June 24, 1930. M. L. BAYARD ET AL 1,767,729

FILTER SAND WASHING MACHINE

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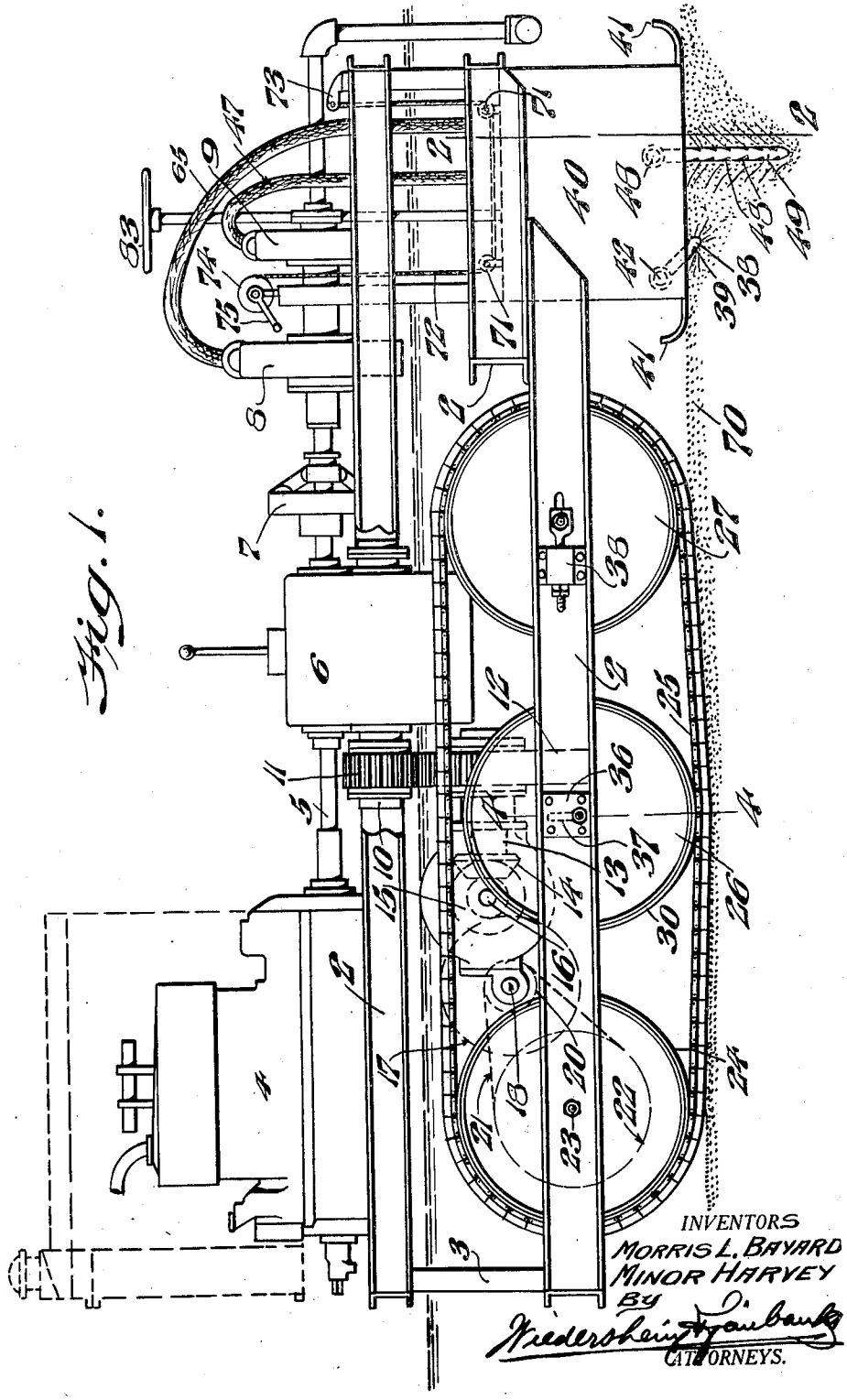


Fig. 1.

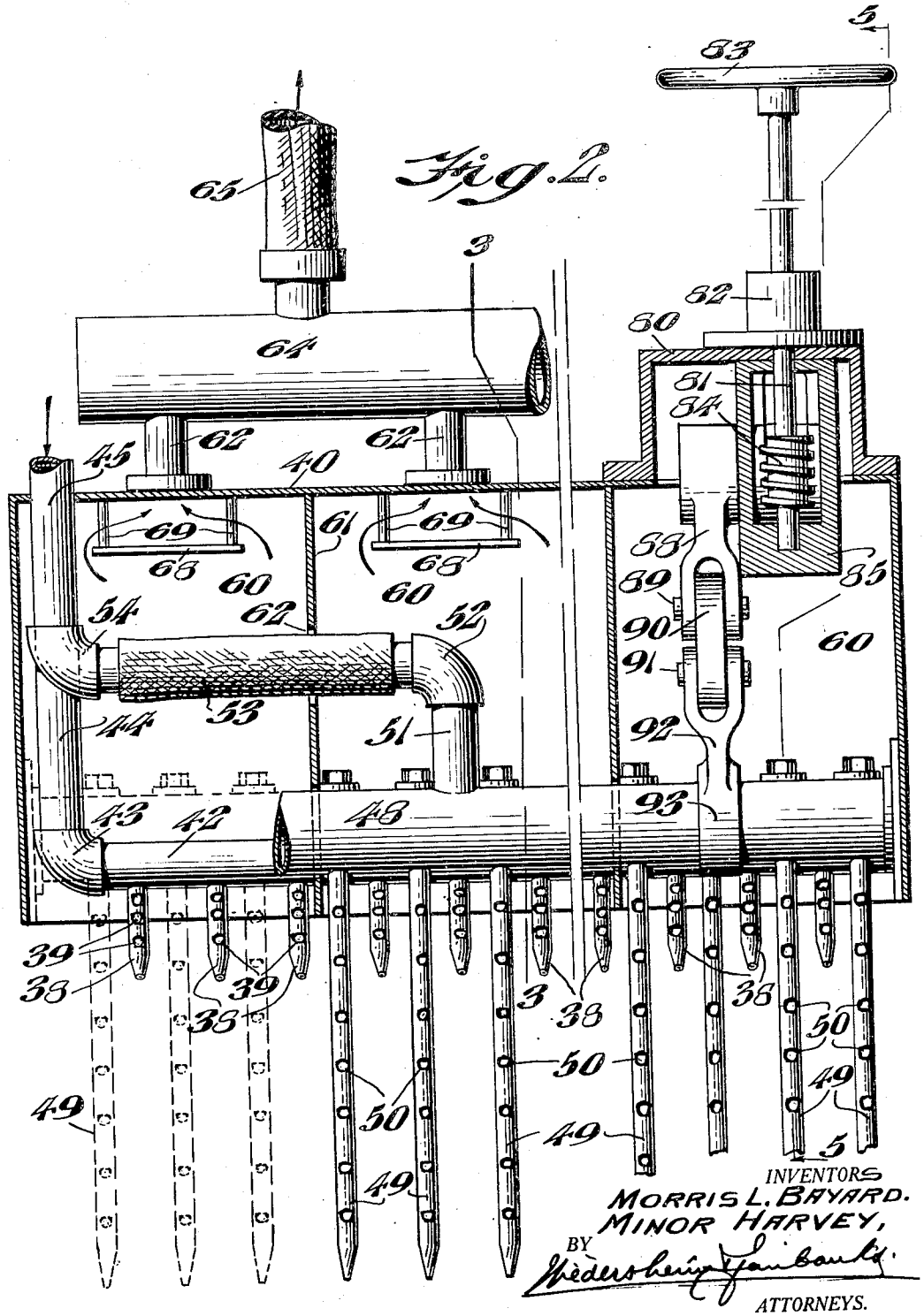
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Fig. 2.



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Fig. 3.

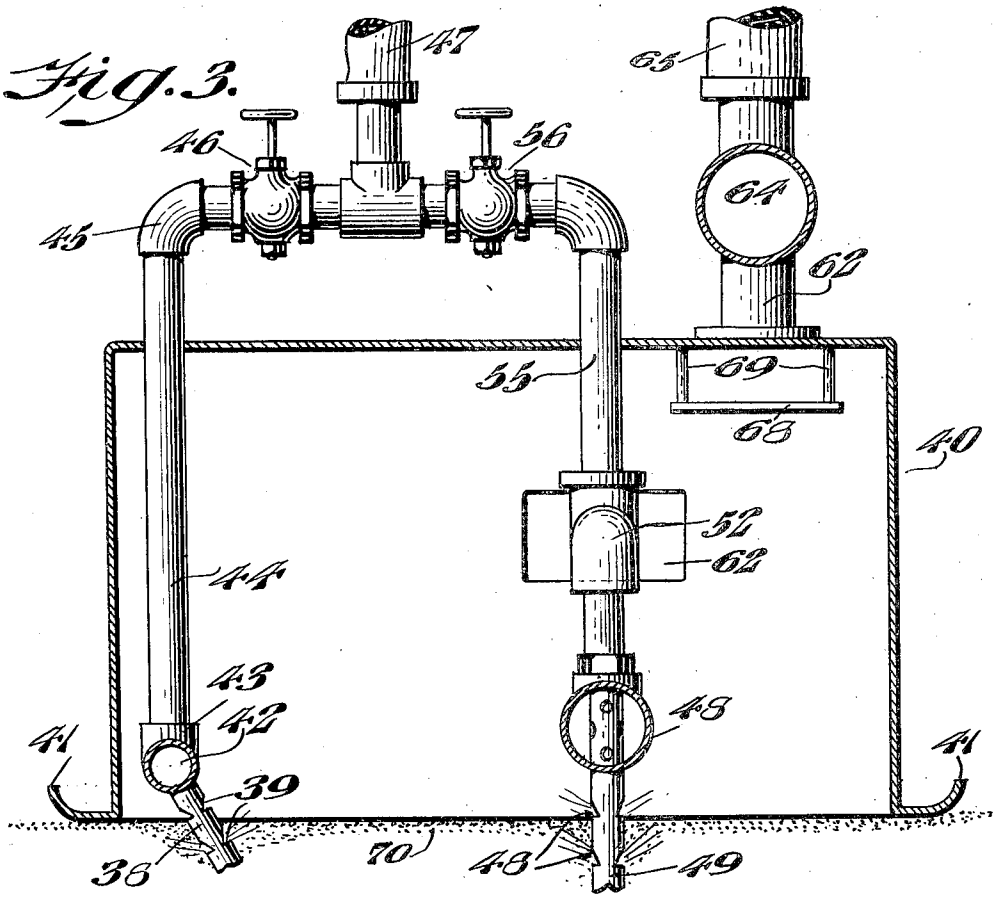
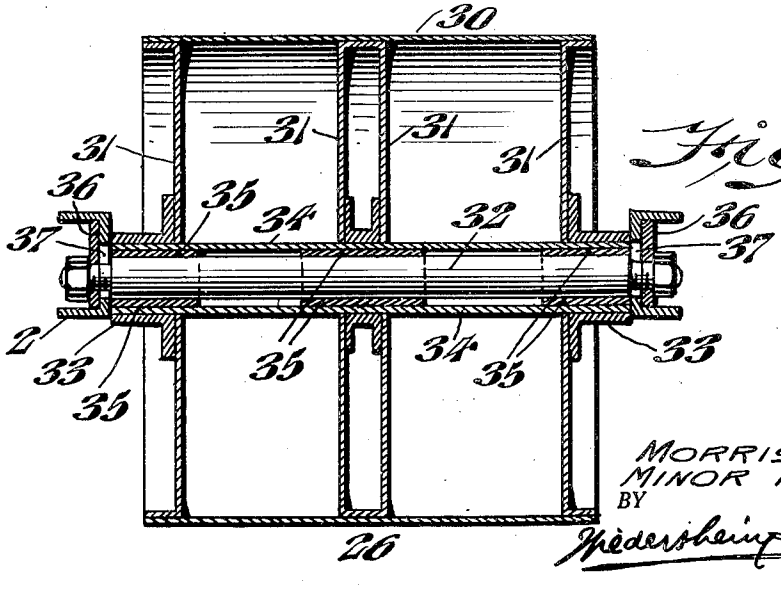


Fig. 4.



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FILTER SAND WASHING MACHINE

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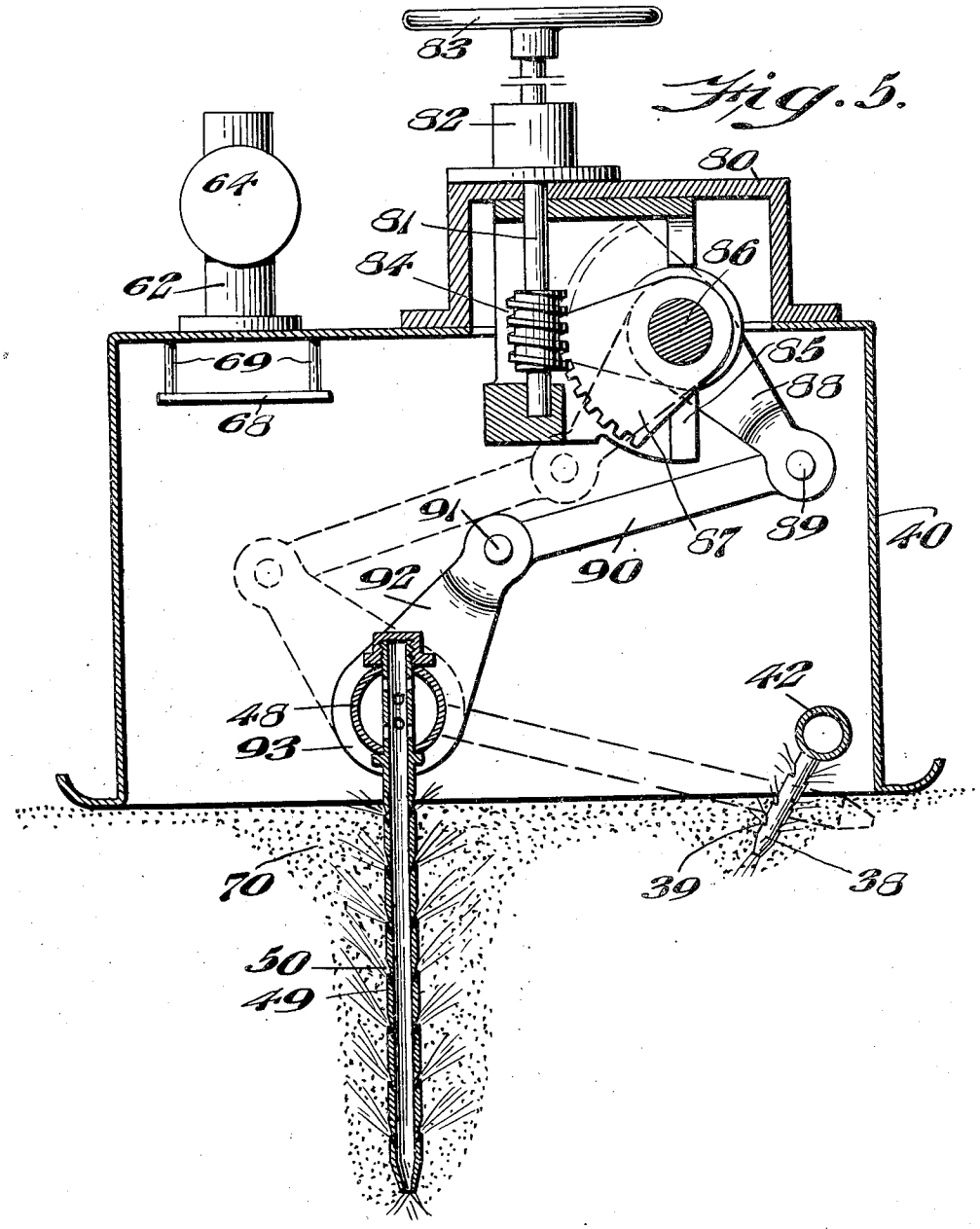


Fig. 5.

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UNITED STATES PATENT OFFICE

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FILTER-SAND-WASHING MACHINE

Application filed April 1, 1929. Serial No. 351,606.

In washing the sand layer of a filter bed it is desirable that the sand be washed in place, by injecting clean water into said sand with or without agitating the latter, and then withdrawing the used or turbulent water in which the scum and sludge formed on the sand layer has been suspended or dissolved.

To effect this object, various devices have been employed, such as a washing head having a series of nozzles which penetrate into the sand layer to pump clean water thereinto, said washing head being mounted on a vehicle adapted to travel over the sand bed. To prevent the wheels of such vehicles from sinking into the sand or from packing the sand, the tractor type of vehicle, that is one provided with an endless tread belt, has been used.

It has heretofore been the practice to position the washing elements of a sand filter washing machine, to wit: the jets and nozzles which agitate and wash the sand, directly in front of the supporting tractor or vehicle with the result that after the sand has been washed and agitated, the wheels or the tread belt of the supporting and propelling vehicle, in passing over the washed sand, naturally packed or compressed the same with obvious undesirable results.

In our co-pending application, Serial No. 274,376, we have disclosed a sand washing machine wherein the elements for washing and agitating the sand are positioned intermediate the front and rear wheels of the propelling and supporting vehicle so that only the rear wheels of said vehicle will pass over the sand after the latter has been agitated and washed, thereby decreasing the risk of packing and hardening of the sand bed. While this apparatus functions satisfactorily in practice, we have found it desirable under certain conditions completely to eliminate the packing and hardening of the sand bed after the latter has been washed, and to that end we have in the present invention positioned the washing and agitating elements at the rear of the sand washing machine, thus to avoid packing and hardening of the sand bed after the latter has been agitated and washed and to leave the same in a soft cultivated and fluffy condition, thereby increasing the efficiency of the filter sand bed.

It is therefore the object of our invention to provide a washing machine for cleaning the sand of a filter bed, which is adapted to travel over said bed without packing the latter or sinking thereinto and one which at the same time is provided with means for compensating the dead weight of the machine necessarily resulting from its rather bulky and heavy construction.

To the above ends, our invention consists of a self-propelled vehicle, sand agitating and washing devices carried at the rear end thereof, means for adjusting said sand washing devices, and buoyant wheels for said vehicle.

Our invention further relates to a filter sand washing machine which, while operated by the same source of power which propels the tractor or other supporting vehicle, may nevertheless be operated at various speeds or stopped completely irrespective of the propulsion or stopping of said supporting vehicle.

Our invention further relates to a filter sand washing machine which is adapted for cleaning the sand layer of a filter bed superficially or to a given predetermined depth independently or simultaneously.

Our invention further relates to a washing machine of the character provided with vertically adjustable central buoyant wheels especially adapted to facilitate the propulsion and turning of the vehicle or tractor supporting said washing machine.

Our invention further relates to a novel construction whereby the sand agitating and washing elements proper may be withdrawn from the filter bed when the washing machine is not in use.

Our invention further consists of various other novel features of construction and advantage all as hereinafter described and claimed.

In the accompanying drawings:

Fig. 1, represents a side elevation of a filter sand washing machine embodying our

invention shown in operative condition on a filter bed.

Fig. 2, represents on an enlarged scale, a sectional view taken on line 2—2 of Fig. 1.

Fig. 3, represents a sectional view taken on line 3—3 of Fig. 2.

Fig. 4, represents, on an enlarged scale, a section on line 4—4 of Fig. 1.

Fig. 5, represents a section on line 5—5 of Fig. 2.

For the purpose of illustrating our invention we have shown in the accompanying drawings one form thereof which is at present preferred by us, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which our invention consists can be variously arranged and organized and that our invention is not limited to the precise arrangement and organization of the instrumentalities as herein shown and described.

Referring to the drawings, in which similar numerals of reference indicate corresponding parts, 1 designates a filter sand washing machine embodying our invention supported on the horizontal frame 2 connected by the upright braces 3 to form a chassis for a self-propelled vehicle of the tractor type. 4 designates a motor which revolves the shaft 5 which is connected through the gear box 6 to the clutch 7 which in turn connects or disconnects the suction pump 8 and the force pump 9 with and from the motor 4. The shaft 5 is also connected through the gear box 6 to the stub shaft 10 carrying the pinion 11 in mesh with the gear 12 mounted on the shaft 13. The shaft 13 carries the bevel pinion 14, which is in mesh with the bevel pinion 15 on the shaft 16. The pinion 15 meshes with the gear 17 on the shaft 18 which also carries the pinion 20. A sprocket chain 21 engages the pinion 20 and the sprocket wheel or gear 22 on the shaft 23 to revolve the front driving wheel 24, the central idling wheel 26 and the rear idling wheel 27, as will be seen from Fig. 1. The wheels 24, 26, and 27 are of a buoyant type, being air-tight and watertight drums as will be best understood from Fig. 4, in which a section of the central wheel 26 is shown. Each of the wheels 24, 26, and 27 is thus composed of the outer shell or drum 30 having the inner reinforcing members 31 and is carried by a shaft 32 carrying the hubs or collars 33. 34 designates a tubular member or sleeve surrounding the shaft 32 and spaced therefrom by the spacing members 35. The central wheel 26 is vertically adjustable; that is, said wheel may be raised or lowered with respect to the wheels 24 and 27. The raising and lowering of the central wheel 26 is effected by means of the supporting plate 36 which is provided with the vertical slot 37, as will be seen from Figs. 1 and 4. The rear wheels 27 are provided with the lateral or horizontal adjustment device 38 of any conventional construction, by means of which said rear wheels may be moved away from or towards the central wheel 26 to take up the slack or to adjust the tension of the endless belt 25.

40 designates the washing head which consists of an inverted cup-shaped member having the upwardly deflected bottom flanges 41 to facilitate the travel of said head on the surface of the sand bed in a water tight manner. Within the head 40 is positioned the transverse tube or pipe 42 which carries the relatively short nozzles 38 having the discharge ports or apertures 39. The tube 42 is connected by means of the elbow 43, the pipe or conduit 44 and the elbow 45 through the valve 46 to the inlet pipe 47 leading from the force pump 9. A similar but preferably larger tubular member 48 is provided with the relatively long nozzles 49 having the discharge ports 50 and best seen in Fig. 2. The tube 48 is connected by means of the pipe 51, the elbow 52, the flexible hose 53, the elbow portion 54, and pipe 55, through the valve 56 to the common inlet pipe 47 above mentioned. The short nozzles 43 and the long nozzles 49 are thus supplied with water from the force pump 9 simultaneously or independently by the manipulation of the valves 46 and 56 respectively. The head 40 is divided into any suitable number of compartments 60, separated from each other by the partitions 61 having the openings 62 for the passage of the various pipes and conduits 42, 48, and 53. Each of the compartments 60 is provided with the upper outlet or discharge pipe 62 which leads into the common discharge pipe 64 from which a flexible discharge hose 65 leads to a point outside of the filter bed being washed. 68 designates a baffle or deflecting plate positioned in each of the compartments 60 and secured to the top of the head 40 by means of the bolts or their equivalent 69, the water passing from the compartments 60 into the discharge pipe 62 in the direction of the arrows seen in Fig. 2. The entire head 40 is constructed for vertical adjustment with respect to the sand bed 70 and to that end we provide the rollers 71, secured to the top of the head 40, over which passes the chain 72, one end of which is secured to the fixed anchor 73 while the other end of said chain is wound around the drum 74 provided with the handle 75. Referring to Figs. 2 and 5, the head 40 is provided with an upper supporting frame or block 80 through which passes the worm shaft 81 journalled in the bearings 82 and provided with the upper operating hand lever 83 and carrying the lower worm 84. 85 designates a bearing block or member in

which is journalled a shaft 86 which has fast thereon the gear sector 87 which is adapted to mesh with the worm 84 on the shaft 81. The shaft 86 also has fast thereon a drop lever 88 the free end of which is pivoted at 89 to one end of the link 90, the other end of which is pivoted at 91 to one end of the drop arm 92, the other end 93 of which is fast on the transverse tube 48, carrying the large nozzles 49 above referred to. In Fig. 5 we have shown the large nozzles 49 in the operative position; that is, engaging the sand bed 70.

The operation is as follows:

The sand washing machine is propelled into the filter bed to be washed and the head 40 is adjusted vertically to the desired height with respect to the sand bed 70. In this position the short nozzles 43 engage the surface of the filter bed, thereby agitating and washing the surface sand by cultivating and ploughing furrows therein and by injecting thereinto streams of water through the discharge ports 39. If it is desired to wash and agitate the sand bed to a greater depth, the long nozzles 49 are forced into the sand bed by the manipulation of the hand wheel 83 which revolves the worm 84 engaging the gear sector 87 to actuate the drop arms 88 and 92 connected by the link 90 into the position shown in full lines in Fig. 5. The washing machine now travels over the filter bed which is thus engaged by the front short nozzles 38 for cleaning the surface or upper layers of the sand and by the rear longer nozzles 49 for washing the deeper or lower layers of sand in said filter bed, the nozzles 38 and 49 being supplied with clean water through the tubes 42 and 48 respectively in the manner herein described, and the used or turbulent water into which the sludge and scum extracted from the sand bed has been dissolved or suspended, being withdrawn from the head 40 through the outlet pipe 62 and conveyed to a point without the filter bed by means of the flexible hose 65, all as hereinbefore described. When it is desired to wash the sand superficially only or when it is desired to withdraw the washing machine from the filter bed it is necessary to withdraw the long nozzle 49 out of engagement with the sand bed 70. This is accomplished by manipulating the hand wheel 83 to bring the gear sector 87, the drop lever 88, the link 90, the drop lever 92, and the long nozzles 49 into the position shown in dotted lines in Fig. 5.

In order to facilitate the travel of the washing machine over a relatively soft cultivated and fluffy sand bed the center idling wheel 26 is lowered with respect to the front driving wheel 24 and the rear idling wheel 27 so as to give the lower portion of the tread belt a forward and upward inclination, thereby greatly facilitating the travel of the vehicle.

Furthermore, by lowering the center wheel 26 by means of the slotted plate arrangement 36, hereinbefore described, regardless of the condition of the sand bed, we facilitate the turning of the vehicle which as is well known will turn more easily if the weight thereof is concentrated on a relatively small portion of the tread belt 25 than if the entire bottom portion of the tread belt 25 were in contact with the sand bed 70. The lowering of the center wheel 26 serves further to take up the slack on the tread belt 25 in the event that the adjustment 38 of the rear wheel 27 should prove insufficient for this purpose or if said adjustment were omitted entirely. By the provision of the gear box 6 and the clutch 7 intermediate the motor 4 and the pumps 8 and 9, we are enabled to operate said pumps independently of or simultaneously with the propulsion of the vehicle or the rate of its travel.

A very important feature of our present invention is the positioning of the washing head 40 and its adjuncts in the rear of the supporting vehicle, thereby preventing the packing and hardening of the sand bed by the passage of the tread belt 25 (or the wheels) of said vehicle over the sand bed after the latter has been washed, thereby leaving the sand bed 70 soft cultivated and fluffy, and increasing the efficiency of the filter bed as will be apparent. By the use of the buoyant wheels 29, 26, and 27, which tend to float the washing machine 1, the propulsion of the vehicle over the sand bed is greatly facilitated and packing and hardening of the sand resulting from the weight of the washing machine is greatly reduced.

We are aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and we 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.

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

1. A filter sand washing machine of the character stated, comprising a self-propelled supporting vehicle, driving and supporting buoyant wheels therefor, sand cultivating and washing devices positioned at and carried by the rear of said vehicle, including relatively short stationary nozzles for acting on the surface of said sand, and relatively long movable nozzles for acting on said sand at a predetermined depth below the surface thereof, and means for actuating said long nozzles into and from engagement with said sand.

2. In a washing machine of the character

stated, a self-propelled vehicle, a head carried by the rear portion of said vehicle, a series of relatively short nozzles carried by said head, a series of relatively long nozzles movably mounted in said head, water supply pipes for both said series of nozzles, and means operable from without said head for actuating said longer nozzles.

3. In a device of the character stated, a self-propelled vehicle of the tractor type, a washing head carried by the rear end thereof, a series of relatively short nozzles carried by said head, a series of relatively long nozzles carried by said head, water supply pipes for both said series of nozzles, means for raising and lowering said head with respect to said vehicle, and means for raising and lowering said series of long nozzles with respect to said head.

4. In a device of the character stated, a self-propelled vehicle of the tractor type, a washing head carried by the rear end thereof, a series of relatively short nozzles carried by said head, a series of relatively long nozzles carried by said head, water supply pipes for both said series of nozzles, means for raising and lowering said head with respect to said vehicle, means for raising and lowering said series of long nozzles with respect to said head, and means for controlling the flow of water to both said series of nozzles.

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