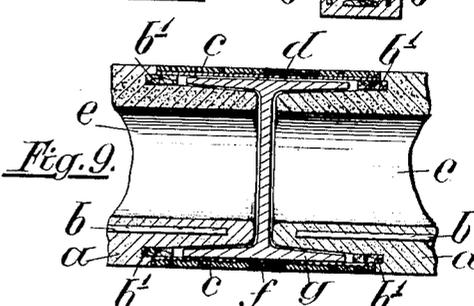
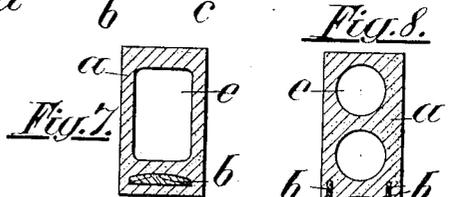
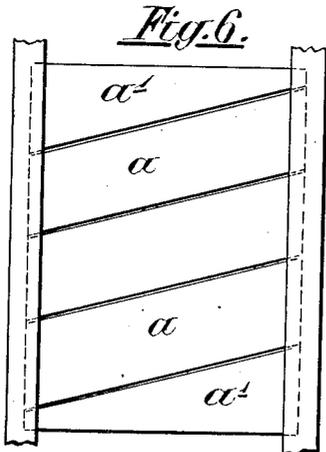
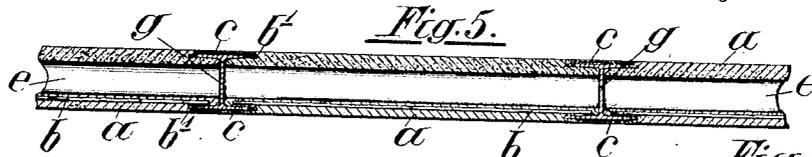
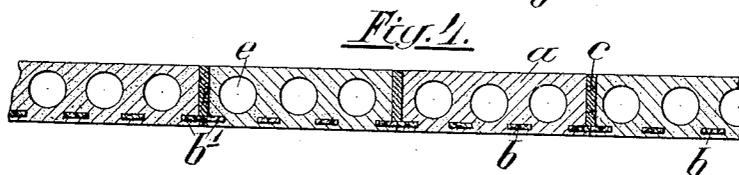
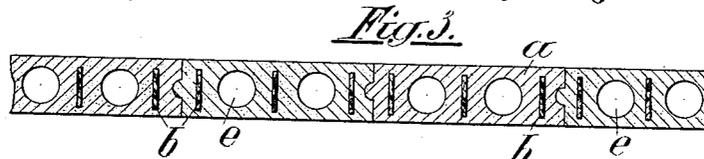
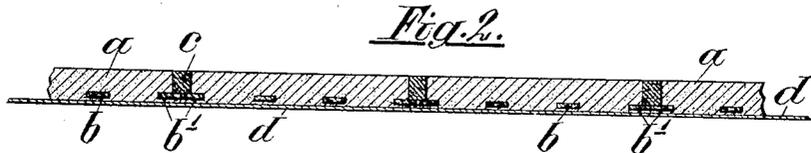
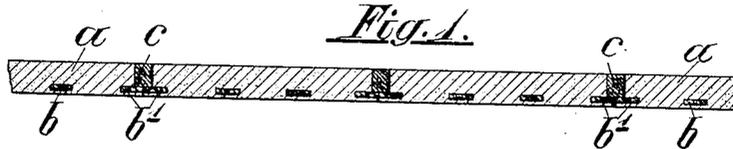


K. HENGERER.  
ARTIFICIAL LUMBER.  
APPLICATION FILED JUNE 22, 1907.



Witnesses  
R. N. Flint  
C. C. Bruce

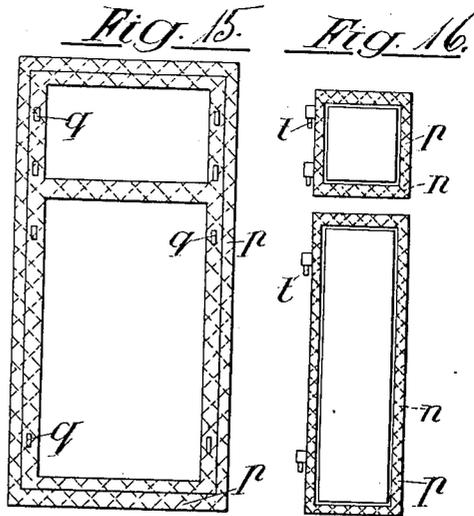
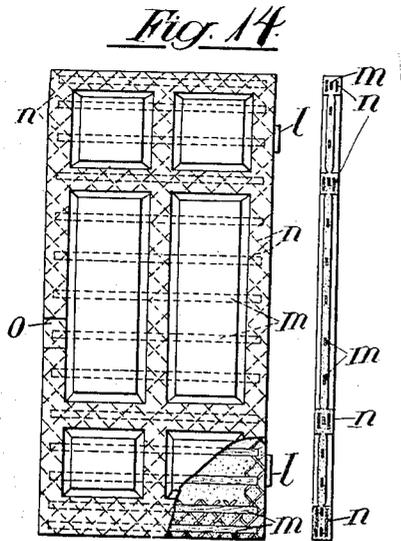
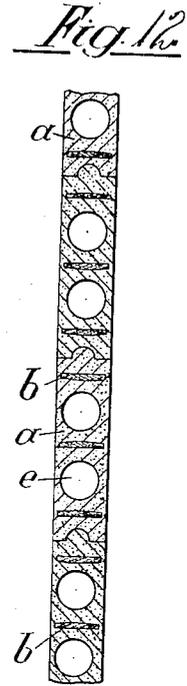
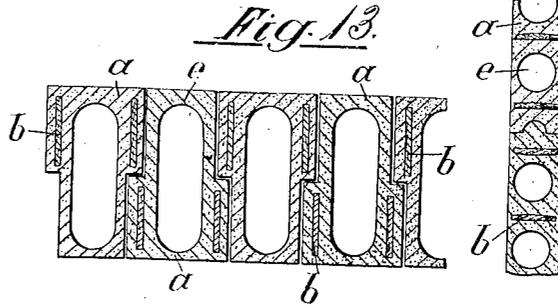
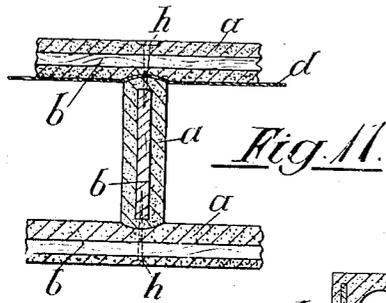
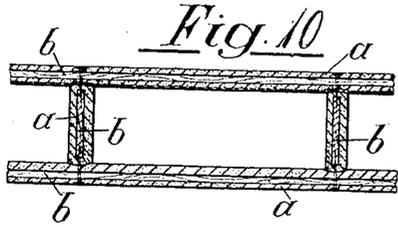
Inventor:  
Karl Hengerer  
by A. Plunz  
attorney

No. 888,399.

PATENTED MAY 19, 1908.

K. HENGERER.  
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2 SHEETS—SHEET 2.



Witnesses  
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Karl Hengerer  
by *A. S. M. S.*  
attorney

# UNITED STATES PATENT OFFICE.

KARL HENGERER, OF STUTTGART, GERMANY.

## ARTIFICIAL LUMBER.

No. 888,399.

Specification of Letters Patent.

Patented May 19, 1908.

Application filed June 22, 1907. Serial No. 380,284.

*To all whom it may concern:*

Be it known that I, KARL HENGERER, a citizen of the German Empire, residing at Stuttgart, in the Kingdom of Württemberg, Empire of Germany, have invented certain new and useful Improvements in Artificial Lumber; and I 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 apper-  
tains to make and use the same.

For a long time efforts have been made to replace, more particularly for building purposes, natural wood, which is becoming more expensive, by artificial wood. All experiments however have hitherto failed owing to the drawback that the artificial wood hitherto known, such for instance as stone wood, cork flooring and the like, possess no or only extremely little elasticity and supporting capability. The floorings or the like made, for instance, of such stone wood therefore require a continuous support of suitable material on which the stone wood or stone wood boards are then only laid, as the latter are not capable of supporting tractional strains. In this way the floorings made of this stone wood are usually dearer or at least equally as dear as those made of ordinary wood.

Now this invention has for its object the manufacture of artificial wood, artificial wood boards, artificial wood planks, artificial wood beams, floorings, ceilings and so forth of great elasticity and strength and capable of being worked like wood. Windows, doors, frames, furniture and the like are also made of such artificial wood. The artificial wood boards, planks, beams and the like form an excellent and cheap substitute for natural wood which is becoming constantly dearer, and have several substantial advantages over the latter. The ceilings, floors and doors made of such artificial wood boards, planks and beams have very great strength, do not crack and warp, and are not deleteriously affected by moisture. These artificial wood boards are also capable of being painted and receive the paint equally as well as wood, and also nails driven therein or wood screws inserted therein adhere thereto equally as well as in wood. All this is attained by the artificial wood being made of a substance of certain composition and wood insertions being cast or let into the artificial wood boards, planks, beams and the like,

preferably in such positions that the insertions are adapted to absorb, wholly or partially, tractional strains arising in the artificial wood boards or the like when the latter are exposed to bending strains. For this result it is necessary that the wood insertions should adhere extremely firmly to the mass just as if they were formed in one piece therewith. For this purpose an extremely effective adhesive also of peculiar composition is employed, which produces an equally thorough connection with the artificial wood mass as with the wood bar inlays, and with which the wood inlays may be coated before the artificial boards and the like are made. After the adhesive and artificial wood mass has hardened, the wood inlays adhere so firmly in the latter that they can only be separated therefrom by the destruction of the artificial boards and the like.

In making thicker artificial wood boards or artificial wood planks or beams, the wood inlays may be inserted edgewise, in fact entire boards placed edgewise may be cast in the mass. Thereby the artificial wood beams, planks and the like are in a position, by means of their wood inlays, to take up both below as well as above, strains arising in cross section, such as for instance actually occur in continuous and unbroken ceilings, and the like. In such wood inlays the actual strength against bending of the same is further utilized, as the surrounding mass prevents a lateral bending out of these inlays.

As may also be remarked, not only artificial boards, planks, beams, walls, ceilings and the like provided in the manner hereinbefore set forth with stiffening wood inlays, may be made, but also doors, windows and their frames, and furniture of all kinds, while the advantage is afforded, for instance in the case of doors and windows, that the corresponding attachment devices may be cast simultaneously with the article, and by the use of the adhesive may be equally firmly retained in the artificial wood mass, as the wood inlays, and only separated therefrom after the destruction of the mass. The artificial wood mass is extremely hygroscopic and if immersed in tar vapor or in hot fluid tar, which is preferably done under high pressure, is penetrated by the latter to the innermost parts. Artificial wood and artificial wood boards, planks and the like treated in this way are thereby rendered completely weather proof and may preferably be em-

ployed for roof covering, cellar construction, outside coatings and the like, as even an alternate direct influence of rain, cold or heat does not exert any deleterious influence thereon. In this way also paving blocks, pavement slabs, border stones and the like may be made and used. It is evident without further explanation that substantial advantages are obtained by the use of such artificial wood boards, planks, beams, floors, walls, ceilings, windows, and doors, more particularly in building construction.

The artificial wood boards and the like may, in approximately similar manner to ordinary boards, be employed for making floorings, and like these laid on wood beams and exposed to bending. A floor without joints is obtained after the laying of the boards by the joints being cast or run full with the substance. They have the advantage of being considerably cheaper than the wooden boards and blanks which are at present so extremely expensive, and form an excellent substitute for these wood planks, while they also have the advantage that floors made from them are noiseless and non-inflammable. By using roofing paper under the artificial wood boards and the like which may also be thoroughly connected by the adhesive substance with the mass of the artificial board; the artificial wood boards are completely protected against encountering moisture and thereby also against decay, so that their wood insertions can never decay, the artificial wood board therefore also retains its durability and in particular the production of dry rot is completely prevented.

The floors made of these artificial wood boards have the advantage over ordinary wooden floors that they do not warp or crack and are capable of being nailed and treated like wooden floors. In such floors of artificial wood boards the filling up of the spaces between the wood beams with filling material is unnecessary, as a completely fire-resisting and soundproof floor can be obtained without the spaces being filled.

The manufacture of the artificial wood, artificial wood boards and the like is carried out under high pressure by means of presses, rollers or the like.

A number of forms of construction of artificial wood boards, planks, beams and floors made of such boards as well as doors and window frames and windows made of artificial wood with ordinary wood inlays and the like, are shown in the accompanying drawings as examples in Figs. 1-16.

Figure 1 is a section of a portion of a floor made of artificial wood boards; Fig. 2 shows such a floor in which the artificial wood boards are also provided with an under covering or layer of roofing paper; Fig. 3 shows hollow wood planks, the wood insertions of which are placed vertically, with the

object of utilizing the carrying power of the wood inlays itself and making the inlays adapted for receiving tractional strains arising from above or below in the planks; Fig. 4 shows hollow artificial wood planks in which the wood insertions are merely located in the zone of traction or tension. In the planks shown in Figs. 3 and 4 roofing paper coverings or layers may also be employed underneath for the same object as in the artificial wood boards; Figs. 5, 6, 7, and 8 show the arrangement of a ceiling made of artificial wood planks having iron supporting beams, the artificial wood planks, as may be seen in Fig. 6, lying obliquely in order that they may be conveniently inserted between two iron carrying beams or the like; Fig. 9 is a section on an enlarged scale of the iron beam of the ceiling shown in Fig. 5, in which figure the manner in which the ceiling is made directly above and beneath the iron beams with the object of rendering it extremely soundproof is disclosed; Figs. 10 and 11 represent a sound- and fireproof ceiling of very light weight made merely of artificial wood boards, in which ceiling the spaces between the vertical struts need not be filled up and yet the ceiling is perfectly soundproof; Fig. 12 is a vertical section of a wall made of artificial wood planks; Fig. 13 is a ceiling of exceptionally great supporting capacity or strength intended for wide spaces and made of hollow artificial wood planks; Fig. 14 shows in elevation and section, a door of artificial wood provided with thin inserted wood bars in similar manner to the artificial wood beams; finally, Figs. 15 and 16 show window frames and window sashes made in similar manner in which, as also in the case of the doors, the fittings or attachments are cast directly in the frame and sashes.

The mass of the artificial wood consists of a mixture of about 40% magnesite, about 20% sawdust, peat dust or wood shavings, or completely dried vegetable fiber or the like, about 8-10% of stone dust, about 8-10% of clay and about 20% of magnesia salt or water glass or the like dissolved in water. This substance hardens completely in about 24 hours and is then capable of being worked like wood. The wood inlays or insertions which are to be cast in the mass for forming artificial wood boards, planks, beams and the like are first covered with a coating of an adhesive or binding material which is composed of three parts of China clay, two parts magnesite, two parts asbestos, two parts French red lead and one part of lead oxid dissolved in oil. This mixture is at first somewhat thick fluid paste which hardens after about six hours, and has an extremely great binding or adhesive power for the wood inlays and also for the artificial wood mass.

The manufacture of the artificial wood

boards, beams, planks and the like is carried out under high pressure produced by means of pressing or rolling or the like.

In the artificial boards *a* shown in Figs. 1 and 2 the wood inlays *b* are located in the lower part of the same, that is to say in the tensional zone. These inlays consist of a cheap wood material, such for instance as outside planks or the like, and lie in any suitable manner at a uniform distance apart in such a way that the artificial board material may be conveniently placed between the wood insertions. In making floors without interstices from such artificial boards they are provided with wood laths or bars *b'* projecting from each side of the board which bars *b'* when the boards are put together fit closely one against the other, and the intervals *c* existing between two artificial boards are then filled with the artificial wood mass, and thus a perfectly jointless flooring obtained.

The wood bar inlays *b b'* have previously been coated with the adhesive substance hereinbefore described and after hardening adhere so firmly in the artificial wood mass that even under the strongest bending strain any displacement of the mass is prevented.

In the use of roofing paper linings under the artificial wood boards (Fig. 2), the roofing paper *d* is nailed on the wood bars *b* and *b'* which stand in any suitable way uniformly apart from one another, the wood bars and the paper having been first coated with the adhesive substance hereinbefore mentioned.

Artificial wood planks such as shown in section for instance in Figs. 3 and 4 are preferably made hollow (see the hollow spaces *e*), and the wood bars may either be inserted on edge in the manner shown in Fig. 3 or as shown in Fig. 4 merely laid in the tensional zone.

In making floorings the artificial wood planks and boards may be tongued and grooved at the sides in the wellknown manner (Fig. 3) or be placed bluntly against one another and the interstices *c* subsequently filled up with the artificial wood mass (Fig. 4).

The artificial wood beams *a* shown in Figs. 5 to 9 are preferably made hollow in order to save weight and one or more wood bars *b* inserted in the tensional zone of the beam. When the beam is exposed to bending strains these wood bar insertions absorb the tensional strains, while the mass of the artificial wood is quite in a position to absorb the compression strains both in the case of beams and also planks and boards.

In Fig. 5 it is shown, for instance, in what manner a ceiling may be made of artificial wood planks, the ceiling being made soundproof both above and beneath the places in the ceiling where the iron beams lie.

Fig. 9 shows a section on an enlarged scale of this carrying or supporting beam place.

The artificial wood boards *a*, the tapered ends of which rest on the flanges of the iron beam or girder *g*, have wooden bars *b'* cast into them above and below, which bars lie above and below at the sides directly near the flanges of the iron beam and flush therewith. On these wood bars *b'* roofing paper *d* is nailed above, and beneath a wire network *f* (plaster carrier) is nailed. The roofing paper and the wire network are both coated with the adhesive substance, after which the wide intervals between the planks are coated fully and smoothly with the artificial wood mass. The mass adheres very firmly and the ceiling is thus soundproof even at the places where the iron beams lie.

In order that the artificial planks may be conveniently placed without wedge bearings between the flanges of the iron beams, they are cut off obliquely at the ends, as shown in Fig. 6, and placed in an inclined position between the beams.

Figs. 10 and 11 show a hollow ceiling which merely consists of artificial wood boards *a* provided with wood inlays *b*, in which the artificial wood boards which stand vertically engage in recesses of the artificial wood boards located above and below, and are connected to these by means of the adhesive substance at the joints, and are attached to the former by means of nails or screws *h*, or the like. The artificial wood boards located above may if desired also be provided with an under-lining *d* of roofing paper, with the object of keeping off moisture and increasing their power of not conveying sound. These very strong ceilings, even without intermediate lining are also perfectly fire and sound proof, and extremely light in weight. The wood board inlays of the vertical artificial boards are prevented from lateral deflection by the surrounding mass of artificial wood.

Fig. 12 shows a wall made of hollow tongued and grooved artificial wood planks, which wall has great strength.

Fig. 13 shows a beam ceiling or floor of extraordinarily great carrying capacity, made of hollow artificial wood beams *a* arranged in close proximity to one another. These artificial wood planks are of similar width and are provided with vertical wood inlays. They are adapted for large spans up to 15 meters and more and as the wood inlays are located sometimes below and sometimes above, they are preferably more particularly for continuous ceilings in which the tensional strains arise partly above and partly below.

Fig. 14 shows a door made of artificial wood mass which is provided with thin wood bar inlays *m* running right through transversely and lying parallel to one another, and also at the thicker places with diagonally laid thin wood or the like inlays *n*. Such doors thereby obtain uncommon strength, they do

not warp, they are non-susceptible to cold, heat or moisture, are capable of being painted and have also the advantage that simultaneously with the making of the doors the attachment parts or fittings *t* may be cast thereon without further difficulty by using the adhesive and adhere extremely firmly in the mass, that is to say in the door. For the subsequent attachment of the lock a suitable recess *o* is provided in the door in such a way that the lock need only be inserted and attached to the door by means of screws, rivets or the like.

In similar manner window frames and window sashes may be made of the artificial wood mass as shown in Figs. 15 and 16, wood bars *p* and diagonally running thin wood bars *n* or like inlays, network or the like being also cast all round the frame. The butt hinges *q* and *t* may also be cast with the frame and window at the time of its manufacture. The windows and the like made in the manner hereinbefore described are also extraordinarily durable, they do not warp and are non-susceptible to the influences of weather. It is evident that not only doors and windows but furniture of any suitable kind may also be made from the artificial wood with insertions of wood bars or the like, and by employing the adhesive hereinbefore mentioned, and the articles of furniture may also be provided on their outside with veneers of rare woods or with metal insertions or inlays.

The cross sectional form of the wood inlays may be any suitable one. Of course the wood bars should not be angular and preferably waste wood and outside boards or laths or the like are preferably employed as inlays, as they are extremely cheap. As the raw materials for making the artificial wood mass are also not expensive, the artificial wood boards, planks, beams, ceilings, floors and walls, doors, windows, furniture and the like may also be made very cheaply. This is a great advantage more particularly for building purposes where it is of importance that the artificial wood and the boards and the like made therefrom do not warp or crack and are non-susceptible to moisture and also floors, ceilings and walls made from the artificial wood boards and the like are completely fire and sound proof.

I declare that what I claim is:—

1. Artificial lumber comprising a plastic composition made up of materials which will harden into a solid mass and which composition is given a form corresponding with the piece of lumber to be produced, a wooden strengthening member embedded in said composition and extending longitudinally thereof, and an adhesive substance other than said plastic composition for uniting said composition and bar together into a substantially integral piece.

2. Artificial lumber comprising a plastic composition made up of materials which will harden into a solid mass and which composition is given a form corresponding with the piece of lumber to be produced, and a wooden bar embedded in said composition and extending longitudinally thereof and located adjacent one of the peripheral surfaces of said lumber, whereby said bar will be subjected to tension when the lumber is in use.

3. Artificial lumber comprising a plastic composition made up of materials which will harden into a solid mass and which composition is given a form corresponding with the piece of lumber to be produced, and a wooden bar embedded in said composition and extending longitudinally thereof the location of said bar being such that it may be subjected to tension when the artificial lumber is in use, said bar having been coated with a suitable adhesive material other than said plastic composition before being embedded in said composition whereby the bar and mass will be united together into a substantially integral piece.

4. Artificial lumber comprising a plastic composition made up of materials which will harden into a solid mass and which composition is given a form corresponding with the piece of lumber to be produced, a wooden bar embedded in said composition and extending longitudinally thereof and located adjacent one of the peripheral surfaces of the piece of lumber whereby the piece may be so placed that said bar will be subjected to tension when the lumber is in use, and an adhesive substance other than said plastic composition for uniting said composition and bar together into a substantially integral piece.

5. Artificial lumber comprising a plastic composition made up of materials which will harden into a solid mass and which composition is given a form corresponding with the piece of lumber to be produced, a cavity formed within said mass and extending longitudinally thereof, a wooden bar embedded in said composition and extending longitudinally thereof, and an adhesive substance other than said plastic composition for uniting said composition and bar together into a substantially integral piece.

6. Artificial lumber comprising a composition made up of magnesite, sawdust, stone dust, clay, and water glass dissolved in water, in substantially the proportions stated, said composition being given a form corresponding with the piece of lumber to be produced; a wooden bar embedded in said composition and extending longitudinally thereof and located adjacent one of the peripheral surfaces of the piece of lumber; and an adhesive substance other than said plastic composition for uniting said composition and bar together into a substantially integral piece.

7. Artificial lumber comprising a composi-

tion made up of magnesite, sawdust, stone  
dust, clay, and water glass dissolved in water,  
in substantially the proportions stated, said  
composition being given a form correspond-  
5 ing with the piece of lumber to be produced;  
a wooden bar embedded in said composi-  
tion and extending longitudinally thereof; and  
an adhesive substance comprising china clay,  
magnesite, asbestos, French red lead, and  
10 lead oxid dissolved in oil, in substantially

the proportions stated, for uniting said com-  
position and bar together into a substantially  
integral piece.

In testimony whereof I affix my signature,  
in presence of two witnesses.

KARL HENGERER.

Witnesses:

AUGUST DRAUTZ,  
JEAN GULDEN.