2 Sheets—Sheet 1.

O. V. FLORA.

Bending-Machine.

No. 220,229. Patented Oct. 7, 1879.

Fig. 1.

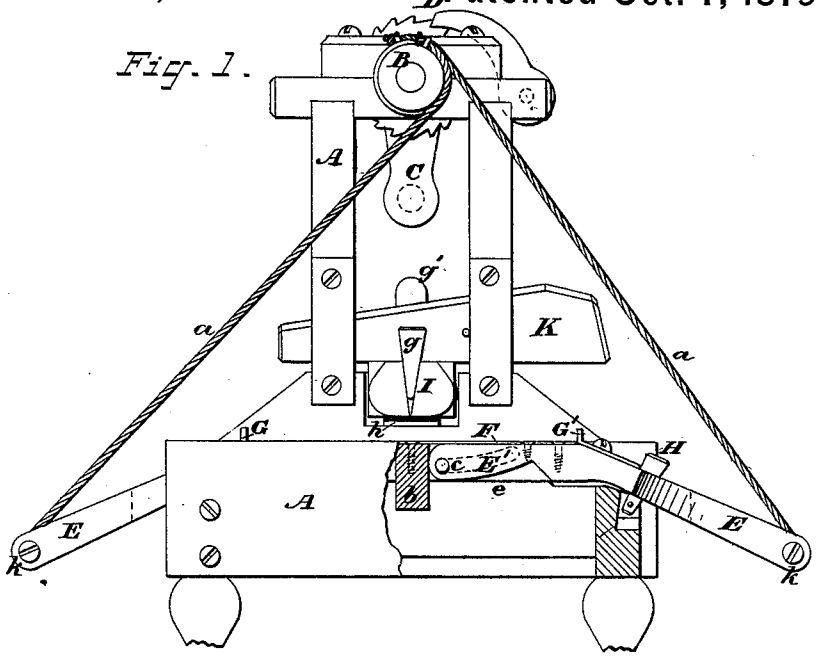
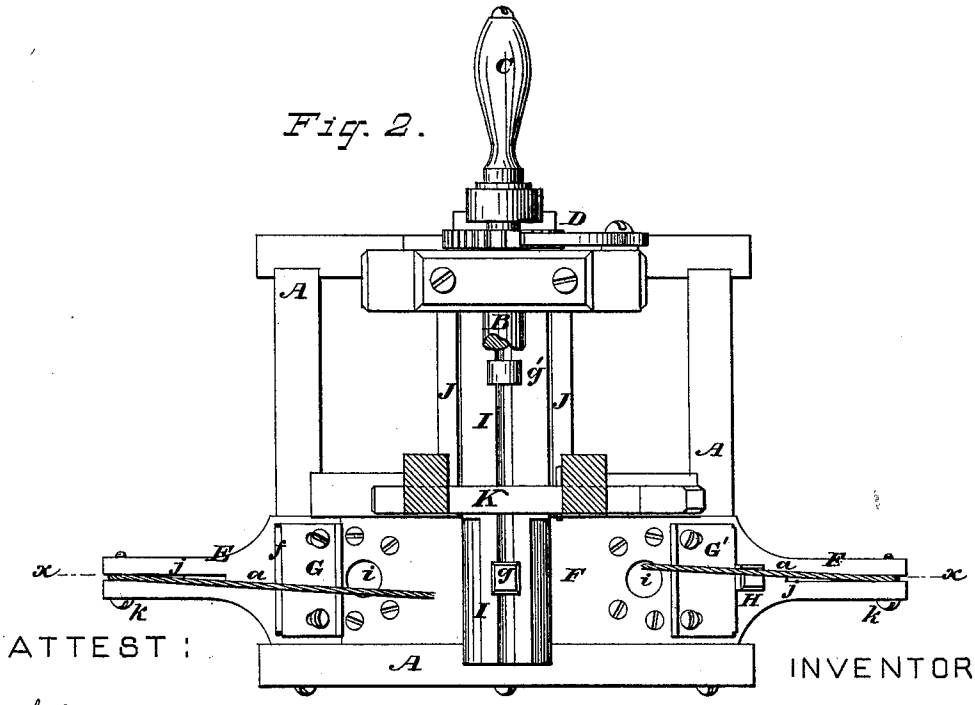


Fig. 2.



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2 Sheets—Sheet 2.

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Fig. 3.

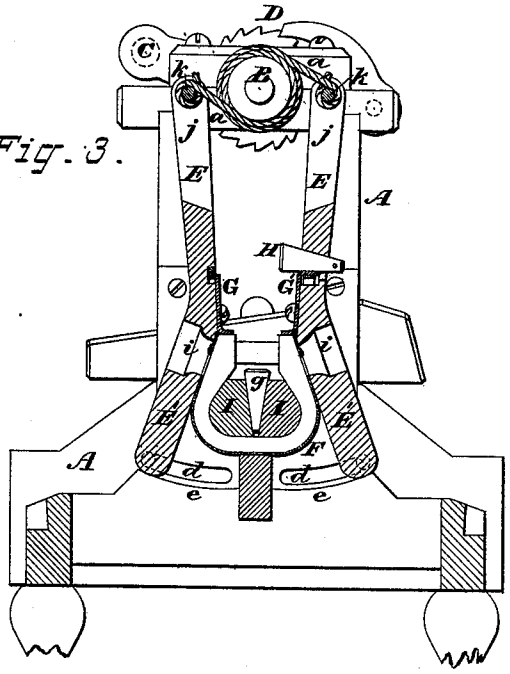


Fig. 4.

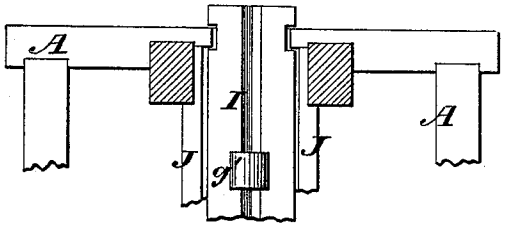
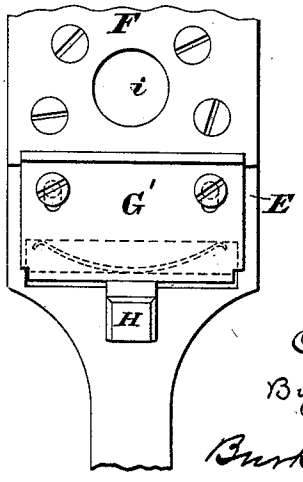


Fig. 5.



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UNITED STATES PATENT OFFICE.

ORLANDO V. FLORA, OF MADISON, INDIANA.

IMPROVEMENT IN BENDING-MACHINES.

Specification forming part of Letters Patent No. **220,229**, dated October 7, 1879; application filed July 24, 1879.

To all whom it may concern:

Be it known that I, ORLANDO V. FLORA, of Madison, Jefferson county, Indiana, have invented certain Improvements in Bending-Machines, of which the following is a specification.

This invention, as herein shown and described, is especially arranged and adapted for bending wooden stirrups; but the novel features may be also applied to other wood-bending machines.

The invention consists, partly, in an expanding and contracting form of peculiar construction, so arranged that the bent article may be readily removed therefrom; also, in the arrangement of curved cam ways or grooves for the prolongations of the bending-levers to ride over or in during the bending operation, so as to keep the back-strap properly stretched; and, also, in the various combinations and arrangements of the parts, all as will be hereinafter more fully set forth.

In the drawings which illustrate my invention, Figure 1 is a front elevation of the machine. Fig. 2 is a plan of the same, part of the windlass being broken away. Fig. 3 is also a front elevation with the bending-levers and form in section on the line *x x* in Fig. 2. This figure is adapted to illustrate the operation of the machine. Figs. 4 and 5 are detail views, the latter enlarged.

In bending steamed wood to form various articles, as stirrups, &c., it is necessary to employ back-straps and end-pressure blocks, and these have been in common use for years; but to guard against splintering and breaking the wood at certain points where the article has a varying thickness and curve, and to insure uniformity in the bends, something more is necessary. This I have sought to accomplish in my present invention, which I will now describe.

Let A represent an ordinary frame-work to support the bending mechanism, and B a windlass-barrel mounted in suitable bearings therein. This barrel is provided with a crank, C, whereby it is rotated, a suitable pawl-and-ratchet device, D, and cords or other flexible connectors, *a a*, which extend down and take hold of bending-levers E E.

F is a back-strap, which I prefer to make of sheet-steel. This strap is secured at the center to a bar, *b*, which forms a part of the frame, and at the ends to the levers E E, as shown.

When the levers are depressed, as in Fig. 1, their prolongations E′ E′ rest under the strap and extend to or nearly to the bar *b*, thus forming a support for the strap throughout its entire length.

As both bending-levers are constructed alike, it will be necessary to describe only one.

The prolongation of the lever is provided with a pin, *c*, on each edge near its tip, which project laterally, and engage cam grooves or ways *d d* (see Fig. 3) in those portions of the machine-frame between which the levers play. These grooves are in a curve traced by the pins *c* when the wood is bent around the form by the upward movement of the levers, the back-straps being held taut or stretched; and the object is to keep the back-strap strained, so as to prevent its giving down as the wood is bent.

If the strap were not supported in this manner, the wood would be distorted, and in many cases splintered, at the bend. The end of the groove also serves as a stop to limit the movement of the levers and prevent their being brought up too far.

In addition to the grooves *d d*, or in lieu of them, I employ curved re-enforce plates *e*, upon which the rounded ends of the levers ride in bending. These plates are curved on their upper edges to correspond with the curve of the cam-grooves, and serve to take some of the strain off the pins *c* in bending.

I prefer to employ both the grooves *d d* and the re-enforce plates *e e;* but it is obvious that either would alone accomplish the desired result in a more or less perfect manner.

G G′ are the end-pressure stops. Both of these may be adjusted; but one is provided with a permanent adjustment and the other with a temporary adjustment, as will be described.

The stop G is a plate provided with a raised flange to engage the end of the piece to be bent, and slotted or elongated bolt-holes, whereby it is secured to the bending-lever. Behind

this stop, and interposed between it and a shoulder on the lever, is, or may be, slipped an adjusting-plate, *f*. Several of these plates may be employed, or plates of different thicknesses can be used. This adjustment is employed only where blanks of different lengths are to be bent.

The stop G′ is constructed in a similar manner to that last described, except that it is provided (see Fig. 5) with a downwardly-projecting flange at its rear edge, against which a retracting-spring in a recess under the stop impinges, as indicated in dotted lines.

H is a wedge or key arranged in a tapered mortise in the lever E at the rear edge of the stop G′. When this wedge is driven in the stop is pressed forcibly forward against the end of the wood blank to be bent.

I is the bending-form. This form is divided longitudinally, and its inner faces are beveled to receive wedges *g g′*, whereby it is expanded. The outer end of the form, which projects over the back strap and levers, is shaped to give the proper form or contour to the article to be bent; but the inner prolongation is substantially rectangular, and rests in a box, J, which serves to support it and limit its expansion when the wedges are driven. To prevent the halves or parts of the form from moving endwise they are gained at their rear ends and arranged to engage suitable projections on the main frame, substantially as represented in Fig. 4.

Under the forward end of the form I (see Fig. 1) is arranged a spring, *h*, and over the form is arranged a cross wedge or key, K, provided with bearings or ways in the posts of the frame A. The spring *h* serves to raise the form when the key K is loosened, and its purpose will be more fully hereinafter set forth.

Having described the construction of my machine thus far, I will now describe its operation.

A steamed wooden stirrup-blank of the proper size and length is placed on the level back-strap between the stops G G′, and the wedge or key H driven down. This clamps it firmly and supplies the proper end-pressure. The wedges *g g′* are now driven down, and the key K driven in. This latter forces the form down upon the blank and clamps it, firmly compressing the spring *h*.

The windlass is now rotated by means of the crank, and the bending-levers are gradually brought up together, as shown in Fig. 3, bending the steamed blank around the form I. Previous to the bending operation, however, the blank is bored and prepared to receive the roller and bolt, and the roller is inserted between the stirrup ends before they are brought together in bending. To enable the operator to insert the bolt while the stirrup is yet on the form, I provide the levers E E with openings *i i* at the proper points to permit the insertion of the bolts and the fixing of the nuts on the same. After the bolts are inserted the levers are brought back to a horizontal position, the keys and wedges released by a tap from a mallet, and the stirrup removed from the form. When the key or wedge K is loosened the spring *h* throws the form up and releases the bent stirrup from contact with the back-strap, between which and the form it was firmly clamped during the bending operation.

The sectional or divided form enables the stirrup to be readily removed after bending, and the arrangement of the levers to play in or on curved guides or camways under the back-strap serves to keep the strap strained while bending.

The levers E are slitted at *j j*, and are provided with clamping screws or bolts *k k*, to which the connectors *a a* are attached. The object of this construction is to enable the slack or stretch of the connectors to be readily taken up. When the connector becomes lengthened by stretching, the bolt *k* is loosened, the connector wrapped around the same until the slack is taken up and the bolt again tightened. This brings the jaws of the slitted lever forcibly together upon the connector and holds it firmly.

The ratchet device D serves to hold the windlass at any desired point during the bending, and requires no special description.

Having thus described my invention, I claim—

1. The combination, in a bending-machine, of the divided form I, provided with rectangular prolongations arranged in a guiding box or frame, as shown, the cross key or wedge K, arranged in keepers in the main frame, and the wedges *g g′*, arranged to expand the form, all as and for the purposes substantially as set forth.

2. In a bending-machine, the combination of the divided form I with the keys or wedges *g* K, the spring *h*, and suitable side guides or stops to limit the lateral expansion of the form, all arranged substantially as set forth.

3. The combination of the back-strap F, secured rigidly at its center to a fixed part of the frame and at its ends to the bending-levers at a point between their extremities, and the said bending-levers provided with prolongations E′ E′, arranged to play over curved cam ways or surfaces, whereby the back-strap is kept uniformly strained during the operation of bending, substantially as set forth.

4. In a machine for bending stirrups, the combination of the back-strap F, rigidly secured at its center to some fixed part of the machine and at its ends to the bending-levers, as shown, the bending-levers provided with openings *i i* and prolongations arranged to play over curved cam-surfaces, whereby the strap is kept uniformly strained, and a divided form, I, provided with expanding and depressing keys *g g′* K and a lifting-spring, *h*, all constructed and arranged to operate substantially as set forth.

5. The combination of the bending-levers E E, provided with prolongations E′ E′ and pins *c c*, with the back-strap F and the side frames of the machine, provided with cam ways or grooves *d d*, all arranged substantially as set forth.

6. The stop G′, provided with a retracting-spring and a wedge or key, H, substantially as set forth.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

ORLANDO V. FLORA.

Witnesses:
HENRY CONNETT,
JOHN A. ZUCK.