No. 801,496. PATENTED OCT. 10, 1905.

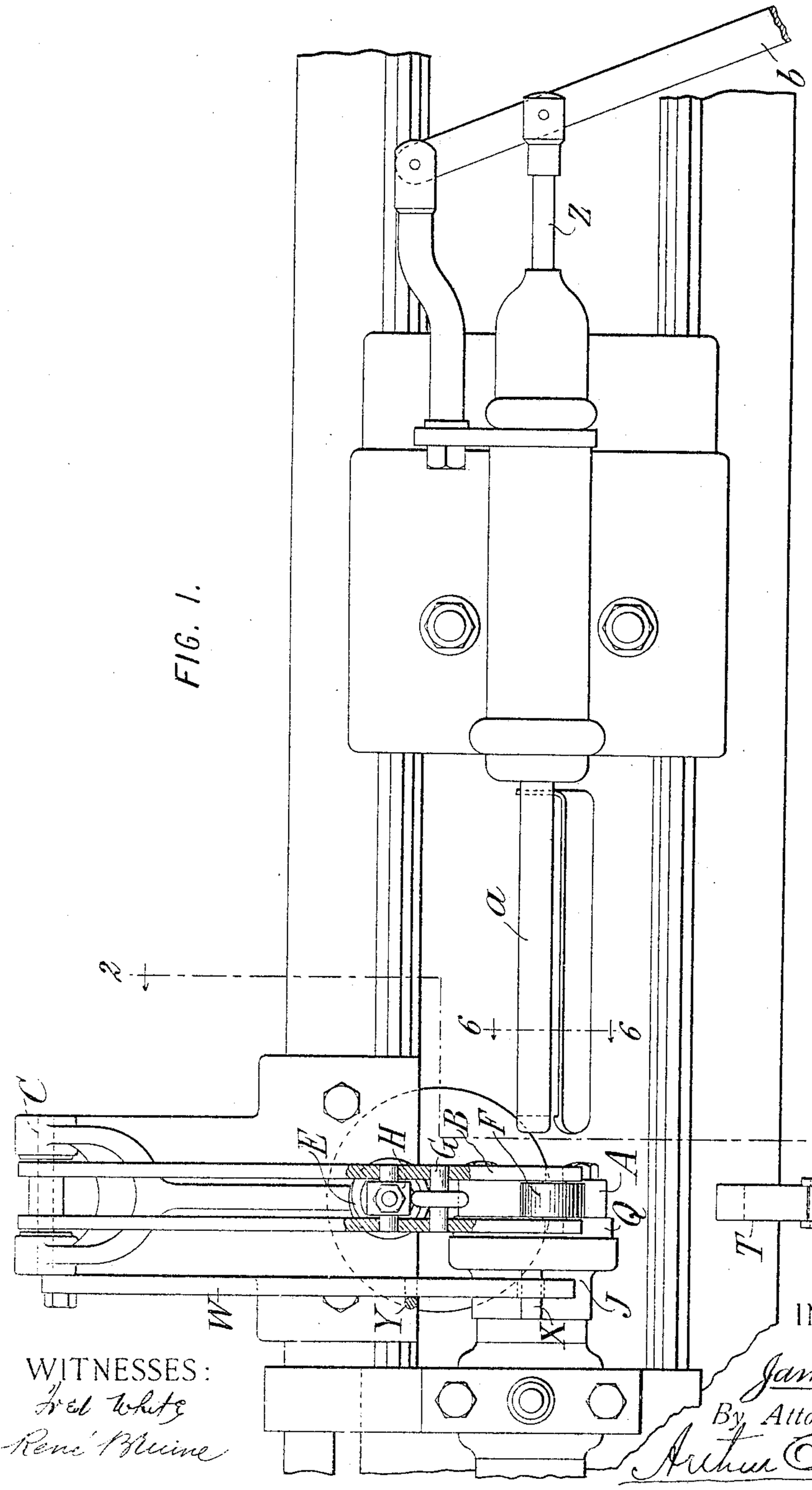
J. J. WOOD.

BENDING MACHINE.

APPLICATION FILED MAY 9, 1904

3 SHEETS—SHEET 1.

FIG. 1.



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3 SHEETS—SHEET 2.

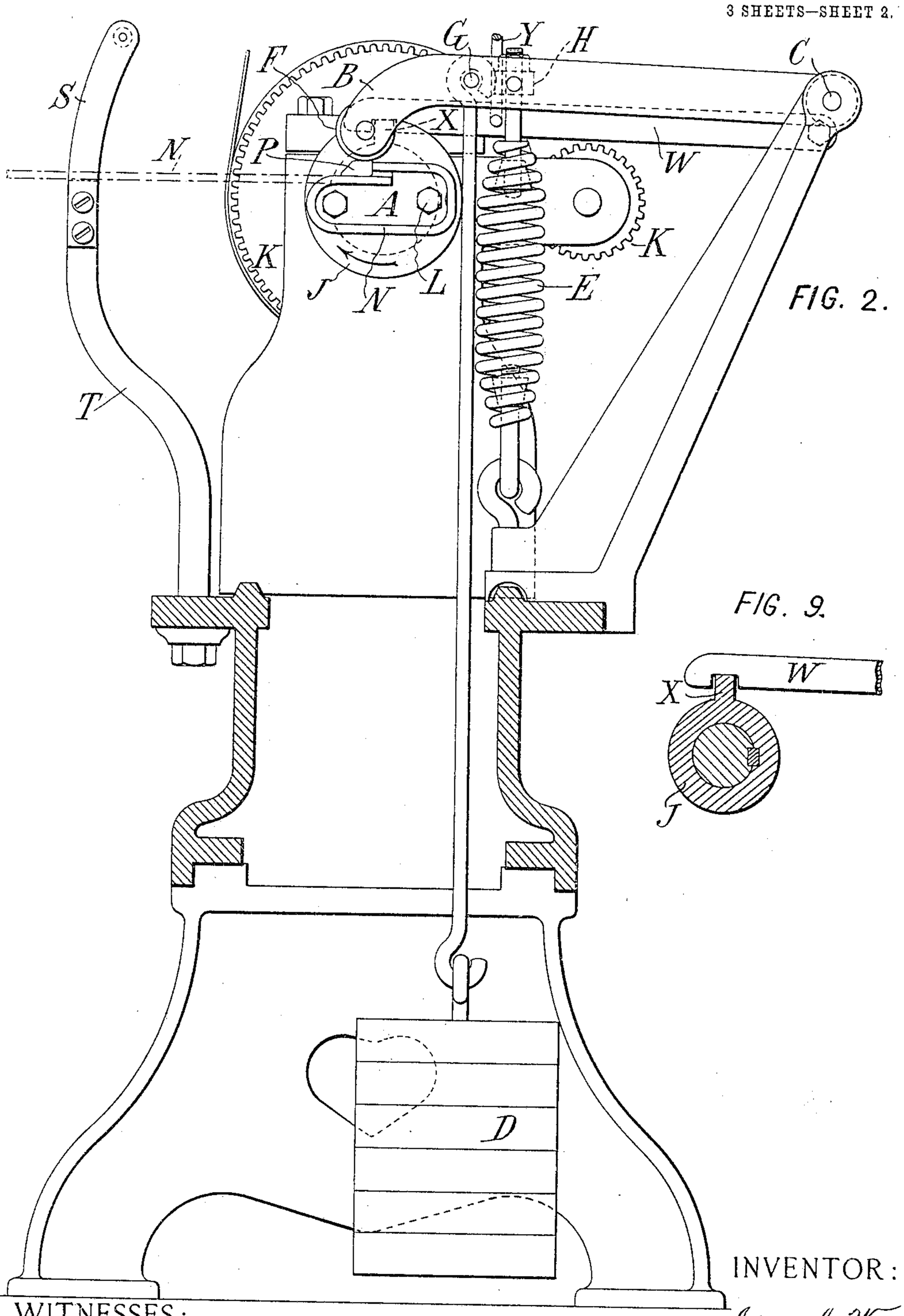

FIG. 2.

FIG. 9.

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3 SHEETS—SHEET 3.

FIG. 3.

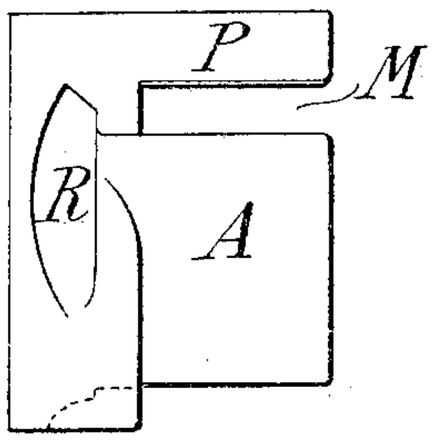

FIG. 4.

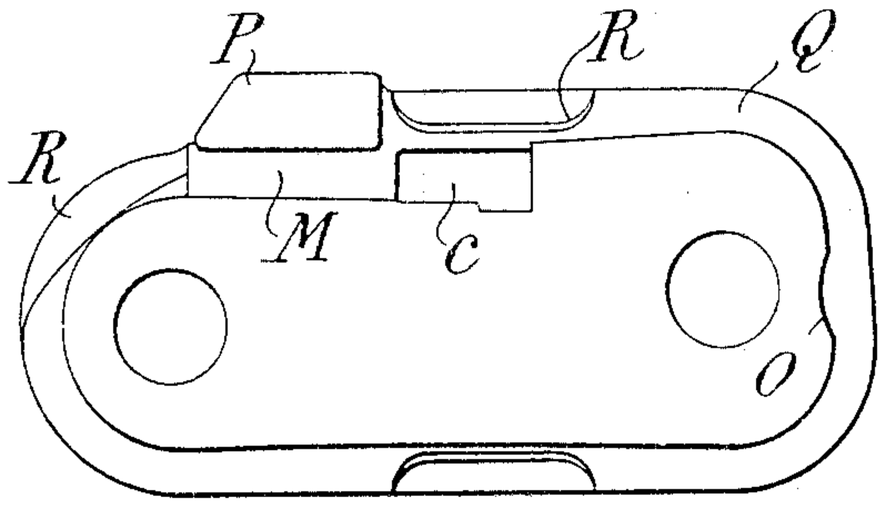

FIG. 5.

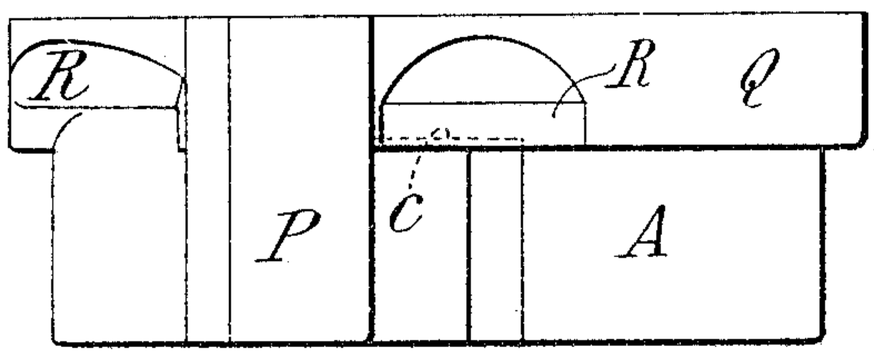

FIG. 6.

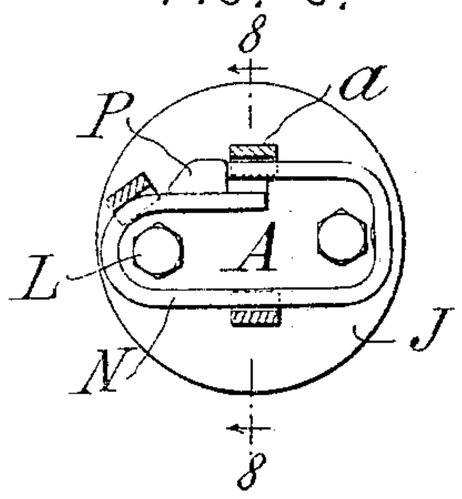

FIG. 7.

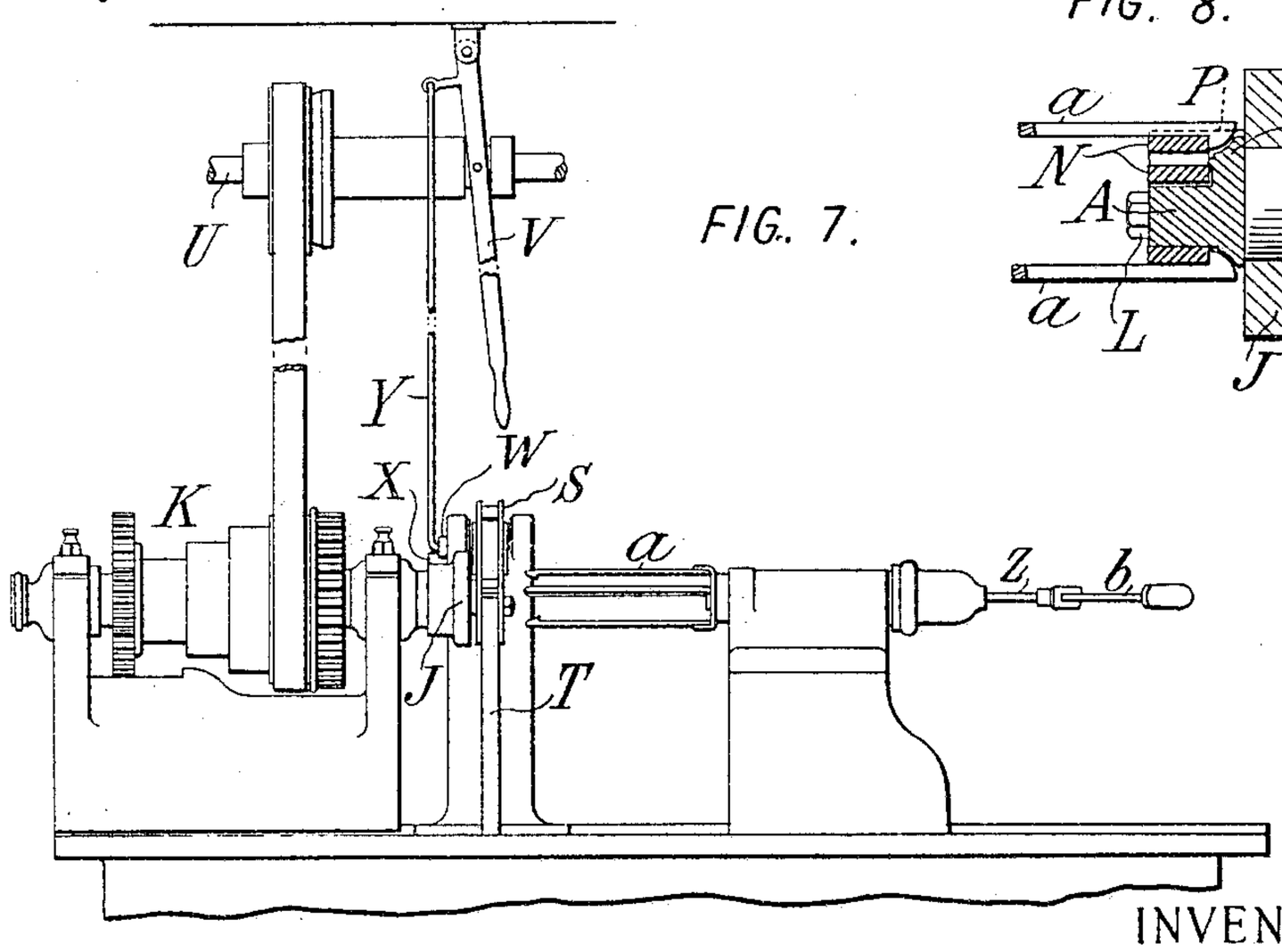

FIG. 8.

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UNITED STATES PATENT OFFICE.

JAMES J. WOOD, OF FORT WAYNE, INDIANA.

BENDING-MACHINE.

No. 801,496. Specification of Letters Patent. Patented Oct. 10, 1905.

Application filed May 9, 1904. Serial No. 207,176.

To all whom it may concern:

Be it known that I, JAMES J. WOOD, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Bending-Machines, of which the following is a specification.

This invention aims to provide a certain improved machine whereby a bar or other piece of metal may be bent very quickly and very accurately to a desired shape. The machine is especially adapted to the bending of magnets, in which it is important to avoid flaws in the steel, especially at the corners, where the sharp bends occur. This purpose is accomplished by pressing the work against a former and shifting the pressure gradually along the work from end to end to press it to the contour of the former. The bending is preferably accomplished by means of a pressure member which is longitudinally stationary (though arranged to yield laterally) and a movable former, the work being held fixed upon the former, so that as the former moves the work is carried from end to end into position for engagement by the pressure member, the pressure being thus shifted along the work to bend it to the shape of the former. Preferably the former is a rotating block which engages one end of the work and rotates with it under a pressure-roller held down upon the work with a strong but yielding pressure. The work is thus subjected to an action somewhat similar to that of the bars in a rolling-mill.

The accompanying drawings illustrate a machine designed to bend bars into a special shape used as a magnet in one of the Wood type of wattmeters.

Figure 1 is a plan of the principal parts of the machine. Fig. 2 is a section approximately on the line 2 2 of Fig. 1. Figs. 3, 4, and 5 are respectively end, front, and top views of the former employed. Fig. 6 is a section approximately on the line 6 6 of Fig. 1, showing the stripper advanced and in engagement with the work. Fig. 7 is a side elevation of the complete machine, including the driving mechanism. Figs. 8 and 9 illustrate details.

Referring to the drawings, A is a rotary former, and B a pressure member which bears upon the former or upon the work carried thereby, yielding to the shape of the former, but being otherwise stationary. The pressure member, for example, may be a lever pivoted at C to a rigid arm of the frame of the machine and held down upon the work by means of a heavy weight or series of weights D or a strong spring E and preferably by both, as illustrated. The lever B may conveniently be made of a pair of bars, as illustrated in Fig. 1, between which are carried the bearing-roller F, the pin G for supporting the weight, and the pivoted block H for supporting the spring.

The former A is carried upon a rotating head J, which is rotated by a suitable back gearing K, which it is not necessary to describe in detail, since it forms no part of the invention, but which is illustrated as a whole in Fig. 7 and in part in Fig. 2. The head is provided with bolt-holes, the former being bolted thereto, as by bolts L, thus permitting the making of the former of special metal and the use of formers of different shapes. The former shown is for shaping a bar into substantially an oblong with its ends overlapping and slightly separated at about the center of one of the longer sides. The former is provided with a means for engaging the forward end of the bar during the bending operation. Preferably this consists of a groove or slot M, into which the forward end of the bar N is thrust, so as to be held by the former as it rotates. The working face at the end is elevated sufficiently to lap one end of the work over the other. The side and end edges of the former are preferably made somewhat concave, so that after the work has passed under the pressure-lever its slight spring will restore it to exactly the desired shape, this depression being shown most markedly at O, Fig. 4. Upon the former a projection P is preferably provided upon which the pressure-lever rides at the completion of one operation and which thus lifts and holds the pressure-lever off the rearward end of the work to permit the work to be stripped from the former. A stop—such, for example, as the flange Q—is preferably provided on the former for guiding the work, and notches R are made in this flange at intervals to permit the introduction of stripping hooks or fingers to the rear of the work to strip the same from the former.

For directing the work properly in the beginning a gage S is preferably provided consisting of a pair of uprights on each side of a standard T, Fig. 7, and between which the end of the work distant from the former is held so that the work lies in the plane of the former, resting upon the top of the standard

T. As soon as the former has commenced to rotate to give the first bend to the work and the pressure-lever is held down upon the work there is no danger of its getting out of line. The construction of the gage to secure the result stated might be considerably varied.

The rotating head, which carries the former, is driven by the back gearing K, as previously stated, and the latter is clutched to or released from the overhead driving-shaft U by means of a clutch-lever V. In order to prevent the former from rotating too far and to hold it always in the same starting position, a lock is preferably provided comprising a swinging arm W, having at its free end a recess, Fig. 9, which is entered by a lug X on the head J when the former is in its proper starting position. A rod Y is connected to the locking-lever W and extends upward to an arm on the lever V. Consequently when the clutch-lever V is thrown into the clutching position the locking-lever W is lifted to permit the rotation of the head and with it the former. The clutching-lever is thrown to its unclutching position at the end of the operation, and the locking-lever W drops upon the head J. The rounded end of the locking-lever is engaged by the projection X and lifted until the projection comes under the recess in the lever, when the latter drops upon it and holds the head from further movement.

Means are provided for very quickly and conveniently stripping the work from the former. A sliding rod Z carries at its inner end three hooks or fingers *a*, the relative positions of which are indicated best in Fig. 6. The outer end of the rod Z is connected to a hand-lever *b*, by means of which it may be reciprocated to first move the fingers *a* inward until the hooks on their ends pass over the work and engage the rear edge thereof, Fig. 8, whereupon the lever *b* is swung outward and the fingers *a* pull the work off the former and drop into a suitable receptacle.

The operation of bending a bar may be very quickly accomplished with this apparatus. The bar having been previously heated, if necessary, is brought up to the machine and its forward end inserted in the groove M of the former with its rear resting on the standard T and alined with the gage S. The clutch-lever is operated to lift the locking-lever W and start the head J. As the former rotates the pressure-roller F rolls down from the projection P against the work and bends it around the former. As the former approaches the end of the rotation the clutch on the countershaft is shifted and the locking-lever W dropped. The pressure-roller F rides up onto the projection P from the rearward end of the work and the locking-lever drops down over the projection X. The operator then gives a quick movement of the lever B inward and outward and the work is done.

A recess *c* may be provided at the end of the groove M for receiving any scale which may fall from the end of the heated bar and which might otherwise collect in the corner and prevent the bar from being pushed home.

In the operation of the machine the pressure is shifted gradually around the work, thus avoiding the formation of small cracks at the bends which materially affect the permanency or life of the magnet. In practice the percentage of defective magnets produced is negligible.

What I claim is—

1. In a magnet-bending machine, a former adapted to bend a bar to form a magnet having substantially straight overlapping ends, said former having those portions of its working face about which the ends of the magnet are bent lying in different planes, one of such portions extending above the other a distance greater than the thickness of the metal to be bent, and means for holding the forward end of the bar during the bending operation in fixed relation to the former in a plane substantially parallel to the working face thereof for the rearward end.

2. In a magnet-bending machine, a former having a working face having curved end portions, one of said end portions being wider than the other by a distance greater than the thickness of the metal to be bent, whereby the latter when bent may have substantially straight overlapping ends spaced apart from each other, and a pressure member adapted to bend the metal around said former.

3. In a magnet-bending machine, the combination of a pressure member and a former having a working face one part of which extends adjacent to but on a higher plane than another part, and having a projection P extending forwardly therefrom over the lower part of said face and having its under side spaced apart therefrom a distance approximating the thickness of the work, and having its upper side in a plane to receive said pressure member when the latter runs off the work.

4. A bending-machine including in combination a former A having a groove M for receiving the end of a bar, said former being rotatable, and a pressure member arranged to bear at a point adjacent to said groove as the former is rotated, said former having a projection P above said groove M the lower face of said projection being adapted to engage the end of the bar, and its upper face being adapted to receive the pressure member and hold it out of engagement with the work.

5. The combination of a rotary former shaped to produce an article having a substantially straight side, and having its working face for such side slightly concave to compensate for the springing back of the metal, and a pressure member adapted to force the metal into such concavity.

6. In a magnet-bending machine, a former having a groove M having a fixed upper wall

adapted to engage the end of a bar, said upper wall being substantially straight and extending in the same direction as the end of the magnet to be bent, and a recess *c* adapted to receive scale or the like, leading from said groove M.

7. A bending-machine including in combination a rotating former A having a flange Q with recesses R, and a series of hooks arranged in front of said former, and in line with said recesses R and adapted to move inwardly to enter said recesses and engage the rear edge of the work and pull it off the former.

8. A bending-machine including in combination a rotating former arranged to engage one end of the work and to rotate therewith, a pressure member arranged to press the work upon said former to bend it into the shape of the former, a lock for holding said former in a predetermined position, a clutch for connecting and disconnecting the former with a driving-shaft, and a connection between said clutch and said lock whereby to unlock the former at starting.

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

JAMES J. WOOD.

Witnesses:
W. H. CRIGHTON,
W. L. BLISS.