Aug. 10, 1937. R. H. GORDON 2,089,648

METHOD OF AND APPARATUS FOR TREATING METAL SURFACES

Filed May 3, 1935 5 Sheets-Sheet 1

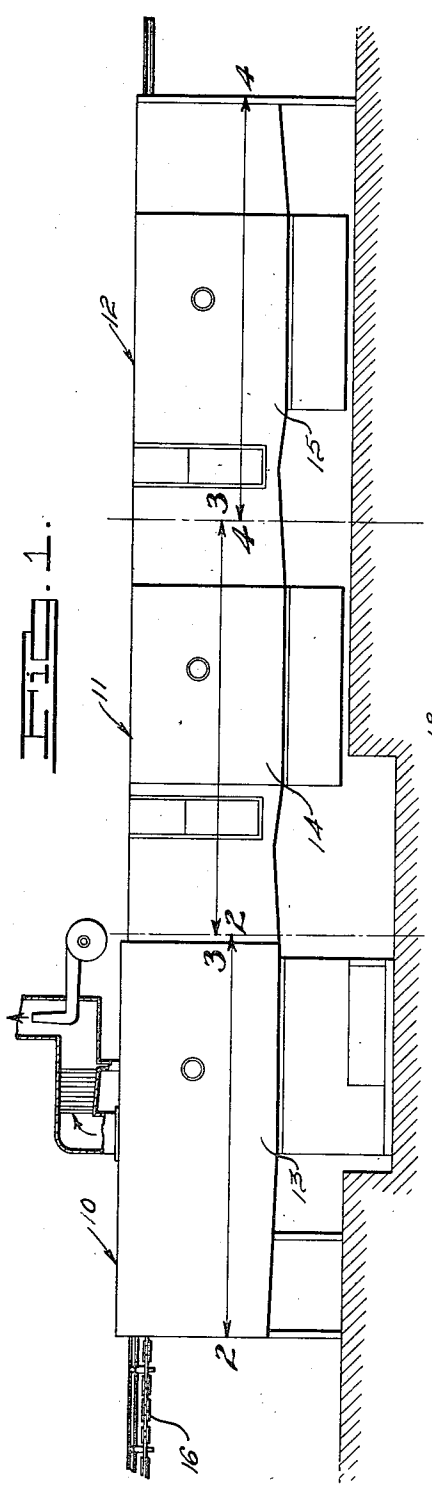


Fig. 1.

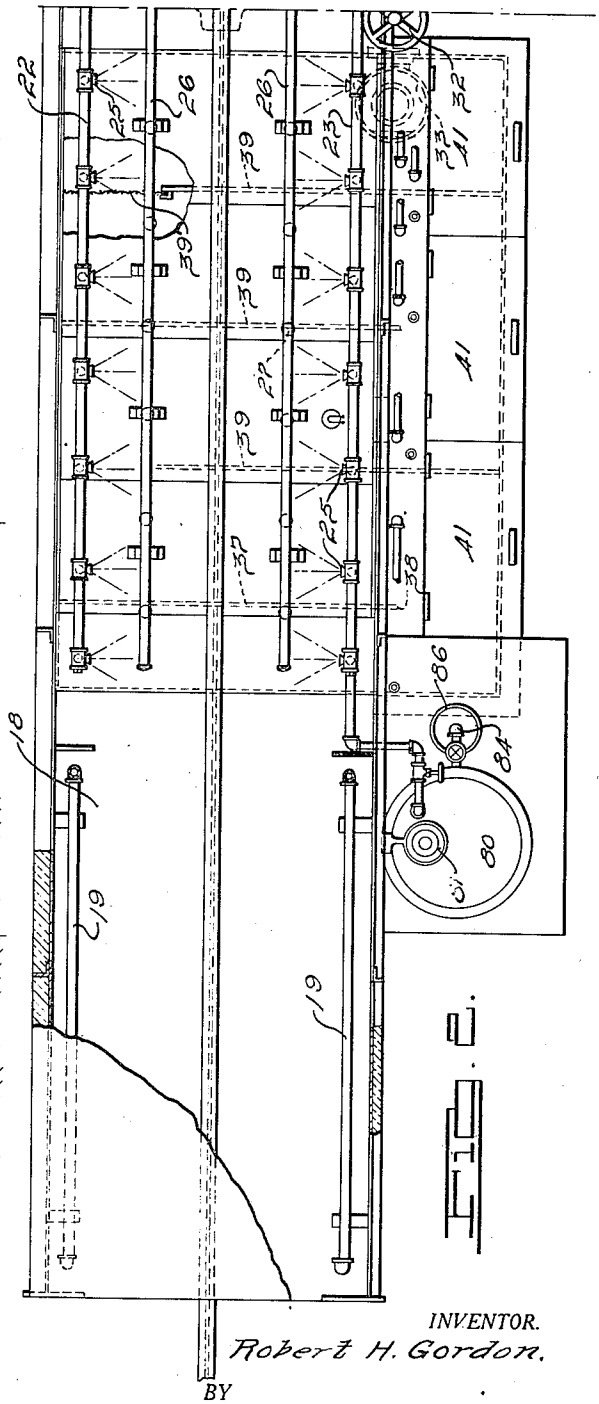


Fig. 2.

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Filed May 3, 1935 5 Sheets-Sheet 2

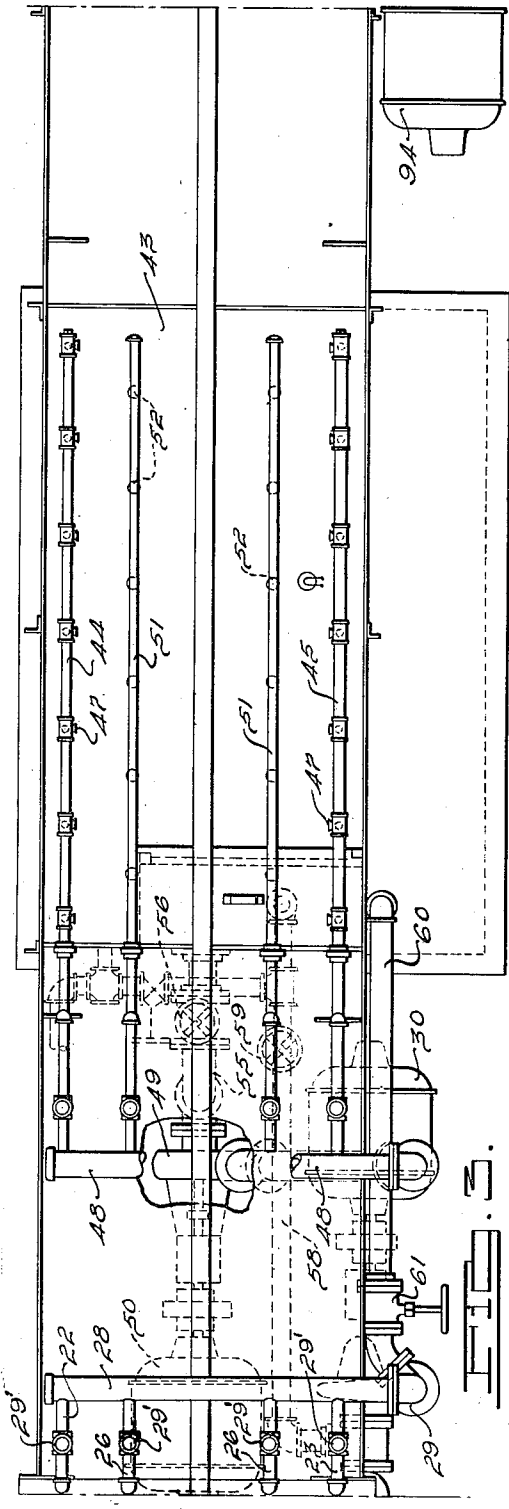


Fig. 3.

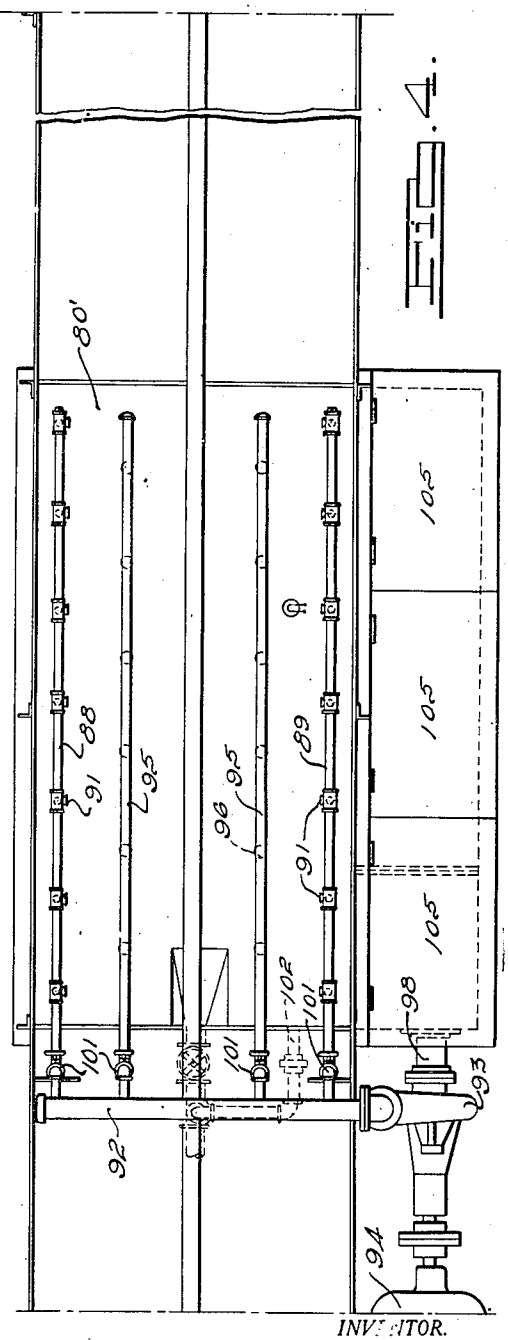


Fig. 4.

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METHOD OF AND APPARATUS FOR TREATING METAL SURFACES

Filed May 3, 1935 5 Sheets-Sheet 3

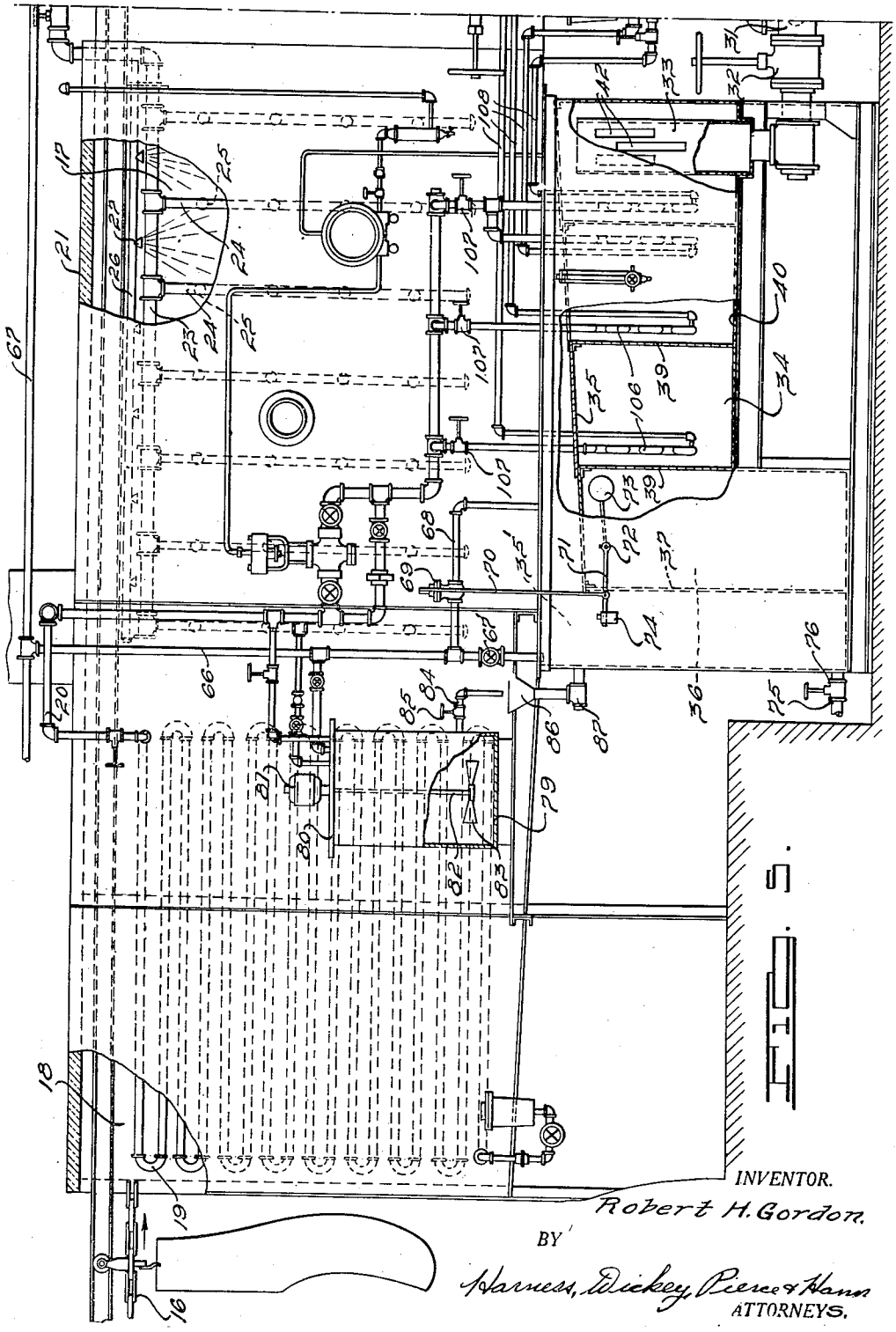


Fig. 5.

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METHOD OF AND APPARATUS FOR TREATING METAL SURFACES

Filed May 3, 1935 5 Sheets-Sheet 4

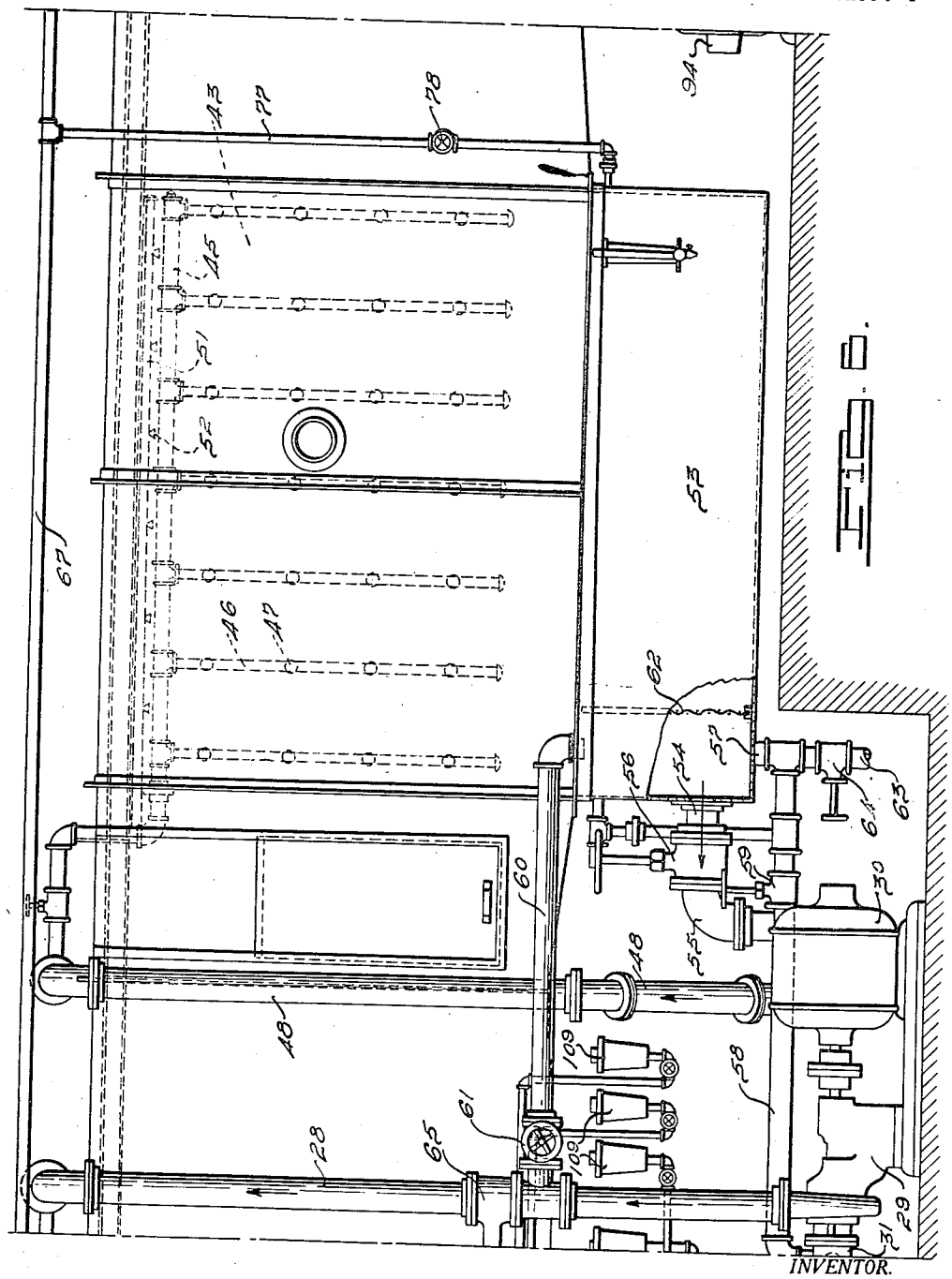


Fig. 6.

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METHOD OF AND APPARATUS FOR TREATING METAL SURFACES

Filed May 3, 1935 5 Sheets-Sheet 5

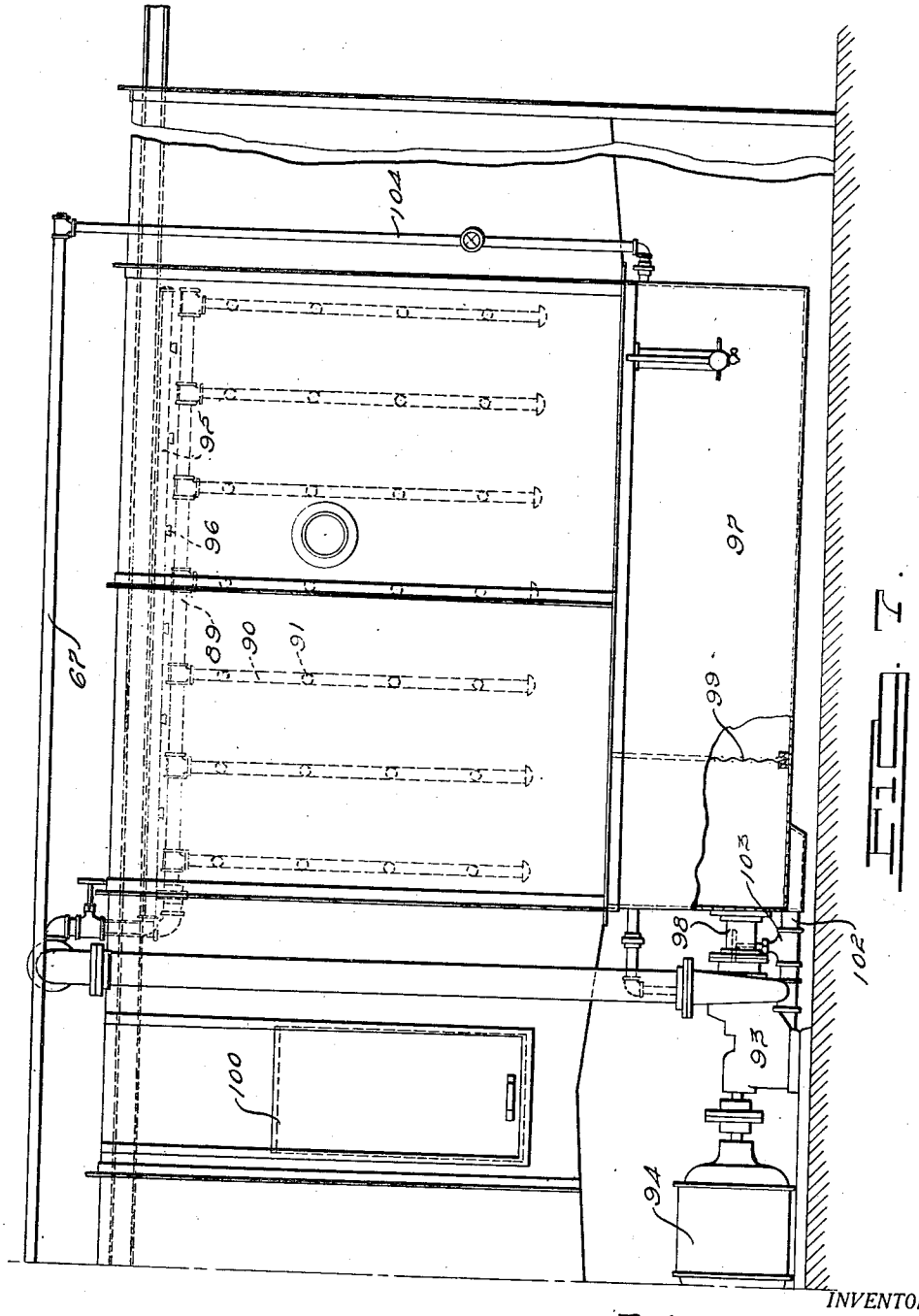


Fig. 5

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UNITED STATES PATENT OFFICE

2,089,648

METHOD OF AND APPARATUS FOR TREATING METAL SURFACES

Robert H. Gordon, Detroit, Mich., assignor to Parker Rust Proof Company, a corporation of Michigan

Application May 3, 1935, Serial No. 19,556

12 Claims. (Cl. 148—6)

This invention relates to an improved apparatus and method for applying rustproofing solutions to articles.

More particularly the invention relates to a method and apparatus of this character for spraying on articles, rustproofing solutions of the character which react with the metal of the articles to form a protective coating thereon.

The reaction which takes place between the metal under treatment and the solution used in a rustproofing process of this character is accompanied by the formation of a flocculent precipitation and/or scale which frequently so fouls the solution as to render it unsuitable for repeated re-use, particularly in a spraying system having nozzles provided with relatively small outlet orifices.

One of the main objects of the invention is to provide for the removal of contaminating solid matter from the rustproofing solution and from the container and conduits thereof so that the solution can be repeatedly re-used and discharged from spray nozzles having relatively small outlet orifices without clogging the latter.

Other objects of the invention are to provide improved means for allowing the solid matter of the used rustproofing solution to settle out of suspension before returning to the discharge spray nozzles; to provide a rustproofing solution tank having a sump therein for collecting the main portion of the solid constituents of the used solution; to provide means for causing the solution to travel through a tortuous course in returning to the discharge nozzle so as to prolong the period during which settling of the solid particles may take place; and to provide means of this character which so directs the flow of solution during the settling stage as to prevent the transfer of deposited solid matter from the region of the sump to the conduits by which the nozzles are supplied with solution.

A further object of the invention is to provide controllable, interconnected rustproof spraying and rinsing units by which both the rustproofing solution and the rinsing liquid can be reused and re-circulated repeatedly.

Additional objects of the invention are to provide a supply tank in the rinsing unit which may be used to accommodate the rustproofing solution during flushing and cleaning of the rustproofing unit; to provide a system of conduits for conveying the solution from its normal tank to the spray nozzles, which is so connected with the tank of the rinsing unit as to facilitate the transfer of the solution thereto before flushing the rustproofing unit tank, and to return the solution directly to the spray nozzle of the rustproofing unit after the cleaning and flushing operation has been completed; to provide a single pump for propelling the solution through the rustproofing unit, transferring the solution to the rinse liquid tank as well as for circulating the flushing liquid throughout all portions of the rustproofing unit and returning the solution to the nozzle through which it is normally discharged during operation; to provide valve means in a system of conduits of this character for selectively conditioning the latter to accomplish any of the foregoing results; and to provide means for flushing all portions of the rustproofing unit through which the solution travels during normal operation of the system.

Still further objects of the invention are to provide closed, re-circulating rustproofing solution and rinse liquid systems which require the provision of only a relatively small quantity of solution or rinse liquid at any one time; to provide closed spraying systems of this character, the contents of which are not subjected to loss by evaporation; to provide improved means for replenishing the rust proofing circulating system with a solute in order to increase or maintain constant the concentration of the solution; and to provide automatic means for maintaining the rustproofing solution at a substantially constant elevation in its supply tank.

The above being among the objects of the present invention, the same consists in certain novel features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings and then claimed, having the above and other objects in view.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a longitudinal, side elevational view of a rustproofing apparatus embodying the invention;

Fig. 2 is a plan view, partly in section, of the rustproofing unit of the apparatus and the preheating chamber thereof which extends between the extremities of the line 2—2 of Fig. 1;

Fig. 3 is a top plan view of the rinsing section of the apparatus which is disposed immediately adjacent the rustproofing unit thereof and which extends between the extremities of the line 3—3 of Fig. 1;

Fig. 4 is a top plan view of the acid rinsing section of the apparatus which is disposed at the end thereof opposite the rustproofing unit and

which extends between the extremities of the line 4—4 of Fig. 1;

Fig. 5 is an enlarged side elevational view of the rustproofing unit and associated pre-heating chamber showing portions thereof broken away to disclose the underlying structure;

Fig. 6 is an enlarged side elevational view of the first rinsing section of the apparatus;

Fig. 7 is an enlarged side elevational view of the second, or acid rinsing station of the apparatus.

In the form of the invention illustrated in the drawings, the rustproofing apparatus includes a plurality of aligned, adjacent units, generally designated in Fig. 1 by the numerals 10, 11 and 12, each comprising a substantially rectangular sheet metal casing 13, 14 or 15, respectively, having registering opened extremities for accommodating the passage through the apparatus of articles to be treated. The articles may be supported by, and propelled through the apparatus by a conveyor, generally designated by the numeral 16, or other suitable means. The unit 10 of the apparatus through which the articles are initially passed, is provided with a rustproofing solution spraying system for applying to the articles a rustproofing solution of the character which reacts with the metal thereof to form an exterior protective coating thereon. The second unit 11 through which the articles pass, contains a rinse liquid spraying system which preferably discharges water, or any other suitable liquid, on the treated surfaces of the article so as to remove substantially all the rustproofing solution adhering thereto. The unit 12 of the apparatus is provided with an acid rinse spraying system for finally treating the articles and their rust resisting coatings preparatory to delivery from the apparatus.

The rustproofing unit 10 includes a spraying chamber 17 in advance of which is provided a pre-heating chamber 18 having a heating coil 19 disposed adjacent each vertical side wall thereof. The heating coils 19 are supplied with steam from a suitable source (not shown) by a pipe line 20. Although heating of the articles before entering the spraying chamber 18 is not essential, by increasing the temperature thereof the chemical reaction of the rustproofing solution upon the articles is stimulated and the time required for treatment thereof in the spray chamber 17 is reduced.

Extending longitudinally of the spraying chamber 17, adjacent the roof 21, and the vertical side walls thereof are header pipes 22 and 23 respectively. The header pipes 22 and 23 are provided with longitudinally spaced, downwardly extending branch pipes 24 which are disposed adjacent the opposite side walls of the spraying chamber and provided with inwardly extending nozzles 25. Disposed between the header pipes 22 and 23 are longitudinally disposed and laterally spaced branch pipes 26 which extend longitudinally of the drying chamber at a location slightly above the header pipes and which are provided with outlet nozzles 27 that are directed downwardly toward the central portion of the spraying chamber. The right end portions of the header pipes 22 and 23 and the branch pipe 26 communicate with a supply conduit 28 which extends transversely of the rustproofing apparatus, as illustrated in Fig. 3. The flow of rustproofing solution from the supply conduit 28 to the foregoing header pipes and branch pipes may be selectively controlled by a valve 29' with which each pipe is provided. The branch pipes of the rustproof solution spraying system may be disposed in any suitable relationship with respect to each other and with respect to the spraying chamber and the nozzles thereof may be arranged to spray the solution in any desired direction as required by the particular shape and contour of the articles operated upon.

The supply conduit 28 communicates with the outlet of a pump 29 which is driven by an electric motor 30, or other suitable means. The inlet of the pump 29 is connected by a conduit 31, having a control valve 32 therein, with a removable stand pipe 33 disposed in a tank 34 that is located directly below the spraying chamber 17. The tank 34 has a leftwardly declined top wall 35, as viewed in Fig. 5, which extends from the right end portion of the tank to within limited spaced relationship of the left end wall thereof. The space between the left extremity of the inclined top wall 35 and the left end wall of the tank provides an inlet opening 35' through which excess rustproofing solution discharged by the spraying system may enter the interior of the tank. Provided at the left end portion of the tank 34 is a downwardly extending sump 36, a portion of which registers vertically with the inlet opening 35'.

The sump 36 and the portions of the tank 34 immediately thereabove are internally divided by a partition 37 which extends from the uppermost vertical side wall of the tank, as viewed in Fig. 2, to within spaced relationship of the opposite side wall of the tank. This partition extends transversely of the tank 34 and sump 36 and permits the flow of rustproofing solution only around the vertical extremity 38 of the partition. Spaced longitudinally of the remaining portion of the length of the tank 34 are vertically extending partitions 39. Successively adjacent partitions 39 extend inwardly transversely from the opposite vertical side walls of the tank respectively. Each partition 39 is substantially narrower than the width of the tank and the inner extremities of successively adjacent partitions 39 are spaced from respectively opposite vertical side walls of the tank so as to provide a tortuous, zig-zag shaped passage for the flow of rustproofing solution from the space above the left hand section of the sump 36 to the stand pipe 33 and outlet pipe 31 with which the latter is connected.

The provision of the tortuous path for the used rustproofing solution prolongs the time of travel thereof from the inlet of the tank to the outlet and thus provides ample time for suspended particles of solid matter to settle out of the solution. The main portion of the solid constituents of the used rustproofing solution is deposited in the sump 36, but any solid matter which is carried past the latter settles on the lower floor portion 40 of the tank 34. The deposited sludge may be removed periodically through openings provided in the top wall of the tank located externally of the spraying chamber. These openings are normally closed by hinged covers 41. The stand pipe 33 is provided with staggered longitudinally extending slots 42 having lower extremities located sufficiently above the floor 40 of the tank to insure the separation of the clean solution from the deposited solid matter during passage of the solution into the stand pipe. Filters 39' may be provided between the inner extremities of the partitions 39 and

the associated vertical side walls of the tank to assist in removal of suspended particles of solid matter from the solution.

The first rinsing unit 11 shown in plan and side elevational views in Figs. 3 and 6, respectively, is provided with a spraying chamber 43 having upper longitudinally extending header pipes 44 and 45, each located adjacent the upper wall of the spraying chamber 43 and in close proximity to one of the respectively opposite side walls thereof. The header pipes 44 and 45 are provided with downwardly extending branch pipes 46, each of which has a plurality of vertically spaced nozzles 47 directed inwardly for spraying rinse liquid toward the central portion of the spraying chamber. These header pipes communicate with a supply conduit 48 which leads to the outlet of a pump 49 that is driven by an electric motor 50, or any suitable driving means. Rinse liquid conveying pipes 51 extend longitudinally of the spraying chamber 43 in substantially parallel relationship to the header pipes 44 and 45 and they communicate with the rinse liquid supply conduit 48, as illustrated in Fig. 3. The pipes 51 are provided with downwardly directed nozzles 52, spaced longitudinally thereof, which discharge rinsing liquid downwardly toward the lower portion of the spray chamber. The various pipes and branch passages of this spraying system may be arranged in any desired manner to so direct the rinse liquid sprays as to subject all portions of the articles operated upon to a thorough rinsing operation.

Disposed below the rinse liquid spraying chamber 43 is a collecting tank 53 which extends laterally from one side wall of the rinse liquid spraying chamber 43, as illustrated in Fig. 3. The tank 53 has an open upper extremity for accommodating the reception of the spray liquid discharged from the nozzles 47 and 52. Provided at the left end of the tank 53, as viewed in Fig. 6, is an outlet 54 which is connected by a conduit 55 with the inlets of the rinse liquid supply pump 49. The conduit 55 is provided with a valve 56 for controlling the flow of rinse liquid to the inlet of the pump and by which the flow may be completely cut off. The tank 53 has a second outlet 57 at its lower left hand extremity, as viewed in Fig. 6, which is communicatively connected by a pipe 58, having a valve 59 therein, with the inlet of the rustproofing solution pump 29. Leading from the upper left hand extremity of the tank 53 is an inlet pipe 60 which communicates with the rustproofing solution supply conduit 28 and which is provided with a control valve 61. All of the liquid leaving the main body portion of the tank 53 may be passed through a filter 62 extending transversely of the tank 53, as illustrated in Fig. 6, if desired.

The foregoing interconnections between the rustproofing unit 10 and the rinsing unit 11 are not employed during normal operation of the rustproofing apparatus, but when it becomes necessary to flush the rustproofing system, the rinse liquid tank 53 may be drained through an outlet 63 having a control valve 64, so as to provide space for accommodating the rustproofing solution which may be transferred thereto from the rustproofing unit 10 by the action of the pump 29. This is accomplished by closing a valve 65 located in the rustproofing solution supply conduit 28 above the connection thereof with the pipe 60 and opening the valve 61 of the pipe 60. During this transfer operation the valve 59 of the return pipe 58 is closed so that the rustproofing solution is forced by the pressure of the pump 29 through the lower section of the conduit 28, pipe 60 and into the tank 53, whereas the flow of rustproofing solution from the tank 53 is prevented by the valve 59.

After the rustproofing solution has been transferred to the tank 53, the valve 61 is closed and the valve 59 remains closed so as to entrap the rustproofing solution in the tank 53. Water or any other flushing liquid is then introduced into the tank 34 and sump 36 of the rustproofing unit 10 through a branch pipe 66 which communicates with a liquid supply line 67, as illustrated in Fig. 5. The flow of the flushing liquid through the branch pipe 66 is controlled by a manually operable valve 67'. This branch pipe 66 is also employed to supply water or other liquid to the tank 34 during normal operation of the apparatus, through a by-pass pipe 68 connected with the branch pipe 66 above the valve 67 and provided with an automatically operable valve 69. The valve 69 is automatically actuated to maintain a predetermined level of liquid in the tank 34 by a rod 70 which is pivotally connected with a lever arm 71. The lever 71 is pivotally mounted on an axis 72 and located within the tank. The right end of the lever 71 is provided with a float ball 73 and the left end thereof is provided with an adjustable weight 74. The weight 74 and the float ball 73 are normally in balanced relationship with respect to the axis 72, so that as the liquid in the tank 34 raises the float ball 73, the lever 71 is turned in a counter-clockwise direction and the rod 70 is moved downwardly to close the valve 69 and maintain the latter closed until the level of the liquid in the tank 34 is again lowered.

After the tank 34 of the rustproofing unit 10 is filled to a desired level either by manual control of the valve 67 or automatic control of the valve 69, the supply of liquid thereto is discontinued, the valve 65 in the supply conduit 28 is opened, and the motor 30 is started to drive the pump 29. The pump 29 then circulates the liquid through the supply conduit 28 and the associated spraying system of the rustproofing unit 10 as long as is required to thoroughly flush the same. Then operation of the pump 29 is discontinued and the flushing liquid is removed from the tank 34 through a drain 75 having a control valve 76 and located at the lower left hand extremity of the sump 36. The rustproofing solution temporarily stored in the tank 53 of the rinsing unit 11 may then be returned to the rustproofing unit 10 through the spray nozzles 25 and 27 thereof by opening the valve 59 and closing the valve 32 in the outlet pipe 31 of the rustproofing solution tank 34 so as to allow the rustproofing solution to flow through the pipe 58 into the inlet of the pump 29 and from the latter through the supply conduit 28 to the spraying system. After the tank 53 has been emptied of rustproofing solution, the valve 59 is again closed and the normal outlet valve 56 of the tank 53 and outlet valve 32 of the tank 34 are opened. A new charge of rinsing liquid is introduced into the tank 53 through the branch pipe 77 which communicates with the liquid supply pipe 67 and through which the flow of liquid is controlled by a valve 78. When the tank 53 has again been re-charged with rinsing liquid, the motor 50 may be started to drive the pump 49 so as to circulate the rinsing liquid from the tank 53 through the supply conduit 48 and nozzles 47 and 52 of the rinse liquid

spraying system. Both units of the rustproofing apparatus may then be operated in a normal manner as separate and individual closed spraying systems.

During normal operation of the rustproofing apparatus, it sometimes becomes necessary to add a certain quantity of the chemicals which comprise the solute of the rustproofing solution, acidified water being generally used as the solvent of the solution. This may be conveniently accomplished by mechanically mixing together the required compounds and liquids in a mixing drum 79 mounted externally of the pre-heating chamber 18 of the rustproofing unit 10. The mixing drum 79 has an upper wall 80 on which is mounted an electric motor 81, or other suitable driving means, having a shaft 82 extending centrally of the drum and provided at its inner end with a mixer, or paddle 83 by which the materials used to replenish the solute of the rustproofing solution may be thoroughly mixed and incorporated together. The mixing drum 79 is provided with an outlet conduit 84 which is adapted to discharge any desired quantity of the contents of the drum 79 into a funnel 86 provided with an outlet 87 which communicates with the interior of the rustproofing solution tank 34, as shown in Fig. 5. The outlet conduit 84 has a valve 85 by which the flow of the contents of the drum 79 to the tank 34 may be manually controlled.

The acid rinsing unit 12 also includes a spraying chamber 89' having an independent closed, spraying system comprising a pair of header pipes 88 and 89, each located at the upper extremity of the chamber 89' and disposed adjacent one of the vertical side walls thereof respectively. The header pipes 88 and 89 are provided with longitudinally spaced downwardly extending branch pipes 90 which are located adjacent the respectively opposite vertical side walls of the acid rinse spraying chamber and which have vertically spaced, inwardly directed nozzles 91 for discharging the acid rinse liquid inwardly toward the central portions of the spray chamber. The header pipes 88 and 89 communicate with an acid rinse liquid supply conduit 92 which lead from the outlet of a pump 93 that is drivingly connected with an electric motor 94, or other suitable driving means. Pipes 95 which communicate with the header 92 and extend longitudinally of the acid rinse liquid spraying chamber are disposed adjacent the upper wall of the latter and provided with downwardly directed spray nozzles 96. The nozzles of the various branches of the acid rinse spraying system may be directed in any desired manner as required by the particular shape and contour of the articles operated upon in order to subject substantially all portions of such articles to action of the spray nozzles.

An acid rinse collecting tank 97 having an upper open extremity is disposed below the acid rinse spraying chamber 89' and provided at its lower left hand extremity, as viewed in Fig. 7, with an outlet pipe 98 that communicates with the inlet of the pump 93. A filter 99 extending transversely of the tank 97 may be provided at the left end portion thereof for preventing the flow of any solid matter, which may be removed from the articles operated upon and introduced into the acid rinsing liquid, from flowing through the outlet 98 and pump 93 so as to prevent particles of solid material from being delivered to the nozzles and clogging the latter. Access may be had to the interior of the acid rinse spraying chamber through a doorway 100 provided in one vertical side wall thereof. The header pipes 88 and 89 and the pipes 95 are provided with individual control valves 101 by which the flow of acid rinsing liquid to the various nozzles thereof may be individually controlled. Leading from the lowermost left hand portion of the tank 97 is a drain outlet 102 having a valve 103, through which the acid rinse liquid may be removed from the tank 97. The solvent of the acid rinse liquid, which is preferably water, may be introduced into the tank 97 through a branch pipe 104 which communicates with the pipe 67 that is common to all three of the units of the apparatus. The interior of the tank 97 may be cleaned through openings in a laterally protruding portion thereof which are normally closed by hinged covers 105. Any one of the doors 105 may be opened to permit pouring of a suitable acid into the tank 79 during re-charging thereof and after the tank has been filled to a desired extent with water.

In Fig. 5 is illustrated an improved method for heating the rustproofing solution while the latter is contained in the rustproofing solution tank 34. This same construction may be used in heating either the rinse liquid of the first rinsing unit 11 or the acid rinsing liquid of the second rinsing unit. Adjacent one or both sides of the partition 39 may be located a vertically disposed heating coil 106 which is preferably supplied with steam through the steam line 20 and associated branches thereof. The heating coils 106 are preferably located sufficiently above the bottom of the tank 34 and preferably so spaced from the sump 36 as to prevent churning of the rustproofing solution and re-mixing of the deposited solid matter therein. Each heating coil 106 is provided with an individual control valve 107 by which the application of steam thereto may be regulated. A steam outlet pipe 108 leads from each heating coil 106 through a steam trap 109, respectively, in accordance with conventional steam heating practice.

With the foregoing apparatus and method of operation thereof, it is possible to repeatedly reuse and re-circulate rustproofing solution of the character which re-acts with the metal of the articles operated upon through a spraying system without clogging the outlet orifices of the spray nozzles thereof and without requiring frequent shut down and cleaning. When it becomes necessary to thoroughly clean the system, this may be accomplished without wasting the rustproofing solution and without the requirement of a large tank for temporarily storing the solution. This is accomplished by utilizing the tank of the rinse liquid spray system for this purpose. During the flushing operation all of the passages which are apt to become clogged or contaminated in any way by reason of the reaction of the rustproofing solution therewith, are thoroughly cleaned and subjected to the action of the flushing liquid for the latter is circulated through each and every conduit, nozzle, branch passage, receptacle and pump through which the rustproofing solution is normally passed. The rustproofing solution tank and associated sump are so constructed and provided with means for causing the solution to travel through a tortuous path that substantially none of the flocculent precipitate or scale formed during the reaction of the rustproofing solution upon the articles under treatment is allowed to re-enter the pump during re-circulation of the solution.

All parts of the system with which the rustproofing solution contacts are preferably formed of metal which is not subject to reaction there-

with. The walls of the spraying chamber 17 and the tank 34 preferably comprise Monel metal but they may be formed of wood suitably treated to prevent leakage of the solution therethrough. The pipes of the spray system through which the rustproofing solution passes may also be formed of suitable metal which is not reacted upon by the solution.

Although but one specific embodiment has been described and illustrated, it will be apparent to those skilled in the art that formal changes may be made in the invention without departing from the spirit and substance of the broad invention, the scope of which is commensurate with the appended claims.

What I claim is:

1. The method of rustproofing metal articles which consists in spraying thereon a rustproofing solution of the character which reacts chemically with the metal of said articles to form a protective coating, collecting the excess sprayed solution within a tank, causing said collected solution to flow through a tortuous path within said tank from the location at which it is collected therein to a location from which it may be removed from and re-sprayed on articles to be treated so as to provide time for substantially all solid matter to settle out of suspension in said solution and re-spraying the resulting collected solution on articles to be treated.

2. In a rustproofing apparatus having means for continuously spraying and re-spraying a rustproofing solution of the type which reacts with the metal of the articles under treatment to form a protective coating thereon including a spraying chamber having a plurality of discharge nozzles therein, the combination of a tank for collecting excess sprayed solution and accommodating the latter during settling of any solid matter introduced into said solution during operation, said tank having an inlet at one end portion and an outlet at its opposite end portion, and means in said tank for causing repeated reversed flow of said collected solution laterally of said tank in passing from said inlet to said outlet so as to provide time for settling out of said solid matter.

3. In rustproofing apparatus having means for continuously spraying and re-spraying a rustproofing solution of the type which reacts with the metal of the articles under treatment to form a protective coating thereon including a spraying chamber having a plurality of discharge nozzles therein, the combination of a tank below said spray chamber for collecting excess sprayed solution having an inlet at one end portion and an outlet at its other end portion and having a sump at its inlet end portion for receiving the main portion of the settled solid matter introduced into said solution by said reaction and during operation thereof, and means in said tank for causing repeated reversed flow of said solution laterally of said tank in passing from said inlet to said outlet so as to provide time for settling out of substantially any solid matter not deposited in said sump and to hold said solution against flowing directly from the vicinity of said sump and carrying solid matter deposited thereinto to said outlet.

4. Rustproofing apparatus comprising a rustproofing unit including a closed rustproofing solution applying system having a plurality of spray nozzles, a collecting and settling tank for receiving excess sprayed solution and having means for delivering solution from said tank to said spray nozzles under pressure; a rinsing unit adjacent said rustproofing unit including a closed rinse liquid spray system having a plurality of spray nozzles, a tank for collecting rinse liquid and means for delivering the latter from said rinse liquid tank to said rinse liquid spray nozzles under pressure; and means including one of said delivering means for transferring said rustproofing solution from said rustproofing unit to said rinse liquid tank preparatory for flushing said rustproofing solution applying system.

5. Rustproofing apparatus comprising a rustproofing unit including a closed rustproofing solution applying system having a plurality of spray nozzles, a collecting and settling tank for receiving excess sprayed solution and having means for delivering solution from said tank to said spray nozzles under pressure; a rinsing unit adjacent said rustproofing unit including a closed rinse liquid spray system having a plurality of spray nozzles, a tank for collecting rinse liquid and means for delivering the latter from said rinse liquid tank to said rinse liquid spray nozzles under pressure, means for transferring said rustproofing solution from said rustproofing unit to said rinse liquid tank preparatory for flushing said rustproofing solution applying system, and means for returning said rustproofing solution from said rinse liquid tank directly to the spray nozzles of said rust-proofing unit.

6. Rustproofing apparatus including a rustproofing solution spraying system and means for delivering solution thereto, a liquid rinsing system having a rinsing liquid supply tank and means for delivering liquid thereto, and means including one of said delivering means for transferring the solution of said rustproofing spraying system to the tank of said rinsing system to condition said rustproofing spraying system to be flushed.

7. Rustproofing apparatus including a rustproofing solution spraying system having a supply tank and a plurality of discharge nozzles, a liquid rinsing system having a rinsing liquid supply tank, a pump in said spraying system for delivering rustproofing solution to said nozzles under pressure, and a connecting conduit between said pump and said rinse liquid supply tank for transferring rustproofing solution thereto from said rustproofing solution tank by the action of said pump to condition said rustproofing spraying system to be flushed.

8. Rustproofing apparatus including a rustproofing solution spraying system having a supply tank and a plurality of discharge nozzles, a liquid rinsing system having a rinsing liquid supply tank, a pump in said spraying system for delivering rustproofing solution to said nozzles under pressure, a connecting conduit between said pump and said rinse liquid supply tank for transferring rustproofing solution thereto from said rustproofing solution tank by the action of said pump to condition said rustproofing spraying system to be flushed, and valve mechanism for selectively predetermining the course of flow of said solution to said nozzles and to said rinse liquid supply tank respectively.

9. Rustproofing apparatus including a rustproofing solution spraying system having a supply tank and a plurality of discharge nozzles, a liquid rinsing system having a rinsing liquid supply tank, a pump in said spraying system for delivering rustproofing solution to said nozzles under pressure, a connecting conduit between said pump and said rinse liquid supply tank for transferring rustproofing solution thereto from said

rustproofing solution tank by the action of said pump to condition said rustproofing spraying system to be flushed, and means connecting said rinse liquid supply tank with said spraying system for returning said solution directly to said nozzles under the action of said pump after said flushing operation.

10. Rustproofing apparatus including a rustproofing solution spraying system having a supply tank and a plurality of discharge nozzles, a liquid rinsing system having a rinsing liquid supply tank, a pump in said spraying system for delivering rustproofing solution to said nozzles under pressure, a connecting conduit between said pump and said rinse liquid supply tank for transferring rustproofing solution thereto from said rustproofing solution tank by the action of said pump to condition said rustproofing spraying system to be flushed, means connecting said rinse liquid supply tank with said spraying system for returning said solution directly to said nozzles under the action of said pump after said flushing operation, and valve mechanism for selectively predetermining the course of flow of said solution.

11. Rustproofing apparatus including a spraying chamber, discharge nozzles in said chamber for spraying a rustproofing solution thereinto, a tank below said chamber having a top closure extending over all but a limited extent of one end portion thereof and declined toward said end portion, a sump registering with the open portion of the top of said tank and extending below the bottom thereof for receiving solid matter introduced into said solution during operation thereof, a plurality of baffles in said tank extending laterally thereof, opposite side edges of adjacent baffles being spaced from the opposite side walls of said tank respectively to provide a tortuous path for said solution, and means for delivering solution from the end portion of said tank opposite to said sump to said nozzles.

12. In rustproofing apparatus having means for continuously spraying and re-spraying a rustproofing solution of the type which reacts with the metal of the articles under treatment to form a protective coating thereon including a spraying chamber having a plurality of discharge nozzles therein, the combination of a tank for collecting excess sprayed solution and accommodating the latter during settling of any solid matter introduced into said solution during operation, said tank having an inlet and an outlet, and means including a plurality of baffle plates in said tank for causing the solution collected in said tank to follow a tortuous path in passing through said tank between said inlet and outlet.

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