Aug. 29, 1933. **L. M. YOUNG** **1,924,825**

SAND SPREADER

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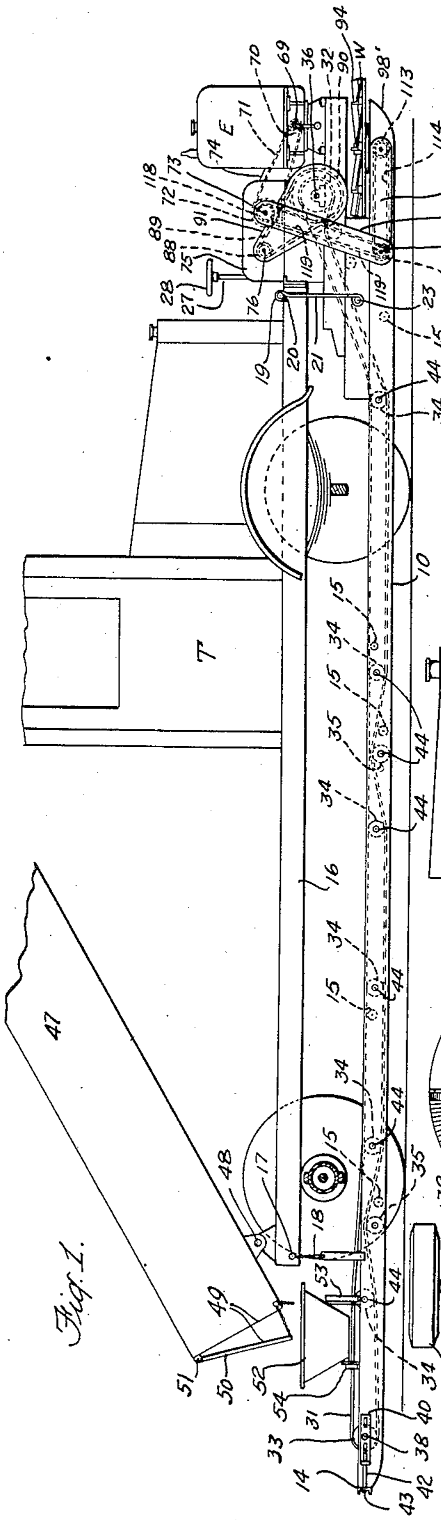

Fig. 1.

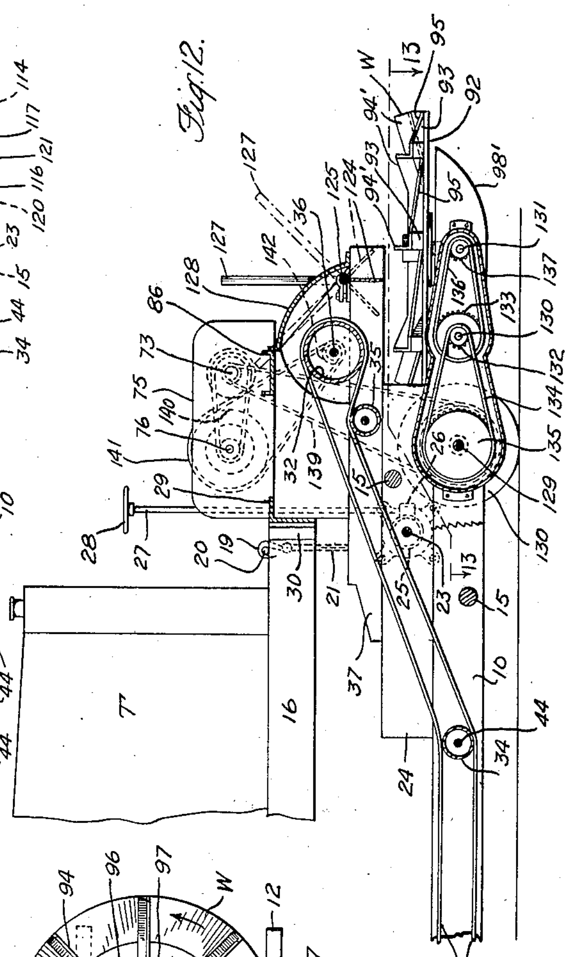

Fig. 12.

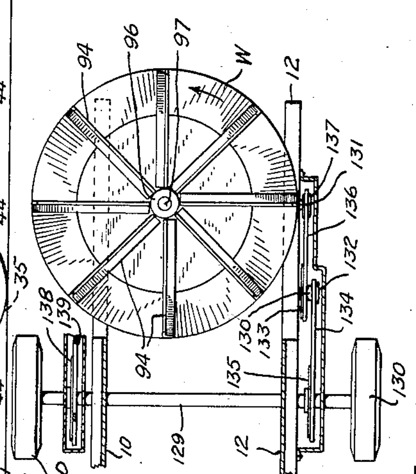

Fig. 13.

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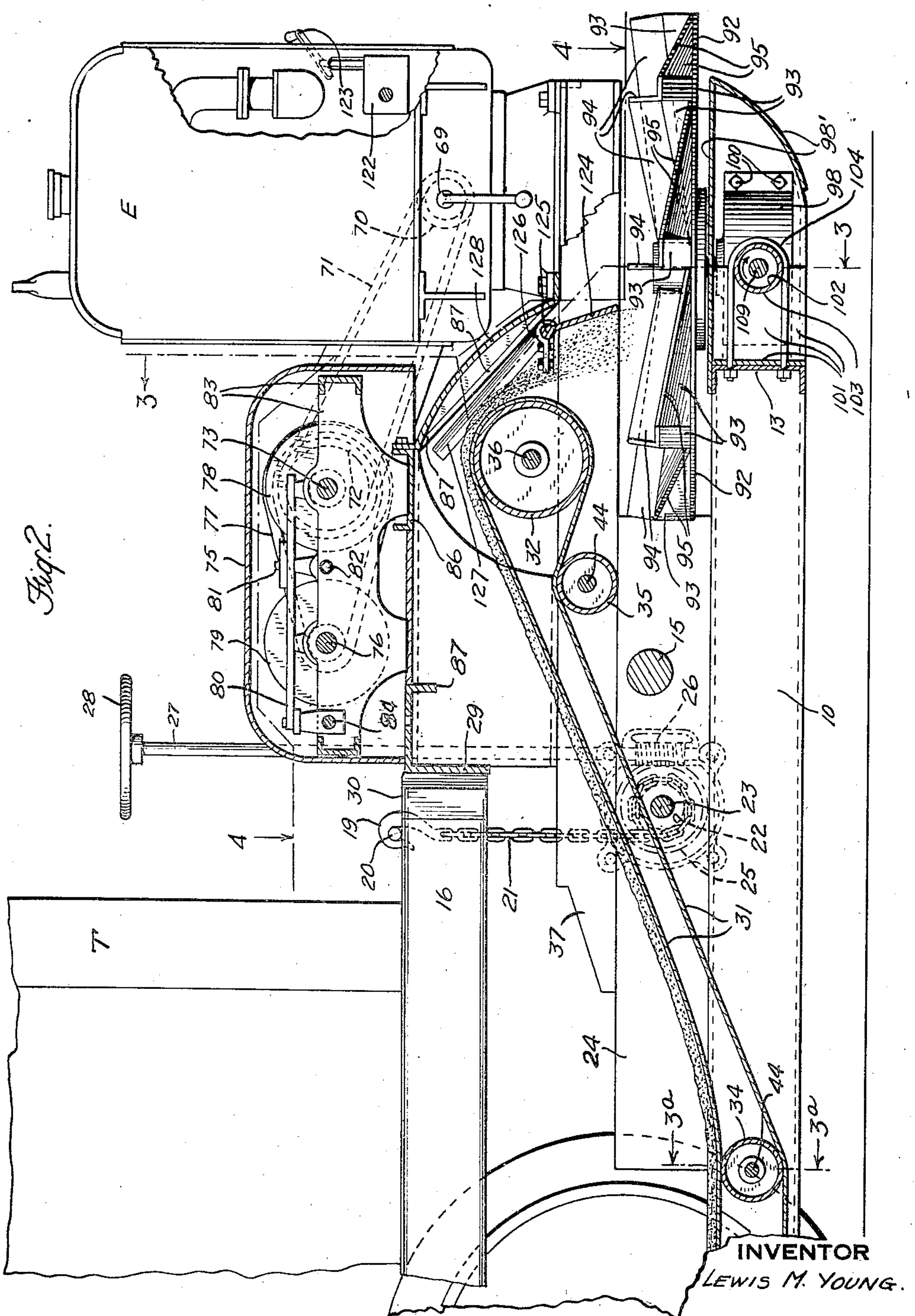

Fig. 2.

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Fig. 3

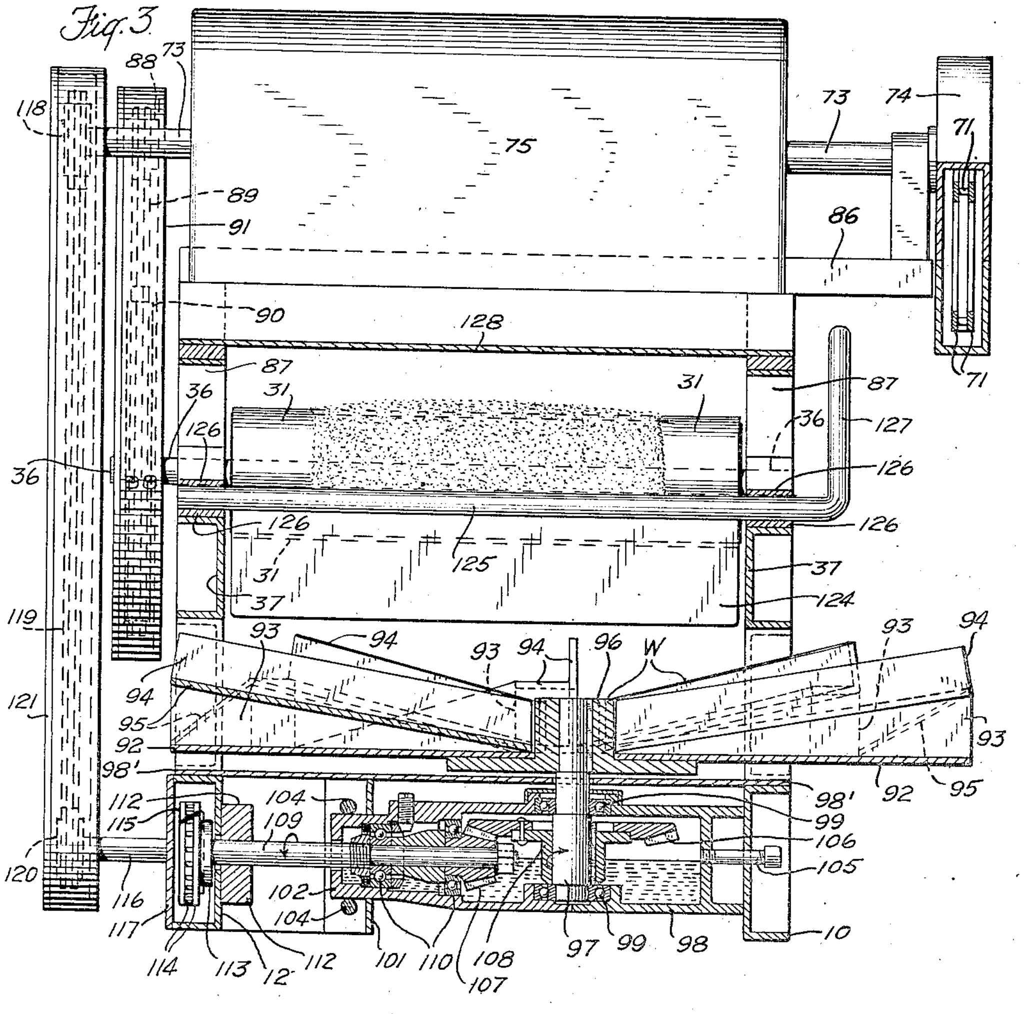
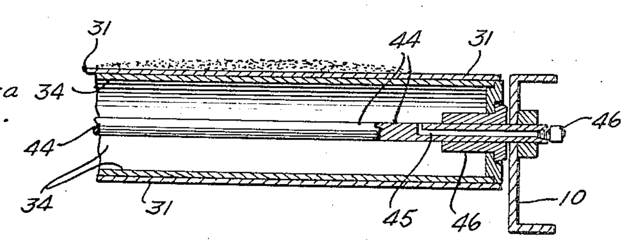


Fig. 3a



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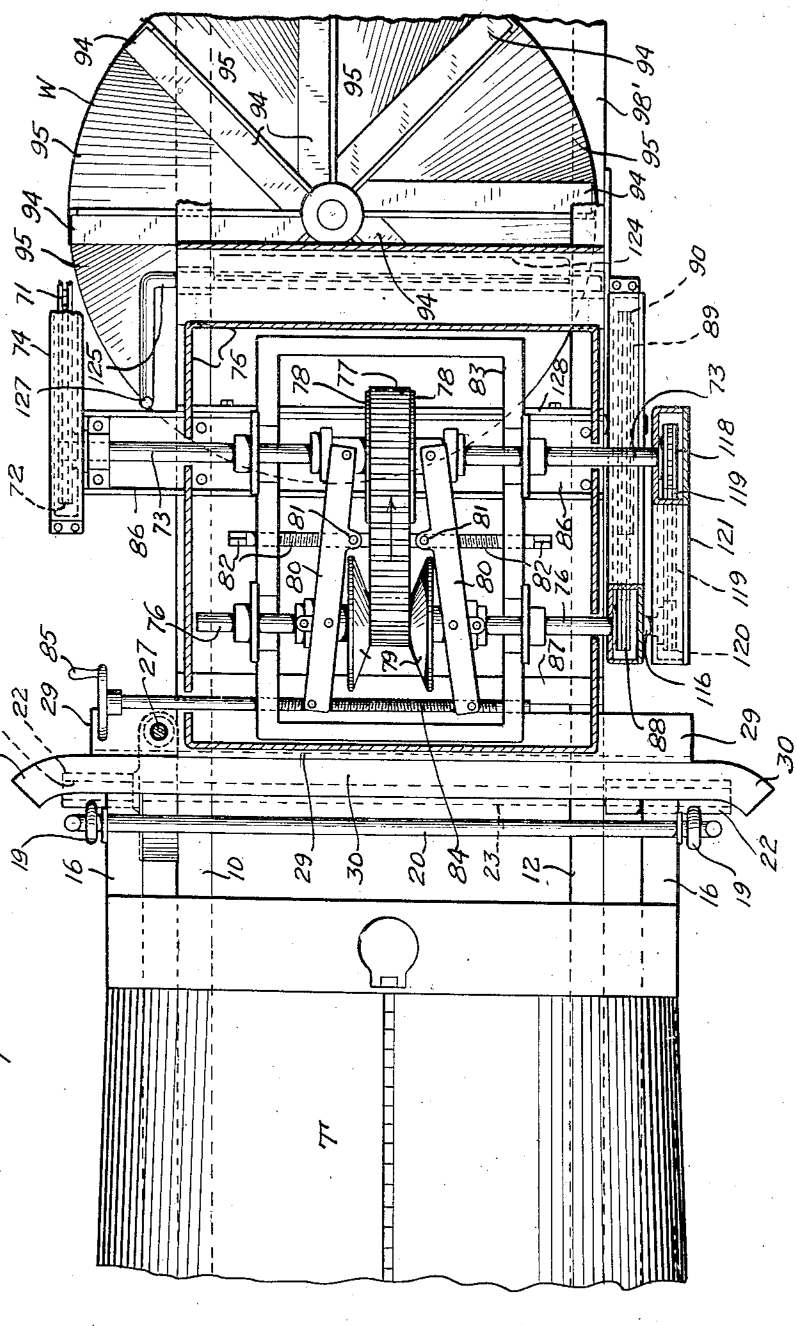

Fig. 4.

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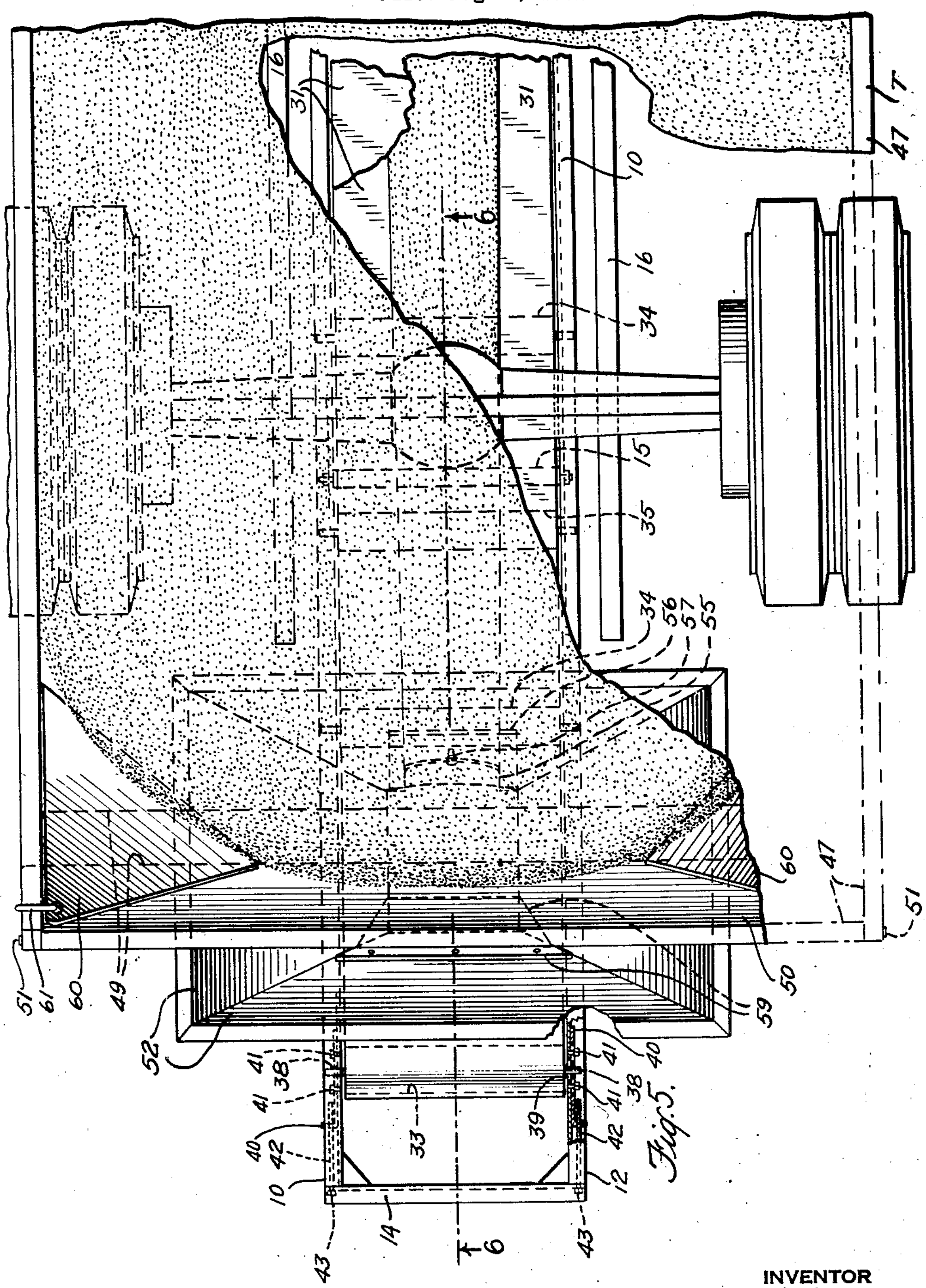

Fig. 5.

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Fig. 6.

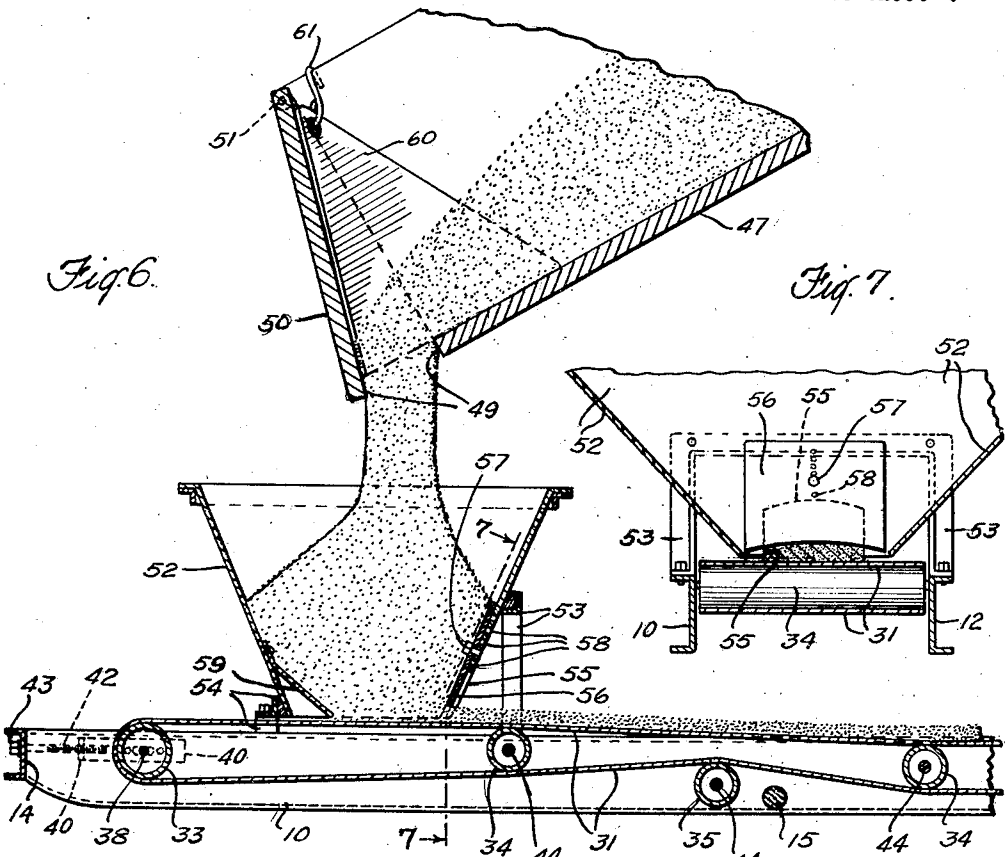


Fig. 8.

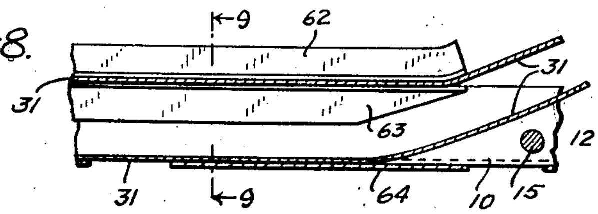


Fig. 9.

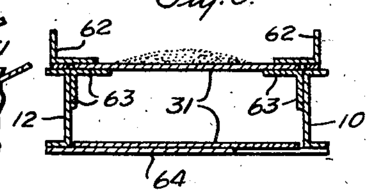


Fig. 10.

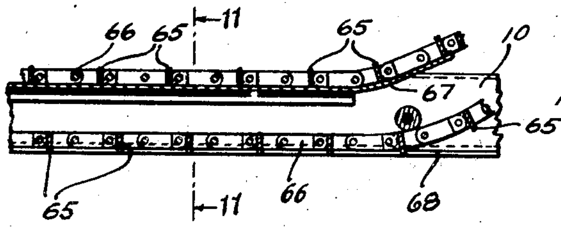
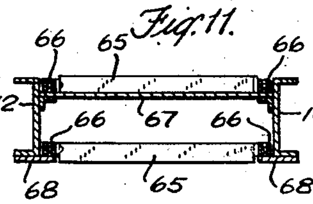


Fig. 11.



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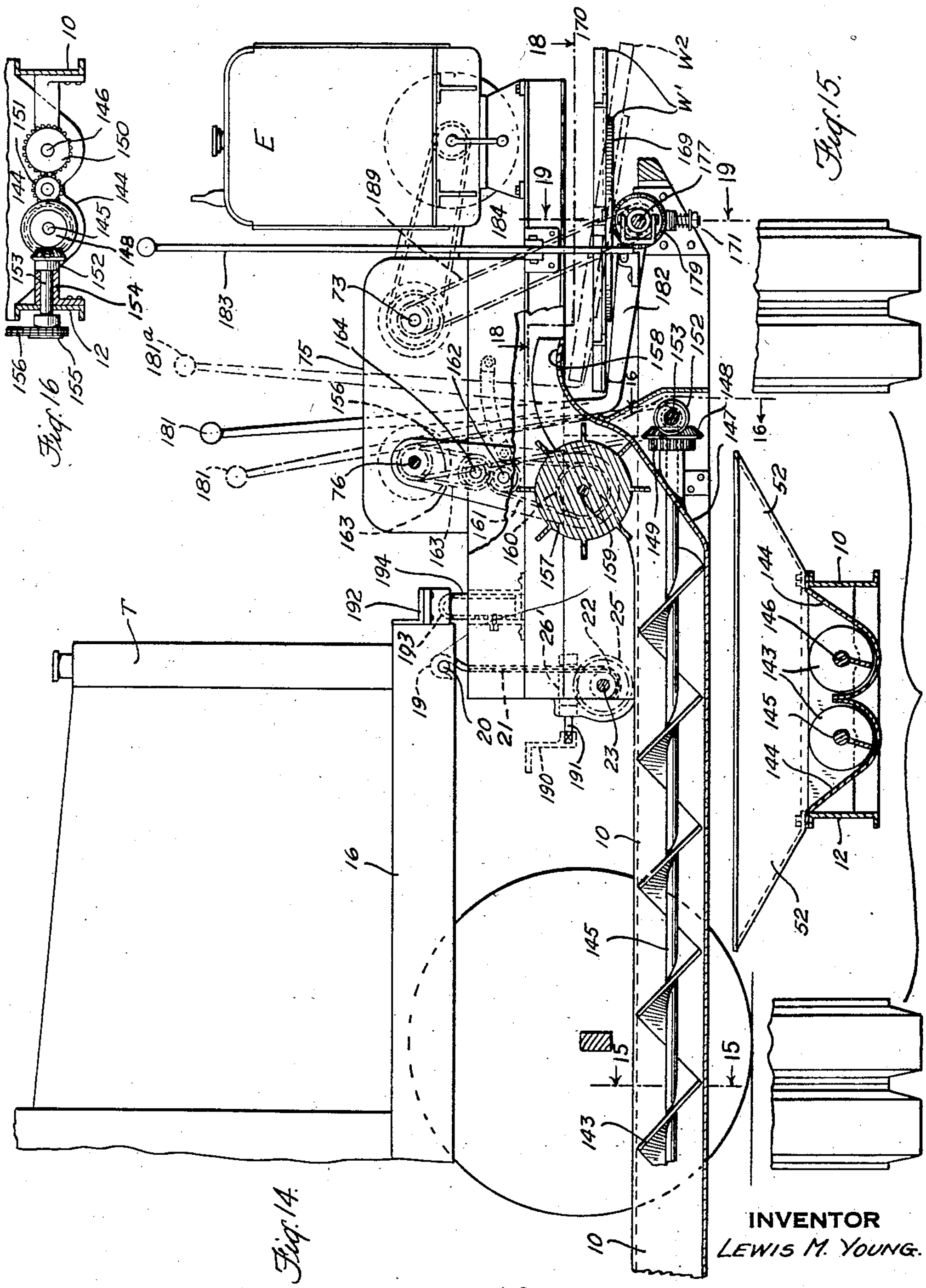

Fig. 14. Fig. 15. Fig. 16.

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Fig. 17.

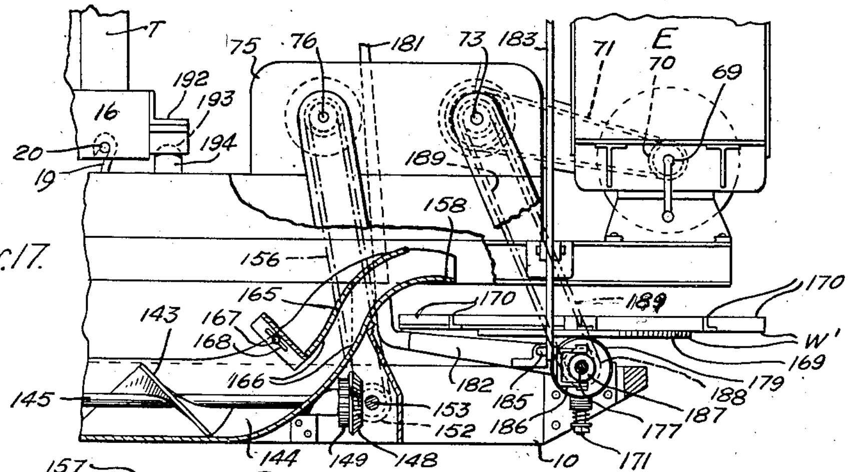


Fig. 18.

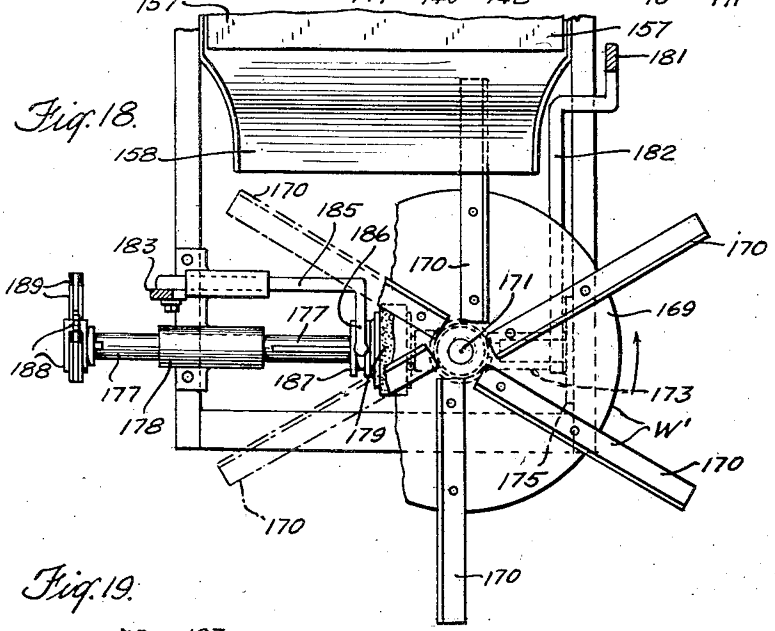
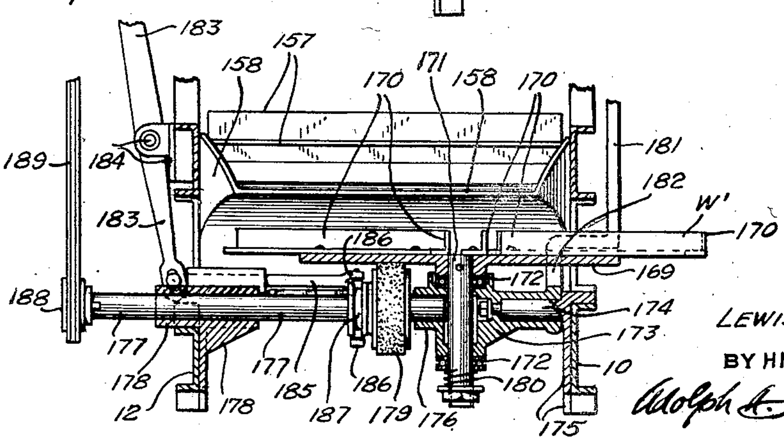


Fig. 19.



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UNITED STATES PATENT OFFICE

1,924,825

SAND SPREADER

Lewis M. Young, Norwich, Conn.

Application August 4, 1932. Serial No. 627,446

7 Claims. (Cl. 275—8)

My invention relates to machines for spreading sand or like material over the surface of road-beds, and its object is to provide a sand spreader of novel structure adapted to be attached to any standard sand truck.

One of the important features of my new device lies in the fact that it is suspended beneath the truck between the traction wheels thereof. Consequently, no part of the sand-spreading attachment projects sideways beyond the width of the truck, so that traffic is not interfered with. A moving belt or other practical conveyor carries the sand from the rear of the truck to the front, where a rotary spreading wheel receives the sand in a continuous feed and throws it over the road in a uniform layer.

In a preferred form of my invention, I use a spreading wheel of novel construction comprising radial fins or blades which rise at the periphery of the wheel. The surface of the wheel between the radial blades is steped upward in the direction of rotation, whereby the sand is thrown forward and upward in a long trajectory. The result is a smooth uniform covering of sand on the roadbed, as I have actually demonstrated. I may also provide an adjustable deflector plate or plates to regulate the point of delivery of the sand to the distributing wheel, in order to vary the direction and angle in which the sand stream leaves the wheel. This regulation enables me to cover any desired part of the road. As a further means for controlling the action of the rotary distributing wheel, I may mount the latter so as to be tiltable on a horizontal transverse shaft.

In a preferred form of my invention, the moving parts of the said spreader are driven by a small gas engine (or other prime mover) mounted in front of the truck. The spreading wheel is rotated at a predetermined constant speed, which may be varied by changing the speed of the engine, or by an adjustable transmission connection. The sand conveyor beneath the truck is also driven by the small engine at a certain speed, which is controlled independently of the engine in any practical way. In a machine which I have built and actually operated on the road with success, I used a standard Lewellen transmision for varying the speed of the conveyor without affecting the speed of the spreading wheel. It is also possible to drive the conveyor and the distributor from the truck itself by providing the sand-spreading framework with a pair of traction wheels and letting the truck push it. The axle of these auxiliary traction wheels furnishes the power for the conveyor and distributor.

The various novel features and practical advantages of my invention will be clear from a detailed description of the accompanying drawings, in which—

Fig. 1 is a side elevation of my new sand spreader attached to a standard truck;

Fig. 2 is an enlarged side view of the mechanism at the front end of the truck, certain parts being in section for clearness;

Fig. 3 is a vertical section on line 3—3 of Fig. 2;

Fig. 3*a* is a fragmentary detail sectioned on line 3*a*—3*a* of Fig. 2, showing one of the rollers that support the sand belt;

Fig. 4 represents a plan view on line 4—4 of Fig. 2;

Fig. 5 shows an enlarged plan view of the rear portion of the truck and the attached sand spreader, certain parts being sectioned and others broken away for clearness;

Fig. 6 is a longitudinal cross-section of the rear portion of the machine, showing how the sand falls from the truck into a hopper with an adjustable gate, and from there onto the conveyor belt;

Fig. 7 represents a section on line 7—7 of Fig. 6;

Fig. 8 is a fragmentary view in longitudinal section, showing a modified support for the conveyor belt;

Fig. 9 is a transverse section on line 9—9 of Fig. 8;

Fig. 10 shows still another form of sand conveyor comprising movable cross-bars that push the sand forward over a fixed plate;

Fig. 11 is a transverse section on line 11—11 of Fig. 10;

Fig. 12 (on sheet 1) shows a modification in which the sand-spreading attachment has a pair of traction wheels on which it is pushed along by the truck, the conveyor and distributor being driven from the axle of those traction wheels;

Fig. 13 is a plan view on line 13—13 of Fig. 12;

Fig. 14 shows another modification employing a screw conveyor and a paddle to feed the sand onto the spreading wheel, this view being partly sectioned for clearness;

Fig. 15 represents a cross-section on line 15—15 of Fig. 14;

Fig. 16 is a fragmentary view on the broken section line 16—16 of Fig. 14;

Fig. 17 is a fragmentary view similar to Fig. 14, except that the rotary feed paddle is replaced by a fixed guide plate for the sand; and

Figs. 18–19 are sections on lines 18—18 and

19—19 of Fig. 14, to show the variable friction drive for the tiltable spreading wheel.

I shall first describe the construction shown in Figs. 1–6, in which a belt carries the sand forward to the distributing wheel, both of which parts are operated by a small gas engine mounted in front of the truck. All the parts comprising the sand-spreading attachment are carried by a long narrow frame suspended beneath the truck between its traction wheels. I need not go into the structural details of the supporting frame, for it may be built in any practical way. It is enough to say that this frame comprises a pair of side bars 10 and 12, a front cross bar 13, and a rear cross bar 14. These bars are preferably channel irons to produce a frame of the required strength with minimum weight. Intermediate connecting rods or spacers 15 may be used for additional rigidity. It will be convenient to indicate this framework as a whole by the reference numerals 10–12.

The truck T, of any standard make, has a pair of side bars 16 to which the frame 10–12 is hooked or otherwise attached in any practical way. In the present instance, I have shown the rear end of frame 10–12 attached to lugs 17 (see Fig. 1) on bar 16 by chains or other connecting members 18. The front end of frame 11–12 is suspended by hooks 19 to a cross rod 20 (see Figs. 2 and 4) carried by the front end of the truck bars 16. The hooks 19 are attached to chains or cables 21, which pass over a rotary drum 22 mounted on a shaft 23. The drum 22 is supported between a pair of side pieces 24 on frame 10–12, and one end of the drum carries a worm-gear 25 in mesh with a worm 26 on a vertical shaft 27, as indicated in Fig. 2. By turning the wheel 28 on shaft 27, the operator can easily raise and lower the front end of frame 10–12 and all parts carried thereby. A cross-plate 29 on frame 10–12 abuts against the bumper bar 30 of the truck, whereby the frame is steadied against swinging movements. I want it understood that any other practical means may be employed for securing the frame 10–12 beneath the truck, either permanently or in such a way that it is easily removed.

The unitary framework 10–12 has several transverse rollers for supporting an endless belt 31, which carries the sand forward to the spreading wheel, as will be described later on. These rollers include a front roller 32, a rear roller 33, and a number of intermediate rollers 34 and 35. The rollers 35 are beneath the lower run of belt 31 and hold it tensioned. The roller 32 is a driving pulley mounted on a shaft 36 between a pair of side bars 37 on frame 10–12. The rear roller 33 may be mounted so as to be adjustable longitudinally of the frame to regulate the normal tension of belt 31. A simple way to adjust the roller 33 is shown in Figs. 1, 5 and 6. This roller is mounted on a shaft 38 arranged to extend through slots 39 in the side bars 10–12, and the ends of this shaft are supported in a pair of plates 40 which are slidably attached to the side bars by bolts 41 passing through slots in the plates. The plates 40 are adjustable by screw rods 42, which have heads 43 adapted to receive a suitable implement for turning the rods either way. In a full-size machine which I have built and operated, the conveyor belt 31 is about twenty inches wide, the horizontal distance between the two end pulleys 32–33 is about twenty-six feet, and the diameter of the driving pulley 32 is seven inches. I mention this figure merely by way of illustration. To reduce the friction of the belt rollers 34 and 35 as much as possible, I may construct them as shown in Fig. 3*a*. That is, each roller is a closed hollow cylinder turning on a fixed rod 44 supported between the side bars 10–12. One end of rod 44 has an axial bore 45 open at its inner end to the interior of the hollow roller, which is filled with oil to lubricate the bearings 46. The oil is pumped through the opening 45, which is closed by a screw cap 46.

The sand truck T has the usual body 47 pivoted at 48 for upward tilting at the front to discharge the sand through the rear opening 49 formed by the swinging gate 50 which is hinged at its upper end on pins 51. The frame 10–12 carries a hopper 52 arranged beneath the discharge end of the truck and open at the bottom to the conveyor belt 31, as best shown in Fig. 6. The hopper 52 may be secured to the side bars 10–12 in any practical way, as by means of brackets 53 and 54. The front wall of hopper 52 has an opening 55 covered by an adjustable plate 56 to regulate the rate of flow of the sand upon the moving belt 31. A simple way to adjust the plate 56 is by a bolt or pin 57 arranged to enter any one of a series of vertical holes 58 in the adjacent hopper wall. The rear wall of hopper 52 may carry a deflector 59 to guide the sand toward the discharge opening 55. Since the body 47 of the truck is considerably wider than the hopper 52, I insert a pair of triangular plates 60 into the rear corners of the truck body, as shown in Figs. 5 and 6. The plates 60 may simply be hooked over the body 47, as indicated at 61, and they converge the sand into the hopper 52 without spilling any through the ends of the gate opening 49. It is understood that the gate 51 is held in any adjusted position to control the flow of sand into the hopper 52.

Instead of supporting the conveyor belt 31 on rollers 34 and 35, I may use the modified belt-support shown in Figs. 8 and 9, where the upper run of the belt moves between two pairs of spaced guide strips 62–63, which thus support the belt along both edges. The lower run of the belt rests on a stationary plate 64. Also, in place of an endless belt I may resort to the use of cross-blades 65 carried by a pair of endless sprocket chains 66, as shown in Figs. 10 and 11. The blades 65 are spaced a certain distance apart and move over a fixed plate 67, on which the sand falls from hopper 52. The blades 65 push or scrape the sand along toward the front of the truck to the distributing wheel, which I shall presently describe. The lower runs of sprocket chains 66 rest on ledges or side strips 68 attached to the angle bars 10–12. I have briefly described the conveyor modifications of Figs. 8-11 as coming within the scope of my invention, but not as limitations thereof, for it is evident that any practical form of conveyor may be employed.

On the side bars 37 at the front end of the supporting frame 10–12 is mounted a small gas engine E, which need not be of more than ten horse-power. In the broad aspect of my invention, the engine E represents any practical form of prime mover. The crank-shaft 69 of the engine carries at one end a sprocket wheel 70, which is connected by a chain 71 to a larger sprocket wheel 72 fixed on one end of a transverse shaft 73. The sprocket wheels 70 and 72 and the connecting chains 71 are preferably enclosed in a dust-proof housing 74. The shaft 73 extends through a casing 75 which in the present instance contains a standard Lewellen transmission for obtaining variable speed. As this type of transmission is well known, and does not by itself form part of this invention, I need describe it only in a few sentences, reference being had to Fig. 4.

The shaft 73, which may be considered the input or driving shaft, is connected to a second shaft 76 through a wedge-shaped belt 77 arranged in variable engagement with two pairs of cone disks 78 and 79 slidably keyed on their respective shafts 73 and 76. The cone disks 78 and 79 are connected by a pair of operating levers 80 pivoted at 81 on a cross-rod 82 mounted in the rectangular frame 83. The free ends of levers 80 are slidably connected to a rotary screwshaft 84 in frame 83, and a crank 85 permits easy rotation of the shaft in either direction to spread or bring together the free ends of the levers. In this way, when the cone disks 78 are moved toward each other, the other cone disks 79 are spread apart, and vice versa, whereby the belt 77 rides up and down the disks to vary the transmission ratio between the input shaft 73 and the output shaft 76. It will be understood that the engine-driven shaft 73 rotates at predetermined constant speed, so that only the speed of shaft 76 is changed by turning the screwshaft 84. For convenience I shall refer to this variable transmission mechanism as a whole by the numeral 75, which includes the casing enclosing all the parts. This mechanism is mounted as a unit on a base plate 86, which is fixed on top of a pair of side pieces 87 (see Fig. 3) on frame 10—12. In the broader aspect of my invention, any other practical form of speed-changing device for shaft 76 may be used.

One end of shaft 76 carries a sprocket wheel 88, which is connected by a chain 89 to a larger sprocket wheel 90 on shaft 36 (see Fig. 3). A dust-proof casing 91 preferably encloses the parts 88, 89 and 90. I have previously explained that the shaft 36 carries the driving pulley 32 of belt 31, so that the latter is driven from the variable-speed shaft 76. In practice I have found that the conveyor belt 31 may have a speed between 200 and 250 feet per minute for good results. By simply turning the crank 85 of transmission mechanism 75, the operator can readily adjust the speed of belt 31 to obtain the best results in any particular sanding job, without changing the speed of engine shaft 69.

I will now describe the structural details of my new spreading wheel, which I have indicated as a whole by W. This wheel comprises a flat base plate or disk 92, on which several radial wedges 93 are fixed, these wedges rising toward the periphery of the disk, as clearly shown in Figs. 2 and 3. An angle iron 93 is mounted on each wedge, and these radial angle irons constitute blades which throw the sand off the rotating wheel. To improve the sand-distributing action of the wheel, I provide triangular inclined plates 95 between the radial blades 94. These inclined plates rise from the base of each wedge 93 to the top of the next wedge in the direction of rotation of the wheel. It is thus clear that the plates 95 have a double inclination: they rise radially from the center toward the periphery of disk 92, and they also rise circumferentially to form a series of steps adapted to guide the sand against the blades 94. At the same time, the inclined plates 95 act to throw a portion of the sand upward and forward. In other words, the inclined members 94 and 95 are so shaped and arranged as to cooperate in throwing the sand upward through a long trajectory. The practical result, as I have actually demonstrated, is a continuous rain or stream of sand which covers the road-bed with a uniform layer. There is no piling up of the sand in ripples, as happens with the use of flat spreading wheels that throw the sand horizontally instead of upwardly. The parts 92, 93, 94 and 95 of the spreading wheel may in some instances be a unitary casting, preferably of light strong metal, like aluminum or an aluminum alloy.

The spreading wheel W has a central hub or bearing 96 adapted to be mounted on the upper end of a short shaft 97, which projects through a closed housing 98 where it is journaled in suitable bearings 99. The housing 98, which is conveniently made in two parts secured by bolts 100, is mounted between the main side bar 10 and a plate 101 secured to the cross-bar 13, as shown in Figs. 2 and 3. A cylindrical lateral extension 102 on housing 98 fits against a semi-circular recess 103 in the front edge of plate 101, and a U-shaped shackle bolt 104 holds the housing 98 clamped rigidly to the plate. The interior of housing 98 is kept filled with lubricating oil through a pipe 105, which projects through side bar 10, as may be seen in Fig. 3. The housing 98 contains a horizontal bevel gear 106 and a vertical bevel pinion 107, these two members being permanently in mesh. The large gear 106 is fixed on shaft 97, as by means of a bushing 108, and the small gear 107 is mounted on the inner end of a horizontal shaft 109, which is rotatably supported in housing 98 by suitable bearings 110. The shaft 109 projects laterally out of housing 98 through the side bar 12, and an additional bearing block 112 may be used if advisable. The outer end of shaft 109 carries a sprocket pinion 113, which is connected by a chain 114 with a similar pinion 115 on a horizontal stub shaft 116. The pinion 115 is directly behind pinion 113, and that is why the latter is partly broken away in Fig. 3 to show the top of pinion 115. A cover plate 117 secured to side bar 12 encloses the parts 113–114–115 in a dust-proof housing, and a separate cover 98′ secured to side-bars 10–12 may enclose the gear casing 98 and the outer portion of shaft 109.

I have already explained that the upper cross-shaft 73 is driven directly from the engine E and constitutes the input shaft of the variable transmission mechanism 75. The left end of shaft 73 (as viewed in Fig. 3) carries a sprocket pinion 118, which is connected by a chain 119 with a similar pinion 120 fixed on the outer end of stub-shaft 116. A dust-proof casing 121 may enclose the parts 118–119–120. It will thus be clear that the spreading wheel W is rotated at reduced speed from the engine-driven shaft 73 through the chain-and-sprocket connections 118–119–120 and 115–114–113. The correct rotational speed of spreading wheel W is easily determined by trial in each particular case to obtain a layer of sand of the required thickness. Obviously, the linear speed of the feed belt 31 should be in proper relation to the rotary speed of wheel W. Also, the speed at which the truck T travels has something to do with getting the desired layer of sand. These different factors are readily determined by the skilled operator. If it is found necessary to vary the speed of the spreading wheel, the speed of engine shaft 69 is varied in any practical way. For example, in Fig. 2 the engine E is provided with a fuel-control device 122 of the ball-governor type, and this device is regulated by a hand lever 123. After the correct speed of the spreading wheel W has thus been determined, the speed of belt 31 is separately regulated by means of the crank or hand-wheel 85, as previously explained.

In a preferred form of my sand-spreading machine, I arrange one or more manually adjustable deflectors above the spreading wheel W to vary the delivery of sand to the wheel. Referring to Figs. 2 and 3, there is a deflector plate 124 pivoted on a rod or hinge-pin 125, which is mounted in suitable bearings 126. One end of rod 125 carries a handle 127 for swinging the plate 124 to any desired angle. Above the plate 123 is a curved shield 128 arranged in front of the discharge end of belt 31 to deflect the sand downward toward wheel W. The point at which the sand is delivered to the spreading wheel from belt 31 depends upon the angular position of deflector plate 124. When this plate is swung forward, as shown in Fig. 2, the sand striking it falls near the center of wheel W, which rotates through a comparatively wide angle before the sand is thrown off. Consequently, the sand is thrown in front of or toward the left of the truck (as viewed from the driver's seat). When the deflector plate 124 is swung rearward, the sand drops near the periphery of wheel W, and is therefore thrown off sooner, so that it covers the right side of the road. Thus, by adjusting the position of plate 124, it is possible to vary the brief interval of time during which the sand remains on the rotating wheel W before being thrown off. In this way the operator can select the road area to be sanded,—whether to the right of the truck, or directly in front of it, or to the left. I have found this feature of my invention to be of great practical value. It goes without saying that the deflector plate 124 remains firmly in any adjusted position, either by friction or by means of a suitable locking device, like a pawl and ratchet arrangement.

Instead of having a separate engine to drive the sand belt 31 and the spreading wheel W, I may use the truck itself as a source of power by letting it push the framework 10–12 on a pair of traction wheels 130, as shown in Figs. 12 and 13. The auxiliary traction wheels 130 on which the front portion of the sand-spreading attachment is supported, are fixed on a cross-shaft 129 in frame 10–12, which is attached to the truck as previously described, or in any other practical way. We may therefore consider 129 to be a power shaft which turns when the truck moves. In front of the traction shaft 129 are mounted two cross-shafts 130 and 131 carried by the main supporting frame 10–12. One end of shaft 130 carries a small sprocket wheel 132 and a large sprocket wheel 133. A chain 134 connects the sprocket wheel 132 with a large sprocket wheel 135 on shaft 129, and a chain 136 connects the sprocket wheel 133 with a small sprocket wheel 137 on shaft 131. It should be understood that the shaft 131 takes the place of shaft 109 in Fig. 3, so that the rotation of shaft 129 is communicated in properly increased transmission ratio to the spreading wheel W.

The construction of spreading wheel W in Figs. 12–13 is exactly the same as that in Figs. 2–3, except that the upper edge of the radial blades 94 in Figs. 12–13 is straight for a certain distance from the center and then rises toward the periphery of the wheel, as indicated at 94' in Fig. 12. The driving shaft 129 carries a second sprocket wheel 138, which is connected by a chain 139 to shaft 73 of the variable transmission mechanism 75, previously described. The variable-speed shaft 76 of this mechanism carries a large sprocket 142 on shaft 36, whereby the belt 31 is driven at increased speed from the power shaft 129. This increased transmission ratio is necessary for driven shafts 36 and 131, because the traction shaft 129 of framework 10–12 rotates slowly at the same speed as the traction wheels of the truck. Otherwise, what has been said for the construction of Figs. 1–6 applies to the modification of Figs. 12–13 without the need of repetition.

Figs. 14–19 show a construction in which the sand-feeding belt 31 of the previously described figures is replaced by a pair of screw conveyors arranged to discharge the sand on a tiltable spreading wheel. All those parts of Figs. 14–19 that are duplicates of (or correspond to) certain parts of Figs. 1–13 wll not be described again, but will simply be indicated by the same reference numerals heretofore used for those parts in Figs. 1–13. Referring now to Figs. 14–17, the main framework 10–12 carries a pair of screw conveyors 143 arranged in troughs 144, which at their rear end receive the sand from the hopper 52 previously described. The screw conveyors 143 include rotary shafts 145–146, which extend through the rising front wall 147 of troughs 144. The front end of shaft 145 carries a bevel gear 148 and a pinion 150, which is connected to pinion 149 through an idler 151. The bevel gear 148 meshes with a bevel pinion 152 on a lateral stub-shaft 153, which rotates in a bearing 154 attached to the main side bar 12, as clearly shown in Fig. 16. The outer end of shaft 153 has a sprocket pinion 155, which is connected by a chain 156 to the outut shaft 76 of the variable transmission mechanism 75. It is thus clear that the two conveyor shafts 145–146 are driven from the variable speed shaft 76 and rotate in the same direction at the proper speed.

In Fig. 14 there is a paddle wheel 157 in the front end of the conveyor trough to feed the sand up the rising wall 147 through the discharge spout 158. The paddle wheel 157 is mounted on a shaft 159 which carries a sprocket gear 160, and a chain 161 connects the latter with a sprocket pinion on a stub-shaft 162. The variable-speed shaft 76 is connected by a sprocket chain 163 with a sprocket wheel on shaft 164, which is geared to shaft 162 to cause rotation of paddle wheel 157 in the right direction. That is to say, assuming the shaft 76 to rotate clockwise (as viewed in Fig. 14), the paddle wheel 157 will rotate in a reverse direction to feed the sand through spout 158. Any other practical arrangement may be used to operate the screw conveyors 143 and paddle wheel 157 from the engine E, or from any other source of power. The paddle wheel 157 may in some cases be omitted, as indicated in Fig. 17, where this wheel is replaced by a stationary guide plate 165 so shaped and mounted as to form a shallow channel or throat 166 through which the sand is pushed. The plate 165 is preferably adjustable, as by means of a pin-and-slot connection 167–168, to vary the width of channel 166.

In Figs. 14–19, the spreading wheel W' is mounted for forward tilting to vary the trajectory of the sand thrown off the wheel. In this instance the structure of the wheel itself is simpler than that of wheel W previously described, because the inclined surface is obtained by tilting the wheel. For this reason the spreading wheel W' need only comprise a small flat disk 169 provided with angle irons 170 arranged to form radial blades for throwing the sand. Six of these blades are usually sufficient, and I have found that the disk 169 need not extend to the ends of the blades. The disk 169 is mounted on the upper end of a short vertical shaft 171 journaled in suitable bearings 172 of a casting 173, which is rotatably supported on a stud 174. The latter may be an integral lateral extension of (or otherwise secured to) a plate 175 mounted on the main side bar 10. The casting 173 has a lateral socket 176 in line with the supporting stud 174 for receiving one end of a rotary shaft 177, which is journaled in a bearing 178 carried by the side bar 12 of the main supporting frame. A small friction wheel or pulley 179 is slidably keyed on shaft 177 and engages the underside of disk 169 of the spreading wheel W′. An expanding coil spring 180 on the lower end of shaft 171 always tends to pull the latter downward, whereby the disk 169 is maintained in firm driving contact with friction pulley 179.

The casting 173 is rotatably adjustable on its supporting stud 174 by means of a hand lever 181 arranged within easy reach of the operator. The lever 181 has a forward extension 182 which is suitably attached to casting 173. Thus, by simply moving the lever 181 forward, the casting 173 is turned to tilt the front wheel W′ downward the desired angle. In Fig. 14 a tilted position of wheel W′ is indicated by the dotted outline W^2, and the corresponding position of lever 181 is indicated at 181*a*. The greater the angle of tilt, the farther will the sand be thrown at a given speed of the spreading wheel. The tilting of wheel W′ has no effect on the driving contact between friction pulley 179 and the underside of disk 169, because the axis of the pulley is coincident with the tilting axis of the wheel.

The axial adjustment of friction pulley 179 on shaft 177 is to vary the speed of the spreading wheel. Fig. 19 shows the pulley 179 nearest the center of disk 169 for maximum speed, which is decreased as the pulley is moved toward the periphery of the disk. To vary the driving position of pulley 179, I provide a lever 183 pivoted at 184 and connected at its lower end to a slidable bar 185, which terminates in a yoke 186 arranged to engage in the annular groove of a collar 187 attached to the friction pulley. When the lever 183 is rocked clockwise (as viewed in Fig. 19), the pulley 179 is shifted to the left to decrease the speed of the spreading wheel W′. By moving the lever 183 the other way, the driving pulley 179 is shifted toward the center of disk 169 to increase the speed of the spreading wheel. The shaft 177 is rotated at predetermined constant speed from shaft 73 of the variable transmission mechanism 75. For this purpose there is a sprocket wheel 188 on the outer end of shaft 177, and a chain 189 connects this wheel with a sprocket wheel on shaft 73.

The front end of the main supporting frame 10-12 in Figs. 14-19 may be attached to truck T in the same way as the frame of Figs. 1–13,—that is, by means of chains or cables 21 hooked to the cross-bar 20. Instead of using a vertical shaft 27 to wind up and unwind the chains, as in Fig. 2, I substitute in Fig. 14 a crank 190 for turning a horizontal shaft 191, which carries a worm 26′ in mesh with the worm gear 25 attached to the chain drum 22, as previously explained. To steady the framework 10-12 in raised position on the truck, I provide the front end of the truck with a bracket 192 having a spherical socket 193 adapted to receive the spherical head of a cylindrical post 194 on the framework. A simple procedure for connecting my unitary sand-spreading attachment to a truck is to place the framework on the ground, fully equipped except for the hopper 52. The truck is run over the long narrow framework to proper position, and then the framework is attached to the ends of the truck as previously described. The hopper 52 is thereupon mounted on the rear portion of the framework.

It is obvious that the tiltable spreading wheel W′ of Figs. 14-19 can be substituted in Figs. 1–13 for the wheel W, and vice versa. Likewise, the belt conveyor 31 and screw conveyor 143 may be interchanged in the various modifications, which are to be considered as practical examples of my invention, and not as limitations thereof. Although I have called my machine a sand spreader, it may be used for spreading other kinds of road material. It is not necessary that a single machine embody all the features of my invention, for some of them may be used without others. Various changes will doubtless occur to those skilled in this art without departing from the scope of the invention as defined in the appended claims.

I claim as my invention:

1. In a sand-spreading machine, a horizontal distributing wheel, a normally vertical axis on which said wheel rotates, a friction pulley engaging said wheel to drive the same, means for adjusting said pulley radially of said wheel to vary the speed of the wheel, and means for tilting the axis of rotation of said wheel without disengaging it from said pulley.

2. A sand-spreading machine comprising a self-propelled sand truck having a discharge opening at the rear, a long narrow frame supported beneath said truck between the traction wheels thereof and extending in front of the truck, a conveyor carried by said frame, a hopper mounted on said frame over the rear end of said conveyor in line with the discharge opening of the truck, the extending front part of said frame carrying a sand-spreading wheel and an engine, said wheel being mounted to receive sand from the discharge end of said conveyor, and means for connecting said conveyor and wheel to said engine for simultaneous operation.

3. A sand truck of standard make carrying a sand-spreading machine which is arranged entirely within the maximum width of the truck, said machine comprising a distributor in front of the truck, a conveyor arranged beneath the truck between the traction wheels thereof for carrying sand from the rear of the truck to said distributor, an engine mounted in front of the truck above said distributor, variable speed mechanism carried by said machine and arranged in front of the truck near said engine, means for connecting said engine with said mechanism, driving connections between said mechanism and said distributor, and other driving connections between said mechanism and said conveyor.

4. A sand truck of standard make carrying a sand-spreading machine which is arranged entirely within the maximum width of the truck, said machine comprising a distributor in front of the truck, a conveyor arranged beneath the truck between the traction wheels thereof for carrying sand from the rear of the truck to said distributor, an engine mounted in front of the truck above said distributor, variable speed mechanism carried by said machine and arranged in front of the truck near said engine with said mechanism, driving connections between said

mechanism and said distributor, and other driving connections between said mechanism and said conveyor, said last-mentioned driving connections including manually operable means for varying the speed of said conveyor without affecting the speed of said distributor.

5. A sand-spreading machine comprising, in combination with a sand truck, a unitary framework constructed to be attached to said truck within the maximum width of the truck, said framework having a front portion and a long narrow extension, said front portion of the framework being positioned in front of the truck and said extension being adapted to fit beneath the truck between the traction wheels thereof without interfering with the movements of the truck, a sand conveyor carried by said extension for receiving sand from the rear discharge end of the truck, a rotary sand distributor carried by the front portion of said framework for receiving sand from said conveyor and throwing it on the road-bed, a prime mover mounted on said front portion of the framework, and transmission connections leading from said prime mover to said conveyor and said distributor for simultaneously operating the two last-mentioned parts.

6. As a new article of manufacture for attachment to a sand truck of standard make, a sand-spreading machine consisting of a unitary framework comprising a front portion and a rearward extension which is long and narrow, said extension being of less width than the lateral space between the traction wheels of the truck and so low that the truck may be driven over the extension when the framework is on the ground, a sand conveyor carried by said extension for feeding sand forwardly, an engine and a sand-spreading wheel mounted on the front portion of said framework, said wheel being arranged to receive sand from said conveyor, transmission connections between said engine and said belt and wheel for simultaneously operating the two last-named elements, and means for attaching said unitary framework to the truck after the latter has been moved over said extension, said sand-spreading machine when attached to the truck being wholly within the maximum width of the truck.

7. A sand-spreading machine comprising, in combination with a sand truck, a unitary framework constructed to be attached to said truck within the maximum width of the truck, said framework having a front portion and a long narrow extension, said front portion of the framework being positioned in front of the truck and said extension being adapted to fit beneath the truck between the traction wheels thereof without interfering with the movements of the truck, a sand conveyor carried by said extension for receiving sand from the rear discharge end of the truck, a rotary sand distributor carried by the front portion of said framework for receiving sand from said conveyor and throwing it on the road-bed, a prime mover mounted on said front portion of the framework, and transmission connections leading from said prime mover to said conveyor and said distributor for simultaneously operating the two last-mentioned parts, said transmission connections including manually operable means for varying the speed of the conveyor without affecting the speed of the distributor.

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