April 15, 1924. 1,490,522

J. M. STOCKER

ROAD SPRAYING MACHINE

Filed Oct. 14, 1920 2 Sheets-Sheet 1

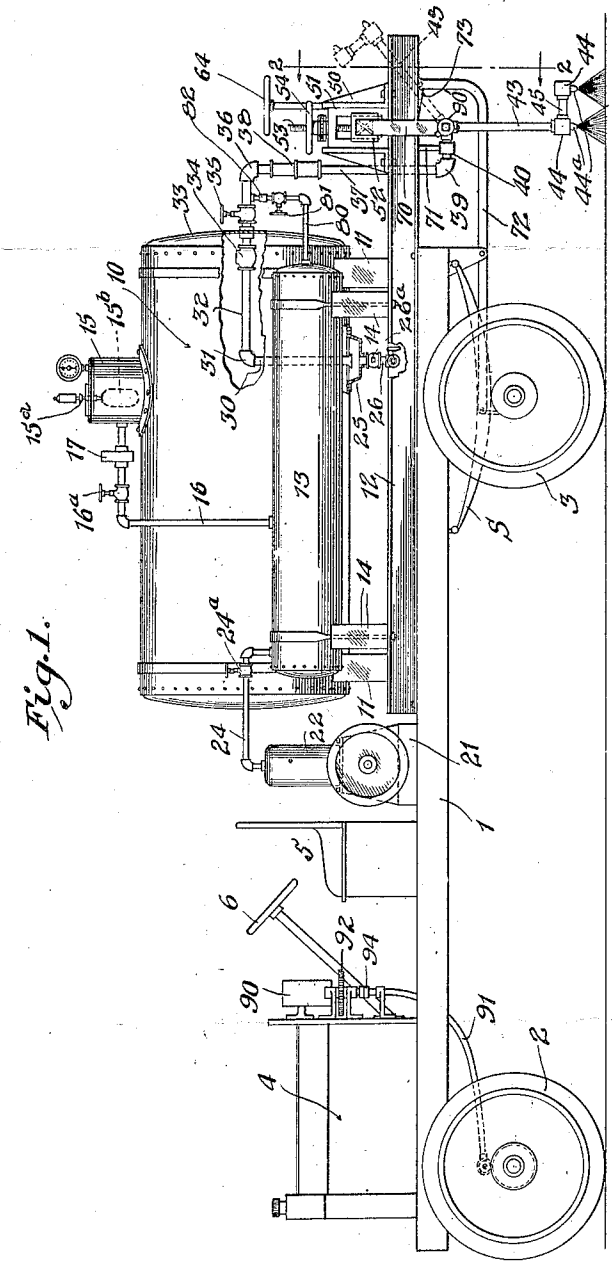

Fig. 1.

Inventor

James M. Stocker

By Mason, Fenwick & Lawrence,

Attorneys

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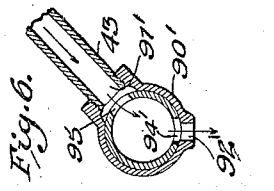

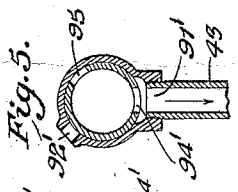

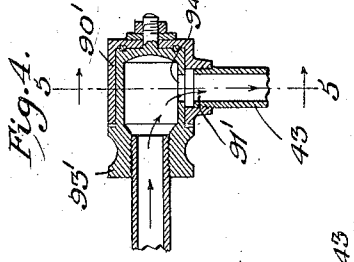

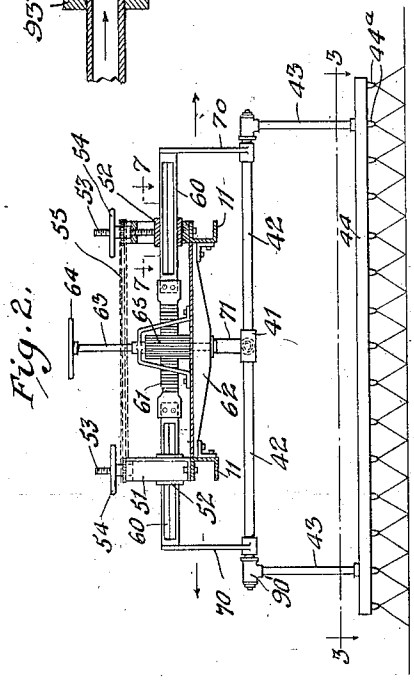

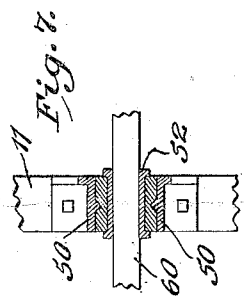

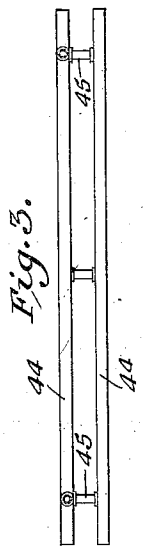

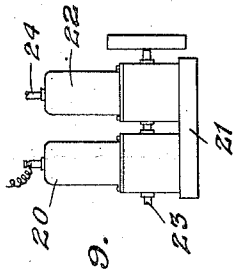

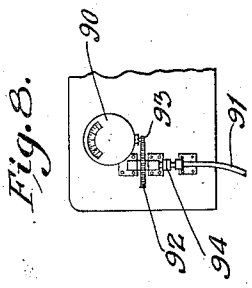

Inventor

James M. Stocker

By Mason Fenwick & Lawrence,

Attorneys

Patented Apr. 15, 1924. 1,490,522

UNITED STATES PATENT OFFICE.

JAMES M. STOCKER, OF ATLANTA, GEORGIA.

ROAD-SPRAYING MACHINE.

Application filed October 14, 1920. Serial No. 416,809.

To all whom it may concern:

Be it known that I, JAMES M. STOCKER, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Road-Spraying Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to portable spraying apparatus, and it pertains more particularly to automotive apparatus adapted to distribute a bituminous or similar binder-material over the surface of a road.

It has for its objects to control accurately the quantity of binder distributed over a given area; to render the control extremely flexible; to prevent the binder remaining in the sprayer pipes after the valve that regulates the flow from the binder containing tank has been closed from being deposited irregularly on the road, and to eject the binder remaining in said pipes after the closing of said valve in such manner as to distribute it upon the road in the same even quantity as the binder was distributed before the closing of the valve, and to prevent any residue of binder from freezing in the spray orifices when the sprayer is not operating.

The invention consists, in general, of a motor vehicle carrying a tank and suitable spraying apparatus, with means for forcing a liquid binder from the tank and through the spraying apparatus by air pressure, said forcing means comprising an independent power unit unconnected with the motor that operates the vehicle. It further comprises the combination of a tank and an air compressing system by means of which air under compression may be forced into the tank and also, at will, into the spraying apparatus outside of the tank; also a hinged spray header adapted to be elevated, and when elevated, to drain the binder from the spray nozzles into buckets or other receptacles placed under the drain orifice so as to prevent the hardening of the binder in the nozzles; also the adaptation to the vehicle of a speedometer, calibrated to indicate multiples of the actual speed of the vehicle, in combination with a spraying apparatus attached to the same vehicle. It includes, also, various combinations and sub-combinations more fully set forth in the ensuing description, illustrated in the accompanying drawings and defined in the appended claims.

In the said drawings:

Figure 1 is a side elevation of the essential apparatus of my invention, the tank being broken away in part to disclose the internal construction, and the motor vehicle upon which the apparatus is sustained being shown somewhat diagrammatically;

Figure 2 is a section on the line 2—2 of Figure 1 looking in the direction of the arrows, one of the spray header elevating devices being illustrated in vertical cross section, the parts forward of the elevating devices and the automatic means for holding the spray header at the same elevation having been omitted for the sake of clearness;

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is a section taken transversely through the joint connecting the branch pipes that lead to the spray header with the pipe to which said header is hinged;

Figure 5 is a section on the line 5—5 of Figure 4;

Figure 6 illustrates the parts shown in Figure 5 arranged in position to drain the binder from the spray nozzles;

Figure 7 is a transverse section on the line 7—7 of Figure 2;

Figure 8 is a front elevation of the speedometer and a portion of the operating mechanism therefor;

Figure 9 is an elevation of the air compressing power unit.

The frame of a motor truck is indicated at 1; 2 represents the front wheels; 3 the rear wheels; 4 the engine hood enclosing any usual internal combustion or other engine adapted to be geared to the rear wheels 3 of the truck. It will be understood that the usual engine controls are placed within the reach of the driver occupying the seat 5, and that the driver controls the speed of the vehicle thereby, and steers it by means of the steering wheel 6.

In the embodiment illustrated a tank 10 is cradled upon suitable cradles or chocks 11, resting upon a frame 12 supported by the truck frame 1. At one side of said tank an air tank 13 is mounted on suitable chocks or cradles such as 14 and held in proper position on the frame 12. Rising from the top of the tank 10 is an air dome 15 into which is tapped a pipe 16 leading from the air tank 13. The pipe 16 may be controlled by

a hand valve 16ª while a suitable reducing valve or pressure regulator 17 is placed between the hand valve 16ª and the dome 15.

An internal combustion engine 20 of any suitable type and number of cylinders, a single cylinder engine being illustrated, is mounted on a base 21, while an air compressor 22 stands alongside of said engine 20 upon the same base 21. A common crank shaft 23 is connected to the pistons of both engine and air compressor. Although I have shown the engine and air compressor built as a unit it will be obvious that the purposes of my invention may be subserved to an extent by coupling an internal combustion engine, unconnected with the vehicle driving mechanism, with a suitable air compressor, the principal object being to have the air compressing plant independent of the motive power unit so that it will not be affected by the speed of the vehicle, and even compression may be maintained in the air pressure system independent of the speed that the vehicle may be travelling. From the air compressor 22 a pipe 24 is connected to the tank 13, said pipe 24 being controlled by a suitable hand valve 24ª. By means of the air compression plant described air may be maintained in the tank 10 under a predetermined pressure, the reducing valve 17 regulating the pressure within said tank. Tank 13 is not intended as a source of reserve pressure but rather to absorb the pulsations of the air compressor and give a steady flow of compressed air into said tank 10. The pressure in the tank 13 is intended to be kept only very slightly higher than the pressure within the tank 10 and the pressure regulator 17 will be adjusted accordingly. The pressure within the tank 13 may be controlled by means of a pressure operated switch communicating with the tank 13 and governing the engine 20. This mechanism is not shown. The difference in the pressure in tank 13 and tank 10 is used for purposes hereafter described.

At the bottom of the tank 10 is a trap or depression 25. From the bottom of the depression a pipe 26 projects downward, controlled by a valve 26ª, below which lateral pipes extend to each side of the vehicle, said lateral pipes having suitable control valves. Through these pipes the tank will be filled with hot road binder prepared at a suitable heating plant, all as fully disclosed in my application Serial No. 319,944. A suitable vent 15ª in the top of the dome 15 provides for the outlet of air as the binder is pumped into the tank and, if desired, the said vent may be controlled by a float 15ᵇ so that when the binder has filled the tank to a desired level the float will close the vent.

Having an open end disposed in the trap or depression 25 at a level lower than the general bottom wall of tank 10 is a pipe 30 connected by an elbow 31 with a horizontal pipe 32 which extends out substantially through the center of the head 33 of the tank and is secured therein. The lower end face of pipe 30 is substantially horizontal or parallel with the bottom of depression 25. Within the pipe 32, either inside or outside said tank but preferably inside, as shown, is a check valve 34, adapted to open under outward pressure from the tank and to close under the influence of backward pressure. Outside of the head 33 of the tank and close thereto is a valve 35, preferably of the quick acting type, designed to be placed within reach of the operator occupying the rear of the frame. Rearward of the valve 35 is an elbow 36 of the swing type adapted to rock around a horizontal axis. Extending downward from the elbow 36 is a pipe 37 adapted to be lengthened or shortened by means of an expansion joint 38. The lower end of the pipe 37 is coupled to an elbow 39 also of the swing type which is also coupled to a horizontal pipe section 40 and is adapted to rock around the axis of said section 40 the latter being tapped into a T 41, Fig. 2. Extending horizontally in opposite directions from the T 41 are sections of pipe 42, to the ends of which are coupled at right angles pipe sections 43 leading to a spray header 44 preferably consisting of two transverse parallel pipes connected by branches 45, said pipes 44 having nozzles 44ª from which the liquid binder may issue.

The side beams of the frame 12 extend to the rear of the truck frame as shown in Figure 1. Upon each of the beams of said frame 12 is erected a pair of upright guides 50. Between these guides 50 is a vertically movable guide member 51 and slidable vertically within the member 51 is a box slide 52. Projecting from the upper side of said box slide 52 is a screw 53, said screw passing through the top of the member 51 and carrying a hand nut 54. As shown in my said prior application said nuts may be formed with sprocket teeth and be connected by a sprocket chain 55, if desired, in order that the operation of one nut may operate the other.

Slidable longitudinally through the box slides 52 are a pair of bars 60, Fig. 2, which are connected, in alinement with each other, by a rack 61. Extending from side member to side member of the frame 11 is a supporting platform or other suitable bridging member 62. Journaled in the platform or bridging member 62 is an upright shaft 63 carrying a hand wheel 64 at its upper end. Keyed or otherwise secured to the shaft 63 is a long toothed pinion 65 the teeth of which are in mesh with the teeth of the rack 61. Secured to the other ends of the bars 60 are

depending straps 70 the lower ends of which are rigidly affixed to the pipe 42 near the ends. A strap 71 depends from the rack 61 and is rigidly affixed to pipe 40. When, therefore, the hand wheel 64 is rotated the bars 60 are moved longitudinally, either to right or left, and carry with them the pipes 42 which are connected by the pipes 43 with the spray headers 44. By this means the operator may cause the binder to be deposited further to the right or to the left and may cause a stripe of binder being deposited to follow and match up with one that has been previously made.

In order to automatically hold the spray header at substantially the same distance above the road surface at which it has been adjusted by manipulation of the hand wheel 54, regardless of the rising and falling of the frame 1 as the load in tank 10 varies, a train of compound levers 72, 73 is provided. Said levers extend from the rear axle to the vertically movable guide member 51 and operate in response to the movements of the frame 1 relative to the rear axle as the spring 3 yields and recovers to form. This mechanism is not a part of the invention claimed in this application but is disclosed in my application Serial No. 319,944, before referred to.

Extending from the air tank 13 is an air pipe 80 having a valve 81, preferably of the quick acting type, within reach of the operator. Between the valve 81 and the pipe 32, with which said pipe 80 communicates, is a check valve 82, the said check valve being adapted to open under pressure from the tank 13 and to close against back pressure. The purpose of the pipe 80 and associated valves is to admit air pressure into the spraying pipes before valve 35 has been closed but is about to be closed, in order to force out the contents of said spraying pipes in such manner as to distribute their contents upon the road at substantially the same rate as that at which the contents of the tank 10 was distributed before the closing of the valves 34 or 35. The pressure thus admitted is not materially greater than that in tank 10, but is sufficiently greater to close the check valve 34.

In order to drain away residue of binder remaining in the spray nozzles and piping leading thereto after spraying has ceased the spray header 44 is pivotally connected to the said pipe sections 42 so that the said spray header may be swung upward on said pivotal connections, thus inverting the spray nozzles. In the upper of each pipe section 43, considering now said sections as depending in normal operating position of the sprayer, is an outside fitting 90′ having one radial port 91′ into which the pipe 43 is tapped and a second radial port 92′ which may be denominated a drainage port angularly separated therefrom as illustrated particularly in Figs. 5 and 6. The said fitting 90′ is sleeved over an inside fitting 93′ secured to the pipe 42. Said fitting 93′ is provided with ports 94 and 95 separated to the same extent as are the ports 91′ and 92′ but in a reversed sense or circumferential direction. When the ports 91′ and 94′ are in registration as illustrated in Figure 5, which shows the position of the parts when the spray header is in position to discharge binder on a roadway, ports 92′ and 95 are out of registration and a closed fluid circuit is formed between the tank and spray nozzles so that liquid binder may then flow from the pipes 42 into the pipes 43 and into the spray header and cannot flow through any other passages. When ports 91′ and 94′, (and all others) are out of registration which happens when the spray header is swinging outward and upward, the flow into the spray header is cut off; and when said spray header is inverted or reaches a position above the horizontal as shown in dotted lines in Figure 1 and in full lines in Figure 6, the ports 91′ come into registration with the ports 95 and the drainage ports 92′ come into registration with the inside drainage ports 94′, so that any liquid binder that may be in the piping between the tank and drainage ports or in the header will flow out through the ports 94′ and 92′ and may be caught by a bucket or other receptacle placed under said ports for the purpose. The main body of the binder will have been driven out by the pressure of air entering through the pipe 80, but some residue is likely to cling to the sides of the piping and this residue tending to flow down into the small orifices of the sprayer would be likely to harden therein and plug the spray orifices if the header were left in operating position. For this reason the swing spray header shown associated with the described means for discharging the drip is extremely useful in apparatus of this character.

Mounted on the dash board is a speedometer 90 which may be of any known type and mode of operation and coupled, as indicated in Figure 1, to one of the front or steering wheels by a flexible shaft 91 and gears 92 and 93. The gearing is, however, not proportioned to indicate the actual speed but to indicate a multiple of the actual speed,—preferably for convenience, to indicate ten times the speed actually travelled. The gear 92 will therefore have ten times as many teeth as the gear 93 that directly operates the indicator mechanism within the casing. With a speedometer thus calibrated very small differences of speed will be indicated very plainly upon the speedometer, and the operator may accurately adjust the speed of the truck so as to deposit the required number of gallons of binder upon a

given area of roadway. A small clutch 94 enables the speedometer to be disconnected when desired.

In operation the apparatus will be filled at the central heating plant and thereafter driven to the area of road to be coated with the binder. By previous experiments and calculations the degree of pressure required upon the binder in the tank in order to give a predetermined flow in gallons per minute will have been determined. The required pressure will then be established in the tank 10 by the operation of the independent air compressing plant. This pressure will be determined by the speed of operation of internal combustion engine 20, which will be of the automatic speed regulating type, and by the pressure regulator 17. The air compressing plant will be operated so as to maintain in the tank 13 a pressure slightly, but not very considerably, above the pressure required in the tank 10. The vehicle will then be started and caused to travel over the road at a speed previously calculated so as to distribute a certain number of gallons over a certain predetermined area of road. The number of gallons discharged per minute by the air pressure established being known, it will be easy to determine how fast the machine must travel in order to distribute the desired volume over a given area. The driver on the seat 5 will then control the motive power engine so as to cause the truck to move at the desired speed. In order that he may do this with accuracy, the speedometer described is provided.

It is contemplated that an operator shall take a position upon the rear of the machine within reach of the valves 35 and 81 and of the hand wheels 54 and 64. As the machine advances over the roadway the operator by manipulating the hand wheel 64 will keep the stripe of binder being deposited in an even course; if the machine is moving alongside of a previously deposited stripe, the operator will be able to make the stripe being deposited match with the one previously deposited. The header will be adjusted above the roadway at a distance so that the binder sprayed from the nozzles will produce an even coating. The adjustment will be such that the bases of the cones of spray will touch each other in order that there may be no streaks of uncovered road left. Adjustment by means of the hand wheel 54 may be necessary as the binder cools in the tank 10. When a strip of roadway has been covered and it is desired that no binder shall be deposited, the operator opens the valve 81 letting pressure from the pipe 80 into the pipe 32 on the outlet side of check valve 34, said pressure then closing the check valve and flowing out into the pipe 37 and spray header, forcing the binder before it so that the mass of binder in the piping beyond the valve 34 will be forced toward the spray orifices to be spread upon the road at substantially the same rate of speed as it was being spread before the admission of air to the pipe 80 into said pipe 32. After the valve 81 has been opened to admit pressure into said pipe 32 the operator will quickly close the hand valve 35. After the binder has been forced from the spray header by air pressure through the pipe 80 with the valve 35 closed, the valve 81 will be closed; the check valve 82 will prevent anything from flowing back into said pipe. The spray header 54 will then be swung upward in its position shown in Figure 1 by dotted lines. Any binder clinging to the walls of the pipes that would tend to flow slowly into the spray orifices and clog them when the spray header is in spraying position will now tend to flow backward to the hinged joint and out of the drainage orifices 92. Also binder remaining in piping 37 and 43 will flow toward the drainage orifices. Thus little or no binder will remain in the piping outside of tank 10, so that when the apparatus is to be used again there will be no obstructions to the free flow of binder through the pipes and spray orifices. The spray header may be held in its upturned position by any suitable tie or hook if found needful.

Having thus described my invention in such manner as to enable those skilled in the art to make and use the same, what I claim and desire to secure by Letters Patent of the United States is as follows:

1. In an apparatus of the class described, a tank, a spray header, a pipe connecting said tank with said spray header, said pipe comprising two horizontal sections connected by an upright section, swing elbows at the ends of the upright section, an expansion joint in said upright section, and means whereby the said spray header may be raised up and down or moved horizontally to right or left.

2. In apparatus of the class described, a tank having a depression in its bottom, a spray header, means for applying pressure to the contents of the tank, rigid piping leading horizontally through a head of said tank approximately at the center thereof, and thence extending downward to said spray header, said piping having an open end extending to a point within the tank adjacent the bottom thereof, and movable connections in the downward extension, a quick action valve in said pipe located close to the exterior of said head, a support extending rearward of said tank, means mounted on said support for adjustably supporting the spray header, and means above said support whereby the spray header supporting means may be adjusted vertically and horizontally.

3. In apparatus of the class described, a tank, a spray header, a conduit for convey-

ing liquid from the tank to said spray header, a valve for controlling the flow of said liquid through said conduit, a hinged connection between said header and said conduit, constructed and arranged to permit said spray header to be inverted about an axis parallel with said header, said conduit having a drain port that is opened by the inversion of the spray header so as to drain the spray header and conduit.

4. In apparatus of the class described, a tank, a spray header, a conduit leading from said tank to said spray header, said conduit having a drainage orifice, a hinged connection between said spray header and said conduit, said flexible connection permitting the spray header to be inverted, and a means controlled by the movements of the spray header to and from its inverted position for opening and closing said drainage orifice.

5. In apparatus of the class described, a tank, a spray header, a conduit connecting said tank with said spray header, a hinge joint in said conduit comprising concentric hollow members, each member having angularly separated orifices so disposed that when the spray header is in normal operative position, the spray nozzles are in communication with said tank with the said orifices closed, and in another position a drainage passage is opened by the registration of the orifices in said members.

6. In apparatus of the class described, a tank, an elongated spray header, a pipe parallel with said spray header, said pipe having angularly spaced orifices in its opposite ends, a sleeve surrounding each end of said pipe, said sleeve having angularly spaced orifices, a pipe connecting each sleeve with the spray header, said pipe being in communication with one of the orifices in the sleeve, the orifices being so disposed that when the spray header is in normal operative position the spray nozzles are in communication with said tank and the orifices in said pipe and sleeve are closed, and in another position a drainage passage will be opened by the registration of the orifices in said pipe and sleeve.

In testimony whereof I affix my signature.

JAMES M. STOCKER.