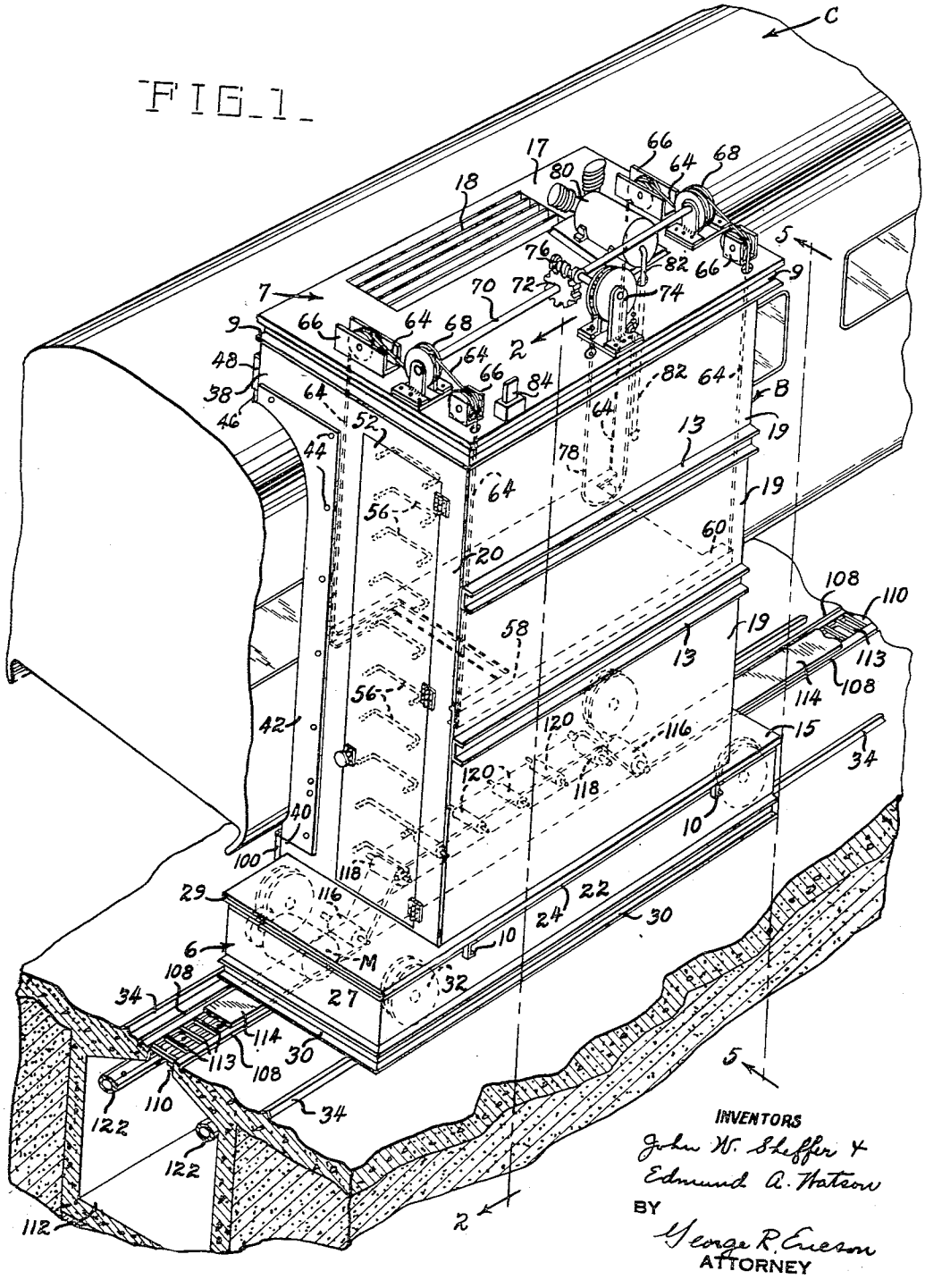
Jan. 15, 1957 J. W. SHEFFER ET AL 2,777,782

METHOD FOR THE EXTERIOR FINISHING OF VEHICLES

Filed Nov. 21, 1952

5 Sheets-Sheet 1

FIG. 1



INVENTORS
John W. Sheffer &
Edmund A. Watson
BY
George R. Emerson
ATTORNEY

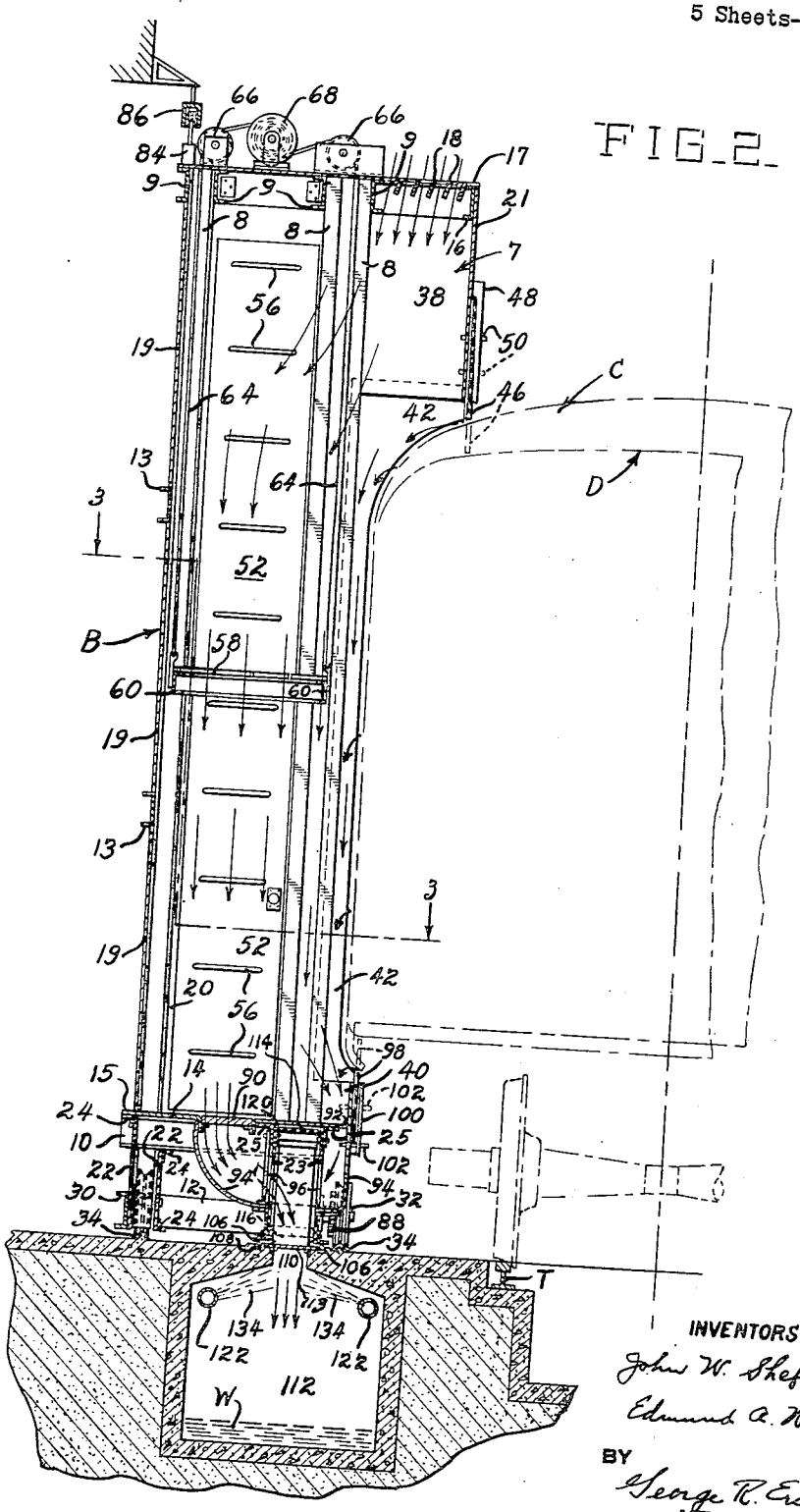
Jan. 15, 1957 J. W. SHEFFER ET AL 2,777,782

METHOD FOR THE EXTERIOR FINISHING OF VEHICLES

Filed Nov. 21, 1952

5 Sheets-Sheet 2

FIG. 2.



INVENTORS

John W. Sheffer &

Edmund A. Hatem

BY

George R. Ericson

ATTORNEY

Jan. 15, 1957 J. W. SHEFFER ET AL 2,777,782

METHOD FOR THE EXTERIOR FINISHING OF VEHICLES

Filed Nov. 21, 1952

5 Sheets-Sheet 3

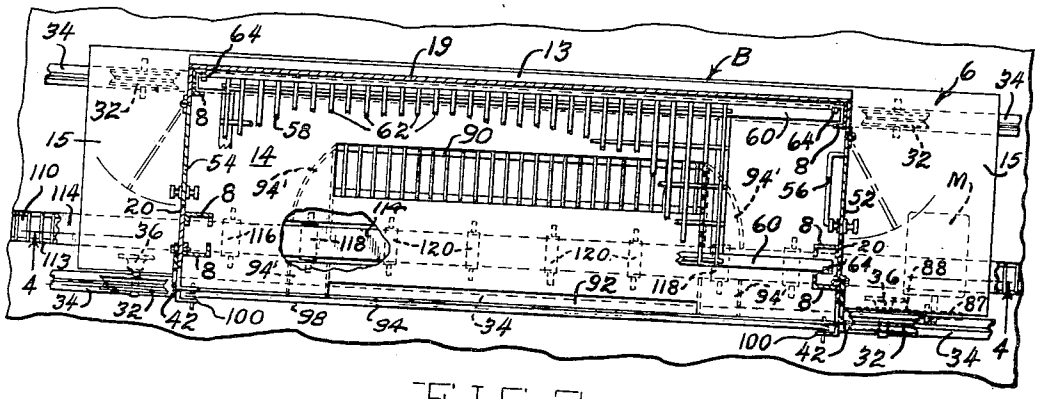


FIG. 3

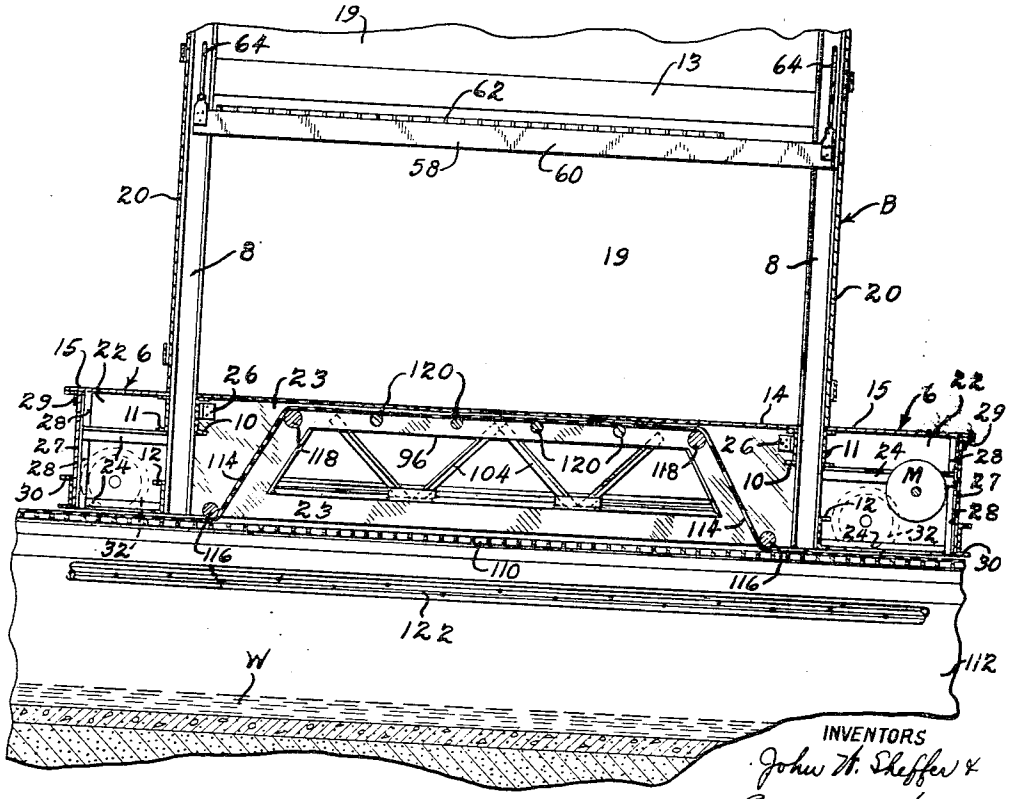


FIG. 4

INVENTORS
John W. Sheffer &
Edmund A. Watson
BY
George R. Ericson
ATTORNEY

Jan. 15, 1957 J. W. SHEFFER ET AL 2,777,782

METHOD FOR THE EXTERIOR FINISHING OF VEHICLES

Filed Nov. 21, 1952

5 Sheets-Sheet 4

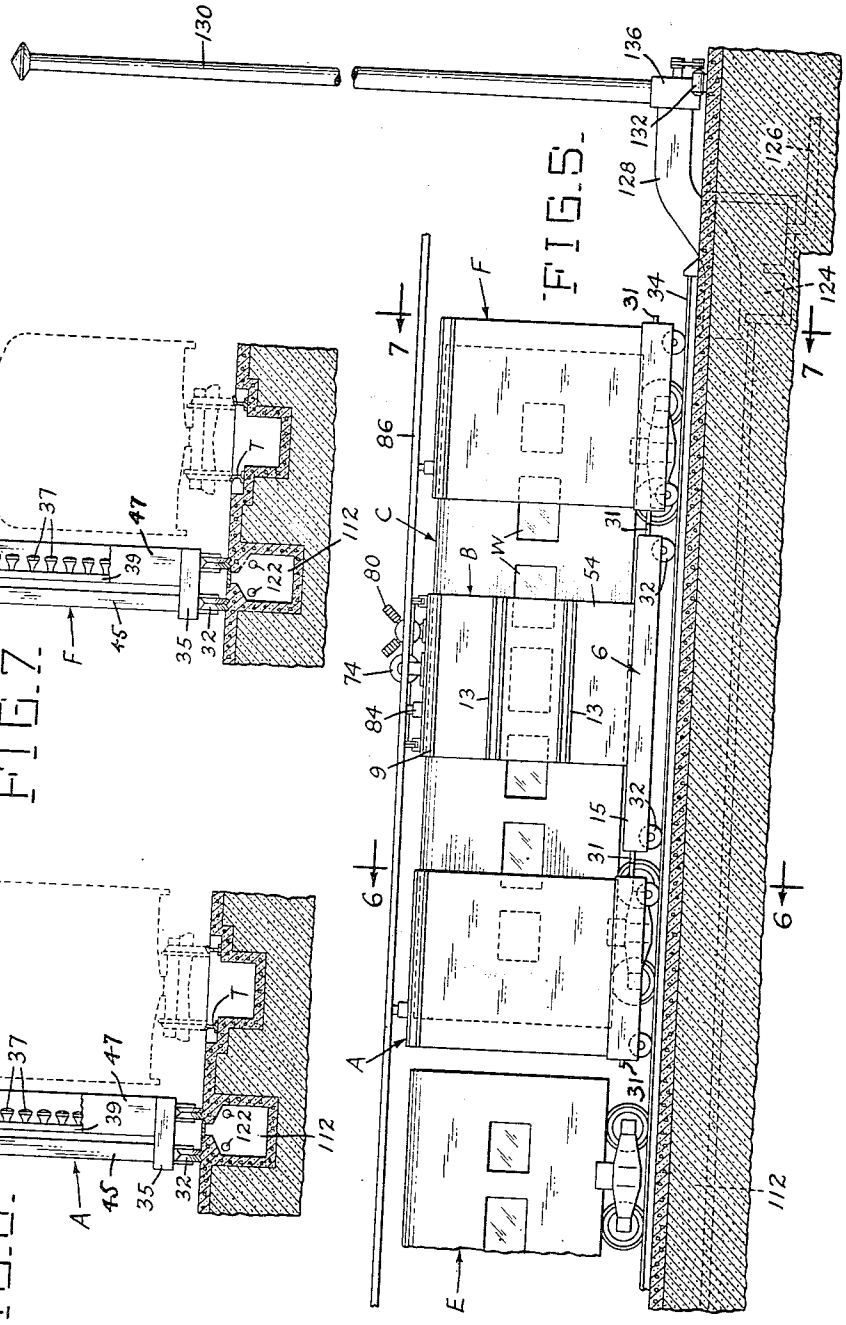


FIG. 5.

FIG. 7.

FIG. 6.

INVENTORS.
John W. Sheffer
Edmund A. Hatson
BY
George R. Ericson
ATTORNEY.

Jan. 15, 1957 J. W. SHEFFER ET AL 2,777,782

METHOD FOR THE EXTERIOR FINISHING OF VEHICLES

Filed Nov. 21, 1952

5 Sheets-Sheet 5

FIG_8_

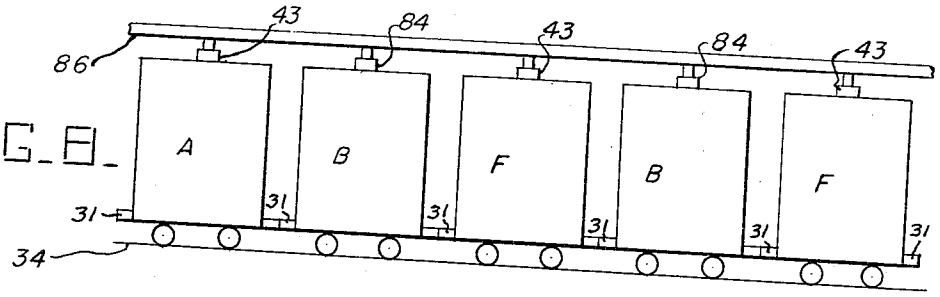


FIG_9_

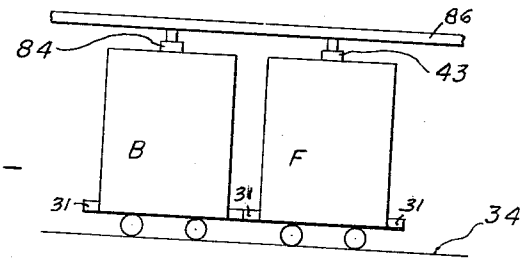


FIG_10_

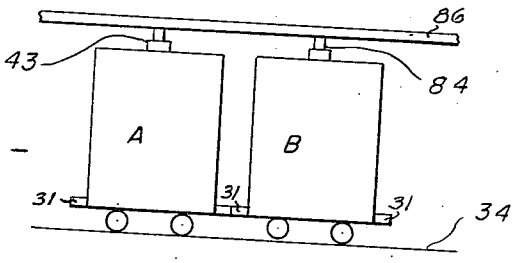
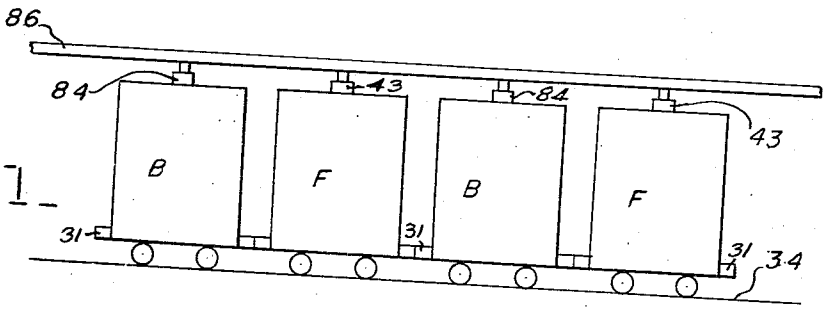


FIG_11_



INVENTORS.
JOHN.W.SHEFFER &
EDMUND.A.WATSON

BY
George R. Ericson
ATTORNEY

United States Patent Office 2,777,782 Patented Jan. 15, 1957

2,777,782

METHOD FOR THE EXTERIOR FINISHING OF VEHICLES

John W. Sheffer, Williamsport, Pa., and Edmund A. Watson, Ridgewood, N. J., assignors to ACF Industries, Incorporated, a corporation of New Jersey

Application November 21, 1952, Serial No. 321,884

1 Claim. (Cl. 117—49)

This invention relates to an improved method for the exterior finishing of railway cars and similar vehicles, the present application being a continuation-in-part of our pending application Serial No. 127,848, filed November 17, 1949, now abandoned.

In conventional practice, the cars to be finished are run into a large heated shop or stationary booth where paint or other coating is applied, usually by spraying. Due to the large working zone of the shop or booth, the paint overspray and fumes incident to the spraying operation cannot be efficiently confined to and exhausted from the area of spray application. This condition results in spreading of the overspray and fumes over a wide area, which is injurious to workmen breathing the contaminated air and constitutes a fire hazard in the paint shop. Further, the necessity of moving the cars through the paint shop requires the use of motive power, which adds to the cost of the painting operation. In addition, these large paint shops or booths are expensive to install and the cost of adequately heating and ventilating such large areas is substantial. The car surfaces should not only be thoroughly dry before application of the paint, but should also be heated to a temperature sufficient to insure the proper bonding of the paint to the surfaces. This is often difficult to do with present methods especially where the cars are run into the heated shop after standing in a cool place and moisture from the warm air condenses on the car surfaces.

It is an object of this invention to provide an improved method for the exterior finishing of railway cars and the like in which the cars are progressively coated with paint while standing stationary.

Another object of the invention is to provide a selective method of progressively treating and painting the side of a stationary object.

Still another object of the invention is to provide an improved method as above described in which sections of the car exterior surfaces are first progressively heated, spray painted, and the paint then progressively dried, all in a substantially single continuous operation.

A further object of the invention is to provide an improved apparatus train for the exterior finishing of railway cars adapted to run alongside a train of cars standing on a track to progressively heat, spray paint and dry the car surfaces in continuous sequence.

A further object of the invention is to provide a finishing train for progressively painting the side of a railway car composed of heating and painting cars that can be arranged in different orders of sequence to best suit atmospheric and temperature conditions.

These and other objects of the invention will be apparent to those skilled in the art from the following description taken with the accompanying drawings in which:

Figure 1 is a perspective view showing the spray booth of the apparatus in position for spraying a railway car.

Figure 2 is a cross-sectional view through the spray booth taken on line 2—2 of Figure 1.

Figure 3 is a sectional view taken on line 3—3 of Figure 2, a portion of the structure being broken away to more clearly disclose other parts thereof.

Figure 4 is a sectional view taken on line 4—4 of Figure 3.

Figure 5 is a view taken on line 5—5 of Figure 1 showing the heating, spraying and drying booths of the apparatus in side elevation.

Figures 6 and 7 are sectional views taken, respectively, on lines 6—6 and 7—7 of Figure 5.

Figure 8 is a side view of a modified type of finishing train employed when two colors of paint are used.

Figure 9 is a side view of another type of finishing train employed when preliminary heating or drying of the car side is not required.

Figure 10 is a side view of another arrangement of finishing train employed when drying of the paint coat is not required.

Figure 11 is a side view of still another arrangement of finishing train employed when two colors of paint are to be employed and preliminary heating of the railway car side is not necessary.

Referring now more in detail to the drawings, a railway car C is shown on track T in position for spray application of paint or similar coating, or any other fluid with which the car is to be treated. A spray booth B has a base portion 6 and an overhanging top portion 7 arranged to partially embrace the car or other object to be sprayed. The framework of the booth includes upright channels 8 joined together by top inner and outer horizontal channels 9, inner base channels 10, outer upper and lower base channels 11, 12, respectively and intermediate channels 13. A floor 14, formed with openings through which the upright channels 8 extend, is supported on the inner base channels 10 and outer upper base channels 11. This floor extends beyond the upright channels 8 to provide a top cover plate 15 over the base portion 6. The top outer channels 9 at the ends of the booth are extended forwardly and tied together by a similar channel 16 to form the frame for overhanging portion 7. A roof or top plate 17, mounted on top channels 9 and channel 16, covers the top of the booth and is provided with air inlet louvres 18 in the overhanging portion 7. The framework is covered by sheet metal or similar panels 19 forming the side wall of the booth, panels 20 forming the end walls, panel 21 forming the front wall of the overhanging portion and panel 94 forming the front wall of the projecting under portion secured to floor 14.

The base structure 6 of the booth includes the lower portion of upright channels 8, inner and outer base channels 10, 11, which project laterally beyond the upright channels under floor 14 and top cover plate 15, and lower base channels 12, which extend only between the upright channels 8. A supporting truss structure is formed by a pair of spaced longitudinally extending plates 22 at the outer side of the base portion and another pair of more widely spaced plates 23 at the inner side of the base 6. All of these longitudinal plates extend the full length of the base structure beyond the upright channels 8 beneath the floor 14 and base cover plate 15, except the inner of plates 23 which extends only between opposite upright channels and outer base channels 11, 12. The plates are fitted around and secured to base channels 10, 11, 12, to floor 14 and base cover plate 15 by longitudinally extending angle bars 24, 25 and additionally to the base channels by angle pieces 26, forming a rigid supporting truss structure. The ends of the base portion are closed by end walls 27 secured to upright angle bars 28 connected at the ends of angle bars 24, 25 and to top cover plate 15 by horizontal angles 29, the bottom of the base being reinforced by outer channels 30. The booth is mounted on wheels 32 running on rails 34 extending alongside the car C, the wheels at the outer side of the

booth being journalled between the plates 22 and at the inner side of axle brackets 36 secured to the outer of plates 23.

The end walls 20 of the booth have forwardly projecting upper end portions 38 and forwardly projecting bottom end portions 40. These projecting wall portions are so arranged and of such dimensions as to embrace or envelop in spaced relation thereto the outer surface of vehicles of varying smaller contours. Profile plates 42 of substantially the same contour as the surface to be sprayed are detachably connected by fasteners 44 to the edges of the forwardly extending wall portions 38 and end walls 20. These profile plates do not entirely close or span the space between the end walls 20, wall portions 38, 40 and the surface being sprayed, but are of such size as to be spaced from the said surface when in operative position. The space below the bottom edge of the front wall 21 of top portion 7 and the surface being sprayed is partially closed by an upper adjustable plate 46 preferably formed of rubber. This plate 46 is slidable in guideways 48 on the upper wall portions 38 and is held in any one of a plurality of adjusted positions to accommodate the contour of the vehicle to be sprayed by means of a pin 50 passing through alined holes in the plate and guideways. Outwardly swinging doors 52, 54 are provided in end walls 20 for entrance to and exit from the booth, the door 52 being provided on its inside surface with a flight of rungs 56 forming a ladder permitting access to an elevator platform 58. This platform is made up of a pair of spaced side rails 60 connected together by a grille or grating 62 which terminates a sufficient distance from the end of the platform adjacent door 52 to provide an opening large enough for one to pass through when using the ladder 56 to reach and descend from the platform. The ends of the side rails 60 at the outer side of the booth are guided in upright channels 8 while at the inner side they are arranged between the pairs of spaced channels 8, as shown in Figure 3, thus preventing lateral movement of the platform but permitting its vertical movement. The elevator platform 58 is suspended by four cables 64, one being connected to each end of the side rails 60 and running through the top of the booth over roller devices 66 secured thereon. The pairs of cables at each side of the booth are wound in opposite directions on and anchored to sheaves 68 also secured to the roof of the booth and rotated by a shaft 70 provided with a gear 72. The shaft 70 is turned by means of a pulley wheel device 74 acting through the worm 76 meshing with gear 72. The pulley wheel 74 is actuated by a chain 78 extending through the roof 17 of the booth within easy reach of one standing on platform 58 for manipulation to either raise or lower the platform.

The booth is equipped with an air compressor 80 mounted on the roof and from which a pipe 82 extends through the roof to provide a connection for spraying apparatus (not shown) such as a hose and nozzle. Current for operating the compressor is obtained through a trolley 84 located on top of the booth in slidable contact with a power line 86 running coextensive with the direction of travel of the booth. The booth is also equipped with a motor M carried within the base 6 and having a gear 87 in position to drive one of the wheels 32 through a gear 88 secured to the inner face thereof. The motor is provided with suitable controls to permit running of the booth at a predetermined and continuous rate of speed along the rails 34 during the spraying operation. Like the air compressor 80, electric current for operating motor M is obtained through the trolley 84.

The floor 14 of the booth is provided with a substantially centrally located grid or grating 90 and formed at its inner side edge with a narrow cut-out portion 92 of the same length as the grating. A chute 94' preferably formed integral with lower plate 94 is secured around the outer edges of and below the grating 90 and cut-out floor portion 92 and secured around and encompassing openings 96 formed in truss plates 23. The space between the upper edge of the plate 94 and the lower side wall of the car being sprayed is regulated by a lower adjustable plate 98 similar to the upper adjustable plate 46. The plate 98 is slidable in guideways 100 on the lower projecting wall portions 40 and like plate 46 is adjustable to accommodate varying contours by means of a pin 102 which is passed through alined holes in the plate and guideways. The plates 23 are reinforced at the openings 96 by braces 104 and the bottom edges of the plates are provided with sealing strips 106 arranged to slide in grooves 108 at opposite sides of a slit 110 opening into a discharge trough 112 underneath and extending the length of rails 34. Secured across the slit or elongated opening 110 are spaced bars 113 on which rests a flexible strip or belting 114 of synthetic rubber or similar material closing the opening 110 in the trough 112. The flexible strip 114 has its ends anchored or fastened at the ends of the slit 110 and is threaded under relaying rollers 116 at opposite ends of the booth and up and over pickup rollers 118 and carrier rollers 120 under the floor 14 and between the spaced plates 23 in which all of the rollers are journalled. The flexible strip 114 is thus raised or lifted as the booth moves in either direction to uncover that portion of the opening 110 beneath the booth and maintain constant communication between the booth and discharge trough 112. In other words, the flexible strip 114 provides a running valve connection between the booth and discharge trough through the floor grating 90, chute 94' and between the spaced plates 23, which form a substantially enclosed air outlet for the booth.

The bottom of the discharge trough 112 is slightly sloping, as more clearly shown in Figure 5, and provided with longitudinally extending spray pipes 122 connected with a suitable source of water pressure. At the lower end of the trough a drainage basin 124 is connected with a sewer or other disposal pipe 126. Also at this end of the trough 112 is an air conduit 128 leading to an exhaust stack 130 in which is a fan 136 driven by a motor 132. The air drawn by the fan enters the booth through louvres 18 in the top or roof 17 and through the space between the profile plates 42, adjustable plates 46, 98 and the surface of car C, as indicated by the arrows in Figure 2. The air flows downwardly through the grille elevator platform 58, floor grating 90, floor cut-out portion 92, chute 94' and into the discharge trough 112 through water sprays 134. The fan is of such power as to produce air flow of sufficient velocity and volume to create a slightly negative pressure or suction in the trough 112, acting to hold the flexible strip 114 closed over opening 110. The negative pressure in trough 112 will also act by suction to quickly and completely exhaust the paint overspray and fumes from booth B into the trough 112. The water sprays 134 cleanse the air of overspray particles of pigment or the like, carrying them into the water W with which they are drained off through the disposal pipe 126. The air is thus free of such overspray before reaching the fan, avoiding clogging thereof and contamination of the outside atmosphere.

It will be seen that a spraying system has been provided in which the spray is confined substantially to the area of application and the overspray completely and quickly exhausted. A novel running valve connection has been provided for a moving booth insuring continuous communication between the booth and exhaust outlet during movement of the booth. Further, the booth is adapted to carry all necessary spraying apparatus together with its operators and to be run at a continuous and controlled rate of speed whereby an uninterrupted spray application may be made simultaneously to both upper and lower portions of a railway car or other vehicle. In addition, the booth is adapted for use in spraying vehicles of various contours and sizes. For example, if it is desired to spray a car D as shown in Figure 2 of differ-

ent size and shape than car C, the detachable profile plates **42** are replaced by other profile plates of the proper contour and size, and the plates **46** and **98** are adjusted to give the proper spacing between the vehicle surface and the top and bottom front edges of the open side of the booth. This spacing of the open side of the booth from the surface area being sprayed provides an air seal preventing escape of overspray and fumes around the perimeter of the open side because air drawn into the booth through the space between the perimeter and the surface area will continuously carry the overspray and fumes to the air outlet chute. This spacing will normally supply a sufficient volume of air so that in most instances the air supply from air inlet louvres **18** can be dispensed with. The spraying operation is thus not only reduced in cost due to the adaptability of the system but it is also considerably speeded up by making possible continuous and simultaneous spray application to both upper and lower portions of the car.

With the spraying system described, it will be seen that an improved method for the exterior finishing of railway cars is provided in which an area alongside of and slightly spaced from the surface of the car to be finished is progressively confined by the power propelled spraying booth car B as it moves along the sides of the car on rails **34**. The car exterior surface is spray painted from within this area as it is progressively confined by the booth, the stream of downwardly flowing air drawn into the booth through the space between the perimeter of its open side and car C acting to restrict spreading of overspray and fumes substantially to the area of spray application. The paint overspray and fumes are continuously exhausted from the area of spray application as it is progressively confined by the booth car during its movement along the side of the car, the outlet from the booth being in constant communication through the running valve connection **114** with the low pressure discharge trough **112** into which the overspray and fumes are exhausted. Thus by use of the improved method described the necessity for large costly paint shops and booths is eliminated as well as the necessity of moving the cars into and through them. Since spreading of the overspray and fumes incident to the spraying operation is confined to a relatively restricted area from which they are continuously exhausted, the problems of air contamination, ventilation and fire hazard are also eliminated.

For preheating the car exterior surfaces to the proper temperature in advance of the paint spraying operation to insure a good bond of the paint to the surfaces, a heating booth car A is provided as shown in Figs. 5 and 6. The heating booth car A, like the spray booth car B to which it is detachably coupled as indicated at **31** in Fig. 5, has similar wheels **32** running on the rails **34**. The heating booth car precedes and is propelled by the spray booth car as both move together alongside the cars C and E in a direction to the left as viewed in Fig. 5. The heating booth car A is generally similar in size and shape to the spray booth car B.

The heating booth car A includes a vertical side wall **45**, an overhanging roof **33** and a base portion **35**. A panel **39** equipped with a bank of electric heating lamps or bulbs **37** extending the entire height of the car side wall is secured at its sides to end walls **47** bearing against rollers **41** carried by the overhanging roof **33** and against similar rollers (not shown) at the base portion **35**. The panel **39** is thus adjustably mounted in the booth car A to permit varying the distance of the lamps **37** from the car for controlling the degree of heat application. Current for the heating lamps **37** is supplied through suitable wiring (not shown) from a trolley **43**, similar to the trolley **84** provided for spray booth car B, located on top of the heating booth car A and in slidable contact with the electric power line **86**.

By use of the above described heating booth car A with the spray booth car B a method has been provided which includes the step of progressively heating sections of the car exterior surfaces in advance of the spraying operation as the coupled booth cars move together as a train along the sides of the cars C and E standing on track T. The rate of movement of the self-propelled spray booth car B is regulated to accommodate the rate of spray application and the sections of the car surfaces are heated only as they are about to be sprayed. This results in an economical and efficient use of the heat and reduces to a minimum the amount of heat required to raise the temperature of the car surface sufficient to effect a proper bond of the paint thereto.

The coating of paint is progressively dried as it is sprayed onto the car surfaces by a drying booth car F detachably coupled as indicated at **43** with the spray booth car B to follow it along the sides of the cars C and E during the finishing operation. This drying booth car F is the same in all respects as the heating booth car A and therefore the description of the latter previously given will apply to the drying booth car, the same reference numerals being used for both. The panel **39** with the bank of drying lamps **37** is adjustable by means **41**, the same as in the heating booth car A, so that the rate at which the coating of paint is dried may be varied as required to suit the pace of the preheating and spraying operations.

With the apparatus and method described, relatively small sections of the car exterior surface are progressively preheated to the required temperature only as they are about to be spray painted, and then progressively dried as they are painted, all in a substantially continuous single operation as the booth cars move as a train along the sides of the railway cars standing on the track. Thus, the necessity of heating and ventilating large areas for receiving the cars to be finished as well as movement of the cars is eliminated. The direction of the finishing operation may be reversed when necessary by running the train of booth cars in a direction to the right as viewed in Fig. 5. The booth car F would then precede the spray booth car B to progressively preheat the car exterior surfaces in advance of the spraying operation, while the booth car A would follow to progressively dry the coating of paint as it is sprayed onto the car surfaces. The apparatus train is thus adapted to perform the complete finishing operation starting from either end of a line of railway cars to suit prevailing conditions.

As shown in Fig. 7, the finishing train consists of a forward car A for heating and drying the railway car side, an intermediate paint spray boot car B and a rear car F for drying the paint on the railway car side. Finishing cars A and F are similar and all of the cars are provided with coupler sections at both ends so that they can be detachably joined at either end to an adjacent car as indicated by couplings **31**.

The cars may be arranged and coupled in various relations and numbers to provide a finishing train suitable for varying conditions. Different types of such trains are illustrated by Figs. 8 to 11.

When two paints of different color are to be applied to the railway car side and the car side requires preliminary heating for drying or raising its temperature, the finishing train can be made up of a leading car A followed in order by cars B, F, B and F as shown in Fig. 8. It will be noted that a drying car is interposed between the paint spray booth cars in order to dry the first coat of paint before application of the second coat. Masking and unmaking of railway car surfaces can be done while the train is progressing.

When drying or raising the railway car temperature is not required preliminary to applying paint, the finishing train can be made up of a leading paint spray booth car B and a following drying car F as shown in Fig. 9.

The finishing train can be made up of a leading heating and drying car A and a following paint spray car

B, as shown in Fig. 10 when drying of the painted car side is not required.

Another type of finishing train is shown in Fig. 11 for use where car A is not required, as in dry summer weather, and two colors of paint are to be used. Such train will include cars B, F, B and F in the order named.

The invention may be modified in various respects as will occur to those skilled in the art and the exclusive use of all modifications as come within the scope of the appended claims is contemplated.

What is claimed is:

The method of exterior finishing the side of a railway car in uninterrupted successively concurrent steps comprising progressively heating the car side wall from end to end in continuously advancing full height sections thereof, progressively spray painting said full height car side wall sections as soon as they have been heated from within an isolated area adjacent to and progressively enveloping said car side wall sections being spray painted while maintaining a sub-atmospheric pressure within said isolated enveloping area to prevent escape of paint overspray from the perimeter thereof, simultaneously progressively establishing an outlet for exhaust of said paint overspray from said isolated enveloping area into an otherwise closed fixed discharge trough coextensive with the side of the railway car, and then progressively applying drying heat to said full height car side wall sections as soon as they have been spray painted, said first heating step, said spray painting and said second heating step being carried out so that the distance between the points of performing the separate steps is maintained substantially constant.

References Cited in the file of this patent

UNITED STATES PATENTS

1,285,542	Yamashita	Nov. 19, 1918
1,382,957	Curry	June 28, 1921
1,424,969	White	Aug. 8, 1922
1,980,224	Paasche	Nov. 13, 1934
2,057,776	Groven	Oct. 20, 1936
2,081,742	Glaze	May 25, 1937
2,137,862	Steins	Nov. 22, 1938
2,425,940	Iversen	Aug. 19, 1947
2,555,519	Tolle	June 5, 1951