

Jan. 19, 1932.

C. J. PATER

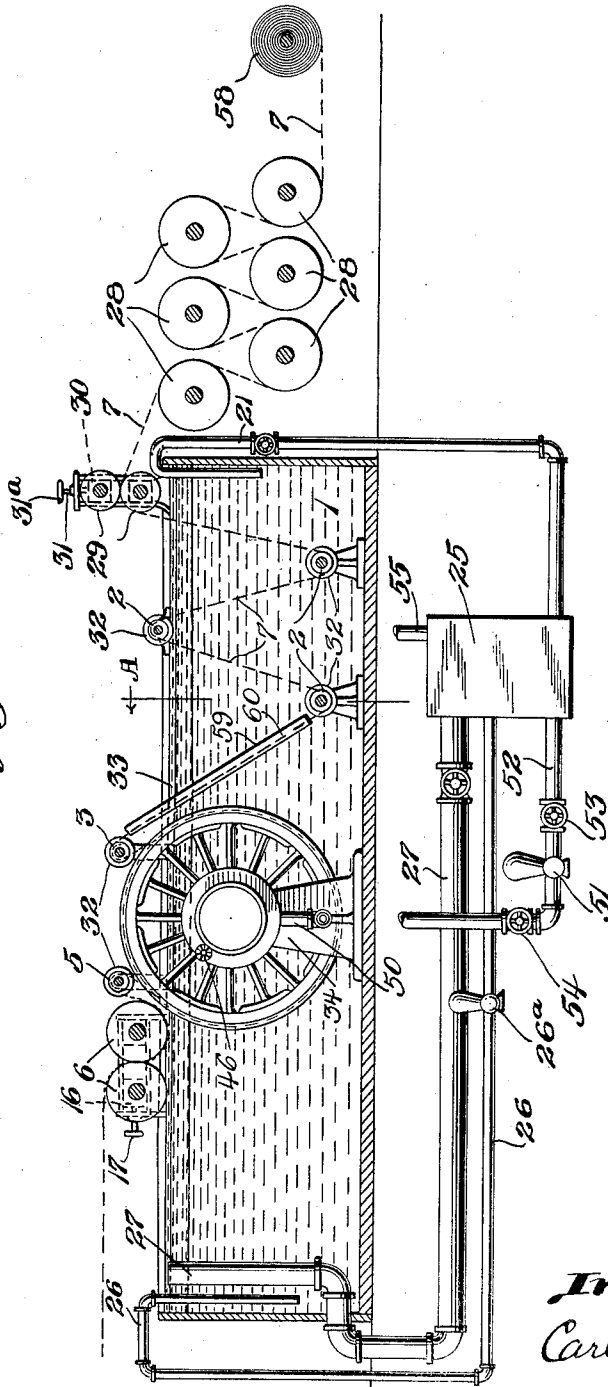
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SATURATING APPARATUS AND METHOD OF SATURATING

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3 Sheets-Sheet 1

*Fig. 1.*



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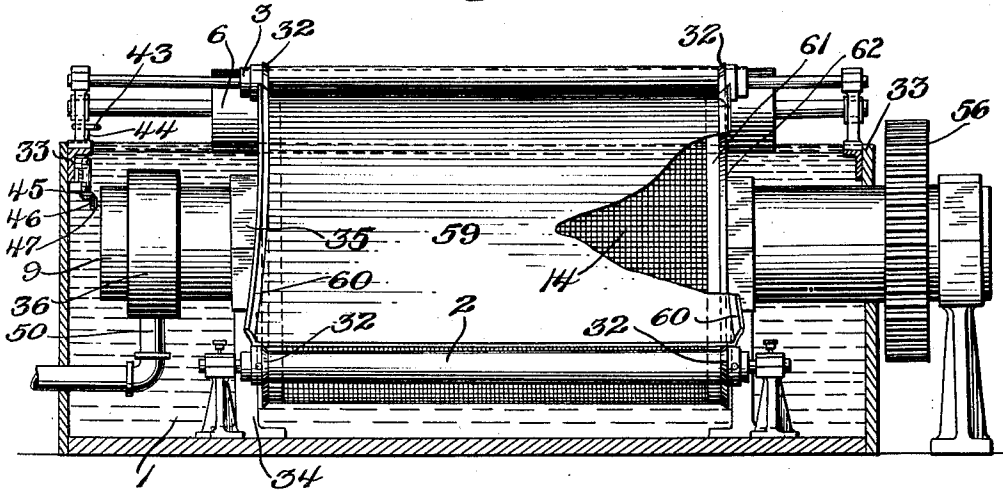
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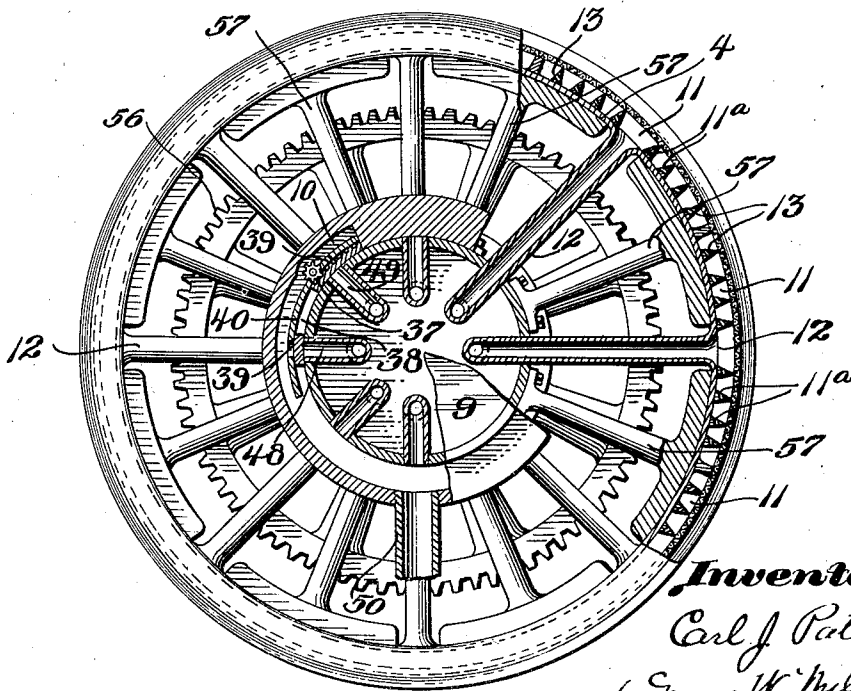
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*Fig. 2.*



*Fig. 3.*



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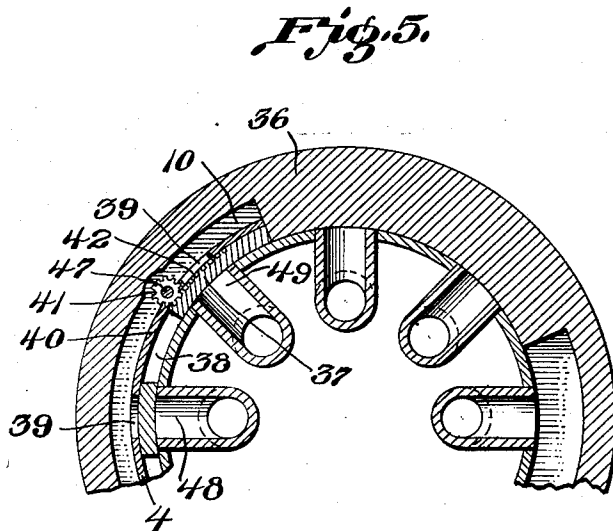
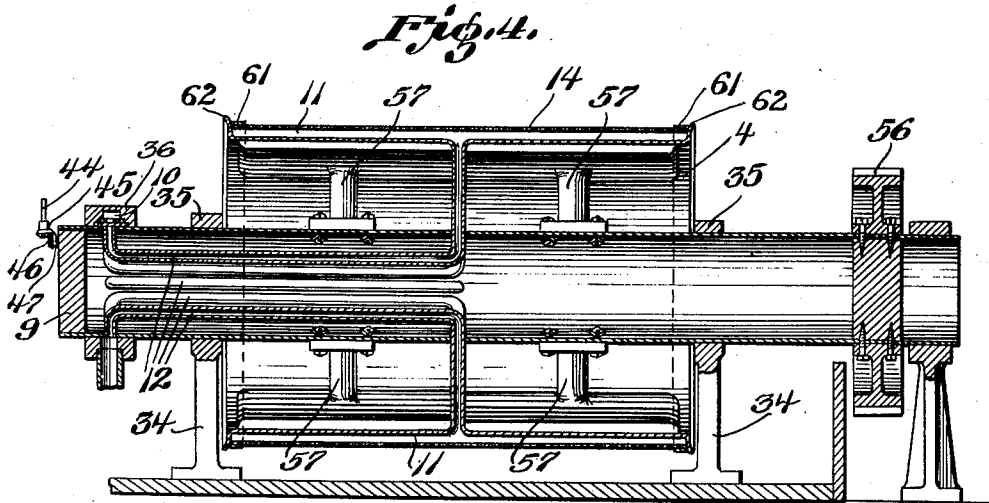
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SATURATING APPARATUS AND METHOD OF SATURATING

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3 Sheets-Sheet 3



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# UNITED STATES PATENT OFFICE

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## SATURATING APPARATUS AND METHOD OF SATURATING

Substitute of application Serial No. 514,483, filed November 12, 1921. This application filed June 29, 1926. Serial No. 119,464.

This application is filed as a continuation of my application Serial No. 514,483 filed November 12, 1921, for saturating apparatus and method of saturating.

5 My invention relates to the method of, and apparatus for, saturating felts, paper, canvas, burlap and similar products with bituminous or other saturating materials, such as asphalt, coal tar or any suitable material. It is especially adapted for use in saturating felt, paper for roofing purposes, sheathing purposes, floor covering purposes, etc. In saturating of felt, for instance for roofing purposes, floor covering purposes, etc., it is desirable that the  
10 saturating of the felt be not only thorough and uniform for practical purposes but that the saturating operation be performed rapidly. I have found that a substantially thorough and uniform saturation can be per-  
15 formed very rapidly by carrying the material on a movable support while subjecting it to a difference in pressure on opposite sides as for instance by creating a vacuum or partial vacuum on one side while on the  
20 opposite side the saturating material is supplied. Such method results in thoroughly and rapidly drawing the saturating material into and through the felt whereby a uniform saturation is obtained. I have found that by  
25 supporting the felt, or other materials, to be saturated upon a support such for instance as a wire mesh and then passing the support through, or in contact with, the saturating material while subjecting the material to a  
30 difference in pressure on opposite sides that the saturating material in contact with the face of the material is passed through the material thereby saturating it. This method may be performed with considerable rapidity  
35 and large quantities of the material saturated thoroughly and uniformly in a very short period of time. It also permits of regulation of the saturation as to the quantity of saturant left in the material. It permits of using a  
40 liquid or semi-liquid as the viscosity of the saturant used is dependent upon porosity of the material being treated. This method also permits of treating materials so as to merely coat the fibers or strands of the material if  
45 desired, such for instance, as the coating of

the warp and weft strands of burlap with a coating of waterproofing or other material without saturating the same. In carrying out my method of saturation, I provide a rotating drum adapted to be rotated in a tank  
55 containing saturating material. I preferably use a drum provided with a series of compartments and at the inner end of each compartment is a passage which is brought  
60 intermittently into register with one of a series of passages located in a head communicating with a pump adapted to create a vacuum in said head. The periphery of the  
65 drum is provided with a wire mesh support which acts as a support for the material to be saturated. The material to be saturated is fed to the periphery of the drum by passing  
70 it around a small rotating shaft or roll on to the wire mesh support forming the drum periphery. When the drum has rotated a considerable distance, preferably more than  
75 180°, the saturated material passes around another roller and away from the drum. As the material being saturated is in place on the rotating drum it is passed down into a  
80 tank containing the saturating material where, the compartments registering with the openings in the periphery of the shaft, the pump pulls a vacuum which draws the saturant through the material completely saturating it. The saturating material which  
85 passes through the material being saturated then passes out through the suction pump and back into the storage supply or into the saturating tank. Preferably means are provided for keeping the saturating material in the tank in which the saturating drum rotates at a given temperature.

I have also found that by preheating the material before it is subjected to the saturation treatment, the process is greatly facilitated and a more uniform saturation obtained. This preheating I perform by either  
90 subjecting the material to passage over or between heated rolls or coils or by passing it through the heated saturant. This preheating results in substantially removing the air and moisture from the material which facilitates the saturation.

I also provide means for maintaining the

saturant in the tank, in which the saturating drum rotates, at a substantially fixed level whereby the rotation of the drum being at a constant speed the material is subjected to the saturation under same conditions continuously throughout its length.

In the drawings accompanying this application I have shown one form of apparatus for carrying out my saturating method and will proceed to describe it as utilized by me in the manufacture of saturated felts for roofing, floor covering and similar purposes. Of course, the method and apparatus may be used for saturating any materials for the purpose of waterproofing them or may be used in the dyeing of materials or for any purpose where it is desirable to impregnate or saturate a felted or woven or other material.

In the drawings, Figure 1 is a side elevation of my improved apparatus, Figure 2 is a view taken on line A—A of Figure 1, Figure 3 is a section of the saturating drum, Figure 4 is a cross sectional view of the shaft of the drum, Figure 5 is an enlarged view of a detail of the valve.

In the drawings in which like numerals represent like parts, 1 is a tank or a receptacle into which is fed the saturating material through the pipe 21 which leads from the saturant mixer or heater or reservoir 25. Pipe 26 is a return pipe from the saturant tank 1 to the saturant heater or mixer or reservoir in which is located a pump 26a. Between the pump 26a and the tank 25 may be located a heater or mixer for the saturant. A circulation of the saturant from the heater or mixer through the pipe 21 to the tank 1, and back to the heater or mixer or reservoir by the return pipe 26 is thus maintained. 27 is a pipe which is arranged so that it will maintain a maximum level of the saturant in the tank 1. If desired a float valve may be located in the pipe 21 to be opened or closed by the level of the saturant. The circulation of the saturating material may be by means of a pump, or by gravity or otherwise as desired. I have shown a pump 26a in the return line 26 for this purpose.

Rollers 2, 2, 2 are arranged at the top of the tank and near the bottom to partially saturate the felt by passing it down into the saturant before it is submitted to the difference in pressure on its opposite faces. To preheat the felt, driving off all moisture and facilitate the saturation I have provided steam heated drums 28, which the felt passes over before it reaches the tank 1. 29—29 are pull rolls operated by suitably applied power to feed the felt into the tank. One of these rolls 29 is mounted in bearings 30 so as to regulate by screw 31 the pressure on the felt by rotation of the wheel 31a. 3 is a roller for guiding the felt to the rotating saturating drum 4. 5 is an idler roll which acts to guide

the felt away from the saturating roll 4. Upon rollers 2, 2, 2; 3 and 5 are arranged movable collars 32 adapted to be adjusted to the width of the felt being treated. These collars have their adjacent faces beveled to facilitate the felt being held in alignment. The rollers 3 and 5 also serve to hold the felt in position on the periphery of the saturating drum 4. To assist in keeping the felt in alignment for proper feeding to the drum 4, I arrange a guide way 59 which is as shown in the form of an open end pan having upwardly extending sides 60 which at the lower end are wider than the felt and gradually approach nearer until they are about as far apart as the width of the felt being treated. The sides 60 are preferably arranged so that they may be adjusted as to the distance apart to permit treatment of different widths of felt in the same way that the collars 32 are adjusted for this purpose. 6—6 are compression rolls mounted in moving bearings 16 so as to compress the saturated felt between the compression rolls 6—6. The pressure of the compression roll 6 may be increased or diminished by rotation of the screw 17 rotatably held in the bearing 16 so that rotation of the screw 17 will move the bearing 16 to increase or decrease the compression between the rolls 6—6. The rollers 3, 5 and 6 are mounted in bearings supported on the angle irons 33 fixed to the top of the sides of the tank 1. Rollers 2—2 of which there are shown three are mounted on supports, two on bottom and one on the sides of the tank 1. The saturating drum 4 is fixedly mounted upon a rotating shaft 9 on supports 34 in bearings 35 so as to rotate therein. Fixedly mounted on shaft 9 is a gear 56 which engages with another gear driven by any suitable power to rotate shaft 9. Preferably the drum 4 is provided with a series of compartments 11 in the periphery thereof open to the atmosphere except for a cover of wire mesh cloth or other suitable material through which saturant can pass. These compartments are held on radial arms 57 fixed on shaft 9. In the compartments 11, I provide supports 13 for the mesh cover 14. These supports are arranged so as to permit of free communication between all portions of the compartments 11 and for that purpose may have in them the passages 11a as shown in Figure 3. Upon these supports 13, I place a felt support 14, preferably of mesh like material which may be wire mesh or other suitable material adapted to support the felt while permitting the suction created by the vacuum or partial vacuum hereinafter referred to, to freely draw the saturant through the felt. In practical operation it will be found that the felt may vary slightly in width and thereby expose openings in the periphery of the drum 4, I provide flaps or endless belts 61 arranged so as to project under the edges of the felt

and cover the spaces in the mesh support 14 not covered by the felt. For these flaps 61, I preferably use a porous material which may be felt, canvas or any other material, through which the saturant may be drawn, whereby the felt being treated will be saturated in the portions that overlap the flap. As shown the drum may be provided with outwardly flaring rims 62 on each side to assist in locating the felt in the proper position on the periphery of the drum. Leading from each of the compartments 11 are pipes 12 which extend into the hollow shaft 9, through the shaft and out to openings in the periphery as shown in Figure 4. Surrounding the shaft and enclosing the ends of the pipes 12 is a sleeve 36 having a compartment 10 which extends three quarters of the distance around the shaft. This compartment as shown normally connects with six of the compartments 11 through the pipes 12. Of course, the compartment could be arranged so as to normally connect with more or less of the pipes if desired. To permit of closing one or more of the passages from the pipes 12, I provide a slide valve 37 which has openings 38 adapted to be brought into alignment with the opening in the periphery of the shaft 9 and an opening 39 in partition wall 40 as shown in Figure 5. This slide valve 37 is operated by rotation of the gear 41 which meshes with the gear rack 42 on the valve 37. The gear 41 is rotated, see Figures 2 and 4, by rotating the wheel 43 fixedly mounted on shaft 44 which carries bevel gear 45 meshing with bevel gear 46 on shaft 47 to which gear 41 is fixed. As shown in Fig. 5 the valve 37 is closing two of the openings in the periphery of the shaft 9 so that only 4 of the openings would be communicating with the compartment 10 in this arrangement. If it is desired to open others the valve 37 is operated by wheel 43 and the opening 38 is brought into alignment with the passage 48 in shaft 9 and the passage 39 in wall 40, whereby an additional opening is brought into communication with the compartment 10. Continued operation of the valve would without closing the opening just referred to, by reason of the size of the opening 38 in the valve 37 cause the valve to pass over the opening 49 so as to bring that into communication with compartment 10. This compartment 10 is fixedly held against rotation and has a pipe 50 leading from it to the suction side of a pump 51. From the discharge side of the pump 51 is a pipe 52 leading to the reservoir or tank 25. In the pipe 50 is located a valve 54 and a similar valve 53 is located in the pipe 52. When the pump 51 is operated it draws the saturant from the tank through the felt on the mesh cover 14 into the compartments 11 through the pipes 12 into the compartment 10 through the pipe

50 into the pump 51 and discharges it through the pipe 52 into the tank 25.

The saturant may be prepared and fed into the tank 25 through pipe 55 by gravity or by pump, from there it passes to the tank by gravity or by being pumped through the pipe 21. Suitable means should be provided for maintaining the temperature of the saturant in its passage and in the tanks such as heat insulation on the pipes, etc., and if desired means such as steam coils, etc. could be used.

If desired the series of rollers 2, 2, 2; 3 and 5 and roll 6 are preferably rotated by the application of suitable power at a speed in unison with the rotation of drum 4.

The operation of the apparatus shown is as follows: The tank having been filled with saturant to its maximum as controlled by the pipe 27 so as to preferably submerge all but a portion of the drum equal to an arc large enough to take in about three compartments 11 as shown in Figures 1 and 2. A roll of felt 58 is placed and fed around the apparatus as shown by the dotted line. The felt is preheated by passage over the rolls 28 and is fed into the tank 1 by the pull rolls 29—29. From there is passed around the rollers 2, 2, 2 and over the roller 3 to the drum 4. As the saturating drum 4 rotates, after the felt has been guided to it by passage over the guide roller 3, it carries the felt down into and passes it through the saturating material in the tank 1. This saturation operation is performed by the suction created by the pump 51 which creates a vacuum or partial vacuum in the compartments 11 covered by the felt. The felt is held in position on the mesh support 14 so as to permit the suction to pull the saturant through the felt. The mesh of the support 14 must be such as will permit this operation while at the same time small enough to hold the felt against being damaged. As the drum rotates the pipes or passages 12 leading from the compartments 11 are brought into register with the compartment 10 in the sleeve 36 and the pump 51 being in operation a vacuum or partial vacuum is pulled by the pump through the pipe line 50, compartment 10, pipes 12 leading to the compartments 11 so that this vacuum or partial vacuum draws or pulls the saturant through the felt thoroughly and uniformly saturating it. As shown in the drawings the arrangement is such that suction is only created for saturating the felt when the felt is below the level of the saturating material. To accomplish the removal of the surplus saturant the felt is passed between the compression rolls 6—6 where the surplus saturant is removed. If desired another roll in all respects like saturating roll 4 could be provided arranged after the saturating roll 4 shown in the drawing but not rotating in a saturant to

draw out the surplus saturant and also to dry the material by the passing through it of heated or cold air.

Claims:

5 1. In an apparatus of the character described, a tank, a drum rotating therein, compartments arranged in said drum, means for intermittently reducing and equalizing the pressure in said compartments as said drum  
10 rotates, said drum provided with a surface for supporting flat sheet materials.

2. In an apparatus of the character described, a tank, a rotating drum therein, compartments arranged in the periphery of said  
15 drums, means for pulling a vacuum in said compartment, means for passing the material to be treated through a saturant arranged ahead of the drum.

3. In an apparatus of the character described, a tank, a drum rotating therein, compartments arranged in said drum, means for  
20 intermittently reducing and equalizing the pressure in said compartments as said drum rotates, and means for regulating the number of compartments in which the last mentioned  
25 means are simultaneously acting, said drum provided with a surface for supporting flat sheet materials.

4. In an apparatus of the character described, a tank, a drum rotating therein, compartments arranged in said drum means for  
30 intermittently reducing and equalizing the pressure in said compartments as said drum rotates, flanges flaring outwardly from each other extending beyond the operative surface  
35 of said compartments.

5. In an apparatus of the character described, a tank, a drum rotating therein, compartments arranged in said drum, means for  
40 intermittently reducing and equalizing the pressure in said compartments as said drum rotates, and a guide pan for guiding the material to be treated to the drum.

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

CARL J. PATER.

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