(No Model.)

C. SOMMER.

STAVE BENDING MACHINE.

No. 501,697. Patented July 18, 1893.

Fig. 1.

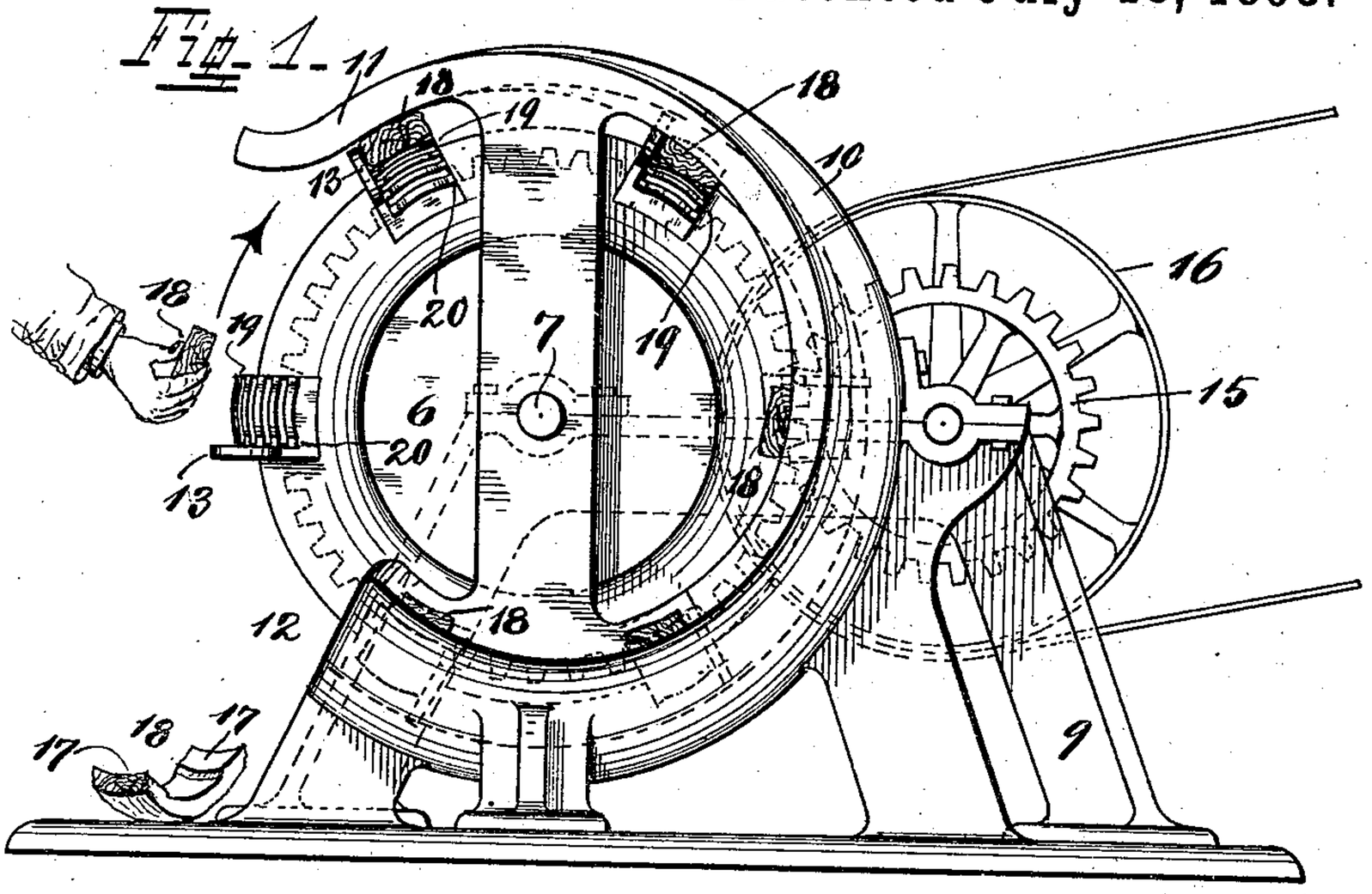


Fig. 2.

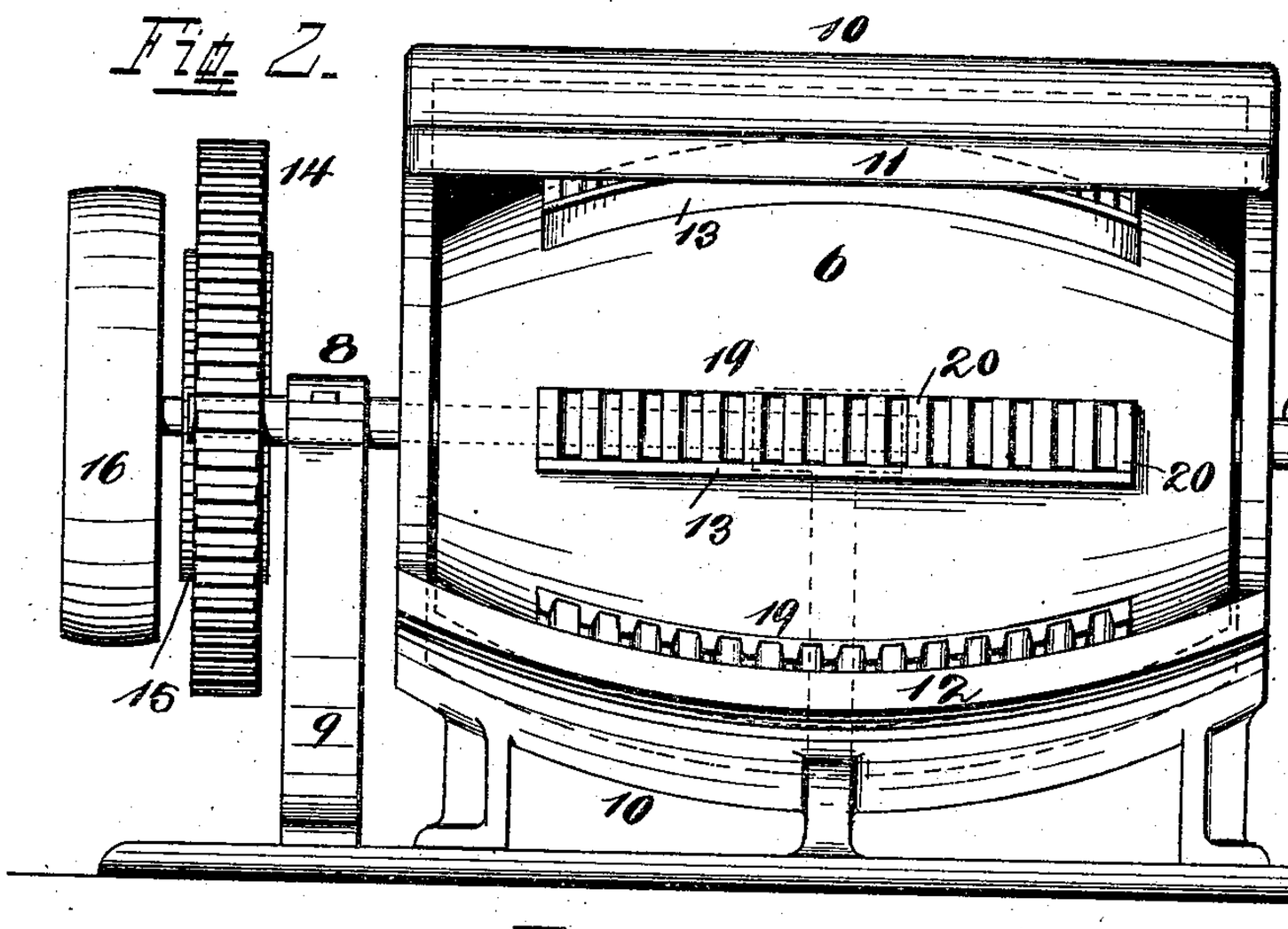


Fig. 3.

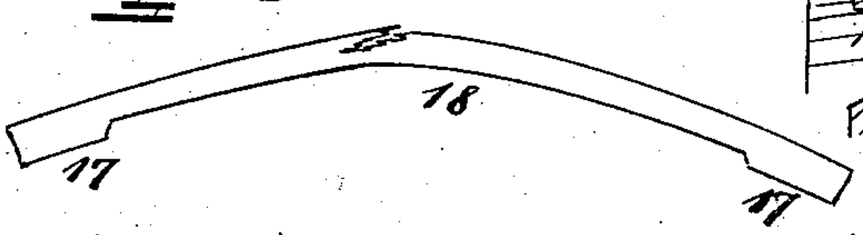
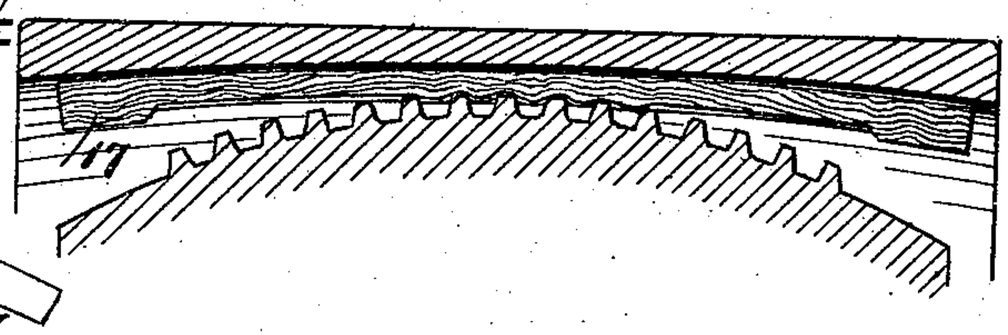


Fig. 4.



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UNITED STATES PATENT OFFICE.

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STAVE-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 501,697, dated July 18, 1893.

Application filed April 10, 1893. Serial No. 469,771. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SOMMER, a citizen of the United States, residing at Sloan's Valley, in the county of Pulaski and State of Kentucky, have invented certain new and useful Improvements in Stave-Bending Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to a class of machines by which staves used for the manufacture of cooperage are bent longitudinally before they are assembled to form the respective vessels for which they are intended. This bending should not be confounded with the bending which occurs later and by different means when the staves are joined together or "set up" and to which latter operation it is preliminary, the object being to facilitate this second bending and avoid concurrent breakage. The staves are generally prepared for the first bending process by steaming, whereby they are softened. Staves which pass successfully through the first bending process, will stand in most cases the second one without breaking, but during the first bending many break, and of course become a total loss. In some machines this loss is considered unavoidable and if none, or very few staves break during the second bending, the machines which do the preliminary bending are deemed to work satisfactorily.

My object is to construct a machine for the preliminary bending whereby this first loss is greatly reduced and if possible avoided altogether, and I accomplish such by not only bending the stave "in a new way," but also by treating the fibers of the wood at the same time in a manner which the occasion requires. While a stave is being bent, the fibers of the wood are affected in different ways. Those at the outside, which is convex, are being stretched, while those on the inside, which is concave, are compressed. These two actions take place at the same time and are directly dependent on each other and it is evident, that if the fibers at the concave side of the stave are not sufficiently compressed, the ones at the convex side cannot stretch and the stave, not having resistance enough to withstand the powerful action of the machinery, is forcibly broken. In the manner by which the wood is acted upon in these machines, it stretches much more readily than it compresses, and the losses are mostly due to the fact that the compression does not proceed in the same ratio with the stretching and either prevents or greatly impedes the same. It is my object to overcome this inequality and to bring about a larger degree of compression than is ordinarily attained in machines of this kind in which such compression is merely an incidental effect of the bending.

In my improved machine it does not occur incidentally, but proceeding simultaneously with the bending, is accomplished positively by special mechanical means, and independent of such bending. The concave side of the stave is thereby shortened in a manner which permits the fibers at the convex side to stretch freely without being subjected to excessive strains which are generally the cause of the breakage.

In the following specification is found a full description of my invention, the same being also particularly pointed out in the claims at the end thereof and its construction illustrated in the accompanying drawings, in which—

Figure 1, is a side-elevation of a machine, parts of it, nearest to the spectator, removed. Fig. 2, is an elevation of the front or feed-side of the same. Fig. 3, is a side-elevation of a stave, showing a break caused by excessive strain on the fibers on the convex side which could not overcome the resistance against compression offered by the fibers on the concave side, and Fig. 4, shows a stave in longitudinal section with adjacent parts of the machine. This figure shows the compression necessary, brought about in a direct way and by special mechanical means.

6 is a drum supported on a shaft 7, which revolves in bearings 8, on standards 9. Its diameter decreases toward its ends, the resulting curve being about of the shape to which the staves have to be bent. Most of the curved

and round part of this drum is surrounded by a rigid and strong frame 10, which at no point approaches the former any closer than a distance which corresponds with the thickness of the staves. At 11, this frame is preferably straight across, while at 12 its shape corresponds with the curve of the drum to which it is parallel at this point. This transformation from the straight part at 11, to the curved part at 12, proceeds gradually. The face or curved part of the drum is provided with a suitable number of ridges 13, running lengthwise over such face, and parallel with the drum-shaft. Drum 6, revolves in the direction indicated by an arrow in Fig. 1, being driven preferably by a gear wheel 14, pinion 15, and pulley 16, and if a stave is placed upon any of these ridges before it passes under the end 11, of frame 10, the stave will in its passage eventually become bent by reason of the shape of frame 10, which shape the stave gradually assumes and by which frame it is held down against the drum. When emerging at the open end at 12, the stave simply drops out. In this manner of bending, the backs of the staves are fully supported by frame 10, and their bending occurs equally at all points, whereby breakage and splintering of such backs are greatly lessened. Drum 6, and frame 10, may be of any diameter and size so as to accommodate more or less staves at a time.

Staves are usually thicker at the ends, such increased thickness projecting toward that side of the stave which is going to be its inside, see 17, 17, of Fig. 4, in which 18, indicates a stave having passed under end 11, of frame 10. To provide a full support for such staves, part of the drum immediately in advance of ridges 13, is raised to conform to the increase of thickness at the ends of the staves, which raised part is of a length corresponding with the thinner parts of the staves between their ends and is indicated by 19. While the stave is thus being bent, and concurrently with such bending, I treat the fibers of its wood in a manner to further reduce the chances of breakage, which treatment consists of shortening the fibers at the concave side of the stave in order to permit the fibers on the outside to stretch more freely. This I accomplish by providing the raised portions 19, of the drum, with corrugations which, as the staves are gradually bent down against the drum, and beginning from the center impress them at intervals, thereby producing the shortening of the fibers desired. In Fig. 4, the effect of this procedure is shown, while in Fig. 3 the usual form of a break, as they often occur in staves, is shown. This compression of the fibers should however not be extended to those fibers near the edges or sides of the staves, because it might crowd out the wood laterally and cause such sides or edges to become uneven, which is objectionable inasmuch as it would interfere with the forming of close joints later on when the completed staves are set up to form vessels. This is obviated by diminishing the projection between each corrugation from its middle toward its end, leaving at these ends short portions 20, at which the projection has been so reduced as to be unable to make any impression in the wood near the edges of the staves. This may be best observed in Figs. 1 and 4. The construction whereby this impression on the concave sides of the staves is produced may be left off however, where such staves are very thin or where the degree of bending is limited. In such cases the staves are simply bent between the drum and the shaping frame 10. For such purpose, raised portions 19, may be substituted by similar raised portions without corrugations. Where staves are of equal thickness these raised portions are of course not needed.

Having described my invention, I claim as new—

1. In a stave bending machine the combination of a drum the face of which is curved barrel shaped or bulged to a form which corresponds with the shape to which the staves are to be bent, and provided with projections 13, to support the latter, means to rotate this drum, and a frame partly surrounding it having its surface opposite the face of the drum varying gradually from the form of a cylinder at one end, to the shape of the face of the drum at the other end, whereby the staves are caused to gradually assume the shape of the latter.

2. In a stave bending machine the combination of a drum the face of which is curved barrel shaped or bulged to a form which corresponds with the shape to which the staves are to be bent and provided with projections 13, to support the latter, means to rotate this drum, and a concentric frame partly surrounding its curved and round part, provided with an opening to permit feeding and egress of the staves, its distance from the drum corresponding with the thickness of the staves, its receiving end being straight as shown at 11, and its discharge-end corresponding to the curve of the drum to which the frame is parallel at this point and which transformation of shape proceeds gradually from the receiving-end.

3. In a stave bending machine the combination of a drum the face of which is curved barrel shaped or bulged to a form which corresponds with the shape to which the staves are to be bent and provided with projections 13, to support the latter, raised portions 19, adjacent and in advance of projections 13, means to rotate this drum, and a frame partly surrounding its curved and round part, provided with an opening to permit feeding and egress of the staves, and its distance from the drum corresponding with the thickness of the staves, the receiving-end of such frame being straight, as shown at 11, and its discharge-end corresponding to the curve of the drum

to which it is parallel, which transformation of shape proceeds gradually from the receiving-end.

4. In a stave bending machine the combination of a drum the face of which is curved barrel shaped or bulged to a form which corresponds with the shape to which the staves are to be bent and provided with projections 13, to support the latter, raised portions 19, adjacent and in advance of projections 13, and provided with corrugations as shown, means to rotate this drum and a frame partly surrounding it and having its surface opposite the face of the drum varying gradually from the form of a cylinder at one end, to the shape of the face of the drum at the other end, whereby the staves are caused to gradually assume the shape of the latter.

5. In a stave bending machine the combination of a drum the face of which is curved barrel shaped or bulged to a form which corresponds with the shape to which the staves are to be bent and provided with projections 13, to support the latter, raised portions 19, adjacent and in advance of projections 13, and provided with corrugations as shown, means to rotate this drum and a frame partly surrounding its curved and round part, provided with an opening to permit feeding and egress of the staves, and its distance from the drum corresponding with the thickness of the staves, the receiving-end of such frame being straight as shown at 11, and its discharge-end corresponding to the curve of the drum to which it is parallel, which transformation of shape proceeds gradually from the receiving-end.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES SOMMER.

Witnesses:
C. SPENGEL,
ALFRED M. DAVIES.