March 22, 1938. B. H. URSCHEL 2,111,919

HEAT TREATING APPARATUS

Filed Dec. 10, 1937

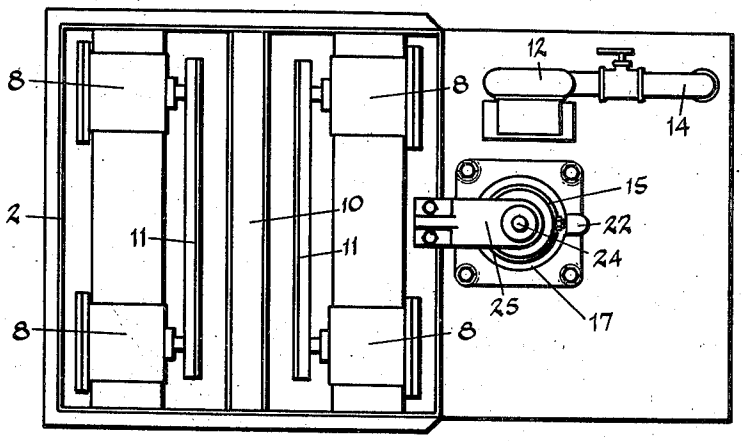


Fig 2

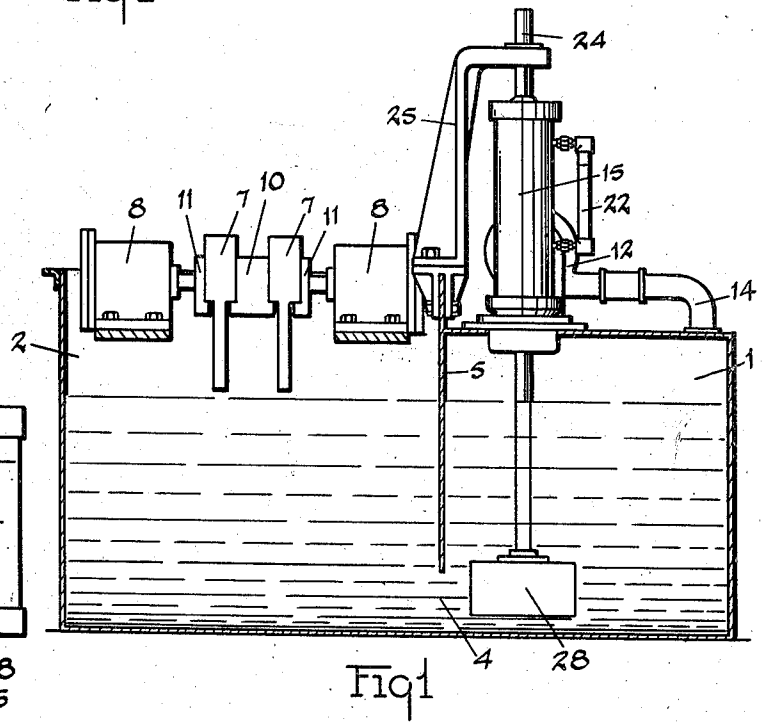


Fig 1

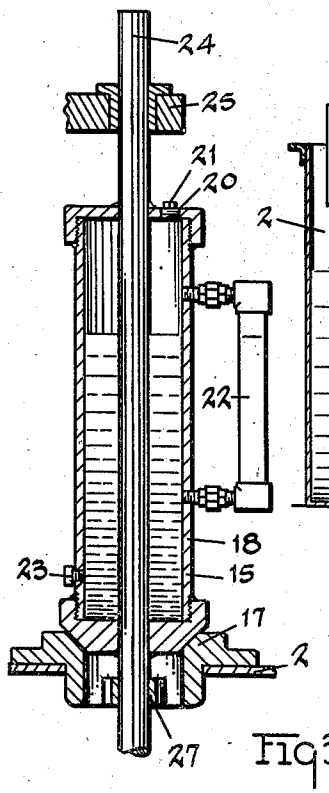


Fig 3

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HEAT-TREATING APPARATUS

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4 Claims. (Cl. 266—6)

My invention has for its object to provide a means for producing a predetermined maximum pneumatic pressure on the surface of a liquid in a container that communicates with a receptacle to raise the level of liquid to a desired level in the receptacle.

The invention also provides a liquid-weighted, pneumatic-pressure, release valve for limiting the differential head of liquids in a receptacle communicating with a closed container and expelled pneumatically from the container into the receptacle.

The invention particularly provides a pneumatic pressure means for expelling a ferrous metal heat-treating liquid from a closed reservoir to a heat-treating trough to produce a desired differential head between the liquids in the reservoir and the trough, the reservoir having a movable, normally float-balanced valve member additionally weighted by a column of said liquid having the same cross sectional area as the valve seat and a height the same as the desired differential head to limit the level of the liquid to which it may be raised in the trough by the pneumatic pressure in the reservoir.

The invention may be contained in structures of different forms and to illustrate a practical application of the invention, I have selected a heat-treating apparatus for heat-treating ferrous metals as an example of the various structures contained in the invention and shall describe the selected structure hereinafter. The particular structure selected is shown in the accompanying drawing.

Fig. 1 illustrates a vertical section of the heat-treating apparatus. Fig. 2 illustrates a top view. Fig. 3 illustrates a section of the liquid-weighted release valve.

The apparatus is provided with a substantially closed reservoir 1 that communicates with a trough 2 through an opening 4 formed in the lower end of the partitioning wall 5 that divides the reservoir from the trough. The trough 2 is provided with means for supporting articles formed of a material that is physically modified by contact of liquids. As an example of the application of the invention, steel tools, such as punches 7, that require liquid submersion to predetermined depths for short periods of time for tempering or hardening end or edge portions, are secured by means of suitable clamping devices that may be readily operated to secure the punches in position for simultaneous heat-treatment of a plurality of the tools. Thus, the punches 7 may be secured by pneumatic cylinders 8 that clamp the shanks or heads of the punches against an anvil or bridge 10. The pistons of the pneumatic cylinders 8 are provided with clamping heads 11 that engage the shanks of the tools to position the tools so that their ends project to definite points with reference to the normal level of the liquid in the reservoir and the trough.

The level of the liquid in the reservoir 1 is depressed pneumatically by introducing air under pressure into the reservoir. In the form of construction shown, a blower 12 is supported on the top of the reservoir and is connected to the interior of the reservoir by means of the pipe 14. The blower is driven by a suitable motor for causing rotation of its fan to produce a pressure sufficient to force the liquid above the level of the top of the opening 4 from the reservoir 1 into the trough 2.

The reservoir has a normally floatable valve that may be weighted by the liquid used in the heat-treatment of the punches 7 to limit the rise of the level of the liquid in the trough 2. The valve has a movable valve member 15 that seats upon a seat 17 formed in or secured to the top wall of the reservoir 1. The movable valve member has a shell 18, preferably cylindrical in form, having an internal diameter substantially the same as the inner diameter of the seat 17. The shell has an opening 20 that may be closed by a plug 21 for filling the shell 18 to the desired depth and a plug 23 that may be loosened or removed to lower the level of the liquid in the chamber to the desired point, as may be determined by a suitable gauge 22. The weight of the liquid introduced into the chamber counteracts the pneumatic pressure produced by the blower to cause the rise of the level of the liquid in the trough. The valve is opened when the pressure rises to a predetermined point and allows the escape of the air introduced into the reservoir by the blower and thus maintains the level of the liquid constant. The quantity of the liquid introduced into the chamber is sufficient to produce the desired differential head in the trough to submerge the lower ends of the punches 7 to the desired depth. The liquid that is used in heat-treating the articles affords a convenient material for producing, with exactness, a desired differential head in the liquid of the trough and reservoir. Introduction of the liquid into the shell 18 produces a differential head the same as the depth of the liquid in the shell.

The movable valve member 15 is connected to a rod 24 that is slidably supported on the end of

an arm or bracket 25 secured to the upper end of the trough 2, and by a boss 27 formed in a bridge located in the valve seat 17, the boss 27 having an opening through which the rod 24 may slidably move. The lower end of the rod is provided with a float 28 which substantially counterbalances the weight of the movable valve member 15 when the liquid contained in the shell 18 is removed. The inner diameter of the valve seat, being substantially the same as the inner diameter of the shell, is pressed by a pressure corresponding to that produced by the blower 12 which lowers the level of the water in the reservoir when the valve is held closed by the weight of the column of liquid within the shell 18, but when the pressure produced by the blower on the surface of the liquid in the reservoir 1 reaches a point sufficient to produce a differential head between the liquids in the reservoir and the trough substantially equal to the height of the column of the liquid in the shell, the pressure on the valve member is sufficiently great to open the valve and allow the air to escape from the reservoir 1 as it is introduced into the reservoir by the blower 12, and thus the valve maintains the level of the liquid in the trough 2 at the desired point with reference to submergence of the lower ends of the tools. When it is desired to return the liquid from the trough to the reservoir, the circuit of the motor that drives the blower 12 may be opened to cause cessation of the operation of the blower, whereupon the air will be forced from the reservoir through the pipe 14 and through the fan of the blower 12.

I claim:

1. In a heat-treating apparatus, a closed reservoir and a trough for containing a heat-treating liquid, the trough having means for supporting the articles to be heat-treated, a pneumatic pressure means connected to the reservoir for forcing the liquid from the reservoir into the trough, and a valve for opening the reservoir to allow the air to escape from the reservoir when the level of the liquid in the trough is raised to a desired predetermined level with respect to the articles to be heat-treated and maintain the level of the liquid in the trough at the said predetermined level.

2. In a heat-treating apparatus, a closed reservoir and a trough for containing a heat-treating liquid, the trough having means for supporting the articles to be heat-treated, a pneumatic pressure means connected to the reservoir for forcing the liquid from the reservoir into the trough, and the movable valve member of the valve having a chamber for containing a liquid for weighting the valve to produce the desired differential head in the reservoir and the trough and operative to open the reservoir when the level in the trough is raised to a desired predetermined level with respect to the articles to be heat-treated.

3. In a heat-treating apparatus, a closed reservoir and a trough for containing a heat-treating liquid, the trough having means for supporting the articles to be heat-treated, a pneumatic pressure means connected to the reservoir for forcing the liquid from the reservoir into the trough, a float located in the liquid and connected to the movable valve member of the valve for normally floating the valve member, and the movable valve member having a chamber for containing a liquid for counterpressing the pneumatic pressure in the reservoir and allowing the air to escape from the reservoir when the level of the liquid in the trough is raised to a predetermined point with respect to the articles heat-treated.

4. In a heat-treating apparatus, a closed reservoir and a trough for containing a heat-treating liquid, the trough having means for supporting the articles to be heat-treated, a pneumatic pressure means connected to the reservoir for forcing the liquid from the reservoir into the trough, a valve having a movable valve member and a fixed valve seat for opening the reservoir, the valve member having a cylindrical chamber, the inner diameter of the chamber being substantially the same as the smaller diameter of the valve seat and for containing liquid, and a float for counterbalancing the weight of the valve member and cooperative with the pressure of the air upon the movable valve member to open the reservoir when the differential head produced is substantially equal to the height of the column of liquid in the movable valve member to allow the air to escape from the reservoir as it is introduced and maintain the level of the liquid in the trough at a predetermined point.

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