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PROCESS FOR CAUSING SOLIDS TO BE PENETRATED BY OR IMPREGNATED
WITH LIQUIDS OR SOLUTIONS OF VARIOUS SUBSTANCES
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FIG. 2.

[Diagram of a process for causing solids to be penetrated by or impregnated with liquids or solutions of various substances.]

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[Signature]

[Diagram signature]
This invention relates to an improved process of and apparatus for causing solids to be penetrated by or impregnated with liquids or solutions of various substances.

The process is applicable generally, wherever it is desired to induce or force a liquid or solution or a liquid having solids in suspension therein into the pores or interstices of a solid. Some examples are, the treatment of hides or leather, the preservation or staining of wood, the filling or loading of textile materials, waterproofing materials, the curing or preserving of foodstuffs.

According to the invention, the substance is suspended in the liquid or solution in a suitable container, under pressure and then, by a continuous series of variations of the volume occupied by the liquid, there is produced a continuous series of impulses or variations in the pressure, depending upon the compressibility of the liquid and/or the solid acting with or without the elasticity of the container, the change of volume being effected by actual mechanical displacement of a portion of the liquid. Various means may be adopted for producing the impulses for example, the liquid in the container may be kept under pressure by a pump which draws its liquid supply from a reservoir, suitable valves being provided between the container, pump and reservoir. A bypass may be provided on the delivery side of the pump so that, when the by-pass is opened, continued action of the pump will produce continuous alterations in the pressure in the container. If desired the pump may be so driven that the speed of the delivery stroke is suddenly accelerated as the end of the stroke is reached, so that a more sudden increase of pressure is produced, causing a correspondingly sharper hammer blow or impulse on the liquid in the container. Again, a suitably loaded valve may be interposed between the pump delivery and the container which will cause the pressure to build up until a definite point is reached when the valve will open, causing a sharp impulse on the liquid in the container. Such a valve may be combined with a pressure storage vessel, an air vessel, for example, in fact, any method may be used whereby the liquid in the container is caused to receive a series of sharp impulses or pulsations.

To enable the invention to be fully understood it will now be described by reference to the accompanying drawings in which:

Fig. 1 is a sectional elevation of one form of apparatus suitable for carrying out the invention, and

Fig. 2 is a part sectional plan view thereof.

The apparatus illustrated is particularly applicable for treating hides or leather in a tan solution. As shown, it comprises a drum 3 having a filling funnel 4 at the top controlled by a stop cock 5, a connection 6 at the bottom for attachment to a pressure system and a support 7 for the material to be treated. One side 8 of the drum is removable and is provided with a handle 9 and is preferably bolted to the flange 10 of the drum, a rubber orlike packing ring 11 being inserted at the joint so that an airtight fit is ensured.

It will be understood that the drum is so constructed that it is airtight. The connection 6 at the bottom of the drum is adapted to receive a delivery pipe 12 connected to a suitable pump 13, the suction side of the pump being connected to a reservoir 14 containing the desired impregnating liquid. The pump is of any suitable type and an ordinary solid piston pump is here shown such as is used for supplying fuel in internal combustion engines. The delivery and suction valves of the pump are indicated at 15, 16 respectively. At a point between the delivery valve 15 and the drum 3 a by-pass line 17 is provided, connected to the pump chamber by a pipe 18 and running back into the reservoir as shown. Stop cocks may be provided at 19, 20 and 21. The reservoir 14 is further provided with a drain pipe 22 and a stop cock (not shown). The various pipes connected to the reservoir preferably terminate in a block 23, having passages as shown, secured to the reservoir bottom, and a filter may be arranged on the top of the
The wet hide is hung in the drum and the latter is filled with a tan solution of approximately 65 barkometer and is then placed under a mean pressure of 100 lbs. per square inch by means of the pump. The pump is then operated to produce a continuous variation of the pressure in the drum of 32 lbs. either way, that is to say, the forward or delivery stroke of the pump raises the pressure to 125 lbs. per square inch and the return or suction stroke reduces the pressure to 75 lbs. per square inch by displacement of the liquid in the closed circuit. Under these conditions, if the pump is operated at 250 strokes per minute, it is found that the hide will be struck through with a tan in approximately six hours. If a tan solution of approximately 200 barkometer is then substituted in the drum and the process is repeated, the pump running for approximately a further 18 hours at the same speed and producing the continuous pressure variations mentioned above, the hide will be completely tanned and filled.

It will be understood that any suitable form of pump or other apparatus for producing the desired pulsations may be employed and the pump or other apparatus may be driven by hand or power.

In a modification, the liquid in the drum may be separated from the liquid in the pressure system by a diaphragm and the pulsations produced by applying the pressure to the diaphragm. Such an arrangement is of advantage when dealing with corrosive fluids, since water or any other liquid may be used in the pressure system and the corrosive liquid confined to the drum.

In this case, it will be understood that the liquid in the drum will be placed under the desired pressure by suitable means before the pulsations are applied to the diaphragm.

In place of the diaphragm a cylinder containing a piston may be employed, one side of the piston communicating with the liquid in the drum and the other side with the pump circuit.

The process may be carried out with hot or cold liquids and it will be understood that the pressure of the liquid in the drum will be varied according to the nature of the substances treated.

Having thus described the nature of my invention and the best means I know of carrying the same into practical effect, I claim:

1. A method of impregnating a solid with a liquid, consisting in suspending the solid within a closed chamber completely filled with liquid under pressure and imparting to the liquid a continuous series of rapid impulses in the nature of hammer blows.

2. A method of impregnating a solid with a liquid, consisting in suspending the solid within a closed chamber filled with liquid under pressure and then by a continuous series of variations of the volume occupied by the liquid producing a continuous series of variations in the pressure, the changes of volume being effected by actual mechanical displacement of a portion of the liquid.

3. A method of impregnating a solid with a liquid consisting in suspending the solid within a closed chamber containing liquid under pressure and imparting to the liquid a continuous series of rapid impulses in the nature of hammer blows.

4. A method of impregnating a solid with a liquid consisting in suspending the solid within a closed chamber containing liquid under pressure and then by a continuous series of variations in the volume occupied by the liquid producing a continuous series of variations in the pressure, the changes of volume being effected by actual mechanical displacement of a portion of the liquid.

In testimony whereof I have signed my name to this specification.

HORATIO JOHN COLLINS.