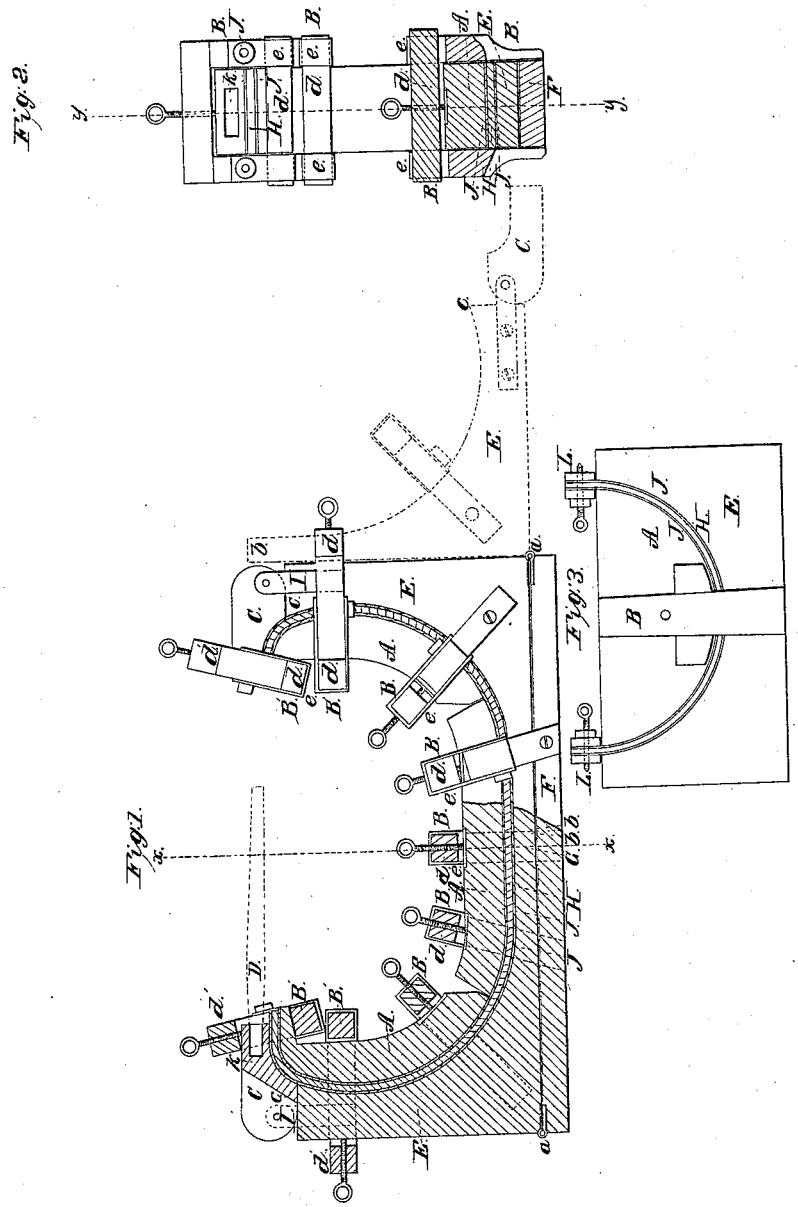
E. C. Harris,

Bending Wood.

No. 52,944. Patented Feb. 27, 1866.



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UNITED STATES PATENT OFFICE.

EDWARD C. HARRIS, OF NEW YORK, N. Y.

IMPROVEMENT IN WOOD-BENDING MACHINES.

Specification forming part of Letters Patent No. **52,944**, dated February 27, 1866.

To all whom it may concern:

Be it known that I, EDWARD C. HARRIS, of No. 150 West Forty-Eighth street, in the city, county, and State of New York, have invented a new and useful Improvement in Bending Wood; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents an elevation, partly in section, on the line *y* of Fig. 2, of an apparatus made according to my invention. Fig. 2 shows a cross-section taken on the line *x* of Fig. 1; Fig. 3, a modification of a portion of the apparatus.

Similar letters of reference indicate like parts.

This invention consists in bending wood to the shapes required—as, for instance, the rims or cases for pianos, square or grand—by forcing the stuff into concave beds, in contradistinction from the familiar method of drawing it about convex forms. It is also adapted for the application of veneers.

The invention further consists in the combination, with said concave forms, of movable supplementary sections for bending parts whose curves extend beyond the limit of one hundred and eighty degrees, as hereinafter explained.

In carrying out my invention I use metallic plates J, which can be easily bent and afterward straightened out again to a flat state. The wood H, to be bent, is placed between these plates, and may either be one piece, as in bending the solid piece for the inside of a piano-case, called the "block," or it may be composed of several sheets or layers of wood for the case itself. In bending several layers, in order to make the case of a piano, the usual veneer of ornamental wood is placed on the outside of the layers and bent up with them.

The mode usually followed in bending wood, whether a solid piece or several thin layers or veneers, is to steam the stuff to be bent so as to soften its fibers, and then to bend it around a form. This mode is not useful in bending the curved parts of piano-cases, because it is necessary in making pianos that all the stuff be dry, it being common to kiln-dry it after it is well seasoned. Another objection to this mode arises from the expansion given to the stuff lengthwise when it is bent up around a convex surface, thereby making it necessary to allow for this increase of length when cutting the stuff out. Moreover, this expansion is not uniform, and therefore it becomes difficult to fit the case to the adjacent parts.

My invention is intended to get rid of these difficulties and also to avoid the necessity, now universal, in making pianos with rounded corners, as well the cycloid as square and grand pianos, of building up the rounded portions piece by piece. The parts built up are required to be strong, and therefore it is necessary to add greatly to their bulk. These parts are therefore cumbrous and their construction is expensive.

In carrying out my invention I use a concave bed, into which the stuff to be bent is forced, and I apply my invention in bending the front corners and other parts which have sharp curves, as well as the parts whose curves are drawn with a considerable radius.

F designates any platform to which the bed E may be attached.

In Fig. 1 the bed E is made in two parts hinged to the platform at *a a*, so as to be capable of being opened outward. When the sections of the bed are closed their inner ends, *b b*, meet on the line G, so that the inner face of the sections form a bed whose shape is to be of the shape to be given to the stuff. To the upper ends of the sections of the bed I attach, by strap-hinges I, supplementary sections C C, whose inner faces when the supplementary sections are closed are continuations of the curves of the bed E.

The letters A designate blocks whose size and contour are such as to enable the workman to place them in the concavity of the bed, their place, however, being above the stuff to be bent.

The letters B B′ designate clamps which serve to bend the stuff and to hold it after it is bent. Some of them are pivoted to the platform, some of them to the bed E, and some of them are detachable from the apparatus. Their blocks *d* are all detachable, being held by their ends in the sockets *e* of the clamps. These blocks extend across the apparatus, and have most of them a screw-rod

passing through them, whose ends work against metallic plates set in the block A or in the bed E, or on the supplementary sections C, as the case may be. The detachable clamps B′ have their screws in their fixed sides *d*.

The form given to the apparatus in Fig. 1 is intended to illustrate the manner of forming the entire outline of the case of a cycloid piano. In bending the stuff for a piano of that kind it is desirable to form the front corners at the same time with the rest of the case; but since the curved line thus produced is greater than a half circle it would not be possible to remove the stuff from the bed after the operation of bending unless it was removed laterally, even if the stuff was successfully driven down into the bed. Besides this difficulty it is desirable to hold the ends of the stuff firmly during the operation. I have therefore provided the supplementary sections C C.

In using the apparatus shown in Fig. 1 the blocks *d* of the clamps and the blocks A are removed and the supplementary sections C are thrown back. The sections of the bed E are then turned outward about one-quarter of a circle, which movement will bring their ends *c b b c* in about the same horizontal line.

If the stuff to be bent consists of layers or veneers their surfaces are to be coated with glue before they are placed together. The plates J are to be brought to a flat condition, and having been heated to a high temperature the stuff is placed between the plates and the whole laid upon the bed, with which the lower plate will be in contact at the points *c b b c*. The middle one of the blocks, A, is next laid upon the upper plate, J, and pressure is brought to bear thereon sufficiently to enable the workman to secure said block within the clamps B. In order to effect this the sections of the bed E are forced inward until their inner ends, *b b*, are brought together, the construction of those sections being such that a powerful leverage is obtained in forcing the stuff down into the concavity of the bed.

When that part of the stuff which comes down into the central part of the bed has been firmly secured the upper side blocks, A, are brought up against the plates J and the stuff H, and pressure is brought to bear upon them by means of the horizontal clamp B, and those clamps B which are pivoted to the sections of the bed E, and they are in this manner forced snugly into the concavity of the bed. The supplementary sections C of the bed are then brought down to the position shown in Fig. 1, so as to bend the ends of the stuff to form the corners and front parts of the case. Each of the said supplementary sections has a socket, *k*, to receive the end of a lever, D, by means of which they are brought down to the required position, when the ends of the stuff H and the inclosing-plates will be bent over on the adjacent parts of the blocks, so as to form the corners of the piano-case and those portions of its front which are on either side of the space left for the bench of keys. Clamps B′ are next applied, so as to inclose the plates and stuff between the supplementary sections and the adjacent parts of the blocks A. When the stuff has been held in this way for about a day it may safely be removed from the apparatus.

It will be observed that the stuff is by this system bent without being saturated or softened by steam or liquid, and it has not therefore lost its character of dryness, and can be immediately used. Furthermore, great solidity is imparted to the corners of the case, which are made by my mode as strong as the straighter parts of the case without being built up piece by piece, and without being made thicker than the other parts. By forcing the stuff into a concave bed in this way between inclosing-plates whose surfaces are always at all points in contact with the stuff I accomplish the bending without separating the fibers and without permitting the stuff to become increased in length. Furthermore, by bending the ornamental with the body of the case I give to it the same fixed contour and unite them together in the same operation.

When the block or piece of solid wood which is put inside the case of a piano as a lining or support is to be bent it is necessary to confine its ends rigidly, so as to prevent the fracture of its fibers, since its flexibility is not as great as is the mass of layers or veneers. In Fig. 3 I have shown a manner of confining its ends in the operation of bending in the frame E. I do this by means of clamps L, whose screw-rods pass through longitudinal slots in plates J J, and which hold the block H so tightly compressed between the plates as to prevent it from moving or expanding while it is being forced down into its bed.

This method of bending wood can be applied to any form—as, for instance, to the construction in one piece of the cases of grand pianos. In that case the bed of the apparatus must be of a shape corresponding to the shape of the piano front or frame, and it may be necessary to change the places of the hinges *a*, and to divide the bed E into a greater number of sections.

This invention is applicable also to all cabinet-work which has curved lines or surfaces.

The apparatus may be of wood or metal, and is to be of suitable strength and character, and guides may be placed on each side of the bed so as to prevent the plates J and wood and veneers H from lateral displacement, and to make them more in a vertical line.

The blocks A may be made of wood or metal. In bending thick solid stuff, such as piano-blocks, the blocks A are made hot, so as to heat the stuff more or less, and thereby cause its fibers to become contracted on that side which is to be most contracted in bending it to a concave shape, while the bed itself, which is contiguous to the convex side of the stuff, is left comparatively cold, so that the fibers will

be contracted in a less degree; but in bending stuff which consists of thin layers glued together, and stuff on which veneers are laid to be glued and bent at the same time, both sides of the stuff are inclosed between hot plates, and the veneers and stuff or the several layers of the stuff become properly and firmly cemented at the same time they are bent in shape.

I claim as new and desire to secure by Letters Patent—

1. Bending the fronts of pianos, whether formed of thin sheets of wood glued together and veneered, as described, or in one piece and veneered, by forcing such front or block into the concaved bed E applying power to blocks A, and holding the stuff thus bent in position by clamps B and B′, operating on the bending-blocks, in combination with the heated bending-plates, substantially as set forth.

2. In combination with the above, the movable supplementary sections C, arranged and employed in the manner and for the purposes specified.

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