

J. GRADY.
BENDING MACHINE.
APPLICATION FILED MAR. 27, 1911.

1,061,067.

Patented May 6, 1913.

3 SHEETS-SHEET 1.

Fig. 2

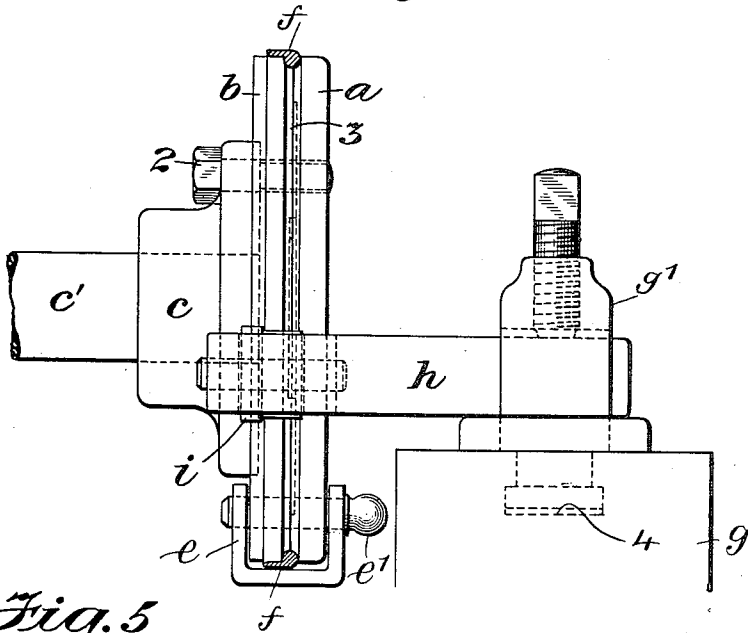


Fig. 5

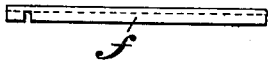
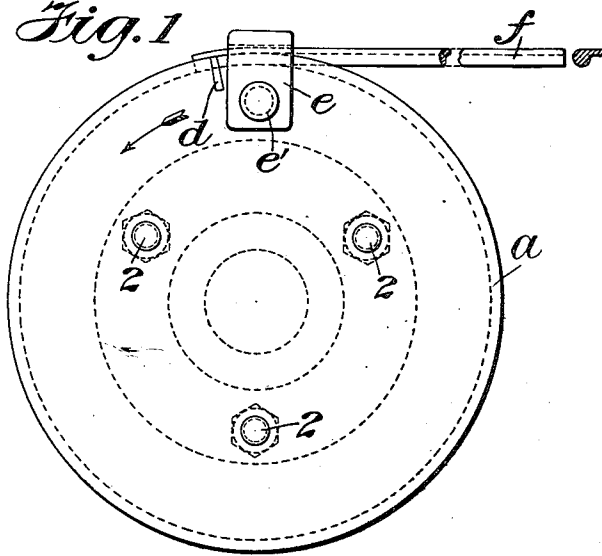


Fig. 1



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3 SHEETS—SHEET 2.

Fig. 3

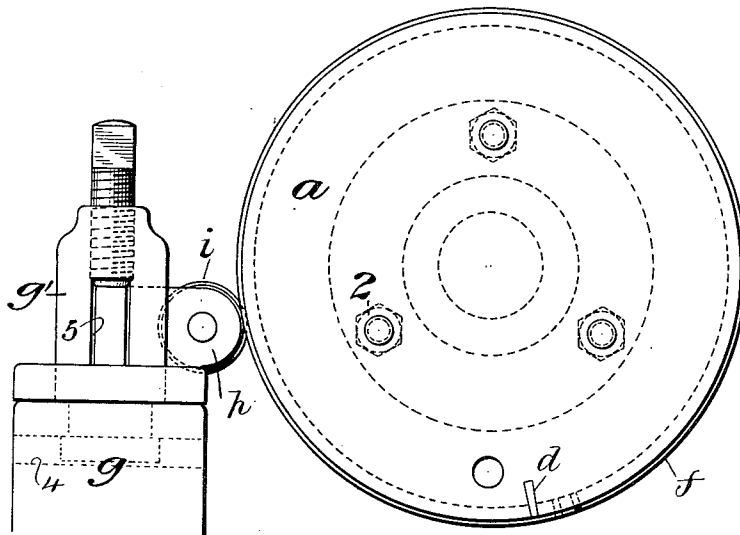
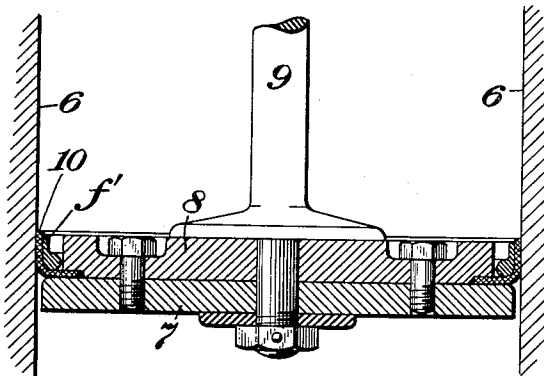


Fig. 4



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3 SHEETS—SHEET 3.

Fig. 6

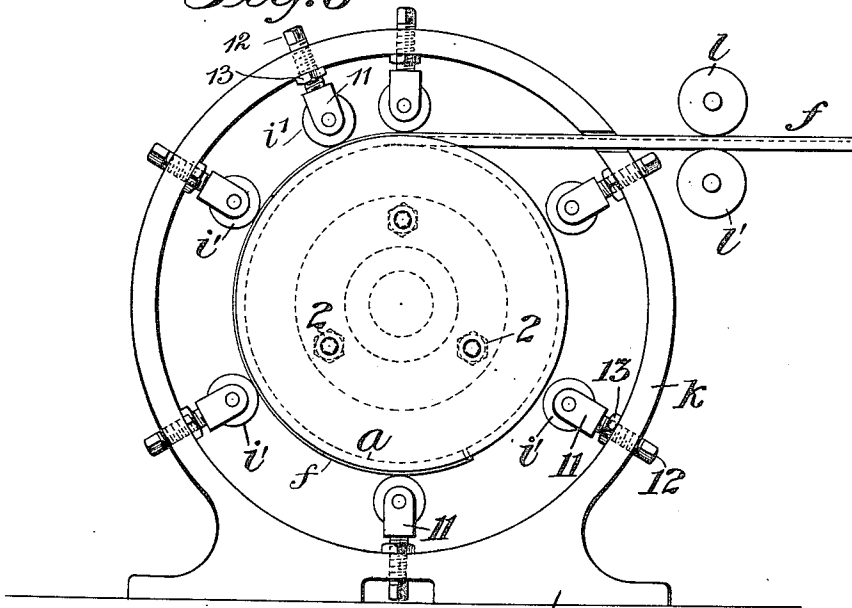


Fig. 7

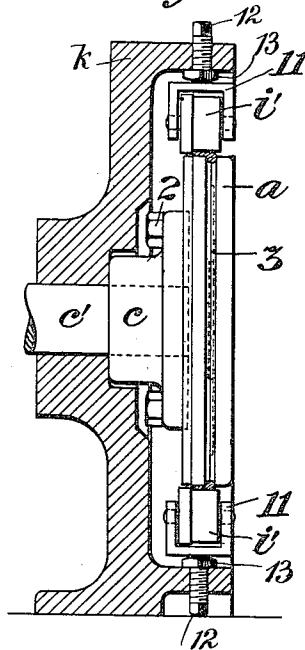


Fig. 8

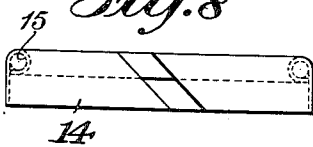


Fig. 9



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UNITED STATES PATENT OFFICE.

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BENDING-MACHINE.

1,061,067.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JAMES GRADY, a citizen of the United States, residing in the borough of Brooklyn, in the county of Kings, city and State of New York, have invented an Improvement in Bending-Machines, of which the following is a specification.

In the pistons of air compressors and other mechanical devices or machines, metal rings are used inside the piston leathers or packings to get the same pressed outward against the inner walls of the air compressor cylinder. These rings are formed from pipe or tubular bodies cut up into sections of the desired diameter and thickness and they are expensive to make.

The object of my invention is to lessen the cost of manufacture, the time consumed in making the rings, and to improve the product.

In carrying out my invention, I take a single or composite rod member rolled of the desired cross section and cut the same up into suitable and approved lengths and preferably heat the same, and I employ a circular and revoluble mandrel having a peripheral groove adapted to receive the rod lengths, with similar faces toward one another. The mandrel is mounted in a lathe or other suitable machine and I provide means for advancing the rod and rolling the same around the mandrel in the groove thereof while a circular or ring form is being imparted thereto. I also provide an adjustable and removable pressure roller or plurality of such rollers adapted to press against the periphery of the ring form and mandrel for rolling and simultaneously pressing the ring form compactly into the groove of the mandrel, imparting a finished form thereto. I may also provide the mandrel with suitable means for engaging the advancing ends of the rod lengths and holding the same against longitudinal stress and with other means for holding the rod length at the advancing ends in the grooves and a pressure roller for completing the rolling operation, all of which is hereinafter more particularly described.

In the drawing Figure 1 is an end elevation representing the devices of my invention in their initial position of operation. Fig. 2 is a side elevation of the same parts

later on in their movement. Fig. 3 is an end elevation representing the finishing act upon the ring form and Fig. 4 is a vertical section and partial elevation of the piston rod and the walls of an air compressor or other cylinder showing the position of the finished ring form and its relation to the other parts. Fig. 5 shows the notched advancing end of the rod. Fig. 6 is an elevation and Fig. 7 a vertical central section and elevation through Fig. 6 representing a form of my invention. Fig. 8 is a plan and Fig. 9 a cross section of a modified form of ring.

Similar letters and numerals of reference throughout the drawings represent similar parts.

The circular and revoluble mandrel comprises suitable disks *a b*, of which *a* is preferably the outer disk and *b* the inner disk, and these disks are constructed to fit one another in any well known manner in the art because of internal recesses and projections, so that there is no difficulty in at once bringing the parts of the mandrel, or in other words, the disks together. These disks are preferably connected together and mounted upon a head stock *c* and lathe arbor *c'* by a series of tap bolts 2 in spaced apart relation. The mandrel is peripherally grooved at 3, a part of the groove being in each disk by preference. The mandrel is provided with a transverse peripheral key *d* which is preferably slightly tapering so as to prevent the same being pulled in a radial direction out of the mandrel. I also provide a yoke bar *e* adapted to straddle the periphery of both disks *a b*, and a yoke bar pin *e'* is adapted to pass through the ends of the yoke-bar and through a hole in the mandrel, or in other words, two aligned holes in the respective disks, and this yoke bar is located adjacent to the key *d*,—see particularly Fig. 1.

The rod to be bent is shown at *f*. As illustrated, this rod is a flat strip with a semi-circular bead on one side along one edge. This is simply a form of rod advantageous to be bent up into a ring form. In the manufacture of the rod, and as hereinbefore stated, the form in cross section is given to the rod by prior treatment between suitable rollers and the same is cut up into suitable and predetermined lengths according to

the size of the ring to be formed and the mandrel on which it is formed. The respective ends are preferably tapered so as to overlap one another as is usual with the metal rings that are employed in connection with pistons of various characters.

The pressure roller employed by me in connection with the mandrel is adjustable and movable and as shown generally comprises a head *g* and auxiliary head *g*¹, the latter movable with reference to the former in a slide-way 4, while in a slide-way 5 in the auxiliary head there is an adjustable and movable bar *h* carrying a roller *i*. The auxiliary head *g*¹ with reference to the head *g* and the adjustable bar *h* and roller *i* with reference to the auxiliary head *g*¹ are movable by any similar and well-known devices in this art, as these parts while performing a necessary and useful function, form no necessary part of my invention.

Referring particularly to Fig. 1, the rod *f* is illustrated in its initial position with reference to my improved mandrel. In other words, the advancing end of the rod *f* has been notched to be passed over the key *d*. (See Fig. 5.) This notch is made through a semi-circular bead of the rod and the groove in the mandrel is preferably made semi-circular to receive this bead; the flat strip portion of the rod preferably overlying the face or periphery of the mandrel, therefore the rod is in position to be pulled upon by the rotation of the mandrel and in order that the rod in this position may not jump away or pull over the key *d*, I employ the yoke bar *e* and pin *e*¹ hereinbefore described. This bar is placed over the rod close to the key *d*; the pin *e*¹ being removable and the inner surface of the yoke-bar touching the outer face of the flat strip of the rod so that by these devices the pulling stress and the holding down function are performed as the rod is connected to the mandrel and while the rod is being turned. Of course the yoke bar cannot be retained on the mandrel for a complete revolution, otherwise the end of the rod *f* would overlap the outer surface of the yoke bar, and this yoke bar must be removed by pulling out its pin and laying the two parts aside before the rotation of the mandrel is completed.

In the operation of rolling the rod *f* the parts are connected as shown in Fig. 1 and hereinbefore described, and the mandrel started in its rotation. As soon as the yoke bar passes by the location of the roller *i* the mandrel is stopped momentarily and the roller brought up into position to bear with force upon the outer face of the rod *f* and the rotation of the mandrel continued. The mandrel is again stopped before the yoke bar will reach the free end of the rod *f* and said yoke bar and its pin are then re-

moved from the mandrel, the rotation of which is thereafter continued, with the pressure of the roller *i* against the rod for any appreciable time desired until the rod *f* is completely and fully rolled in the groove of the mandrel and a permanent form imparted thereto. After this permanent form is imparted to the prepared rod section *f* and the ring formed, this ring may be removed in any manner desired, but preferably by taking off the outer face or disk *a* which is accomplished by loosening up the tap bolts 2 a sufficient distance so that they are withdrawn from the disk *a* and one can also spring the ring out of the groove of the mandrel and so move it over the periphery of the disk *a*.

In Fig. 4, 6 represents the inner surface of the walls of the air compressor itself. The piston is shown as composed of two disk members 7 8 connected together and to the piston rod 9 in any usual or well known manner.

10 represents the packing or piston leather of L-form in cross section and *f*¹ is the circular pressure ring formed by rolling the rod *f* around the mandrel in a position in which the outer flat face of the same bears against the portion of the packing which lies parallel with the inner circular walls and in which a part of the semi-circular bead fits the curved portion of said packing; the spring function of said rod tending to push the packing out against the inner surface of the cylinder and to hold the same in said position, yielding when the piston is moving in an opposite direction to permit the fluid to pass by the packing ring 10.

The device of my invention may be made of any diameter and any cross sectional area, and the same is adapted for use with any usual form of piston member for an air compressor or any similar mechanical device or machine, consequently my invention is not limited in its application. While I have shown a single roller *i* adapted to be brought up to the mandrel against the rod to be rolled to force the same into the groove, I do not limit my invention to the use of one roller as several or a series may be employed spaced around the mandrel and all performing the same function, without departing from the spirit of my invention.

In the form of my invention shown in Figs. 6 and 7, the parts composing the mandrel are the same and carry the same designating letters and numerals of reference as the same parts in the other figures; and in addition thereto, and for the reason that therein I do not employ the key *d* or the yoke *e* and pin *e*¹, I provide a series of rollers *i*¹ spaced around the mandrel *a* and all adapted to press the rod member *f* into the groove of the mandrel *a* in rolling the

same into a ring. In this connection I have shown the rollers i^1 each mounted in a yoke 11 with a screw-stem 12 passing through a ring frame k upon a base k^1 and each screw-stem 12 is provided with a lock nut 13 for fastening the stem of the roller after adjustment. I have also shown a pair of feeding or advancing rollers l l^1 and the frame k notched for the rod f , as it will be necessary to employ some means for feeding the rod member f throughout its length.

In Figs. 8 and 9 I have shown a modified form of ring in which the same is formed from a wire 15 and a strip of sheet metal 14, one edge of which is rolled around the wire, the completed form agreeing in cross section with the solid rod Fig. 1.

I claim as my invention:

1. In a rod bending device and in combination a suitable revoluble support, a circular and revoluble mandrel having a peripheral groove, a device for engaging the initial or advancing end of the rod with the mandrel, a removable device for initially holding the end of the rod in the groove of the mandrel and a roller device for pressing the rod into the groove of the mandrel

while being bent through continuous revolutions.

2. A forming mandrel comprising the disks a b with a peripheral groove in the adjacent edges of each disk, together forming a groove of predetermined form, a head stock and lathe arbor and tap bolts for simultaneously connecting the said head stock and disks removably together, a key of tapering form adapted to be seated in a tapering aperture across the periphery of the disks forming the mandrel and across said groove, a yoke-bar adapted to straddle the said disks at their peripheries and adjacent to said key, and a pin adapted to pass through the free ends of the yoke-bar and through apertures in the disks to hold the yoke-bar in a removable and replaceable relation to the mandrel disks adjacent to the said key.

Signed by me this 18th day of March, 1911.

JAMES GRADY.

Witnesses:

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