

July 19, 1932.

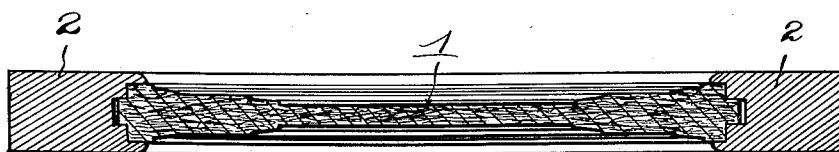
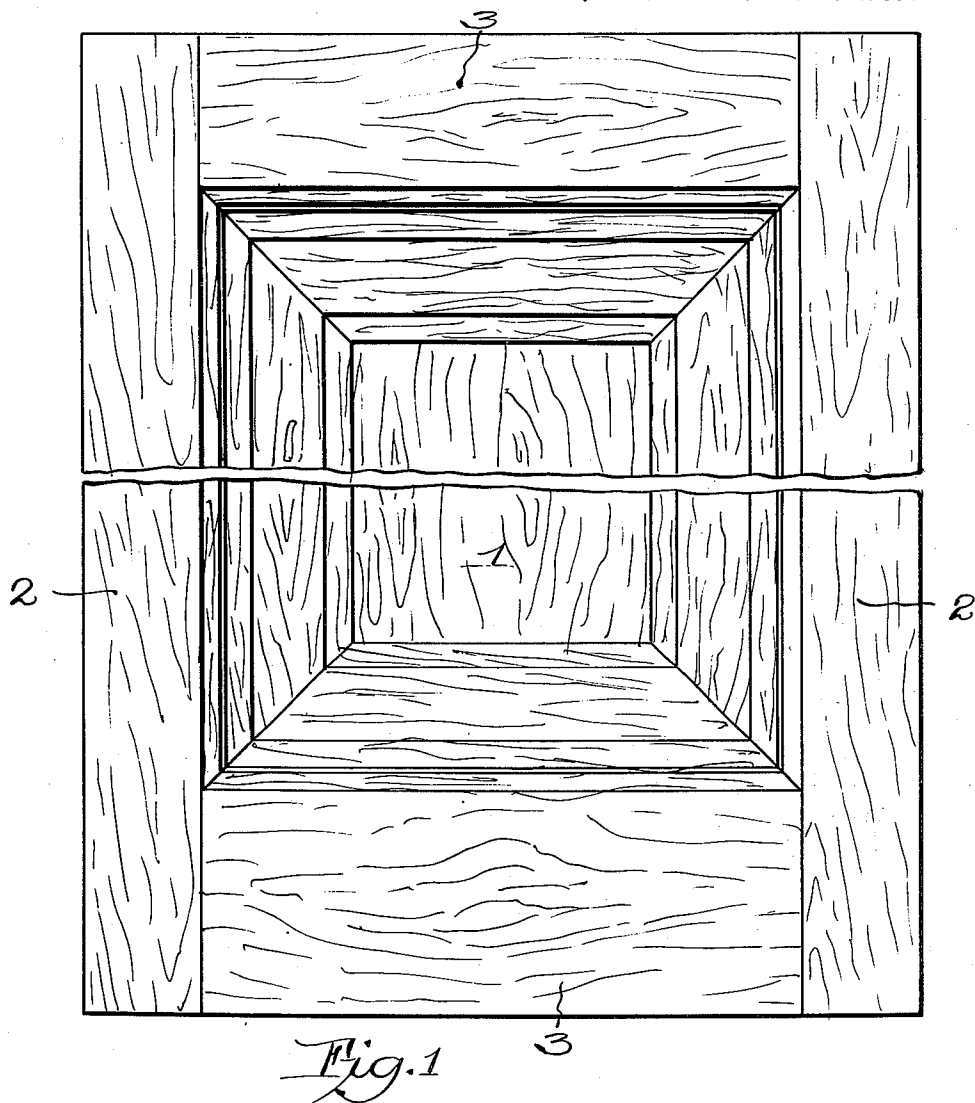
E. C. LOETSCHER

1,867,575

PROCESS FOR MAKING ARTICLES OF FIBROUS MATERIALS

Filed Dec. 12, 1929

3 Sheets-Sheet 1



Witness:
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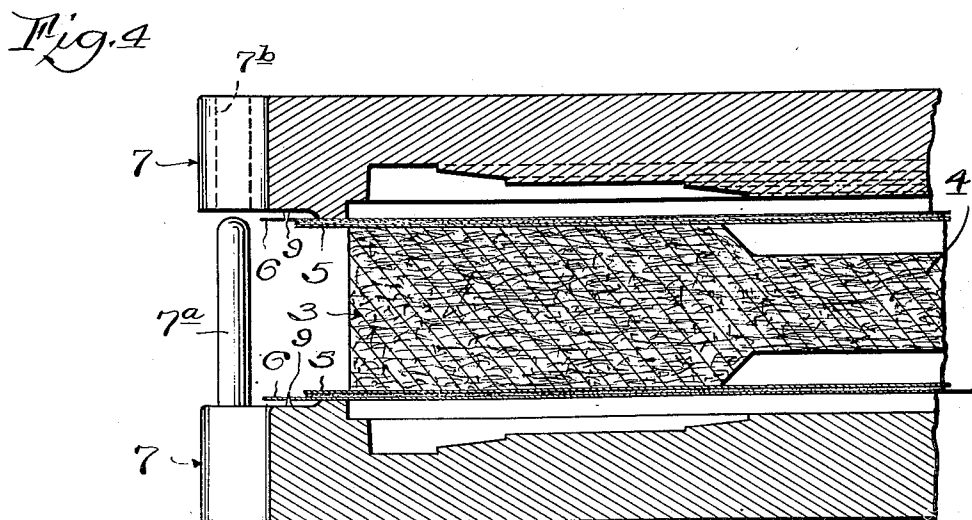
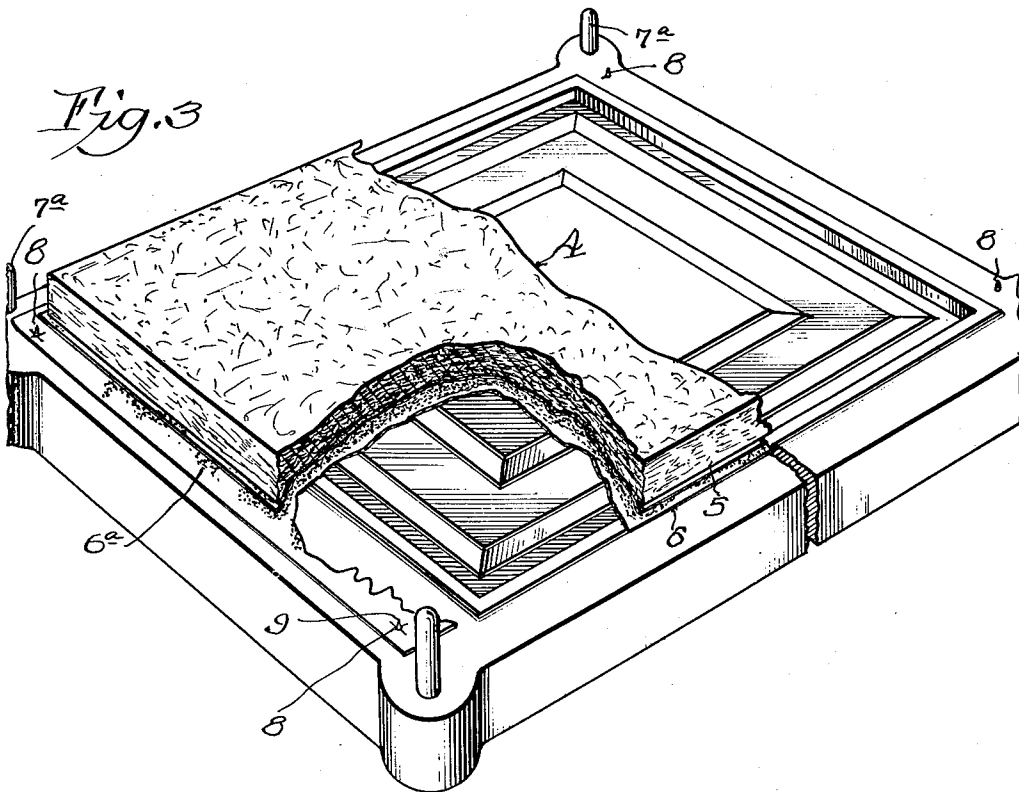
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PROCESS FOR MAKING ARTICLES OF FIBROUS MATERIALS

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3 Sheets-Sheet 2



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PROCESS FOR MAKING ARTICLES OF FIBROUS MATERIALS

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3 Sheets-Sheet 3

Fig. 5

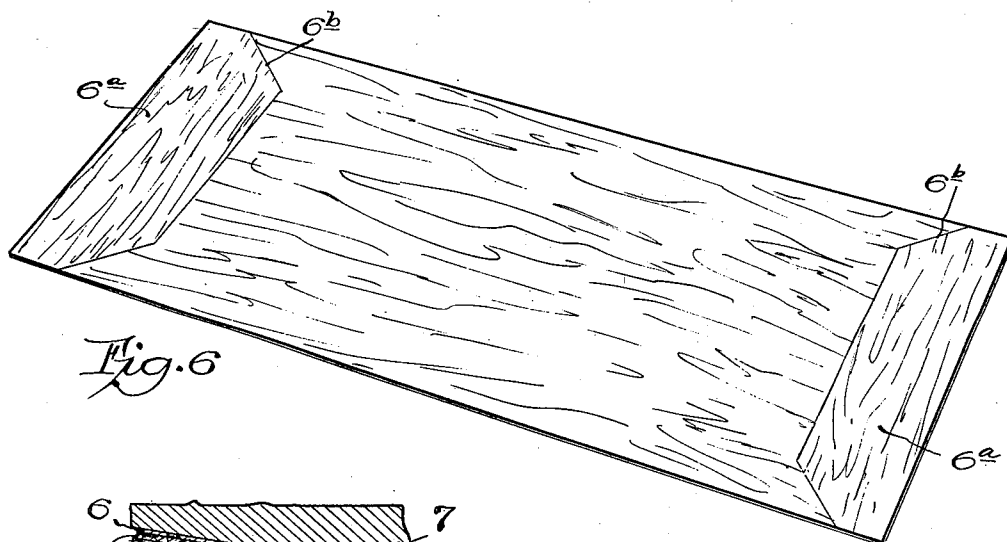
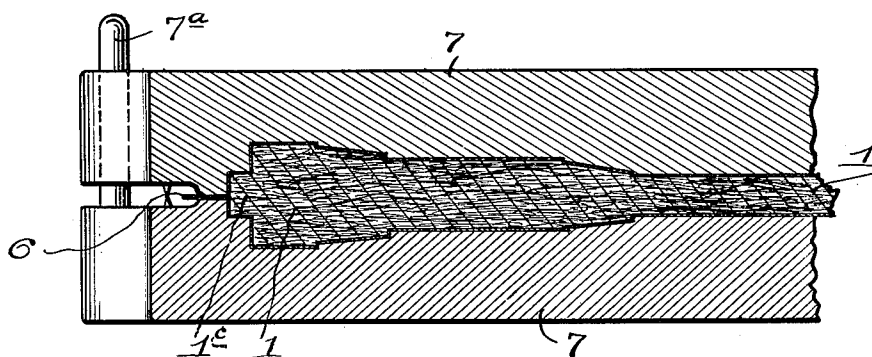


Fig. 6

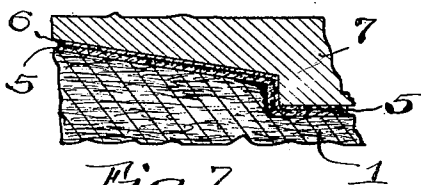


Fig. 7

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UNITED STATES PATENT OFFICE

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PROCESS FOR MAKING ARTICLES OF FIBROUS MATERIALS

Application filed December 12, 1929. Serial No. 413,453.

This invention relates to improvements in process for making articles of compressed fibrous materials, and more particularly to an improved process for treating irregular surfaces of such articles, not only to provide a hard wear-resisting finish, but to faithfully reproduce the surface contour of the dies used in the production of ornamental door panels, moldings, and the like.

10 The present invention pertains generally to the subject matter disclosed in applications filed by me on October 15, 1928, Serial No. 312,744, and July 12, 1929, Serial No. 377,917, which dealt with the processing of cellulose
15 fibrous substances into materials having the qualities and surface characteristics of natural wood and therefore capable of being utilized as a substitute therefor in the manufacture of mill products, articles of furniture,
20 and the like. These prior disclosures, however, were concerned particularly with products having plain or flat surfaces as distinguished from surfaces having an irregular sectional contour or ornamentation in relief.

25 The object therefore of the present invention is to provide a process for producing articles of fibrous material having sharply defined surface ornamentation, by treating the surface in such a manner as to conform
30 exactly to the dies between which the material is compressed.

As an example of the class and character of work which can be accomplished by the improved process, a panel for a door has been
35 selected, and the various steps in its manufacture will now be described in connection with the accompanying drawings, in which

40 Figure 1 is a view in front elevation of a door having a panel constructed in accordance with the improved process;

Figure 2 is a view in cross section through the door;

45 Figure 3 is a perspective view of the lower die with the layers of material superimposed thereon;

Figure 4 is an enlarged detail view in cross section showing the materials arranged between the panel forming dies, before the
50 pressure is applied;

Figure 5 is a view similar to Figure 4 showing the materials after compression;

Figure 6 is a perspective view of an outer sheet of grained bakelized paper; and

Figure 7 is an enlarged detail view in section of a portion of the panel showing the manner in which the layers of materials are disposed in conforming to the sharp contours of the die plates.

The door panel 1 to be made by the process may be considered as that portion of a door which is fitted into and surrounded by the outer frame consisting of the upright members or stiles 2, 2 and the transverse members or rails 3, 3, suitably joined together and having grooves or rabbets along their inner edges (Figures 1 and 2). In a door made entirely of wood, the stiles and rails would either be made of solid wood or a veneer of hard wood over a soft wood core. Similarly, the central panel would be solid or veneered, but considerably thinner than the stiles and rails, and between the two either a separate mitered frame would be inserted or a wide molding would be applied around the edges of the central panel, the purpose in either case being to enhance the general appearance to relieve the door of its otherwise severe plainness.

To reproduce the same effect in a panel of compressed fibrous material including a mitered frame or molding necessitates the use of especially prepared dies, which not only compress the material to different thicknesses but bring out in sharp relief the desired surface ornamentation. Moreover, if the surface of the panel is to be colored and grained in imitation of mahogany or other hard wood, the effect of graining running in different directions and the miter joint may also be reproduced.

The present disclosure therefore, is a process for the production in a composite material having a cellulose fibrous base, the panel 1 including the thin central portion 1a of uniform thickness and the surrounding mitered frame or molding 1b, duplicating not only the surface contour of the molding in sharp detail, but the miter joints and the longitudinal graining as well, where the door

is to have a natural wood finish. Manifestly, the door may be one intended to be coated with an opaque enamel, in which case the surface contour of the panel is the important feature of the process. But in either case the chief advantage of the process would be the production at a relatively low cost, of panels which could be fitted into an outer frame of wood and thereby eliminate the high cost of assembling and finishing operations that attend the making of doors entirely of wood and according to the standard mill practice. It would be possible, in this connection, to manufacture the entire door in one piece and by the same process as the panel, in other words, to make the entire door as a single unit, but since the ornamentation does not extend to the outer frame members it will suffice to confine the disclosure to the manufacture of the panel.

The process for making the panel will now be described: The first step is to form a mat 4 of fibrous material of the desired quality and texture, by pressing a mass of the fibre pulp in a suitable form or press into the form of a slab having substantially the length and width of the finished panel but of considerably greater thickness. The mat may be of uniform thickness throughout or so constructed that the marginal portions are thicker than the central portion, thus allowing for the difference in thickness between the central portion and the surrounding mitered frame of the finished panel.

The mat is next subjected to pressure in the presence of heat by placing the same in a hydraulic press provided with hollow platens and equipped with connections for admitting steam thereto. Smooth steel plates are preferably applied in contact with the faces of the mat and by the application of the pressure with the accompanying heat, the same is further compressed, that is, reduced in thickness and proportionally increased in density and a considerable portion of the moisture driven off. However, the mat is not reduced to its final thickness or density in this initial pressure treatment nor is it necessary to prolong the treatment until all of the moisture is driven off. In fact, it is found to be more economical to remove the compressed mat with from 5% to 7% of moisture still remaining, and completing the drying operation in a suitable oven or kiln.

The surfaces of the mat are now prepared in the following manner: A coating of varnish of rather heavy consistency is applied to both surfaces of the mat, a suitable bakelite varnish being preferably used for this purpose. Over the varnished surfaces is next spread a thin coating of an especially prepared molding mixture, composed of substantially one-half of wood flour (pulverized wood pulp) and one-half bakelite or other

equivalent resinous substance in finely divided form. The molding mixture is applied to the surfaces of the mat while the varnish is still wet and in a tacky condition so that the dry mixture adheres as a thin layer or coating over the surfaces. The mat is then dried in an oven at a temperature of from 120° to 130° C., thus driving off the solvents in the varnish and leaving the surface coating quite dry and hard.

Having thus prepared the mat (Figure 3) sheets of covering paper are next prepared to be applied over the surfaces of the mat. For this purpose a medium grade of kraft paper is used and the treatment consists in coating one side (or both, if greater plasticity is desired) with a bakelite or other varnish and while still in a tacky condition a thin layer of the same molding mixture of bakelite and wood flour is dusted over the varnished surface.

An outer layer or surface covering to be applied over the heavier layer of treated kraft paper is an especially prepared paper known as bakelized paper, that is, paper which has been treated or impregnated with a solution of bakelite varnish. A thin alpha-cellulose paper is preferably used as the base for this outer covering material. For a painted or enamelled surface a plain bakelized paper is used, but for a natural wood finish, the paper is also colored and printed to reproduce the graining and color of the wood being imitated. The effect of graining can be obtained by one of several methods, such as by the use of graining rollers, or by printing the sheets from plates prepared from the negative of a photograph of a panel made up in natural wood. For large production the photographic process is perhaps more satisfactory and particularly in panels in which the grain runs in different directions as in the reproduction of a mitered frame or molding of the present disclosure.

Having prepared and cut the sheets of kraft and bakelized paper to the required size, the several layers of material are now assembled preparatory to placing the same between the dies as will now be described with reference to Figures 3, 4 and 5. A sheet 5 of the treated kraft paper is first applied over each face of the mat 4, having the surface coated with the molding mixture outermost, and a sheet 6 of the bakelized paper over the sheets of kraft paper. As to the size of these sheets it is apparent that they must be somewhat larger than the mat 4, inasmuch as they eventually must assume the contour of the dies, and therefore in assembling the materials these sheets extend on all sides some distance beyond the edges of the mat as shown in Figure 3.

The die plates 7, 7, are heavy steel plates each having the impression of one face of the panel cut in the opposing faces, there being

a lower and an upper plate which are placed with the assembled panel materials, between the platens of a heavy hydraulic press capable of exerting a pressure of from 500 to 1000 pounds per square inch. The die plates are prepared in accordance with the standard practice with the usual arrangement of reciprocating pilot pins 7a and cylindric bores 7b to insure the exact registration of the plates. The impressions cut in the faces of the die plates are manifestly depressions of varying depth which are the reverse of the surface contour of the panel to be formed. The central portion of the impressions are therefore flat to conform to the thin central portion of the panel, while the marginal portions consist of a series of narrow surfaces either flat or beveled offset from each other in different planes with narrow vertical faces making sharp right-angled intersections therewith.

In the making of panels having their surfaces finished in imitation of natural wood, the preferable procedure is to register the grained and colored sheets 6, 6, with the faces of the die plates in order that the graining will properly be disposed over the corresponding areas on the panel. Thus Figure 5 shows a printed sheet having an all over printed impression of the grain of a selected natural wood wherein the grain extends lengthwise of the sheet except within the areas 6a, 6a, at the ends included between the diagonal lines 6b, which represent the lines of the miter joints at the corners of the mitered frame or molding. These lines may or may not be visible, but in any event it is essential that they register with the corresponding lines of miter on the die plates. To bring this about there are printed along the end margins of the sheets, register marks 8, 8, and set into the marginal portions of the die plates are pins 9, 9, so located that when the sheets are stretched over the plates and the pins forced through the centers of the register marks, the perfect registration is assured. Accordingly, the outer sheets 6, 6, are preferably applied directly to the die plates and the base material or mat 4 with the intermediate layer of kraft paper 5, 5, placed between as shown in Figure 4.

The die plates with the assembled materials between are now placed in the press with the hollow platens above and below. Steam is first turned into the platens before any considerable pressure is applied, so that the bakelite impregnated coatings between and on the surfaces of the layers of base material and paper are thoroughly heated and thus reduced to a plastic condition. The pressure is now applied, varying from 100 to 500 pounds per square inch, depending on the depth of the impression to be made, the pressure and heat being maintained for a period of from 10 to 15 minutes, after which the

dies are cooled by circulating water through the platens until normal temperature conditions have been restored. Under the pressure and heat the fibrous material of the mat is compressed to its final density and assumes substantially the contour of the dies, that is to say, it is capable of conforming to varying thicknesses in the finished panel but due to the fibrous texture is not capable of conforming exactly to the sharp bends and corners on the face of the die. The outer layers of paper, however, being rendered plastic by the bakelite are capable of conforming to the exact contour of the dies, with the aid of the molding mixture which fills in or builds up the void between the relatively imperfect impression in the fibre base and the layers of paper where the sharp angles or corners are formed.

Manifestly the compression of the materials between the dies is accompanied by a shifting of the layers of paper relative to each other and the mat as the pressure is increased and the impressions take form. But this is readily accomplished without tearing or distortion of the paper sheets, a phenomena that is attributed to the fact that the intermediate coatings of varnish and layers of the molding mixture become quite plastic when heated and thus allow the sheets to be drawn laterally as they assume the contour impressions of the die plates. This result would ordinarily be unexpected in the case of the relatively thin outer sheets but experience has shown that they register accurately with contour of the panel without any appreciable distortion. Manifestly as the pressure is applied and the sheets begin to shift to assume the contour of the die faces the pins will tear through the marginal portions, but since the registration has been made at the outset, the ultimate registration is certain.

Thus as shown in Figure 7, the surface layers of the panel follow exactly every detail of the irregular and sharply defined surface contours of the dies due to the capacity of the paper to bend at sharp angles and especially to the intermediate layers of the plastic molding mixture which flows under the pressure, to fill in and reinforce the paper at the points of abrupt changes in direction essential to an accurate and sharply defined reproduction of the dies.

On completion of the panel it is removed from the press and without further finishing of the surfaces is ready to be assembled with the stiles and rails into a complete door. In this connection it will be noted that the panel formed in the dies has a tongue 1c extending entirely around its outer edge (Figures 2 and 3) which fits into grooves or rabbets formed in the inner edges of the stiles and rails as at 2a (Figure 2), the abutting surfaces of

the panel 1 and surrounding stiles and rails being glued in the usual manner.

The resulting product is an ornamental panelled door in which the central portion is one piece panel of composite material, having the appearance and finish of natural wood, but of superior wearing qualities and fire resisting properties.

It will be understood that for cheaper grades of panels and like articles a natural resin varnish may be used in place of bake-lite, so wherever the latter is mentioned, the former may be substituted. Likewise, the several steps of the process may be variously modified without departing from the spirit of the invention.

I claim as my invention:

1. A process for manufacturing articles of a composite fibrous material and having irregular and sharply defined surface contours, consisting of forming a mat from a cellulosic fibrous pulp with portions of varying thickness and of substantially greater thickness and less density than the finished article, coating the surfaces of said mat with a resinous varnish and allowing the same to dry, preparing a covering for said mat of a plurality of sheets of paper coated with a resinous substance and having an intermediate layer of a dry mixture of a pulverized resinous substance and a cellulose filler, applying the covering over said mat and compressing the whole between heated dies whereby the same is reduced to the final thickness and surface contour of the finished article.

2. A process for manufacturing articles of a composite material, consisting of forming a mass of cellulose fiber pulp into a mat having portions of varying thickness, coating the surface of said mat with a resinous substance, applying over the surface of said mat a covering consisting of sheets of resin-coated sheets of fibrous material having an intermediate layer of pulverized cellulose substance, placing the mat and covering between die plates of irregular surface contour and subjecting said assembled materials to heat and pressure between said die plates.

3. A process for manufacturing articles of a composite material having irregular surface contours, consisting of forming a compressible mat from a pulp of fibrous material and having portions of varying thickness, applying over the surface of the mat a covering composed of a plurality of resin impregnated sheets of fibrous material with an intermediate layer of a mixture of a pulverized resin and a filler, placing the mat and surface covering between the plates having the impressions of the surface contour of the article to be made, and subjecting the same to heat and pressure in a press.

4. A process for manufacturing panels or the like of composite material having sharp angularly offset surface portions, consisting

of forming a mat of a cellulose pulp substantially thicker and less dense than the finished panel, covering said mat with sheets of fibrous material coated with a resinous substance and having an intermediate layer of a dry molding mixture composed of substantially equal parts of a pulverized resin and wood flour, applying sheets of paper printed and colored in imitation of a grained wood over said fibrous covering sheets, registering said last mentioned sheets with die plates having the surface contour of the panel impressed in the faces thereof, placing the assembled materials between said die plates, heating the die plates to a temperature sufficient to render the resin plastic, and finally applying heat and pressure to said die plates to compress the materials to the desired density and surface contour.

Signed at Dubuque this 7th day of Dec., 1929.

EMIL C. LOETSCHER.