(No Model.) 4 Sheets—Sheet 1.

F. SOTTER.

MACHINE FOR BENDING SPECIAL SHAPES OF IRON, STEEL, OR OTHER METAL.

No. 529,536. Patented Nov. 20, 1894.

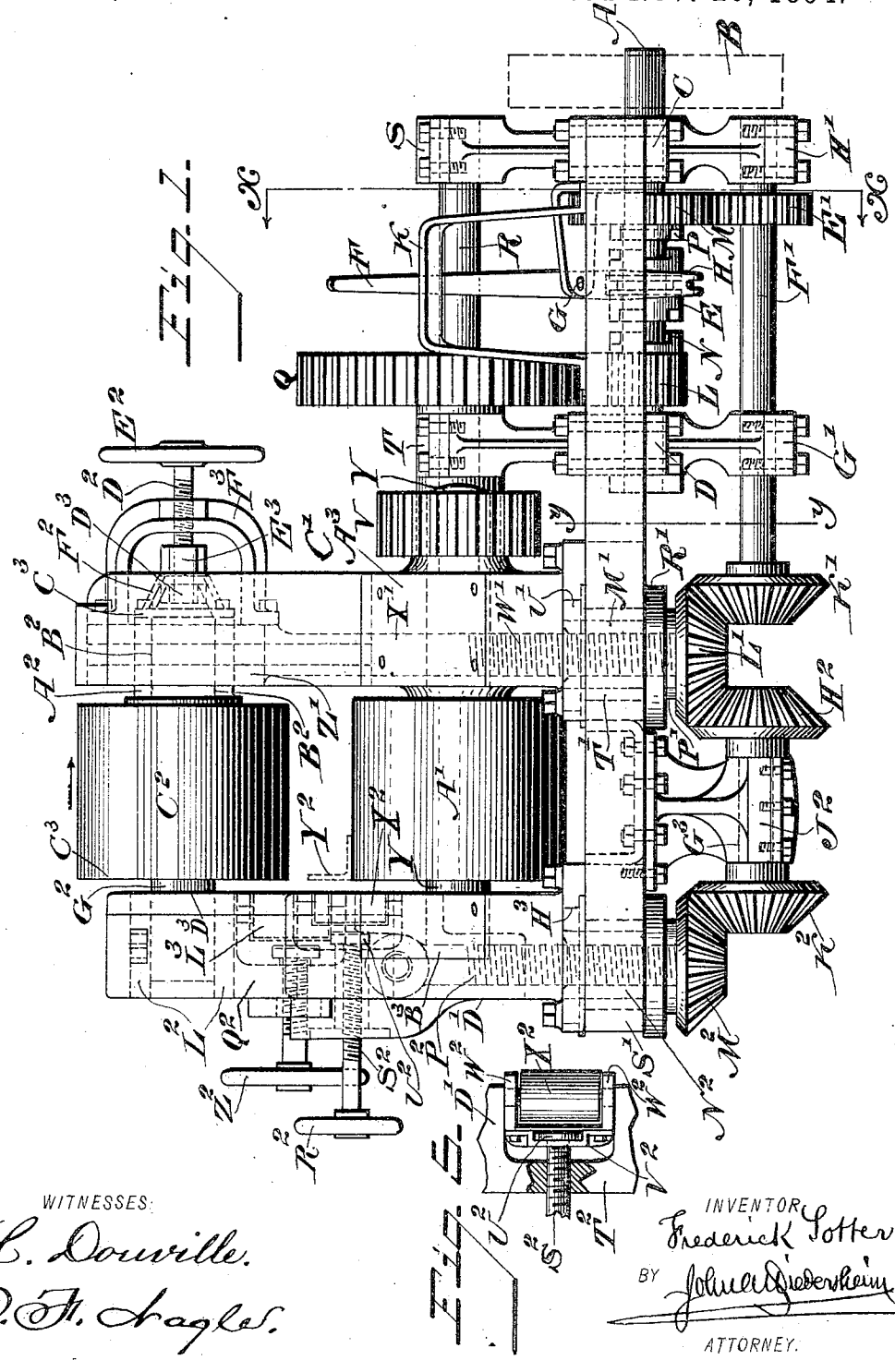

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Fig. 2.

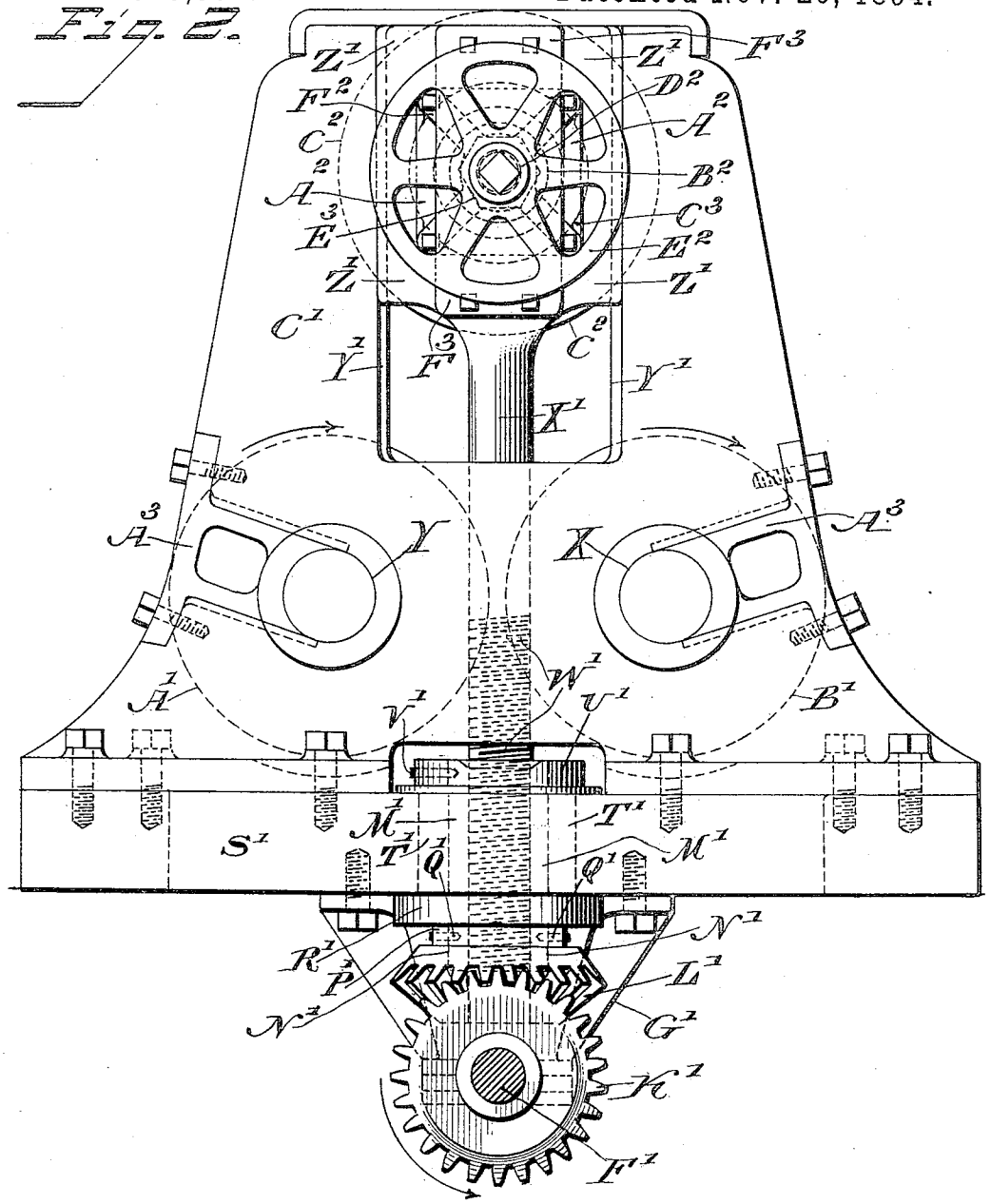

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Fig. 3.

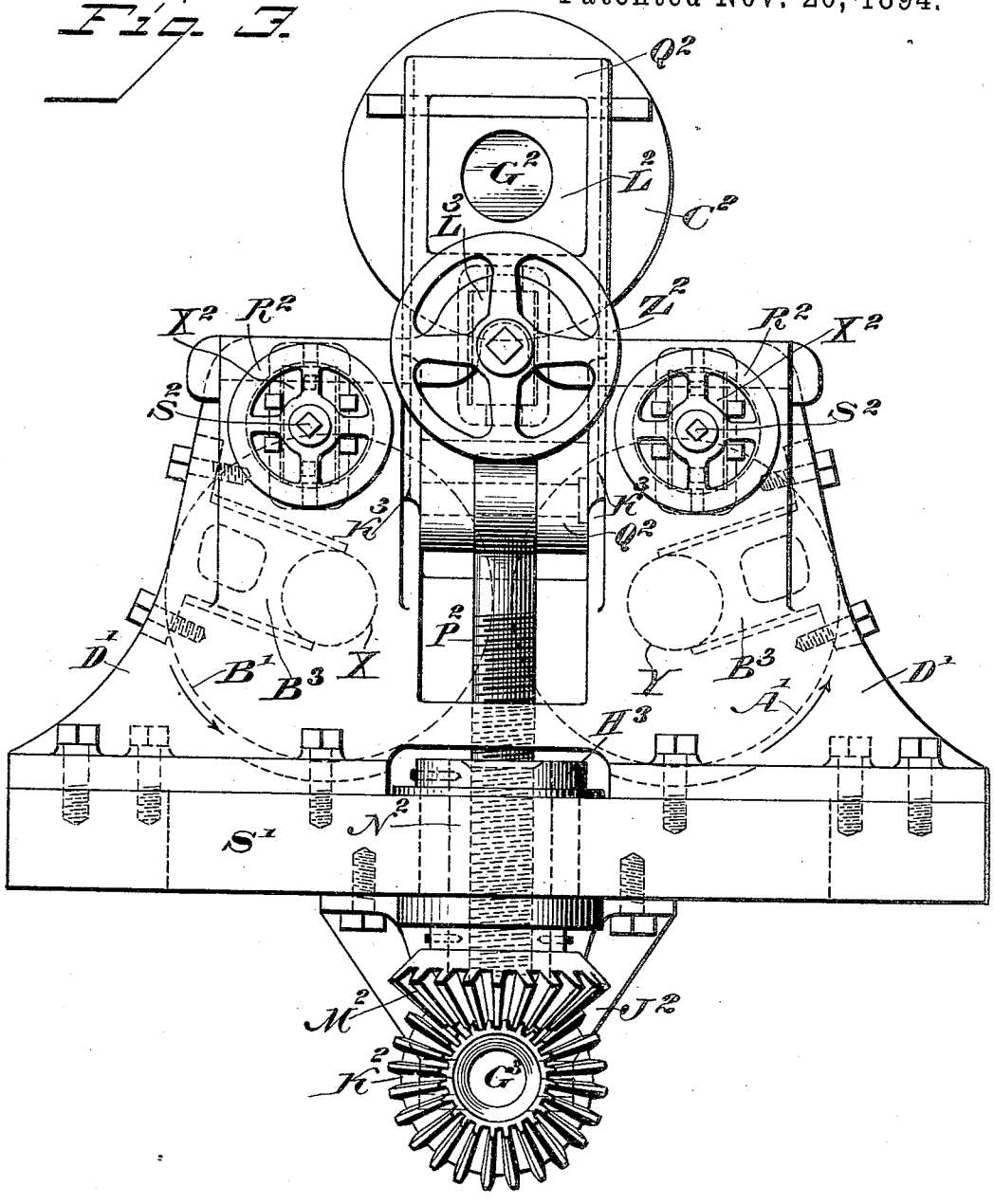

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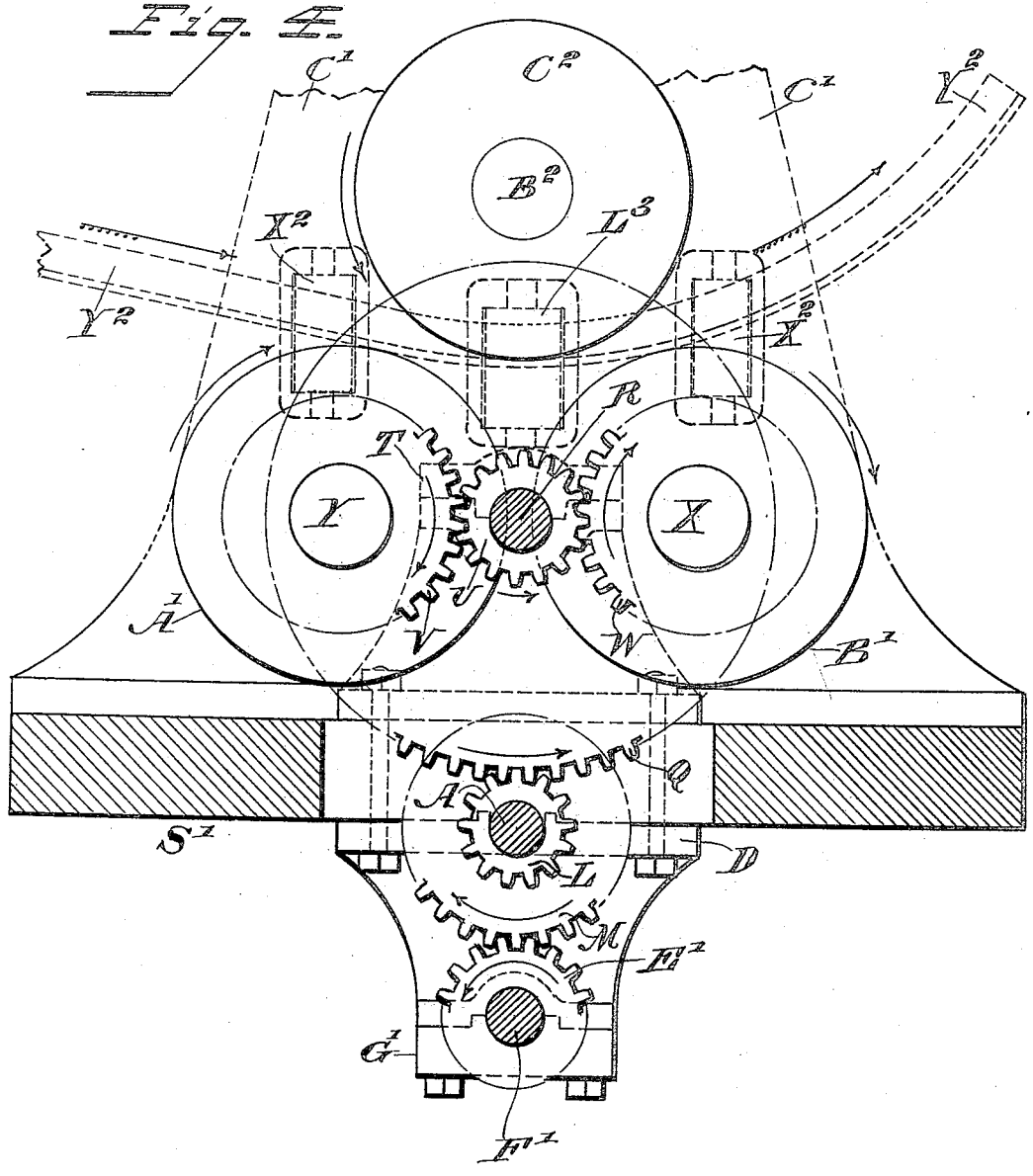
Fig. 4.



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UNITED STATES PATENT OFFICE.

FREDERICK SOTTER, OF COATESVILLE, PENNSYLVANIA.

MACHINE FOR BENDING SPECIAL SHAPES OF IRON, STEEL, OR OTHER METAL.

SPECIFICATION forming part of Letters Patent No. 529,536, dated November 20, 1894.

Application filed May 14, 1894. Serial No. 511,117. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK SOTTER, a citizen of the United States, residing at Coatesville, in the county of Chester, State of Pennsylvania, have invented a new and useful Improvement in Machines for Bending Special Shapes of Iron, Steel, or other Metal, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of an improved machine for bending special shapes of iron, steel and other metals, wherein the metal to be bent is positively held in position and prevented from lateral twisting by means of a series of rolls and other devices arranged in a novel position relative to each other.

It also consists of improvements in various details of construction, all as will be hereinafter set forth.

Figure 1 represents a side elevation of a machine for bending metal embodying my invention. Fig. 2 represents an end elevation of the same, the lower portion being a section on line *y*, *y*, Fig. 1. Fig. 3 represents the other end elevation of the machine from that shown in Fig. 2. Fig. 4 represents a diagrammatic view of a section taken on line *x*, *x*, Fig. 1, showing the elevation of the gears and pinions to each other, and a bar of metal in the act of being bent, and Fig. 5 represents a detail to be hereinafter referred to.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings: A designates the main shaft, to which power may be applied in any suitable manner, in the present instance by the belt pulley B. The shaft A is mounted on suitable bearings C and D, and has secured to it, in such a way as to revolve therewith, the clutch E, which is adapted to be moved from right to left, or vice-versa.

F designates a rod which is suitably fulcrumed at G and has one end H adapted to engage the clutch E, so that the latter can be moved thereby.

K designates a frame or guide for the rod F. L and M designate two pinions loosely mounted on the shaft A, said pinions being provided with the recessed faces N and P, respectively, which are adapted to be engaged by the faces of the clutch E, so that when the latter is moved into engagement with either one of the said faces, the pinion L or M, as the case may be, will be caused to revolve and to actuate the gear intermeshing therewith.

Q designates a gear adapted to mesh with the pinion L, said gear being mounted on the shaft R, which is suitably supported in the bearings S and T. The said shaft R has mounted thereon the pinion U, Fig. 4, which is adapted to mesh with the gears V and W, the said gears being suitably attached to the journals X and Y, on which are mounted the rolls A′ and B′ respectively, the said shafts being journaled in the frames C′ and D′, which are suitably attached to the base S′. The loose pinion M meshes with the pinion E′, which is suitably attached to the shaft F′, said shaft being journaled in the boxes or bearings G′ and H′, which are attached to the under side of the base S′.

K′ designates a bevel gear mounted on the end of the shaft F′, said gear meshing with a second bevel gear L′ to which is pinned or otherwise suitably secured the sleeve or collar M′, Fig. 2, which has the annular projection N′, which extends a short distance into the hub P′ of the gear, and is secured thereto by the pins Q′.

R′ designates a flange on said collar, which is adapted to bear on the under side of the base S′.

T′ designates a bushing in the base S′ which serves as a bearing for the sleeve M′.

U′ designates a flange which is adapted to rest on the upper side of the base S′, and which is secured to the sleeve M′ by the pins V′. The collar or sleeve M′ is threaded internally, and is adapted to engage the threaded portion W′, of the rod X′, whose upper extremity Z′ is widened and is adapted to slide freely in the way Y′.

A^2 designates a box, which is squared in the present instance, and is supported on the head Z′, and in which the journal B^2 of the roll C^2 is adapted to revolve. On the end of the journal B^2, is a head or collar C^3, and the box A^2 fits closely to the journal between the roll C^2 and the collar. The yoke F^2 is attached to said box, through which passes the

threaded stem D^2, which is provided with the hand wheel E^2 at one end, and is held in position relative to the yoke F^2 by means of the nuts D^3 and E^3, Fig. 1.

F^3 designates a yoke attached to the head Z′, and threaded to engage the threaded stem D^2, whereby it will be seen that a revolution of the hand wheel in either direction imparts a longitudinal movement to the roll C^2.

G^2 designates the other journal of the said roll C^2, which revolves in a suitable box L^2, which is supported in the head Q^2.

H^2 designates a bevel gear adapted to mesh with the gear L′, the said gear H^2 being secured to one end of a shaft G^3, which has a suitable bearing in the box J^2, which is attached to the base S′, the other end of said shaft carrying the bevel gear K^2, which is adapted to mesh with the bevel gear M^2, the same being provided with an internally-threaded collar or sleeve N^2, which is pinned to the hub of the said gear M^2, and revolves within a bushing and has a flange H^3 pinned to the sleeve, &c., in the same manner as the bevel gear L′, whose operation has already been described.

P^2 designates a threaded stem which is adapted to engage with the internally-threaded sleeve N^2, the upper end of said stem being pivotally secured to the head or knuckle Q^2 which slides freely in the ways K^3, and which carries the box L^2, in which the journal G^2 revolves.

R^2 designates hand wheels arranged on each side of the machine, which are provided with the threaded stems S^2, Fig. 5, which pass through and engage the internally-threaded portions T^2 of the frame D′.

U^3 designates heads on the stems S^2, said heads engaging a recess in the frame or housing formed by the piece V^2, and the pieces W^2 in which the vertical rolls X^2 are journaled whereby the rotation of the hand wheels R^2 and the screws S^2 will move the roll X^2 to or away from the article which is being bent, which in the present instance is the angle iron Y^2, Fig. 1.

Z^2 designates a third hand wheel, which has a stem, a vertical roll L^3, housing &c., substantially the same as has just been described with reference to Fig. 5. The vertical roll L^3 and its adjuncts however are located in the movable head Q^2 instead of the frame D′.

A^3 and B^3 designate caps which partially inclose the shafts X and Y, and which are bolted to the frames C′, D′.

The operation will now be apparent. When the parts are in the position shown in Fig. 1, only the shaft A and the clutch E can revolve. If now it is desired to bend the angle iron Y^2, Figs. 1 and 4, the roll C^2 must first be lowered to about the position shown in Fig. 4, which would be done by causing the clutch E to engage the face P of the gear M. By following the system of gearing at the bottom of Fig. 1, it will be seen that by the revolution of the shafts A and F′, the sleeves M′ and N^2 are caused to revolve, and since they engage with the threaded stems P^2 and W′, the roll C^2 is lowered. The said roll C^2 can be adjusted longitudinally by means of the hand wheel E^2, stem D^2 and its adjuncts, so that the space between the end C^3 of the roll C^2, and the edge D^3 of the side D′ can be increased or diminished. The positions of the rollers X^2 and L^3 can be accurately adjusted by means of the hand wheels R^2 and Z^2. To bend angle iron, as in the present instance, in Figs. 1 and 4, one flange of the metal would be held between the rolls A′, B′, and C^2, and the other flange between the edge C^3 of the roll C^2, and the vertical rolls X^2, and L^3 Figs. 1 and 4. The rolls C^2 having been adjusted vertically, the clutch E is disengaged from the face P, and thrown into engagement with the face N of the gear L, whereupon the gear Q, pinion U and gears V and W, and the rolls A′, B′ are caused to rotate, the upper roll C^2 acting as a follower, and caused to revolve by being in contact with the metal Y^2. The function of the vertical rolls is to uniformly stretch the bar which is being bent, since angle iron, which is shown in the present instance as being operated upon, has a tendency to take a double curve unless uniformly stretched upon the outer surface, and the action of the above combination of vertical and horizontal rolls is to bend a bar of angle iron exactly and uniformly into the desired shape, so that one portion of the metal is being compressed in a degree exactly proportionate to that in which another portion is being stretched, both of which steps are accomplished simultaneously with accuracy and speed by my machine.

The entire machine is readily accessible for renewal or repairs of any kind, the caps, housings, &c., in all cases, being easily reached, removed or repaired, whenever desired.

The degree of curvature to be given to the article which is to be bent, can be varied by varying the distance between the upper and lower rolls. When it is desired to raise the roll C^2, the clutch E is thrown into engagement with the face P, the direction of the rotation of the shaft A, being changed by any suitable means.

It is obvious that many special shapes other than angle iron can be bent by my machine, and therefore I do not desire to be limited thereto, although I have shown my machine in the present instance especially adapted for angle iron and similar shapes, and it is also evident that changes may be made in the positions of the horizontal and vertical rolls, relative to each other, in order to adapt the machine to the different shapes which can be bent by it, and that other changes can be made by the skilled mechanic, which will come within the scope of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A machine for bending metal, a frame, a main shaft A, a vertically adjustable roll, two horizontal rolls below the latter, mech-

anism connected with said shaft for rotating said latter rolls, and mechanism for laterally adjusting the journal of said first roll, and vertical rolls adjustable relatively to said horizontal rolls said parts being combined substantially as described.

2. In a machine for bending metal, horizontal rolls another horizontal roll located adjacent thereto and adjustable vertically and longitudinally, vertical rolls located in proximity thereto, one of said vertical rolls being adjustable vertically and horizontally, the others being adjustable horizontally, said parts being combined substantially as described.

3. In a machine for bending metals, a base with a driving shaft journaled therein, a roll having journals at each end thereof, the same being provided with box bearings, rods under each journal of said roll supporting said boxes and having threaded lower ends, sleeves swiveled in said base and having screw threads engaging said rods, and mechanism connected with sleeves, and two rolls in substantially the same plane, and below said first roll and shaft for rotating said sleeves, said parts being combined substantially as described.

4. In a machine for bending metals, a base, a driving shaft having clutch mechanism thereon, a roll having its journal bearing laterally adjustable, rods supporting said journal bearings, mechanism connected with said rods and shaft for vertically adjusting said bearings, two rolls adjacent to said first roll, and mechanism connected with said two rolls and shaft for rotating the said two rolls, said parts being combined substantially as described.

5. In a machine for bending metals, a base, a driving shaft, with a clutch mechanism thereon, a roll with laterally adjustable bearings, rods supporting said bearings, mechanism connected with said shaft and rods for vertically adjusting the latter, two rolls journaled in attachments to said base, and gears on the journals of said two rolls meshing with a pinion on said shaft for rotating said rolls, said parts being combined substantially as described.

6. In a machine for bending metals, a frame a main shaft A, a roll vertically adjustable by mechanism from said main shaft, two horizontal rolls, mechanism connected with said shaft for rotating said latter rolls, and mechanism for laterally adjusting said first roll, from the exterior when the machine is in operation, substantially as described.

7. In a machine for bending metal, the herein described device for laterally adjusting a roll and its journal, the same consisting of the box A^2 and the journal B^2 adapted to carry a roll C^2, said journal having the head C^3 thereon and the yoke F^2 attached to said box and means for imparting motion to said yoke, consisting of the threaded stem D^2 secured thereto, and provided with the yoke F^3 and the hand wheel E^2 substantially as described.

8. In a machine for bending metals, an upper and two lower horizontal rolls, mechanisms for laterally and vertically adjusting the bearings of said upper roll, mechanism for simultaneously rotating said lower rolls, vertical rolls adjacent to the ends of said horizontal rolls, and mechanism for horizontally adjusting said vertical rolls, said parts being combined substantially as described.

9. In a machine for bending metal, the roll C^2 adjustable horizontally and vertically, whereby the distance between the adjacent rolls or the space between the end of said roll C^2 and the edge D^3 can be varied said roll being journaled in boxes supported on the stems P^2 and X', the stem P^2 being provided with a knuckle as shown, means for actuating said stems, rolls A', B' and means for actuating the same, said parts being combined substantially as described.

FREDERICK SOTTER.

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