My invention relates to the process of making a laminated construction unit, the laminated product of said process, the process of making the adhesive for said unit and the adhesive product of said last process.

More particularly, my invention relates to a new laminated construction unit characterized by its exceedingly high water and weather resisting properties, and by its being cold pressed for the initial setting of the glue binder for the plies and then its being heated without pressure to increase the water resistance; and my invention relates to the process of treating blood to serve as the glue base for the binder of the plies of such unit and to the glue blood composition as a whole.

While it has been known for a long time that blood, in the form of a wet glue, when hot pressed made a highly water resistant construction unit, nevertheless, the hot press with wet glues has so many serious disadvantages in practice that its use is exceedingly limited and rare in American plywood plants. In fact, its use with wet glues is so limited that for practical purposes, it can be said to be scarcely used at all in the United States for the manufacturing of plywood. The hot press, besides being of itself exceedingly expensive, does not lend itself to economical large scale production, for among other reasons, too much of the press opening is occupied with the press members. Hot pressing is expensive and cumbersome and is limited to stock sizes of panels, being uneconomical and inconvenient to use when making panels of varied sizes. There have also been proposals to first cold press blood glued plywood panels, and then follow this with a hot pressing. This, of course, has all the disadvantages of hot pressing, coupled with the extra expense of cold pressing.

A primary object of my invention is to eliminate the hot press in making laminated products with a dispersed blood glue, and still obtain the high water resistance which is a concomitant of a heated blood glue line.

By far the greatest part of total amount of plywood laid up today in the United States is composed of coniferous woods as, for example, fir, pine, etc. However, heretofore, hot pressing with wet blood glue has not been adaptable to the manufacture of plywood from coniferous woods because these woods do not have sap vessels, nor do they have any ducts or cells of sufficient length to permit escape of moisture during hot pressing, thereby resulting in severe checking and blistering of the faces. A primary object of my invention, or discovery, is to make the water resistant properties of heated blood glues available for coniferous woods.

Serious objection to plywood manufacturing processes as applied to ordinary coniferous woods as ordinarily followed involving blood glue used heretofore, obtains in that such plywood is lacking in dry strength even though the wet strength or water resistance was good. A primary object of my invention is to provide blood glued plywood having both great dry and wet strength. By dry strength I mean the shear test of plywood dry, and by wet strength I mean the shear test after soaking forty-eight hours in water, as well as the ability of the panels to remain sound during soaking in water for months. Also serious objection obtains to the process followed in the manufacture of blood glued plywood in that it is quite impossible to control the moisture content of the plywood panel when the hot press is used, and as a result the great difficulty of “blistering” is encountered, i.e., the bulging out of areas due to internal steam pressure of trapped moisture. Also, there is the necessity to dry out or season the panel after removal from the hot press as heretofore employed. A primary object of my invention is to overcome this objection and to provide a plywood blood glued panel of exceedingly high dry strength and high water resistance, in which the moisture content is controllable so that subsequent seasoning is obviated. It is to be understood that my invention is applicable not only to plywood, but other materials suitable for lamination, such as cellulose containing composition boards, etc.

Blood glue as heretofore commonly spread upon wood piles, if cold pressed affords little or no strength. A primary purpose of my invention is to provide a glue composition having blood as the base which, when spread upon wood piles, and cold pressed, will have such strength that despite the great strains set up between the plies when it dries out, nevertheless, it will hold the piles together, so that the panel can be handled and subjected to a subsequent heating operation in the absence of pressure without damage. In providing such a blood base glue, my invention goes directly contrary to prior teaching in that instead of no alkalinity, or very low alkalinity, I find in my new blood base glue and processes, that a positive alkalinity is essential to obtain the necessary adhesion in the cold press, so that the cold pressed panels will withstand the after heating operation and also provide the proper water requirement to secure a desired glue spread.

Furthermore, a primary purpose of my invention is to provide a glue composition having blood as the base which, when spread upon wood piles, and cold pressed, will have such strength that despite the great strains set up between the plies when it dries out, nevertheless, it will hold the piles together, so that the panel can be handled and subjected to a subsequent heating operation in the absence of pressure without damage. In providing such a blood base glue, my invention goes directly contrary to prior teaching in that instead of no alkalinity, or very low alkalinity, I find in my new blood base glue and processes, that a positive alkalinity is essential to obtain the necessary adhesion in the cold press, so that the cold pressed panels will withstand the after heating operation and also provide the proper water requirement to secure a desired glue spread.
tion is to make blood as a glue base, economically, practically usable, and this I accomplish by my discovery that various seed flours may be admixed with either blood alone, or even with the combination of blood, blood-casein, or blood-isolated vegetable protein, which same may be thus used to constitute a considerable percentage, even seventy-five percent of the base of the glue used in my process, as well as by the fact that the water requirement is increased by using properly proportioned alkalinity. My discovery includes the fact that with such a degree of alkalinity as will give the necessary water requirement to provide an economical spread, nevertheless the initial set in the cold press is of sufficient strength to hold the plies without pressure against the stresses developed during heating and that such alkalinity does not prevent the heating step imparting the necessary water resistance. Also my discovery includes the fact that such initial setting does not prevent the development of water resistance in the glue upon subsequent heating.

Finally, a primary purpose of my invention is to make a plywood product as characterized by the properties above set forth which can be readily produced in large scale production and at greatly reduced cost.

These objects are achieved by my invention or discoveries which will next be fully set forth. Before doing so I will explain the details of the invention will be set forth in a summary manner.

Briefly, therefore incompletely stated, my invention or discovery comprises that blood can be treated as the base of an adhesive or glue, or as the principal portion of the base, with chemicals which impart a positive and essential alkalinity so as to make a glue which, when spread by means of the usual mechanical rollers and laid up to form a panel and cold pressed as usual as one member of a rack of panels, will have the requisite dry strength and sufficient adhesion to hold the plies, despite the severe strains developed when the moisture content of the panel changes during the next following step. Then, the panel is heated without pressure, (i.e., without using a hot press), the heat being sufficient, about 212° F., to act on the blood as to give a very unexpected increase in wet strength, and usually some increase in dry strength. Instead of a mild or no alkalinity, my adhesive composition comprises the reaction products of blood and alkalinity producing chemicals of 3% to 20% of the glue base, besides lime and soluble silicate salts in some formule, and as a foaming agent. The panel thus produced by this process and by means of this adhesive, results in a panel practically waterproof and weather resistant as to be useful for outdoor purposes in contrast to the indoor use of plywood generally at the present time.

While a high water resistance is obtained even in the unheated panels and while highly water resistant glues have been known before, I believe that this new discovery of mine enables the making of a different character of plywood than has been heretofore known, namely, that it has such properties that will enable plywood made by the use of my glue and process to withstand the action of moisture indefinitely. While the commonly used shearing strength test on plywood after soaking for 48 hours gives very high figures on plywood glazed with this new glue, the same may also be true of other glues, but I have found by practical tests such as weathering tests, exposure to the elements, repeated alternate soaking and drying tests, long continued soaking tests, freezing tests and alternate heating and soaking tests, that plywood made with the combination described under these practical tests and is for all practical purposes waterproof. Endurance to these practical tests is a thing which is not determined by the ordinary wet shear test and it is in this endurance to these practical tests that I consider that my process and glue give new, unique and very valuable practical results for plywood. Prior known glues, even though giving high wet shear tests, have suffered a deterioration in strength when exposed to moisture or weather for some time and for this reason such panels have not been of practical use for outdoor purposes.

After the cold pressing of the plywood, the panels contain a considerable percentage of moisture, and when such moist panels are heated a very severe strain is set up. Published figures show that the transverse strains set up in even the weakest native woods during change of moisture content amount to over 200 pounds per square inch. To hold the panels during this second operation, that is, heating, it is necessary that the glue line be strong enough to withstand this severe strain, and to make finally a panel without pressure which will be stronger than the unheated panel, requires a glue which will increase in strength during heating, such increase being greater than the strain set up.

When plywood is to be hot pressed, using a blood-base glue, a low degree of alkalinity hereof has no effect upon the end result. Thus ammonia, or small amounts of alkaline salts such as sodium silicate, or very small percentages of caustic soda will furnish sufficient alkalinity for hot pressing. The case is radically different however, in my process. I must use a positive alkalinity to secure the necessary adhesion in the cold press, so that the cold pressed panels will withstand the after heating operation.

To secure this positive alkalinity I prefer to use caustic soda as such, and in amounts over 3% referred to the adhesive base. Thus using caustic soda as such I am free from all the uncertainties of producing caustic soda by double decomposition chemical (By double decomposition I mean whatever reaction occur in an aqueous colloid dispersion of protein substances and other colloids, between lime and sodium salts such as sodium fluoride, sodium silicate, etc.)

While I prefer to use caustic soda as such, I find that I can get good results by using double decomposition chemical such as the ones named, and I consider, in this invention, the combinations lime and sodium silicate, lime and sodium fluoride, etc. the equivalents, so far as alkalinity is concerned, of caustic soda as such, with this reservation however, which I can best explain by an example, viz.: Sodium fluoride has a molecular weight of 42, and by reaction with excess lime in water (i.e., in the absence of colloids) 42 parts sodium fluoride will give theoretically 40 parts caustic soda. The case is entirely different, however, in the presence of colloids. In such case I find that a combination of excess lime and 42 parts sodium fluoride is nowhere near as effective for my purpose as 40 parts caustic soda as such. Furthermore, the effectiveness of double decomposition combinations varies greatly with the kind of sodium salt used, so that in general I consider that a double decomposition combination for my purposes is less than 50% as effective.
five as the amount of caustic soda as such which would be theoretically produced by reaction in the absence of colloids. All the ingredients, or a part thereof, of the formulae embodying my invention may be mixed in the dry form with the glue base to be marketed in sacks as a glue composition, for example, in the form of sodium metasilicate and the chemicals which react to form caustic soda by double decomposition in aqueous medium, and terpineol. In general I find best results when using from 8% to 15% caustic soda as such, (i.e., 8% to 15% of the dry adhesive base) or correspondingly larger amount of double decomposition chemicals. Above 20% caustic soda as such I find that deterioration sets in, so that I consider 20% the upper limit.

Along with caustic soda I prefer also to use lime as I find that this increases the water resistance, and in some formulae also the dry strength. Of course when using double decomposition combinations, lime is present, and in such case I prefer to add an excess of lime, by which I mean an excess over the amount that would be theoretically required to combine with whatever sodium salt or potassium salt is used, in the absence of colloids. I find that lime in amount of 7% gives excellent results, while 15% also gives very good water resistance.

When I use lime, I also may use sodium silicate to give increased water resistance, e.g., 30% water glass with 7% lime gives very great water resistance. To a certain extent the combination lime plus sodium silicate may substitute for caustic soda. That is, when I use this combination, I may use as much caustic soda as I would without the combination. Silicate thus plays a dual role.

In carrying out my invention, or discoveries, I have developed many formulae of which examples will be set forth with actual experimental tests, results and explanation. A typical formula with blood as is follows:

<table>
<thead>
<tr>
<th>Parts</th>
<th>I. Dried blood</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaOH</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Lime</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Sodium silicate</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>675 to 725</td>
<td></td>
</tr>
</tbody>
</table>

When this is spread using 18 lbs. of dried blood per thousand square feet of plywood, three-ply i.e., two glue lines with 10 minutes time of assembly and pressed cold with 150 pounds pressure, with 3% inch fir plywood, it gives a dry strength of 283 and a wet strength of 243.

After they are removed from the press, I then place the panels in any convenient apparatus for heating. This may be, for example, a veneer dryer, as used for drying the single plies, or better still a tunnel dryer such as used for redrying panels. The panels may even be placed in racks in a hot room. By whatever means is used for the heating, I bring the glue line to a temperature of approximately 212°F., and hold it at this temperature for at least several minutes, this time varying somewhat with the kind and thickness of wood and with the percent of moisture desired in the finished panel. I consider that a temperature of not less than 170° or 180° F. is necessary for good practical working results. Greater temperatures decrease the time necessary. By controlling the dry temperature, time and degree of humidity of the air in the heater, I control the percent of moisture in the finished panel, and turn out a panel with correct moisture content, ready to use without further seasoning. Because of the high, dry strength of the bond before heating, I run no risk of blistering, which is one of the disadvantages of hot pressing. It should be noted that this is not a drying operation, but an essential, although some drying may take place unavoidably or even intentionally, as the panels can be turned out at any desired moisture content by controlling the humidity in the heating apparatus. Obviously, moisture may be added to the panel if desired. Such control of moisture content is impractical to realize with the hot press. The purpose of the heating is to increase the water resistance, and weatherproofness.

A typical procedure in heating is as follows: Time 15 minutes, and temperature 300°F. These panels gave the following results expressed in pounds per square inch shear strength:

<table>
<thead>
<tr>
<th>Dry strength</th>
<th>293</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet strength</td>
<td>233</td>
</tr>
</tbody>
</table>

I find that considerable amounts of proteins, such as casein or isolated vegetable proteins, can be added with the blood and the combination base then subjected to the same chemical treatment as specified hereinabove. These added proteins which I call "alkali-dispersibles", are distinguished as a class by the fact that they require alkali to disperse them, whereas blood is dispersible in water alone. The various oil seed meals or flours, such as soybean, peanut, hempseed, cottonseed, castor, etc., also I include in this class of "alkali-dispersibles" and may be used instead of casein or the isolated proteins or used with these materials. On the other hand, if the "alkali-dispersible" proteins are used without blood in my process, they give considerable lower results as far as wet strength is concerned. The combination of some substantial amount, at least 10% of the glue base, of blood appears necessary in my process. Although the "alkali-dispersible" proteins give good results in my process, they can be mixed with blood in large proportions, up to 90% of the glue base, and still obtain many of the benefits of my process.

With certain woods, for example, birch, I find that the chemical treatment of blood alone as described herein, is not sufficient to give the requisite dry strength for some purposes with cold pressing. On such woods, I have found that I can incorporate a protein such as casein, or isolated vegetable proteins, or both, with the blood, and then treat the combination base with the same chemical treatment as described above, and can obtain a glue better suited for these woods with my process. I have found good results with mixtures of 10% blood and 90% casein or chemically isolated protein with birch.

A typical formula is as follows:

<table>
<thead>
<tr>
<th>Parts</th>
<th>II. Blood</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terpineol</td>
<td>1 1/2</td>
<td></td>
</tr>
<tr>
<td>Casein</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Lime</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>NaOH</td>
<td>10</td>
<td>145</td>
</tr>
<tr>
<td>Silicate</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>460</td>
<td></td>
</tr>
</tbody>
</table>

Spread on birch wood, cold pressed, then heated to 220°F., this gave the following results in 150
Soya bean protein can be substituted for casein in the above formula although more water must be added, which in this process, is not a detriment. Also, the thinning tendency of soya bean protein is counteracted in this mixture. It will be noted that my process so far has been intended to furnish plywood of maximum water resistance, as well as high, dry strength. However, it will be seen by the above results that even without the after heating it gives very good results, and this is true on a number of different woods. I may therefore stop short of the heating step and produce a thoroughly commercial plywood, especially where water resistance of the very highest order is not desired.

I have also found that the various seed floors may be admixed with either blood alone, or even with the combinations, blood-casein or blood-isolated vegetable protein, and may be thus used to constitute a considerable percentage, even seventy-five percent of the base of the glue used in my process, so long as blood constitutes 10% of the base. The glue made from such admixture has advantages in working properties, in particular, it tends to lump very much less than the glue does made without the seed floors. Also, the viscosity and consistency of the glue made by admixture of seed floors is much more constant with time. I have used amounts of seed floors up to 75% of the base and find that my process can be effectively carried out with such an adhesive.

The amount which I use varies with different woods. For example, on fir I find that a mixture of 50 parts of soya bean flour with 50 parts of blood gives excellent results. By thus using these considerable amounts of seed floors, I am enabled to make a much more economical adhesive for use in my process and at the same time realize all the necessary requirements to fit into my process. In fact, I find that although casein gives relatively inferior wet strength when used alone as the glue base in my process, yet a glue made from a mixture of 50 parts casein and 50 parts blood as a base, gives much better wet strength than is obtained with blood alone.

When using seed floors admixed, I use substantially the same chemical treatment as specified for the blood. The use of caustic soda as such is particularly desirable with seed flour combinations.

Typical formula of such seed floor-blood glues are as follows:

<table>
<thead>
<tr>
<th>Soya bean flour</th>
<th>Hemp seed flour</th>
<th>Penn flour</th>
<th>Casein</th>
<th>Blood</th>
<th>Lime</th>
<th>Caustic soda</th>
<th>Etherate</th>
<th>Sosa ssh</th>
<th>Water</th>
<th>Unheated fir</th>
<th>Heated fir</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>50</td>
<td>50</td>
<td>7</td>
<td>8</td>
<td>30</td>
<td>535</td>
<td>285</td>
<td>180</td>
<td>13</td>
<td>350</td>
<td>285</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>50</td>
<td>7</td>
<td>8</td>
<td>30</td>
<td>535</td>
<td>285</td>
<td>180</td>
<td>13</td>
<td>350</td>
<td>285</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>50</td>
<td>7</td>
<td>8</td>
<td>30</td>
<td>535</td>
<td>285</td>
<td>180</td>
<td>13</td>
<td>350</td>
<td>285</td>
</tr>
</tbody>
</table>

All of the glues above described tend to foam considerably in the spreader. In order to make the highly resistant plywood that I have described, it is particularly essential that this foam be eliminated or kept at a minimum. Otherwise, a sufficient spread can not be obtained, and

A typical mixing formula follows:

VII. To 135 lbs. of water, add 100 lbs. of a mixture of 50 parts soya bean flour and 50 parts blood and 2 parts of alpha terpineol, stir 10 minutes, add 330 lbs. of water, stir 2 minutes, add 7 lbs. of lime suspended in 25 lbs. of water, stir 1 min.
ute, add 8 lbs. of caustic soda dissolved in 25 lbs. of water, stir 1 minute, add 30 lbs. of water glass, stir 2 minutes. The glue is now ready for use. I am aware that several proposals have been made for cold press blood glues. Such glues have generally used ammonia and lime, or else the glue has been made hot. When ammonia is used with blood, the water requirement of the glue is very less than 2 parts of water to 1 part of dry adhesive base. Such a glue is of course costly to use as a high spread is necessary. The action of caustic soda is entirely different than the action of ammonium hydroxide, as by the use of caustic soda, a considerable amount of water can be used in the glue, and still maintain a spreadable consistency, thus affording an economical glue to use. Also, the use of caustic soda gives the high dry strength needed in my process, whereas ammonium hydroxide, when used in my process does not give sufficient dry strength. This in itself is a very unexpected result for it has commonly been found that the greater is the concentration of the glue solution, the greater is the strength of the bond obtained therefrom. Manufacturers of glue who faced with the problem of increasing the strength of the bond to be obtained from any glue base, have heretofore striven to reduce the amount of water required to bring the glue to a proper working consistency, for the rubber it was the opinion of workers in this art that concentration of the glue solution tends to increase the strength of the bond, whereas dilution of the glue solution weakens the bond obtained. It is therefore a most unexpected and surprising thing to discover that a glue made by the treatment of blood with considerable amounts of caustic soda, which requires about seven parts of water to one part of blood in order to bring the glue to proper working consistency should be capable of giving a bond far superior in strength to that obtained with the blood glues commonly in use which contain only comparatively mildly alkaline reagents and are very concentrated, containing only about 1 to 3 parts of water to each part of dry blood.

Blood glues made by heating during the mixing are quite different than glues made without heat. Blood in the presence of water and heat coagulates rapidly, and glues made hot have a higher water requirement than glues made cold, but the advantage suffers by the heating. In hot pressing procedure, the usual procedure is to apply a thin coating of blood glue and immediately place in hot press and apply pressure. There is little lapse of time so that the glue does not have opportunity to penetrate or "dry out" to any great extent. However, in cold pressing, considerable time in ordinary manufacturing procedure elapses between the time of assembly and the time when pressure is applied. Hence the relatively large amount of glue base used in hot pressing with blood would necessarily be increased by the step of cold pressing of my process. I overcame this objection by discovery that blood could be treated with a large percentage of chemicals which imparted a positive alkalinity and that this provided an increased water requirement whereby the amount of glue base was made sufficiently low for commercial use.

It will be noted that I avoid heat in making my glue, I thus avoid coagulation of the blood in the glue mixer, as well as in the pressing operation, and no coagulation takes place in my process until the glue has set in place. After that, heating can be safely carried out not only without adversely affecting strength, but markedly increasing wet strength.

I may also use sodium silicate, that is, water glass, with caustic soda and without lime. I find that blood and sodium silicate is as follows:

<table>
<thead>
<tr>
<th>VIII. Dried blood</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caustic soda</td>
<td>12</td>
</tr>
<tr>
<td>Sodium silicate</td>
<td>30</td>
</tr>
<tr>
<td>Water</td>
<td>600-650</td>
</tr>
</tbody>
</table>

It is to be understood that I do not confine myself to sodium silicate, commonly known as water glass, but may use other soluble silicates as well. I find also that sodium metasilicate can be used with blood in my process and give very good results. A typical formula with blood and sodium metasilicate is as follows:

<table>
<thead>
<tr>
<th>IX. Dried blood</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium metasilicate</td>
<td>100</td>
</tr>
<tr>
<td>Water</td>
<td>700-750</td>
</tr>
</tbody>
</table>

The construction unit resulting from the use of the glue and process herein set forth may be identified by the physical and/or chemical properties of the same.

The advantages of my process are:

1. That I am enabled to secure a high degree of water resistance, without the disadvantages of the hot press.
2. Securing the benefit of heat treatment of blood in inexpensive heating apparatus, without danger of checking or blisters, and with the moisture content of the panel under control.
3. Using high water requirement glue thereby securing economy.
4. Providing a means of treating blood to give high, dry strength so that cheaper adhesive bases can be admixed, and still realize the benefits of heat treatment of blood.
5. On some woods, such as coniferous, the hot press is impractical because of checking, etc. But I can secure all the benefits of the hot press in my process, without its disadvantages, and with many positive advantages, both in low cost and superior quality.

It is to be understood that I can also use blood that has been heated in a dry state. I have found that dried blood can be heated to temperatures much higher than those at which the blood coagulates in the presence of moisture, without causing the dry blood to become non-dispersible in alkalis. I have raised the temperature of dry blood to 270° F. without causing it to become non-dispersible in alkalis. I have found that the heat treatment of blood is in many cases beneficial to the water resistance of the resulting glue.

By the term "blood" I mean to include fresh blood as well as spray dried or film dried bloods, which have not been rendered non-dispersible in alkalis in the drying. I also include blood from which fibrin has not been separated.

As equivalents of caustic soda, I include potassium hydroxide, but not ammonia; as equivalents of sodium salts the corresponding potassium salts; as equivalents of lime, baryta and strontia.

This of course includes caustic soda or potash developed by double decomposition as described herein.

By glue I mean ordinary aqueous dispersed glue, spread wet.

By "dry adhesive base" I mean dry blood or
mixture of dry blood and other protein containing material. When fresh blood is used I mean the solid contents of such blood.

I claim:

1. A glue for use in a cold press comprising the reaction products in aqueous medium at normal temperature of blood treated with not less than approximately 3%, nor more than approximately 20% of caustic alkali, said percentage being based upon the blood constituent.

2. A glue for use in a cold press comprising the reaction products in aqueous medium at normal temperature of blood treated with not less than approximately 3%, nor more than approximately 20% of caustic alkali; and hydrated lime, said percentage being based on the blood constituent.

3. A glue for use in a cold press comprising the reaction products in aqueous medium at normal temperature of blood treated with not less than approximately 3%, nor more than approximately 20% of caustic alkali; hydrated lime; and sodium silicate, said percentage being based on the blood constituent.

4. A glue comprising the reaction products in aqueous medium of blood treated with not less than approximately 3%, nor more than approximately 20% of caustic alkali; and terpineol, said percentage being based upon the blood constituent.

5. A glue composition comprising blood, hydrated lime, sodium silicate and terpineol.

6. In the process of making an adhesive having blood as the base or critical constituent of the base, the step of treating blood with terpineol for overcoming the foaming tendency of blood glue.

7. A glue for use in a cold press comprising the reaction products of a base consisting of not less than 10% blood, and not more than 90% of an alkali-dispersible protein containing material, which base is acted upon in aqueous medium at normal temperature by not less than approximately 3%, nor more than approximately 20% of caustic alkali, said percentage being based upon said base.

8. A glue for use in a cold press for plywood comprising the reaction product of a base consisting of not less than 10% blood and not more than 90% of an alkali-dispersible protein containing material, which base is acted upon by not less than approximately 3%, nor more than approximately 20% of caustic alkali; hydrated lime; and sodium silicate, said percentage being based on the said base.

9. A glue for use in a cold press for plywood consisting of the reaction product of a base consisting of not less than 10% blood and not more than 90% of an alkali-dispersible protein containing material, which base is acted upon by not less than approximately 3%, nor more than approximately 20% of caustic alkali; hydrated lime; and sodium silicate, said percentage being based upon the said base.

10. A glue for use in a cold press for plywood comprising the reaction products of a base consisting of not less than 10% of blood and not more than 90% of an alkali-dispersible protein containing material in aqueous medium, which base is acted upon by not less than approximately 3%, nor more than approximately 20% of caustic alkali; and terpineol.

11. A glue for use in a cold press for plywood comprising the reaction products of a base consisting of not less than 10% of blood and not more than 90% of soya bean flour, which base is acted upon in aqueous medium at normal temperature by not less than approximately 3%, nor more than approximately 20% of caustic alkali, said percentage being based upon said base.

12. A glue for use in a cold press for plywood comprising the reaction products of a base consisting of not less than 10% blood and not more than 90% soya bean flour, which base is acted upon in aqueous medium at normal temperature by not less than approximately 3%, nor more than approximately 20% of caustic alkali; and hydrated lime, said percentage being based upon said base.

13. A glue for use in a cold press for plywood comprising the reaction products of a base consisting of not less than 10% blood and not more than 90% soya bean flour, which base is acted upon in aqueous medium at normal temperature by not less than approximately 3%, nor more than approximately 20% of caustic alkali; and hydrated lime; and sodium silicate, said percentage being based upon said base.

14. A glue for use in a cold press for plywood comprising the reaction products of not less than 10% blood and not more than 90% soya bean flour, which base is acted upon in aqueous medium at normal temperature by not less than approximately 3%, nor more than approximately 20% of caustic alkali; and hydrated lime; and sodium silicate, said percentage being based upon the dry adhesive base.

15. An adhesive for use in a cold press comprising the reaction products of blood acted upon in aqueous medium at normal temperature by 8% caustic soda, 7% lime and 30% silicate, said percentage being based upon the blood constituent.

16. An adhesive for use in a cold press comprising the reaction products of blood and alkali-dispersible protein containing material, which base is acted upon in aqueous medium at normal temperature by 8% caustic soda, 7% lime, 30% silicate; and terpineol, said percentage being based upon the blood constituent.

17. A glue for use in a cold press comprising the reaction products of blood and alkali-dispersible protein containing material, which base is acted upon in aqueous medium at normal temperature by 8% caustic soda, 7% lime, 30% silicate; and terpineol, said percentage being based upon the dry adhesive base.

18. A glue for use in a cold press comprising the reaction products in an aqueous medium at normal temperature of 100 parts dried blood; 12 parts dried blood; 30 parts sodium silicate; and 600 to 650 parts water.

19. A glue for use in a cold press comprising the reaction products in an aqueous medium at normal temperature of 100 parts dried blood; 42.5 parts sodium metasilicate; and 700 to 750 parts water.

20. A glue for use in a cold press consisting of the reaction products, in an aqueous medium at normal temperature, of blood, and sodium metasilicate.

21. A glue for use in a cold press comprising the reaction products, in an aqueous medium at normal temperature, of blood, sodium metasilicate, and caustic soda, the latter in the proportion of not less than 3% or more than 20% of the blood constituent.

22. A glue for use in a cold press consisting of the reaction products, in an aqueous medium at normal temperature, of blood, and sodium metasilicate, and caustic soda, the latter in the proportion of not less than 3% or more than 20% of the blood constituent.

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