

Sept. 20, 1927.

1,643,174

G. E. RICE ET AL

COMBINATION TREATING TANK AND DRY KILN

Filed July 21, 1925

4 Sheets-Sheet 1

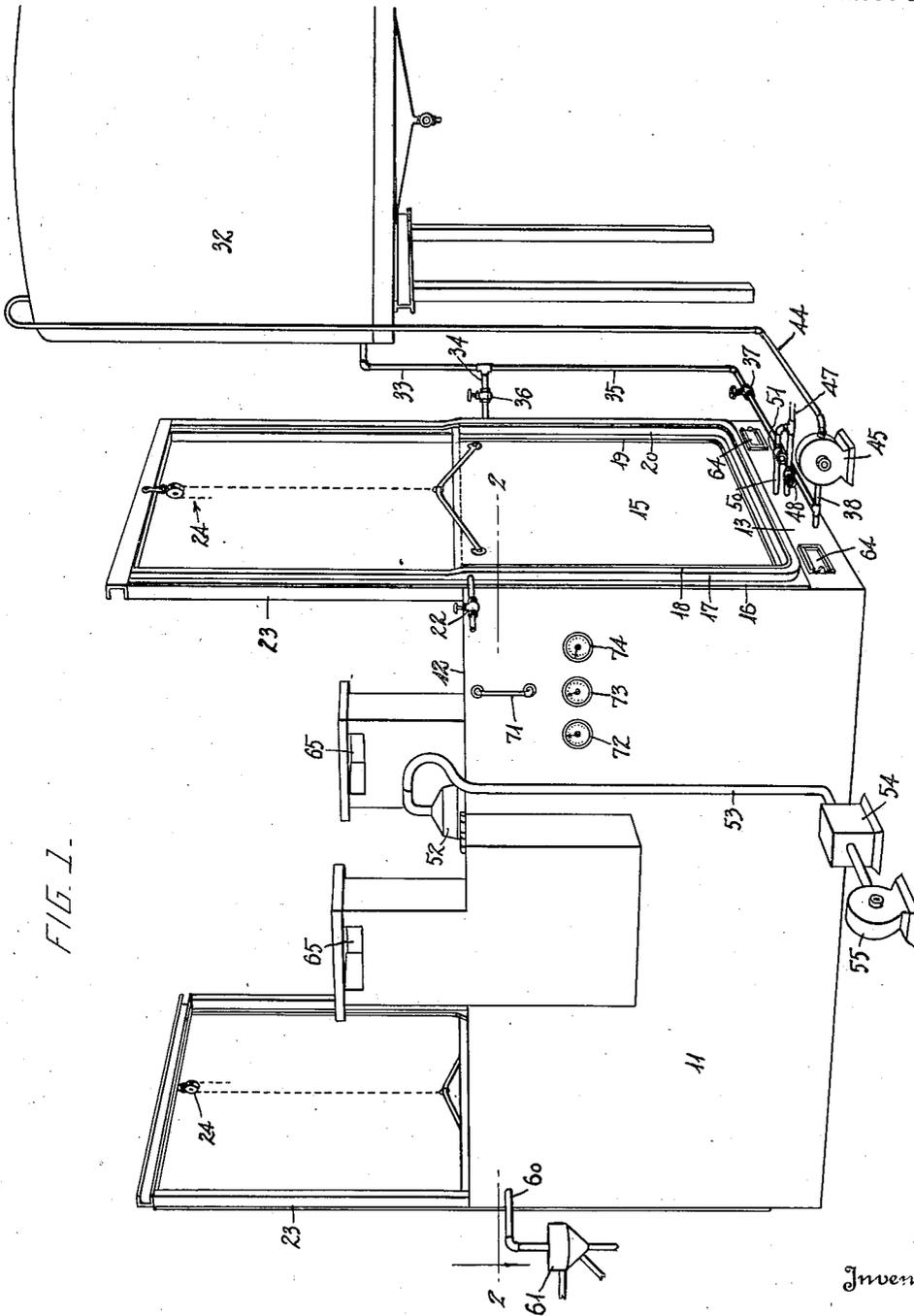


FIG. 1.

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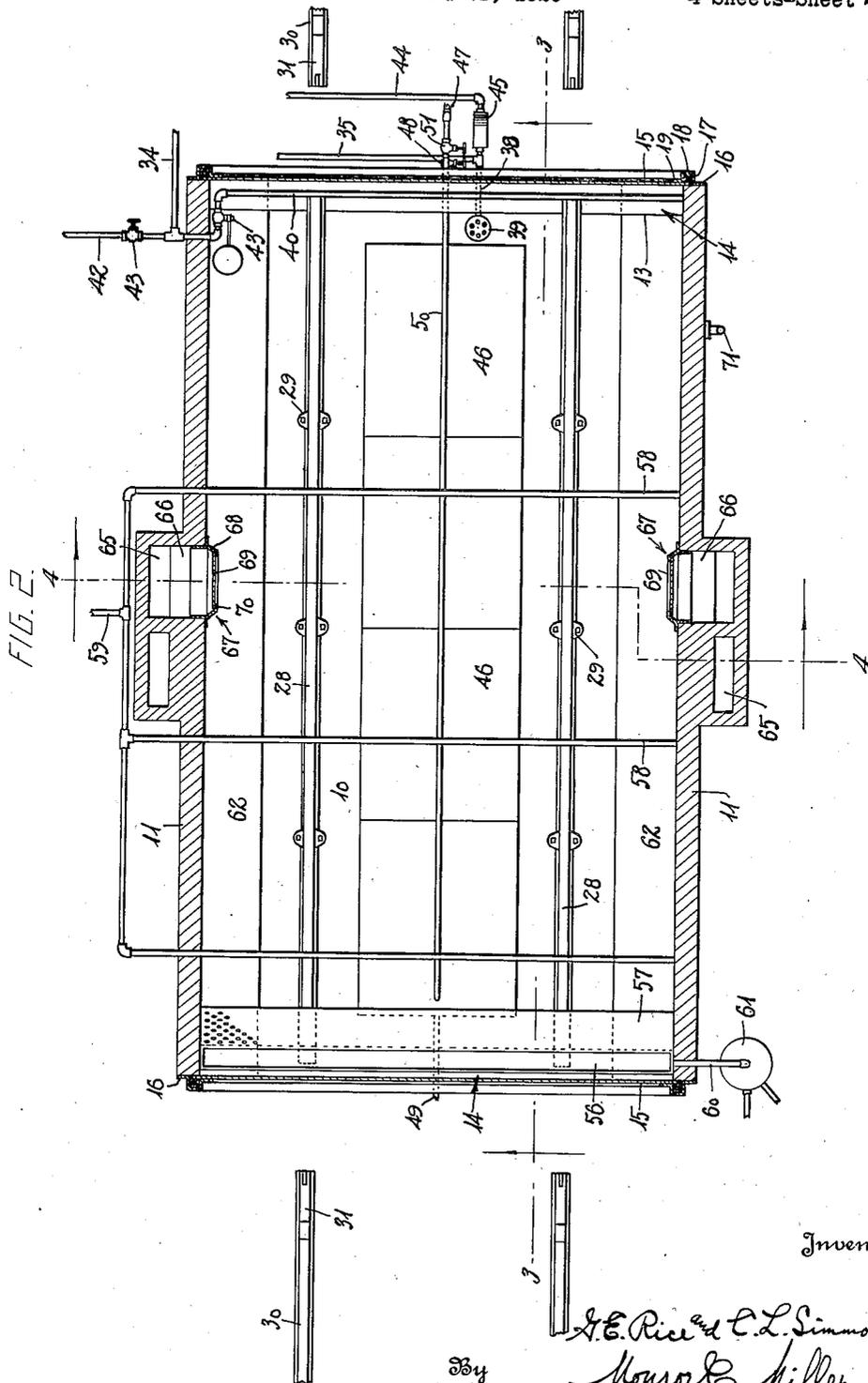
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COMBINATION TREATING TANK AND DRY KILN

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4 Sheets--Sheet 3

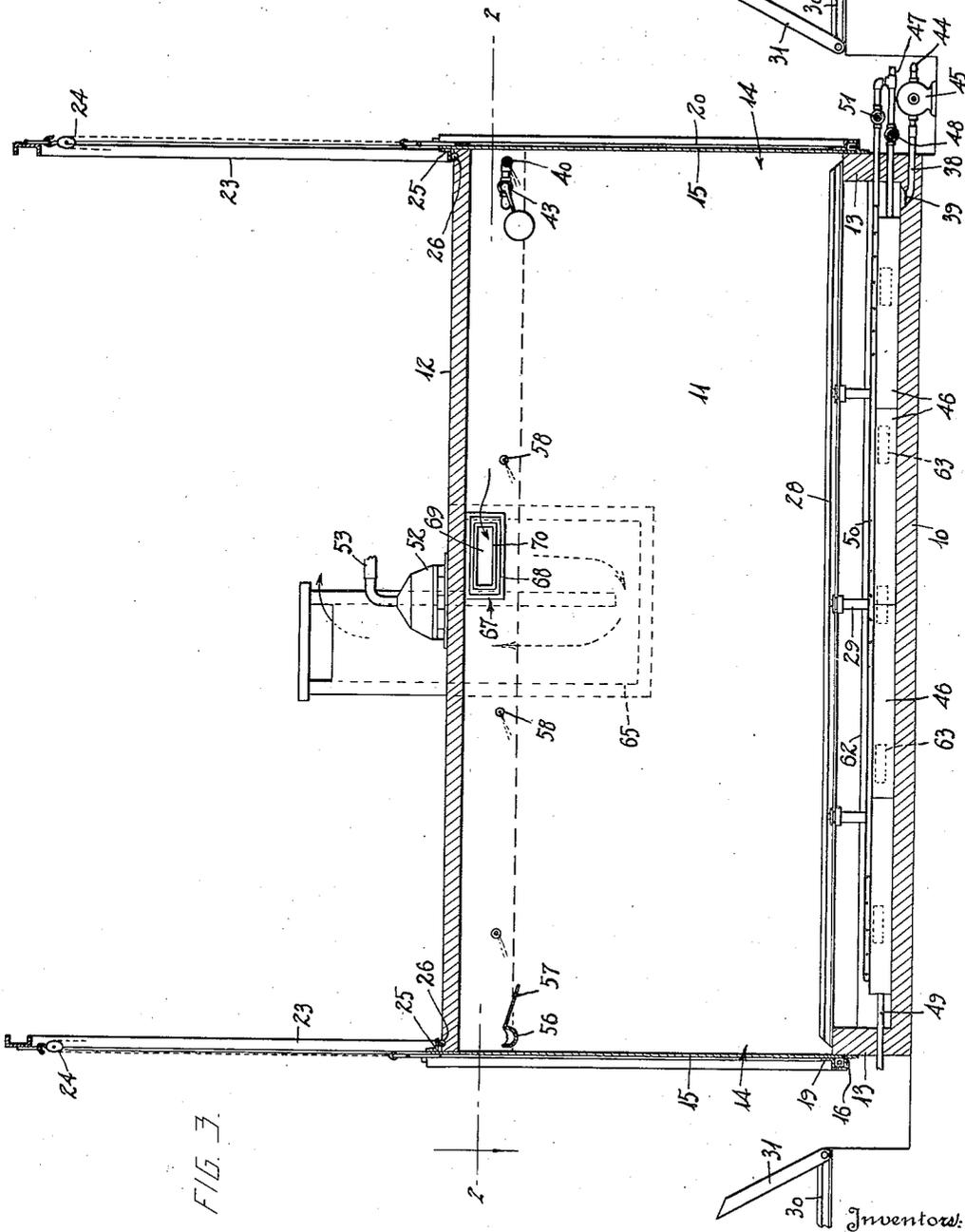


FIG. 3.

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Sept. 20, 1927.

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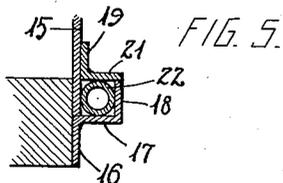
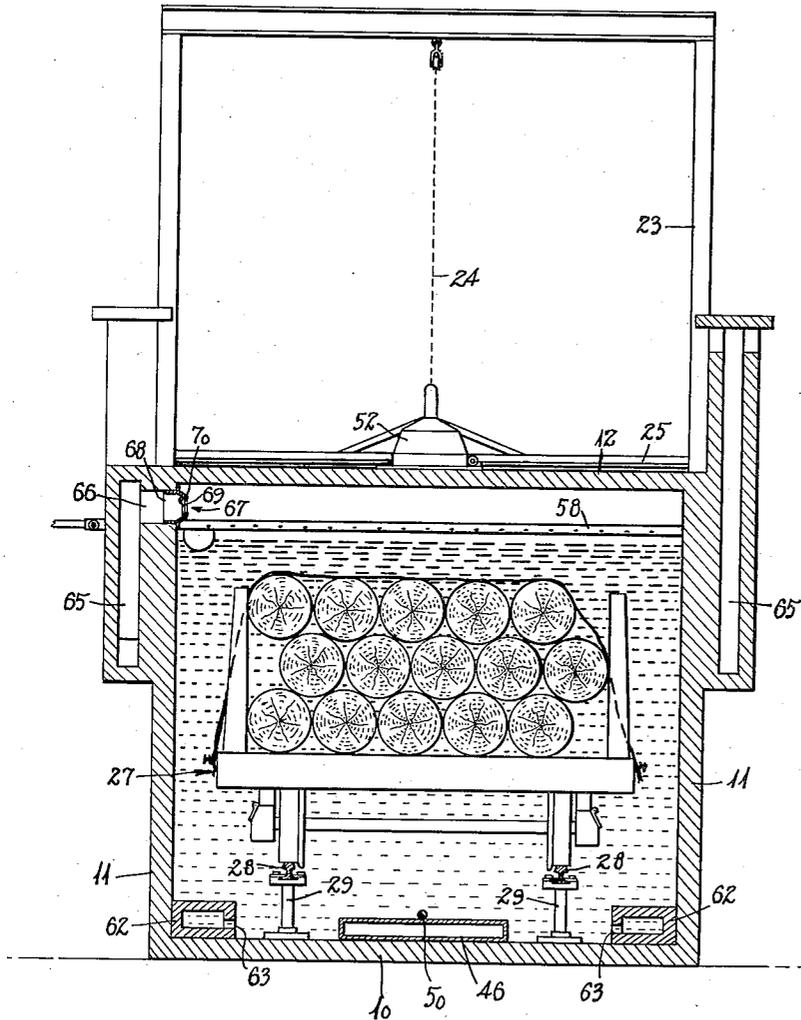
G. E. RICE ET AL

COMBINATION TREATING TANK AND DRY KILN

Filed July 21, 1925

4 Sheets-Sheet 4

FIG. 4.



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UNITED STATES PATENT OFFICE.

GEORGE E. RICE AND CLARENCE L. SIMMONS, OF BROOKLYN, NEW YORK, ASSIGNORS,
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COMBINATION TREATING TANK AND DRY KILN.

Application filed July 21, 1925. Serial No. 45,105.

The present invention relates to apparatus for the treatment of wood and other material, and aims to provide a combination treating tank and dry kiln in which the wood or other material may be cleansed, sterilized and impregnated with a preserving solution and then dried with a continuous operation, so as to save time and expense and also obtain desired results.

Another object is the provision of such an apparatus having means for drawing off or conveying the vapors to an approved condensing equipment and obtaining valuable by-products therefrom.

A further object is the provision of such an apparatus having means for removing the scum which rises to the surface of the liquid in order that valuable by-products may be obtained from the scum.

A still further object is the provision of such an apparatus having novel means for sealing the doors to provide air and liquid tight joints.

With the foregoing and other objects in view, which will be apparent as the description proceeds, the invention resides in the construction and arrangement of parts, as hereinafter described and claimed, it being understood that changes can be made within the scope of what is claimed, without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a perspective view of the improved combination treating tank and dry kiln.

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1.

Fig. 3 is a vertical longitudinal section on the line 3—3 of Fig. 2.

Fig. 4 is a cross section on the line 4—4 of Fig. 2.

Fig. 5 is an enlarged sectional detail of the door sealing means.

The tank, which also serves as a dry kiln, may be made of wood, or any other suitable material, and comprises the bottom 10, side walls 11, top or roof 12, and low end walls 13, the ends of the tank being open, as at 14, so that the material may be moved into and out of the tank. The openings 14 are closed by doors 15 of sheet metal or other suitable material, which are slidable vertically as shown.

In order to guide the door 15 for vertical movement and to seal the doors when in closed position, Z-irons 16 are secured to the ends of the tank along the vertical and lower edges of the openings 14 and have the outstanding webs or portions 17 and inverted flanges 18 behind which the vertical and lower edges of the doors extend. Angle irons 19 are secured to the doors along the vertical and lower edges thereof and have the flanges 20 extending along the edges of the flanges 18 and confronting the portions 17. A hose 21 extends along each of the Z-irons or members 16, so as to be confined between the flanges 18 and corresponding edge portions of the door and between the portions 17 and flanges 20. The hose 21 provides an inflatable packing or gasket, so that when the hose is inflated by compressed air, water or other fluid it will expand, and in pressing tightly against the door 15, flanges 18 and 20 and portion 17, the hose will provide an air and liquid tight joint between the door and body of the tank along the vertical and lower edges of the door. One end of each hose 21 extends outwardly and has a valve 22 in order that the flow of air into and out of the hose may be controlled, the air being discharged from the hose so that same is deflated when the door is to be raised for opening the tank.

Arches 23 are mounted on the end portions of the tank, and each arch and corresponding door may be connected by block and tackle 24 or other suitable means for conveniently raising the door.

In order to provide tight joints between the top 12 of the tank and the upper edge portions of the doors, angle irons or flanged members 25 are secured to the inner sides of the doors at the upper edges thereof and seat on packing strips 26 on the top 12 of the tank when the doors are lowered to closed position.

The lumber, timber, or other material is conveyed into and out of the tank on a truck 27, and the tank may be of sufficient size to hold a number of trucks. Rails 28 extend longitudinally in the tank for the movement of the trucks thereon, and are supported from the bottom 10 on standards 29. Rails 30 extend to and from the tank at the opposite ends thereof in alinement with the rails 28, and loose sections 31 can

be disposed between the rails 28 and 30 when the doors 15 are raised, so that the trucks or cars may move into and out of the tank. As shown, the loose sections 31 are hingedly
 5 connected to the rails 30 to swing down on the end walls 13 of the tank.

The liquid with which the material in the tank is treated is supplied from a reservoir 32 which, as shown, is elevated for the grav-
 10 ity flow of the liquid from the reservoir into the treating tank. A supply pipe 33 extends from the lower portion of the reservoir 32 and has branches 34 and 35 connected to the upper and lower portions of the tank. Said
 15 branches have the control valves 36 and 37, respectively. The branch 35 is connected to a pipe 38 leading to a drain opening 39 in the bottom 10 of the treating tank. The branch 34 is connected to a discharge pipe
 20 40 extending transversely across the tank at one end thereof above the level of the liquid when the tank is filled. A water supply pipe 41 is also connected to the pipe 40 and has a control valve 42, and a float controlled
 25 valve 43 controls the flow from either the branch 34 or the pipe 41 into the discharge pipe 40, in order to maintain the liquid in the tank at a predetermined level.

A return pipe 44 is connected to the pipe
 30 38, and a pump 45 is provided (between the pipes 38 and 44 as shown) for pumping the liquid from the treating tank back into the reservoir 32, in order to empty the treating tank and conserve the solution.

Radiators 46 are disposed on the bottom 10
 35 of the tank, and are supplied with steam from a steam supply pipe 47, a valve 48 controlling the flow of steam into said radiators, and the discharge pipe 49 leads from the radiators at the end opposite to the supply
 40 pipe 47. Any suitable radiators may be used.

A steam spray pipe 50 is connected to the pipe 47 and has a control valve 51. The
 45 pipe 50, as shown, extends longitudinally above the radiators 46, and when the valve 51 is opened steam will be discharged into the tank, when the device is used as a dry kiln, to supply the necessary humidity.

The vapors are drawn off through a hood
 50 52 on the top 12 of the tank, and a hose or pipe 53 leading from said hood. The hood 52 is preferably hinged on the top 12 so that the hood may be swung open for access into
 55 the tank from above. The hose or pipe 53 is connected to a condenser 54 to condense the vapors so that valuable by-products may be recovered, and a suction pump 55 is connected to the condenser 54 to draw off the
 60 vapors from the upper portion of the tank. The pump 55 is also used, as hereinafter pointed out, for creating sub-atmospheric pressure in the tank.

A scum trap is provided in the tank in
 65 order that the scum can be removed and

valuable by-products recovered therefrom.

As shown, the scum trap comprises a trough
 56 disposed transversely of the tank at one end thereof and at the level of the liquid
 70 when the tank is filled, with an inclined screen 57 extending downwardly from one edge of the trough 56 toward the opposite end of the tank. As shown, the scum trap is located at that end of the tank opposite
 75 to the end where the liquid delivery pipe 40 is located, and the jets of liquid discharging from the pipe 40 are directed toward the end of the tank where the scum trap is located so as to create a current at the sur-
 80 face of the liquid toward the scum trap. This current or flow of scum toward the scum trap is facilitated by the discharge of air, steam or liquid from pipes 58 extending
 85 transversely within the tank at suitable longitudinal points thereof above the liquid level, and the pipes 58 are supplied with air or fluid under pressure from a pipe 59. The air discharged from the pipes 58 is di-
 90 rected toward the end of the tank where the scum trap is located. Thus, the scum rising to the surface of the liquid is made to move toward the scum trap, and the scum passes
 95 up the inclined screen 57 into the trough 56, and any liquid passing over the screen 57 trickles down through the screen, so as to separate the liquid from the scum. The
 100 trough 56 is inclined slightly so that the scum will flow down to one end of the trough from which a drain pipe 60 leads to a centrifugal separator 61 that separates the solid and liquid matters of the scum, and the solid and liquid matters are discharged separately from the separator 61 which may be of any
 105 suitable type.

Air ducts 62 extend longitudinally of the
 105 tank at the corners between the bottom and side walls, and are provided at longitudinally spaced points with openings 63 in their inner sides for discharging air into the tank along the bottom thereof. Suitable
 110 doors 64 are provided to close the ends of the ducts 62 in order to shut off the flow of air into said ducts, and said doors are liquid tight, when closed, to prevent the escape of
 115 liquid when the tank is filled with liquid in the treatment of the material. The air ducts 62 are used for the admission of air when the device is used as a dry kiln.

The tank is provided with flues for the dis-
 120 charge of moisture laden air when using the device as a dry kiln. As shown, the flues 65 are formed in the side walls 12 and open at their inner ends, as at 66, into the tank adjacent to the top thereof and above the
 125 liquid level. From the air outlet openings 66 of the tank, the flues 65 extend downwardly and then upwardly to provide traps, and the upwardly extending portions of the flues rise above the top or roof of the tank. The discharge of air from the tank through
 130

the flues is controlled by regulators 67 comprising the frames 68 fitted in the openings 66, and flap valves 69 hingedly connected at their upper edges with the frames 68. Said frames have flanges 70 forming seats for the valves 69, whereby said valves serve as check valves to prevent air from flowing into the tank from the atmosphere through the flues 65. Said valves 69 close by gravity, and serve to regulate the flow of air through the tank or kiln, by requiring a slightly higher than atmospheric pressure in the tank to open the valves and permit the escape of air. Thus, the moisture laden air in the tank or kiln rising to the upper portion thereof will, by pressure against the valves 69, swing said valves open to let the air escape through the flues 65.

The treating tank is provided with a gage 71 to indicate the level of the liquid in the tank, and the tank is also equipped with a thermometer 72 to indicate the temperature of the liquid or air in the tank, a hygrometer 73 to indicate the humidity of the air in the tank or dry kiln, and a specific gravity gage or indicator 74. These instruments may be located at any suitable point.

The operation varies according to different grades or kinds of wood or other suitable material to be treated and dried, but briefly described is as follows:

The wood or other material is placed in the tank, which is conveniently done by loading the wood on a truck, skid, basket or other conveyance and moving it on the rails into the tank, one or both doors 15 having been opened. The doors are then closed and the hose 21 of each door inflated, thereby sealing the doors. The doors 64 of the air ducts 62 are also closed. The saccharine or other solution is then delivered into the tank, and may be run through both branches 34 and 35 of the pipe 33 by opening the valves 36 and 37. The wood is held down by any suitable means. When the tank is filled to or near the predetermined level, as shown in Fig. 4 and in dotted lines in Fig. 3, the valve 37 is closed, and the float valve 43 will then automatically control the flow of the liquid into the tank by the addition of either water, oil, or a mixed solution, as may be required, to maintain the liquid at the predetermined level. The valve 48 is then opened to admit steam into the radiators 46, so as to heat the solution or liquid. The heating of the solution may be continued for any desired length of time, according to the material being treated, and the temperature may be controlled for maintaining a predetermined temperature, or increasing or decreasing the temperature. The specific gravity of the solution may be controlled by controlling the valves 36 and 42 so that the solution from the reservoir 32 or fresh water may be delivered into the

tank, the specific gravity of the liquid in the tank being indicated by the gage 74. During the boiling or heating of the wood in the solution the liquid discharged from the pipe 40 and air discharged from the pipes 58 will create a current at the surface of the liquid toward the scum trap, so that the scum is directed toward the scum trap over the screen 57 into the trough 56. The scum is thus caught and discharged into the centrifugal separator 61 so that the solid and liquid constituents of the scum may be separated and valuable by-products reclaimed or recovered. The pump 55 may be operated during the impregnation of the wood in the solution, for drawing off the vapor rising from the solution, and the condenser 54 will condense the vapor so that valuable by-products may be recovered. The suction created by the pump 55 may also be used to facilitate the cooling of the solution in the tank, such as when the valve 48 is closed to shut off the flow of steam into the radiators. The withdrawal of the vapor from the upper portion of the tank above the surface of the liquid will create a sub-atmospheric pressure in the tank, and this will have the effect of carrying off the heat units from the surface of the liquid quickly, so as to facilitate the cooling of the liquid.

The process employed for treating, impregnating, seasoning and stabilizing wood may be of the character of the processes disclosed in the copending applications for patents of George E. Rice, Serial Nos. 726,834, 735,218 and 21,695, filed July 18, 1924, Aug. 30, 1924, and April 8, 1925, respectively. However, the apparatus may be used for other treating or impregnation processes, and different solutions may be used for impregnation of the wood or material.

After the treatment of the wood in the solution has been completed, following a predetermined schedule, the valves 36 and 42 are closed to shut off the flow of liquid from the reservoir 32 into the tank, the valve 37 having been previously closed. The liquid is then discharged from the tank by operating the pump 45 which will pump the liquid from the tank back into the reservoir. If desired, the interior of the tank may be washed out with hot water and rinsed before the drying operation takes place. This may be done by opening the hood 52 and spraying the water through the opening into the top of the tank, but this may not be necessary excepting with some solutions.

The drying operation immediately follows the completion of the impregnation of the wood and discharge of the liquid from the tank. A suitable dry kiln schedule is used, according to the grade of wood being treated and other conditions. The radiators 46 heat the air in the tank or kiln at the bottom thereof, and it will be observed that the

wood remaining in the tank after the liquid is discharged, will contain latent heat from the solution so that the drying action is facilitated. The valve 51 is opened in order to discharge steam into the kiln to supply the desired humidity, as indicated by the hygrometer 73, and the doors 64 are opened so that air flows through the ducts 62 and openings 63 thereof into the kiln. Fresh air is thus supplied at opposite sides into the kiln adjacent to the radiators 46, so that the air is heated below the wood, and the heated air rises past the wood. The moisture laden air rises to the upper portion of the tank or kiln, and the regulators 67 control the discharge of the air. Thus, the flaps 69 retain the air in the kiln until the pressure of the moisture laden air against the flaps 69 swing said flaps open, so that the moisture laden air can escape through the flues 65. Said flues serve as traps to hold the moisture laden air therein and thereby retard the flow of air from the kiln.

It is also possible to operate the pump 55 during the operation of the apparatus as a dry kiln, for withdrawing the moisture laden air and condensing the vapors to obtain by-product therefrom. The apparatus, when used as a dry kiln, is of a type known in the trade as the Emerson dry kiln, and the operating schedules thereof may be followed, with possibly some modifications owing to the impregnation of the wood with the saccharine or other solution previous to the drying operation.

The time required for drying depends on the material and other circumstances, and the heat and humidity are controlled according to schedules found best suited for the particular wood or material. After the drying has been completed, the doors 15 are opened and the wood removed from the tank or kiln, and a new load may be run immediately into the tank for impregnation and drying.

With the present apparatus the wood or material need not be touched or moved from the time it is placed into the tank until it is removed, and green timber or lumber, which may even be freshly felled, may be treated and then dried, so as to be ready for use in a few days, without requiring lengthy air seasoning. Not only is the handling of the wood reduced to a minimum, by the successive treating and drying operations in the same tank, but, furthermore, the wood remaining warm following saturation thereof, will facilitate drying which starts in immediately after the tank is emptied by the discharge of the liquid therefrom. The tank may even remain closed so that the heating or drying operation takes place immediately after the liquid is discharged, and the same radiators or heating elements 46 are used for heating the liquid during impregnation and

the air during drying. The pump 55 and condenser 54 are also used advantageously during the impregnation treatment and also during the drying step.

A tank may be used having solid side and end walls, with the top 12 removable, but this requires that the wood or material be lowered into the tank and lifted therefrom when the top is open. Such type of tank may be suitable for small operations when large capacity is not essential.

Having thus described the invention, what is claimed as new is:—

1. A combination treating and dry kiln apparatus including a closed liquid holding tank, heating means therein, air inlet means at the bottom of the tank having a liquid tight closure, air outlet means at the upper portion of the tank having a regulator preventing the inflow of air and adapted to permit of outflow at slightly above atmospheric pressure in the tank, and means for supporting liquid into and withdrawing it from the tank.

2. A combination treating and dry kiln apparatus including a closed liquid holding tank, heat radiators therein at the bottom thereof, an air inlet duct at the bottom of the tank, a liquid tight closure for said duct, an air outlet flue leading from the upper portion of the tank, a regulator controlling the flow of air through said flue and preventing the inflow of air and adapted to open outwardly by pressure within the tank slightly above atmospheric pressure, and means for supplying liquid into and withdrawing it from the tank.

3. In an apparatus of the character described, a liquid holding tank, a scum trap in the tank at the liquid level, and means for creating the movement of the scum at the surface of the liquid to said trap.

4. In an apparatus of the character described, a liquid holding tank, a scum trap in the tank, at the liquid level and means for directing fluid to the surface of the liquid in the tank for moving the scum to said trap.

5. In an apparatus of the character described, a liquid holding tank, a scum trap therein at the liquid level including a trough and an inclined screen extending from one edge of the trough, and means for creating the movement of the scum on the surface of the liquid to and over said screen into the trap.

6. In an apparatus of the character described, a liquid holding tank, a scum trap therein at the liquid level including a trough and an inclined screen extending from one edge of the trough, and means for directing fluid to the surface of the liquid in the tank for moving the scum to and over said screen into the trough.

7. A combination treating and dry kiln apparatus including a closed liquid holding

tank, means in the tank for heating either liquid or air therein, air inlet and outlet means for the tank arranged for the automatic flow of air through the tank when using the tank as a dry kiln, means for discharging steam into the tank to humidify the air therein, and means for supplying liquid

into and withdrawing it from the tank for impregnating the material in the tank.

In testimony whereof we hereunto affix our 10 signatures.

GEORGE E. RICE.
CLARENCE L. SIMMONS.