(No Model.) 2 Sheets—Sheet 1.

J. C. HERMAN.

METAL BENDING AND TWISTING MACHINE.

No. 499,733. Patented June 20, 1893.

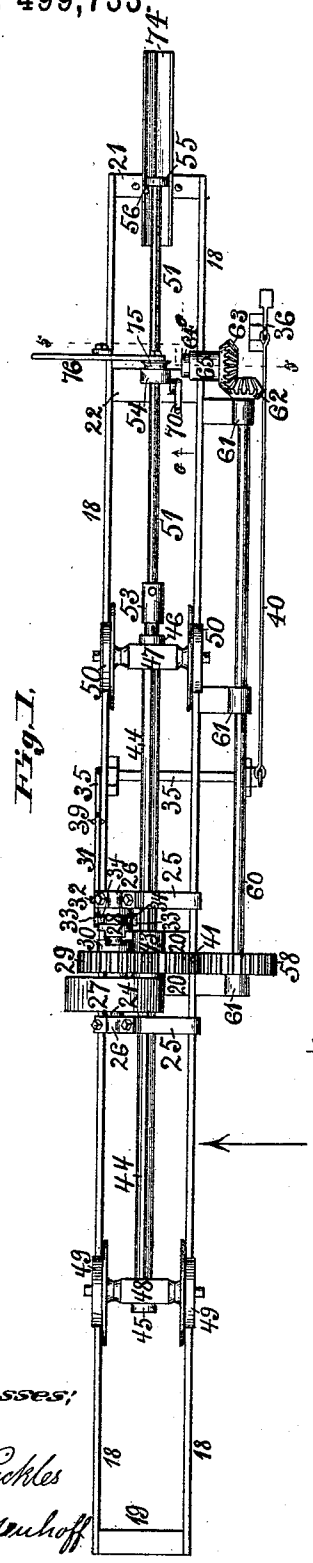

Fig. 1.

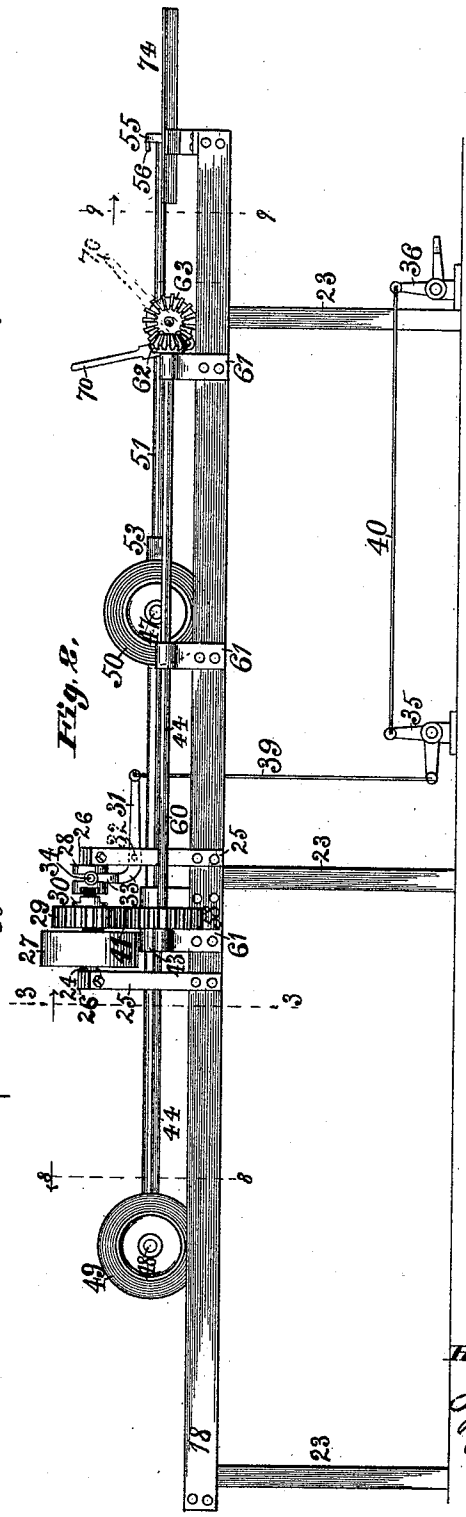

Fig. 2.

Witnesses;
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Geo. L. Neuhoff

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

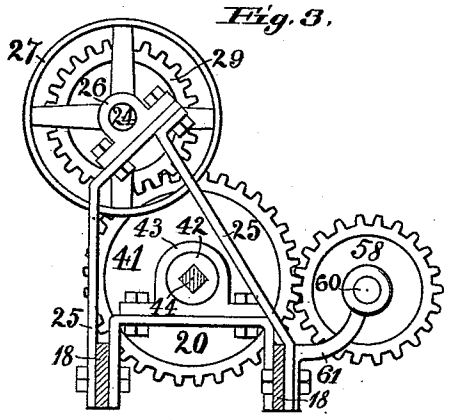

Fig. 4.

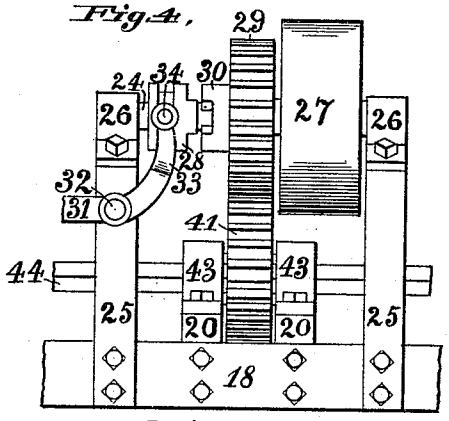

Fig. 5.

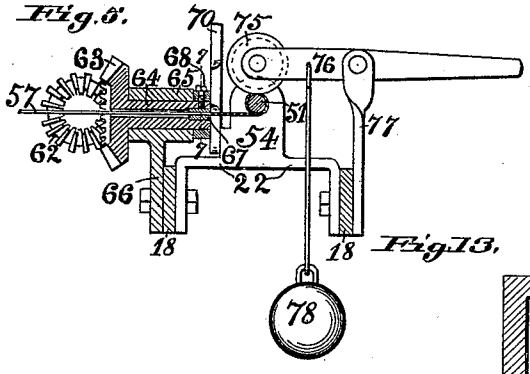

Fig. 6.

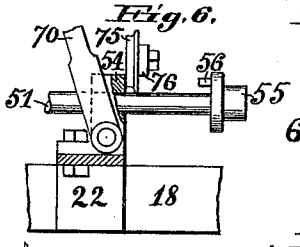

Fig. 7.

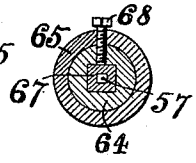

Fig. 13.

Fig. 12.

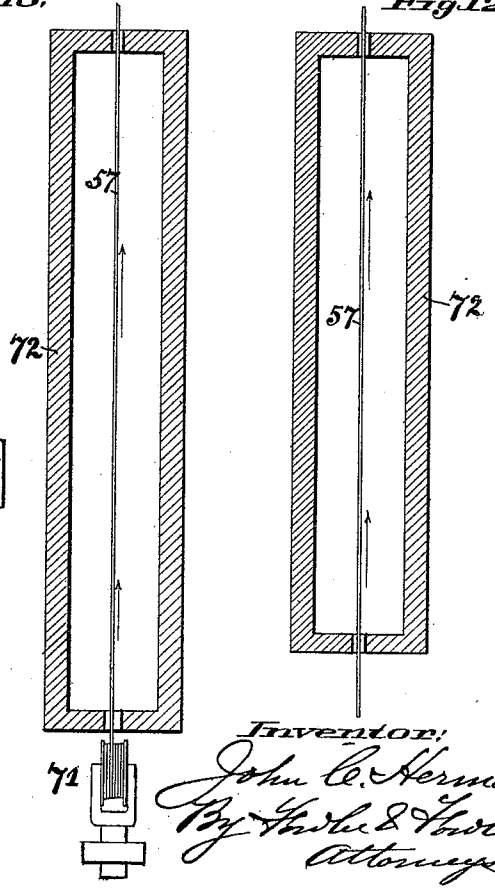

Fig. 8.

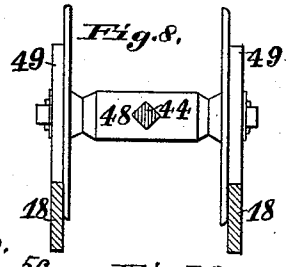

Fig. 9.

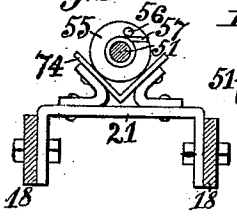

Fig. 10.

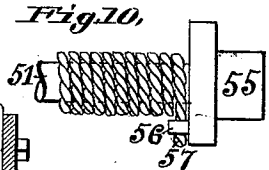

Fig. 11.

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UNITED STATES PATENT OFFICE.

JOHN C. HERMAN, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE AMERICAN NUT-LOCK COMPANY, OF SAME PLACE.

METAL BENDING AND TWISTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 499,733, dated June 20, 1893.

Application filed August 20, 1892. Serial No. 443,601. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. HERMAN, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have invented a certain new and useful Metal Bending and Twisting Machine, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates more particularly to the manufacture of nut-locks of the kind described in Letters Patent of the United States No. 249,383, issued to George H. Moore and dated November 8, 1881, but some of its features are applicable in the art of metal twisting and metal bending generally.

The object of the invention is to provide simple and convenient means for winding a bar or rod of metal into a continuous coil, and to provide also means for twisting such rod or bar of metal at the same time it is being coiled. For this purpose I provide a mandrel adapted to engage one end of the rod to be coiled and adapted to be rotated and at the same time to move longitudinally, while the coil is formed upon it, past a guide through which the rod is fed from a furnace to the machine. The twisting of the rod may be accomplished by passing it through an angular central perforation in said guide, a little larger but of substantially the same cross-sectional shape as the rod, the guide being rotated while the rod feeds therethrough.

The invention will be best understood by referring to the accompanying drawings illustrating a machine made in accordance with one form of my invention specially adapted for coiling and twisting rods of metal to be afterward cut into suitable sections or pieces and used as nut-locks of the kind above referred to.

Figure 1 is a top view of such machine. Fig. 2 is a front elevation thereof looking in the direction of the arrow in Fig. 1. Figs. 3, 4, 5, 6, 7, 8, 9, 10, and 11, are detail views drawn to enlarged scales, Fig. 3 being a sectional view on the plane of line 3—3 of Fig. 2, looking from the left hand side of Fig. 2. Fig. 4 is a rear view of the part of the machine at which the power is applied. Fig. 5 is a sectional view on the plane of line 5—5 of Fig. 1, looking from the right hand side of Fig. 1. Fig. 6 is a sectional detail view on the plane of line 6—6 of Fig. 1 looking in the direction of the small arrow to said line 6—6. Fig. 7 is a cross-section on the plane of line 7—7 of Fig. 5. Figs. 8 and 9 are sectional views respectively on the planes of lines 8—8 and 9—9 of Fig. 2 looking in the direction indicated by a small arrow to each of said lines. Fig. 10 is a detail view of one end of the mandrel with a coil of metal wound thereon. Fig. 11 is a view of a finished nut-lock made by the help of my machine. Fig. 12 is a sectional plan view of the furnace showing how the bar of metal is placed therein when it is to be both twisted and coiled. Fig. 13 is a sectional plan view of the furnace illustrating a preferred arrangement for passing the metal through the furnace when the twisting device is not used.

Like marks of reference indicate like parts throughout the several views of the drawings.

The parallel bars 18—18 which are connected by cross-pieces 19, 20—20, 21 and 22, form the main frame-work of the machine (Fig. 1), which is preferably mounted upon three pairs of legs 23 (Fig. 2). The spindle 24 (Figs. 1, 2, 3 and 4) is mounted upon a supplementary frame 25 which is bolted to the main frame 18, the ends of said spindle being journaled in journal boxes 26—26 carried by said supplementary frame. The belt pulley 27 (Figs. 1, 2, 3, and 4) over which the power belt is stretched, is rigidly mounted on said spindle 24. A collar 28 is mounted upon said spindle, and is adapted to slide laterally upon the same but cannot rotate independently thereof. A gear wheel 29 is freely mounted to revolve on spindle 24, being firmly united to a disk 30 also freely mounted upon said spindle and adapted to rotate independently of said spindle. The collar 28 has, upon the face adjacent to said disk, one or more projections adapted to take into corresponding depressions in the disk 30 when said collar is made to slide toward the same. The pulley 27 being rotated by the power belt, it will be seen that the gear wheel 29 may be made to

rotate by sliding the collar 28 toward the disk 30, and may be permitted to remain at rest by sliding the collar in the opposite direction. This device for throwing the machine in and out of gear is preferably controlled as follows: A lever 31 is mounted by a lug 32 on the supplementary frame 25, and has a forked arm 33 bearing lugs 34 which project into a peripheral groove in the collar 28. Two bell crank levers 35 and 36 (Fig. 2) having each a horizontal and a vertical arm, are mounted upon brackets secured to the floor under the machine. The horizontal arm of the bell crank lever 35 is connected to one end of lever 31 by a link 39, the vertical arm of said bell crank levers being connected by link 40. Normally the weight of link 39 will depress the end of lever 31 to which it is secured, and the forked arm of said lever, by means of said lugs 34 taking into the peripheral groove of the collar 28, causes said collar to slide away from the disk 30, so that the gear wheel 29 will be at rest (Fig. 2). If it is desired to drive the gear-wheel 29, the operator places his foot upon the horizontal arm of bell crank lever 36, depressing the same. In this manner link 39 will evidently be made to raise the end of lever 31 to which it is attached, and the forked end of said lever will cause the collar 28 to slide toward disk 30, whereby a rigid grip is effected between said disk and said collar the projections on the one falling into the depressions in the other. The gear wheel 29 is thus set at work. As soon as the operator releases the bell crank lever 36, the parts controlling said grip drop back to their normal position, and the wheel 29 is again left at rest. The teeth of the gear wheel 29 take into those of the gear wheel 41 (Fig. 3) which is mounted on a thick spindle 42 (Fig. 3.) whose ends are journaled in the journal boxes 43 (Fig. 4) carried by the cross pieces 20—20. Said spindle 42 has throughout its entire length, a central perforation preferably square in cross section, (Fig. 3) through which passes a similarly shaped prismatic bar 44 adapted to slide freely therein. The ends of said bar 44 are cylindrical and are journaled in journal boxes 45 and 46 (Fig. 1) mounted respectively on the axles 47 and 48. The axle 48 is carried by a pair of wheels or rollers 49—49 adapted to run along the upper edge of parallel bars 18, and having suitable flanges to prevent their running off the said bars (Figs. 1 and 8). A similar pair of rollers 50—50 carries the axle 47. A mandrel 51 (Figs. 1 and 2) is rigidly united to the end of the bar or rod 44, which rod projects beyond journal box 46, and is made into a socket 53 to receive one end of mandrel 51, the socket and the mandrel being rigidly united preferably by a pin (Fig. 1.) The other end of the mandrel 51 passes through a perforation in a block or abutment 54 (Figs. 1, 5 and 6) carried on the cross bar 22, and normally projects slightly beyond said block. Near its tip the projecting end of the mandrel 51 bears a removable disk 55 provided with a lug 56 (Figs. 1 and 10) and serving to engage one end of the rod to be coiled. It will be seen that if the operator depresses bell crank lever 36, the gear wheel 29 will be rotated as above explained. The gear wheel 41 is thereby set at work and the rectangular bar 44, and mandrel 51 rigidly secured to said bar, will also be rotated. The lug 56 engages the end of the rod 57 (Figs. 9 and 10), which rod is thereby coiled about the mandrel 51. As the metal is coiled about the mandrel it is continually interposed between block or stationary abutment 54 and the metal already coiled about the mandrel, whereby said mandrel is continually pushed forward to make room for new coils as they are being formed, the rectangular bar 44 being meanwhile drawn through the central perforation of the spindle 43. When the rollers 49—49 have thus been drawn almost up to the supplementary frame 25, the bell crank lever 36 is released and the machine stopped, a coil of metal having been formed along the entire portion of the mandrel 51 which has passed through the block or abutment 54. The teeth of the gear wheel 41 (Fig. 3) take into the teeth of the gear wheel 58 rigidly mounted on one end of horizontal shaft 60, which shaft is suitably journaled in and supported by the brackets 61 secured to the frame of the machine. On the opposite end of said shaft is rigidly mounted a beveled gear wheel 62 (Figs. 1 and 2) which engages another beveled gear wheel 63, rigidly mounted on a hollow horizontal shaft 64 mounted preferably at right angles to the rotating mandrel and journaled in a sleeve 65 supported by a bracket 66 fastened to the frame of the machine (Fig. 5). The metal bar to be coiled, passes from the furnace to the mandrel through the longitudinal central perforation of said hollow shaft, which perforation serves as a guide for such bar of metal. When the bar of metal is to be twisted as well as coiled, a die 67 is inserted preferably in that end of said perforation which is nearest the mandrel, being held therein by a set screw 68 (Figs. 5 and 7). Said die has a central angular perforation substantially similar in cross section to the bar of metal to be twisted but large enough to permit said bar to feed freely therethrough. When the machine is actuated to coil the metal upon the mandrel as heretofore explained this die is rotated by means of the beveled gear wheel 63 and intermediate mechanism just described. As the metal feeds through said rotating die it is twisted thereby, the twisting taking place between the die and the mandrel.

70 is a movable shear blade having a suitable handle and mounted so as to move parallel to and in close contact with the end of the shaft or guide 64, so that the rod of metal which is fed to the machine may, when desired, be sheared or clipped off between said shear blade and said shaft or guide 64 by suitably manipulating the said blade (Fig. 5).

The operation of the machine is as follows:

When the metal is only to be bent or coiled and not twisted, I prefer to wind the rod or bar upon a large bobbin 71, (Fig. 13) which I place at one end of the furnace 72 and from which bobbin the rod of metal passes into the furnace. At the opposite end of the furnace there is a suitable aperture through which the rod projects slightly (Fig. 13). The projecting end which of course is comparatively cold and rigid is grasped with a pair of tongs or other suitable means and the rod is drawn from the furnace sufficiently to permit its being passed through the hollow shaft 64 or other suitable guide, to the mandrel, being inserted between the mandrel and the lug 56. The machine is then started as heretofore explained for example by depressing the horizontal arm of bell crank lever 36. The end of the rod being comparatively cold and rigid, is firmly held by lug 36 and as the mandrel rotates a coil of metal is formed thereon as aforesaid, the metal being automatically unwound from the bobbin 71 at the one end of the furnace as fast as it is coiled at the other end by the machine. When a sufficient quantity of metal has been coiled, the machine is stopped, for example by releasing bell crank lever 36 as heretofore explained. The rod is then clipped or sheared off by suitably manipulating the shear blade 70. The disk 55 is slipped off the mandrel, the coil of metal is removed, and the mandrel is pushed back to its normal position, ready to be again operated. When the rod of metal is to be twisted as well as coiled, the die 67 is inserted and secured in the hollow shaft 64 as aforesaid. The angular bar of metal to be twisted is passed from the furnace through the hollow shaft 64 and through the angular aperture in the die 67 and thence to the mandrel where it is held as above. The machine being now operated, the rod while it is drawn through said die by the revolving mandrel, is also twisted between the die and the mandrel by the revolution of said die. I prefer in this case not to use the bobbin 71 as the same would have to be revolved laterally to prevent the portion of the rod which is in the furnace from being twisted also. As it would be inconvenient to so rotate the bobbin I prefer to cut the rod into pieces of suitable length and I lay these into the furnace. While one end of such a piece is fed to the machine, the other end is free to turn in the furnace and double twisting of the rod is thereby avoided.

74 (Figs. 1, 2, and 9) is a triangular trough suitably mounted on the cross bar 22, and serving to support the mandrel when a considerable coil of metal has been formed thereon and it has moved some considerable distance from its normal position.

75 (Figs. 1, 5, and 6) is a roller preferably provided with a peripheral flange and mounted preferably on one end of a lever 76 which lever is pivotally mounted on an arm 77 projecting from the frame of the machine. This roller or its peripheral flange, is adapted to come transversely against the mandrel and is preferably held firmly against the same by a weight 78 suspended from the lever 76, but it may be taken out of contact with the mandrel by manipulating the arm 76.

The coils of metal made by the form of my machine above described may be cut into suitable pieces Fig. 11 constituting nut-locks of the kind hereinbefore referred to. It will be seen that these nut-locks are not exactly circular but that their ends diverge slightly owing to the fact that they are sections or pieces of a continuous coil, but this in no wise interferes with their functions as nut-locks, and increases the efficiency of the nut-lock by calling into play its elasticity in a well known manner.

In the device shown in the drawings the longitudinal motion of the mandrel is brought about automatically by the metal which is being coiled about the same, the new coils, as they are formed, being constantly interposed between the block or abutment 54 and the coils already on the mandrel. The form of the block or abutment 54 may be greatly varied, its main object being simply to afford a fixed bearing surface for the metal being coiled, for the purpose of imparting actual or longitudinal motion to the mandrel as aforesaid. If other means be employed for imparting such motion to the mandrel, the abutment 54 may be entirely dispensed with, but I regard any other means of imparting such motion to the mandrel as within the spirit of my invention.

I do not wish to limit myself to the exact mechanism described and illustrated, because many changes may be made therein without departing substantially from my invention, the essential features of which will be more particularly pointed out in the claims making a part of this application.

Having fully described my invention, what I desire to claim, and secure by Letters Patent of the United States, is—

1. In a metal bending machine, the combination of a rotary mandrel free to move longitudinally, and to which the metal passes directly in its uncoiled condition and automatic impelling means for continuously moving the mandrel longitudinally while rotating by the pressure of the metal being coiled thereon.

2. In a metal bending machine the combination of a rotating mandrel free to move longitudinally through a considerable space while rotating, a stationary abutment against which the metal bears while the coils are being formed on the mandrel, and means for rotating said mandrel.

3. The combination of a furnace of considerable length, having a suitable aperture at one end thereof, a metal bending machine provided with a freely longitudinally movable and rotating mandrel adapted to engage one end of the metal to be coiled, whereby said mandrel is automatically caused to move

longitudinally past said aperture, while rotating, by the metal coiled thereon, and impelling means for rotating said mandrel whereby the metal will be drawn automatically through the furnace and will be fed automatically to the bending machine by the motion of the mandrel.

4. The combination of a furnace, a suitably mounted bobbin at one side thereof, having a coil of metal wound thereon, and a metal bending machine at the other side of the furnace, said metal bending machine being provided with a rotating mandrel free to move longitudinally while rotating, and adapted to engage one end of the metal to be coiled, whereby the metal is automatically unwound from the bobbin, drawn through the furnace and fed to the machine by the motion of the mandrel.

5. The combination of a rotating mandrel adapted to engage one end of the metal to be bent or coiled, a metal-twisting device to which the metal is adapted to be fed automatically by the mandrel as the coils are being formed thereon and a power mechanism for actuating the twisting device whereby the bar of metal is twisted and coiled by a single operation.

6. The combination of a rotating mandrel for coiling metal and adapted to engage the metal to be coiled, a guide through which the metal feeds to the mandrel, and means for rotating said guides as the metal feeds therethrough.

7. The combination of a mandrel adapted to move longitudinally, a rotating guide through which the metal feeds to the mandrel, and impelling means for moving said mandrel longitudinally while rotating.

8. In a metal-bending machine the combination of a rotating mandrel, suitable bearings wherein said mandrel is journaled and beyond which an end of the mandrel projects, and a removable part carried by the projecting end of the mandrel and adapted to engage one end of the bar or piece of metal to be coiled.

9. In a metal-bending machine, suitable bearings adapted to be moved to and fro, a shaft mounted in said bearings and carried thereby, actuating mechanism for rotating said shaft, a mandrel rigidly united to said shaft and adapted to engage the metal to be bent, a stationary abutment beyond which said mandrel projects and adjacent to which the metal is coiled upon said mandrel.

10. In a metal-bending and twisting machine the combination of a mandrel adapted to engage the rod or piece of metal to be bent, a metal twisting device, a power mechanism suitable connecting devices intermediate said power mechanism and the mandrel and twisting device, and adapted to be thrown in and out of gear, whereby the machine may be put in and out of operation at the will of the operator for the purpose set forth.

In testimony whereof I have hereunto set my hand and affixed my seal, this 15th day of August, 1892, in the presence of the two subscribing witnesses.

JOHN C. HERMAN. [L. S.]

Witnesses:
JAMES B. WILDE,
GEORGE L. NEUHOFF.