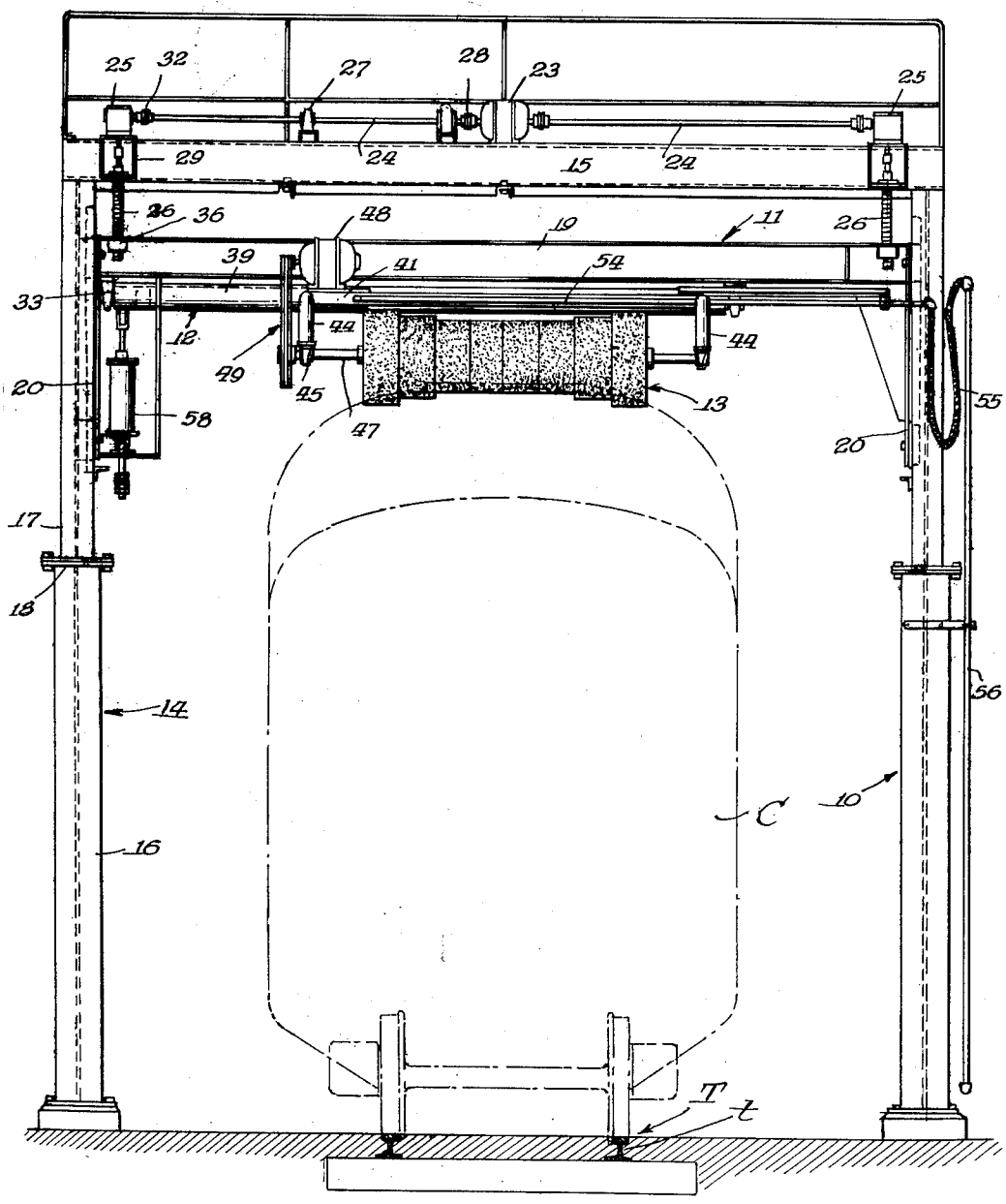
Feb. 3, 1953 L. D. HOLMES 2,627,080

APPARATUS ADAPTED TO WASH THE ROOFS OF RAILWAY AND LIKE VEHICLES, AND EMBODYING A VERTICALLY SWINGING BRUSH-CARRYING FRAME

Filed Aug. 24, 1948

4 Sheets-Sheet 1

Fig 1.



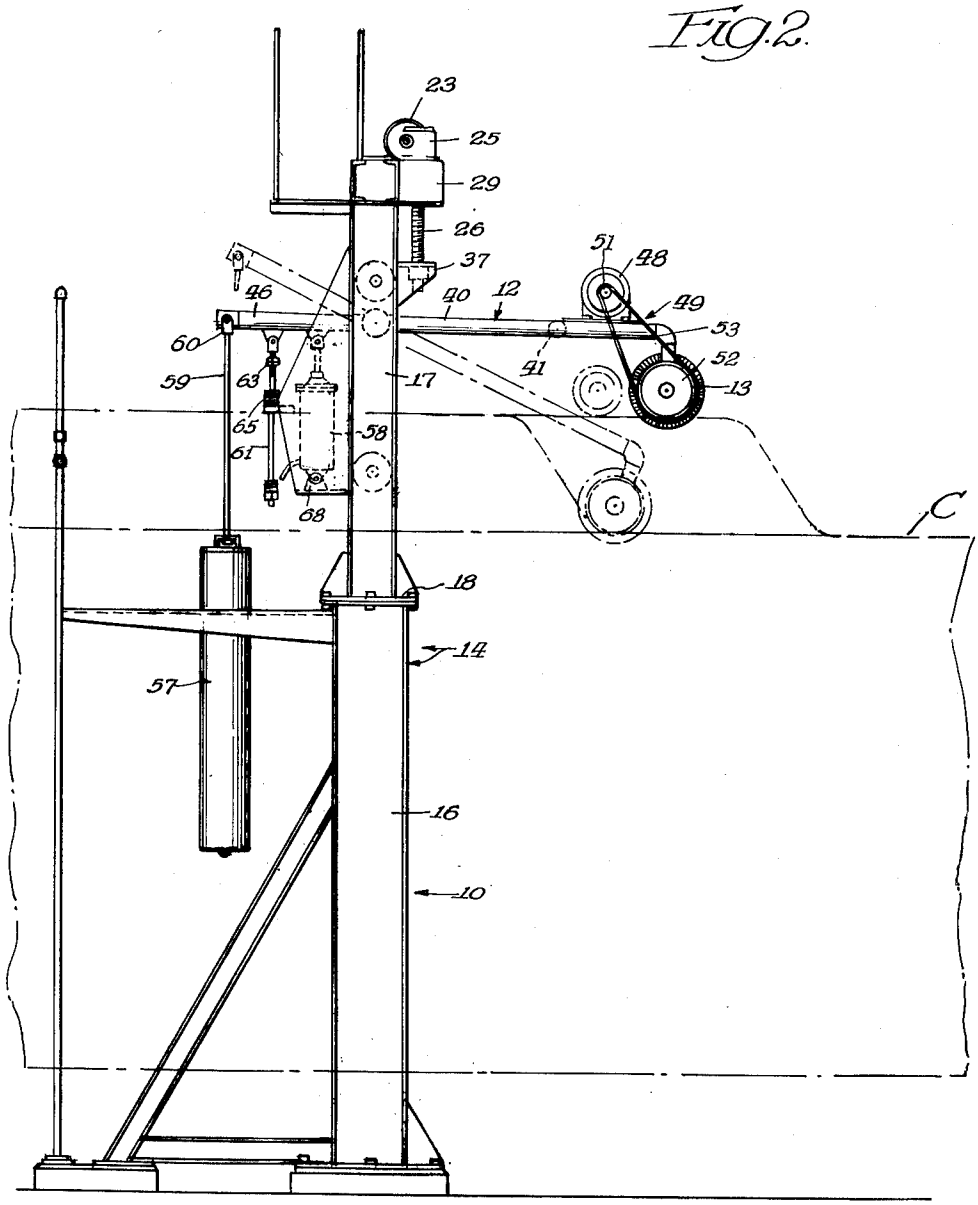

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FIG. 2.




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Fig. 3

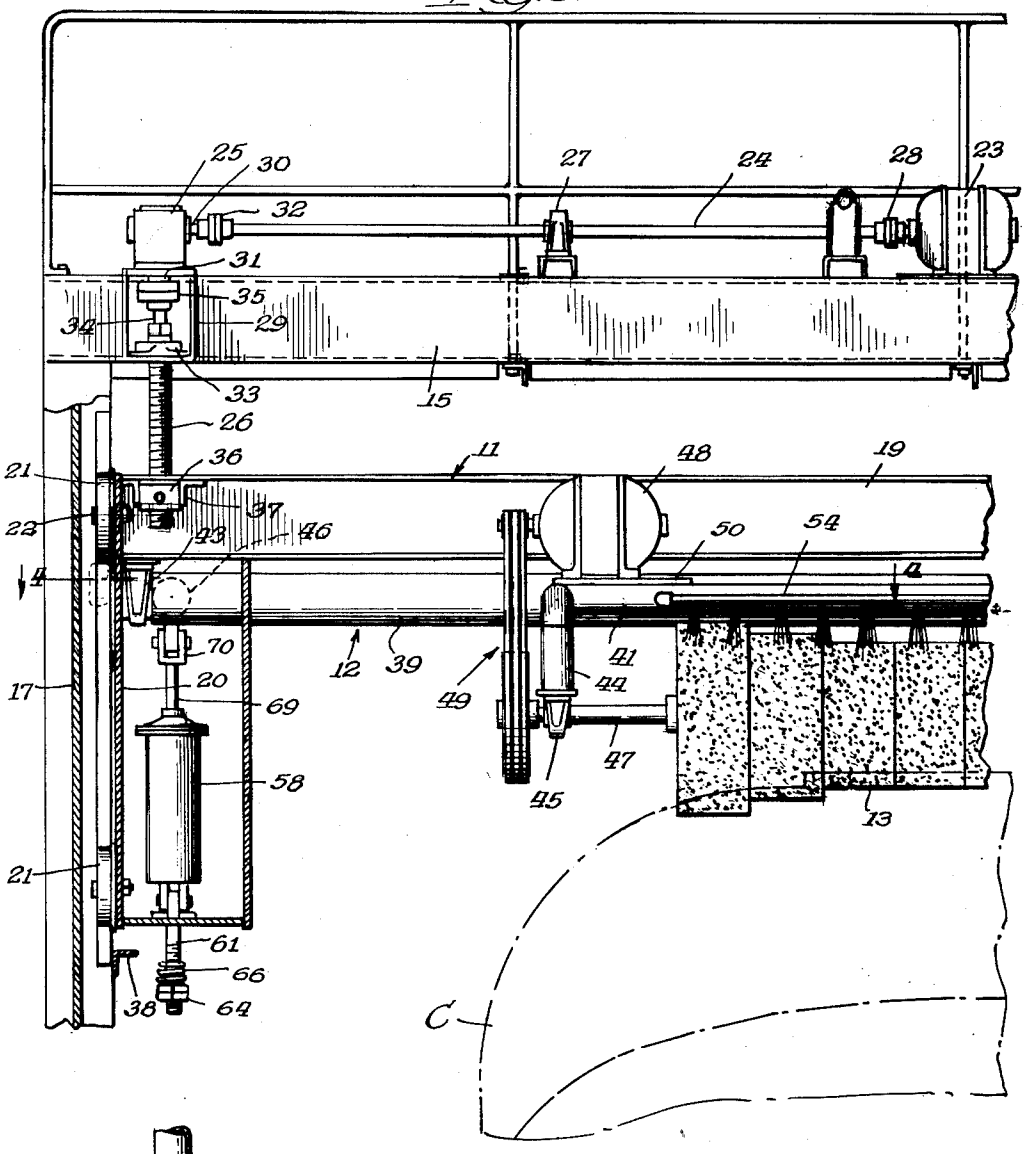
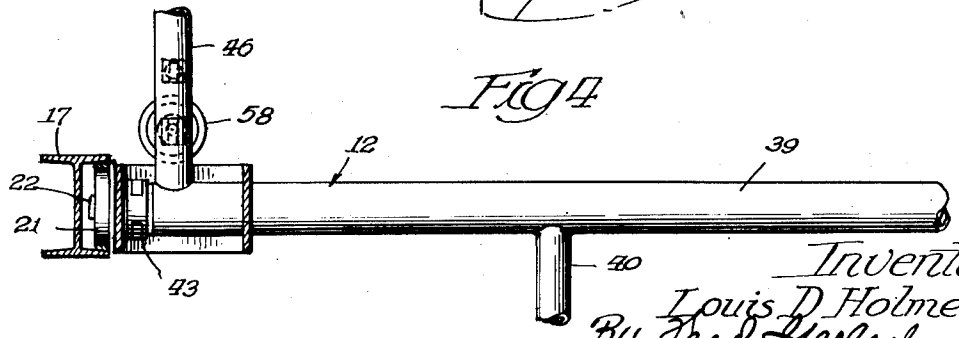



Fig 4



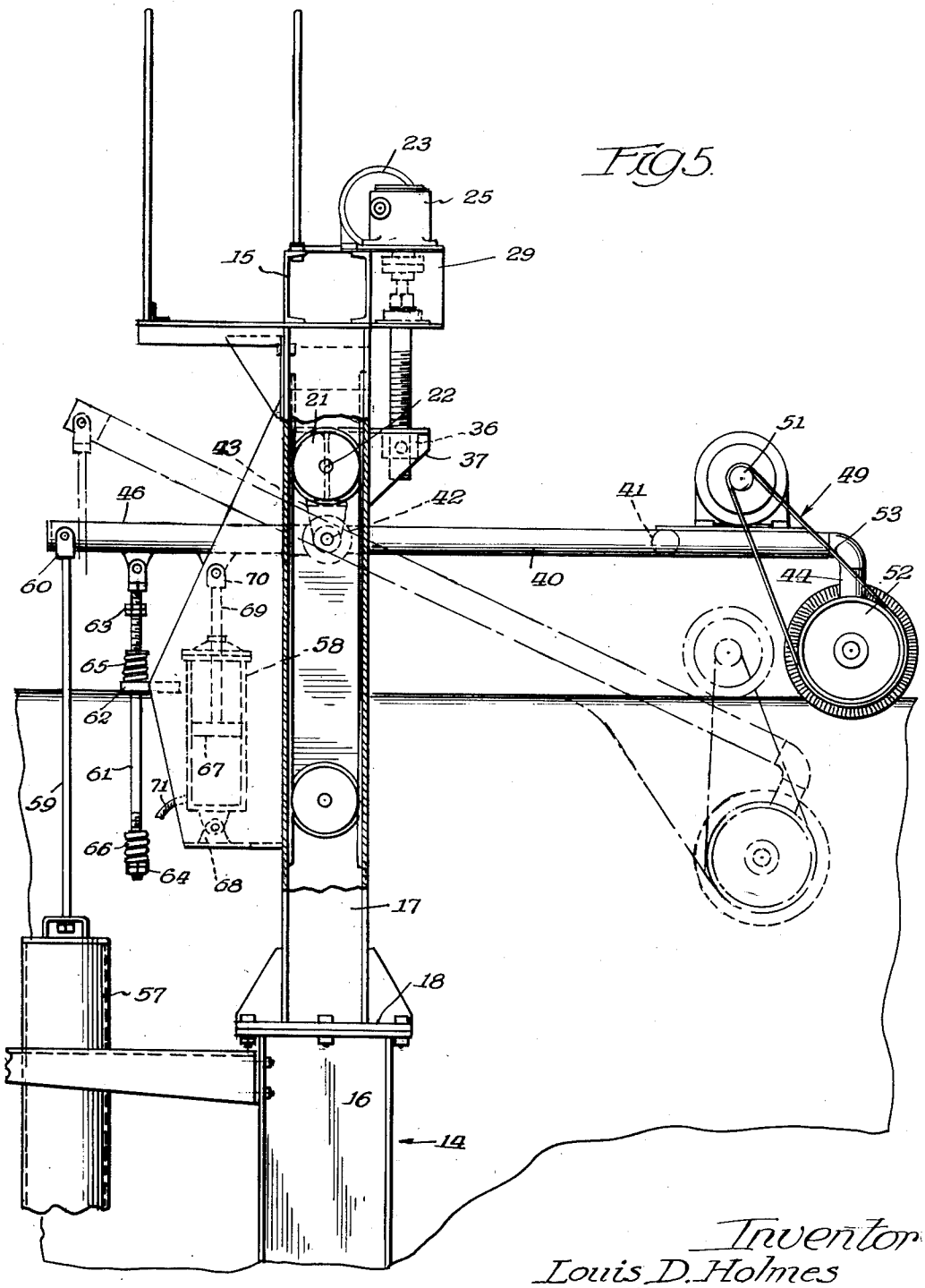

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Fig 5.




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# UNITED STATES PATENT OFFICE

2,627,080

## APPARATUS ADAPTED TO WASH THE ROOFS OF RAILWAY AND LIKE VEHICLES, AND EMBODYING A VERTICALLY SWINGING BRUSH-CARRYING FRAME

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Application August 24, 1948, Serial No. 45,886

5 Claims. (Cl. 15—53)

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The present invention relates generally to apparatus for washing roofs of railway cars and like or other vehicles. More particularly the invention relates to that type of washing apparatus which is adapted to effect washing of the roofs of railway cars during propulsion therepast and comprises as its principal components or parts an inverted U-shaped supporting structure over the track along which the cars to be washed are propelled at a comparatively slow rate of speed, a vertically slidable carriage on the supporting structure, a frame on the carriage and a rotary power driven brush on the frame.

One object of the invention is to provide a railway car washing apparatus of this type which is an improvement upon, and has certain advantages over, previously designed apparatus for the same purpose and of the same general character and is characterized by high efficiency, simplicity of design and construction and a novel arrangement of parts.

Another object of the invention is to provide a railway car washing apparatus of the type under consideration in which the rotary power driven brush is mounted on the frame to revolve about a horizontal axis and the frame is pivotally connected to the carriage and so supports the brush that the latter is capable of swinging bodily upwards and downwards in order to adapt itself to the various irregularities on the roofs of the car, such, for example, as hatches and observation domes.

Another object of the invention is to provide a railway car washing apparatus of the type and character last mentioned in which the pivotally mounted brush carrying frame on the vertically slidable carriage is urged downwards by way of an air cylinder in order that the brush is yieldingly held against the roofs of the cars being washed, and has associated therewith a counterweight which is so arranged and positioned that it serves partially to counterbalance the brush carrying frame and also to swing the frame upwards into an inoperative position when the supply of air to the air cylinder is cut off.

A further object of the invention is to provide a railway car washing apparatus of the aforementioned type in which the vertically slidable carriage on which the brush carrying frame is pivotally mounted is provided with novel means for lowering it into an operative position a close distance above the roofs of the cars to be washed and raising it into an inoperative position wherein it is disposed an appreciable distance above the car roofs.

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A still further object of the invention is to provide a railway car washing apparatus which is generally of new and improved construction, effectively and efficiently fulfills its intended purpose and is capable of being produced and operated at a comparatively low cost.

Other objects of the invention and the various advantages and characteristics of the present vehicle washing apparatus will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like letters and numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a rear elevation of a railway washing apparatus embodying the invention;

Figure 2 is a side view illustrating in detail the manner in which the frame is so pivotally supported with respect to the vertically slidable carriage that the rotary power driven brush is capable of swinging bodily upwards and downwards to accommodate different protuberances on the roofs of the cars being washed;

Figure 3 is an enlarged fragmentary rear elevation of the apparatus, certain parts being broken away and other parts being shown in section for illustrative purposes;

Figure 4 is a horizontal section on the line 4—4 of Figure 3, and

Figure 5 is an enlarged fragmentary side view illustrating in detail the construction and design of the sliding connections between the carriage and the inverted U-shaped supporting structure, the construction of the brush carrying frame and the position and arrangement of the air cylinder for urging the frame downwards and the counterweight for partially balancing the brush carrying frame.

The apparatus which is shown in the drawings constitutes the preferred form or embodiment of the invention. It is designed and adapted automatically to wash the roof of a railway car C as the latter is propelled on a track T past the apparatus and as its principal parts comprise a supporting structure 10, a carriage 11, a frame 12 and a brush 13. As hereinafter described more in detail, the carriage 11 is mounted for vertical sliding movement on the supporting structure 10. The frame 12 is mounted on the carriage so that it is capable of swinging or

rotating on a horizontal axis and the brush 13 is mounted rotatably on the frame.

The supporting structure 10 is shaped conformably to an inverted square U and consists of a pair of laterally spaced truly vertical standards 14 and an upper cross beam 15. The standards 14 are positioned in straddled relation with the track T and consist of large sized lower I-beams 16 and smaller sized upper I-beams 17. The track T along which the car C is propelled past the washing apparatus in connection with washing of the roof thereof consists of a pair of laterally spaced rails *t* and these are suitably mounted with respect to the floor where the washing apparatus is located. The lower I-beams 16 have the lower ends thereof suitably anchored to the floor and are preferably arranged so that the webs thereof extend parallel to the rails of the track T. The upper ends of the lower I-beams 16 are provided with horizontal plates 18 to which the lower ends of the upper I-beams 17 are welded or otherwise fixedly secured. As shown in the drawings, the upper I-beams extend in longitudinal alignment with the lower I-beams 16 and are arranged so that their webs are in parallel relation with the track rails *t*. The upper cross beam 15 of the supporting structure 10 is of so-called box section and extends between and surmounts the standards 14. The ends of the upper cross beam 15 rest on, and are welded or otherwise fixedly secured to, the upper ends of the small sized I-beams 17. The height of the standards 14 is such that the upper cross beam 15 of the supporting structure is positioned an appreciable distance above the roof of the car C. The inverted U-shaped supporting structure 10 is essentially a rigid unitary structure.

The carriage 11 underlies and is in parallel relation with the upper cross beam 15 of the supporting structure 10 and extends between the small sized upper I-beams 17 of the standards 14. It is of rigid, unitary construction and consists of a horizontally extending I-beam 19 and a pair of vertically extending plates 20. The I-beam 19 extends parallel to the upper cross beam 11 of the supporting structure and is arranged so that the web thereof extends vertically. The vertically extending end plates 20 depend from the horizontally extending I-beam 19 and have the upper ends thereof welded to the ends of said beam. They are positioned directly inwards of, and are of less height than, the upper I-beams 17 of the standards 14 and carry upper and lower flanged wheels 21. The latter are rotatably mounted on horizontally extending stub axles 22 and fit between the inner portions of the flanges of the upper I-beams 17. The inner ends of the stub axles 22 are suitably fixedly connected to the end plates 20 of the carriage. The wheels 21 coact with the inner portions of the flanges of the upper I-beams 17 to form connections whereby the carriage 11 as a whole is slidable upwards and downwards. It is contemplated that when the washing apparatus is in use the carriage will be slid downwards into an operative position wherein the horizontally extending I-beam 19 is positioned a small distance above the roof of the car C and when the apparatus is not in use the carriage will be slid upwards into an inoperative position wherein the I-beam 19 thereof is located an appreciable distance above the roof of the car C. Raising and lowering of the carriage 11 is effected by way of power mechanism which is mounted for the most part on the upper cross beam 15 of the supporting structure 10 and comprises a reversible electric motor 23, a pair of horizontally extending shafts 24, a pair of worm gear variety speed reducing units 25 and a pair of vertically extending screw shafts 26. The electric motor 23 is mounted on the central portion of the upper cross beam 15 of the inverted U-shaped supporting structure 10 and is arranged so that the armature shaft thereof extends horizontally and in parallel relation with the cross beam. The horizontally extending shafts 24 are disposed at opposite sides of the reversible electric motor 23 and overlie and extend parallel to the cross beam 15. They are journalled in suitable bearings 27 on the cross beam 15 and have the inner ends thereof connected to the ends of the armature shaft of the motor 23 by couplings 28. The speed reducing units 25 are mounted on rectangular brackets 29 and embody horizontally extending drive shafts 30 and vertically extending driven shafts 31. The brackets 29 are fixedly connected to, and project rearwards from, the ends of the horizontally extending upper cross beam 15 of the supporting structure and are located a small distance inwards of the end plates 20 of the carriage 11. Certain ends of the horizontally extending driven shafts 30 of the worm gear variety speed reducing units 25 are connected to the outer ends of the shafts 24 by couplings 32. The lower ends of the vertically extending driven shafts 31 of the speed reducing units 25 project downwards through holes in the upper portions of the brackets 29 and terminate within the central portions of the brackets. The vertically extending screw shafts 26 are disposed beneath, and in coaxial relation with, the driven shafts 31 and have the upper ends thereof journalled in bearings 33 and provided with stems 34. The latter are connected to the lower ends of the driven shafts 31 by couplings 35. The bearings 33 are mounted on the lower portions of the brackets 29 and are so designed and constructed that they hold the screw shafts 26 against axial displacement while at the same time permitting them to rotate about their axes. The lower ends of the screw shafts 26 extend through nuts 36 which are carried by rearwardly extending brackets 37 on the ends of the I-beam 19 of the carriage 11. The worm gear variety speed reducing units 25 are so constructed and arranged that when the electric motor 23 is driven in one direction they operate conjointly to drive the screw shafts 26 in one direction and when the electric motor is reversely driven they operate conjointly to drive the screw shafts in the opposite direction. When the screw shafts are driven in one direction they operate through the medium of the nuts 36 positively to raise the carriage 11 and when they are driven in the reverse direction they coact with the nuts positively to lower the carriage. Downward sliding movement of the carriage 11 is limited by a pair of horizontally extending angle bars 38, as shown in Figures 1 and 3. These angle bars are welded or otherwise fixedly secured to the inner portions of the flanges of the upper I-beams 17 and are spaced a small distance above the plates 18 to which the lower ends of said I-beams are connected.

The brush carrying frame 12 is supported by the carriage 11 to pivot about a horizontal axis and comprises a horizontally extending tubular member 39, a pair of tubular arms 40 and a horizontally extending tubular cross member 41. The member 39 underlies and is disposed in parallel relation with the I-beam 19 of the vertically slidable carriage and has at the ends thereof out-

wardly extending pintles **42** which are journalled in a pair of bearings **43**. The latter are connected to, and depend from, the I-beam **19** and together with the pintles **42** support the frame **12** so that it is free to rotate or swing about a horizontal axis. The arms **40** of the frame are fixedly connected to, and project rearwards from, the tubular member **39** and are provided at their rear or distal ends with downwardly extending extensions **44**. They are spaced laterally apart and, as shown in Figure 1, are located outwards of the track rails *t*. The lower ends of the extensions **44** embody depending bearings **45**. The tubular cross member **21** extends between, and is connected to, the rear or distal ends of the arms **40** and serves as a cross brace or strut for the arms. In addition to the parts heretofore mentioned the brush carrying frame **12** comprises a forwardly extending arm **46**. The latter is disposed in the same plane as the rearwardly extending arms **40** and is fixedly connected to one end of the horizontally extending tubular member **39**.

The brush **13** of the apparatus consists of a longitudinal series of side by side, circular, bristle equipped sections and these are fixedly mounted on the central portion of a shaft **47**. The latter extends horizontally and has its ends journalled in the depending bearings **45** on the lower ends of the downwardly extending extensions **44** of the arms **40**. By reason of the fact that the frame **12** is pivotally mounted by way of the pintles **42** and the bearings **43** the brush **13** is free to swing bodily upwards and downwards. As shown in Figure 1, the brush is so positioned with respect to the track T that when the car C is propelled rearwards past the washing apparatus the brush rides on the roof of the car. By reason of the fact that the brush is capable of swinging bodily upwards and downwards it is readily capable of accommodating any protuberances on the car roof which it may encounter. If, for example, the car C is provided with a conventional observation dome in the central portion of the roof the brush, in connection with initial rearward propulsion of the car, first rides on and serves to wash the portion of the roof that is rearwards of the dome. As soon as the brush is brought into contact with the dome it swings upwards and effects washing of the rear portion of the dome. In connection with further rearward propulsion of the car the brush washes the top of the observation dome. As the car is propelled further rearwards in connection with the washing operation the brush **13** swings downwards and effects washing of the front portion of the dome and then washes the remainder of the roof of the car. The brush **13** is driven constantly during a car washing operation by means of an electric motor **48** and a pulley and belt connection **49**. The motor is located adjacent one end of the horizontally extending shaft **47** and is mounted on a platform **50** which surmounts and is fixedly connected to one end of the horizontally extending tubular cross member **41** of the brush carrying frame **12**. The pulley and belt connection **49** comprises a pulley **51** on one end of the armature shaft of the motor **48**, a pulley **52** on the aforementioned one end of the shaft **47** and an endless belt **53** around the two pulleys. Water or a washing liquid is sprayed downwards onto the brush **13** by way of a horizontally extending spray pipe **54**. The latter is connected to, and extends lengthwise of, the tubular cross member **41** of the brush carrying frame **12**. One end of the spray pipe **54** is connected by a hose **55** to the upper end of a vertically extending supply pipe **56**. The lower end of the last mentioned pipe is connected to a source of water or washing liquid under pressure. The hose **55** permits the spray pipe **54** to swing upwards and downwards with the brush carrying frame **12**.



In addition to the parts or elements heretofore mentioned the apparatus comprises a counterweight **57** for partially counterbalancing the pivoted brush carrying frame **12** and an air cylinder **58** for urging the frame in such direction that the brush **13** is held yieldingly in contact with the roof of the car being washed by the apparatus.

The counterweight **57** is disposed directly forwards of the front portion of one of the standards **14** of the supporting structure **10**. It is vertically elongated and has its upper end connected to the front or distal end of the arm **46** of the brush carrying frame by an upstanding rod **59**. The lower end of the rod is suitably connected to the upper end of the counterweight and the upper end of the rod is connected by a clevis **60** to said front or distal end of the arm **46**. The weight of the counterweight is such that when the air cylinder **58** is inoperative the counterweight operates to swing the brush frame upwards into an inoperative position wherein the brush **13** is out of contact with the roof of the car C. Upward and downward swinging movement of the brush carrying frame is limited or restricted by way of a vertically extending restraining rod **61**. The upper end of the rod **61** is pivotally connected to the central portion of the forwardly extending frame arm **46** and the lower end of the rod extends loosely through a hole in a forwardly extending horizontal plate **62**. Such plate is welded or otherwise fixedly secured to an extension on the carriage and plate **20** that is adjacent the arm **46**. Nuts **63** are mounted on the central portion of the restraining rod **61** and serve as stops for limiting upward swinging movement of the brush carrying frame and nuts **64** are mounted on the lower extremity of the restraining rod and serve as stops for limiting downward swinging movement of the frame. A short helical compression spring **65** surrounds the central portion of the restraining rod **61**. Such spring is interposed between the nuts **63** and the upper surface of the plate **62** and serves as a means for cushioning the frame when it is swung upwards to its fullest extent. A short helical compression spring **66** surrounds the restraining rod at a point directly above the nuts **64** and serves as a means or instrumentality for cushioning the brush carrying frame when it is swung downwards to its fullest extent. The nuts **63** are preferably positioned so that they stop the frame when it is swung upwards to approximately a 30° angle above the horizontal and the nuts **64** are preferably arranged so that they stop the frame when it is swung downwards to approximately a 30° angle below the horizontal. The air cylinder **58** extends substantially vertically and is located directly rearwards of the restraining rod **61** for the brush carrying frame. It underlies the frame arm **46** and has a piston **67** mounted therein for vertical sliding movement. The lower end of the air cylinder **58** is pivotally connected to an upstanding bracket **68** on a horizontally extending plate member which is welded to the lower end of the adjacent carriage end plate **20**. The pivot connection permits the cylinder to swing forwards and rear-

wards to a slight extent in connection with up and down swinging movement of the brush carrying frame. The piston 67 in the air cylinder 58 is provided with an upwardly extending piston rod 69 and this extends slidably through a vented head at the upper end of the cylinder and has its upper end pivotally connected to the frame arm 43 by a clevis 70. The cylinder 58 and the rod-equipped piston therein constitute an air energizable cylinder-piston unit which extends between, and is pivotally connected to, the aforementioned plate-member and the frame arm 46. Air under pressure is introduced into the lower end of the air cylinder 58 by way of a flexible hose 71 which includes a valve (not shown) for air controlling purposes. When the valve is opened air under pressure is introduced into the lower end of the cylinder 58 and forces the piston 67 upwards in the cylinder. Upward sliding movement of the piston operates to swing the brush carrying frame downwards, i. e., in a clockwise direction as viewed in Figures 2 and 5. It is contemplated that when the apparatus is in use air under pressure will be supplied to the air cylinder in order that the latter will operate first to swing the brush carrying frame 12 downwards and then yieldingly to maintain the brush in contact with the roof of the car being washed. It is also contemplated that at the conclusion of a car washing operation the supply of air under pressure to the air cylinder will be cut off. As soon as the air cylinder is rendered inoperative by closing of the valve in the hose 71 the counterweight 57, due to its weight, will automatically swing the frame 12 upwards into its inoperative position wherein the brush is located above the roof level. The air cylinder 58 is sufficiently powerful to overcome the weight of the counterweight 57 when it is energized or rendered operative by the supply of air under pressure thereto.

When it is desired to use the apparatus for roof washing purposes the car C is propelled at a comparatively slow rate of speed rearwards past the apparatus. Before the car reaches the apparatus the operator lowers the carriage 11 to the proper extent by driving the electric motor 23 in the proper direction. The operator also energizes the air cylinder 58 so as to cause it to swing the brush frame downwards in opposition to the force of the counterweight 57. As soon as the rear portion of the roof of the car is engaged by the brush 13 the brush, in connection with drive or rotation thereof by its electric motor 48, effects washing of the car roof. The brush rotates at a comparatively high rate of speed as the car is propelled past it and is capable of riding over any protuberances on the car roof as the result of the fact that the frame on which it is mounted is pivotally connected to the carriage 11. By raising or lowering the carriage the brush 13 may be properly positioned to wash roofs of cars that vary in height. If it is desired completely to render the brush inoperative the carriage is raised to its fullest extent with respect to the inverted U-shaped supporting structure 10. After the carriage 11 is shifted or slid downwards into its operative position prior to a roof washing operation it forms a part of the inverted U-shaped supporting structure 10.

The herein described railway car washing apparatus is essentially simple in design and effectively and efficiently fulfills its intended purpose. Due to its construction the apparatus is capable of washing railway car roofs having protuberances thereon. By employing the counterweight 57 and the air cylinder 58 as parts of the apparatus the brush, in connection with a roof washing operation, engages the roof with proper pressure to effect the desired results from the standpoint of washing. The apparatus as a whole is so constructed and designed that it may be produced at a comparatively low cost and operated economically.

Whereas the apparatus has been described in connection with the washing of the roof of a railway car it is to be understood that it may also be used to wash the roofs of other vehicles. It is also to be understood that the invention is not to be restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. An apparatus adapted to wash the roof of a vehicle as the latter is propelled on a runway past it and comprising a rigid upstanding inverted U-shaped supporting structure arranged in straddled relation with the runway and embodying a pair of standards of greater height than the vehicle and a cross beam between the upper ends of the standards, a horizontally elongated carriage extending between the upper portions of the standards and transversely of the runway and mounted on said upper portions of the standards so that it is bodily slidable upwards and downwards to a limited extent, power mechanism operative to effect sliding movement of the carriage and embodying a pair of fixedly mounted nuts on the ends of the carriage, a pair of vertically extending screw shafts depending from the ends of the cross beam, mounted so that they are rotatable without axial displacement and extending through the nuts on the carriage, a reversible electric motor mounted on said cross beam and gearing between said motor and the screw shafts whereby the latter are conjointly rotated in response to drive of the motor, and a frame disposed between the standards, mounted on the carriage to swing upwards and downwards and provided at its distal portion with a rotary power driven brush.

2. An apparatus adapted to wash the roof of a vehicle as the latter is propelled on a runway past it and comprising a rigid upstanding supporting structure in straddled relation with the runway and embodying a pair of standards of greater height than the vehicle, a horizontally elongated carriage extending between the upper portions of the standards and transversely of the runway, mounted on said upper portions of the standards so that it is bodily slidable upwards and downwards to a limited extent, and provided with a horizontal member extending in one direction along the runway and motor actuated mechanism operative to effect sliding movement of the carriage, a substantially horizontal frame disposed between the standards extending in the opposite direction along the runway, having the inner portion thereof pivotally connected to the carriage so that it is capable of swinging upwards and downwards, provided at its distal portion with a rotary power driven brush, and having on its inner portion a rigid arm overlying and extending in the same direction as said member, and an air energizable cylinder piston unit extending between and pivotally connected to the member and arm and operative when energized

by the supply of air under pressure thereto yieldingly to urge the frame downwards.

3. An apparatus adapted to wash the roof of a vehicle as the latter is propelled on a runway past it and comprising a rigid upstanding supporting structure in straddled relation with the runway and embodying a pair of standards of greater height than the vehicle, a horizontally elongated carriage extending between the upper portions of the standards and transversely of the runway, mounted on said upper portions of the standards so that it is bodily slidable upwards and downwards to a limited extent, and provided with a horizontal member extending in one direction along the runway and motor actuated mechanism operative to effect sliding movement of said carriage, a substantially horizontal frame disposed between the standards, extending in the opposite direction along the runway, having the inner portion thereof pivotally connected to the carriage so that it is capable of swinging upwards and downwards, provided at its distal portion with a rotary power driven brush, and having on its inner portion a rigid arm overlying and extending in the same direction as said member, a counterweight suspended from the arm and serving to urge the frame upwards, and an air energizable cylinder piston unit extending between and pivotally connected to the member and arm and operative when energized by the supply of air under pressure thereto yieldingly to urge the frame downwards against the force of the counterweight.

4. An apparatus adapted to wash the roof of a vehicle as the latter is propelled on a runway past it and comprising a rigid upstanding supporting structure in straddled relation with the runway and embodying a pair of standards of greater height than the vehicle, a horizontally elongated carriage extending between the upper portions of the standards and transversely of the runway, mounted on said upper portions of the standards so that it is bodily slidable upwards and downwards to a limited extent, and provided with a horizontal member extending in one direction along the runway and motor actuated mechanism operative to effect sliding movement of said carriage, a substantially horizontal frame disposed between the standards, extending in the opposite direction along the runway, having the inner portion thereof pivotally connected to the carriage so that it is capable of swinging upwards and downwards, provided at its distal portion with a rotary power driven brush, and having on its inner portion a rigid arm member overlying and extending in the same direction as said horizontal member, means operative to limit upward and downward swinging movement of the frame and consisting of an apertured element in fixed relation with one of the members and a restraining rod having one end thereof pivotally connected to the other member and its other end portion extending slidably through the apertured element and provided with spaced apart stop-elements on opposite sides of said apertured element, a counterweight suspended from the arm member and serving to urge the frame upwards, and an air energizable cylinder piston unit extending between and pivotally connected to the two members and operative when energized by the supply of air under pressure thereto yieldingly to urge the frame downwards against the force of the counterweight.

5. An apparatus adapted to wash the roof of a vehicle as the latter is propelled on a runway past it and comprising an upstanding supporting structure embodying a pair of standards at opposite sides of the runway and of greater height than the vehicle, and having adjacent the upper portion of one of the standards a horizontal member extending in one direction along the runway, a substantially horizontal frame disposed between the upper portions of the standards, extending in the opposite direction along the runway, having means at its inner portion whereby it is so pivotally supported that it is capable of swinging upwards and downwards, provided at its distal portion with a rotary, power driven brush, and having on its inner portion a rigid arm overlying and extending in the same direction as said member, means operative to limit upward and downward swinging movement of the frame, and consisting of an apertured element in fixed relation with said member and an upstanding restraining rod having the upper end thereof pivotally connected to the arm and its lower end portion extending through the apertured element and provided with adjustable spaced apart stop-elements on opposite sides of said apertured element, counterweight means applied to the arm and serving to urge the frame upwards, and an air energizable cylinder piston unit extending between and pivotally connected to the member and arm and operative when energized by the supply of air under pressure thereto yieldingly to urge the frame downwards against the force of the counterweight means.

LOUIS D. HOLMES.

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