March 20, 1962 R. E. SWARTHOUT 3,025,803

MACHINE FOR SPRAYING PLASTER AND THE LIKE

Filed July 20, 1959 3 Sheets-Sheet 1

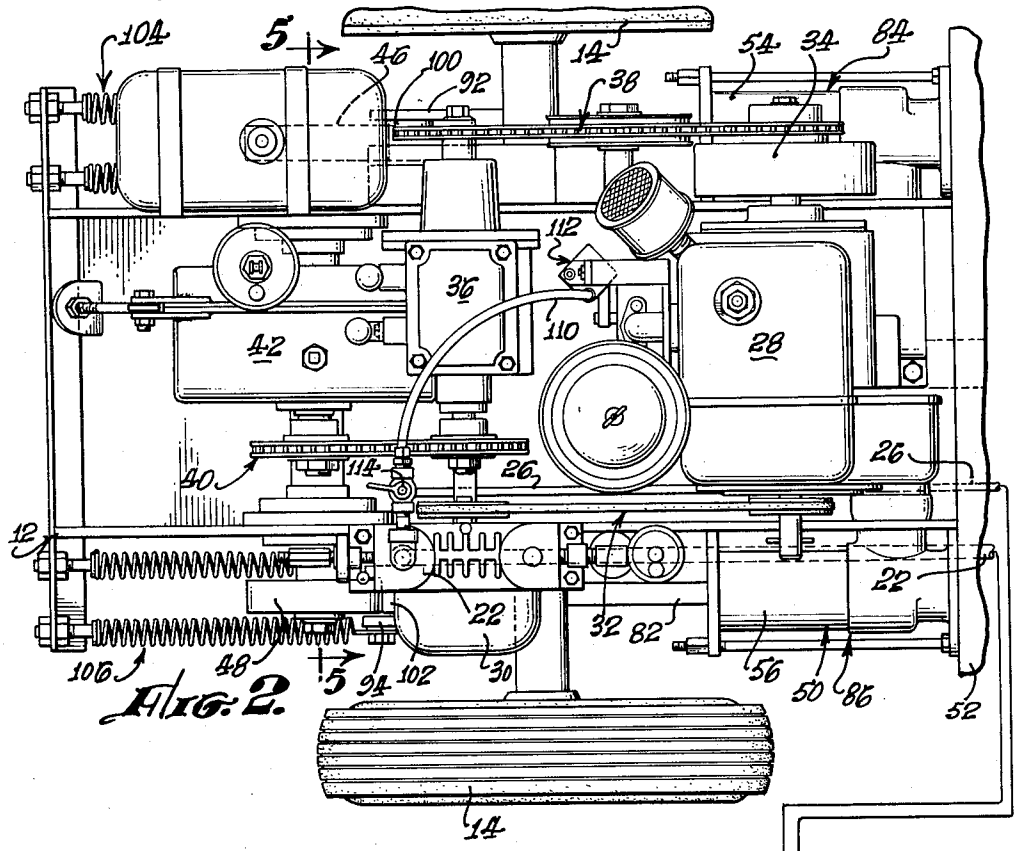


FIG. 2.

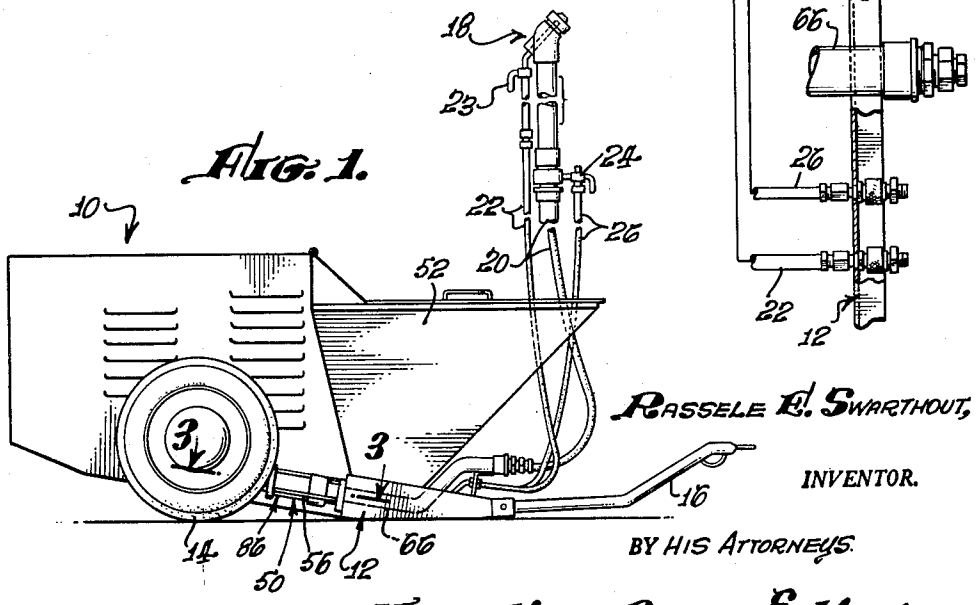


FIG. 1.

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FIG. 3.

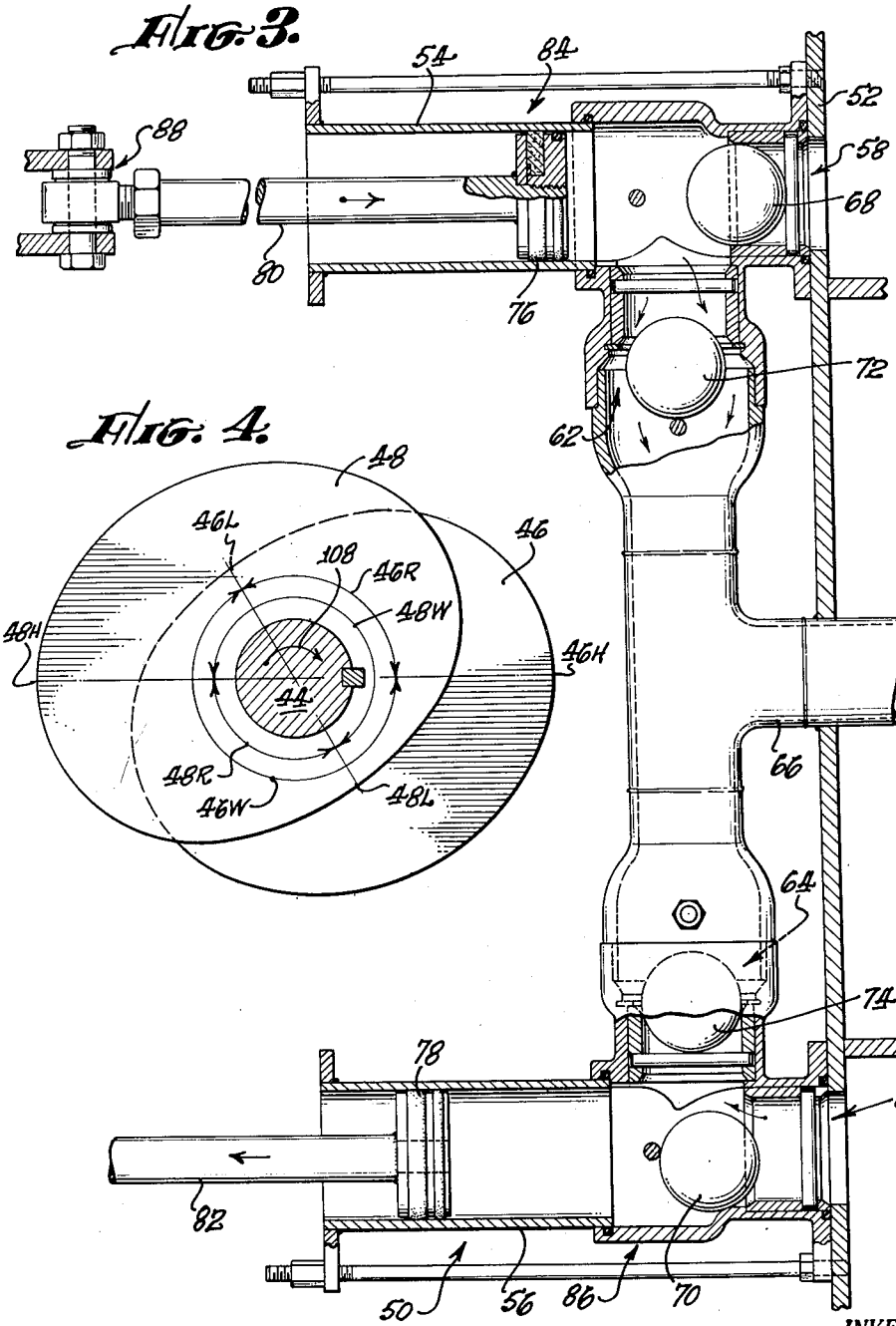


FIG. 4.

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FIG. 5.

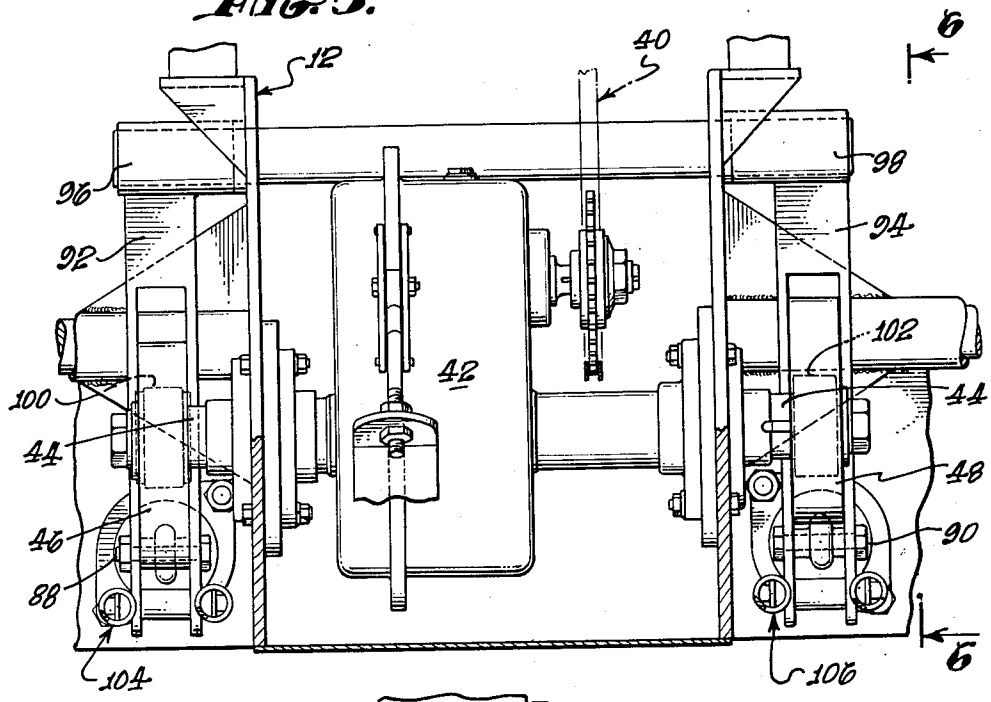
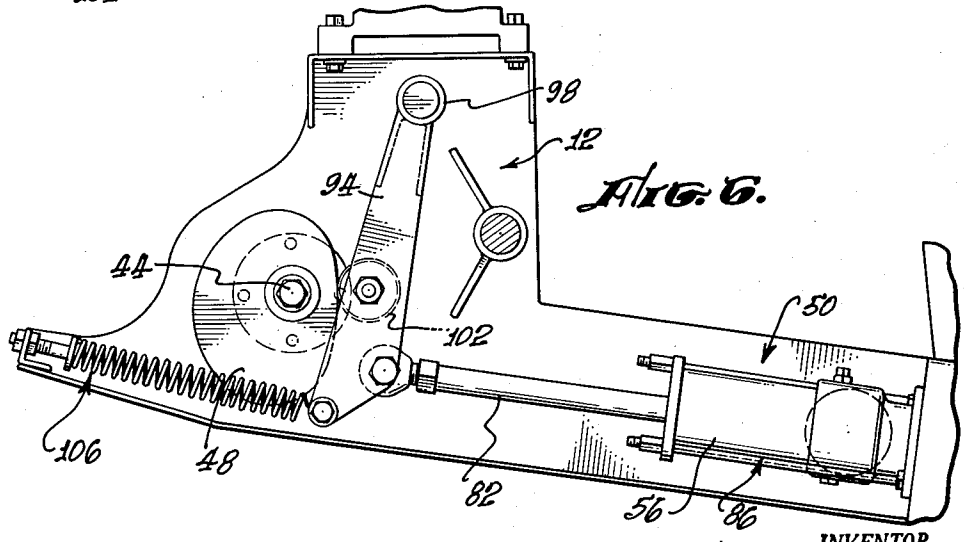


FIG. 6.



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Patented Mar. 20, 1962

3,025,803

MACHINE FOR SPRAYING PLASTER AND THE LIKE

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2 Claims. (Cl. 103—170)

The present invention relates in general to a machine for spray coating structures with plaster, or other semifluid materials, and, more particularly, to an apparatus for pumping plaster and like materials in a machine of this nature, a general object of the invention being to provide an improved actuating or drive means for a pumping means of the reciprocating type in such a machine.

More specifically, a primary object of the invention is to provide a pumping means which includes cylinder means having piston means reciprocable therein, pivoted arm means connected to the piston means, cam means engageable with the arm means, and resilient means for biasing the arm means into engagement with the cam means. With this construction, the cam means pivots the arm means in one direction to move the piston means in one direction and the resilient means pivots the arm means in the opposite direction to move the piston means in the opposite direction, the working or pumping strokes of the piston means being produced by the cam means and the return or suction strokes of the piston means being produced by the resilient means.

Another object is to provide an apparatus wherein the pumping means includes two pumps each comprising a cylinder having a piston therein, wherein the arm means includes two pivoted arms respectively connected to the two pistons and respectively having cam followers thereon, wherein the cam means includes two cams respectively engageable with the cam followers and oriented 180° out of phase to provide a substantially continuous flow of the pumped material, and wherein the resilient means includes springs connected to the respective means and biasing the cam followers thereon into engagement with the corresponding cams. The inlets of the two pumps communicate with a supply hopper for the plaster, or other material, and the outlets of the two pumps are manifolded together so that the substantially continuous flow of pumped material produced by the two pumps may be delivered to a single spray gun, or the like.

An important object of the invention is to so contour the cams that they produce relatively slow working or pumping strokes of the pistons and permit relatively fast return or suction strokes thereof. In other words, each cam produces the working stroke of the corresponding piston throughout a relatively large portion of each revolution of such cam, and permits the return stroke of the corresponding piston throughout a relatively small portion of each revolution thereof.

Another object is to provide a construction wherein each cam produces the working stroke of the corresponding piston throughout an angle of cam rotation which is sufficiently higher than 180° to produce actual discharge of pumped material throughout at least 180° of cam rotation, this differential being necessary to permit the corresponding inlet valve to close. Thus, since the two cams are 180° out of phase and since the two pistons actually discharge pumped material throughout at least 180° of cam rotation, substantially continuous flow of the pumped material from the manifolded outlets is provided, which is an important feature.

Another feature of the present invention is that the cams may readily be replaced by other cams designed

to take care of different valve losses due to differences in the plaster mixes pumped.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the art in the light of this disclosure, may be attained with the exemplary embodiment of the invention described in detail hereinafter and illustrated in the accompanying drawings, in which:

FIG. 1 is a side elevational view of a spraying machine which embodies the invention;

FIG. 2 is an enlarged, fragmentary plan view of the machine with parts removed;

FIG. 3 is an enlarged, fragmentary sectional view taken along the arrowed line 3—3 of FIG. 1;

FIG. 4 is a semidiagrammatic view illustrating cam means of the invention for operating pumping means incorporated in the machine;

FIG. 5 is an enlarged, fragmentary sectional view taken along the arrowed line 5—5 of FIG. 2; and

FIG. 6 is a sectional view taken along the arrowed line 6—6 of FIG. 5.

The invention is illustrated in the drawings as embodied in a portable spraying machine 10 which may readily be moved about from one location to another, the machine being shown as a trailer comprising a chassis or frame 12 equipped with wheels 14 and a drawbar 16. The machine 10 supplies plaster, or other semifluid material to be sprayed, to a spray nozzle 18 through a flexible hose 20, or the like, which hose may be of any desired length so that the spray nozzle may be utilized at any desired distance from the machine 10 within the capacity of the machine to overcome the flow resistance through such hose. Compressed air from the machine 10 is supplied to the spray nozzle 18 through a hose 22 and atomizes the plaster at the nozzle. The machine 10 is controlled from the spray nozzle 18 by means of a control valve 24 on the nozzle and a control hose 26, as will be described hereinafter.

Considering the spraying machine 10 in more detail, mounted on the frame 12 is a suitable prime mover, shown as an internal combustion engine 28, preferably gasoline operated. An air compressor 30 is mounted on the frame 12 and is connected to one end of the crankshaft of the engine 28 by a belt drive 32 which operates the compressor as long as the engine is in operation. Connected to the other end of the crankshaft of the engine 28 is a speed responsive clutch 34 which is engaged as long as the speed of the engine is above a predetermined minimum, but which is disengaged at any engine speed below this minimum. Mounted on the frame 12 is a variable speed transmission 36 the input side of which is connected to the output side of the clutch by a chain drive 38, although a belt drive may be used. Another, similar drive 40 connects the output side of the variable speed transmission 36 to the input side of a speed reducing transmission 42 mounted on the frame 12, this latter transmission having an output shaft which extends transversely across the frame 12 and which constitutes a camshaft 44 of the machine 10. This camshaft carries cams 46 and 48 which operate a pumping means 50 for pumping plaster, or other semifluid material, from a supply hopper 52 on the frame 12 into the hose 20 leading to the spray nozzle 18.

Considering the pumping means 50 in more detail, it includes two cylinders 54 and 56, FIG. 3, mounted on the frame 12 longitudinally thereof so that they extend generally transversely of the camshaft 44. The cylinders 54 and 56 are provided with inlets 58 and 60 in communication with the supply hopper 52 and are provided

with outlets 62 and 64 interconnected by a manifold 66 to which the hose 20 leading to the spray nozzle 18 is connected. The inlets 58 and 60 are provided with suitable inlet check valves 68 and 70 and the outlets 62 and 64 are provided with suitable outlet check valves 72 and 74. Reciprocable in the respective cylinders 54 and 56 are pistons 76 and 78 equipped with piston rods 80 and 82.

Thus, the pumping means 50 comprises two reciprocating pumps 84 and 86 the outlets 62 and 64 of which are manifolded together and connected to the hose 20 leading to the spray nozzle 18. As will be described in detail hereinafter, the working strokes of the pistons 76 and 78 of the two pumps 84 and 86 overlap to such an extent that one or the other of the pumps is always discharging the pumped material into the manifold 66 so as to provide a substantially constant flow of the pumped material through the hose 20 to the spray nozzle 18.

Considering the manner in which the pumps 84 and 86 are operated, the piston rods 80 and 82 are respectively pivotally connected, at 88 and 90, to arms 92 and 94 which are pivotally mounted on the frame 12 at 96 and 98, respectively. The arms 92 and 94 respectively carry cam followers 100 and 102 which are preferably rollers and which are engageable with the cams 46 and 48, respectively. Two resilient means 104 and 106 connected to the frame 12 and respectively connected to the arms 92 and 94 maintain the cam followers 100 and 102 in engagement with the cams 46 and 48. In the construction illustrated, each of the resilient means 104 and 106 comprises a pair of tension springs, but this construction may be varied.

The cams 46 and 48 act through the cam followers 100 and 102, the arms 92 and 94 and the piston rods 80 and 82 to produce the working strokes of the pistons 76 and 78, it being understood that the pistons move to the right, as viewed in FIG. 3, during their working strokes. The return strokes of the pistons 76 and 78 are produced by the resilient means 104 and 106, which cause the cam followers 100 and 102 to follow the cams 46 and 48.

The cams 46 and 48 are so contoured and phased that one or the other of the pumps 84 and 86 is discharging the pumped material at all times. More particularly, the cams 46 and 48 are 180° out of phase and produce the working strokes of the pistons 76 and 78 throughout considerably more than 180° of cam rotation so that the pistons discharge the pumped material throughout at least 180° of cam rotation to insure substantially continuous flow from the manifold 66. The difference between the angle of cam rotation for each complete working stroke and the angle of cam rotation during which actual pumping takes place corresponds to the angle of cam rotation required to close the corresponding one of the inlet check valves 68 and 70.

Considering the cams 46 and 48 still more specifically, they are provided with high points 46H and 48H, respectively, which are out of phase by 180°, and are provided with low points 46L and 48L, respectively, which are also out of phase by 180°. The low points 46L and 48L of the cams 46 and 48 lead the high points 46H and 48H thereof by an angle of considerably more than 180°, the direction of cam rotation being indicated by the arrow 108 in FIG. 4. The angle by which the low points 46L and 48L lead the high points 46H and 48H exceeds 180° by an amount sufficient to insure seating of the inlet check valves 68 and 70, with the result that the pumps 84 and 86 discharge the pumped material throughout at least 180° of cam rotation to insure substantially continuous delivery of the pump material to the spray nozzle 18. In FIG. 4 of the drawings, the cam rotations corresponding to the over-all working strokes of the pistons 76 and 78 are designated by the arrows 46W and 48W, respectively. The cam rotations corresponding to the return strokes of the pistons 76 and 78 are designated by the arrows 46R and 48R, respectively. It will be noted that the return strokes require considerably less than 180° of cam rotation, the balance of each cam revolution being allocated to the working strokes 46W and 48W to insure actual delivery of pumped material throughout at least 180° of cam rotation by each of the pumps 84 and 86.

It will be understood that the actual angle by which the cam rotations 46W and 48W exceed 180° to insure discharging pumped material through cam rotations of at least 180°, depends on the structure of the inlet check valves 68 and 70, and also depends on such things as the compressibility of the pumped material. If the material is less compressible than that for which the cams 46 and 48 are designed, other cams, not shown, may be substituted wherein the angles 46W and 48W do not exceed 180° by as great an amount. Thus, the present invention permits such things as variations in the compressibility of the pumped material to be compensated for by changing cams.

The foregoing completes the description of the structure and operation of the pumping means 50 and the structure and operation of the spray nozzle 18, including the manner in which the pumping means 50 is controlled from the spray nozzle, will now be considered briefly. As previously pointed out, the pumped material is delivered to the spray nozzle 18 through the hose 20. The pumped material is atomized at the spray nozzle 18 by compressed air delivered thereto from the compressor 30 through the hose 22, the compressed air delivered through the hose 22 being applied to the pumped material delivered through the hose 20 in a conventional manner so that a detailed consideration is not necessary. The hose 22 is provided with a valve 23 which regulates the flow of atomizing air to vary the spray pattern. The control hose 26 is also connected to the compressor 30 and compressed air flow therethrough is regulated by the control valve 24 at the spray nozzle 18. Normally, the control valve 24 is open and the compressed air flowing through the control hose 26 escapes into the atmosphere. Under such conditions, the pressure in the control hose 26 is relatively low and this pressure is communicated, through a line 110, FIG. 2, to a governor 112 which controls the speed of the engine 28. When the control valve 24 is fully open so that the pressure delivered to the governor 112 is at a minimum, the engine speed is reduced to a minimum, whereupon the clutch 34 is disengaged to prevent operation of the pumping means 50, wherefore no plaster, or other material, is delivered to the spray nozzle 18. With the control valve 24 closed, the governor 112 is subjected to maximum pressure and the engine 28 operates at maximum speed and, under these conditions, the clutch 34 is engaged and the maximum flow of plaster is delivered to the spray nozzle 18. Thus, the flow of plaster, or other material being pumped, is controlled remotely at the spray nozzle 18.

Communicating with the control hose 26 and the line 110 leading from the control hose to the governor 112 is another valve 114 located directly on the machine 10. When this valve is opened, the governor 112 is subjected to minimum pressure and thus reduces the speed of the engine 28 to a minimum, thereby disengaging the clutch 34. The valve 114 thus provides means mounted directly on the machine 10 for preventing operation of the pumping means 50.

Although an exemplary embodiment of the invention has been disclosed herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiment without departing from the spirit of the invention as defined by the claims which follow.

I claim:

1. In combination: a frame; a supply hopper carried by said frame; two pumps mounted on said frame and respectively including cylinders having pistons reciprocable

therein, said pumps respectively having inlets communicating with said supply hopper and having manifolded outlets; two arms pivotally mounted on said frame and respectively connected to said pistons, whereby pivotal movement of said arms produces reciprocatory movement of said pistons, respectively; two cam followers on said arms, respectively; two rotatable cams respectively engaging said cam followers to pivot said arms and thus reciprocate said pistons, said cams being 180° out of phase, each of said cams having a high point and a low point spaced apart circumferentially thereof by angles differing from 180°; means for maintaining said cam followers in engagement with said cams, respectively; a camshaft rotatably mounted on said frame and having cantilevered ends, said cams being removably and nonrotatably mounted on said cantilevered ends, respectively, of said camshaft; and driving means connected to said camshaft between said cams for rotating said camshaft to rotate said cams.

2. In combination: a frame; two pumps mounted on said frame and respectively including cylinders having pistons therein, said pistons being movable through working and return strokes; means for moving said pistons

through their working and return strokes with the working strokes of said pistons overlapping, including two eccentrics respectively engaging said pistons, said eccentrics being substantially 180° out of phase and each having a high point and a low point spaced apart circumferentially thereof by angles differing from 180°; a shaft rotatably mounted on said frame and having overhanging ends, said eccentrics being removably and nonrotatably mounted on said overhanging ends, respectively, of said shaft; and driving means connected to said shaft between said eccentrics for rotating said shaft to rotate said eccentrics.

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