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PROCESS OF MAKING FIRE PROOFED WOOD AND LIKE CELLULAR PRODUCTS

No Drawing.

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This invention relates to a process of making fire-proofed wood and like cellular products, and particularly to a process of fire-proofing wood furniture.

5 An important object of the invention is to provide a process of the character referred to which is simple, efficient and relatively inexpensive.

10 Another object of the invention is to provide a process by which wood and other like cellular products can be satisfactorily fire-proofed at ordinary atmospheric pressure.

15 A further object of the invention is to provide an improved process of producing fire-proofed articles of wood or other cellular material in which the article is first made in the desired form, and the article subsequently treated to fire-proof it.

20 A further object of the invention is to provide a process of the character referred to which eliminates the necessity for constantly resharpening the tools used in producing the article, such as is necessary when the material which is used to form the article is first fire-proofed and subsequently formed into the desired article.

25 A further object of the invention is to provide a process of the character referred to which materially decreases the amount of dust which is usually incident to the production of fire-proofed wood and the like cellular products by processes in which the material used to form the article of furniture is fire-proofed prior to forming the article.

Other objects and advantages of the invention will become apparent from the following description.

30 Heretofore it has been proposed to fire-proof wood furniture by covering the surfaces thereof with a paint containing an incombustible material such as silicate of soda, chalk and the like. It will be apparent that
45 this method can not be used if it is desired that the grain of the wood be visible in the finished product. It also is known that wood may be fire-proofed by impregnating it under pressure with materials such as ammonium sulfate, borax, ammonium phos-

phate, sodium phosphate and other similar products which when subjected to temperature high enough to fuse the impregnating material, evolve noncombustible vapors, and leave fusible salts deposited in the pores of the wood. The impregnation of the material desired to be fire-proofed with a fusible salt under pressure accordingly is the process most commonly used. This method has several disadvantages among which is the length of time required to carry out the process. After the wood has been impregnated with the fire-proofing material it is necessary to dry it in a kiln or similar drying device. The total time usually required from the time the wood is sent to the impregnating plant until it is returned from the kiln, dried and ready for use by the furniture maker is ordinarily about six weeks. Another disadvantage of this process is that the wood which has been impregnated with the salt is very dusty when being worked and is consequently objected to by the workman. Furthermore, sawing, planing and otherwise working the impregnated wood is accomplished with such difficulty that the tools used become dull very rapidly and it is necessary to resharpen them about three times as often as would be required if the tools were used to perform an equal amount of work on untreated wood. Saws of the rotary type, such as disk saws and band saws, heat up much more rapidly than they do when employed on untreated wood and there is a pronounced tendency for these tools to lose their temper.

Textiles such as curtains and portières have been fire-proofed by treating them with various salts such as ammonium phosphate, ammonium sulfate, borax, alum and other salts, but this treatment has not proved successful in the treatment of wood and like cellular products unless the impregnation has been carried on under elevated pressure.

The most advantageous method of making fire-proofed furniture is by a process in which the furniture is first made up into the desired finished form from untreated material and the article thereafter subjected to a fire-proofing treatment which may be fol-

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lowed by the usual finish coating of shellac, varnish or other desired finishing material. Previous attempts to devise such a process have proved unsuccessful for the following reasons:

5 If an alkaline material, such as sodium silicate, borax or sodium stanate is employed, the alkali attacks the varnish or other finish coating rendering the product unattractive in appearance and unsalable. 10 If on the other hand, it is attempted to employ a neutral salt to impregnate the article, the salt fails to penetrate the fibers of the wood and thus fails as a medium for fire-proofing the article.

15 I have discovered that I may successfully employ a solution of a fire-proofing salt such for example, as an alkali metal phosphate, and preferably a solution of ordinary 20 ammonium phosphate $(\text{NH}_4)_2 \text{HPO}_4$ in the presence of a gaseous or readily volatile alkaline agent, such for example as ammonia or a gaseous or freely volatile alkyl derivative thereof but preferably ammonia, 25 as a treating solution to render the article fire-proof. Amines have an even more marked basic character than ammonia and the lower amines are either gaseous or highly volatile. While these lower amines are 30 well suited for use as agents for causing the fire-proofing salt to penetrate the wood at ordinary atmospheric pressure and are removed by simply drying, their disagreeable odor renders their use unpleasant. Of 35 all the impregnation promoters investigated, ammonia has been found to be most satisfactory for practical use. The formed article of furniture may be dipped in a bath of a solution of the character referred to, 40 or the solution may be sponged or sprayed on to the wood either at ordinary room temperature or preferably at a temperature 10 or 20° F. above room temperature, or the article may be treated with the solution by 45 any other desired method. The fire-proofing salt in the presence of the alkali rapidly penetrates the fibers of the wood, and after allowing the article to dry for a few days by exposing it to the atmosphere, the 50 free ammonia volatilizes leaving the fire-proofing salt in the fibers of the wood so that the wood is satisfactorily fire-proofed. Wood so treated, can be shellaced or varnished according to ordinary practice with 55 no difference in its initial or later appearance from similar wood which has been finished with a coating of shellac or varnish without having been first subjected to a fire-proofing treatment.

60 In the preferred practice of my invention I employ a solution of ammonium phosphate containing about 40 parts by weight of the salt in 100 parts by weight of water. Either ammonia gas or aqua ammonia is 65 added to the salt solution in an amount suf-

ficient to raise the pH value of the solution to approximately 8.5.

Although a solution of ammonium phosphate alone may be employed for surface 70 fire-proofing wood with some measure of success the use therewith of an alkaline solution of a gaseous or volatile base, preferably ammonia, is preferred as the volatile base greatly increases the normally slight 75 penetrating quality or tendency of the impregnating phosphate salts. After the impregnated article has been subjected to drying either by subjecting it to the atmosphere for a few days or otherwise drying it, the ammonia volatilizes so that the surface 80 of the wood is no longer alkaline and consequently any desired finish coating may be applied thereto without being attacked by any of the materials used in treating the article to fire-proof it. It will be obvious 85 that instead of employing ammonia gas or aqua ammonia with the ammonium phosphate solution, there may be added to such solution a material such as caustic soda which will react with a part of the am- 90 monium compound to liberate ammonia therefrom. My invention contemplates broadly the employment with a fire-proofing solution of any gaseous or volatile alkaline agent or any material or materials from 95 which such alkaline agent will be evolved or produced in use.

Although I prefer to treat the article which has been made into the desired form, 100 in order to fire-proof it as described, it will be obvious that if desired the untreated material from which the article is to be formed may, with some measure of success, be subjected to my fire-proofing treatment, and the furniture subsequently formed from the 105 fire-proofed material.

If a piece of wood which has been treated in accordance with the hereinabove described process be subjected to a temperature sufficient to char or ignite it, either 110 by inserting it into a furnace or otherwise, it has been found that upon removal from the source of heat the flame lasts only for a few seconds, say for from 5 to 15 seconds, 115 whereas if a similar piece of wood which has not been treated to fire-proof it is charred or ignited, upon withdrawal from the source of heat the flame lasts for many minutes or until the wood is completely 120 burned up.

By the term "furniture" it is intended to include not only such articles as desks, chairs, and the like, but also doors, door casings, window casings, partitions, wall-board, and other wood or like cellular building 125 material. If the finished article is to be subjected to the weather, the fire-proofing coating must be protected from the elements by a coating of paint or varnish or other protective coating. Obviously it

would be desirable to employ such a protective coating on wood floors in order to protect the salt which has been deposited in the fibers of the wood from being washed out when the floor is scrubbed.

5 The term "volatile alkaline impregnation promoting agent" as used herein is intended to include any material having a basic character which upon addition to a solution of a fire-proofing salt imparts temporarily a
10 basic character thereto, whereby the solution will impregnate wood or like dense cellular material to a substantial depth without the application of pressure in excess
15 of atmospheric pressure, and from which solution the alkaline agent will volatilize on drying, leaving the fire-proofing salt in neutral condition upon and within the fire-proofed material, whether the alkaline agent
20 is gaseous as in the case of ammonia and the first term amines, or freely volatile as in the case of some of the higher amines.

The term "non-metallic" as employed in the claims is used in its ordinary sense as
25 indicating the absence of metals such as zinc, copper and the like, either in the form of the metals themselves or in the form of compounds of such metals. The term is not intended to indicate the absence of elements
30 commonly termed "base-forming metals", such as the hypothetical alkali metal ammonium, or the like. Such elements are understood to be "non-metallic".

Although I have described in detail the
35 preferred practice of my process and the materials which I prefer to employ, it is to be understood that I am not limited thereto except as set forth in the subjoined claims.

40 I claim:

1. The process of producing fire-proofed wood and like dense cellular products which comprises treating such products with a
45 solution of ammonium phosphate in the presence of free ammonia, such treatment being conducted at substantially atmospheric pressure, and at a temperature not materially in excess of prevailing atmospheric temperature, and drying the treated
50 products.

2. The process of producing fire-proofed wood and like dense cellular products which comprises treating such products with a
55 solution of ammonium phosphate containing about 40 parts by weight of ammonium phosphate in 100 parts by weight of water in the presence of ammonia in an amount sufficient to produce a solution having a pH value of about 8.5.

60 In testimony whereof I affix my signature.

RALPH H. McKEE.