

J. A. KAPLAN.
BENDING APPARATUS.
APPLICATION FILED JUNE 30, 1905.

2 SHEETS—SHEET 1.

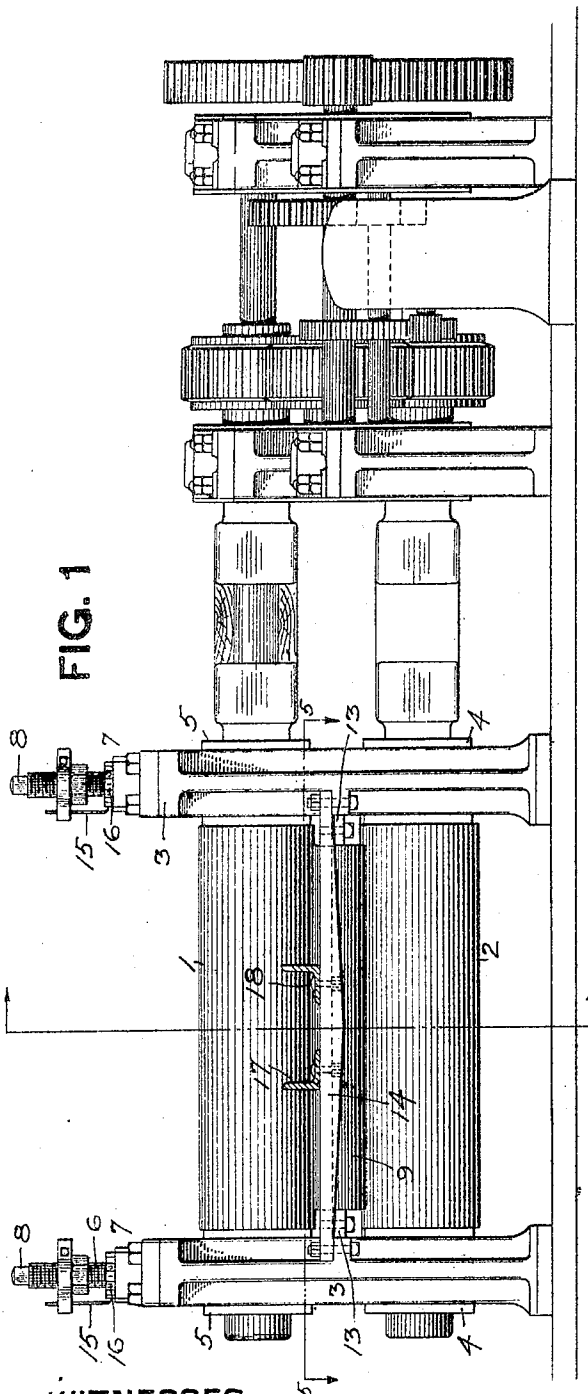


FIG. 1

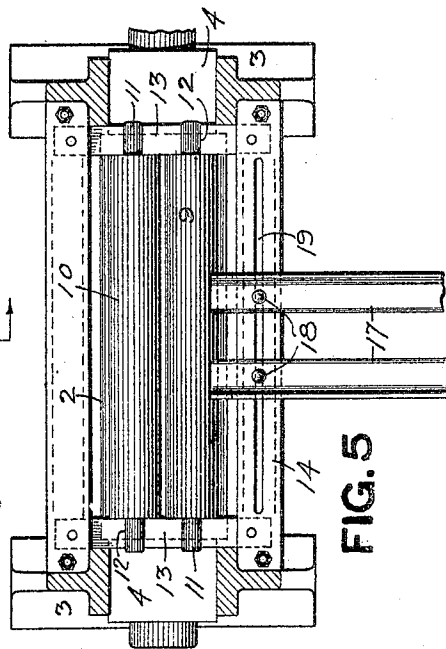
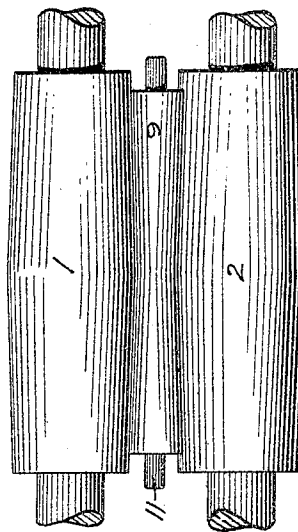


FIG. 5

FIG. 6



WITNESSES.

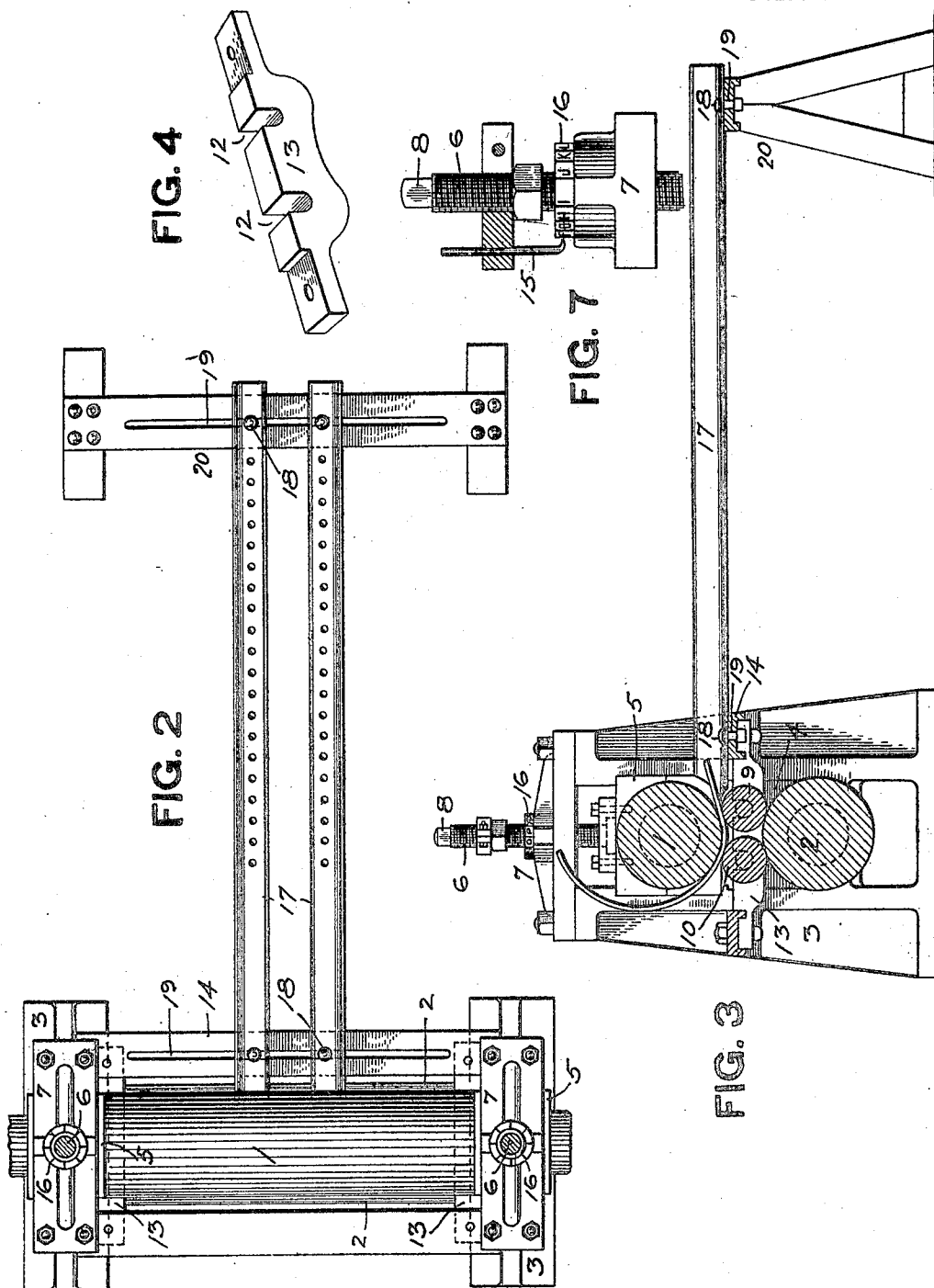
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2 SHEETS—SHEET 2.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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BENDING APPARATUS.

No. 801,989.

Specification of Letters Patent.

Patented Oct. 17, 1905.

Application filed June 30, 1905. Serial No. 267,789.

To all whom it may concern:

Be it known that I, JOSEPH A. KAPLAN, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Bending Apparatus; and I do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to bending apparatus, and is designed especially for bending metal plates or bands to form pulley-rims, although its use is not limited to this purpose. The object of the invention is to provide rolls for this purpose whereby all the blanks treated will be absolutely uniform in curvature, whereby pulley-rims of different widths or radius can be made with equal facility and which with slight modification can be adapted for either plane-faced or crown-faced pulleys.

It has been attempted heretofore to bend strips or plates of metal by passing the same endwise through a set of rolls, consisting of three or more, one of the rolls being placed above and between two opposite rolls and serving to press the strip or plate into the angle between the other two rolls, thus bending it into approximately circular form. With all prior rolls of this character, however, it has not been possible to produce uniformity in the curvature of successive strips or plates. The present invention has been designed with a view of overcoming this defect.

The invention consists, generally stated, in bending apparatus comprising a pair of main rolls and a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of the main rolls and bearing against and being backed by one of said main rolls and arranged to receive the plate or strip between themselves and the other main roll.

The invention also consists in a guide for directing the blanks and holding them in proper position while passing through the rolls, which guide is adjustable, so as to accommodate plates or blanks of various widths, also in suitable adjusting and indicating or index means for the top roll, whereby pulley-rims or the like of different radii can be readily formed on the same set of rolls, as well as in various details of construction and arrangement hereinafter described and claimed.

In the accompanying drawings, Figure 1 is

a front elevation of the rolls. Fig. 2 is a plan view of the same. Fig. 3 is a vertical transverse section thereof. Fig. 4 is a perspective view of a bearing for the small rolls. Fig. 5 is a horizontal section on the line 5 5, Fig. 1. Fig. 6 is an elevation showing rolls for forming crown-faced pulley-rims, and Fig. 7 is an enlarged detail of the indicator.

The invention comprises a plurality of main rolls 1 and 2, preferably two rolls mounted one above the other, as shown in the drawings. These rolls are mounted in suitable housings 3 and will be driven by any suitable means now in vogue for driving metal-reducing and similar rolls. The driving-gearing will be so arranged as to drive the two rolls in the same direction. They will be so mounted as to be adjustable toward and from each other. Preferably the lower roll is mounted in stationary boxes 4, while the upper roll has its journal-boxes 5 suspended by swiveling on the lower ends of adjusting-screws 6, which work in suitable nuts formed or placed in the upper portions 7 of the housings. These adjusting-screws can be turned by any suitable means. In the drawings I have shown each screw provided with a lever-receiving end 8, whereby the same can be turned.

Interposed between the rolls 1 and 2 are a pair of smaller rolls 9 and 10, one lying on one side of the plane, which coincides with the axes of the rolls 1 and 2 and the other on the opposite side of said plane. The rolls 9 and 10 will be held in place by any suitable bearings, being shown as provided with trunnions 11, fitting in seats 12 in a bar 13, suitably secured in place at the ends of the housings, preferably being bolted to longitudinal bars 14, connecting the two housings. The trunnions 11 are intended merely to guide these rolls and hold them in position. They rest upon the lower roll 2 and receive their entire support from the latter, being backed for their entire lengths thereby. Preferably these smaller rolls are driven merely by frictional contact with the lower roll. These smaller rolls act as an anvil for the blank being bent, and the top roll 1 acts as a die to press the blank into the space between these smaller rolls. The rolls 9 and 10 will be made as small as consistent with strength, so that they may be as close together as possible in order to give a minimum distance between

the points of support of the plate being bent. Because of the necessary small size of these rolls they do not of themselves possess sufficient strength or stiffness to do good bending, as the stress of bending would tend to spring them, if not otherwise supported. They are, however, backed for their entire lengths by the large bottom roll 2, thus holding them absolutely straight and securing uniformity of bending.

The arc or radius of the bend will depend upon the position of the top roll 1 with reference to these smaller rolls. The further the top roll is depressed the smaller will be the arc or radius. Consequently by adjusting the top roll vertically any desired curvature or radius can be given to the blank. The adjusting-screws 6 provide a ready means for making such adjustment. Pulleys are made in certain standard sizes, and in order that the operator may definitely know when the rolls are adjusted to any particular size I provide on the screw 6 a pointer or indicator 15, moving over index-marks 16, formed on a boss on the upper portions 7 of the housings, so that by turning the screws until the indicators point to the proper index-marks the desired curvature or radius of pulley-rim can be made. This adjustment can be quickly effected and with absolute certainty that the desired sizes of pulley-rim will be formed.

Preferably the bottom roll 2 will be slightly larger than the top roll 1, this being for the purpose of having the surface speeds of the top roll 1 and anvil-rolls 9 and 10 correspond substantially to the surface speeds of the inner and outer faces of the bent blanks. It is obvious that the inner circumference of the rim will be less than the outer circumference, and consequently it is desirable that the surface speed of the rolls 9 and 10 be slightly greater than the surface speed of the roll 1. As the rolls 9 and 10 are frictionally driven from roll 2, this increased surface speed can be secured by making the bottom roll 2 slightly larger than the top roll 1. This, however, is not absolutely necessary.

It is necessary that the blank should be guided straight through the rolls so that it will not be given a spiral form. Various forms of guides may be used. In the drawings I have shown for this purpose a pair of angle-bars 17 placed in front of the rolls and forming substantially a trough whose vertical sides engage the edges of the plate and guide the latter straight into and through the rolls. If only a single width of plate were to be bent, a trough or channel-shaped member would form a suitable guide, but to permit the adjustment of the apparatus to plates of various widths I prefer to use a pair of angle-bars. These are secured in place by means of bolts 18 passing through slots 19, formed in the connecting-bar 14 at the front of the rolls, and a similar slot in a suitable stand or

frame 20, upon which the outer ends of the guide-bars rest. By the means described the guide-bars can be adjusted toward and from each other, so as to accommodate plates of various widths.

It will thus be seen that the apparatus is readily adjustable to form pulley-wheels of any desired width and any desired radius or curvature. These adjustments can be so quickly and readily effected that very little time will be lost in changing from one size to another. This is a very important advantage, especially when odd sizes of pulleys must be quickly provided.

The rolls shown in the drawings are provided with straight faces and will form only straight-faced pulley-rims. Many pulley-rims, however, are crown-faced. To form these, the rolls will have to be shaped as shown in Fig. 6, the large rolls 1 and 2 being provided with crown or convex faces, while the anvil-rolls 9 and 10 are provided with matching concave faces.

The apparatus described insures absolute uniformity in output, this being due to the fact that the anvil-rolls 9 and 10 are of small size, so as to support the plate at points very close together. At the same time the lower roll 2 holds these anvil-rolls perfectly rigid, so that they cannot spring or yield. Consequently the plate will be subjected to such stresses that the limit of the elasticity of the metal is entirely overcome. The apparatus also provides means for ready adjustment, so as to manufacture rims of any desired size.

While the invention has been described especially for the manufacture of pulley-rims, it will be readily apparent that it is not limited thereto, but can be used for bending or curving plates, bands, or strips for any purpose whatsoever.

What I claim is—

1. In bending apparatus, the combination of a plurality of main rolls, and a plurality of smaller rolls arranged between the main rolls and bearing against and backed by one of said main rolls, and arranged to receive a blank between themselves and another of said main rolls.

2. In bending apparatus, the combination of a pair of main rolls, and a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of said main rolls and bearing against and backed by one of said main rolls and arranged to receive the blank between themselves and the other of said main rolls.

3. In bending apparatus, the combination of a pair of main rolls and a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of said main rolls and bearing against and backed by one of said main rolls and arranged to receive the blank between themselves and the other of said main rolls, said

smaller rolls being frictionally driven from the main rolls.

4. In bending apparatus the combination of a pair of main rolls, a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of said main rolls and bearing against and backed by one of said main rolls and arranged to receive a blank between themselves and the other of said main rolls, and mechanism for adjusting said rolls toward and from each other.

5. In bending apparatus, the combination of a pair of main rolls, a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of said main rolls and bearing against and backed by one of said main rolls and arranged to receive the blank between themselves and the other of said main rolls, and adjusting mechanism for said last-named roll arranged to suspend the same and move the same toward and from the smaller rolls.

6. In bending apparatus the combination of a pair of main rolls, a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of said main rolls and bearing against and backed by one of said main rolls and arranged to receive the blank between themselves and the other of said main rolls, adjusting mechanism for said rolls, and an index for said adjusting mechanism.

7. In bending apparatus, the combination of a pair of main rolls, a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of said main rolls and bearing against and backed by one of said main rolls and arranged to receive the blank between them-

selves and the other of said main rolls, and a guide in front of said rolls arranged to engage the edges of the blank.

8. In bending apparatus, the combination of a pair of main rolls, a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of said main rolls and bearing against and backed by one of said main rolls, and a guide in front of said rolls provided with side portions adjustable to accommodate blanks of various widths.

9. In bending apparatus, the combination of a pair of main rolls, a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of said main rolls, mechanism for adjusting the main rolls toward and from each other, a guide in front of said rolls and provided with side portions arranged to engage the edges of the blank, and means for adjusting the side portions of said guide to accommodate blanks of various widths.

10. In bending apparatus the combination of a pair of main rolls, and a pair of smaller rolls arranged between the main rolls and one on either side of the plane coinciding with the axes of said main rolls and bearing against and backed by one of said main rolls and arranged to receive a blank between themselves and the other of said main rolls, the backing-roll being of larger diameter than the other main roll.

In testimony whereof I, the said JOSEPH A. KAPLAN, have hereunto set my hand.

JOSEPH A. KAPLAN.

Witnesses:

F. W. WINTER,
ROBERT C. TOTTEN.