J. E. ERICKSON.

BENDING MACHINE.

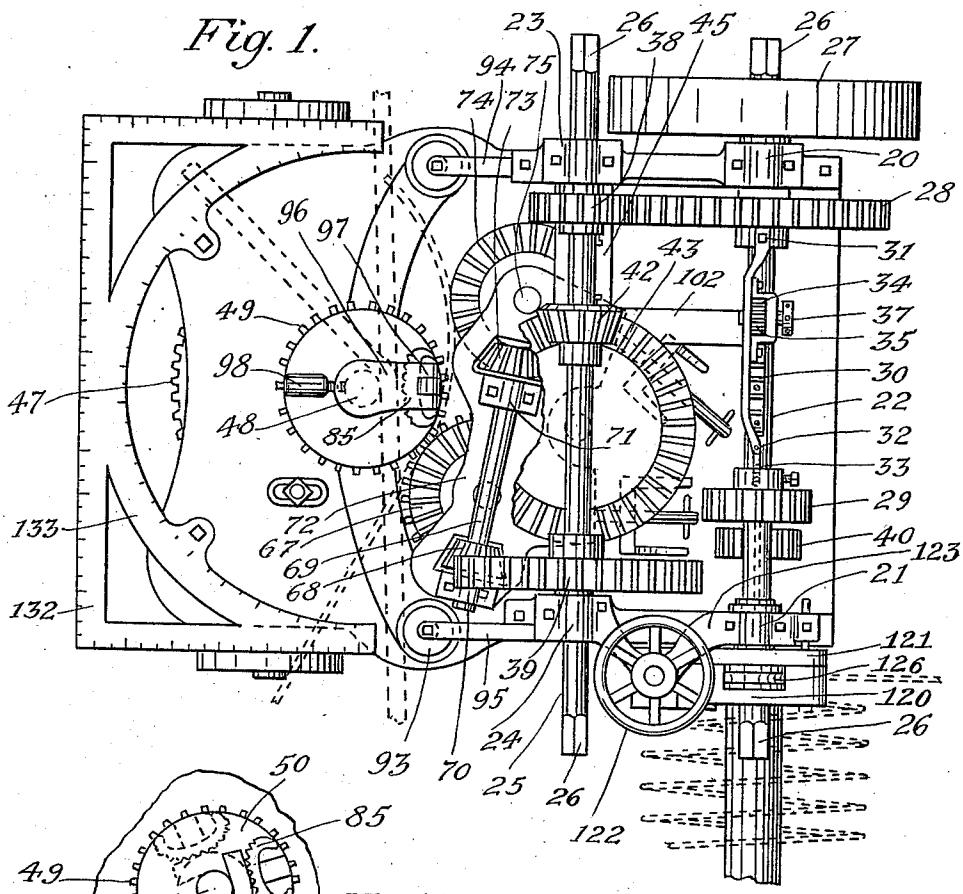
APPLICATION FILED FEB. 20, 1911.

1,028,102.

Patented June 4, 1912.

4 SHEETS—SHEET 1.

Fig. 1.



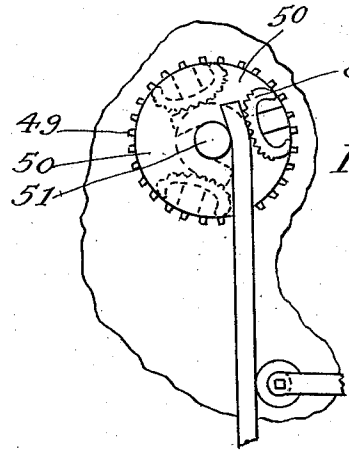


Fig. 7.

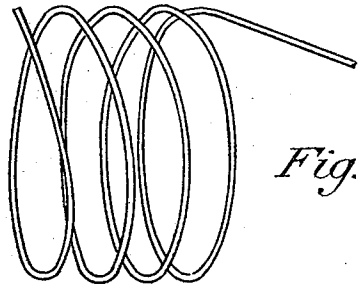


Fig. 9.

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4 SHEETS—SHEET 2.

Fig. 2.

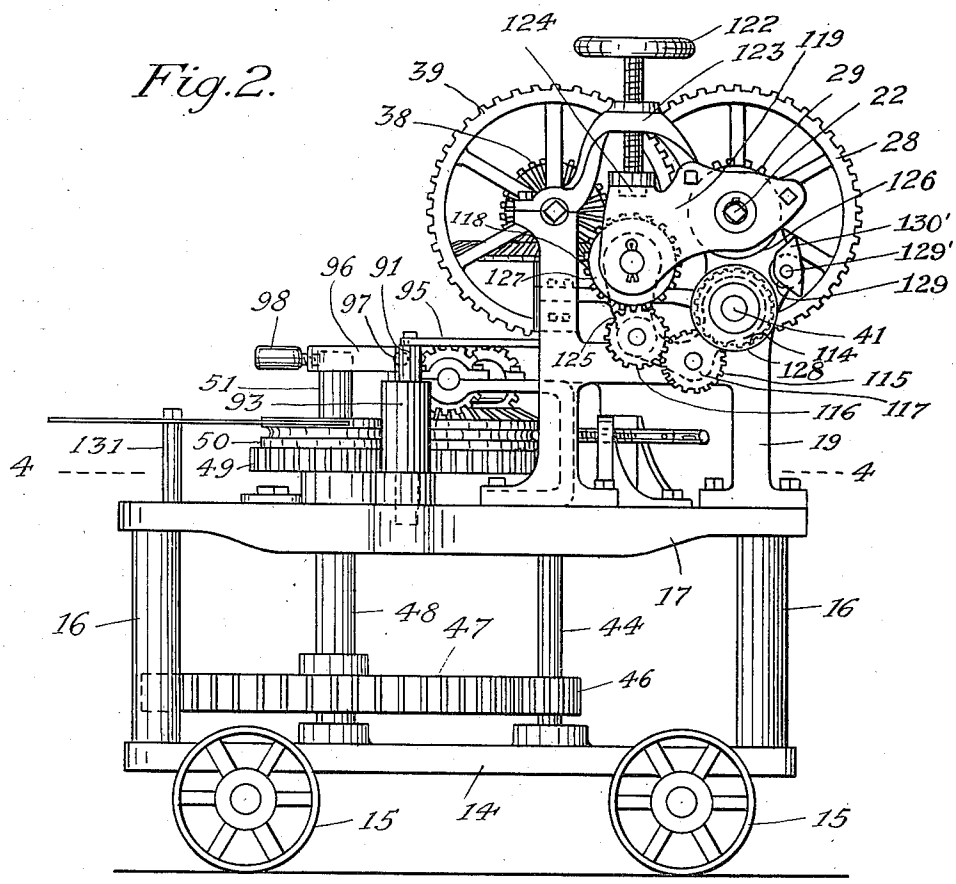
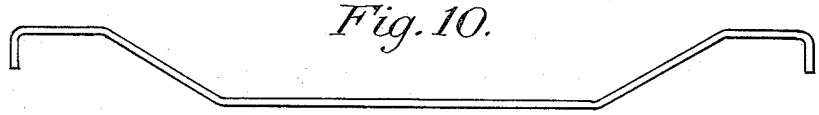


Fig. 10.



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4 SHEETS—SHEET 3.

Fig. 3.

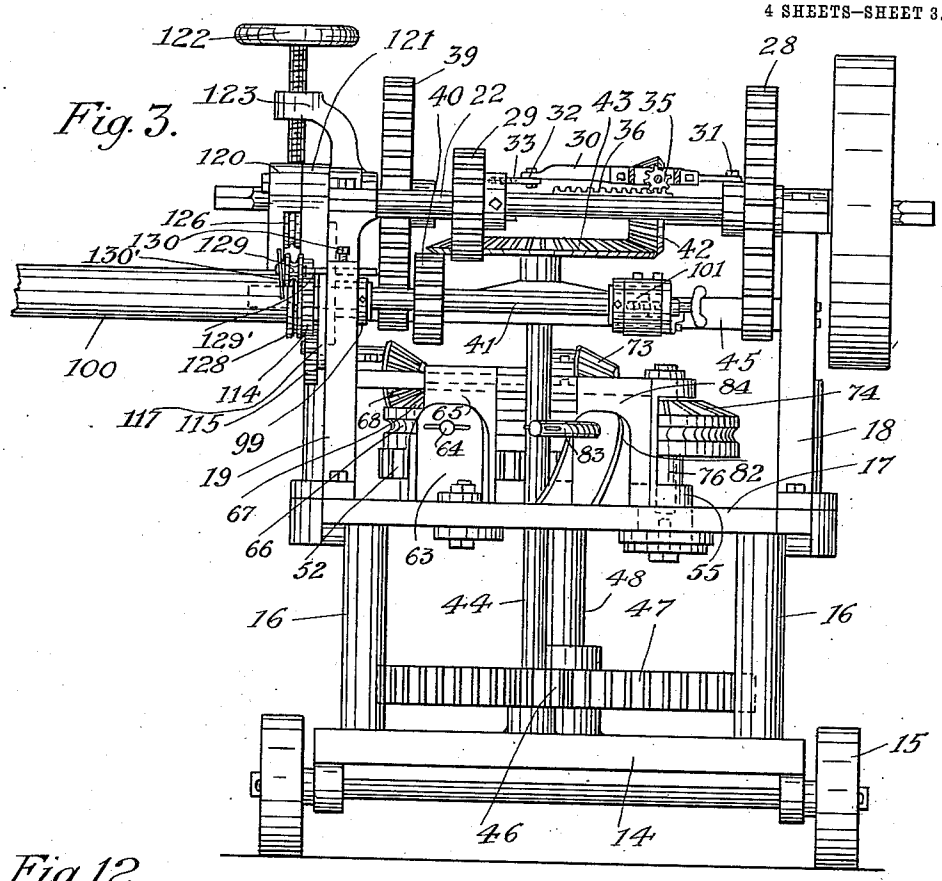

Fig 12

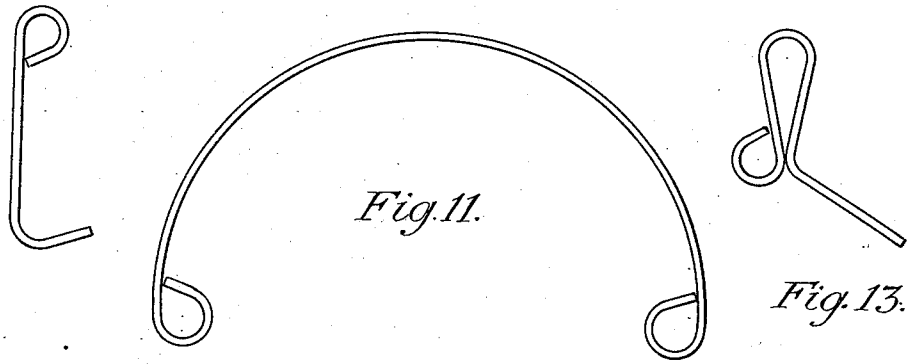

Fig. 11.

Fig. 13.

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4 SHEETS—SHEET 4.

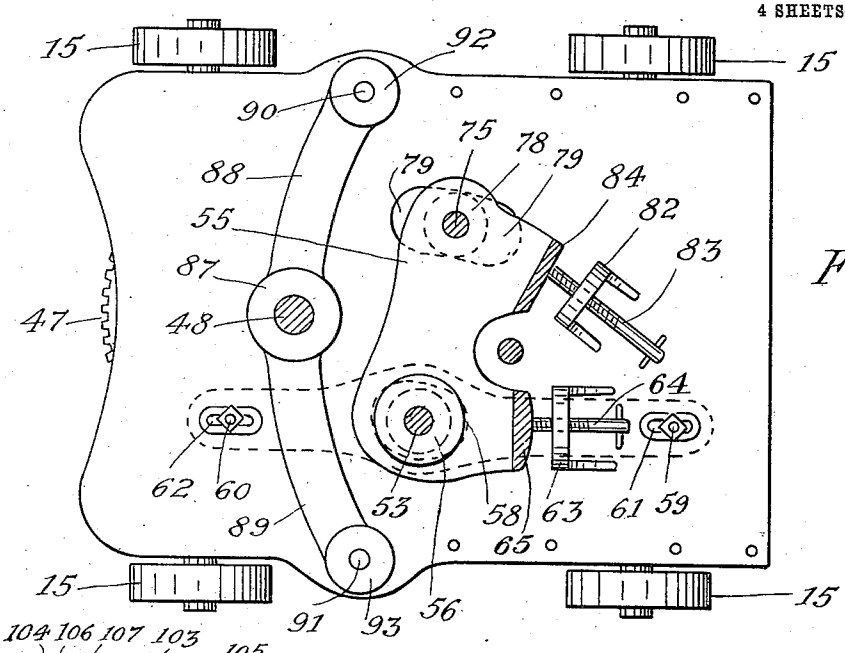


Fig 4

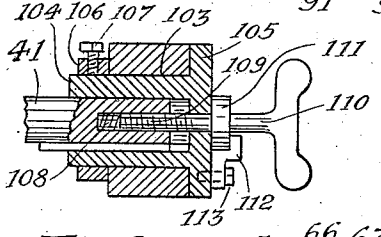
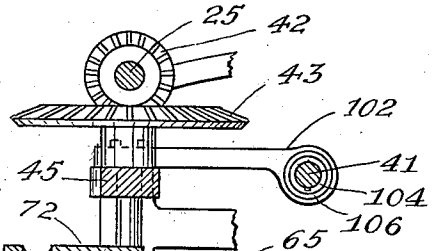


Fig. 8



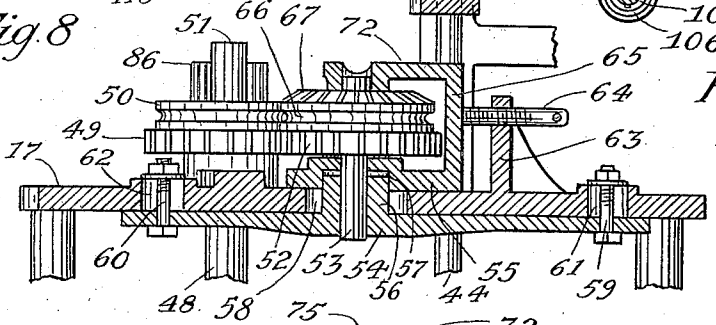


Fig. 5.

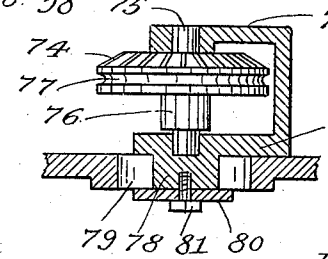


Fig. 6.

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UNITED STATES PATENT OFFICE.

JOHN E. ERICKSON, OF ST. PAUL, MINNESOTA.

BENDING-MACHINE.

1,028,102. Specification of Letters Patent. Patented June 4, 1912.

Application filed February 20, 1911. Serial No. 609,668.

To all whom it may concern:

Be it known that I, JOHN E. ERICKSON, citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Bending-Machines, of which the following is a specification.

My invention relates to a portable machine for bending bars of iron or analogous material and is designed especially for use in connection with the bending of such bars to be used in the construction of reinforced concrete.

The machine of my invention is adapted to operate on bars of various sizes and to bend the same in any desired manner, the nature of the bend in the body of the bar being determined by adjusting devices.

My machine also provides means for making short curved bends at the ends of the bar and for bending a bar in a spiral. The machine is mounted upon trucks so as to be readily movable from point to point, and is adapted to be operated either by power or by hand.

The complete objects to be accomplished by my machine and all the advantages thereof will appear in connection with the detailed description thereof, and are particularly pointed out in the claims.

In the drawings, representing the application of my invention to one form of machine,—Figure 1 is a plan, Fig. 2 a side elevation, and Fig. 3 an end elevation of the machine. Fig. 4 is a sectional plan view on line 4—4 of Fig. 2. Fig. 5 is a section across the top plate of the machine showing the mounting of and connection between the principal feeding rollers. Fig. 6 is a similar detailed view of the bending roller. Fig. 7 is a detail view of the means for turning short bends at the ends of rods. Fig. 8 is a detail sectional view of the means for adjusting the device for bending spirals. Figs. 9 to 13, inclusive, show different forms of bendings which my machine is capable of accomplishing.

The main frame of the machine comprises a bottom plate 14, mounted on wheels 15, which supports, by means of uprights 16, an upper plate 17. Bolted to the plate 17 are two upright bracket members 18 and 19, respectively, having mounted in bearings 20 and 21 thereon a shaft 22, and in bearings 23 and 24 a shaft 25, each of the shafts extending beyond said bearings at both ends and being provided with squared portions 26 to which hand cranks may be applied when desired, the shaft 22 also being provided with a pulley 27 for connection with a source of power. Splined to the shaft 22 so as to be capable of movement longitudinally thereof, is a large gear 28 and a smaller gear 29, said gears being secured together so as to move in unison by a link 30. This link is bolted directly to the hub of the gear 28, as shown at 31, but is connected at 32 with a bolt 33 screwed into the hub of the gear 29, this arrangement being provided so that the distance between the gears 28 and 29 may be accurately adjusted. Bolted to the link 30 is a U-piece 34 between which and the link is rotatably mounted a gear 35 meshing with a rack 36 on the shaft 22. The shaft of the gear 35 is extended outside of the U-piece and has thereon a pin wheel 37 by means of which the gear is rotated, thereby through engagement with the rack 36 simultaneously shifting the position of the gears 28 and 29 upon the shaft 22. Any other form of change-gear device may be used in place of the one herein described, which, however, I have found accurate and convenient for the purpose. Gear 28 is designed to mesh with a gear 38 on the shaft 25. The gear 29 has two operative positions, in one of which it will mesh with a gear 39 on the shaft 25 to rotate said shaft at a slower speed than when the same is geared with the gear 28, and in the other position meshing with a gear 40 on a short shaft 41, the function of which will be hereinafter described.

The shaft 25 is provided with a bevel wheel 42 meshing with a bevel wheel 43 on a vertical shaft 44 mounted in bearings in the plates 14 and 17 and in a cross bar 45 carried by the brackets 18 and 19. To the lower end of the shaft 44, above the bearing in the plate 14, is secured a pinion 46 meshing with a gear 47 on a vertical shaft 48 mounted in bearings on the plates 14 and 17. Above the plate 17, the shaft 48 is provided with a gear 49 and grooved bending roller 50 integral with the gear 49 and a member 51 which may be an extension of the shaft 48. As clearly shown in Fig. 5, the gear 49 meshes with a gear 52 on a short shaft 53 mounted in bearings on a plate 54 adjustably secured to the plate 17, and a yoke bearing-piece 55 adjustably secured to the upper portion of the plate 17. The

plate 54 has an upwardly extending boss 56 surrounding the shaft 53 and entering into a depression 57 in the yoke-plate 55. The boss 56 extends through an elongated opening 58 in the plate 17, as shown in Fig. 4, and the plate 54 is secured to the plate 17 by means of bolts 59 and 60 extending through slots 61 and 62, respectively, in the plate 17. Threaded into an upstanding boss or web 63 on the plate 17 is a hand screw 64, the end of which is adapted to coöperate with an upstanding portion 65 of the yoke bearing piece 55. By loosening the bolts 59 and 60 and turning the hand screw 64, the gear 52 may be adjusted with reference to the gear 49, these gears being provided with extra long teeth to make such adjustment possible.

To the gear 52 is attached a grooved roller 66 in coöperative relation with the roller 50 and said roller 66 has on the upper portion thereof a bevel gear 67 meshing with a bevel gear 68 on a short shaft 69 mounted in bearings 70 and 71 on the top plate 72 of the yoke bearing plate 55, said top plate being cut away above the gear 67 to permit the bevel gear 68 to pass through and mesh therewith. The shaft 69 carries a bevel wheel 73 extending through said top plate 72 and meshing with a bevel wheel 74 on a short shaft 75 mounted in bearings on the yoke bearing plate 55, as clearly shown in Fig. 6, the shaft 75 being provided with a shouldered or thickened portion 76 so as to properly position the gear 74 and more especially a grooved roller 77 thereon to place the groove of said roller in the plane of the grooves of the rollers 50 and 66. The yoke bearing plate 55 is provided beneath the lower bearing of the shaft 75 with a boss 78 extending through a slot 79 in the plate 17, and said member 55 is adjustably secured to the plate 17 by means of a washer 80 and bolt 81, all as plainly shown in Fig. 6. Threaded into a lug or web 82 on the plate 17 is a hand screw 83 having universal joint connection with an upstanding portion 84 of the yoke bearing plate 55. By loosening the bolt 81 and turning the hand screw 83 the bearing piece 55 will be swung on the boss 56, as a pivot in an arc centering at the center of shaft 53 to bring the shaft 75 and the grooved roller 77 carried thereby nearer to or farther from the grooved roller 50, thereby to change or vary the character of the bend produced as the iron is fed in between the rollers 50 and 66 and against the roller 77. It will be noted that since the oscillation of the plate 55 is about the center of the shaft 53, driving connection between shaft 48 and the bevel wheel 74 through the bevel wheels 68 and 73 on the shaft 69 will be maintained in whatever position of adjustment the bearing plate 55 may be placed. Through the above described means the operative peripheries of the feeding rollers 50 and 66 and the bending roller 77 are caused to move in the same direction.

For effecting short bends at the ends of rods, I provide the roller 50 with corrugated gripping members 85 positioned so as to leave a space between the extension 51 of the shaft 48 and said gripping members of approximately the right width to receive said bars. A single one of such gripping members or a plurality thereof will be used as desired, and I contemplate the use of gripping members of different sizes detachably connected with the roller 50, and also washers 86 may be used to place over the member 51 to vary the size of the bend effected by grippers 85. The plate 17 is heavily reinforced at 87 for the reception of the shaft 48 since the strain on such shaft is very great when the aforesaid short bends are made. Bands of reinforcement on the plate 17, 88 and 89, respectively, are carried to the sides of the plate, as shown in Fig. 4, and upon vertical pin shafts 90 and 91 at the ends of such reinforced portions and the sides of the plate 17 are mounted rollers 92 and 93 to form bearings for the bars when the short bends are being made, as clearly indicated in dotted lines in Fig. 1. The short shafts 90 and 91 are additionally secured from distortion during bending operations by means of braces 94 and 95, respectively, from the top of said shafts to the brackets 18 and 19, respectively; and the extension 51 is also secured from distortion by means of a clasp 96 pivoted at 97 to an extension from the gripper 85 and adapted to be swung over the member 51 by means of a handle 98.

The short shaft 41 is carried in a bearing 99 in the bracket 19 through which the shaft extends to form a receiving member for a pipe 100 attached to receive the coils of material when the same is being bent into spirals, the other end of the shaft 41 being held in a special bearing 101 carried by a bracket 102 connected with a cross piece 45, said bearing being shown in detail in Fig. 8. The bearing proper on the member 102 is shown in section in Fig. 8 at 103 as surrounding a sleeve 104 having a flanged extension 105 at one side of the bearing and being secured from movement out of said bearing by a ring 106 secured to the sleeve by set screw 107. The shaft 41 is positioned within the sleeve 104 and splined thereto. Said shaft has a threaded bore 108 with which is adapted to coöperate the threaded end 109 of a hand screw 110, said hand screw being provided with a circular shoulder 111 by means of which the screw is secured to the flanged head 105 of the sleeve 104 by means of an angle piece 112 bolted to said head at 113. By turning the hand screw

110, therefore, the shaft 41 may be adjusted longitudinally through the bearing 99 for a purpose to be later described.

Upon the shaft 41 is a gear 114 meshing with a gear 115 which in turn meshes with a gear 116, said last mentioned gears being carried by a hanger 117, pivoted to the frame member 19 so that its pivotal center will be the center of the shaft 41, as shown in dotted lines in Fig. 2. The gear 116 meshes with a gear 118 carried by a hanger 119 formed of two parts 120 and 121, as shown in Fig. 3, said hanger 119 being connected with the frame member 19 and adapted to be oscillated about the shaft 22, as the center of said connection, by means of a hand screw 122 threaded into a bracket 123 secured to said frame piece 19, the lower end of said screw being connected by a universal joint 124 with the hanger 119. The hanger 119 and hanger 117 are pivotally connected by means of a link 125, so that when the hanger 119 is adjusted about its pivot the hanger 117 will be correspondingly adjusted (the pivotal centers of said hanger 119 and hanger 117 being in the same vertical line) and driving connection between gear 114 and gear 118 will be maintained. Fast on the shaft 22 and mounted between the members 120 and 121 of the bearing plate 119 is a grooved roller 126, which roller is in alining relation with a similar grooved roller 127 on the gear 118. Secured upon the outside of gear 114 on the shaft 41 is another grooved roller 128 beneath a grooved idler roller 129 mounted on a bracket connected at 130 to the frame 19. The roller 128 is adjustable with the shaft 41. The rods to be turned into spirals are fed into the groove of the roller 128 beneath the idler 129 and from there are successively turned by the grooved rollers 126 and 127, and since the grooves of these rollers are out of the vertical plane of the groove of the roller 128, as clearly shown in Fig. 3, the effect will be to bend the bar or rod in two planes causing it to assume the spiral shape indicated in Fig. 9. By adjusting the shaft 41, as above described, so as to vary the extent to which the roller 128 will be out of the plane of the rollers 126 and 127, the pitch of the spiral will be correspondingly varied.

The operation of the device has been given in connection with the detailed description thereof. It is apparent that by means of the adjustments herein described bars of iron may be bent into practically any desired shape and bars of different sizes up to a maximum determined by the sizes of the grooves of the bending rollers and also by the adjustments of said rollers with respect to each other may be so bent. To standards 131 at the front of the machine is secured a square ruled scale 132 and a ruled quadrant 133, the latter of which is especially valuable in bending bars to a specific angle by means of the jaws 85 on the roller 50, as indicated by dotted lines in Fig. 1.

My machine is very easily operated and in ordinary practical use will be operated entirely by hand. A single man or boy at a crank attached to the shaft 22 can bend bars of ordinary size with ease, while two men handling cranks at each end of said shaft can bend bars of the largest size used in reinforced concrete work.

I claim:

1. A bending machine having a frame comprising an upper platform, a vertical shaft mounted in the platform, a unitary gear and feeding roller on the shaft above the platform, a yoke bearing-member mounted on the platform, a feeding roller coöperating with said first named feeding roller mounted in said bearing-member, a gear fast on said last named feeding roller in mesh with the first named gear, a bending roller also mounted in the yoke-member and operatively connected with the feeding roller therein, and means to drive the shaft and the feeding and bending rollers.

2. A bending machine having a frame comprising an upper platform, a vertical shaft mounted in the platform, a unitary gear and feeding roller on the shaft above the platform, a yoke bearing-member movably mounted on the platform, a feeding roller coöperating with said first named feeding roller mounted in said bearing-member, a gear fast on said last named feeding roller in mesh with the first named gear, a bending roller also mounted in the yoke-member and operatively connected with the feeding roller therein, means to drive the shaft and the feeding and bending rollers, and means to adjust the yoke-member so as to vary the distance between the feeding rollers.

3. A bending machine having a frame comprising an upper platform, a vertical shaft mounted in the platform, a unitary gear and feeding roller on the shaft above the platform, a yoke bearing-member movably mounted on the platform, a feeding roller coöperating with said first named feeding roller mounted in said bearing-member, a gear fast on said last named feeding roller in mesh with the first named gear, a bending roller also mounted in the yoke-member and operatively connected with the feeding roller therein, means to drive the shaft and the feeding and bending rollers, and means to swing the yoke-member about the axial center of the feeding roller and gear thereon so as to vary the position of the bending roller relatively to the feeding rollers while maintaining the operative connection between said bending roller and feeding rollers.

4. A bending machine having a frame comprising an upper platform, a vertical shaft mounted in the platform, a unitary gear and feeding roller on the shaft above the platform, a yoke bearing-member mounted on the platform, a feeding roller coöperating with said first named feeding roller mounted in said bearing-member, a gear fast on said last named feeding roller in mesh with the first named gear, a bending roller also mounted in the yoke-member and operatively connected with the feeding roller therein, means to drive the shaft and the feeding and bending rollers, means to adjust the yoke members so as to vary the distance between the feeding rollers, and means to swing the yoke-member about the axial center of the feeding roller and gear therein so as to vary the position of the bending roller relatively to the feeding rollers while maintaining the operative connection between said bending roller and feeding rollers.

5. A bending machine having a frame comprising an upper platform, a vertical shaft mounted in the platform, a unitary gear and feeding roller on the shaft above the platform, a yoke bearing-member mounted on the platform, a feeding roller coöperating with said first named feeding roller mounted in said bearing-member, a gear fast on said last named feeding roller in mesh with the first named gear, a bending roller also mounted in the yoke-member, an operative connection between the rollers carried by the yoke member comprising a shaft mounted thereon having bevel gears at each end thereof meshing with a bevel gear on each of said rollers, respectively, and means to drive the first named shaft and the feeding and bending rollers.

6. A bending machine having a frame comprising an upper platform, a vertical shaft mounted in the platform, a unitary gear and feeding roller on the shaft above the platform, said platform being provided with an elongated opening adjacent said gear and a second elongated opening spaced from said first opening and curved in an arc centering at the center of said first opening, a yoke bearing-member on said platform, means for moving said yoke member to adjust the position thereof on said platform, means extending into said openings, and coöperating members for securing said yoke member adjustably to the platform, a feeding roller mounted in the yoke-member operatively connected with said gear, and a bending roller mounted in said yoke member operatively connected with said last-named feeding roller.

7. A portable bending machine having a frame comprising a lower platform mounted upon wheels and an upper platform spaced from said lower platform, a vertical shaft mounted in the platforms and means to drive the same, a unitary gear and feed roller on said shaft above the upper platform, and a second feed roller and an adjustable bending roller upon said platform and operatively connected with said unitary gear and feed roller and driven therefrom, and means to adjust said bending roller to vary the curve effected thereby without breaking said driving connection.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN E. ERICKSON.

Witnesses:
F. A. WHITELEY,
H. A. BOWMAN.