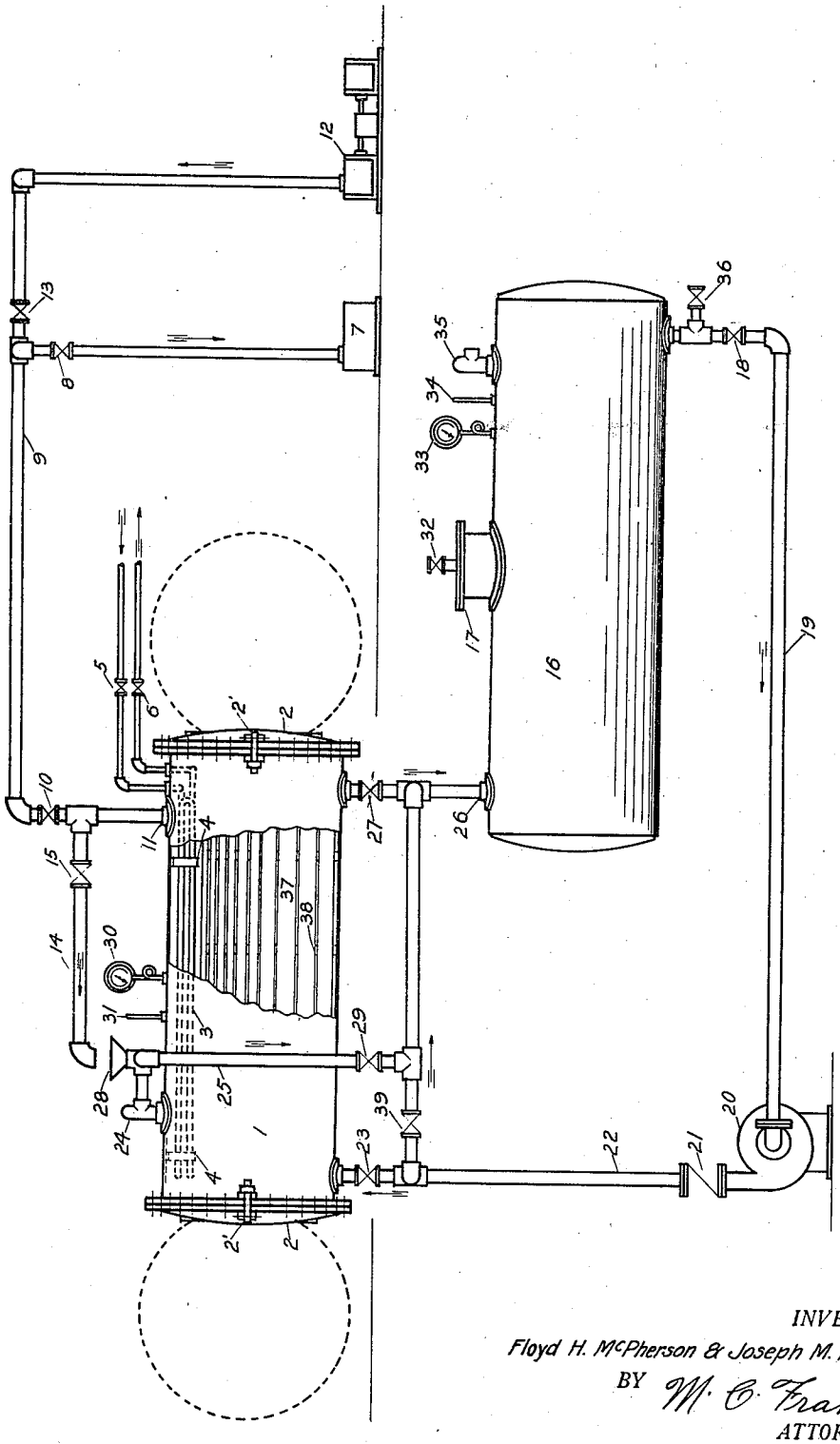
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PROCESS FOR TREATING WOODS AND OTHER POROUS SUBSTANCES

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PROCESS FOR TREATING WOODS AND OTHER POROUS SUBSTANCES.

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To all whom it may concern:

Be it known that we, FLOYD H. McPHERSON and JOSEPH M. ABRAMS, citizens of the United States, and residents, respectively, of the city and county of Los Angeles and the city and county of San Francisco, both in the State of California, have invented certain new and useful Improvements in Processes for Treating Woods and Other Porous Substances, of which the following is a specification.

Our invention relates to processes for the preservation of woods and other porous substances such as fabrics for aeroplanes, by means of forcing any high-grade pulverized cement, such as Portland cement in solution, into the pores of the substances.

The objects of our invention are to treat porous substances by our process, producing products impregnated with cement that will be impervious to moisture and thus permit no passage for general depreciation by the elements. Such products will be rendered more or less fire-proof and also offer great protection against wood-destroying agents common to supporting timbers in the ground or water.

It is also our object to so govern our process-treatment that the full fiber-strength of substances shall be maintained where such strength is necessary.

The principal articles to be treated are construction timbers, rail-road ties, piles, paving-blocks, fence-posts, shingles and small wooden products, also fabrics and other porous substances that could be beneficially treated for preservation by our process.

The accompanying drawing to which reference is hereby made illustrates an apparatus in side elevation for carrying into effect the process, in which:

1 is a metal receiving tank with preferably a hinged door 2 at each end adapted to be closed and sealed by any approved means, such as swing-bolts 2′ spaced around the edge of the door. 3 is a continuous coil of pipe for steam circulation resting on bracket-supports 4, the latter being secured to the inside top of the receiver. The pipe-coil is provided with an inlet and valve 5 and an outlet and valve 6 near one end of the receiver, the steam being supplied from any available source.

7 is a suitable vacuum pump with its suction pipe and valve 8 leading to the pipe-header 9 which is provided with a control valve 10 and terminates in the receiver at 11. 12 is a suitable air-compressor with its discharge pipe and valve 13 also leading into the header 9. From this header beneath its control valve 10, an over-flow pipe 14 extends with its valve 15.

Below the receiver is a mixing and storage tank 16 provided with a manhole 17 at its top, and at its bottom near one end with an outlet and valve 18; the tank being positioned on its foundation sloping slightly towards this outlet end. From the latter end a pipe 19 leads to the suction inlet of a centrifugal pump 20 preferably of the sand and gravel type; from its discharge outlet a suitable check-valve 21, pipe 22, and shut-off valve 23 lead to the bottom of the receiver 1 at one end.

At the top of the receiver is a relief valve 24 with its relief outlet connected to a relief-return line 25 to the mixing-tank 16. This line is open to the atmosphere at one end and its opposite end leads into a drain line 26 just beneath the valve 27. This latter line is the drain from the receiver to the storage and mixing-tank. The receiver also slopes towards its drain outlet. At the open end of the relief-return line is a funnel 28 located just under the outlet opening of the over-flow pipe 14. The relief-return line is also provided with a valve 29 and a branch line and valve 39 leading to it from the pipe line 22.

The receiver 1 is provided at its top with a vacuum and pressure gauge 30 and a thermometer 31, and the mixing and storage tank is also provided at its top with a valve 32, a vacuum and pressure gauge 33, a thermometer 34 and a relief valve 35, and at its bottom with a drain outlet valve 36.

Our process in treating porous materials with this apparatus is as follows: If the timber 37 is seasoned before undergoing our treatment, it is put into the receiver in any advantageous manner and the pieces are spaced apart from each other by thin strips 38. Part or the entire open space may be utilized up to the pipe-coils 3; the doors are then closed and sealed. Valve 15 of the over-flow line is opened and adjacent valve 10 closed.

In the mixing-tank 16 cement and water are put in through the manhole 17 and mixed until a thin solution results. We pre-

fer to accomplish this mixing through the action of the centrifugal pump 20. Valves 23, 29, 27 and 36 are closed and 18 and 39 opened. Pump 20 is then started and the solution flows from the bottom of the mixing-tank through pipe 19 and the pump and back to the mixing-tank at its top through inlet 26. This circulation is continued until the solution is thoroughly mixed and of the desired consistency. Inlet valve 23 to the receiver is then opened and valve 39 closed and valve 29 in the relief-return line opened. The thoroughly mixed solution then discharges into the receiver and around the timbers and the pipe-coil until it is completely full and over-flows through line 14 into the funnel 28, thence back to the mixing-tank 16. When the over-flow is observed, valve 15 is closed and pumping continued for awhile after maximum pressure capacity of the pump has been reached.

At this time steam inlet valve 5 and steam outlet valve 6 are opened and the live steam circulated through the coils 3. Pump discharge valve 23 is then closed and the pump stopped. The circulating steam heats the pipe coils which in turn impart heat to the solution causing the latter to expand. As the temperature of the liquid increases, expansion increases and the liquid exerts increasing pressure to the pores of the wood and the depth of penetration of the cement solution into the pores is thus controlled by the temperature of the steam, the quantity of it circulated and the time duration of the circulation.

Different grades of woods and fabrics require varying temperature and pressure conditions, the object being to so govern the operations that after treatment the fibers of the materials shall retain their full strength. In some cases of timber treatment strength is not so important, the problem being that of protection against wood-destroying agents chiefly.

As the treatment progresses the pressure and vacuum gauge 30 and thermometer 31 are observed, and when the predetermined pressure and temperature have been reached, together with the length of time required, the steam inlet valve 5 is closed.

The relief valve 24 is always set at a predetermined pressure to suit requirements and allowed to exhaust into the relief line 25 and to the atmosphere through funnel 28.

The receiver and contents are allowed to cool to partially set the cement, but in many cases we may prefer to drain the receiver before cooling. To drain the receiver, valve 27 in the drain line to the storage and mixing-tank is opened, also valve 15 in the overflow line for vent. Valve 32 on the manhole cover of the mixing-tank is also opened for vent.

The mixing-tank also has its pressure and vacuum gauge 33, thermometer 34, and relief valve 35 for noting the condition of the drained solution should it be desired to rerun it as soon as the contents of the receiver 1 have been removed and refilled with untreated materials.

As the treated materials are removed from the receiver, dry sand is thrown or sifted on each piece to keep them from sticking together when piled for drying or storage. If the apparatus is not to be immediately used again, the receiver and pipe lines are cleaned and hosed with water.

When green timber is treated the same process is repeated, but an additional preliminary step to dry the timber is necessary, which consists of creating a vacuum in the receiver by means of the vacuum pump 7, all immediate valves being closed with the exception of valve 10 and valve 8 leading to the vacuum pump. At the same time steam is circulated through the pipe-coil 3 to heat the receiver and its contents.

When the combined heat and vacuum accomplish the drying of the timber, the vacuum pump is stopped and the steam shut off and valve 10 closed; then the treatment already described is carried through and in some cases carried further when haste in the setting of the cement-impregnated products is desired. The latter is accomplished by compressed air from the air-compressor 12. Just previous to the draining of the receiver the compressor is started, valves 8 and 15 observed to see if closed and 13 and 10 opened, then drain-valve 27 is opened, also valve 32 on the manhole cover of the mixing-tank for vent. The air pressure on the cement solution in the receiver causes it to drain more rapidly than by gravity. The moment the draining is completed valve 27 and valve 32 are closed. The air pressure is continued and allowed to reach a predetermined pressure depending upon the character of the lumber treated, and maintained a sufficient length of time to set or partially set the cement. The timbers are then removed and sanded and are ready for use or storage.

Valve 32 of the mixing-tank is closed in order to keep the tank air-tight to prevent the liquid cement from evaporating or setting should it be desired to keep the liquid cement for some time; otherwise drain-valve 36 is opened and the solution drained off and the tank flushed out.

At the present time the pressures considered range from below atmosphere to 175 pounds, and the temperature from that of the atmosphere to 250 degrees, and the time for treatment from less than an hour to 10 hours, all depending upon the condition and character of the wood or materials to be treated. For example, redwood shingles are thoroughly treated in less than

an hour, while harder woods take a much greater length of time.

The apparatus throughout is designed for high pressure and all the valves, pipes, fittings and power-driven units are suitably selected for the functions each is to perform.

Our invention may be subjected to modifications within the scope of the appended claims without departing from its spirit.

Having thus described our invention, what we claim and desire to secure by Letters Patent, is:—

1. The process of preserving porous substances of the described character, which consists in impregnating them with cement in solution by means of pressure.

2. The method of treating green timber products, consisting of exhausting the air and moisture from the pores thereof and forcing into said exhausted pores liquid cement, producing thereby cement impregnated products for the purposes set forth.

3. The method of treating wood products, consisting in heating the wood and exhausting the air moisture from the pores thereof, and forcing into the said pores a cement solution and retaining the pressure thereon after the enveloping cement solution has been drained off until the impregnated cement partially sets, substantially as described.

4. The method of treating porous substances, consisting of exhausting the air and moisture from the pores thereof, and injecting into said exhausted pores a liquid cement.

5. The method of treating porous substances, consisting in filling the pores or interstices thereof with cement in solution by pressure, and said pressure adapted to be retained thereon until the cement partially sets.

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