

May 25, 1937.

A. C. H. GLAZE

2,081,742

APPARATUS FOR SPRAY PAINTING AND THE LIKE

Filed July 23, 1936

4 Sheets-Sheet 1

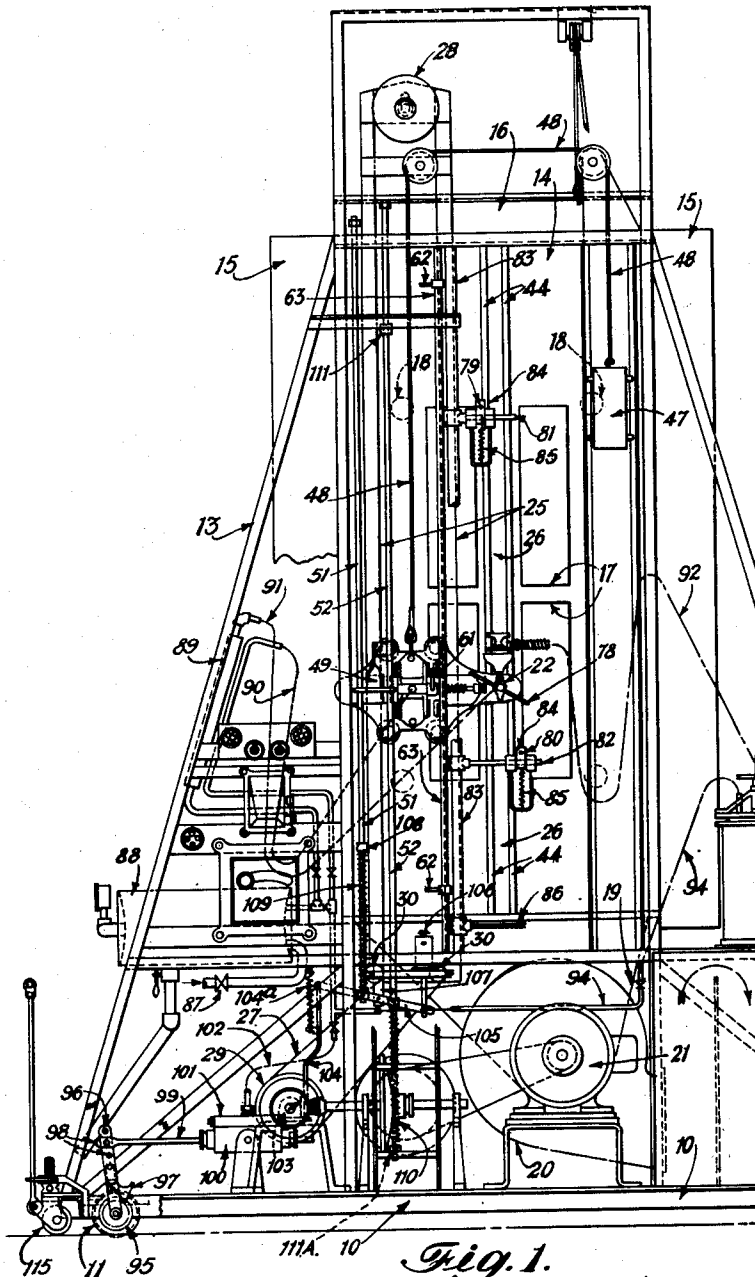


Fig. 1.

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4 Sheets-Sheet 2

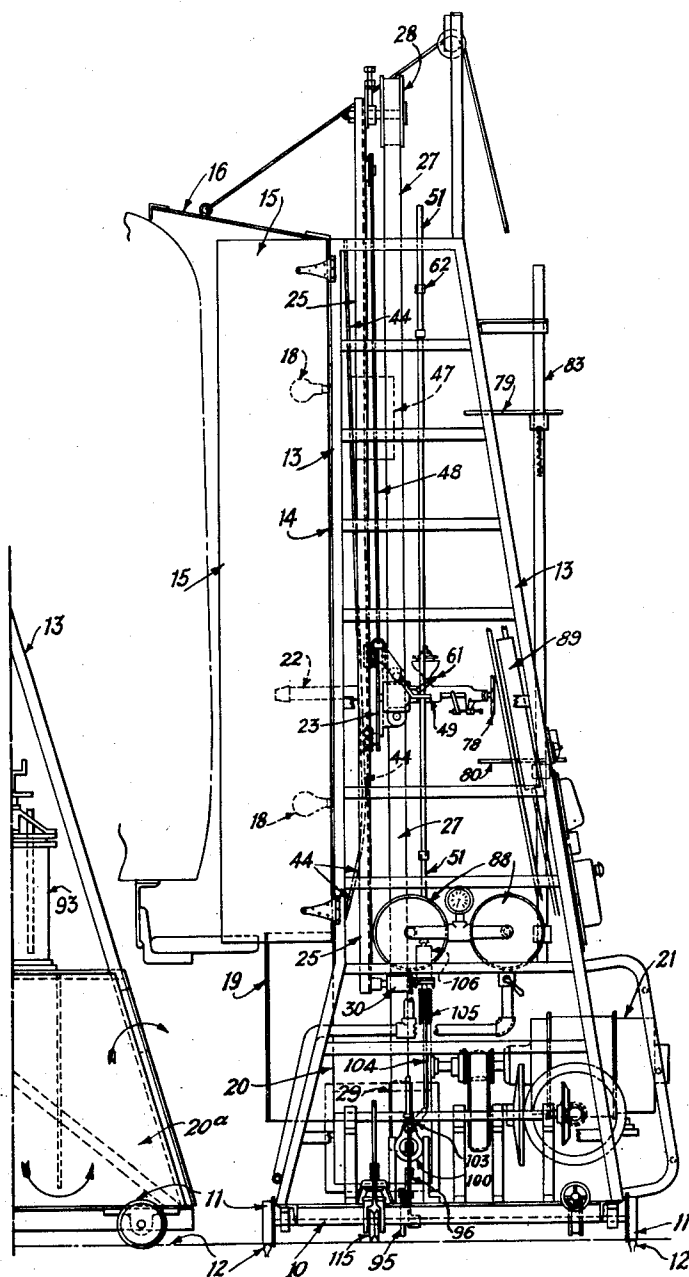


Fig. 1A.

Fig. 2.

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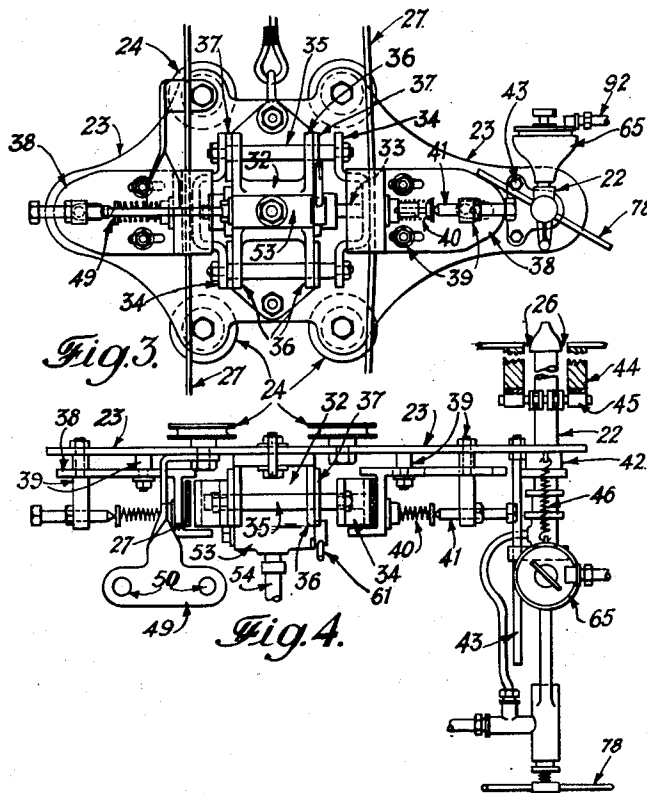
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4 Sheets-Sheet 3



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APPARATUS FOR SPRAY PAINTING AND THE LIKE

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4 Sheets-Sheet 4

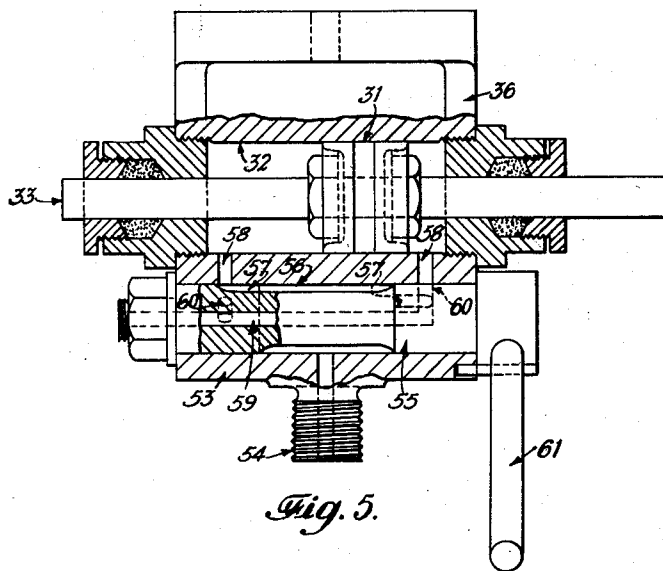


Fig. 5.

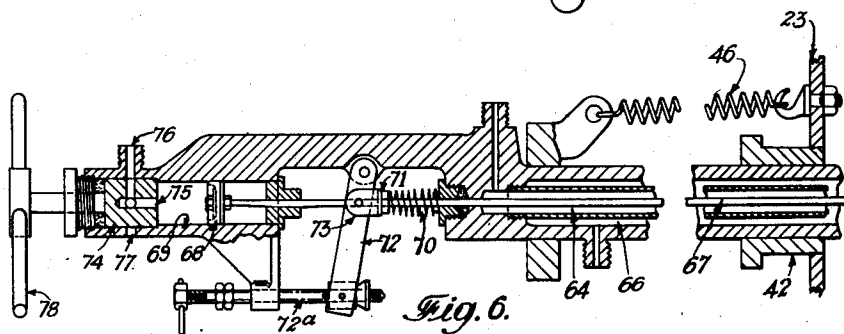


Fig. 6.

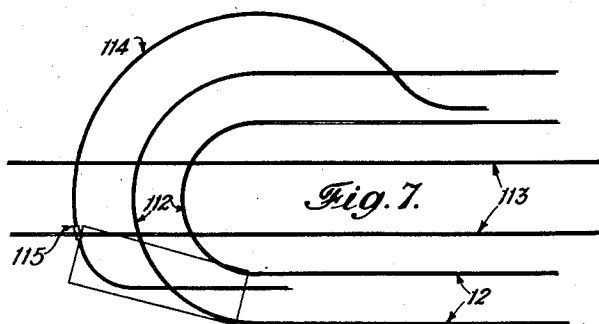


Fig. 7.

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UNITED STATES PATENT OFFICE

2,081,742

APPARATUS FOR SPRAY PAINTING AND
THE LIKEArnold Charles Howard Glaze, Dukinfield,
EnglandApplication July 23, 1936, Serial No. 92,155
In Great Britain May 25, 1935

12 Claims. (Cl. 91—45)

This invention relates to spray painting and the like and to machinery for the application by spraying of all classes of cellulose, oil or other paint mixtures and varnishes and lacquers or other preparations including mixtures or powders or any material which can be sprayed including cleansing preparations or fluids to large surfaces of all descriptions, with particular reference to those forming the exteriors of railway carriage and wagon stock, and the like such as passenger road vehicles.

The object of the invention is an improved machine for that purpose.

According to the invention a machine for spray painting railway carriage and wagon stock and the like comprises a paint gun mounted on a compound carriage so as to be traversed in two dimensions over the surface to be painted, movement of one dimension being to-and-fro and in the other dimension step-by-step so as to cover the said surface.

The paint mixtures, varnishes, lacquers or other preparations including mixtures or powders or any material which can be sprayed including cleansing preparations or fluids which are hereinafter termed "paint" are applied to the surface to be painted, in an atomized form by means of one or more paint guns, for example, a gun operating with a continuous jet of compressed air issuing from a nozzle adjacent to another nozzle which is supplied with the "paint" both nozzles preferably under adjustable control. The paint is supplied from a container fixed to the gun, or by gravity or pressure through flexible piping connected to a separate paint container. Any known type of paint gun or guns may be employed. In the preferred construction of the machine, paint issuing from the gun is deposited evenly over the whole of the surface to be painted, by arranging for the gun to be given automatically an alternative traverse, for example up and down movement of the required amount, whilst at the same time traversing for example in a horizontal forward direction along the surface in suitable equal steps occurring at the ends of each traverse up and down movements of the gun.

Means may be provided for temporarily shutting off the gun or guns while passing for example the window light or other part of the surface which it is not desired to paint. An adequate exhausting arrangement may be provided adjacent to the surface being painted by means of which all fumes or paint vapour formed during the paint spraying operation are collected in a

receiver or filter thereby avoiding contamination of the surrounding atmosphere.

In the accompanying drawings:—

Figs. 1 and 1A together are an elevation of one example of a machine made in accordance with the invention for painting the sides of a railway coach.

Fig. 2 is an end elevation of Fig. 1.

Figs. 3 and 4 are detail views of the slide for the gun.

Fig. 5 is a detail sectional plan of the pneumatic gripping mechanism on the gun slide.

Fig. 6 is a sectional view of the gun control mechanism.

Fig. 7 is a plan of the track for turning the machine at the end of a "road" for painting both sides of a carriage while on the road.

As illustrated, the improved machine comprises a low wheeled platform 10 having two pairs of wheels 11, which engage a double track 12 on the ground arranged parallel with and along each side of a "road" for the coach. An overhead track may of course be used instead of the ground rails if desired. Upon this platform 10 is erected, to the required height, a light framework, preferably of rolled steel sections such as 13 which framework is arranged to carry a light and suitably shaped shield of non-porous material, comprising a back plate 14, and adjustable side and top members 15 and 16 respectively, the side and top members extending in close proximity to the surface and with the back plate enclosing a sufficient area to exclude as far as possible any paint vapour escaping between the edges of the shield and the painted surface. The back plate of the shield is preferably provided with inspection windows 17 and the interior illuminated by lamps 18 so that the progress of the work may be kept under observation.

At the lower end of the shield is an air extractor funnel 19 which connects with a suitable extractor fan 20 driven by an electric motor 21, which funnel substantially forms the lower side of the enclosure and is provided to draw air and paint vapour away from the painted surface, and discharge into a baffled fume box 20a carried on the machine. Other arrangements may be provided for the disposal of the fumes.

A paint gun 22 is mounted on a slide 23 arranged on rollers 24 engaging vertical guide rails 25, and operates through a narrow vertical slot 26 provided in the centre of the back plate 14.

The mechanism for imparting movement to the slide carrying the gun may take a number of forms. One convenient arrangement as illus-

trated comprises the provision of an endless belt 27 arranged over pulleys 28 and 29 mounted at the top and bottom of the machine framework, together with guide pulleys 30 which keep the belt directly in line with the vertical guide rails 25 for the slide. A variable speed gear or other means is preferably provided coupling the motor 21 to the pulley 29, which enables the speed of the vertical traverse to be adjusted.

Attached to the slide 23 is a connecting appliance operating by means of compressed air, which enables the slide to be connected alternately to the upgoing and downgoing side of the belt 27, thereby elevating or lowering the gun at a similar rate of travel as the belt. Such connecting appliance in this example (see Fig. 5) consists of a piston 31 working to and fro in a cylinder 32 mounted on a piston rod 33, the ends of which engage gripping members 34 carried by guide rods 35 passing through flange extension 36 of the cylinder 32, rubber buffers 37 being provided on the outer faces of the flanges.

On the slide 23 are slidably mounted two L shaped brackets 38 facing the gripping members, their ends coacting with the gripping members to grip the belt 27. Such ends of the brackets are formed channel-shaped to locate the belt. Each bracket is mounted on three studs 39 which pass through 3 slotted holes, the purpose of which is to limit the inward movement of the brackets, as shown by the left hand bracket in Fig. 3, so that the belt is just free at one side while it is gripped at the other side. Behind each bracket is a compression spring 40 the load on which is adjustably determinable by a screw 41. As may be seen from the right hand bracket of Fig. 3, the slots in the bracket are longer than the actual movement of the bracket, the rubber buffers 37 limiting the movement of the gripping members 34 so that the pressure of the grip is determined by the adjustment of the load on the springs 40 and not by the air pressure in the cylinder.

The gun 22 is slidably mounted in a socket 42 on the slide and is also guided by a rod 43. The nozzle of the gun projects through the vertical slot 26 in the back plate 14, on each side of which slot is a ramp 44. On the gun are rollers 45 which engage the ramp 44, the engagement being maintained by a spring 46.

The slide 23 is counter-balanced by a weight 47 and cable 48 and carries a bracket 49 having holes 50 through which pass valve operating rods 51 and 52 described later.

On the front of the cylinder 32 is a rotary valve chamber 53, further details of which parts are to be seen in Fig. 5, the air supply connection 54 being shown in Fig. 4. As shown in Fig. 5, the valve comprises a double-ended rotary piston 55 having a waist 56 and a slot 57 in each end of the piston adapted to register with ports 58 leading to each end of the cylinder 32 on either side of the piston 31, the two slots 57 lying in different planes. Through the piston 55 is an exhaust passage 59 and in the piston ends are ports 60 communicating therewith and adapted to register with the ports 58. The rotary movement of the valve is limited by a suitable stop and the ports are arranged so that when in one extreme position air pressure is admitted from the inlet 54 along the waist 56, the slot 57 and port 58 into one end of the cylinder while the port 58 at the outer end of the cylinder allows air to be exhausted through the port 60 and exhaust passage 59. The movement of the

valve is effected by means of a rod 61 which is adapted to engage adjustable stops 62 as the slide moves up and down on its guides, such stops being mounted on a rod 63 secured to the framework parallel to the guide rails 25.

As shown in Fig. 6, the paint gun is provided with pneumatically operated control for the valve so that the paint spray may be shut off in either direction while passing for example over a window. Paint enters at one end of a central passage 64 in the gun from a filter 65 while the air enters an annular passage 66 surrounding the paint passage. The air and paint pass down the full length of the gun to their respective jets at the nozzle, the paint jet being controlled by a needle valve 67, which at its outer end carries a piston 68 slidably mounted in a cylinder 69. A spring 70, engaging a collar 71 secured to the needle valve acts normally to withdraw the needle valve into an open position. The open setting of the needle valve is adjustable by means of a lever 72 and screw 72a, the lever being connected to the needle valve by a slotted member 73 forming part of the collar 71, the slot permitting the needle valve to be moved forward by its piston to close the valve, and allowing the valve to reopen to the same position when the air pressure on the piston is released. In the outer end of the cylinder 69 is a rotary valve 74 having a central passage 75 and ports by which such passage may be placed alternatively into communication with the air inlet 76 or an exhaust port 77. The valve 74 is adapted to be rotated by means of a cross bar 78 by engagement in passing with yieldable arms 79 and 80 adapted to engage with opposite ends of the cross bar. As shown in Figs. 1 and 2, the arms 79 and 80 are mounted in the same manner on rods 81 and 82 adjustably secured to a vertical rod 83 which is rotatably mounted by its ends in the light framework, the rod 82 being longer than 81. On each rod 81 and 82 is fastened a depending stirrup while between the arms of the stirrup and pivoted on the rod is a collar 84 in which the arms 79 and 80 respectively are fitted so as to project backwardly towards the back plate. A spring 85 acts to hold the arms in such position.

By rotating the vertical rod 83 by means of a handle 86 the arms can be moved into the operative position as shown when they lie in the path of the ends of the cross bar 78 or they may be turned out of such operative position. As the gun rises or falls past these arms the cross bar 78 engages the first so as to turn the valve 74 admitting air to the cylinder 69 and closing the needle valve. Then the arm yields without much resistance to allow the cross bar to pass. When the cross bar 78 reaches the other arm, the valve is turned back to re-open the needle valve, such arm also yielding to allow the cross bar to pass as the slide continues to the end of that traverse. Obviously the same action occurs in the other direction, the first arm engaged operating to close the needle valve and the second to re-open such valve.

Air, under pressure, is supplied to the machine by a flexible armored pipe connecting to a valve 87 from which it enters a pair of air storage cylinders 88. From these cylinders two rigid air pipes lead to a point half way up the frame, one of these passing through an electric heater 89. The purpose of heating the air is to reduce the viscosity of the paint so that the machine is not unduly sensitive to atmospheric temperature variations and to facilitate the atomization

of the paint. Flexible pipes 90 and 91 take the cold and heated air to the connection 54 of the valve chamber 53 and to the gun respectively, the heated air operating the control piston 68 as well as passing on to the gun nozzle. Paint is supplied to the gun by a flexible pipe 92 from a paint container 93 to which cold air pressure is also supplied through a pipe 94.

The horizontal traverse of the machine is effected by ratchet mechanism. The pairs of wheels on which the machine is mounted are each fixed on their axles and the two axles are connected together by bevel gearing, it being desirable to drive all four wheels to eliminate the possibility of slip. A ratchet wheel 95 is mounted on one axle and a ratchet lever 96 with its reversible pawl 97 is pivoted on the axle. The ratchet lever has a series of holes 98 to one of which is connected the end of a piston rod 99 mounted in a cylinder 100 and controlled by a rotary valve 101, such valve being similar in construction to the valve 53 of the cylinder 22. The valve 101 is connected to the air pressure supply by a pipe 102 and its piston has an arm 103 connected by a link 104 to one end of a double ended lever 105, the other end of which lever is connected to a dash pot 106, the lever being pivoted in a bracket 107, secured to the framework of the machine. A return spring 104a is connected to the link 104. Two parallel control rods 51 and 52 previously referred to, are provided both of which move in guides at their upper end. The lower end of the rod 51 is slidably pivoted to the lever 105 and is provided with a fixed collar 108 and spring 109. The lower end of the rod 52 is slidably pivoted to the other side of the lever 105 and has a spring 110 and an adjustable fixed collar 111, near its upper end. A fixed collar 111a is also provided at the lower end of the rod 52. As already stated, the rods 51 and 52 pass through the holes 50 in bracket 49.

In operation, when the motor 21 has been started the belt 27 is set in motion through the variable gear drive of the pulley 29 and the exhaust fan 20 is also driven. Air pressure having been previously established the piston 31 is forced to one end of the cylinder 32 causing the belt to be gripped between the member 34 and the L-shaped bracket 38, such gripping pressure, as already explained, being limited to the pressure of the spring 40. The slide 23 now moves with the belt, for example, downwards, until the rod 61 engages the lower stop 62 and moves the rod 61 until the valve 55 is rotated admitting air pressure to the other side of the piston 31, when the other side of the belt will be gripped and the slide will rise therewith. However, before the slide reaches the paint in its downward traverse when the rod 61 engages the stop 62, the bracket 49 engages the fixed collar 108 and compresses the spring 109 pushing down that end of the lever 105 and operating the valve 101, causing movement of the piston rod 99 through which the ratchet mechanism moves the whole of the machine forward. The valve mechanism is returned to its original position by the spring 104a under the control of the dash pot 106 which latter gives a slow initial action ensuring that the piston rod 99 completes its stroke before the valve is returned by the spring 104a causing the return stroke of the rod 99. This delay action is important as the forward driving stroke of the rod 99 may not be quite completed before the slide 23 would otherwise have released its

effective pressure on the collar 108. At the upper end of the traverse of the slide the bracket 49 engages the collar 111 lifting the rod 52 which through the spring 110 produces the same movement of the lever 105. The rod 61 engages the upper stop 62 to operate the valve 55 in the same way as described for such operation when engaging the lower stop 62.

For blanking off, or stopping the paint spray when passing a window, the rod 83 is turned by the lever 86 into the position shown in the drawings so that the arms 79 and 80 are engaged by the cross bar 78 to operate the valve as already described.

During the up and down movement of the slide 23 the gun 22 is moved backwards and forwards in its mounting by the engagement of the rollers 45 with the cam tracks 44 which are shaped to the contour of the carriage side.

Fig. 7 shows one end of the track, the rails 12 of which on each side of the coach road 113 are joined by a loop 112. A ramp 114 of the shape shown is provided, the ends of which are sloped and with which a trolley 115 is adapted to engage. The slope of the ramp raises the end of the trolley while all four wheels are on the straight so that the pair of wheels at that end of the machine are raised off the rails. The machine may then be moved round to the other side of the coach road on the trolley wheel and the other pair of wheels, the curve of the ramp being designed so that the axle of such wheels is maintained substantially radial to the loop. When the machine reaches the other straight rails 12, the trolley runs down the ramp and lowers the wheels 11 onto the rails.

Compressed air may be obtained from any convenient adjacent supply through flexible piping or from a compressor mounted on the carriage. Where electric power is not available a suitable engine can be mounted on the carriage to work the compressor, exhaust fan and drive the belt. Where external electrical power is available this may be picked up by trolley wire or other means or by a flexible cable.

Instead of a pneumatically operated belt clamping device, an electrically-operated device, with suitable switch gear may be employed and the traversing ratchet may also be electrical.

There are of course a large number of ways in which the vertical traversing movement can be obtained other than by a belt, and the invention is obviously not limited to the details of the example of machine herein described in this respect and in other such details.

The machine is also obviously adapted for other purposes than applying paint or varnish, as for example for applying cleaning fluid under pressure. In this latter connection rotary or other mechanical brushes or mops may also be provided.

What I claim is:—

1. A machine for spray painting the outer surface of a railway carriage or wagon stock and the like, comprising a paint gun mounted on a compound carriage so as to be traversed in two dimensions over the surface to be painted, the said compound carriage comprising a truck mounted on wheels for horizontal movement beside the surface to be painted, a vertical guide on said truck, a slide mounted on said guide, means on the slide for carrying the gun, means for imparting to-and-fro movement to the slide on its guide including adjustable control means engaged by the slide for effecting reversal of movement

and means for imparting a step-by-step forward movement to the truck in one direction simultaneously with each change of direction of movement of the slide, including further adjustable control means separately engaged by the slide.

2. A machine for spray painting the outer surface of railway carriage and wagon stock and the like, comprising a paint gun mounted on a compound carriage for movement in three dimensions relative to the surface to be painted, the said compound carriage comprising a truck mounted on wheels for horizontal movement beside the surface to be painted, a vertical guide on said truck, a slide mounted on said guide, means on the said slide for holding the gun movably in the third dimension relative to the movements of the truck and slide, means for imparting to-and-fro movement to the slide on its guide including adjustable control means engaged by the slide, means for imparting step-by-step movement to the truck in one direction simultaneously with each change of direction of movement of the slide including further adjustable control means separately engaged by the slide and means for imparting movement to the gun relative to and during the movement of the slide, including a cam track alongside the said vertical guide and a member on the gun engaging said track.

3. A machine for spray painting the outer surface of railway carriages and wagon stock and the like, comprising a paint gun mounted on a compound carriage, for movement in two dimensions over the surface to be painted, means for imparting to-and-fro movement to the gun in one dimension, means for imparting step-by-step forward movement to the gun in the other dimension, and means for interrupting the paint spray from the gun between predetermined points on its to-and-fro movement.

4. A machine for spray painting the outer surface of railway carriage and wagon stock and the like, comprising a paint gun mounted on a compound carriage, for movement in three dimensions relative to the surface to be painted, the said compound carriage comprising a truck mounted on wheels, for horizontal movement beside the surface to be painted, a vertical guide on said truck, a slide mounted on said guide, means on said slide for holding the gun movably in the third dimension relative to the movements of the truck and slide, means for imparting a to-and-fro movement to the slide on its guide, means for imparting step-by-step movement to the truck in one direction simultaneously with each change of direction of movement of the slide, means for imparting movement to the gun relative to and during the movement of the slide, valve control means on the gun for temporarily interrupting the paint spray, and cooperating means adjacent to the guide and adjustable to predetermined points and engaging the said valve control means, to operate said valve control means for interrupting the paint spray between the said points.

5. A machine for spray painting the outer surface of a railway carriage and wagon stock and the like, comprising a paint gun mounted on a compound carriage, for movement in three dimensions relative to the surface to be painted, the said compound carriage comprising a truck mounted on wheels for horizontal movement beside the surface to be painted, a vertical guide on the said truck, a slide mounted on the said guide, means on said slide for holding the gun movably

in the third dimension relative to the movement of the truck and slide, means for imparting to-and-fro movement to the slide on its guide, means for imparting a step-by-step movement to the truck in one direction simultaneously with each change of direction of movement of the slide, means for imparting movement to the gun relative to and during the movement of the slide, shields mounted on the carriage so as to form an enclosure immediately surrounding the area of application of the paint and adjustable for proximity to the said area, a fume exhauster with air filter mounted on the carriage and connected to the said enclosure, valve control means on the gun for temporarily interrupting the paint spray, co-operating means adjacent to the guide adjustable to predetermined points and engaging the said control valve means to operate said valve control means for interrupting the paint spray between the said points, said means for imparting to-and-fro movement to the slide comprising an endless belt mounted with a rise and fall length parallel and adjacent to the guide means for driving the belt and clamping means on the slide adapted to engage alternately with either the rise and fall length of the belt, comprising pneumatically operated clamps, a change over control valve therefor and adjustable valve operating stops adjacent to the guide.

6. A machine for spray painting both sides of a railway carriage comprising a paint gun mounted on a compound carriage for movement in two dimensions over the surface to be painted, means for imparting to-and-fro movement to the gun in one dimension, and means for imparting step-by-step forward movement to the gun in the other dimension, railway lines for the railway carriage to stand on, two pairs of track wheels for the compound carriage, side tracks therefor on each side of the said railway lines, a loop track connecting the side tracks, a ramp loop adjacent to the said track loops, and a castor wheel on the compound carriage adapted to engage the ramp loops and lift the track wheels at one end of the compound carriage off the track while negotiating the track loop, the castor wheel running on the ramp loop and the ramp and castor wheel being so shaped and arranged respectively that the axle of the pair of track wheels remaining on the track maintains substantially a radial position on the track loop while negotiating the track loop, the first pair of carriage wheels being lowered onto the other side when the curve has been negotiated.

7. A machine for spray painting the outer surface of railway carriages and wagon stock and the like comprising a paint gun mounted on a compound carriage so as to be traversed in two dimensions over the surface to be painted, comprising means for imparting to and fro movement to the gun in one dimension including control means engaged by a part of the carriage for effecting reversal of such movement, and means for imparting forward movement to the gun in the other dimension including control means separate from the first-mentioned control means and engaged by part of the carriage.

8. A machine for spray painting the outer surface of railway carriages and wagon stock and the like comprising a paint gun mounted on a compound carriage for movement in three dimensions so as to be traversed in two of the said dimensions over the surface to be painted, comprising means for imparting to and fro movement to the gun in one dimension including control

means engaged by a part of the carriage for effecting reversal of such movement, means for imparting forward movement to the gun in the other dimension including further control means 5 engaged by part of the carriage, and means for imparting movement to the gun in the third dimension to maintain the gun at substantially uniform distance from the surface to be painted, said means including a cam track mounted on a 10 part of the carriage and a member on the gun engaging said track.

9. A machine for spray painting the outer surface of railway carriages and wagon stock and the like comprising a paint gun mounted on a 15 compound carriage so as to be traversed in two dimensions over the surface to be painted, comprising means for imparting to and fro movement to the gun in one dimension, including control means engaged by a part of the carriage 20 for effecting reversal of such movement, means for imparting forward movement to the gun in the other dimension including further control means engaged by part of the carriage, and means for interrupting the paint spray from the gun 25 between predetermined points on its to and fro movement.

10. A machine for spray painting the outer surface of railway carriages and wagon stock and the like, comprising a paint gun mounted on a 30 compound carriage for movement in three dimensions so as to be traversed in two of the said dimensions over the surface to be painted, comprising means for imparting to and fro movement to the gun in one dimension including control 35 means engaged by a part of the carriage for effecting reversal of such movement, means for imparting forward movement to the gun in the other dimension including further control means engaged by part of the carriage, means for im- 40 parting movement to the gun in the third dimension to maintain the gun at substantially uniform distance from the surface to be painted, said means including a cam track mounted on a 45 part of the carriage and a member on the gun engaging said track, and means for interrupting the paint spray from the gun between predetermined points on its to and fro movement.

11. A machine for spray painting the outer surface of a railway carriage or wagon stock and the like, comprising a paint gun mounted on a 50 compound carriage so as to be traversed in two dimensions over the surface to be painted, the

said compound carriage comprising a truck mounted on wheels for horizontal movement beside the surface to be painted, a vertical guide on said truck, a slide mounted on said guide, 5 means on the slide for carrying the gun, means for imparting to and fro movement to the slide on its guide, including adjustable control means engaged by the slide for effecting reversal of movement, means for imparting a step-by-step 10 forward movement to the truck in one direction simultaneously with each change of direction of movement of the slide, including further adjustable control means separately engaged by the slide, and a fume extractor comprising an open 15 box-like structure secured to the carriage with its opening facing the work and the edges of its sides close to and enclosing an area of the surface including the whole of the to and fro traverse of the gun and a substantial area on 20 each side thereof.

12. A machine for spray painting the outer surface of railway carriages and wagon stock and the like, comprising a paint gun mounted on a compound carriage, for movement in three 25 dimensions relative to the surface to be painted, the said compound carriage comprising a truck mounted on wheels, for horizontal movement beside the surface to be painted, a vertical guide on said truck, a slide mounted on said guide, 30 means on said slide for holding the gun movably in the third dimension relative to the movements of the truck and slide, means for imparting a to and fro movement to the slide on its guide, means for imparting step-by-step movement to the truck in one direction simultaneously with 35 each change of direction of movement of the slide, means for imparting movement to the gun relative to and during the movement of the slide, valve control means on the gun for temporarily interrupting the paint spray, co-operating means 40 adjacent to the guide and adjustable to predetermined points and engaging the said valve control means, to operate said valve control means, for interrupting the paint spray between 45 the said points, and a fume extractor comprising an open box-like structure secured to the carriage with its opening facing the work and the edges of its sides close to and enclosing an area of the surface including the whole of the to and fro 50 traverse of the gun and a substantial area on each side thereof.

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