To all whom it may concern:

Be it known that we, FRITZ PFLEUMER, engineer, a subject of the Austrian Emperor, residing at Dresden, A., 48 Marienstrasse, Germany, and HERMAN PFLEUMER, engineer, a subject of the Austrian Emperor, residing at Dresden, A., 18 Johannstädtener Ufer, Germany, have invented new and useful Improvements in the Treatment of Lumber; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to the treatment of lumber and its particular object is a method of treating light and porous lumber with a view to obtaining a heavy, non-porous material having all the favorable qualities of high grade lumber, and particularly a high specific weight, great hardness, capacity of assuming a high polish and great resistance to the influence of moisture.

We are aware that methods are known for rendering lumber more dense by compression; however such methods merely use mechanical pressure produced by pressing or rolling. In contradistinction thereto our method consists in subjecting the lumber at temperatures varying from 90 to 150 degr. C. to a high-pressure—either hydraulic or gas pressure—acting upon the lumber from all sides. This treatment causes the tubular cells constituting the lumber structure to be considerably narrowed or to be compressed to a total vanishing of the longitudinal pores, that is to say, the piece of lumber thus treated contracts in section, but not in the direction of the fibers. The pressure acting upon it from all sides absolutely excludes the danger of crushing the structure of the wood, which is to be feared with all processes based upon mechanical compression.

During the compression no gas or liquid should enter into the longitudinal pores, or else no excess pressure from without could be created nor would the structure undergo any compression.

Accordingly our process is carried out for instance in the following manner: The lumber to be treated is covered with a layer of tough elastic material absolutely impervious to the pressure generating medium, for instance with a skin of cheap rubber or a coating of soft metal such as lead, and a gas or hydraulic pressure of at least 200 kg. per square centimeter is allowed to act upon it at a temperature of from 90 to 150 degr. C. This mode of carrying the process into effect is rather too expensive for commercial purposes, it being very difficult to render a comparatively thin coating absolutely impervious to hydraulic and even more so to gas pressure. For commercial purposes the following far simpler, cheaper and safer method can be recommended: A vessel adapted to withstand high pressure, preferably an upright thick-walled steel cylinder being closed at one end and provided with a tight-fitting cover at the other end and inclosed in a heating envelop adapted to heat it to about 150 degr. C., is filled with a material which is viscous at this temperature. Pitch, asphaltum, resins, dense solutions of glue and the like are suitable for this purpose; we prefer employing ordinary asphaltum such as is used for street pavements. The asphaltum is freed from gases by several hours' boiling and in case it should still be found too tough, some pitch is added. Into this tough mass the lumber is totally immersed and fixed therein so as to be prevented from rising to the surface. The pressure-cylinder is then closed and the empty space above the asphaltum is filled with compressed gas or a liquid, preferably water is pressed in, until the required pressure—200 kg. per square centimeter at the least—is reached. When employing a pressure liquid, according to the progressing contraction of the lumber treated fresh liquid should be introduced, while if compressed gas is used, this is not necessary, as a rule, owing to its higher elasticity. After the lumber has been subjected to the pressure for 2 or 3 hours, the pressure is released and the cylinder is opened. The lumber has been converted by compression into a considerable more dense product and volume reduction of one third or one half of its original volume has taken place. In this way logs can be compressed, to be worked only after the compression. The process does not pertain to a final shaping, but, contrary to the mechanical pressing-processes, merely reproduces the raw heavy lumber.

The color, density and other qualities of the product obtained depend upon the na-
ture of the raw material treated and upon the temperature and pressure employed. Higher pressure and higher temperature produces an end-product of greater hard-
ness and better polishing capacity.

It will be observed that when a liquid is employed for the purposes of our inven-
tion, such liquid is used in a condition of great density or viscosity, and for this rea-
son the liquid does not impregnate the wood, but simply exerts pressure thereon exter-
ally.

Although it is possible to increase the density of highly porous lumber without heating, merely by the action of hydraulic or gas pressure, nevertheless such densifica-
tion as expressed by an increase of the specific weight, is not only far less than by simultaneously applying heat, but also ex-
tends merely to the porous layers of the lumber and at the end results in a mechani-
cal deterioration of the structure of the wood.

Example: Dry pine- or fir-lumber of 0.82 specific density is heated for 2 hours in molten asphaltum to 150 deg. C. at a pres-
sure of 230 kg. per square centimeter. The product obtained is a lumber having a spe-
cific weight of 1.45 and a chocolate-colored section and being capable of being highly polished.

We claim:

1. The method of treating lumber and the like to increase its density, which consists in sub-
jecting such material, at an ele-

vated temperature, to pressure transmitted through a fluid in contact with said mate-
rial externally but of such nature as not to penetrate into it materially and impervious to the pressure-generating medium.

2. The method of treating lumber and like materials to increase their density, which consists in immersing the material in a liquid of considerable density or viscosity incapable of penetrating materially into the pores of the material, and applying pressure to such liquid while heating it to a tempera-
ture of from 90 to 150° centigrade.

3. The method of treating lumber and like porous materials to increase their den-
sity, which consists in enveloping the ma-
terial in a protective liquid which closes the pores on the surface of the material but does not enter said pores materially, and then applying pressure to said liquid to compress the material without impregnating it with said liquor.

4. The method for the densification of lumber which comprises heating the lumber submerged in a bath of molten asphalt for about two hours at a temperature of about 150° C. and at a pressure of about 230 kg. per square centimeter.

In testimony whereof, we have signed this specification in the presence of two sub-
scribing witnesses.

FRITZ PFLEUMER,
HERMAN PFLEUMER.

Witnesses:
HENRY HASSEL,
ALLEN T. JENKINS.