

Aug. 21, 1951

C. V. MORINE
SOIL FUMIGANT PUMP

2,565,255

Filed Aug. 26, 1948

5 Sheets-Sheet 1

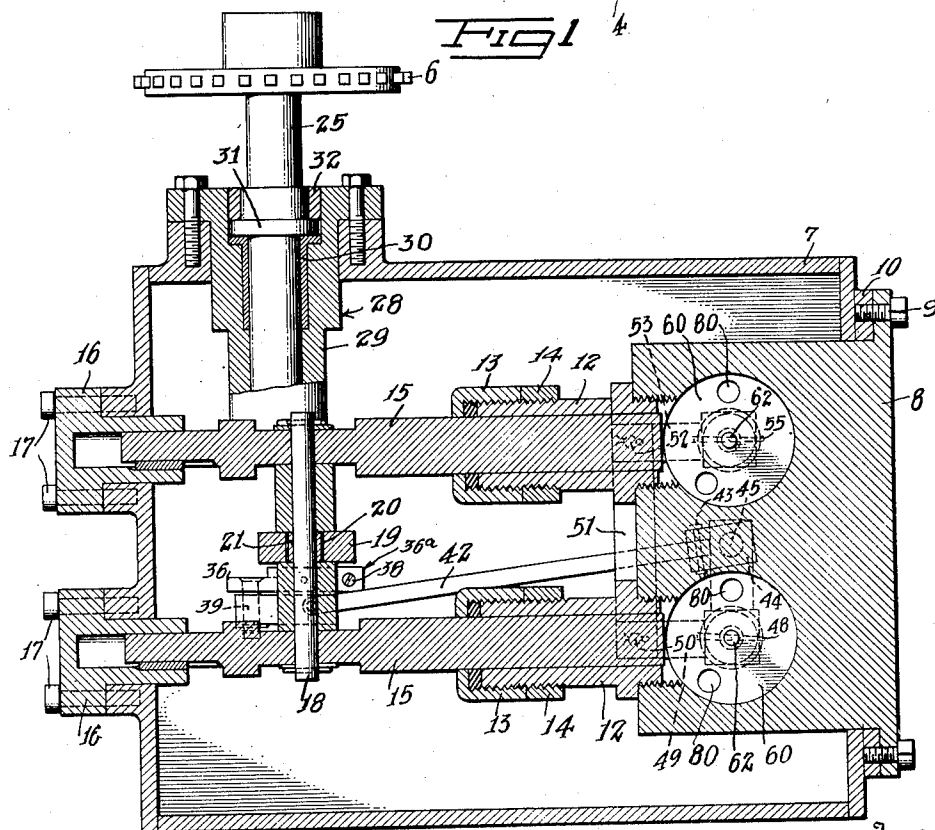
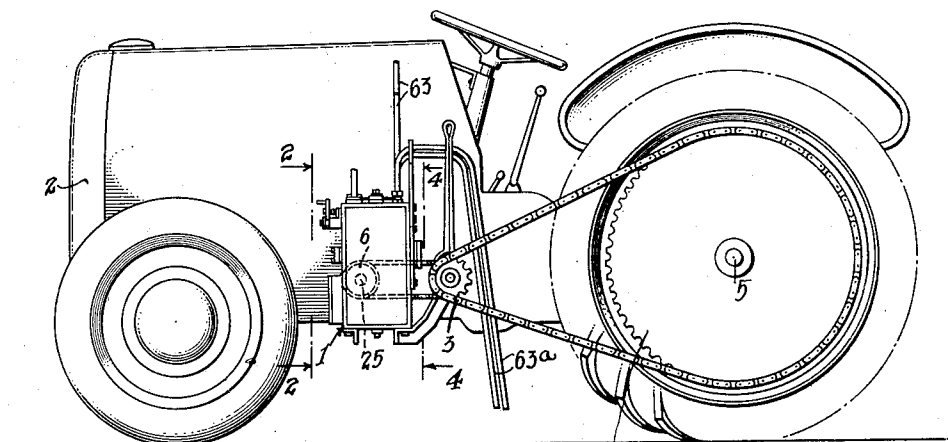


FIG 8

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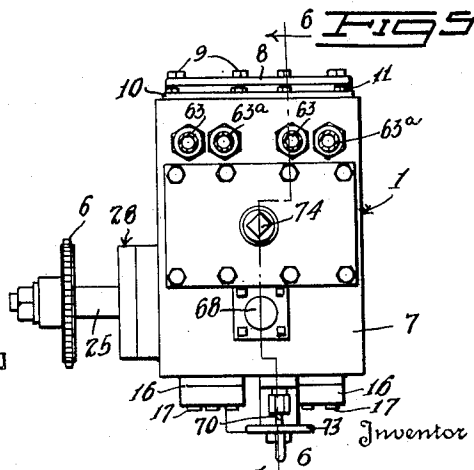
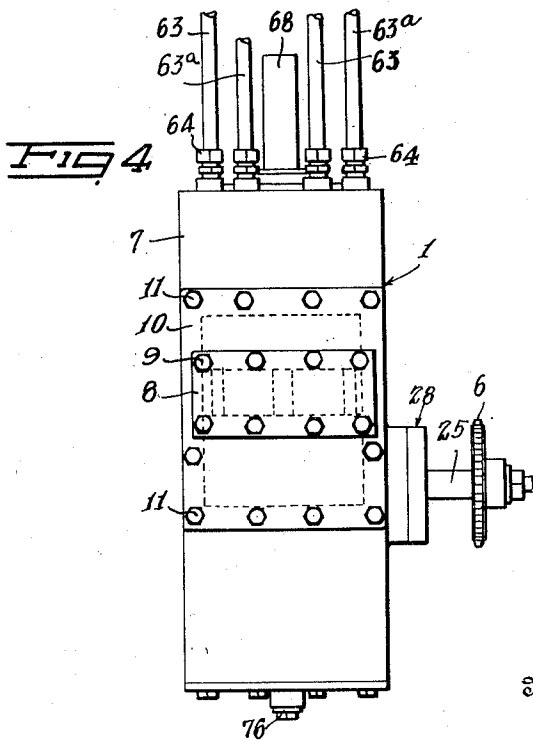
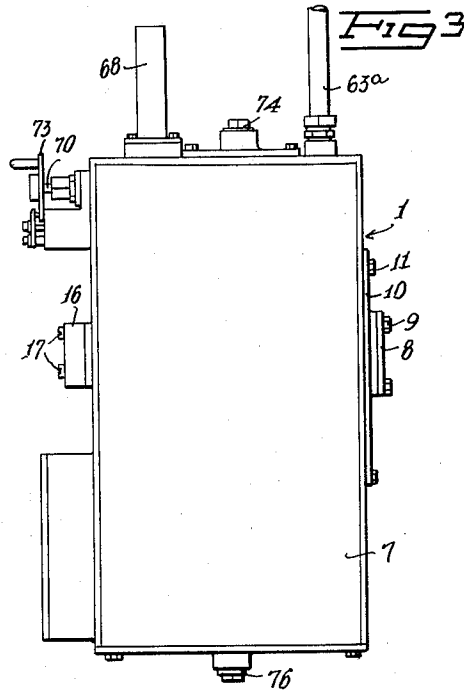
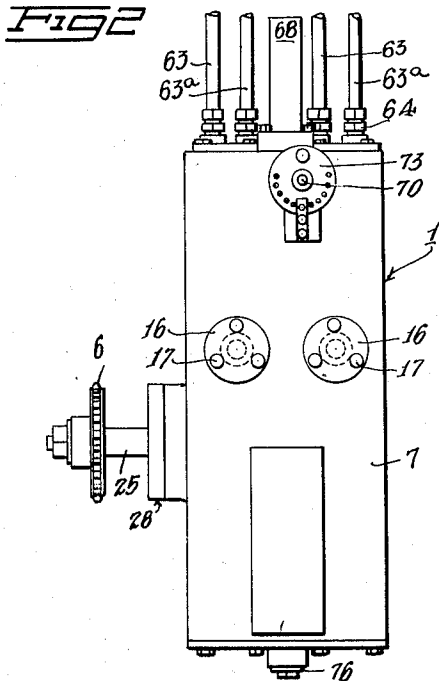
Aug. 21, 1951

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5 Sheets-Sheet 2



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334

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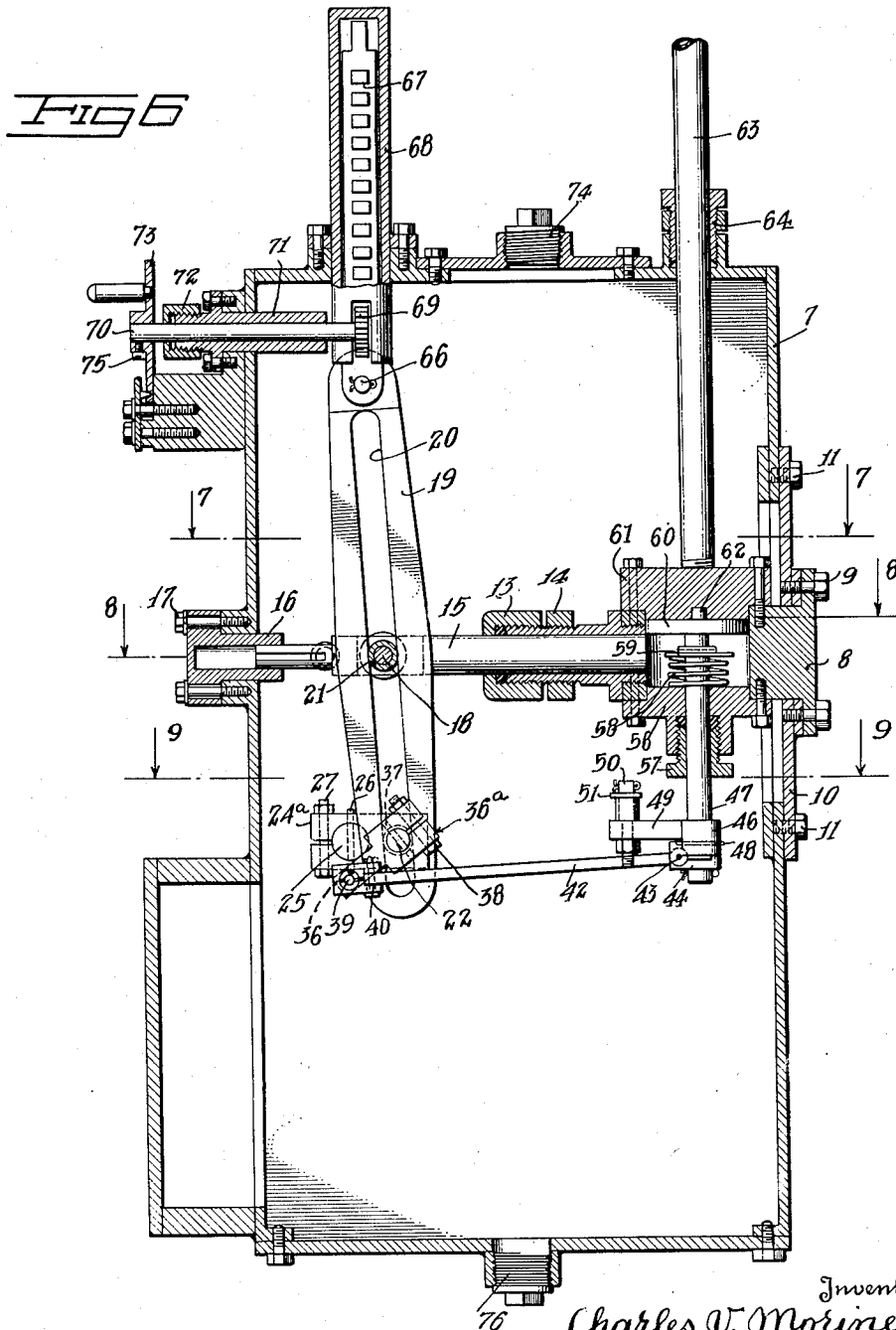
Aug. 21, 1951

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5 Sheets-Sheet 3



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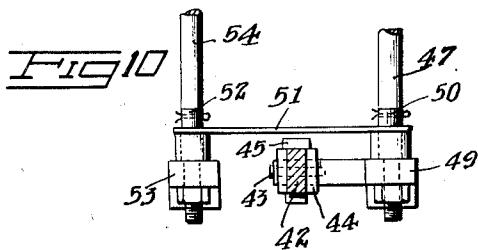
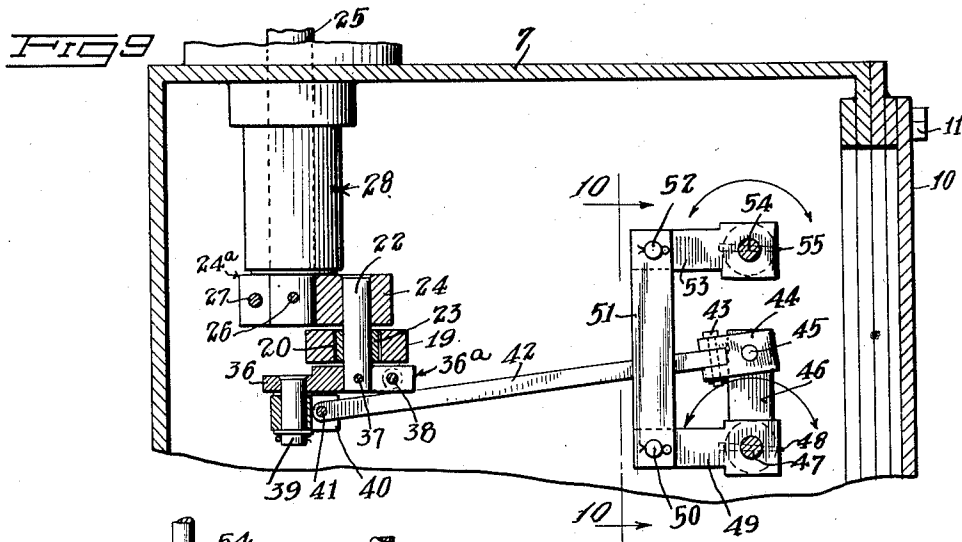
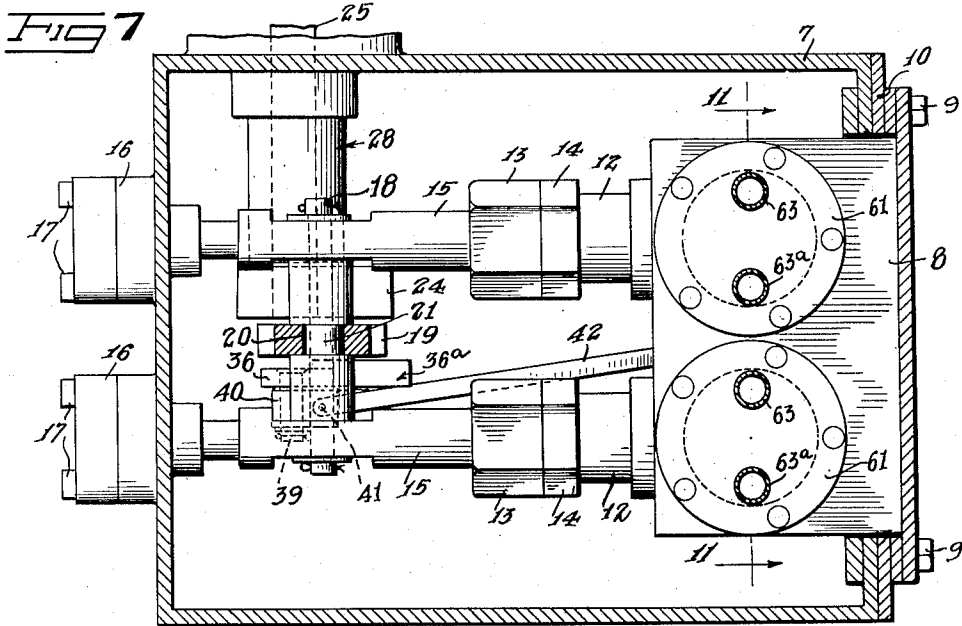
Aug. 21, 1951

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Filed Aug. 26, 1948

5 Sheets-Sheet 4



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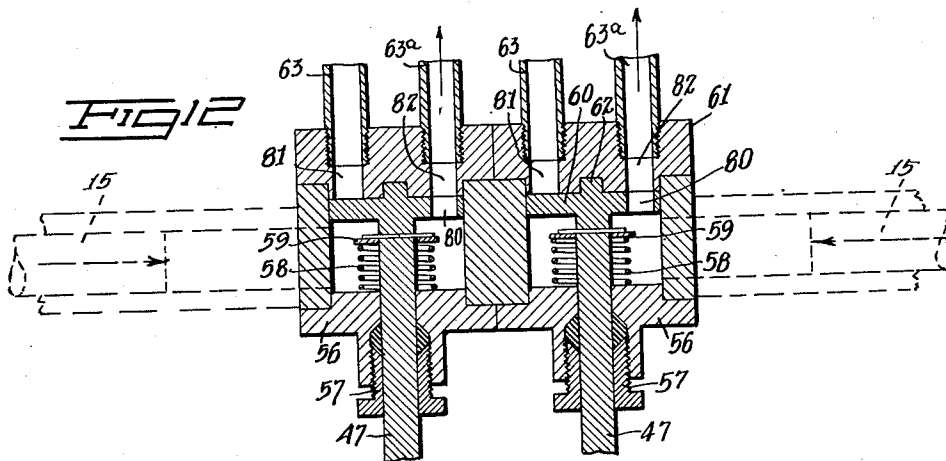
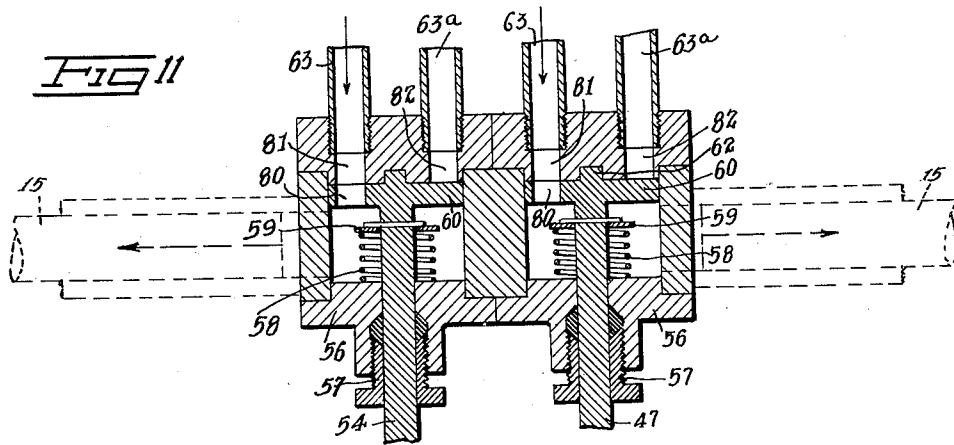
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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SOIL FUMIGANT PUMP

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8 Claims. (Cl. 103—38)

1

My invention relates to pumps which may be adapted to pumping fluids when a variable amount of discharge is desired. It is often desirable to have a pump with a variable displacement, especially for the injection of soil fumigant into the soil to kill nematodes which attack the roots of plants, or other organisms injurious to plants.

It is therefore an object of my invention to provide a variable displacement pump which can be used to dispense fumigants under pressure.

Another object of my invention is to provide a variable displacement pump which can be adjusted from the exterior of the pump case by a simple means, such as a hand wheel, so as to vary the amount of fumigant applied by each injection.

Other objects and advantages of my invention will be apparent from the following description of the preferred embodiment thereof.

In the drawings:

Figure 1 is a side elevation of my soil fumigant pump attached to a conventional tractor;

Figure 2 is an end elevation of my pump looking in the direction 2—2 of Figure 1;

Figure 3 is a side elevation;

Figure 4 is an end elevation looking in the direction 4—4 of Figure 1;

Figure 5 is a top plan view;

Figure 6 is a section taken on the line 6—6 of Figure 5;

Figure 7 is a section taken on the line 7—7 of Figure 6;

Figure 8 is a section taken on the line 8—8 of Figure 6;

Figure 9 is a fragmentary section taken on the line 9—9 of Figure 6;

Figure 10 is a fragmentary section taken on the line 10—10 of Figure 9;

Figure 11 is a section taken on the line 11—11 of Figure 7; and

Figure 12 is a similar section to Figure 11 showing the pump in the opposite cycle.

A soil fumigant pump 1 constructed in accordance with my invention is preferably mounted upon a tractor or other mobile unit 2 and is driven by a chain 3 connecting a sprocket 4 on the axle 5 of the tractor 2. A sprocket 6 which drives the pump 1 is to be hereinafter described.

My pump 1 comprises an outer case 7 which has a cylinder block 8 attached thereto by cap screws 9 which hold same to the case end cover 10 bolted at 11 to the case 7. Into the cylinder block 8 are threaded two bronze cylinders 12. These cylinders 12 are provided with packing

2

nuts 13 and packing nuts 14. Two stainless steel reciprocating pistons 15 operate in the cylinders 12. The pistons 15 are supported at one end by two bronze thrust bearings 16, which are attached to the outer case 7 by the cap nuts 17.

The pistons 15 are connected together by a cross shaft 18 and are operated by a lever 19 connected to the cross shaft 18, which passes through a slot 20 in the lever 19. A roller 21 on the cross shaft 18 rolls in the lever slot 20. The lever 19 is operated by a stub shaft 22 which carries a roller 23 movable in the lever slot 20.

A stub shaft 22 is preferably welded to an arm 24 which carries a clevis 24a to connect the same with a main shaft 25 by means of a tapered pin 26 and bolt 27. The main shaft 25 is supported by a housing 28 which is bolted to the outer case 7.

The main shaft 25 revolves in the housing 28 on a bronze bushing 29 and a bronze thrust bushing 30 and is held in the correct longitudinal position by a shoulder 31, which is positioned between the thrust bushing 30 and an oil seal 32 pressed into the housing 28. The main shaft 25 receives power by means of the sprocket 6 keyed thereon.

To the stub shaft 22 is affixed a valve arm 36 by means of a clevis 36a which rigidly holds the valve arm 36 to the stub shaft 22 by means of the pin 37 and bolt 38. The valve arm 36 is welded to a stub shaft 39.

To correctly time the valves to be hereinafter described the pin 39 must be at a 90° angle to the pin 22 in relation to the shaft 25. A line through the center of the stub shaft 39 and the center of the main shaft 25 is perpendicular to a line through the center of the main shaft 25 and the stub shaft 22.

A connector 40 is rotatively attached to the stub shaft 39 in a vertical plane and is attached to a push rod 42 by means of a pin 41. At the other end of the push rod 42 is attached a connector 44 by means of a pin 43. The connector 44 is free to move in a horizontal plane around a stub shaft 45. The stub shaft 45 is welded to an arm 46 and is attached to a stainless steel valve stem 47 by means of the tapered pin 48. Perpendicular to the arm 46 is attached an arm 49 affixed to a stub shaft 50.

Attached to the stub shaft 50 is a rod 51 which is free to move in a horizontal plane around the shaft 50. The rod 51 is attached to a stub shaft 52 and is free to move around this shaft in a horizontal plane. The stub shaft 52

is affixed to an arm 53 which is attached to a stainless steel valve stem 54 by means of the tapered pin 55.

The center-to-center distances between the valve stem 47 and stub shaft 50 or between the valve stem 54 and the stub shaft 52 is equal to the length of the arms 49 and 53.

The valve stem 47 passes through a bronze valve chamber cover 56, which is attached to the cylinder block 8. A packing nut 57 is threaded into the valve chamber cover 56. The valve stem 47 is held in a vertical position by a spring 58, which is compressed between the valve chamber cover 56 and a valve stem shoulder 59. The valve stem 47 is attached to the stainless steel rotating valve 60 having therethrough a port 80.

The valve 60 rotates on a manifold 61 which is attached to the cylinder block 8. The valve 60 is held in the correct horizontal position by a short stem 62 which rotates in a hole drilled in the manifold 61. A pair of spaced holes 81 and 82 are drilled into the manifold 61 and threaded therein are pipes 63 and 63a which pass through the outer case 7 through packing glands 64. The hole 81 acts as an intake port and the hole 82 as an outlet. I have just described the assembly of the valve connected to the valve stem 47. The other valve attached to the valve stem 54 is identical to the above and is connected to similar pipes 63 and 63a.

At the upper end of the lever 19, attached by means of a pin 66, is a spur gear rack 67. The rack 67 is mounted in a housing 68 bolted to the outer case 7 and is free to move up or down. The rack 67 is moved up and down by the rotation of a spur gear 69. Positioned on a shaft 70 which is supported by a housing 71 bolted to the outer case 7 is a hand wheel 73. The housing 71 has a packing gland 72 surrounding the shaft 70. The hand wheel 73 is attached to the shaft 70 by a lock screw 75.

The entire outer case 7 is designed to be oil tight and the pump to run in oil. To accomplish this purpose I provide a filler cap 74 and a drain plug 76 to permit the filling and flushing of the case 7.

The operation of my pump is as follows:

The sprocket 6 is driven by rotation of the axle 5 of the tractor 2 by means of the chain 3. By consideration of the wheel circumference and sprocket ratio the desired spacing of fumigant injections can be attained. Since the pump has two cylinders, two rows of injections can be made simultaneously. As the axle 5 rotates, the sprocket 6 turns the main shaft 25 which, by means of the arm 24, turns the stub shaft 22 in a circle about the main shaft 25 at a center. The stub shaft 22 moving in the slot 20 moves the lever 19 back and forth with the pin 66 as a pivot point. This movement of the lever 19 imparts reciprocating motion to the pistons 15. The rotation of the stub shaft 39 about the main shaft 25 imparts reciprocating motion to the rod 42, which moves the arms 46 and 49 in an oscillating circular arc pattern and by means of the rod 51 the arm 53 moves in an identical pattern. The oscillation of the arm 46 causes the valve stem 47 to rotate the valve 60.

During the intake stroke the port 80 in the valve 60 is centered over the intake hole 81 in the manifold 61 and fluid is drawn in through the intake pipe 63. During the exhaust stroke the port 80 in the valve 60 is centered over the exhaust port 82 in the manifold 61 and fluid is

exhausted through the exhaust pipe 83a into the soil.

To adjust my pump the hand wheel 73 is rotated, which turns the gear 69, moving the rack 67 up or down. When the rack 67 is moved up, the distance between the pin 66 and the cross shaft 18 is decreased, thereby reducing the stroke of the piston 15. Conversely, when the rack 67 is moved down, the distance between the pin 66 and the cross shaft 18 is increased and the stroke of the piston 15 is increased.

While I have described the preferred embodiments of my invention, I am not limited to any of the details herein set forth except as described in the following claims.

I claim:

1. In a fumigant pump, a cylinder block forming a pump cylinder, a piston adapted to reciprocate in said cylinder, a rocker arm suspended at one end to an adjustable pivot, said piston connected to said rocker arm, a power driven shaft carrying an arm adapted to rotate when said shaft is rotated, a stub shaft attached to said arm and offset in respect to said power shaft and attached to said rocker arm to impart oscillating motion to said rocker arm to reciprocate said piston, and arm affixed at one end to said stub shaft, a pivot at the other end of said arm, a push rod pivotally connected to said pivot, a valve mechanism in said cylinder block actuated by said push rod, said valve mechanism being adapted when actuated by said push rod to port fluid in and out of said cylinder on opposite strokes of said piston.

2. In a fumigant pump, a cylinder block forming a pump cylinder, a piston adapted to reciprocate in said cylinder, a rocker arm suspended at one end to an adjustable pivot, said piston connected to said rocker arm, a power driven shaft carrying an arm adapted to rotate when said shaft is rotated, a stub shaft attached to said arm and offset in respect to said power shaft and attached to said rocker arm to reciprocate said piston, an arm affixed at one end to said stub shaft, a pivot at the other end of said arm, a push rod pivotally connected to said pivot, a valve stem, a valve on said stem in said cylinder adapted to open and close intake and outlet ports to said cylinder, an arm pivotally attached to said push rod and attached to said stem to rotate said valve to selectively open and close said ports.

3. In a fumigant pump, a cylinder block forming a pump cylinder, a piston adapted to reciprocate in said cylinder, a rocker arm suspended at one end to an adjustable pivot, said piston connected to said rocker arm, a power driven shaft carrying an arm adapted to rotate when said shaft is rotated, a stub shaft attached to said arm and offset in respect to said power shaft and attached to said rocker arm to reciprocate said piston, an arm affixed at one end of said stub shaft and adapted to rotate in parallel plane to the first of said arms, a pivot at the other end of said second arm, a push rod pivotally connected to said pivot and adapted to move in a plane parallel to said arms, and a valve mechanism in said cylinder block actuated by said push rod, said valve mechanism being adapted when actuated by said push rod to port fluid in and out of said cylinder on opposite strokes of said piston.

4. In a fumigant pump, a cylinder block forming a pump cylinder, a piston adapted to recip-

rotate in said cylinder, a rocker arm suspended at one end to an adjustable pivot, said piston connected to said rocker arm, a power driven shaft carrying an arm adapted to rotate when said shaft is rotated, a stub shaft attached to said arm and offset in respect to said power shaft and attached to said rocker arm to reciprocate said piston, an arm affixed at one end of said stub shaft and adapted to rotate in parallel plane to the first of said arms, a pivot at the other end of said second arm, a push rod pivotally connected to said pivot and adapted to move in a plane parallel to said arms, and a valve mechanism in said cylinder block actuated by said push rod, said arms and pivots being adjusted to position a line through the centers of said stub shaft and said power shaft at right angles to a line through the center of said power shaft and said pivot for said push rod, said valve mechanism being adapted when actuated by said push rod to port fluid in and out of said cylinder on opposite strokes of said piston.

5. In a fumigant pump, a cylinder block forming a pump cylinder, a piston adapted to reciprocate in said cylinder, a rocker arm suspended at one end to an adjustable pivot, said piston connected to said rocker arm, a power driven shaft carrying an arm adapted to rotate when said shaft is rotated, a stub shaft attached to said arm and offset in respect to said power shaft and attached to said rocker arm to impart oscillating motion to said rocker arm to reciprocate said piston, an arm affixed at one end to said stub shaft, a pivot at the other end of said arm, a push rod pivotally connected to said pivot, a valve mechanism in said cylinder block actuated by said push rod, said adjustable pivot comprising a pivot carried upon a movable spur gear rack, a spur gear controlled by a hand wheel to move said rack to move the position of said pivot to regulate the stroke of said piston, said valve mechanism being adapted when actuated by said push rod to port fluid in and out of said cylinder on opposite strokes of said piston.

6. In a fumigant pump, a cylinder block forming a pump cylinder, a piston adapted to reciprocate in said cylinder, a rocker arm suspended at one end to an adjustable pivot, said piston connected to said rocker arm, a power driven shaft carrying an arm adapted to rotate when said shaft is rotated, a stub shaft attached to said arm and offset in respect to said power shaft and attached to said rocker arm to reciprocate said piston, an arm affixed at one end to said stub shaft, a pivot at the other end of said arm, a push rod pivotally connected to said pivot, a valve stem, a valve on said stem in said cylinder adapted to open and close intake and outlet ports to said cylinder, an arm pivotally attached to said push rod and attached to said stem to rotate said valve to selectively open and close said ports, said adjustable pivot comprising a pivot carried upon a movable spur gear rack, a spur gear controlled by a hand wheel to move said rack to move the position of said pivot to regulate the stroke of said piston.

7. In a fumigant pump, a cylinder block forming a pump cylinder, a piston adapted to reciprocate in said cylinder, a rocker arm suspended at one end to an adjustable pivot, said piston connected to said rocker arm, a power driven shaft carrying an arm adapted to rotate when said shaft is rotated, a stub shaft attached to said arm and offset in respect to said power shaft and attached to said rocker arm to reciprocate said piston, an arm affixed at one end of said stub shaft and adapted to rotate in parallel plane to the first of said arms, a pivot at the other end of said second arm, a push rod pivotally connected to said pivot and adapted to move in a plane parallel to said arms, and a valve mechanism in said cylinder block actuated by said push rod, said adjustable pivot comprising a pivot carried upon a movable spur gear rack, a spur gear controlled by a hand wheel to move said rack to move the position of said pivot to regulate the stroke of said piston, said valve mechanism being adapted when actuated by said push rod to port fluid in and out of said cylinder on opposite strokes of said piston.

8. In a fumigant pump, a cylinder block forming a pump cylinder, a piston adapted to reciprocate in said cylinder, a rocker arm suspended at one end to an adjustable pivot, said piston connected to said rocker arm, a power driven shaft carrying an arm adapted to rotate when said shaft is rotated, a stub shaft attached to said arm and offset in respect to said power shaft and attached to said rocker arm to reciprocate said piston, an arm affixed at one end of said stub shaft and adapted to rotate in parallel plane to the first of said arms, a pivot at the other end of said second arm, a push rod pivotally connected to said pivot and adapted to move in a plane parallel to said arms, and a valve mechanism in said cylinder block actuated by said push rod, said arms and pivots being adjusted to position a line through the centers of said stub shaft and said power shaft at right angles to a line through the center of said power shaft and said pivot for said push rod, said adjustable pivot comprising a pivot carried upon a movable spur gear rack, a spur gear controlled by a hand wheel to move said rack to move the position of said pivot to regulate the stroke of said piston, said valve mechanism being adapted when actuated by said push rod to port fluid in and out of said cylinder on opposite strokes of said piston.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
216,752	Olsen	June 24, 1879
273,276	Hawkinson	Mar. 6, 1883
1,050,745	Moore	Jan. 14, 1913
2,256,237	Broden	Sept. 16, 1941
2,259,587	Rush	Oct. 21, 1941
2,370,710	Blair	Mar. 6, 1945