

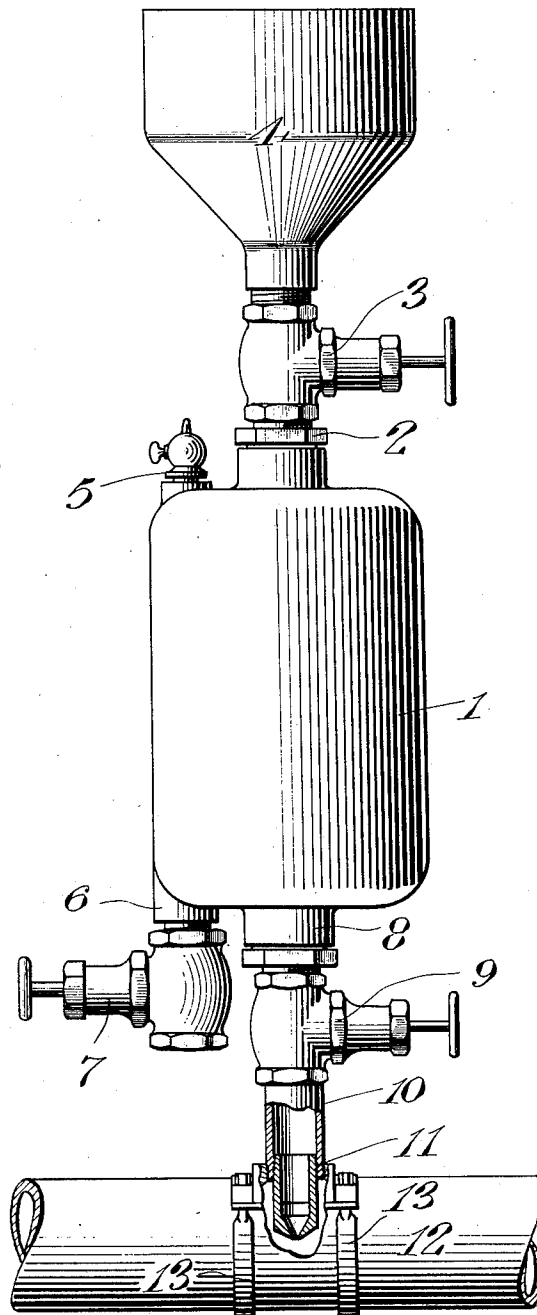
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METHOD AND APPARATUS FOR INTRODUCING RUSTPROOFING SOLUTION

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## UNITED STATES PATENT OFFICE

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## METHOD AND APPARATUS FOR INTRODUCING RUSTPROOFING SOLUTION

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This invention relates to a device for the introduction of relatively small quantities of solution into a confined stream of liquid and will be understood from the following description read in conjunction with the drawing which is a side elevation with parts in section of a preferred embodiment of my invention.

The apparatus comprises the receptacle 1 having an inlet 2 controlled by the valve 3 and terminating upwardly in the funnel 4. A relief cock 5 is provided to release gases when filling the receptacle. A drain 6 is also provided controlled by the valve 7. The receptacle is provided with an outlet 8 controlled by the valve 9 to which there is connected the nipple 10 carrying the nozzle 11. This nozzle has a relatively small orifice, preferably of capillary dimensions, and terminates in the stream of liquid to which solution is to be supplied. It preferably projects a substantial distance into the said stream so as to avoid the region of turbulent flow which is close to the wall surrounding the stream and to be positioned in the region of true telescopic flow. It will be understood, however, that the nozzle may be positioned at any point communicating with the stream and may, for example, be placed above or immediately below the valve 9. In the drawing, the stream is illustrated as flowing in the pipe 12, although a conductor of any form of cross-section area may be alternatively employed, and will be hereinafter referred to as a conduit. The receptacle and connecting parts may conveniently be connected to the conduit by means of clamps such as 13, or pipe fittings, or in any suitable manner.

My device is particularly adapted to the introduction of relatively small quantities of a corrosion preventing solution into water flowing in metal pipes to utilization points of variable demand. Such solutions are usually prepared with water as a solvent and usually have a specific gravity somewhat heavier than that of water. In any event, they are invariably and necessarily freely miscible with water. One of the important problems in connection with the use of such

solutions is to obtain a slow and comparatively regular introduction of the solution into the water without attention over a reasonably long period of time, and this condition is entirely satisfied by the use of my apparatus. The operation of my apparatus will now be described in connection with the employment of such a rust proofing solution, but it will be understood that it is equally applicable to the slow introduction of any liquid into another liquid miscible therewith.

In operating my apparatus, the valve 9 is closed and the receptacle drained by opening the valve 7 and the relief cock 5. The valve 7 is then closed, the valve 3 opened, and the receptacle filled with the corrosion preventing solution through the funnel 4. The valve 3 and the cock 5 are then closed and the receptacle 1 placed in communication with the pipe 12 by opening the valve 9. Inasmuch as the valves 3 and 7 and the cock 5 are closed and ingress of air is thereby prevented, it will be apparent that as soon as the valve 9 is opened the pressures in the receptacle 1 and in the conduit 12 will automatically become equalized. The interface between the solution and the water may initially be above the lower end of the nozzle 11, but diffusion in the receptacle 1 and associated parts and the flow of water past the nozzle 11 will in a short time cause the interface to be located at the lower end of the nozzle 11. The pressure at this interface between the solution in the receptacle 1 and the water in the pipe 12 will be the same as the pressure of the water in the pipe 12. There is, therefore, no difference in pressure to cause a flow of liquid from the receptacle 1 to the pipe 12 or vice versa, and this is true regardless of the relative specific gravities of the solution and of the water.

In spite of the fact that there is no pressure differential at the interface between the solution and the water, a certain amount of solution will slowly pass from the receptacle 1 into the pipe 12, and will be replaced by water. The solution in the receptacle 1 becomes more and more dilute as time goes on, and if the action were permitted to continue for a sufficiently long time the solution in

the receptacle 1 would be entirely replaced by water from the pipe 12. In practice, before this point is reached, the valve 9 is closed and liquid withdrawn from the receptacle 1 through the valve 7. The valve 7 is then closed and an additional supply of solution introduced into the receptacle through the funnel 4 and the valve 3, whereupon the valve 3 is closed and the cycle re-commenced.

10 The supply of the solution from the receptacle 1 into the stream of water flowing in the pipe 12 is in large measure proportional to the total quantity of liquid flowing through the pipe, and independent of the continuous or intermittent character of the flow. 15 Moreover, the quantity of solution supplied to the water in the pipe 12 is to a considerable extent responsive to variations in the rate of flow of the water. I believe that this gradual and relatively controlled supply of 20 solution from the receptacle 1 to the pipe 12 is due wholly to diffusion taking place between the solution in the receptacle 1 and the water in the pipe 12. Experiments that I 25 have made indicate that suction plays no perceptible part in this operation. The well known principles of diffusion, on the other hand account satisfactorily for the operation of my device. In any event, it is possible 30 by the use of my device to accomplish a slow and relatively controlled introduction of small quantities of a liquid into another liquid miscible therewith, said introduction taking place automatically over a relatively 35 long period of time without attention. Furthermore, the rate of addition is sufficiently constant and sufficiently proportionate to the total quantity of liquid flowing through the pipe 12 to be ideally suited for the purpose 40 of adding rust proofing and similar solutions to water systems.

It will, of course, be understood that where the liquid to be introduced or the liquid stream have corrosive properties, the materials of the conduit and distributing apparatus 45 will be appropriately selected to minimize corrosion.

It will of course be understood that the foregoing specific description of apparatus is 50 by way of illustration and not of limitation. It is my intention that the invention be limited only by the appended claim, or its equivalents, in which I have endeavored to claim broadly all inherent novelty.

55 Wherever I have used the term "capillary" with reference to the cross-sectional area of the connection between the receptacle 1 and the conduit 12, this term is to be construed as defining an opening of such cross sectional 60 area as would occasion capillary action in a tube containing a free space above the liquid level therein. It is to be noted, however, that the actual area of the opening in said connection will be dependent upon the viscosity 65 of the liquid involved under this definition.

#### I claim:

An apparatus for the slow continuous introduction into a stream of liquid flowing in a conduit of a second liquid miscible therewith, comprising in combination a receptacle 70 adapted to contain initially said second liquid only, said receptacle being situated above said conduit, means for preventing ingress of air to said receptacle, and a single connection 75 between the liquid in said receptacle and the stream of liquid in said conduit whereby diffusional interchange may be secured between said two liquids, said connection having a section with a cross-sectional area of capillary dimensions partially projecting into 80 said stream of liquid.

In testimony whereof, I have signed my name to this specification this sixth day of July, 1928.

RALPH M. PALMER.

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