Aug. 20, 1935. G. M. ETNYRE 2,011,894

DISTRIBUTOR FOR ASPHALT AND LIKE LIQUIDS

Filed Feb. 25, 1933 4 Sheets-Sheet 1

Fig. 1

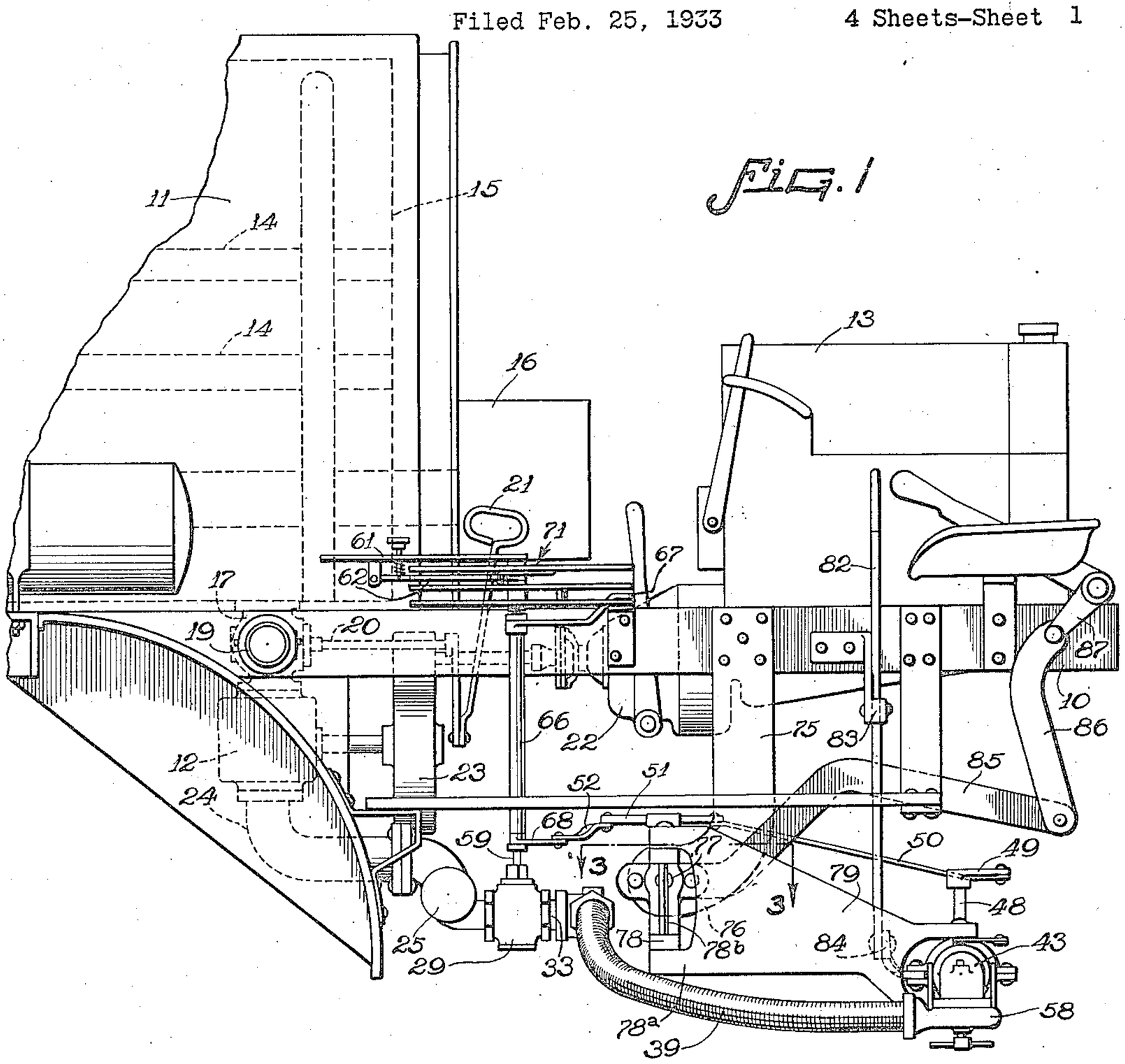


Fig. 2

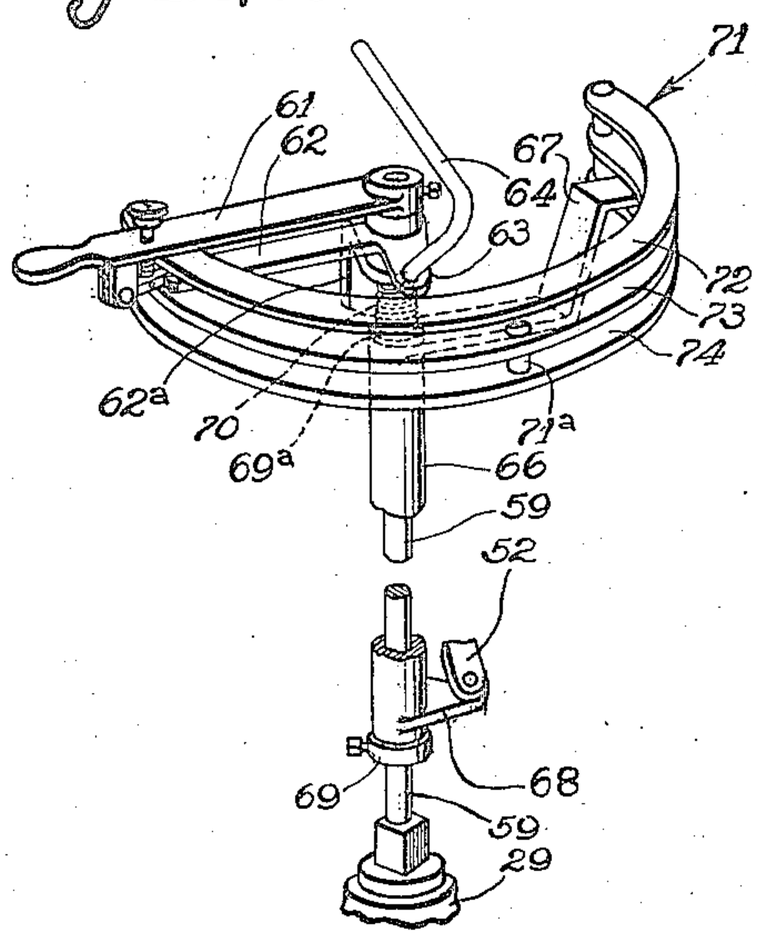
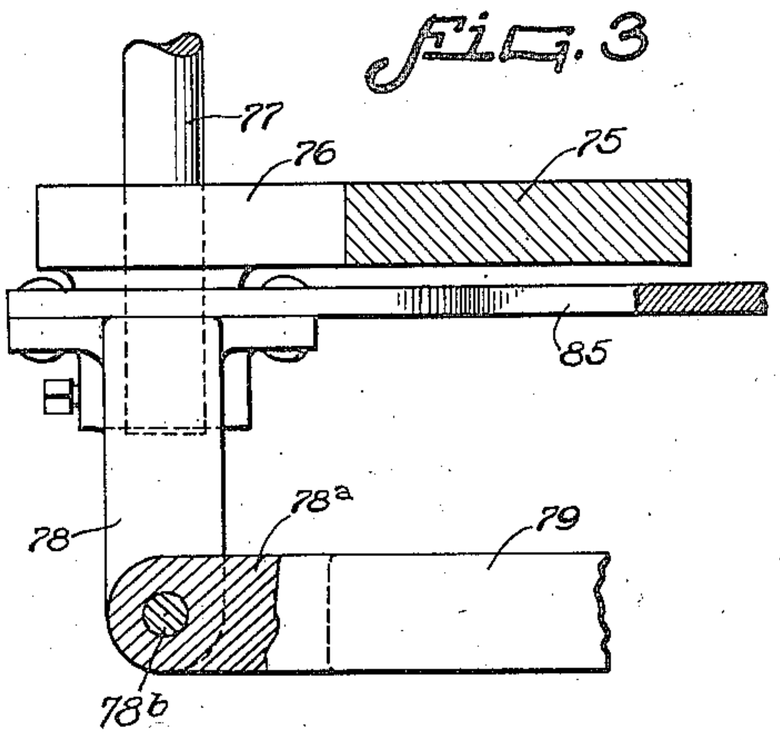


Fig. 3



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Aug. 20, 1935. G. M. ETNYRE 2,011,894

DISTRIBUTOR FOR ASPHALT AND LIKE LIQUIDS

Filed Feb. 25, 1933 4 Sheets-Sheet 2

Fig. 4

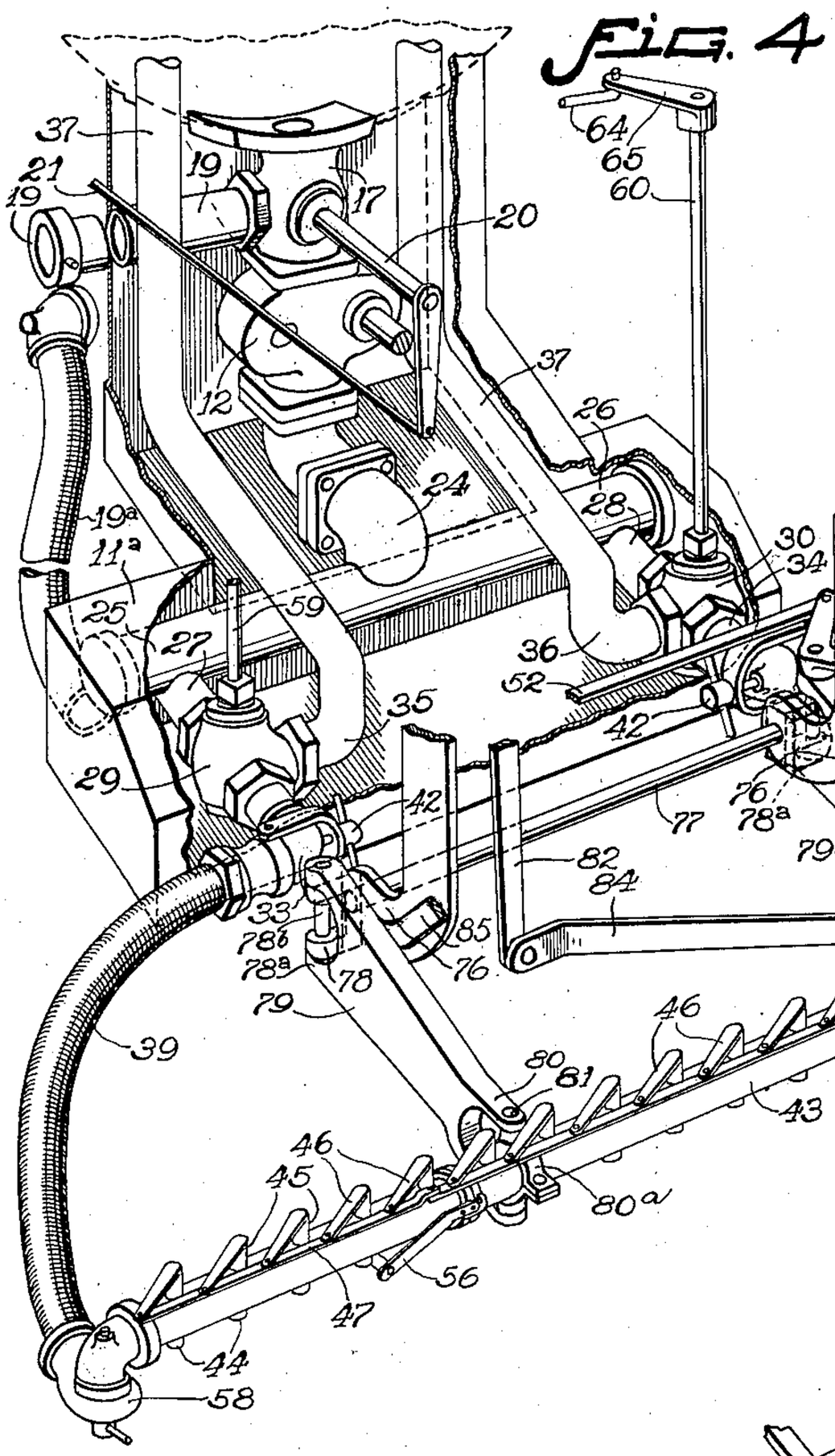


Fig. 5

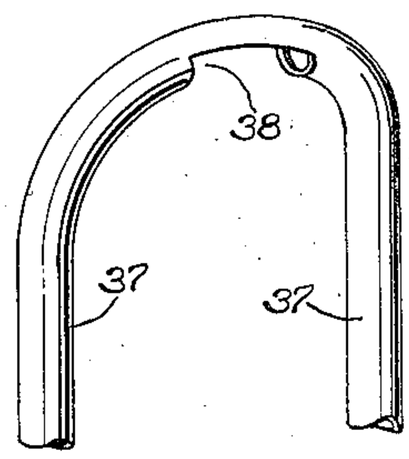


Fig. 6.

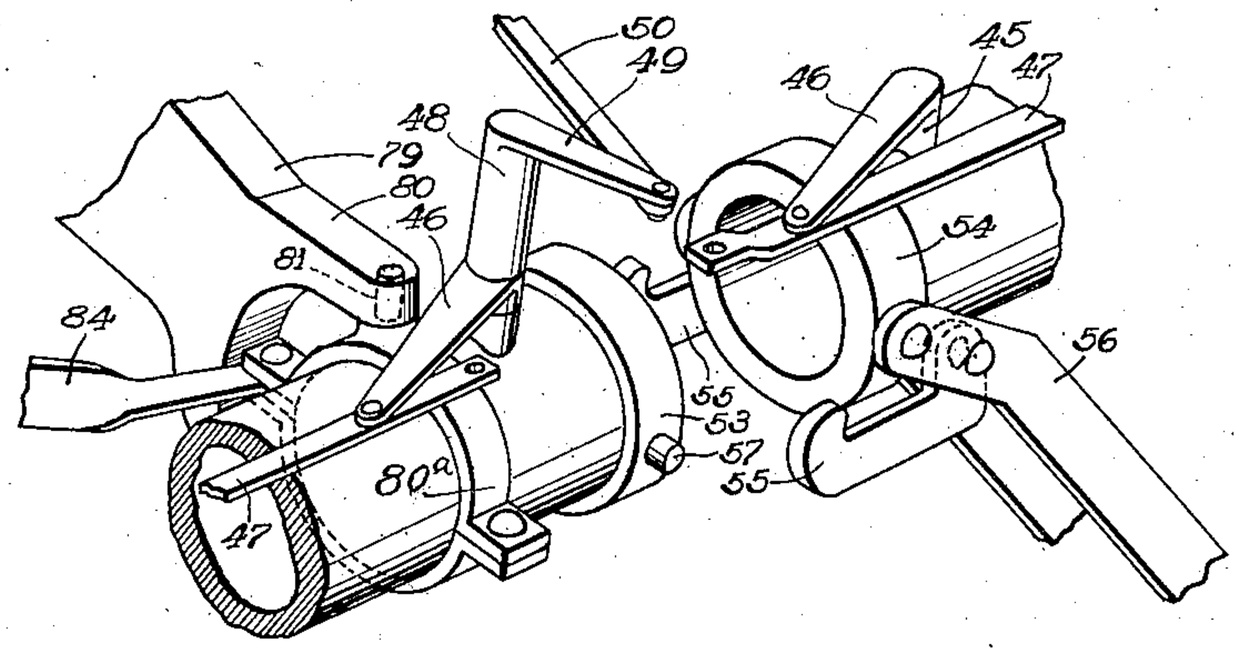
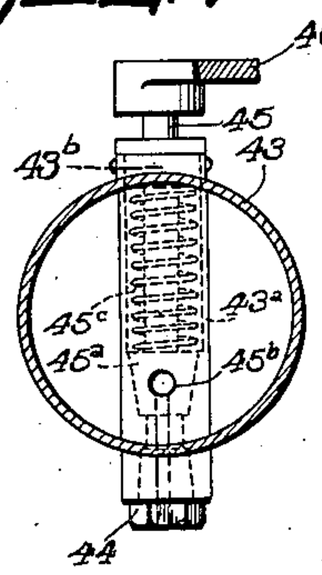


Fig. 7



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Aug. 20, 1935. G. M. ETNYRE 2,011,894

DISTRIBUTOR FOR ASPHALT AND LIKE LIQUIDS

Filed Feb. 25, 1933 4 Sheets-Sheet 3

Fig. 8

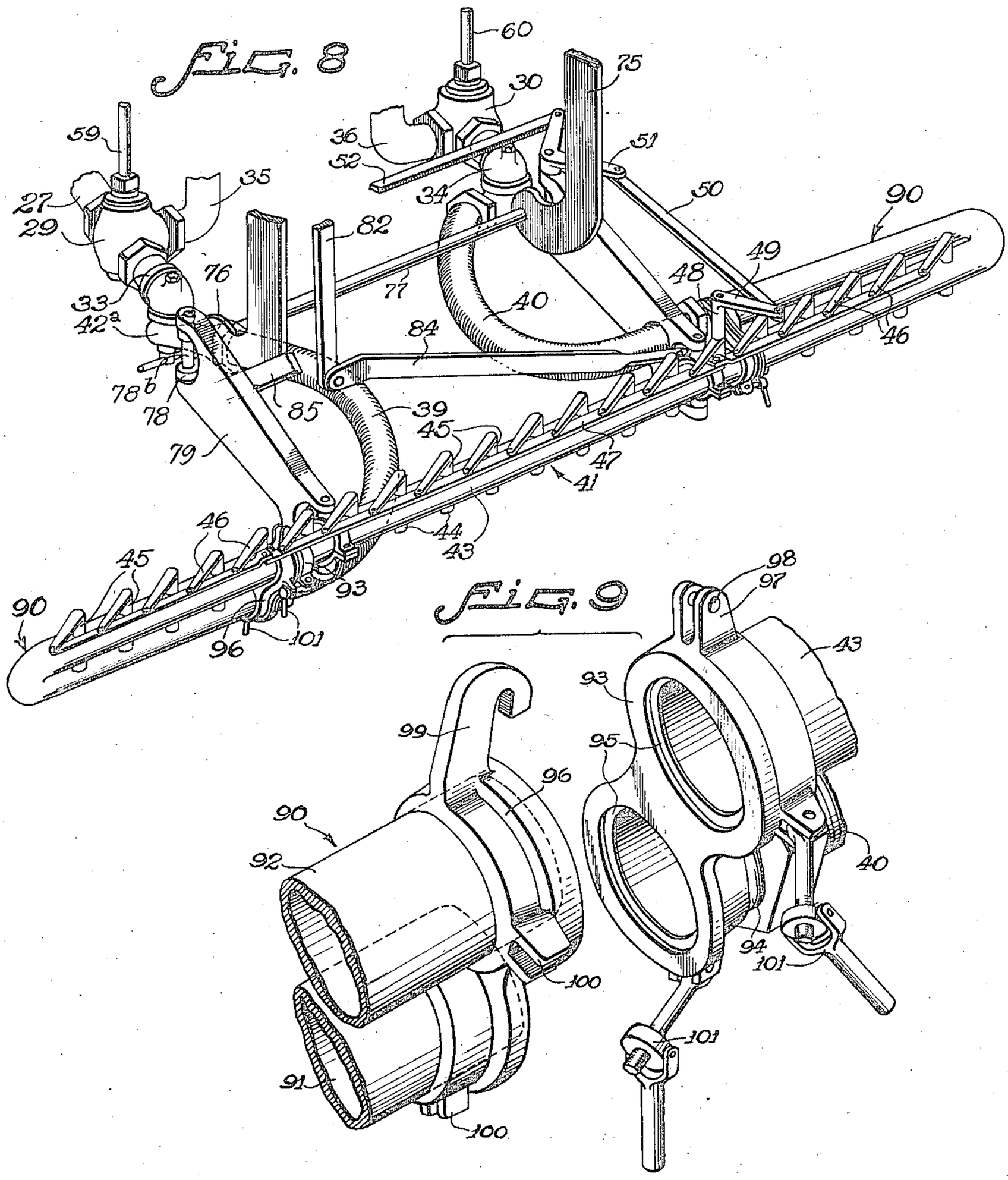
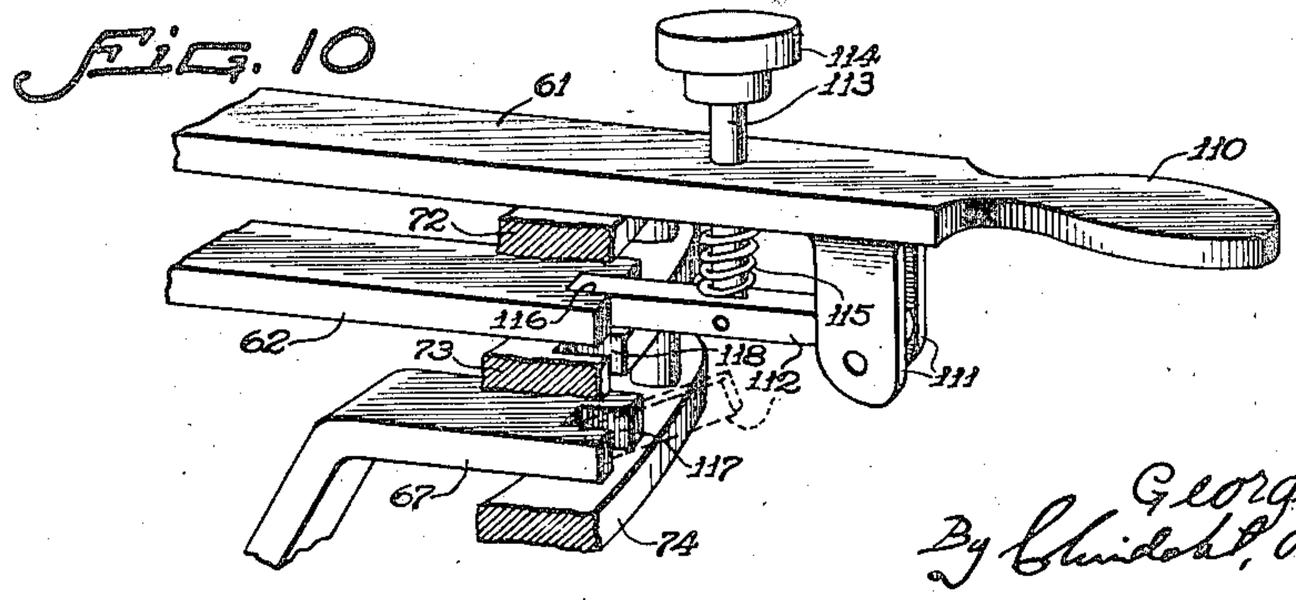


Fig. 9

Fig. 10



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Aug. 20, 1935. G. M. ETNYRE 2,011,894

DISTRIBUTOR FOR ASPHALT AND LIKE LIQUIDS

Filed Feb. 25, 1933 4 Sheets-Sheet 4

Fig. 11

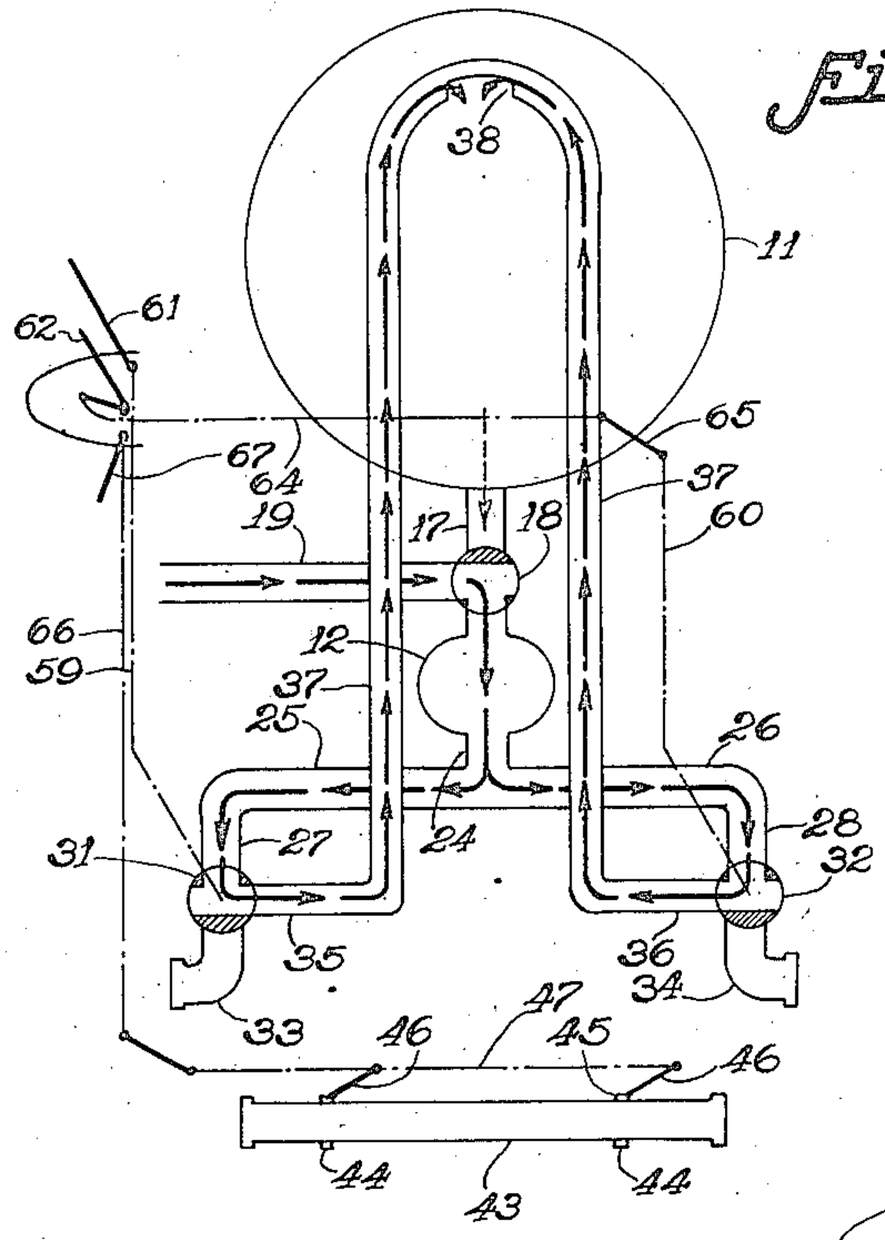


Fig. 12

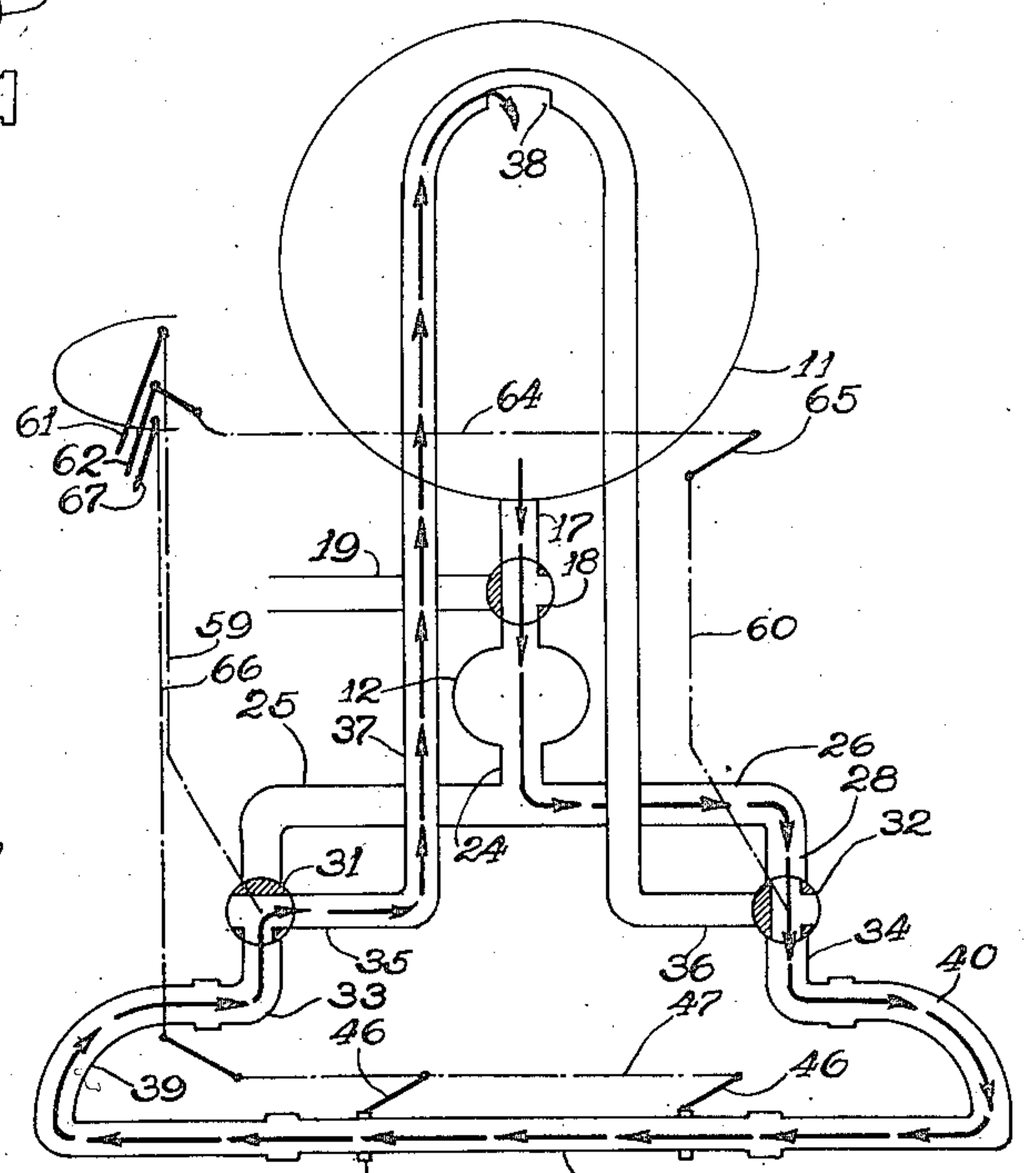
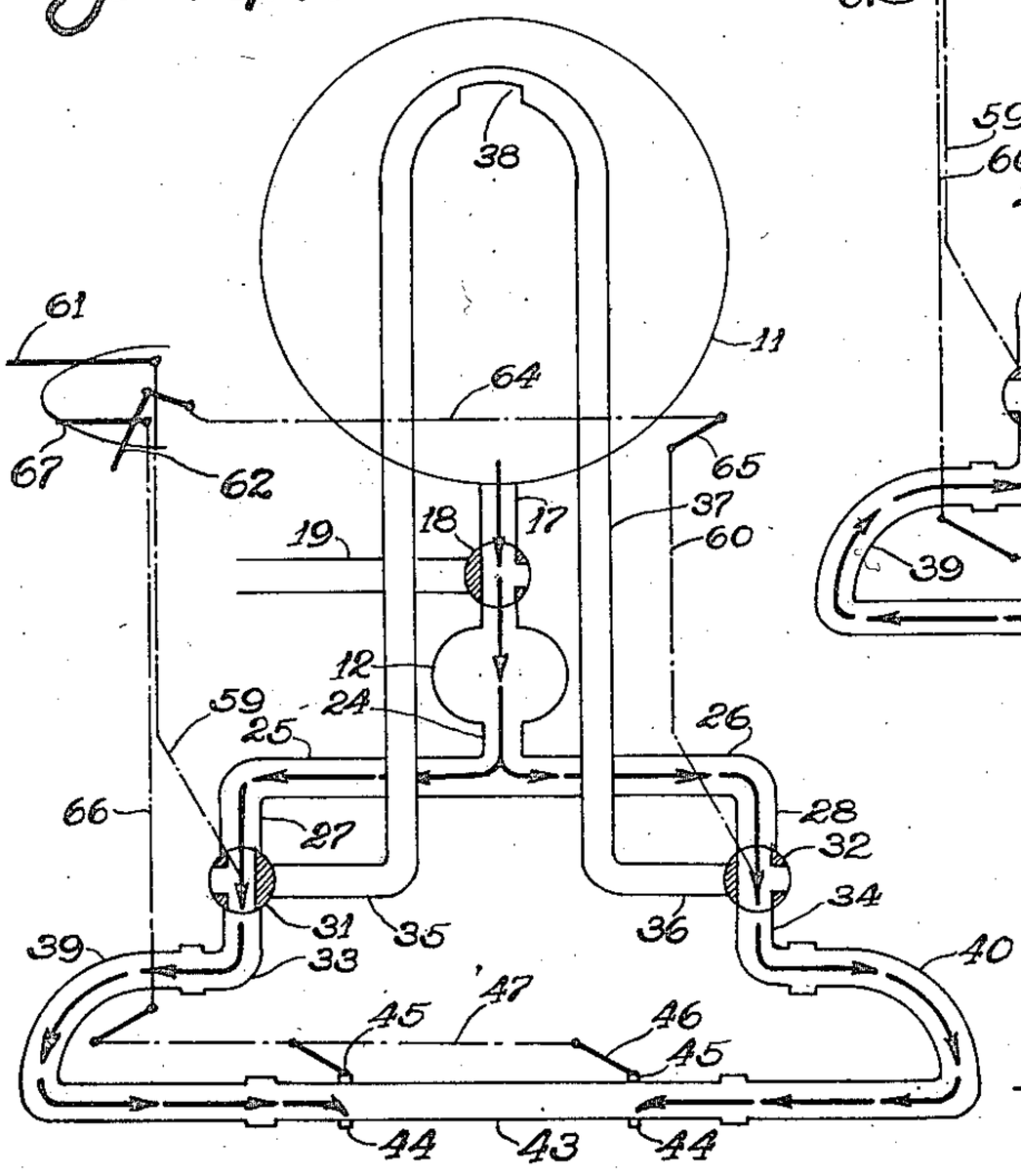


Fig. 13



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Patented Aug. 20, 1935 2,011,894

UNITED STATES PATENT OFFICE

2,011,894

DISTRIBUTOR FOR ASPHALT AND LIKE LIQUIDS

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Application February 25, 1933, Serial No. 658,511

19 Claims. (Cl. 299—34)

The invention pertains generally to apparatus for applying liquid bituminous material, such as asphalt and similar products, to roadways, and particularly has reference to the distributing system thereof.

The general object of the invention is to provide, in a machine of this character, a new and improved distributing system of high efficiency and simple and practical construction.

Asphalt and similar bituminous materials are difficult to distribute since at ordinary temperatures these materials are solid or extremely viscous. Consequently, they are distributed or applied while in a heated condition. Difficulty is encountered in maintaining the distributng systems, and in particular the control devices or valves therein, in operative condition since during any period of idleness the material "freezes" or partially solidifies into a sticky, gummy mass which clogs the system and prevents movement of the control devices.

An important object of the invention, therefore, is to provide a system for the distribution of asphalt and like materials which includes a circulatory system so arranged that every control device in the system may be subjected to the heat of the material to be distributed preparatory to actual distribution, whereby control devices which have become stuck or clogged by the material are freed therefrom.

In conjunction with the foregoing object, said novel circulatory system is arranged to maintain all of the control devices in operative condition during periods of temporary idleness in the actual distributing operation.

Another object of the invention resides in the provision of a novel distributing system which includes a distributor or spray bar extending continuously from one side of the machine to the other and improved connections thereto arranged to deliver material to both ends thereof for distribution, or to circulate material therethrough during intervening periods.

Another object is to provide, in a distributing apparatus, a distributor bar having control devices associated therewith for governing the discharge of material therefrom, and a circulatory system in which material may be caused to flow either to or past said devices and embodying control means operable in synchronism with said devices.

Another object of the invention is to provide a novel material distributing system wherein the system may be entirely cleansed of material remaining in the system, when operation thereof is discontinued, and all such material returned to the source of supply.

Another object is to provide a distributor system embodying a distributor bar and a plurality of valve controlled circulatory systems in one of which the distributor bar forms a part of the flow path and in another of which the flow path is independent of said bar.

Another object resides in the provision of a novel control for the distributor mechanism proper wherein all of the operative steps may be properly performed in sequence by manipulation of a single control member.

A further object is to provide a distributor, the effective length of which may be varied and in which the over-all length may be reduced to less than the width of the machine to condition the machine for idle traveling.

Another object is to provide a distributor bar in sections which are relatively detachable to vary the over-all length of the bar and which embody end sections fashioned to increase the inherent stability of the assembly and to enhance the effectiveness of the bar as a whole.

Another object resides in the provision of novel means in combination with the distributor bar for vertically or transversely adjusting the bar to meet the varying conditions encountered in operation.

Other objects and advantages will become apparent in the following description and from the accompanying drawings, in which:

Figure 1 is a fragmentary view showing in side elevation the rear end of a machine embodying the features of the invention.

Fig. 2 is a perspective view of the operator's control mechanism.

Fig. 3 illustrates a detail of construction on an enlarged scale and the view is taken on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary perspective view showing the material distributing and circulating system of the machine, certain structural parts being omitted or broken away for clarity.

Fig. 5 is a fragmentary perspective view of a part of the circulatory system not seen in Fig. 4.

Fig. 6 is a perspective view of a part of the distributor or spray bar.

Fig. 7 is a transverse section through the distributor bar.

Fig. 8 is a fragmentary view in perspective showing a modified form of distributor bar.

Fig. 9 is an enlarged fragmentary view in perspective illustrating a detail of the distributor bar shown in Fig. 8.

Fig. 10 is an enlarged fragmentary view partially in perspective of a detail of the operator's control mechanism shown in Fig. 2.

Figs. 11, 12 and 13 are schematic illustrations showing the distributing system under various conditions of operation.

The present invention, as shown in the drawings, is illustrated in connection with distributors for asphalt and the like which in general machine organization is somewhat similar to the distributors disclosed in my Patents No. 1,668,309 issued May 1, 1928 and No. 1,778,551 issued October 14, 1930. It will be evident, however, that certain features of the invention are readily adaptable, without substantial modification, to machine organizations other than that disclosed herein.

The general machine organization, as illustrated in the drawings, comprises a frame **10** adapted to be mounted on a motor truck of any suitable character. The frame supports a main reservoir or tank **11** which serves as a source of supply for material to be distributed. For convenience this material will be hereinafter referred to as asphalt. A pump **12** located beneath and at the rear end of the tank **11** is arranged to be operated from a suitable source of motive power such as an internal combustion engine **13** mounted on the rear end of the frame **10**. The independent engine is preferably employed so that the speed of the pump may be separately controlled.

The tank **11**, which is of conventional construction, has means associated therewith for heating asphalt within the tank. As herein shown, this means includes heating flues **14** located within the tank and extending between an end chamber **15** at one end of the tank and a similar chamber (not shown) at the other end of the tank. Heating devices (not shown) are located within a housing **16** for supplying hot gases to the end chamber **15** and flues **14**. The pump **12** communicates with the interior of the tank through a conduit **17** which may be fashioned as the casing for a valve **18** (Figs. 11, 12 and 13). Said valve is of the three-way type and is arranged with one port in the casing in communication with the tank, a second port in communication with the pump, and a third port communicating with an intake pipe **19** (Figs. 1 and 4).

The intake pipe extends laterally of the frame **10** and is arranged to be coupled with a conduit from any suitable source of supply. Thus, the valve **18** in one position thereof controls the flow of asphalt from the tank to the pump and in another position directs the flow of asphalt through the intake pipe to the pump. A valve operator **20**, for manipulating the valve **18**, is connected with a hand rod **21** which extends to a position on the machine convenient to the operator. The driving connections between the pump and the engine preferably include a clutch located within a housing **22** and gears disposed within a gear casing **23**.

The pressure or discharge side of the pump **12** communicates through the medium of a downwardly and rearwardly extending conduit **24** with header **25**, **26** (Figs. 1 and 4) which is rigidly secured to said conduit and extends transversely of the frame in opposite directions from the conduit. At each outer end of the header **25**, **26** a rearwardly and horizontally disposed pipe **27**, **28** is attached. The pipes **27** and **28** communicate with valve housings **29** and **30** for three-way valves **31** and **32**. The valve housings **29** and **30** have rearwardly extending pipes **33** and **34** communicating therewith and a third port in each housing is connected with the lower ends **35** and **36** of a U-shaped circulating pipe **37** which extends upwardly into the interior of the tank **11**. The top of the U-shaped pipe is located near the top of the container and the central portion of the bend is cutaway as at **38** (Fig. 5) so that the legs of the U-pipe form substantially independent conduits. The outer ends of the pipes **33** and **34** are connected with flexible conduits **39**, **40** respectively which, in turn, lead to spaced points on a distributor or spray bar, generally designated **41**. In the construction shown in Figs. 1 and 4, the connections between the pipes **33**, **34** and the flexible conduits **39**, **40** are preferably such that the flexible conduits may be readily detached and, in the present instance, clamps **42** are employed. As illustrated in Fig. 8, the connections are not necessarily detachable and are a well-known type of swivel connection **42a**.

The distributor bar **41** is for the purpose of delivering an even film or layer of asphalt and the like upon the roadbed and comprises an elongated tubular casing **43** which is supported from the frame by means to be presently described. Longitudinally alined along the lower portion of the casing are a plurality of spray nozzles **44**, of any suitable construction, having communication through suitable orifices with the interior of the casing. In the present instance, flow of material through each of the spray nozzles is individually controlled by a valve located within the central portion of the casing and regulated by a valve operator **45** extending through the top of the casing.

The valves are of such size that they do not materially impede the flow of asphalt through the casing. A preferred arrangement is shown in Fig. 7 wherein tubular valve housings **43a** extend from top to bottom through the casing **43**. The spray nozzles are suitably mounted in the lower ends of the housings **43a** and the valve operators **45** extend through plugs **43b** in the upper ends of the housings. Valves **45a** rigid with the operators control the flow of fluid through ports **45b** into the housings **43a** and through the spray nozzles **44**. Springs **45c** within the housings hold the valves against their seats.

The valves are arranged to be actuated simultaneously and to this end each operator **45** has a laterally extending arm **46** (Figs. 4, 6 and 7) rigid therewith. The outer end of each arm **46** is pivotally connected to a bar **47**. One of the valve operators, herein the one designated **48**, is elongated and at its outer end has a second arm **49** extending radially therefrom. A link **50** connects this arm **49** with one end of a bell crank lever **51**, the other end of which is connected with the link **52** constituting a connection with the operator's control mechanism, as will be hereinafter described.

The distributor is arranged normally to extend transversely from one side of the machine to the other and may be fashioned as a single unit, but since occasions may arise where it will be desirable to apply a strip of material of greater or less width the present embodiment makes provision for adjusting the over-all length of the distributor. Thus, the distributor is formed in sections, three of such sections being herein shown. The central or intermediate section is permanently mounted, while the two end sections are arranged to be detachably secured thereto in any convenient manner so that said end sections may be

replaced by other sections of similar construction, but of different lengths.

As shown in Figs. 1, 4 and 6, the distributor is in the form of a straight tubular pipe, the end sections being straight continuations of the middle sections. A suitable means for detachably securing these sections together comprises collars **53**, **54** (Fig. 6) mounted on the ends of the sections to be joined, which collars are arranged to be drawn into close abutment by means of hooks **55** eccentrically mounted on the arms of a lever action yoke **56** pivoted to one collar, said hooks being engageable or disengageable, in the swinging movement of said yoke, with studs **57** carried by the other collar. The elongated bar **47** for operating the spray nozzle control valves is divided between valves on different sections and any convenient and readily detachable means may be provided for operatively connecting these bar sections together.

The flexible conduits **39**, **40** are, in this arrangement, detachably secured to opposite ends of the distributor casing by swivel connections **58**. In consequence of the above construction, when it is desirable to increase or diminish the width of the strip of asphalt to be applied, it is only necessary to uncouple one or the other or both outer sections of the casing, disconnect the adjacent sections of the valve operating bar **47**, uncouple the swivel connections **58**, replace the outer section with another section of proper length, and reestablish the connections. Another inherent advantage in the sectional distributor casing is that the end sections, together with their respective flexible conduits, may be entirely removed when the machine is traveling from one place to another, thereby eliminating the possibility that the distributor bar might be damaged by passing objects.

As shown in Figs. 8 and 9, the distributor may have a somewhat modified construction. Each end section **90** comprises a tubular member having a return-bent part **91** forming a U-shaped structure. The arms of the U are closely adjacent and are of substantially equal length. Only one arm **92** of these end sections is provided with spraying outlets and these arms are secured to the middle section. The flexible conduits **39**, **40** are connected with the corresponding ends of the arms **91**. To facilitate the assembly of the structure, it is preferred to employ such means that the connection of the end section with the middle section and the flexible conduit may be accomplished in a single operation. To this end (see Fig. 9) the middle section, adjacent its ends, carries a laterally extending support **93** for a short nipple **94** to which the corresponding flexible conduit **39** or **40** is connected. The support **93** is recessed about the ends of the middle section and nipple to receive gaskets **95**. The adjacent ends of the end sections are connected by a generally similar support **96** but the ends of the section extend beyond the face of the support to fit into the recesses and against the gaskets. A sealed connection is formed in this manner.

For connecting the parts rigidly together, one support, in this instance the support **93** on the middle section, has a pair of upstanding lugs **97** on the upper side thereof which support therebetween a pin **98** for engagement by an upstanding hook **99** on the other support. Such engagement positions the conduit ends in the recesses and disposes the flat faces of the two supports in opposition. At spaced points on one support are outstanding pairs of lugs **100** for engagement by conventional types of pivoted clamps **101** carried by the other support.

This modification is inherently strong and sturdy and the outer ends of the complete distributor cannot sag even though the end sections are of considerable length. Moreover, the connections may be quickly and easily made or broken. As a further advantage, the flexible conduits are disposed in a protected position entirely within the confines of the frame, are of a constant minimum length, and are always supported out of possible contact with the road. The end sections may be provided in standardized lengths with the shortest being substantially a U-shaped cap employed to minimize the overall length yet permit circulation through the distributor while the machine is being transferred.

The control mechanism for the distributing system will now be described. The valves **31** and **32** are each provided with an upwardly extending valve operating rod **59** and **60** (Figs. 1 and 4), respectively. One of the operators, in this embodiment the operator **59**, has the manually manipulable control elements associated therewith. With reference to Figs. 2 and 10, the valve operator **59** has a hand lever **61** rigidly affixed to its upper end. Immediately below the hand lever **61** is a second lever **62** journaled on the valve operator **59** for relative rocking movement and supported in place by a bracket **62a**. The lever **62** is in the nature of a bell crank lever, the short arm **63** of which is pivotally connected with a rod **64** which extends transversely of the frame of the machine to engage a lateral arm **65** (Fig. 4) rigid with the upper end of the valve operator **60**.

An intermediate portion of the valve operator **59** carries an elongated, relative rotatable sleeve **66**. The upper end of the sleeve **66** has a laterally extending lever **67** rigid therewith and the lower end of the sleeve carries a lateral finger **68**. The link **52** (Fig. 4), which forms a part of the mechanism for actuating the spray nozzle control valves, is pivotally connected with the finger **68**. The sleeve **66** rotatably rests on a collar **69** rigid with the valve operator **59**. A spring **70** is interposed between a second collar **69a** at the upper end of the sleeve and the bracket **62a** to maintain the parts in operative position.

While each lever **61**, **62** and **67** may be arranged for independent manipulation, it is preferred to provide an interconnection therebetween whereby all of the several operative movements may be obtained in proper sequence by a single control lever. One form of such control mechanism, designated **71**, is best seen in Figs. 1, 2 and 10. For convenience, the mechanism may be termed a control quadrant and embodies a frame having three arcuate segments **72**, **73** and **74** which are rigidly secured together in vertical spaced relationship. The segments are suitably secured to the frame of the vehicle about the upper end of the valve operator **59** as a center. The hand lever **67** is intermediately offset to place the outer end thereof between the two lower segments **73** and **74**. The lever **62** projects between the upper and middle segments **72** and **73** and the lever **61** overlies the upper segment **72**.

In the present arrangement of parts when the various valves are in their normal position or, in other words, are in that position from which all operations start (see Fig. 8), the control levers **61**, **62** and **67** (see Fig. 2) have the following relationship to each other and to the quadrant segments. The levers **61**, **62** are vertically alined and

are disposed at one extreme limit of movement, as at the left-hand end of the quadrant. The remaining lever 67 is located at the other extreme or at the right-hand end of the quadrant. In this position, the distributor valves are closed and the valves 31, 32 are positioned to connect the header 25, 26 with the return pipes 37.

The levers 62 and 67 are arranged for proper actuation in sequence by the lever 61. Thus, the lever 61, as best shown in Fig. 10, extends beyond the frame while the other levers terminate adjacent thereto. The projecting end 110 of the lever 61 is fashioned as a hand piece and carries a pair of depending bosses 111 between which a finger 112 is pivoted to extend horizontally toward the frame and partially into overlying relation to the middle segment 73. A vertical rod 113 slidably mounted in the outer end of the lever 62, has its lower end pivotally connected with the finger 112 and its upper end carries a manipulating member 114. A spring 115 is interposed between the finger 112 and lever end 111 and exerts a force for swinging said finger downwardly.

The outer ends of the levers 62 and 67 are longitudinally recessed or notched, as indicated at 116 and 117, respectively, to receive the end of the finger 112 whereby to latch either lever 62 or 67 to the lever 61 for actuation thereby. At that end of the frame at which the lever 67 is normally located (the right-hand end in Fig. 2), the middle segment 73 is notched, as at 118 (Fig. 10), to allow the end of the finger to move between the levers 62 and 67.

In the normal position of the parts, the finger 112 is engaged with the notch 116 in the lever 62 and is restrained against movement out of such engagement by the underlying segment 73. Hence, movement of the lever 61 out of normal position also moves the lever 62. The latched relationship of said levers is maintained through substantially 180° of movement until the end of the finger 112 is opposite the notch 118 in the segment 73, at which point the spring 115 forces the finger downwardly through the notch 118 into engagement with the notch 117 in the lower lever 67 to latch the levers 61 and 67 together. An intermediate stop 71a (Fig. 2) between the two lower segments 73, 74 limits movement of the lower lever 67 to approximately 90°. It will be seen, therefore, that the levers 61 and 62 may be moved out of their normal position through an arc of 180° while the levers 61 and 67 have conjoint movement of only 90° in a reverse direction in moving the lever 67 out of the normal position thereof.

As has been mentioned, lever 61 is directly connected with three-way valve 31 so that said valve may be rotated from its normal position through 180° in a counterclockwise direction. Lever 62 is connected with right-hand three-way valve 32 and this connection is such that valve 32 is rotated in a clockwise direction as the lever 62 moves from its normal position. However, since valve 32 in operation is only moved through 90°, a suitable lost motion connection is provided which, in this instance, comprises arranging the short arm 63 of the lever 62 and the connecting rod 64 (see Fig. 2) so that the rod is swung laterally, in the first movement of the lever 62 through approximately 90°, without moving the valve 32 to any extent. The lever 67 is so connected with the distributor valves that clockwise movement of the lever through 90° from normal opens the valves.

The relationship of the parts and the operation of the distributing system, under various operating conditions, is as follows, it being presumed that the supply tank 11 is empty. In order to fill the supply tank, the intake pipe 19 is connected with a source of supply, the control elements are in their previously described normal positions, and the valve 18 is turned to connect the intake pipe 19 with the inlet side of the pump 12. When the pump is in operation, asphalt will be drawn from the source of supply through the intake pipe 19, valve 18 to the pump 12, and thence forced in a flow path through the header 25, 26; pipes 27, 28; valves 31, 32; lower ends 35, 36 of the U-shaped pipe 37, to discharge through the recess 38 into the tank 11 (Fig. 11). This flow path, it will be observed, is independent of the distributor bar 43.

After the tank 11 has been filled, the valve 18 is turned to establish communication between the tank and the pump through the conduit 17. This is the normal position of the valve 18. If the position of the other control valves remain unchanged, the resulting relationship is that which the parts occupy while the machine is traveling from the filling station to the place where actual distribution is to take place. It will be seen that circulation of the fluid through the supply tank 11 is thereby effected, whereby a uniform temperature of the asphalt is produced and maintained without danger of overheating the asphalt.

To condition the system for a distributing operation, asphalt is caused to circulate from the tank through and past all of the valves in the system, and particularly past the spray nozzle control valves. This circulatory system is shown in Fig. 12 and is attained by the following manipulations on the part of the operator. The hand lever 61 is swung counterclockwise to the opposite side of the quadrant, thereby turning the valve 31 counterclockwise through 180° to establish communication between one end of the distributor, through the rearwardly extending pipe 33, and the lower end 35 of the circulating pipe 37. The lever 62 is simultaneously moved through 180° and the last 90° of such movement is effective to rotate the valve 32 clockwise through 90° thereby connecting the header 26 with the other end of the distributor. The circulating flow of asphalt is, therefore, from the tank 11 through the conduit 17, valve 18, pump 12, conduit 24, header section 26, pipe 28, valve 32, pipe 34, flexible conduit 40, distributor casing 43, flexible conduit 39, pipe 33, valve 31, end 35 of U-shaped circulating pipe 37 to discharge through recess 38 into the tank.

The heat of the asphalt as it passes through this circulatory system liquefies every particle of material which might have remained therein from a previous operation and, in particular, cleans all of the spray control valves 45a and places them in condition for immediate operation. As has been mentioned, this circulatory system is employed prior to starting any distributing operation, but it may also be employed whenever a distributing operation is interrupted momentarily, as for example when crossing paved roads, railroad tracks, or the like.

A particular relationship of the valves 31, 32 during the aforesaid movements thereof is important and may best be understood from a comparison of the valve positions as shown in Figs. 11, 12 and 13. The valve 31, in moving from the position shown in Fig. 11 through that shown in

Fig. 13 to that of Fig. 12, passes intermediate positions wherein the passageways through the valve overlap and connect the three ports controlled thereby. Similary, the valve 32 in the 90° movement thereof passes through an intermediate position in which the three ports are connected. The relationship of both valves in operation is such that said intermediate connections occur at the same time. As a result, it is impossible to position the valves in such manner that a flow through the conduits is entirely prevented, thus eliminating all chance of destructive pressure being built up within the system.

The direction of flow of asphalt through the system during distribution is illustrated in Fig. 13. As the lever 62 moves over the notch 118 in the middle segment, the finger 112 moves downwardly through said notch into engagement with the lever 67. Hence, movement of the lever 61 now carries lever 67 therewith and the extent of movement of both levers is limited to 90° by the stop 71a. If distribution of asphalt is to be made, the operator swings the hand lever 61 clockwise and the accompanying movement of the lever 67 is translated through the sleeve 66, finger 68, link 52, bell crank lever 51, link 50, arm 49, valve operator 48, bar 47 and the lateral arms 46 on the valve operators 45 to open the spray nozzle control valves simultaneously.

The clockwise movement of hand lever 61 through 90° returns the valve 31 into the position shown in Fig. 13 in which the valve connects the associated end of the distributor with the pump through the header section 25. The fluid flow is, therefore, from the tank 11 through conduit 17, valve 18, pump 12, conduit 24, through both header sections 25 and 26, pipes 27, 28; valves 31, 32; pipes 33, 34; flexible conduits 39, 40 into both ends of the distributor casing 43 for discharge therefrom through the spray nozzles 44.

An important feature of this distributor system resides in the delivery of asphalt to both ends of the distributor since smaller fittings, connections and valves may be used than would otherwise be possible. Moreover, such delivery to the distributor assures delivery of asphalt to every spray nozzle at relatively uniform pressure.

The levers 61 and 67 remain latched together until the operator moves both to the right-hand end of the quadrant (thereby closing the distributor valves and conditioning the system for circulation through the distributor), manually raises the finger 112 by manipulation of member 114 into engagement with the notch 116 in lever 62, and moves lever 62 slightly to carry the finger out of registration with the notch 118. Consequently, the operator may change the system from distribution to circulation through the distributor by the movement of a single lever. This is advantageous since, when the machine is in operation, these two control positions are the ones most frequently employed.

In returning the system to normal, the finger 112 is caused to engage the lever 62 and levers 61 and 62 are then moved clockwise to the starting position.

When it becomes necessary to discontinue the distributing operation for any considerable period of time, as when the supply tank 11 has been emptied, the entire circulatory system may be completely drained of asphalt and substantially all of this drainage returned to the supply tank. Thus, it is presumed that distribution has been stopped and that the operator has returned the system to the condition shown in Fig. 12 wherein a circulatory flow through the distributor bar is produced. A short auxiliary section of flexible conduit 19a is connected at one end with the intake pipe 19 and at its other end with a source of air or gas which may be, if desired, heated. If the air or gas is heated, the source may be a heating casing 11a (Fig. 4) which encloses the operative parts of the system. Reference to my aforesaid patents may be had for a more particular disclosure of a casing of this nature.

After this connection has been established, the valve 18 is turned to the position thereof shown in Fig. 11 whereby heated air from the casing will be drawn into the pump and thence forced through the system. In consequence, the residual asphalt is returned, by the force of the heated air, into the supply tank 11. When the distributor bar has been drained, movement of the valves 31, 32 into the position shown in Fig. 11 will practically complete the process of draining the asphalt into the tank. The amount of material remaining in the system is inconsequential and may be drained upon the road when operation is stopped for any length of time.

While it is preferred to utilize hot air or gas to cleanse the system, in order to prevent solidification of material by the air, under favorable circumstances a part of the system may be opened directly to atmosphere, as by connecting the intake pipe with the pump, and air under abnormal atmospheric pressure employed to effect drainage of the system. It will be evident that all of the asphalt in the circulating system will be withdrawn from the circulatory system and returned to the supply tank, thus preventing solidification of asphalt which would result if the system were not drained, or waste if all of the asphalt remaining in the system were allowed to drain upon the roadbed.

Preferably (see Fig. 4), the connections at the inlet and outlet ends of the distributor are turned upwardly and downwardly respectively to eliminate pockets which would hinder a complete draining of the system. For the same purpose (see Fig. 3), the return portion of the U-shaped section at the inlet end of the distributor is level with or above the plane of the distributor while the return portion at the outlet end is below said plane.

Means is provided for adjusting the distributor bar vertically and laterally with respect to the roadbed and such adjustments are controlled from a position convenient to the operator. To this end, a hanger 75 (Figs. 1 and 4) is secured to each side of the frame 10 and the ends 76 thereof support a transverse shaft 77 which is rigidly connected with brackets 78 at each end to mount the brackets for pivotal movement on a horizontal axis. Enlarged arms 79 have one end fashioned as a yoke 78a to straddle the brackets 78 and the arms are pivotally secured thereto by a pin 78b for movement on vertical axes. The arms 79 extend rearwardly of the machine from the brackets 78 and the rear ends thereof are also formed as yokes 80 arranged to straddle the distributor bar. Oppositely disposed and vertically alined pins 81 are provided on collars 80a on the distributor bar for engagement by the arms of the yoke 80. A lever 82, pivoted as at 83 to the frame of the machine, extends downwardly to a point adjacent the distributor bar where the lever is connected by a horizontal link 84 with one of the collars 80a. The distributor bar is, by this construction, supported

for lateral adjustment from side to side under the control of the lever **82**.

The shaft **77** has one end of an elongated bar **85** (Figs. 1 and 3) rigidly secured thereto. The other end of the bar **85** is pivoted to a link **86** which, in turn, is pivoted to the short arm of a bell crank lever **87**. The bell crank lever is pivoted to the frame of the machine and the long arm thereof is formed as a handle. Movement of the bell crank lever in one direction or the other is operable to rock the shaft **77** and thereupon adjust the distributor bar vertically with respect to the roadbed. Moreover, by this vertical adjustment the distributor bar may be elevated to facilitate the operation of draining the system, as well as to prevent injury thereto while traveling.

With reference to Fig. 4, it will be seen that the bell crank lever **51**, which forms a part of the spray nozzle valve actuating connection, is pivoted for movement on the pivotal connection between the yoke **78a** and bracket **78**. The pivotal connection between the distributor bar and the yoke **80** is closely adjacent and parallels the axis of the valve actuating assembly **46**, **48**, **49** and **50** so that these pivotal connections are on approximately the same axis. This relationship allows the valves in the distributor bar to be actuated in any position of lateral adjustment of the distributor bar.

From the foregoing, it will be evident that a novel distributing system has been provided which embodies a circulatory system by which all of the control elements may be subjected to the heat of the material to be distributed in order to condition the system for efficient operation. Moreover, the circulatory system is capable of being completely drained of all material remaining therein after distribution has ceased, without waste of such material. Furthermore, the present organization embodies simple means for varying the width of the strip of material to be applied, as well as for shifting the strip applying distributor relative to the frame of the machine.

I claim as my invention:

1. In a distributor system, the combination of a supply tank for material, a distributor bar including discharge valves and means for operating said valves, a circulatory system connecting said tank and bar for producing a flow of material from and to said tank through said bar, means for selectively directing a flow of material from or to said tank adapted for concurrent operation with said operating means, a pump interposed in said system for effecting such flow of material, and means for delivering air to the intake side of said pump to exhaust said system of material and deliver the material to the tank when said valves are closed to prevent discharge of material from said bar.

2. In a distributor system, the combination of a supply tank for material, a distributor bar including discharge valves and means for operating said valves, a circulatory system connecting said tank and bar for producing a flow of material from and to said tank through said bar, means for selectively directing a flow of material from or to said tank adapted for concurrent operation with said operating means, a pump interposed in said system for effecting such flow of material, a source of heated gas, and means for delivering heated gas from said source to the intake side of said pump to exhaust said system of material and deliver the material to the tank when said valves are closed to prevent discharge of material from said bar.

3. In a distributing device of the character described, the combination of a frame, a distributor bar arranged in horizontal transversely extending relation to said frame, and means for supporting said distributor bar from said frame including a shaft mounted for rocking movement on a horizontal axis, arms secured to said distributor bar and connected at their ends with said shaft adjacent the ends of the latter for relative movement on a vertical axis, means secured to said shaft for rocking the same to adjust the distributor bar vertically, and means for moving said arms to shift said distributor bar transversely.

4. In a liquid distributor system, the combination of a tank, a circulatory system leading from said tank and having two branches returning thereto, a distributor bar, conduits connecting said branches with said bar near opposite ends thereof, valves interposed between said branches and each of said conduits, said valves having one control position wherein a flow from the tank is returned thereto through said branches independently of said distributor bar and having another control position wherein a flow from the tank is directed from one conduit to the other through said distributor bar and returned to the tank through one branch, and a single operating means for moving said valves from one to the other of said control positions.

5. In a liquid distributor system, the combination of a tank, a circulatory system leading from said tank and having two branches returning thereto, a distributor bar having valve controlled discharge outlets therein, conduits connecting said branches with said bar near opposite ends thereof, valves interposed between said branches and said conduits, said valves having one flow controlling relation wherein a flow from the tank is returned thereto through said branches, a second flow controlling relation wherein a flow from the tank is directed from one conduit to the other through said distributor bar and returned to the tank through one branch, and having a third flow controlling relation used when the distributor bar outlets are open in which a flow from the tank is directed to the distributor bar through both conduits, operators for said valves, and a single control member connected with said operators and movable to actuate said operators and valves in proper sequence.

6. In a fluid distributing system of the character described, the combination of a reservoir for fluid, a pump, a hollow distributor bar through which fluid may flow, said bar having a number of discharge orifices therein, valves controllably associated with said orifices, conduits connecting said reservoir with the opposite ends of said bar, flow directing valves interposed in said conduits operable to direct a flow of fluid through said conduits and from one end of said bar to the other when the orifice control valves are closed or to direct a flow into both ends of the bar when the orifice control valves are open, and a single controlling member connected with all of said valves and operable to substantially simultaneously actuate said orifice control valves and said flow directing valves to direct the corresponding flow to the bar.

7. In a liquid distributing system having a source of supply and a distributor, the combination of intermediate connecting conduits providing a circulating flow path independent of the distributor or a second circulating flow path which includes the distributor or a distributing

flow path through the distributor, means for forcing a circulation of liquid through the system, valves for directing the liquid flow through either circulatory path or the distributing path, other valves controlling a flow from the distributor, and a single control member connected with said valves for operation thereof.

8. In a liquid distributing system having a source of supply and a distributor, the combination of intermediate connecting conduits providing a circulating flow independent of the distributor or a second circulating flow which includes the distributor or a distributing flow through and from the distributor, valves for directing the liquid flow through either circulatory flow or the distributing flow, other valves controlling a flow from the distributor, and a single control member connected with said valves for operation thereof in proper sequence, said control member having one movement for changing the system from the first mentioned to the second mentioned circulating flows, and a second movement for changing the system from the second mentioned circulating flow to a distributing flow and at substantially the same time opening the distributor valves.

9. A distributor bar for a machine of the character described comprising, in combination, a tubular casing formed of a plurality of axially alined sections, each of said sections having a series of discharge orifices therein, the end sections of said casing having return bends therein for disposing the opposite end faces of said sections substantially side by side in approximately the same plane, and means for detachably securing all of said sections together.

10. A distributor bar for a machine of the character described comprising, in combination, a tubular casing formed of a plurality of axially alined intermediate and end sections, each of said sections having a series of discharge orifices therein, the end sections of said casing being generally U-shaped in form, means for securing one arm of each end section to an adjoining end of the intermediate section, and conduits for connection with the other arms of the end sections.

11. In a liquid distributor system, the combination of a tank having a conduit leading therefrom, one circulating system leading from said conduit and returning to said tank and including a distributor bar as an intermediate part thereof, a second circulating system including a part of said one system and leading from said conduit and returning to said tank independently of said distributor bar, and control valves operable to direct a flow of liquid through one or the other of said systems.

12. In a liquid distributor system, the combination of a tank, a circulating system leading from said tank and returning thereto, a second circulating system including as a part thereof a substantial portion of said first mentioned system and leading from said tank and returning thereto but including a distributor bar as an intermediate part thereof, spaced control valves operable to direct a flow of liquid through one or the other of said systems, and a single manipulable member for actuating said valves together.

13. In a liquid distributor system, the combination of a tank and liquid conveying means leading therefrom, a circulatory system leading from said means and having two branches returning to said tank, a distributor bar, conduits connecting said branches with said bar near opposite ends thereof, and valves in said circulating system interposed between said branches and said conduits, said valves having one control position wherein a flow from said means is returned to said tank through said branches independently of said distributor bar and having another control position wherein a flow from said means is directed from one conduit to the other through said distributor bar and returned to the tank through one branch.

14. In a liquid distributor system, the combination of a tank, liquid conveying means leading from said tank, a circulatory system leading from said means and having two branches returning to said tank, a distributor bar having valve controlled discharge outlets therein, conduits connecting said branches with said bar near opposite ends thereof, and valves in said circulatory system interposed between said branches and said conduits, said valves having one flow controlling relation wherein a flow from said means is returned to said tank through said branches independently of said distributor bar, a second flow controlling relation wherein a flow from the tank is directed from one conduit to the other through said distributor bar and returned to the tank through one branch, and having a third flow controlling relation used when the distributor bar outlets are open in which a flow from the tank is directed to the distributor bar through both conduits.

15. The combination, in a distributor system of the character described, of a reservoir for material to be distributed, a material distributor including a plurality of discharge valves and positioned in a plane below the lower part of said reservoir, means for creating an abnormal atmospheric pressure in the system, and connections between said distributor and said reservoir for draining residual material in said distributor into said reservoir under the force of said pressure.

16. A distributor device comprising, in combination, a tank for liquid material to be distributed, a system of circulating and distributing conduits including a distributor member including discharge valves operable to permit said material to flow therefrom, said member being in a plane below the lower part of the tank, and means for forcing substantially all of the residual material in said system into the tank when discontinuing operation of the device.

17. A distributor device comprising, in combination, a tank, a circulating system for filling said tank, a second circulatory system including a part of said first mentioned system and a distributing bar as a separate part thereof and adapted for maintaining a circulating flow of material while the device is not distributing material, and common control valves interposed in said systems and operable to direct a flow of material through one or the other of said systems or from said systems to said tank for draining material from all parts of the systems to the tank.

18. In a fluid distributor, the combination of a supply tank; and a circulatory system connected thereto comprising a pipe line from the tank having a pump interposed therein for effecting a flow of material from the tank; an intake pipe communicating with the inlet side of said pump; branch conduits communicating with said pump and leading directly to said tank; a distributor bar; connections extending from said branch conduits to opposite ends of said distributor bar; valves operable to direct the flow

from said tank through said line and to said tank through said branch conduits, connections, and distributor bar or through said branch conduits independently of said connections and distributor bar; and means for admitting fluid to said pump through said intake pipe whereby said fluid may be passed through said system to force the material therein into the tank.

19. In a distributing device of the character described, the combination of a frame, a distributor bar arranged in transversely extending relation to said frame, means for supporting said distributor bar from said frame including a shaft mounted for rocking movement, spaced brackets secured to said shaft, arms pivotally connected at their ends adjacent said distributor bar and pivotally connected at their opposite ends with said brackets, means secured to said shaft for rocking the same to adjust the distributor bar, and means for moving said distributor bar and arms to shift the distributor bar transversely.

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