Feb. 24, 1948. H. A. CARTWRIGHT 2,436,419

AUTOMATIC VALVE-ACTUATING MECHANISM

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Fig. 1

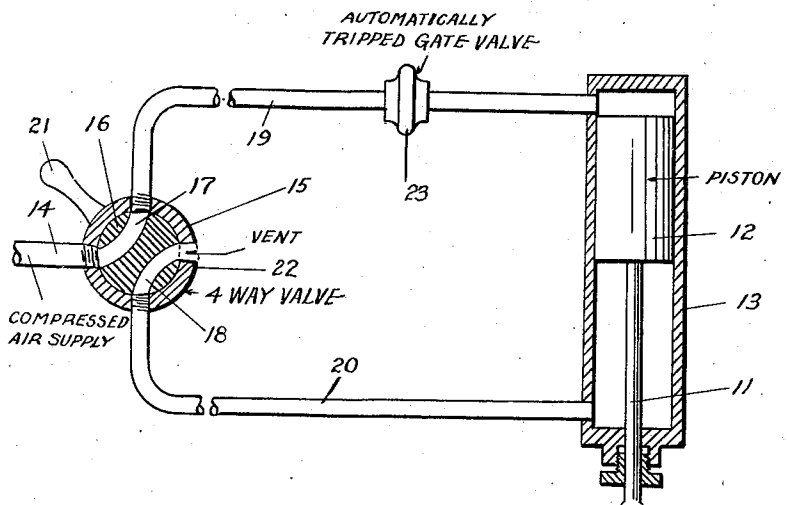
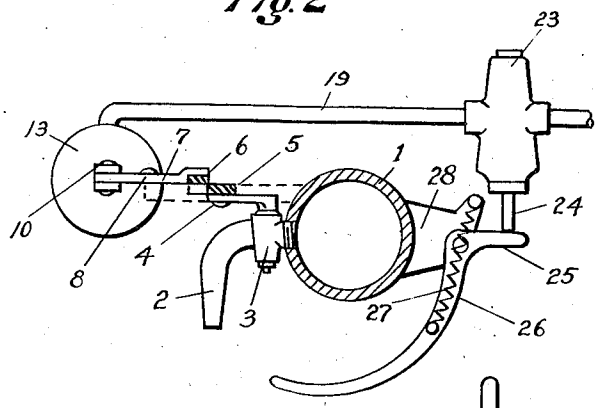


Fig. 2



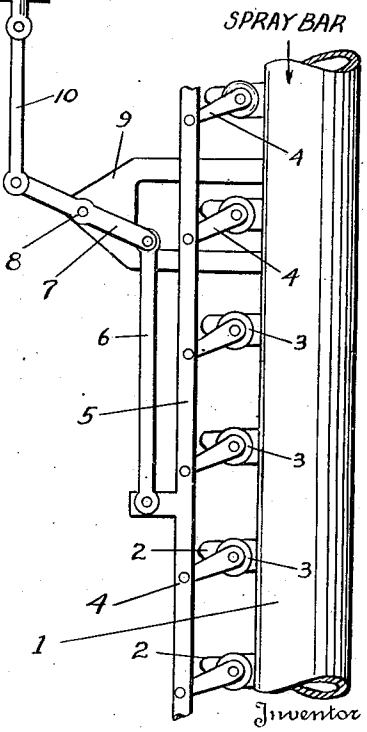
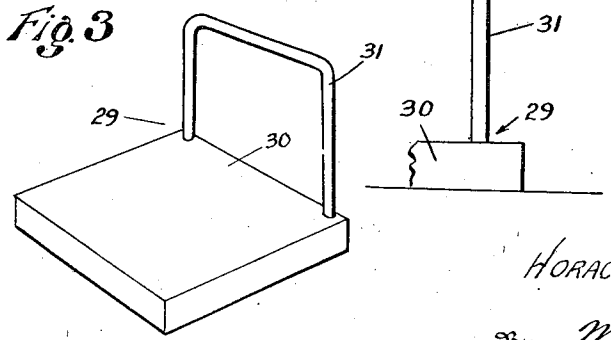


Fig. 3



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AUTOMATIC VALVE-ACTUATING MECHANISM

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Fig. 4

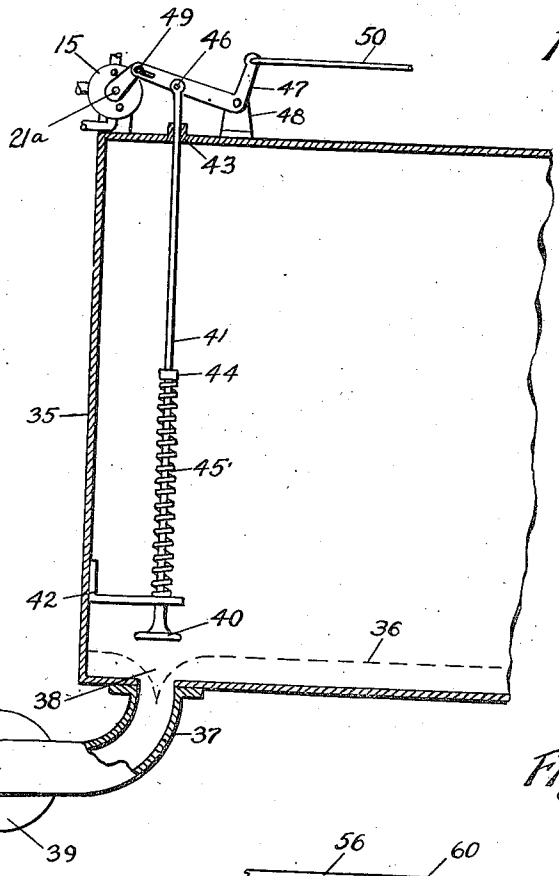
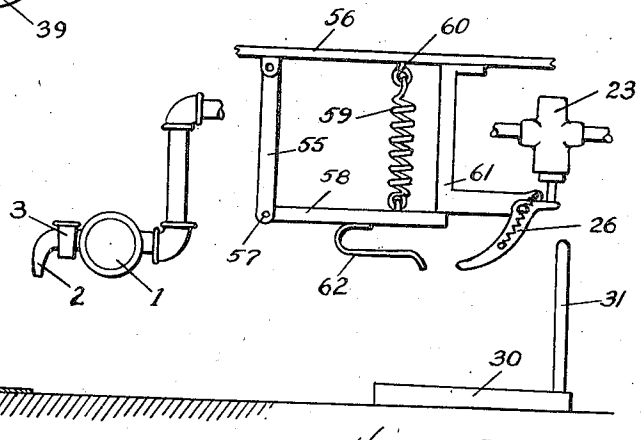


Fig. 5



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AUTOMATIC VALVE-ACTUATING MECHANISM

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3 Claims. (Cl. 299—34)

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Generally, this invention relates to valve-actuating mechanism and, more specifically, the invention is concerned with an improved mechanism for controlling the release of hot asphalt from a portable asphalt spraying machine of the type employed in highway construction and maintenance.

An important object of the invention resides in the provision of a valve-operating mechanism for use on asphalt spraying machines adapted to provide for an accurate lap at the ending of one stretch of asphalt application and the beginning of a second or later application.

Ordinarily, such portable asphalt spraying machines are formed to embody a container for the reception of heated asphalt and a pump mechanism for forcing the heated asphalt from the tank or container to a distributing device, known in the art as a spray bar. This spray bar is equipped with valve regulated nozzles, and when the valves are operated to open the nozzles, heated asphalt passes through the latter and is distributed uniformly and evenly on a road surface. However, the nozzle valves are actuated through a manual control, either from the driver's position on the machine or at the rear end thereof where the spray bar is located. When the valve controls are located in the driver's cab of the machine, considerable difficulty is encountered in preventing overlapping between continuing applications of the deposited asphalt on road surfaces. That is, in a given operation, asphalt will be deposited on the roadway for a suitable distance and for various reasons the application discontinued at a certain point. When the application is to be continued in the same longitudinal direction at a later time, it is necessary for the machine operator to operate the valves of the spray bar nozzles so that hot asphalt will be released on previously laid or deposited asphalt, a condition known as lapping. Any lapping of the two applications produces a thickened region which requires extra stone and this extra stone makes a hump or prominence in the road.

The highway departments of certain states require that paper be put down and the flow of asphalt through the spray bar stopped when the bar is positioned over this paper. When this is done, the end of one application is terminated sharply at the edge of the paper. This application is then covered with stone and paper is put on top of the stone and the next application of asphalt is started on this paper, so that when the spray bar passes over the paper, the new application of asphalt takes on from an exact line.

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While this is an accurate method for obtaining a good joint between successive applications of asphalt, nevertheless, it requires the use of a considerable quantity of paper, time and labor, and the disposition of the used paper is also a matter of some importance.

With a spray bar of the positive shut-off type, the hot asphalt is maintained right at the nozzles and when the valves of such nozzles are opened, the application starts immediately. However, the spray bars should be crossing the starting line at several miles per hour and it is virtually impossible for an operator, using a manual control, to time exactly the opening of the nozzle valves so that the second application will begin precisely in registration with the line of termination of a previous application. Even experienced operators will miss this line by more than two or three inches. Either the applications overlap or there is left a bare streak on the roadway which necessitates hand spraying. Even when the controls for the nozzle valves are located at the rear of the machine and operated by a second attendant especially appointed for that purpose, the overlapping or non-lapping of the successive applications takes place.

The present invention, therefore, aims to provide an automatic system for operating the nozzle valves so that exceptionally close registration between successive applications of asphalt on a roadway may be obtained.

In accordance with the present invention, the nozzle valves of the spray bar are simultaneously actuated to assume flow-permitting or obstructing positions through the use of a pneumatically actuated control mechanism. In this mechanism, there is provided a fluid operated piston arranged in a cylinder, the piston having a linked connection with the operating cranks of the spray nozzle valves. Leading to the opposite ends of the piston cylinder are air flow conductors which include a manually controlled valve by means of which air or other fluid pressure is applied to the piston to govern its direction of movement in opening and closing the nozzle valves, an automatically operated valve being arranged in one of said fluid conductors which, upon the opening thereof, operates the piston to open the nozzle valves, the automatic valve being provided with a movable actuating lever adapted to be tripped or operated by encountering and striking a trip member positioned on the road surface at a selected location, so that upon the opening of the automatic valve, asphalt will be delivered immediately to the roadway, without requiring a man-

ual operation, and exacting registration of successive applications of the asphalt to the roadway thereby obtained.

For a further understanding of the invention reference is to be had to the following description and the accompanying drawings, wherein:

Fig. 1 is a diagrammatic view, partly in section, disclosing the improved valve operating mechanism forming the present invention;

Fig. 2 is a vertical sectional view taken through the automatic valve and its actuating controls;

Fig. 3 is a perspective view of the road-positioned trip means for the automatic valve;

Fig. 4 is a vertical sectional view taken through the asphalt-containing tank of the spray vehicle, and illustrating automatic controlled apparatus for discontinuing asphalt flow when a low level of the asphalt within the tank exists;

Fig. 5 is a detail elevational view disclosing automatic mechanism for lifting the road positioned valve-tripping wicket.

Referring more particularly to the drawings, the numeral 1 designates the spray bar used on standard road machines employed in applying hot fluid-like bituminous materials to road surfaces, although other forms of fluid receivers may be provided. As is well known, in the operation of such machines, heated material in a fluid state is pumped or otherwise forced into the tubular pipe member constituting the spray bar. At suitably spaced longitudinal intervals, the spray bar is provided with outlet nozzles 2 by means of which the heated fluid is discharged from the spray bar and distributed over underlying road surfaces. Each of the nozzles is provided with a control valve 3, the latter carrying exterior crank arms 4, which, at their outer ends are linked together as at 5 so that the valves may be simultaneously actuated. In effecting such actuation of the valves 3, in accordance with the present invention, the link or links 5 are joined by a member 6 with a lever 7 which is centrally pivoted as at 8 on a supporting bracket 9. The other end of the lever is connected by a link 10 with one end of a piston rod 11. This piston rod is connected with a piston 12 which is slidably mounted in a cylinder shown at 13 and which is suitably supported in connection with the spraying machine proper, the parts 11, 12 and 13 forming a servo-motor.

Leading from a source of compressed air, or other fluid supply under pressure, is a pipe line 14, which terminates at the inlet orifice provided in the casing of a manually operated four-way valve 15. This valve is provided with the usual rotatable plug 16 in which is formed a pair of arcuate passageways 17 and 18. The passageway 17 effects communication between the pipe line 14 and a pair of fluid conductors 19 and 20 in order that the compressed air or other fluid may be delivered to the cylinder 13 at one side or the other of the piston 12. The passageway 18 of the plug 16, through manipulation of the valve handle 21, unites the conductors 19 and 20 selectively with a vent aperture 22 provided in the casing of the valve 15, said vent leading to the atmosphere.

The outstanding feature of the present invention resides in providing the fluid conductor 19 with an automatically tripped valve 23. This valve, in a practical embodiment, is of the gate variety and its gate member is provided with an operating stem 24, the outer end of which engages a short lateral extension 25 of a curved

actuating lever 26. This lever has connected in off center relation therewith one end of a coil spring 27, the other end of the spring being connected with a pin carried by a stationary bracket 28. The lever 26 projects downwardly below the horizontal plane of the spray bar 1, with the spring 27 exerting a force on said lever which maintains the gate valve 23 in its position of closure, arresting fluid flow through the conductor 19 in the direction of the cylinder 13. When the lever 26 is rocked in generally an upward direction, and maintained therein by the action of the spring 27, the valve 23 is opened permitting fluid to pass into the cylinder 13 and therein exert pressure on the piston 12 to move the rod 11 outwardly. The movement of the piston rod rocks the lever 7, causing thereby the opening of the nozzle valves 3 of the spray bar.

To actuate the lever 26, I preferably use a wicket 29. The latter comprises a comparatively heavy metallic base plate 30, from one end of which arises a bail-shaped wicket element 31. The upper end of this element terminates, as shown in Fig. 2, in a horizontal plane slightly above that of the lower end of the lever 26 when the gate valve 23 is closed. The wicket is manually positioned on the roadway at or adjacent to the line of termination of an initial application of asphalt. The spraying machine is then advanced toward the wicket at its normal spraying speed. The four-way valve is set so that air pressure exists in the conductor 19 up to the gate valve 23. When the lower curved portion of the lever 26 contacts the top of the wicket element, the lever 26 is oscillated on its pivotal mounting and maintained in its elevated position by the spring 27, thus opening the gate valve 23 and allowing air to pass into the cylinder 13, producing, as aforesaid, the opening of the nozzle valves 3.

As the piston moves in response to air pressure applied thereto through the opening of the gate valve, the air on the other side of the piston passes through the conductor 20, the passageway 18 of the four-way valve and is then vented to the atmosphere. When a given application or course of asphalt has been deposited on the roadway, the operator, by adjusting the four-way valve, shuts off the flow of air to the conductor 19 and permits the compressed air to pass from the pipe line 14, through the passageway 18, conductor 20 to the other end of the piston, causing reversal in its direction of travel, which reversal results in the closing of the nozzle valves 3. The air displaced by the piston 12 during its stroke in closing the nozzle valve passes through the gate valve, which is maintained open by the action of the spring 27, and thence into the passageway 17 of the four-way valve to its vent 22. A manual operation may then be performed to move the lever 26 from its elevated position of valve opening to its lowered position of valve closure, thus finishing a given cycle of operation.

It will be noted that this operation is virtually automatic and does not depend upon human coordination in opening or closing valves. It is for this reason that the matching of successive applications may be so precisely effected.

In the operation of such spraying apparatus, it is customary to continue the supply of asphalt to the spray bar until the entire quantity of asphalt in the receiving tank is about exhausted, this condition being determined by noticing the escape of air from the discharge nozzles of the

spray bar, at which time the valves of the nozzles are closed. The escape of air through the nozzles usually produces a whistling noise which is used as a signal to denote the fact that the asphalt tank is about empty. However, even under such conditions, there is an inaccuracy at the end of the pumping period. Ordinarily, about five gallons of asphalt will be present between the pump and the nozzles, although this quantity is subject to variation. This remaining material is under pressure created by the pump, and when the intake of the latter picks up air, a considerable quantity of the remaining asphalt is replaced by air before the latter reaches the nozzles. The air so trapped is subject to compression, and the amount of the compression is lost in the discharge of the fluid from the spray bar. Thus, even though the operator immediately closes the valves of the outlet nozzles of the spray bar as soon as the whistling noise is noted, the last few feet of the application is apt to be deficient in the quantity of asphalt deposited. It is desirable, therefore, to arrest the asphalt flow before the entrapped air in the asphalt is introduced into the pump.

When the asphalt within the tank, indicated at 35, reaches a low level, as at 36, there is produced in the region of the tank outlet 37 a vortex 38, which results in the passage of air into the intake of the pump 39 which delivers the fluid material to the spray bar, and I make use of this vortex at the moment it is created to arrest material flow from the spray bar. This is preferably accomplished by providing a disk 40 on the lower end of a rod 41, the latter being supported by a bracket 42 mounted within the tank and an upper bearing 43. The rod is provided with a fixed collar 44, and a coil spring 45 is disposed between said collar and the top of the bracket 42, normally tending to maintain the disk in an elevated position. However, during the normal operation of withdrawing asphalt from the tank, the flow of the material into the outlet 37 results in moving the disk 40 downwardly against the resistance of the spring 45. However, when the vortex 38 appears and the disk is no longer submerged in the material, the spring 45 becomes effective to elevate the disk 40 and its associated rod 41.

I utilize this upward movement of the rod 41 to actuate the four-way valve 15 which, in the form of the invention disclosed in Fig. 3, need not be provided with the gate valve 23, so that air will be delivered directly to the servo-motor to close the nozzle valves of the spray bar. The upper end of the rod 41 is pivoted as at 46 to the longer arm of a bell crank lever 47, said lever being pivotally mounted as at 48 on the top of the tank 35 and has the outer end of its longer arm pivoted as at 49 to the operating crank 21a of the valve 15. The shorter arm of the bell crank lever may be connected to one end of a wire or rod 50 leading to an operator's position.

It will be seen that with the use of this construction, just as soon as air or other gases within the vehicle tank becomes entrained in the asphalt flow stream in quantities sufficient to produce the vortex, indicated at 48, the rod 41 will respond to the influence of the spring 45 and move upwardly to effect closure of the air controlling valve 15 which leads to the cylinder 13, thus instantly arresting further out-flow of asphalt from the nozzles of the spray bar and overcoming "leanness" in asphalt application on the roadway.

In a further modification of my invention, as illustrated in Fig. 5, a mechanism is provided for lifting automatically the tripping wicket 30 from the highway after it has acted upon the control trigger 26 of the gate valve 23.

To accomplish the lifting of the wicket so that it may be carried along with the spraying vehicle without requiring manual attention, I employ a pivoted link 55 which is movably suspended from a stationary element 56 of the spraying machine. The bottom of the link 55 has pivoted thereto, as at 57, a bar 58. This bar is normally elevated by one or more strong coil springs 59, the latter being connected as at 60 with the member 56 and, when in a latched position, engages with a stationary bracket 61. The bottom of the bar 58 carries a hook 62 which, when the bar 58 is latched, as shown in Fig. 4, is disposed in the path of the upper end of the bail 31, so that as the vehicle moves forwardly, the upper portion of the bail 31 enters the hook 62 and, by striking the latter, causes the link 55 to be oscillated, withdrawing the free end of the bar 58 from engagement with the bracket 61, thus allowing the bar to move upwardly by the action of the spring or springs 59, lifting with it the wicket member so that the same may be carried along with the spraying vehicle.

The apparatus is comparatively simple and may be applied readily to standard spray machines as an attachment or accessory. While I have described what I now deem to be certain preferred forms of the invention, it is obvious that the latter is subject to considerable further modification without departing necessarily from the scope of the following claims.

I claim:

1. In portable vehicle apparatus for distributing bituminous materials on road surfaces, a receiver for such materials having an outlet, a spray bar communicating with the outlet, said bar being provided with a plurality of valve-controlled discharge nozzles, motion-transmitting means uniting the valves of said nozzles for simultaneous operation, a cylinder, a piston slidably mounted in said cylinder, a rod movable with said piston and extending exteriorly of said cylinder for connection with said motion-transmitting means, means for delivering an operating fluid under pressure to either end of said cylinder, said means including a manually controlled valve and an automatically operated valve, and a movable actuating lever depending from said automatic valve, said lever being disposed for physical engagement with a road-positioned trip device which is cooperative with said lever to effect the opening of said automatic valve while the apparatus is in linear motion on the road surface.

2. In a portable vehicle apparatus for distributing bituminous materials on road surfaces, a receiver for such materials having an outlet, a spray bar communicating with the outlet for the reception of said materials, a plurality of spaced outlet nozzles joined with said spray bar for the discharge of said materials therefrom, control valves for said nozzles, motion-transmitting means connected with said valves for effecting their simultaneous operation, and means for imparting movement to said motion-transmitting means including a depending lever disposed for engagement with a stationary road-positioned device upon movement of the vehicle apparatus thereover to move said valves to positions providing for the passage of bituminous material through said nozzles.

3. In portable vehicle-mounted apparatus for distributing bituminous materials on road surfaces, a spray bar formed for the reception of such materials, said bar having a multiplicity of discharge outlets for said materials, valves controlling the flow of said materials through said outlets, and means actuated automatically during linear movement of the apparatus over a roadway for automatically opening said valves, said means including a movable actuator adapted for striking engagement with a road-positioned trip device when the apparatus is in motion.

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