Aug. 18, 1953 A. C. MERRON 2,649,124

MANUFACTURE OF BARRELS AND THE LIKE

Filed Aug. 25, 1949 2 Sheets-Sheet 1

Fig. 1.

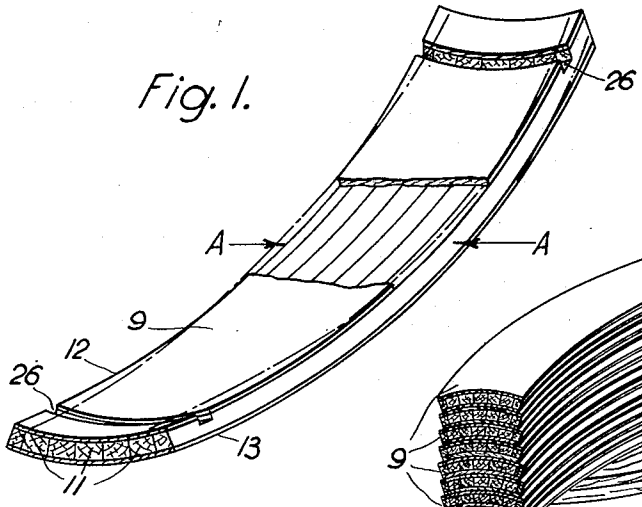


Fig. 3.

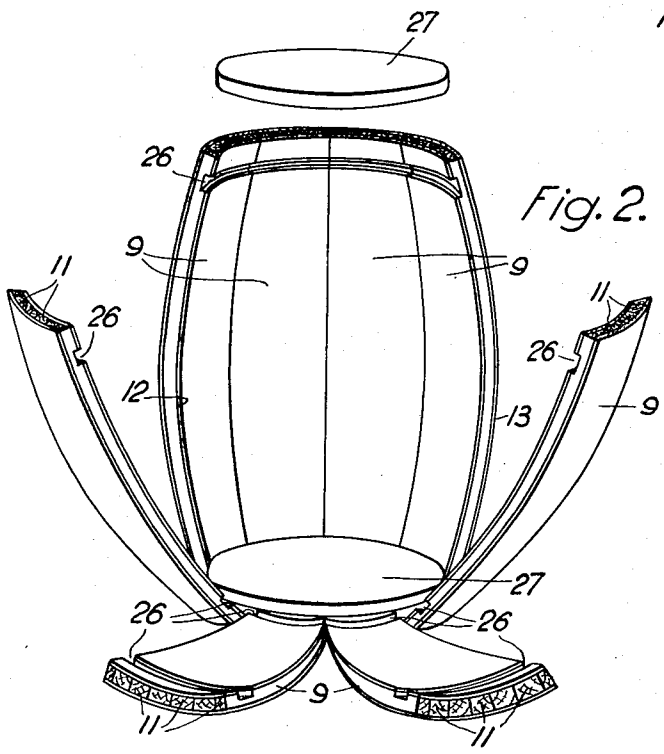


Fig. 2.

INVENTOR
Arthur Cyril Merron
BY A. E. Odell
ATTORNEY

Aug. 18, 1953 A. C. MERRON 2,649,124

MANUFACTURE OF BARRELS AND THE LIKE

Filed Aug. 25, 1949 2 Sheets-Sheet 2

Fig. 4.

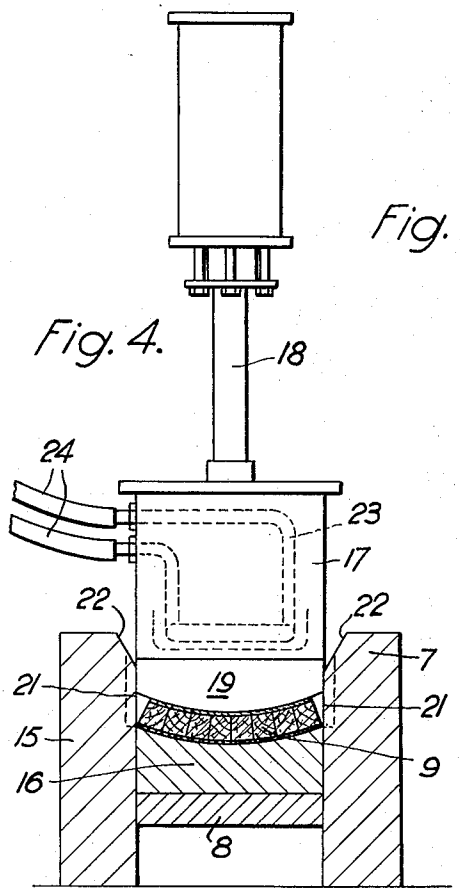


Fig. 5.

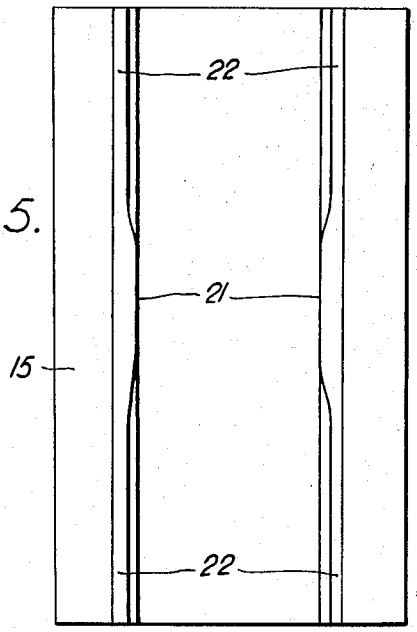


Fig. 8.

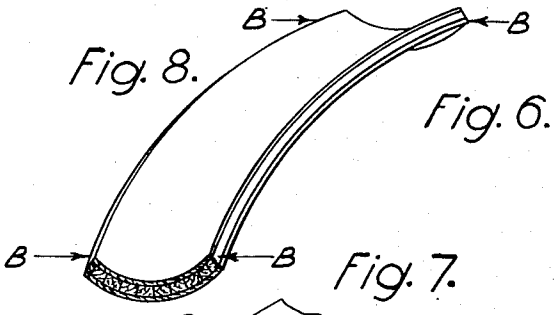


Fig. 6.

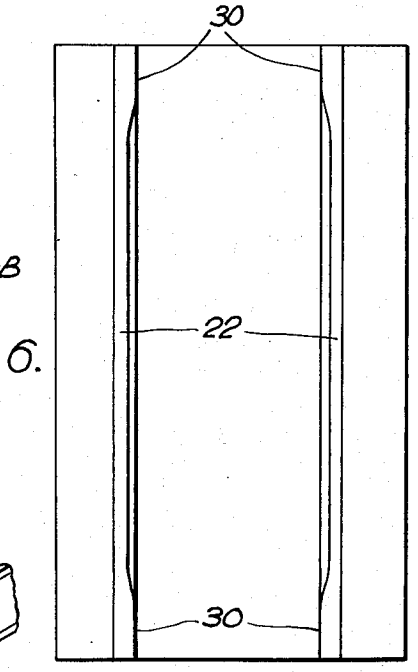
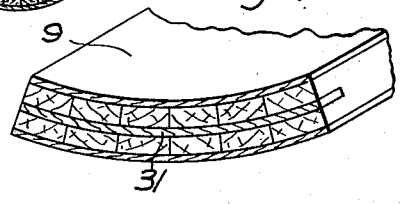


Fig. 7.



INVENTOR
Arthur Cyril Merron
BY A. E. Odell
ATTORNEY.

Patented Aug. 18, 1953

2,649,124

UNITED STATES PATENT OFFICE

2,649,124

MANUFACTURE OF BARRELS AND THE LIKE

Arthur Cyril Merron, Twickenham, England

Application August 25, 1949, Serial No. 112,301
In Great Britain August 30, 1948

5 Claims. (Cl. 144—309)

1

This invention relates to the production of bodies of compound or intrinsic curvature.

The invention is applicable to the manufacture of casks or barrels, boat hulls, aircraft or furniture components, or other articles whose surfaces are of compound curvature.

According to the invention the bodies are made by assembling a plurality of substantially straight wooden core strips laterally coated with adhesive in lateral juxtaposition, subjecting the assembly to pressure normal to its plane to give it the whole of the required longitudinal and transverse curvatures whilst applying pressure laterally to the strips at least at the line or lines where the assembly has the greatest tendency to spread under the resistance of the strips to lateral bending thereby pressing the strips into lateral contact over their whole lengths, and maintaining the pressure until the adhesive has set. In effect, though in general each strip will be bent both longitudinally and laterally, insofar as its width is not substantially greater than its thickness, it will not be stressed substantially more highly than if it were given a curvature of the same value lying in a single plane, whereas if it is attempted to give a wide piece of wood of the same thickness a compound curvature, in many cases the material would break, while if this did not happen the deformation would involve stresses of an altogether different order. Consideration will show that the strips will naturally tend to set themselves during bending along geodetic lines or what may be called the lines of longitude of the form being aimed at, and the resistance of the strips to lateral bending will give them a tendency to spread apart at regions depending on the form being aimed at. Consequently if lateral pressure is applied only at the regions of maximum spread this will suffice to press the assembly together laterally over the whole length of the strips, and the strips in general will be bent laterally by the lateral pressure as well as longitudinally by the pressure normal to the plane of the assembly and so normal to the thickness of the strips.

The structure above described consists only of the strips adhesively secured together in the desired conformation. For some purposes this will suffice. But for many purposes the structure is not sufficiently stable and has other disadvantages. These may be overcome by providing the strip structure with a skin sheet on both faces, secured by adhesive and preferably put in place before the strip assembly is pressed to shape, so that the attachment of the skin sheets and the

2

shaping of the whole is effected in a single operation. The skin sheets must be of material which will yield to the required deformation. They may for example be wood veneers set with the grain across the length of the strips, or thin plywood. The skin sheets not only stabilise the structure but they strengthen it and also help to make the whole impervious to fluids, thus enabling strips of lower quality (for instance with small knot holes) to be used even where an impervious structure is required. With a suitable quality of adhesive, the latter will also contribute to making the structure impervious.

There will be a tendency for the joints between the strips to gape on the face which is transversely convex, but if the curvature is not too great, the lateral compression of the strips will suffice to give adequate joints. If necessary or desirable however the strips may be bevelled to avoid any possibility of gaping. Where skin-sheets are used the slight gaping will generally be of less importance.

Another way of stabilising the structure (which can also be used in conjunction with skin sheets) is to let keys of material such as veneer into grooves cut across the ends of the strip structure and secure them with adhesive.

Where necessary the curved structure as made in the press will subsequently be trimmed to outline and bevel.

A doubly curved body according to the invention may be synclastically curved, i. e. have its convexities facing the same way as a cask or barrel or dinghy hull, or it may be anti-clastically curved having its convexities opposed, as in the inwardly arched bows of a hard-chine type of motor boat hull or in a saddle-shaped body.

When a number of juxtaposed strips are bent synclastically as in the case of the staves of a cask or barrel, as above mentioned there will be a tendency for the middle portions of the strips to move apart along the line of least transverse curvature and set themselves along what may be termed lines of longitude where they will not be subject to transverse bending. To counteract this tendency the strips are laterally confined at least at the region of greatest tendency to spread which will generally be the line of least curvature running across the longitudinal centres of the core-strips. When the strips are bent anti-clastically with their convexities opposed the ends of the strips will tend to separate and lateral pressure will be applied at least along lines passing through the strips at or near their ends. Cor-

responding arrangements will be made with more complicated forms.

The invention as applied to the manufacture of tight casks or barrels will now be described by way of example in greater detail with reference to the accompanying drawings wherein:

Figure 1 shows an unfinished stave in perspective;

Figure 2 is an exploded view of a cask;

Figure 3 shows the dismantled components of the cask stacked for transport.

Figure 4 is a side view of a suitable hydraulic press;

Figures 5 and 6 show two forms of dies;

Figure 7 shows a detail; and

Figure 8 shows an anti-clastically curved body.

Referring to the drawing, the cask is made up of a plurality of identical staves **9** which are adapted to be held by hoops in the usual way. In the example shown eight identical staves are used per cask. Casks may however also be made with four, six or ten or any other convenient whole number of identical staves, though it has been found that with four staves to the cask, i. e. with staves extending over 90°, the staves do not stack very satisfactorily. As the staves are identical they can be assembled in any order and the casks when empty can be knocked down (Figure 2) and nested for transport, see Figure 3. Their re-assembly is a simple matter not calling for great skill, as distinct from the assembly of the traditional tight wooden cask with its random number of staves each of varying width.

Each stave is made up of a plurality of core strips **11** (Figure 1) which are arranged in lateral juxtaposition and are sandwiched between two veneer skin sheets **12**, **13** set with the grain across the stave. The strips are all preferably of the same width and may be cut with a multiple saw from hard wood which may be of inferior quality as the strips themselves need not be liquid-tight.

The amount of bending which can be effected on wood in the cold varies with the species and the proportions of the piece, though it is never very great. But the building up of the core of strips in accordance with the present invention uses wood in an advantageous way as regards bending. In the case of a barrel stave, if the longitudinal curvature is not too severe for the strips to be bent in the cold, then the tranverse curvature presents no substantial additional impediment, and cold bending can be employed. If the curvature in any particular case is too severe however for cold bending, the strips and/or the skin sheets may be given any known pre-treatment to make them pliable, such as boiling in water, steaming or treatment with urea. Boiling or steaming may make for difficulty in gluing in a hot press on account of the increased moisture content.

The strips and if desired, the backs of the skin sheets are then coated with adhesive preferably of the synthetic resin, thermosetting type, and assembled. The assembly is then placed in the base **15** of a hydraulic press Figure 4. The base has a female die **16** resting on cross bars **8** and having a shape to which the outside face of the stave is to be conformed. The deforming pressure is applied by a male die **19** mounted on a plunger **17** carried on a hydraulic ram **18**. The face of the male die corresponds to the inside face of the stave to be moulded.

The lateral pressure to be applied to the middle lines of the core strips, as indicated by the arrows A—A, Figure 1 is produced by providing the base of the press with inwardly protruding bulges **21**. The opening in the base of the hydraulic press tapers from a width large enough to receive the loose core strips, down to the width the core strips are to occupy when compressed.

To keep the core strips and skin sheets hot during the moulding process and the curing of the adhesive where that is of the thermosetting type, the plunger **17** may be internally heated by a steam pipe **23** connected to a steam supply by a flexible connection **24**. The female die **16** may also be heated if desirable. Any volatiles driven off during pressing will escape through the ends and sides of the work piece.

The press may be adapted to mould a number of staves simultaneously. The assembly of core strips and skin sheets are then stacked with the interposition of suitably curved and heated intermediate dies, the lowermost assembly resting on a solid base whilst the uppermost assembly is acted upon by the face of the plunger, suitable means being provided to apply the lateral confining pressure.

The core strips and skin sheets are kept under pressure in the press until the adhesive has set. The staves are then removed and shaved or trimmed as indicated in broken lines in Figure 1. The ends of the staves are crozed as at **26** for the reception of the head pieces **27**.

The skin sheets are made of veneer as above described when the casks are intended for instance to hold beer or wine. The barrels or casks prior to use are washed with hot soda water to remove undesirable extractives in the inner skin sheet. The pickling liquor need only penetrate the thickness of the skin sheet as the bonding line of the adhesive effectively seals off the bulk of the timber in each cask. Thus the pickling is more effective in the cask according to the invention than in the traditional type. The skin sheets may however be made of paper, plastic or metal if the nature of the liquid to be carried in the barrel so requires.

The skin sheets stabilize the staves as a whole so that they do not change their form with the lapse of time. The stave structure can instead be stabilized by cutting grooves (Figure 7) across the ends of the core strips assembly parallel to the faces of the stave and securing a wooden key **31** therein by adhesive.

In the application of the invention to moulding bodies of compound anti-clastic curvature, an example of which is shown in Figure 8 the base **15** of the press has to be modified as regards the disposition of the inwardly protruding bulges for applying the lateral pressures. Two pairs of these bulges **30** are provided to apply pressure in the direction of the arrows B, Figure 8, at or near the ends of the piece to be moulded, the shape of the male and female dies being also modified.

It will be evident from a consideration of the foregoing description that the term "strips" used herein is confined to elements, the cross section of which has a substantial thickness and a width of the same order as the thickness so that a single layer suffices, the layer comprising a relatively high number of strips side by side.

I claim:

1. A method of producing bodies of compound curvature which comprises assembling a plurality of substantially straight wooden strips laterally coated with adhesive in lateral juxtaposition, and curving the assembly both longitudinally and

transversely by pressure applied normal to its plane whilst applying pressure laterally to the strips at the line or lines where the assembly has the greatest tendency to spread under the resistance of the strips to lateral bending thereby pressing the strips into lateral contact over their whole lengths, and maintaining these pressures until the adhesive has set.

2. A method as set forth in claim 1 also including providing the strip structure with a skin sheet on both faces, secured by adhesive.

3. A method as set forth in claim 2 in which the skin sheets are put in place before the strip assembly is pressed to shape.

4. A method as set forth in claim 1 also including pretreating the core strips before assembly to render them pliable.

5. A method as set forth in claim 1 also including grooving the strip assembly across its ends and securing keys in the grooves by adhesive to stabilize the assembly.

ARTHUR CYRIL MERRON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,642,186	Wilson	Sept. 13, 1927
1,976,173	Hutchings	Oct. 9, 1934
1,978,811	Muller	Oct. 30, 1934
1,981,659	Muller	Nov. 20, 1934
2,050,461	Perry	Aug. 11, 1936
2,069,531	Lehner	Feb. 2, 1937
2,279,820	Hamilton	Apr. 14, 1942
2,347,604	McDonald	Apr. 25, 1944
2,365,754	Gramelspacher	Dec. 26, 1944
2,371,305	Marks	Mar. 13, 1945
2,505,302	Ramsey et al.	Apr. 25, 1950

FOREIGN PATENTS

Number	Country	Date
22,439	Australia	Apr. 30, 1935
478,397	Great Britain	Jan. 18, 1938