Jan. 25, 1955 R. J. HARRINGTON ET AL 2,700,535

APPARATUS FOR APPLYING A CEMENT COATING

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Fig. 1

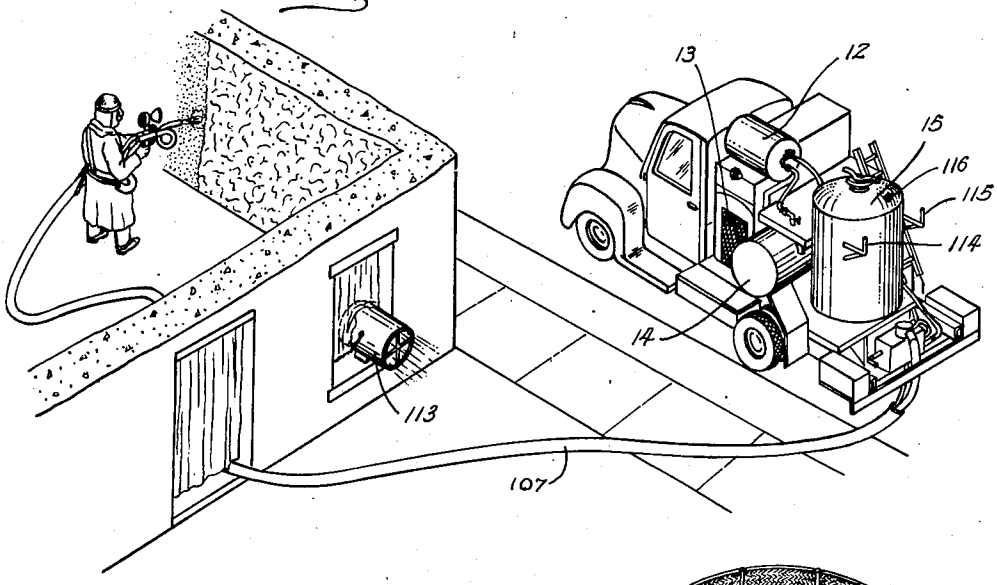

Fig. 2

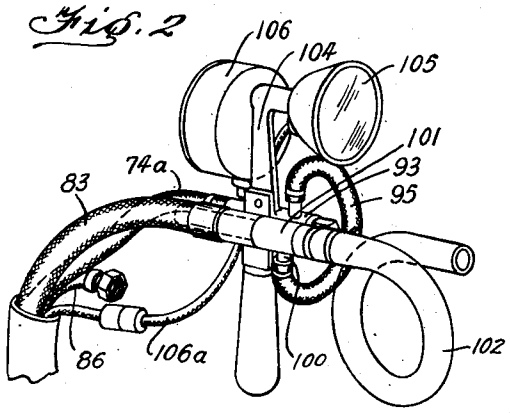

Fig. 4

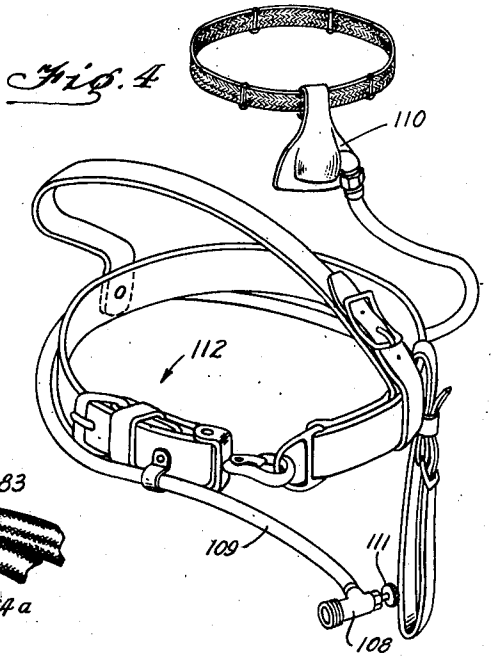

Fig. 3

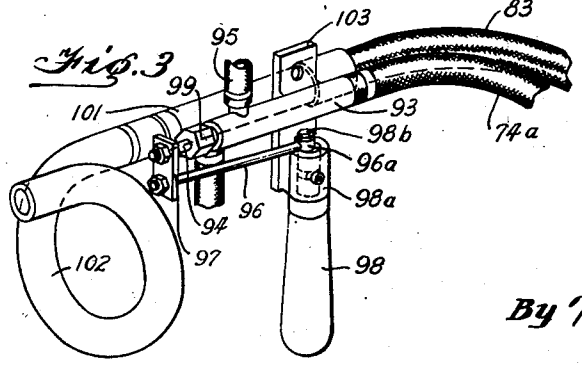

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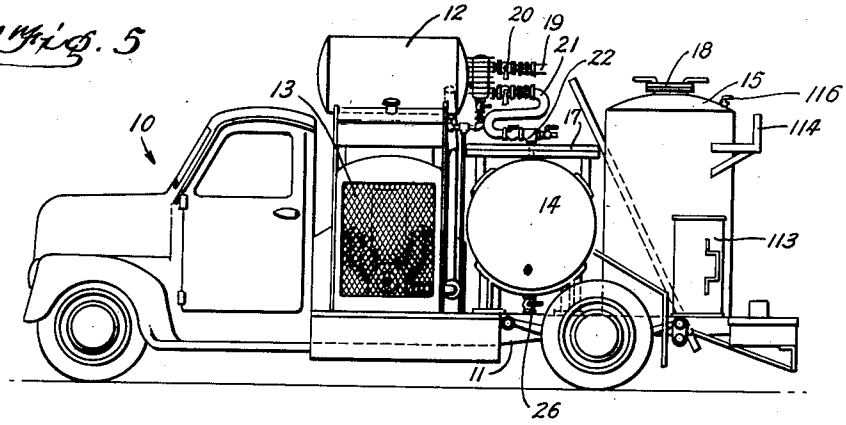
Fig. 5



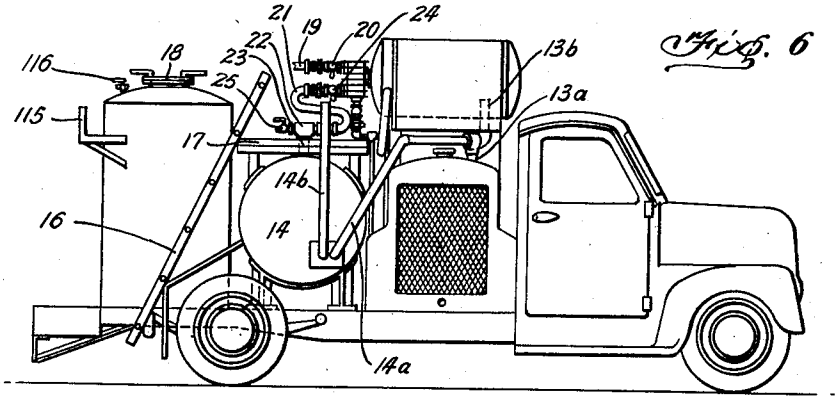


Fig. 6

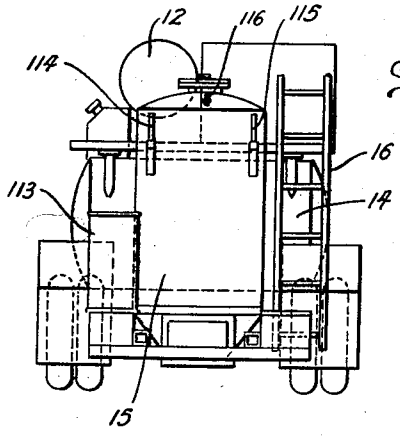


Fig. 7

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APPARATUS FOR APPLYING A CEMENT COATING

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Fig. 8

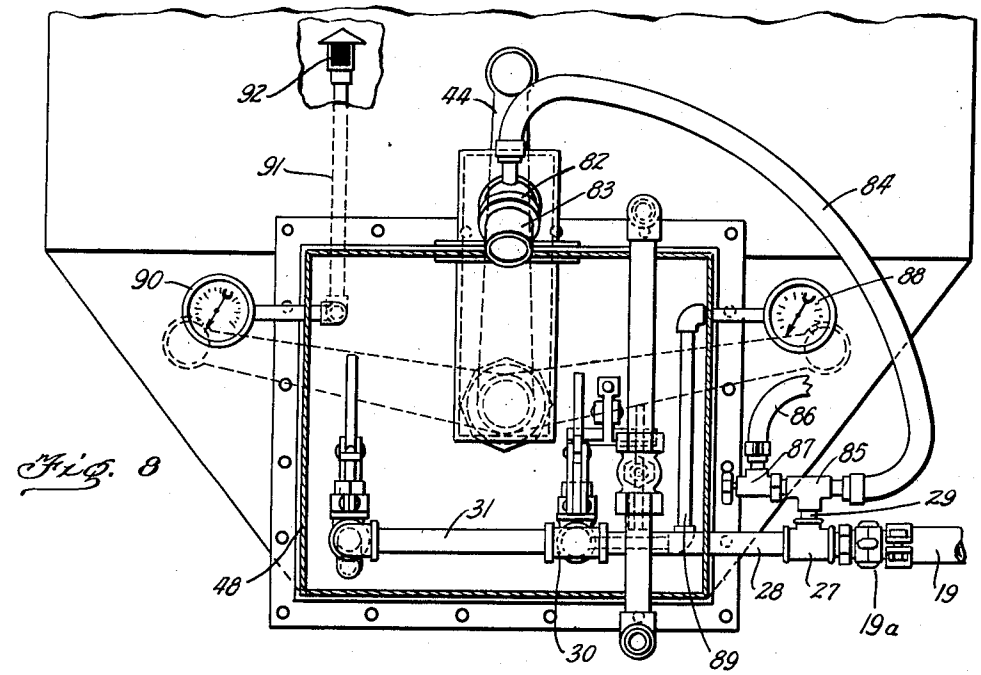
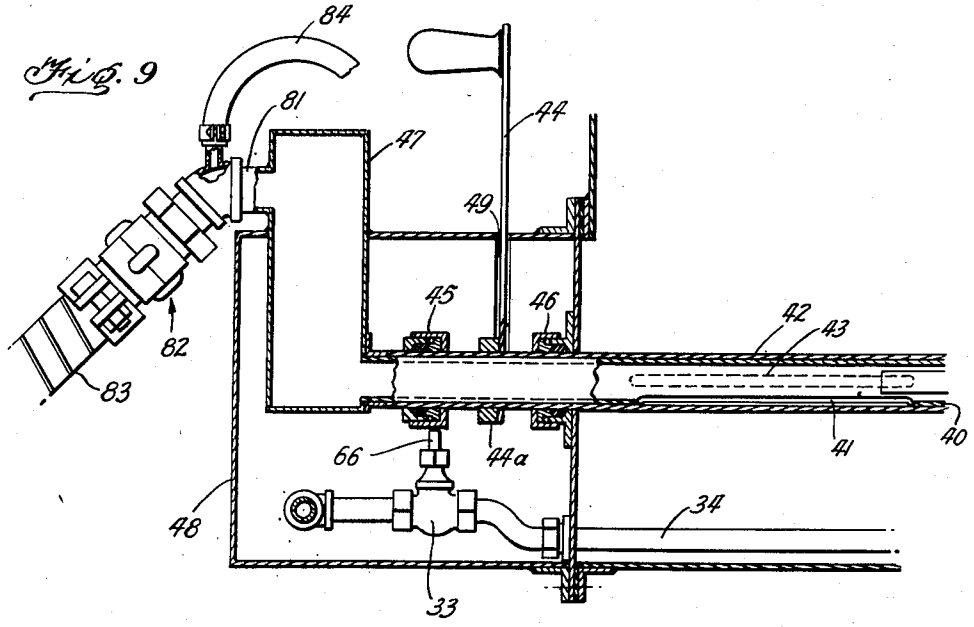


Fig. 9



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APPARATUS FOR APPLYING A CEMENT COATING

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Fig. 10

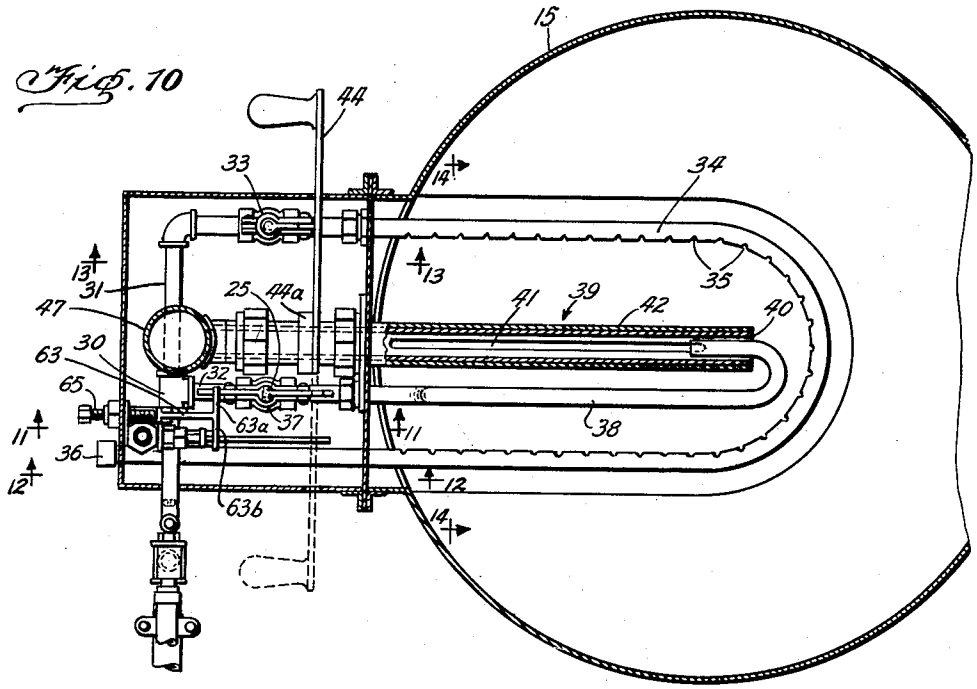


Fig. 11

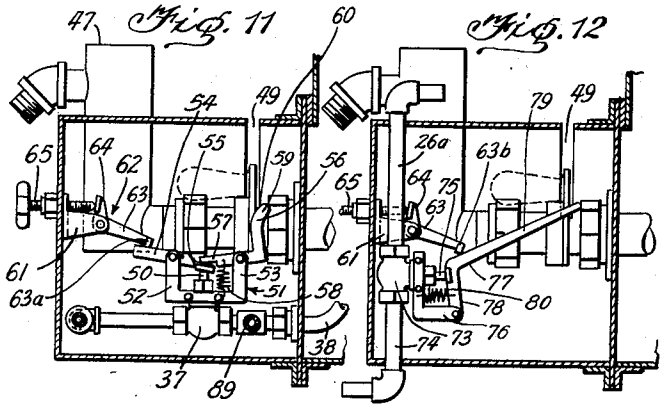


Fig. 12

Fig. 13

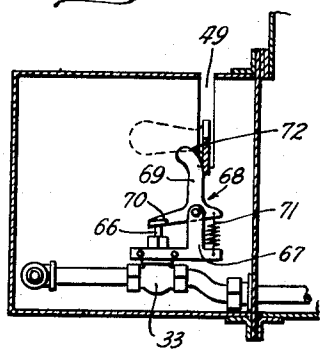
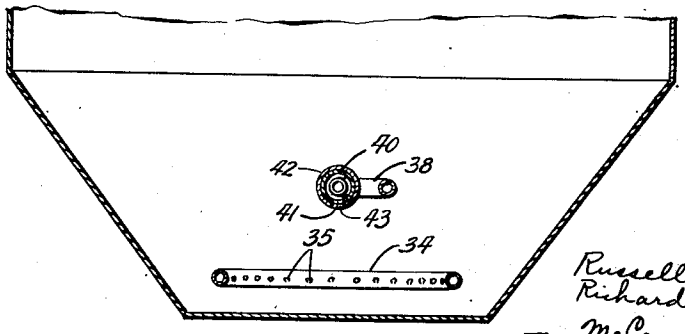


Fig. 14



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2,700,535

APPARATUS FOR APPLYING A CEMENT COATING

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Application June 29, 1951, Serial No. 234,338

20 Claims. (Cl. 259—151)

This invention relates to an apparatus for applying a cement coating.

It is an object of this invention to provide a unitary transportable assembly which contains all of the operating components and materials necessary to the spray coating of cement and which is automatically operative to accomplish such spray coating with a minimum of manual operations by the operator.

It is also an object of this invention to effect a flowing stream of dry cement aggregate in a novel manner, to automatically mix the cement stream and a stream of water in desired proportions, and to apply the wet cement mixture by pneumatic pressure onto the surface desired to be coated.

It is also an object of this invention to spray a wet mixture of cement onto the surface desired to be coated by means adjustable to control the proportions of the ingredients and the texture of the coating.

Another object of this invention is to provide a spray gun for mixing water and dry cement and for discharging the resulting wet mixture, which may be manually held and operated without undue strain on the operator.

A further object of this invention is to provide a unitary control means for controlling the flow of dry cement aggregate and the flow of water to the spray gun.

A still further object of this invention is to provide means for insuring a smooth and even flow of finely divided dry cement aggregate to the spray gun.

Other and further objects and advantages of the invention will become apparent from a consideration of the following description of a preferred embodiment thereof.

In the drawings:

Figure 1 is a perspective view showing the operator applying a cement coating in accordance with the present invention and showing the transportable assembly of the cement, air and water sources, and controls therefor, employed in the present invention.

Fig. 2 is a perspective view of the spray gun for applying the wet spray coating of cement, including the mixing valve for mixing the streams of dry cement and water at the discharge nozzle.

Fig. 3 is another perspective view of the spray gun, taken from the opposite side from the view of Fig. 2.

Fig. 4 illustrates the harness and breathing mask worn by the operator.

Fig. 5 is a front view, with certain of the parts omitted for clearness, of the transportable assembly of dry cement, air and water sources, according to the present invention.

Fig. 6 is a rear view of the assembly of Fig. 5.

Fig. 7 is an end view of the assembly of Figs. 5 and 6.

Fig. 8 is a section illustrating the conduits, valves and control mechanism which govern the supply of dry cement aggregate, air and water from the unitary transportable assembly thereof.

Fig. 9 is a vertical section transversely along the middle of Fig. 8, viewing toward the left therein, illustrating particularly the valve controlling the flow of dry aggregate to the discharge nozzle.

Fig. 10 is a top view in section of the Fig. 9 structure.

Fig. 11 is a section along the line 11—11 of Fig. 10 illustrating the mechanism controlling a valve which controls the flow of air into the cement valve.

Fig. 12 is a section along the line 12—12 of Fig. 10 illustrating the mechanism controlling a valve which controls the flow of water to the discharge nozzle.

Fig. 13 is a section along the line 13—13 of Fig. 10 illustrating the mechanism controlling a valve which controls the flow of agitating air into the tank of aggregate.

Fig. 14 is a section along the line 14—14 of Fig. 10 illustrating the positions in the aggregate tank of the cement valve and of the conduit for discharging agitating air into the tank.

In accordance with the present invention, a truck **10** is provided with a rearwardly extending frame **11** adapted to support the components of the invention, so that the entire assembly is readily transportable to and from the job. An air storage tank **12** is connected to receive and contain air under pressure from an air compressor **13**. A water tank **14** is also supported by the truck frame, as is an upright cylindrical tank **15** which contains an aggregate of dry sand and cement, to be ultimately mixed with water and the resulting wet mixture sprayed onto the surface to be coated, in the manner explained hereinafter. A ladder **16** on the truck frame permits the operator to have ready access to manual shut-off valves adjacent the compressed air tank and the water tank, all of these valves being grouped above a horizontal platform **17** which extends over the water tank. Access to the aggregate tank **15** may be had through a detachable top closure **18**.

One outlet conduit **19** from the air tank **12** is connected to communicate with the aggregate tank, for a purpose which will be apparent hereinafter. A manual shut-off valve **20** controls the supply of air to conduit **19**.

Another outlet conduit **21** from air tank **12** connects with a fitting **22** which communicates through pipe **23** to the top of the water tank. Thus, a portion of the compressed air from tank **12** is used to keep the water in tank **14** under pressure and thereby insures the desired water flow therefrom. Manual valve **24** controls the pressurized air supply to the water tank. The water flow from tank **14** flows past outlet valve **26**. Valve **25** is a release valve for releasing air from the top of the water tank.

Air compressor **13** is provided with a pipe **13***a* communicating with an exhaust outlet **13***b* leading to the atmosphere. Suitable valve means may be provided for selectively directing this exhaust from the air compressor into a conduit **14***a* which extends into the water tank **14** at the bottom thereof to form a loop therein and terminates in an exhaust pipe **14***b* communicating with the atmosphere. In this manner, the water within water tank **14** may be heated to avoid freezing thereof during cold weather.

As best seen in Figs. 8 and 10 the air conduit **19** leads from air tank **12** through a swivel connection **19***a* to a coupling **27** having two outlet conduits, **28** and **29**. Conduit **28** in turn connects with another coupling **30** having two outlet conduits, **31** and **32**. Conduit **31** leads through valve **33** to a U-shaped horizontal conduit **34** which is disposed within the aggregate tank adjacent the bottom thereof. At its inner side conduit **34** is formed with a plurality of openings **35** through which feed air escapes to exert an upward and centrally directed force against the sand and cement in tank **15** and to agitate and mix the same. At its other end feed air tube **34** is provided with a closure cap **36**, so that the entire supply of air to tube **34** is dissipated within the aggregate tank. Cap **36** is readily removable from conduit **34** to permit cleaning out of the latter.

Conduit **32** leads through valve **37** to a drive air conduit **38** which is open at its free end. The free end of eductor conduit **38** is disposed within a tubular assembly, generally indicated at **39**, a portion of which is disposed within the aggregate tank **15** near the bottom thereof and above the agitator conduit **34** centrally located with respect thereto. The tubular assembly **39** includes a fixedly positioned inner tube **40** formed with an elongated slot **41** extending lengthwise along its bottom portion. An outer tube **42** is snugly rotatably disposed about tube **40** and is formed with an elongated slot **43** adapted to register with the slot **41** in tube **40**. When the slots **41** and **43** are in register the cement aggregate is permitted to enter from the tank **15** into inner tube **40** and flow therein

in the direction of the air stream from drive air conduit 38. Since the slots 41 and 43 must be in register for such flow of the aggregate to take place, it will be seen that the tubular assembly 39 forms a sleeve valve controlling the flow of the aggregate from tank 15 into tube 40.

Disposed at the front of aggregate tank 15 is a lever 44 fixedly secured by a collar 44a to the outer tube 42 of the sleeve valve and thus adapted by its angular position to control the alignment of the slots 41 and 43. Suitable bearing mountings 45 and 46 support the tube 42 for rotation at the front of the aggregate tank 15. Inner tube 40 also extends through the front of tank 15 and is fixedly connected to an upwardly extending cylindrical chamber 47. A box-like housing 48 surrounds the forward end of tubes 40 and 42, the connection of lever 44 to tube 42, and the lower portion of chamber 47 at its connection to inner tube 40. A peripheral slot 49 is formed in housing 48 to extend around the upper half thereof. Slot 49 extends completely across the top of housing 48 and about half-way down each side thereof. Lever 44 is positioned to move in this slot as it is rotated about its pivotal axis about tube 40. The shoulders formed by the ends of the slot 49 at the respective sides of housing 48 define the extreme limits of movement of lever 44.

As best seen in Fig. 11, the valve 37 which controls the flow of air to drive air pipe 38 is controlled by a plunger 50 which extends upwardly beyond the casing of valve 37. Plunger 50 is biased upwardly by spring means (not shown) in valve 37 tending to maintain the valve closed and prevent the flow of air to drive air pipe 38. A U-shaped bracket 51 is secured to the valve casing and has two spaced upstanding arms 52, 53 extending thereabove. A lever 54 is pivoted on arm 52 and is formed with a head 55 positioned to bear against the top of plunger 50. Arm 53 pivotally carries a lever 56 which has one arm 57 extending toward plunger 50 and has its free end positioned to overlie the head portion 55 of lever 54. A coil spring 58 urges the free end of arm 57 downwardly to exert downward force on the head portion 55 of lever 54 and on the valve plunger 50 to open valve 37 and permit the flow of air to drive air pipe 38. Lever 56 is also formed with an upstanding arm 59 which has a cam surface 60 at its upper end located in alignment with the slot 49 in which lever 44 moves. A bracket 61 affixed to the inner side of the front wall of housing 48 pivotally supports a bell crank lever 62 having a long arm 63 which has a transverse segment 63a at its free end overlying the lever 54 at the side of the pivotal axis thereof remote from head 55. An upstanding arm 64 of the bell crank lever is adapted to abut against the inner end of a screw 65 which adjustably extends through the front wall of housing 48. The lever 62 is positioned such that the arm 63 forms a limit stop for lever 54 limiting the movement of the latter (clockwise in Fig. 11) about its pivotal axis under the urging of lever 56 and spring 58.

Normally, as shown in Fig. 11, lever 56 bears against the head 55 on lever 54 to maintain valve plunger 50 down and keep valve 37 open. Valve 37 is thus maintained open as long as lever 56 is not engaged by manual lever 44 and is thus free to assume the open position to which it is biased by spring 58. The adjustment of screw 65 determines the full open position of valve 37, and thus the amount of air which can be supplied to the drive air conduit when valve 37 is open. To close valve 37, manual lever 44 is rotated about its pivotal axis (clockwise in Fig. 8) to assume the extreme right hand position in Fig. 8. In so moving, lever 44 bears against the cam surface 60 on lever 56 and moves lever 56 angularly (clockwise in Fig. 11) to lift the lever arm 57 against the urging of spring 58. This releases the downward force exerted by the head 55 on lever 54 and the latter is permitted to move angularly about its pivotal axis (counter-clockwise in Fig. 11). Such movement of lever 54 permits upward movement of valve plunger 50 under its normal spring bias to close valve 37.

As best seen in Fig. 13, the valve 33 for controlling the flow of air to agitator pipe 34 is also controlled by the position of hand lever 44. Valve 33 is controlled by a plunger 66 which is normally biased by spring means (not shown) within the valve to its upper position, in which valve 33 is closed. Plunger 66 extends upwardly through the casing of valve 33. A bracket 67 secured to the casing of valve 33 pivotally supports a lever 68, the latter being formed with an upstanding arm 69 and an arm 70 overlying the top of plunger 66. A coil spring 71 urges lever 69 to assume a normal position in which lever arm 70 does not exert a downward force on plunger 66. A cam surface 72 is formed on upstanding lever arm 69 and is normally disposed in alignment with the slot 49 in housing 48 in which manual lever 44 moves.

With this construction it will be apparent that valve 33 is closed at all times except when manual lever 44 is at its extreme left-hand position in Fig. 8. In moving lever 44 to that position to open valve 33, the lever bears against the cam surface 72 to displace lever 68 angularly about its pivotal axis (counter-clockwise in Fig. 13) to overcome the bias of its associated spring 71. The lever arm 44 in this position causes lever arm 70 to exert a downward force on plunger 66 and to maintain the plunger in its down position as long as lever 44 is in this extreme position.

The water conduit 26a leading from the outlet of valve 26 at water tank 14 extends into housing 48 and is provided with a valve 73 controlling the flow of water from conduit 26 to the outlet conduit 74. As best seen in Fig. 12, water valve 73 is under the control of a plunger 75 which extends outwardly beyond the valve casing. By spring means (not shown) within valve 73 the plunger 75 is biased toward its outer position to tend to close valve 73 and prevent the flow of water therethrough. Normally, however, this bias on plunger 75 is overcome by a spring-pressed lever arrangement which urges plunger 75 inwardly to maintain valve 73 open at all times except when manual lever 44 is in its extreme right-hand position in Fig. 8. A bracket 76 secured to the casing of valve 73 pivotally supports a lever 77, which has an upwardly extending arm 78 adapted to bear against the outer end of plunger 75 and an arm 79 extending outwardly therefrom and extending across the path of movement of manual lever 44. A coil spring 80 normally urges lever 77 (counter-clockwise about its axis in Fig. 12) to a position in which it abuts against valve plunger 75 and forces the plunger inwardly to permit the flow of water through valve 73. The adjustable lever arrangement 61—65 already described in connection with air valve 37 (Fig. 11) also cooperates with lever 77 to form an adjustable limit stop therefore, with a portion of segment 63b of lever 62 overlying the lever 77 to limit movement thereof counter-clockwise in Fig. 12. In this manner, the screw 65 determines the position to which valve 73 can be fully opened and thus governs the rate of water flow therethrough.

Normally spring 80 urges lever 77 to a position forcing plunger 75 inward to open valve 73. To close valve 73 manual lever 44 is moved to its extreme right hand position in Fig. 8. In so moving, lever 44 engages and forces downwardly the free end of lever arm 79. Lever 77 therefore moves angularly about its pivotal axis (clockwise in Fig. 12) against the urging of spring 78 to release the inward force on plunger 75. Plunger 75 is thus permitted to assume its extreme outer position to close water valve 73.

As shown in the drawings, cylindrical chamber 47 has a greater cross-sectional area than tube 40, so that the air pressure within chamber 47 is less than that in tube 40. Only the relatively finely divided particles of aggregate are carried by the air stream upwardly through chamber 47 and out the discharge conduit 81. Any coarse lumps of aggregate drop to the bottom of chamber 47 where they are exposed to the high pressure air stream from pipe 40 and are broken up thereby. After being broken up these particles are carried by the air stream upwardly through chamber 47 to the discharge outlet 81.

The outlet conduit 81 from chamber 47 leads to a swivel connection 82 to which is affixed a hose 83 leading to the discharge gun for the aggregate. Also affixed to conduit 81 is a conduit 84 which at its other end is connected to a coupling 85, which communicates with air conduit 29. Conduit 84 serves as a booster air supply line to assist the flow of aggregate through hose 83.

The air supply to coupling 85 also is in communication with a hose 86 which leads to the operator's mask, for a purpose which will appear hereinafter. A manually controlled valve 87 is positioned to control the air supply to hose 86.

Gage 88 communicates through conduit 89 with the drive air conduit 38 to indicate the air pressure therein,

conduit 89 being joined to the drive air conduit 38 at the outlet side of valve 37.

Feed gage 90 indicates the air pressure within aggregate tank 15 by way of a conduit 91 which extends into the aggregate tank and is connected at its upper end with a screen cap 92. Screen cap 92 is of fine mesh construction preventing the entry of aggregate into conduit 91. The air pressure within the aggregate tank is, of course, due to the feed air entering the tank at ports 35, so that gage 90 is responsive to the feed air pressure in conduit 34. Therefore, the feed air supply is regulated in accordance with the reading of gage 90.

At the gun, where the aggregate and water streams are mixed and sprayed onto the surface to be coated, the water conduit, in the form of a flexible hose 74*a* connected to conduit 74, terminates at the inlet of a valve body 93. A valve member within valve body 93 is controlled by the position of plunger 94 to control the passage of water between hose 74*a* and a flexible outlet hose 95 at the outlet of valve 93. By means of a rod 96 and a bracket 97 rigidly interconnecting rod 96 and valve plunger 94, handle 98 is adapted to control the operation of valve 93. Handle 98 is rotatably mounted within a bushing 98*a* and at its upper end carries a pin 98*b*, which is positioned eccentrically with respect to the axis of rotation of handle 98. Rod 96 carries a ring 96*a* which surrounds pin 98*b*. With this arrangement the angular position of handle 98 with respect to bushing 98*a* controls the position of pin 98*b*, which by its engagement with rod 96 controls the valve within valve body 93.

Water hose 95 extends in a loop from the top of valve body 93 to an inlet 100 formed in a coupling 101. Another inlet to coupling 101 receives the flow aggregate from hose 83. Preferably hose 83 is connected to coupling 101 by a swivel connection, so that to eliminate a twist or kink in hose 83 the entire gun assembly does not have to be manipulated. A flexible hose 102 is connected to the outlet of coupling 101 and serves to mix the respective streams of water and aggregate. The mixed water and aggregate are then sprayed from the outlet nozzle of hose 102 onto the surface to be coated. The shape of discharge hose 102 determines the texture of the sprayed coating. For a coarse textured coating hose 102 should be straight. For a fine textured coating hose 102 should be looped to insure a more intimate mixture of the water and aggregate.

An upstanding bracket member 103 rigidly interconnects the bushing 98*a*, valve body 93 and coupling 101. A standard 104 rigidly connected to bracket 103 and extending thereabove supports a lamp 105 and a microphone 106. An electrical cable 106*a* for the microphone and the lamp extends along the unitary hose assembly 107 from the truck to the gun. The lamp 104 assists the operator in seeing the surface to be coated, while the microphone permits instantaneous communication between the operator of the spray gun and the assistant at the truck.

As best seen in Fig. 1, the operator wears protective clothing, including a face mask to prevent his breathing in the dust and spray from the gun. For this purpose the air hose 86 is connected to a coupling 108, to which is also connected a flexible hose 109 leading to a nose mask 110 worn by the operator (Fig. 4). A regulator valve within coupling 108 is controlled manually by knob 111 to regulate the air pressure in hose 109. A portion of hose 109 is physically supported by the belt of a harness 112 worn by the operator. This air supply to mask 110 assures the operator an adequate supply of fresh air for breathing, and, by exerting a positive air pressure from within the mask, prevents the entry of dust or other particles into the mask.

The unitary hose assembly 107 includes the aggregate hose 83, water hose 74*a*, air hose 86 and electrical conduit 106*a*.

When coating interior walls, such as basement walls, it is preferable to locate an exhaust fan, indicated at 113 in Fig. 1, in one of the windows to exhaust the dust from the room being sprayed.

In using the present invention, the truck 10 carries all of the components thereof to the site of the spray operation. The air compressor 13, air storage tank 12, water tank 14, aggregate tank 15, and the control valve assembly within housing 48 are all supported by the truck frame 11. The air, water and cement hoses leading to the spray gun are conveniently looped around

brackets 114, 115 which project outwardly from tank 15. The spray gun, operator's harness, air mask, protective clothing, and the exhaust fan 113 are also carried on the truck. The entire supply of water and cement used at the job are carried within the respective tanks.

An air release valve 116 is provided at the top of the aggregate tank and may be manually opened to release the air under pressure therein after the spraying job has been completed.

Except when the spray gun is to be operated, control lever 44 is in the extreme right-hand position in Fig. 8 so that there is no air supplied to the feed-air conduit 34 within the aggregate tank, no air supplied to the drive air conduit 38, no cement aggregate beeing supplied to hose 83, and no water supplied to hose 74*a*.

To condition the system for operation of the spray gun the lever 44 is moved away from its extreme right-hand position in Fig. 8. As the lever moves out of engagement with lever 56, valve 37 opens fully to supply air to the drive air conduit 38. When valve 37 initially opens, the sleeve valve 39 controlling the entry of cement aggregate into the hose 83 is still closed, as are the respective valves 33 and 73 controlling the supply of air to the feed air conduit 34 and the water hose 74*a*. Thus, the only result of initial opening movement of lever 44 is to direct a stream of air into pipe 40 and thence to hose 83.

As lever 44 moves away from its extreme right-hand position in Fig. 8 it releases lever 77 and permits valve 73 to open and supply water to water hose 74*a*.

As angular movement of lever 44 is continued (counterclockwise in Fig. 8) the outer tube 42 rotates about tube 40 so that slot 43 approaches alignment with slot 41, so that sleeve valve 39 gradually is opened. The fact that opening of the sleeve valve is preceded by the initiation of a stream of air through tube 40 from drive air conduit 38, and the gradual opening of sleeve valve 39, prevent clogging of the aggregate hose with cement.

When the lever 44 reaches its extreme left-hand position in Fig. 8, it engages lever 68 at 72 and opens valve 33 gradually to supply air to feed air conduit 34. This air supply escapes through holes 35 to discharge a plurality of upwardly and inwardly directed air jets into the bottom of tank 15. These air jets act against the aggregate in the bottom of tank 15 and force it into the elongated hole in sleeve valve 39, whose slots 41 and 43 are fully in register as lever 44 contacts the lever portion 72. The aggregate at the bottom of tank 15 is in the form of finely divided sand and cement because of the agitating action of the air jets emerging from the holes 35, so that a finely divided dry mixture enters tube 40. The drive air stream from conduit 38 pushes the aggregate stream along tube 40, upward in chamber 47, into hose 83. A booster air stream from hose 84 provides additional pneumatic pressure to sustain the flow of aggregate through the hose 83.

At the spray gun the water stream in hose 74*a* is mixed into the stream of dry aggregate from hose 83, under the control of the mixing valve 93 operated by handle 98. The operator holds handle 98 with one hand and with his other hand controls the shape and direction of discharge hose 102 to direct the wet mixture onto the surface being coated. Because of the even flow of dry aggregate through hose 83 and because of the convenient arrangement of the spray gun assembly the gun operator's strength is not taxed in the operation of the present invention.

Air is supplied through hose 86 to the operator's face mask to protect him from dust resulting from the spray operation.

To adjust the relative proportions of water in hose 74*a* and drive air in conduit 38 with respect to feed air in conduit 34 the screw 65 may be adjusted in or out, thereby varying the water and drive air flows in the full open position of their respective valves. This adjustment insures a smooth flow of the dry aggregate through hose 83 and a more accurately controlled mixing of water and aggregate at the spray gun.

Upon completion of the spraying job the lever 44 is moved in the opposite direction (clockwise in Fig. 8) to its extreme right-hand position. This action closes valve 33 to shut off the feed air supply to conduit 34, closes sleeve valve 39 to prevent the further flow of dry aggregate out of tank 15, closes valve 73 to shut off the water supply to hose 74*a*, and finally closes valve 37 to shut off the drive air supply to conduit 38. The release

valve 116 for the aggregate tank is opened manually just before lever 44 has reached its extreme right-hand position.

While there has been described herein a specific embodiment of the invention it is to be understood that various modifications and variations of the described form may be resorted to without departing from the spirit and scope of the invention.

We claim:

1. In apparatus for applying a cement coating, a unitary transportable assembly comprising an air compressor, a compressed air storage tank, a water tank, conduit means connecting said air storage tank to the top of said water tank to pressurize the water therein, a tank containing an aggregate of dry cement, pneumatic means for effecting the flow of material from said aggregate tank, valve means controlling the flow of air from said air compressor tank to said pneumatic means, valve means controlling the flow of water from said water tank to an outlet hose, and valve means controlling the flow of dry cement aggregate from said aggregate tank to an outlet hose.

2. In apparatus for applying a cement coating, a unitary transportable assembly comprising an air compressor, an air storage tank, a water tank, a tank containing an aggregate of dry cement, valve means controlling the flow of dry cement aggregate from said aggregate tank to an outlet hose, valve means controlling the flow of compressed air from said air tank to said outlet hose, valve means controlling the flow of water to another outlet hose, and a single control lever operative to control each said valve means.

3. In apparatus for applying a cement coating, in combination, a compressed air conduit, a valve controlling the flow of air through said conduit, a tank containing an aggregate of dry cement, a valve operative when open to permit the flow of dry cement aggregate out of said tank, means operative when said last-mentioned valve is open to effect a flow of dry cement aggregate out of said tank into said flowing stream of compressed air, and a single movable control means operative to open the valve for the air conduit and the valve controlling the flow of dry cement aggregate out of the tank.

4. In apparatus for applying a cement coating, in combination, a compressed air conduit, a valve controlling the flow of air through said conduit, a tank containing an aggregate of dry cement, a valve communicating with said tank and operative when open to permit the flow of dry cement aggregate out of said tank, a water conduit, a valve controlling the flow of water through said water conduit, means operative when said valve communicating with the aggregate tank is open to effect a flow of dry cement aggregate out of said tank in response to the flow of compressed air through its conduit, and a single unitary control means operative to open the valve communicating with the aggregate tank and the air and water valves.

5. In apparatus for applying a cement coating, a tank containing an aggregate of dry cement, a first tube fixedly positioned in said tank and formed with a longitudinal slot along its bottom, a second tube snugly rotatably mounted about said first tube contiguous therewith and formed with a longitudinal slot aligned with the longitudinal slot in the first tube at a predetermined angular position of the second tube, said first tube when the respective slots therein are so aligned communicating with the interior of said tank, an outlet conduit connected to said first tube, and means for effecting a flow of compressed air in said tank upwardly toward said tubes to force aggregate from said tank into said first tube for passage to said outlet conduit when said slots are so aligned.

6. In apparatus for applying a cement coating, a storage tank adapted for dry cement aggregate, a first conduit of predetermined cross-section communicating with said tank, means for effecting a flow of dry cement aggregate and compressed air through said first conduit, a device for breaking lumps in the dry cement aggregate flowing through said first conduit comprising a chamber attached at the discharge end of said first conduit and extending upwardly and transversely thereof to provide a chamber wall opposite the discharge end of said first conduit for impingement thereagainst of aggregate entering the chamber, said chamber having a larger cross-sectional area than said conduit to reduce the velocity of the air-aggregate stream flowing therethrough from said first conduit, and a discharge conduit communicating with said chamber and connected thereto at a point disposed above the connection of said first conduit thereto for conveying the stream of air and aggregate from the chamber.

7. Apparatus for applying a cement coating which comprises a tank containing an aggregate of dry cement, a valve communicating with said tank and operative when open to permit the flow of dry cement aggregate out of said tank, means for discharging compressed air within said tank to force said aggregate through said aggregate valve when the latter is open, a valve controlling said compressed air discharge, an outlet conduit for said cement aggregate connected to said aggregate valve, means for effecting a flowing stream of compressed air through said outlet conduit to move said aggregate therethrough, a valve controlling said air stream, means for effecting a flow of water through another conduit, a valve controlling said water stream, and a single lever operable in one direction to sequentially open said water valve, said air stream valve, said aggregate valve and said compressed air discharge valve and operable in the other direction to sequentially close said valves in the inverse order in which they were opened.

8. Apparatus as in claim 7 further characterized by means for adjusting said air stream valve and said water valve to control the respective flows therethrough relative to the flow of compressed air through said compressed air discharge valve into the aggregate tank.

9. Apparatus for applying a cement coating which comprises a source of dry cement aggregate, an aggregate hose, means for effecting a flow of air through said hose, means for directing air under pressure in the form of a plurality of jets against said aggregate to thoroughly mix the aggregate and push it into said flowing air stream which passes through the aggregate hose, a water hose, means for effecting a flowing stream of water through said water hose, means for introducing said stream of water into said flowing stream of dry cement aggregate, and means for spraying the resultant stream of wet cement onto the surface to be coated.

10. In an apparatus for applying a cement coating, a tank adapted to contain an aggregate of dry cement, a tubular member disposed horizontally in said tank above the bottom thereof, said member having an inlet opening in the lower portion thereof and an outlet opening on one end thereof, a perforate conduit disposed in said tank below the member, means for supplying air to said perforate conduit to thereby feed aggregate to said inlet opening, and conduit means extending into said tubular member for directing a stream of air longitudinally of said member towards the outlet opening therein to thereby induce the flow of material through said member.

11. The combination of claim 10 including a vertical chamber having a cross-sectional area greater than said tubular member, said member at the outlet end thereof communicating with the lower end of said chamber, and a discharge conduit communicating with the upper end of said chamber.

12. The combination of claim 11 including means connected to said discharge conduit adjacent said chamber for directing a stream of air into said discharge conduit to aid the flow of aggregate therethrough.

13. In an apparatus for applying a cement coating, a tank adapted to receive an aggregate of dry cement, a tubular member disposed horizontally in said tank above the bottom thereof, said member having an inlet opening in the lower portion thereof and an outlet opening in one end thereof, a U-shaped perforate conduit disposed in said tank below said member with the legs of said U-shaped conduit paralleling said member, means for applying air under pressure to said conduit to agitate the aggregate in the tank and feed aggregate to said inlet opening, an eductor conduit extending into said tubular member for directing a stream of air longitudinally thereof towards the outlet opening therein, and means for supplying pressurized air to said eductor conduit to drive the material through said member.

14. The combination of claim 13 wherein said opening in said tubular member comprises a slot extending longitudinally thereof.

15. In an apparatus for applying a cement coating, a tank adapted to receive dry cement aggregate, a tubular member disposed horizontally in said tank above the bottom thereof and having one end extending through said tank, said tubular member having an opening in

the lower portion thereof, a U-shaped perforate conduit disposed in said tank below said member, the legs of said U-shaped conduit extending outwardly of said tank, a closure plug removably mounted on one of the outwardly extending legs of said conduit, means for applying air under pressure to one of the legs of said conduit to cause air to flow through the perforations therein and feed aggregate to said member, and means for effecting the flow of aggregate through said member.

16. In an apparatus for applying a cement coating, a tank adapted to contain an aggregate of dry cement, a tubular member in said tank above the bottom thereof and having one end extending outwardly of said tank, said tubular member having an opening therein, a drive air conduit having one end extending into said tubular member to direct a stream of air longitudinally thereof towards the outwardly extending end of said member, valve means on the other end of said drive air conduit for controlling the flow of air therethrough, a feed air conduit in said tank below said member and having a plurality of apertures therein, and valve means external of said tank for controlling the flow of air to said feed air conduit.

17. In an apparatus for applying a cement coating, a tank adapted to contain an aggregate of dry cement, a tubular member in said tank above the bottom thereof and having one end extending outwardly of said tank, said tubular member having an opening therein, a drive air conduit having one end extending into said tubular member to direct a stream of air longitudinally thereof towards the outwardly extending end of said member, valve means on the other end of said drive air conduit for controlling the flow of air therethrough, a feed air conduit in said tank below said member and

having a plurality of apertures therein, valve means external of said tank for controlling the flow of air to said feed air conduit, and a single control lever operable in one direction to sequentially open said drive air valve means and said feed air valve means and operable in the opposite direction to close the valves in the inverse order of opening thereof.

18. The combination of claim 17 wherein said control lever is pivotally mounted on the outwardly extending end of said tubular member.

19. The combination of claim 17 including a sleeve mounted on said tubular member and having an opening therein adapted to register with the opening in said tubular member in a predetermined angular position of said sleeve, said lever being mounted on said sleeve to rotate said sleeve in response to operation of said lever to open and close said valve means.

20. The combination of claim 17 including cam means engageable by said lever for controllably opening said feed air valve means in accordance with the position of said lever, and means for independently adjusting the flow through said drive air valve means when the latter is opened by said lever.

References Cited in the file of this patent

UNITED STATES PATENTS

998,762	Faller	July 25, 1911
2,261,441	Layne	Nov. 4, 1941
2,495,540	Nichols	Jan. 24, 1950
2,543,517	Anderson	Feb. 27, 1951
2,577,664	Pro	Dec. 4, 1951

FOREIGN PATENTS

614,282	Germany	June 5, 1935