative to the wheel, I prefer to place the nozzle inside the wheel, close to the periphery, and at the bottom. This is shown in Fig. 1 where 1 is the suction pipe mounted inside the hollow shaft 2. This shaft flares at its outer end and is there bolted to the ring-shaped inboard side 3 of the tractor-wheel. On the periphery of the wheel I may use cutter-rings 4 to cut up caked material and help support tractor blades 5 which may also be designed to act as cutter teeth for loosening the material to be dredged. The outboard side 6 of the wheel is a plain disc. The terminus or nozzle 7 of the suction line 1 is shown close to the inner portions of the rings 4 and the blades 5.

Fig. 3 illustrates a preferred method of assembling the tractor wheel on a dredge ladder A. B is the usual hoisting assembly or tripod, and C is the dredge hull. The suction line 1 is carried inside the hollow shaft 2 which runs in bearings 8 and is driven thru gear 9 and pinion 10 by motor 11 with any usual or suitable provision (not shown) for reversing the direction of drive to the tractor-wheel. The suction line is then carried up the ladder onto the hull and to the pump 12 driven by motor 13. The discharge line is indicated at 14.

Hoist drum 15 is for raising the ladder assembly A. A weight box 16 holds weights 17 which are provided to vary the total weight impressed upon the bottom of the cut by the tractor-wheel, more weight being needed when working in the harder and more compacted materials. A variation of this arrangement would be to make the weights 17 of horseshoe shape and adapted to be mounted on the inboard end of the tractor-wheel. A spud is shown at 19.

It may be noted that this dredge cannot "move up" while the cutter-head is raised off the bottom by "walking" on two spuds and pulling on the swinging lines as is customary, there being no swinging lines. Obviously the tractor-wheel must rest upon the bottom to give traction for swinging.

It is also obvious however, that a number of methods of moving up are available. A "push" type spud may be used, such as is shown in U. S. Patent No. 521,580 to Bates; or, the hull may be provided with its own propellers or paddle-wheel.

A preferred method according to the present invention of moving up with two spuds is illustrated in Fig. 4. S is the main or working spud. S' is the auxiliary or walking spud shown as adapted to be put into use for moving up the

dredge as now to be explained. When ready to move up, the dredge is swung to the left pivoting on spud S and just before the tractor-wheel reaches the toe of the side slope of the channel (position X) spud S' is dropped, S is raised, and the tractor-wheel is run up the side slope to position Y, using the hoist to ease the weight on the tractor-wheel if necessary. The dredge is now pivoting on spud S' instead of spud S, and spud S will be moved in the arc y' and advance approximately along the center line of the cut, to the position Sc when the tractor-wheel is at Y. The spud S is now dropped and S' raised, and upon reversing the drive the dredge is swung to the right again on a regular working cut, the tractor-wheel passing through point Z. In the described movement it will be understood that the mounting of spud S' is initially swung on the arc x' to the position S'c, and that in the final movement when the dredge is pivoting on the spud S' dropped in the position S'c that the mounting of spud S will swing to the position Sc.

When depending upon the tractor-wheel to act as a digging or cutting head, the blades 5 will naturally be designed with this in view, and different wheels may be used for working in widely different materials, changing the wheels by means of the cap screws shown at the flared end of the hollow shaft 2.

In use, the speed of the wheel over the bottom of the cut may be varied to suit the existing conditions. With the pump operating at a constant speed, the nozzle can thus be made to pass over a greater or less area per minute, to more nearly maintain the desired percent of solids picked up by the suction.

The tractor-wheel obviously is designed to roll on top of the material to be dredged while also digging thereinto. For this reason, the ladder supporting it should be relatively long as compared with the conventional cutter-head ladder in order to maintain the wheel in a nearly vertical position. Building the ladder with a bend in it, as is even now frequently done, also assists in maintaining this vertical position.

I am aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive, reference being had to the appended claims, rather than to the foregoing description to indicate the scope of the invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A hydraulic suction dredge with a spud at one end, a suction ladder extending diagonally downward and outward, pivotally mounted at its other end, and a power-driven tractor-wheel equipped with radially projecting teeth mounted at and borne by, the outer end of the ladder for swinging the dredge from side to side with the spud as a pivot as the tractor-wheel is caused to roll over the material to be dredged.

2. A hydraulic suction dredge with a spud at one end, a suction ladder extending diagonally downward and outward, pivotally mounted at its other end, a power-driven tractor-wheel equipped with radially projecting teeth mounted at and borne by, the outer end of the ladder for swinging the dredge, and means for adjusting the total weight bearing upon the tractor-wheel.

3. A hydraulic suction dredge with a spud at one end, a suction ladder extending diagonally downward and outward, pivotally mounted at its other end, a power-driven tractor-wheel equipped with radially projecting teeth mounted at the outer end of the ladder for swinging the dredge, and a main suction nozzle mounted inside the tractor-wheel with its open end close to the bottom peripheral portion of said wheel and directed radially thereagainst.

4. A hydraulic suction dredge with a spud at one end, a suction ladder extending diagonally downward and outward, pivotally mounted at its other end, a power-driven tractor-wheel equipped with radially projecting teeth mounted at the outer end of the ladder for swinging the dredge, a main suction nozzle mounted inside the tractor-wheel, and a grating on the periphery of said wheel, said nozzle having its open end at the bottom peripheral portion of said wheel and directed radially downward toward said grating.

5. A hydraulic suction dredge with a spud at one end, a suction ladder extending diagonally downward and outward, pivotally mounted at its other end, a reversible power-driven tractor-wheel mounted at the outer end of the ladder for swinging the dredge, and cutting blades mounted on said wheel's periphery and projecting radially therefrom.

6. A hydraulic suction dredge provided at one end with the usual spud and at the other end with a suction ladder, a hollow shaft mounted in bearings on said ladder and projecting beyond the outer end of the ladder with power connection for rotating said shaft, a tractor-wheel rigidly mounted on the outer end of said shaft, said tractor-wheel having substantially the shape of a squirrel-cage or short cylinder with openings at the periphery thereof, blades mounted on the periphery of said wheel and projecting radially therefrom, a fixed main suction pipe carried within said hollow shaft into said tractor-wheel and thence downward with its end constituting a nozzle positioned just inside the periphery of said wheel, whereby rotation of the tractor-wheel not only swings the dredge from side to side on the spud as a pivot but also loosens material closely adjacent the suction nozzle.

7. A hydraulic suction dredge having a spud mounted at one end thereof, a suction ladder extending downward and outward diagonally at the other end and a combined tractor-wheel and rotary digger with means for driving the same in either direction at will mounted at the outer end of the ladder for swinging the dredge from side to side with the spud as a pivot as the tractor-wheel digger is caused to roll over and dig into the material to be dredged, said rotary digger having cutting blades extending outward from its periphery and constituting peripheral digging elements and also traction members.

8. A hydraulic suction dredge with a spud mounted at one end thereof, a suction ladder extending downward and outward diagonally borne by its other end, a rotary combined digger and tractor-wheel with power means for driving the same in either direction mounted at the outer end of the ladder for swinging the dredge, and a suction nozzle mounted inside the tractor-wheel with its inlet end adjacent and turned downward to extend against the periphery of said wheel.

9. A hydraulic suction dredge having a spud mounted at one end thereof, a suction ladder borne by the other end of the dredge, a power

driven combined tractor-wheel and digger mounted at the outer end of the ladder for swinging the dredge and also for loosening the material to be dredged, a suction nozzle mounted inside the tractor-wheel, and a screen on the periphery of said wheel formed to also constitute peripheral digging means for loosening the material to be dredged, said wheel equipped with transverse traction elements projecting outward from said screen.

10. A hydraulic suction dredge having a spud mounted at one end thereof, a suction ladder at the other end, a power driven combination tractor-wheel and digger mounted at the outer end of the ladder for swinging the dredge and also loosening the material, cutting teeth mounted on the periphery of the wheel constituting both means to provide traction and also to loosen the material to be dredged, and means for drawing by suction loosened material inward through the bottom peripheral portion of the wheel and into a suction line.

11. A hydraulic suction dredge having a pivoting spud mounted at one end thereof, a suction ladder at the other end, a power driven combined tractor-wheel and digger mounted at the outer end of the ladder, said wheel equipped with a series of spaced apart rings around its periphery constituting both cutting means for loosening the material and also a screen to protect the suction passage from unduly large pieces of material, one of said rings closing the outer end of the wheel so that material may enter at the periphery only, and a suction line extending inward through the wheel and bearing a nozzle which is bent to present its open end downward against the inner periphery of said rings.

12. A hydraulic suction dredge having a spud pivotally mounted at one end thereof, a power driven combined tractor-wheel and digger pivotally mounted at a spaced distance outward from the other end thereof, a spaced apart series of rings extending around said wheel constituting both a screen and cutting means, and cutting blades spaced apart around said wheel secured to and braced by said rings and extending radially therefrom to constitute traction means and cooperating with said rings for loosening the material.

13. A hydraulic suction dredge having a suction ladder at one end thereof, a power driven tractor-wheel mounted at the outer end of the ladder adapted to exert impulse for swinging the dredge, a primary spud mounted at the other end of the dredge from the ladder about which the dredge is adapted to swing in operation, and a secondary spud mounted inward from the primary spud and laterally offset with respect thereto for selective use in moving the dredge forward along the center line of the channel for successive cuts.

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