J. E. ERICKSON.

METAL BENDING MACHINE.

APPLICATION FILED DEC. 11, 1909.

965,171.

Patented July 26, 1910.

4 SHEETS—SHEET 1.

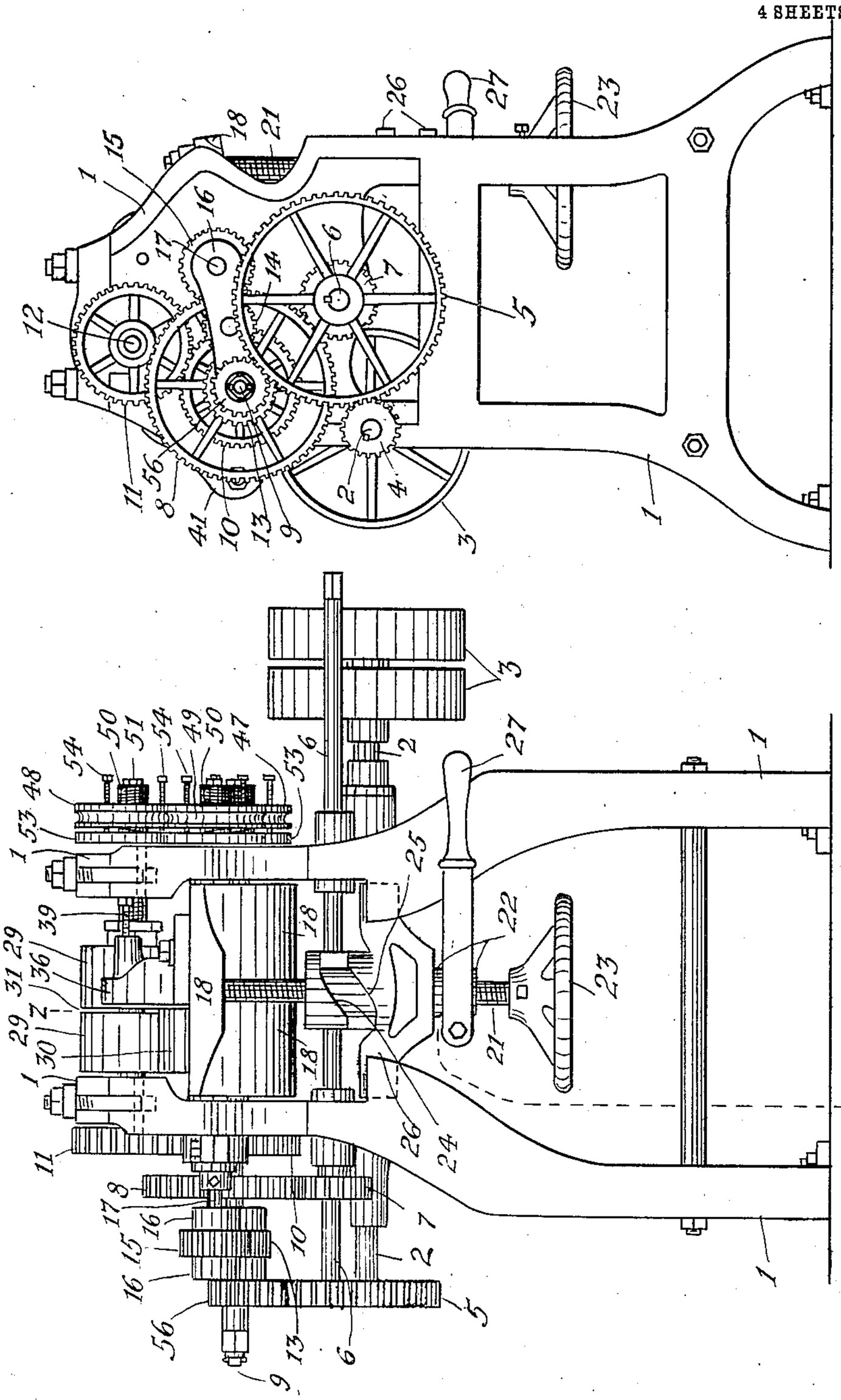

Fig. 1

Fig 2

Witnesses:
Theo. Lagaard.
H. A Bowman

Inventor:
John E. Erickson.
By P. H. Gunckel
his Attorney.

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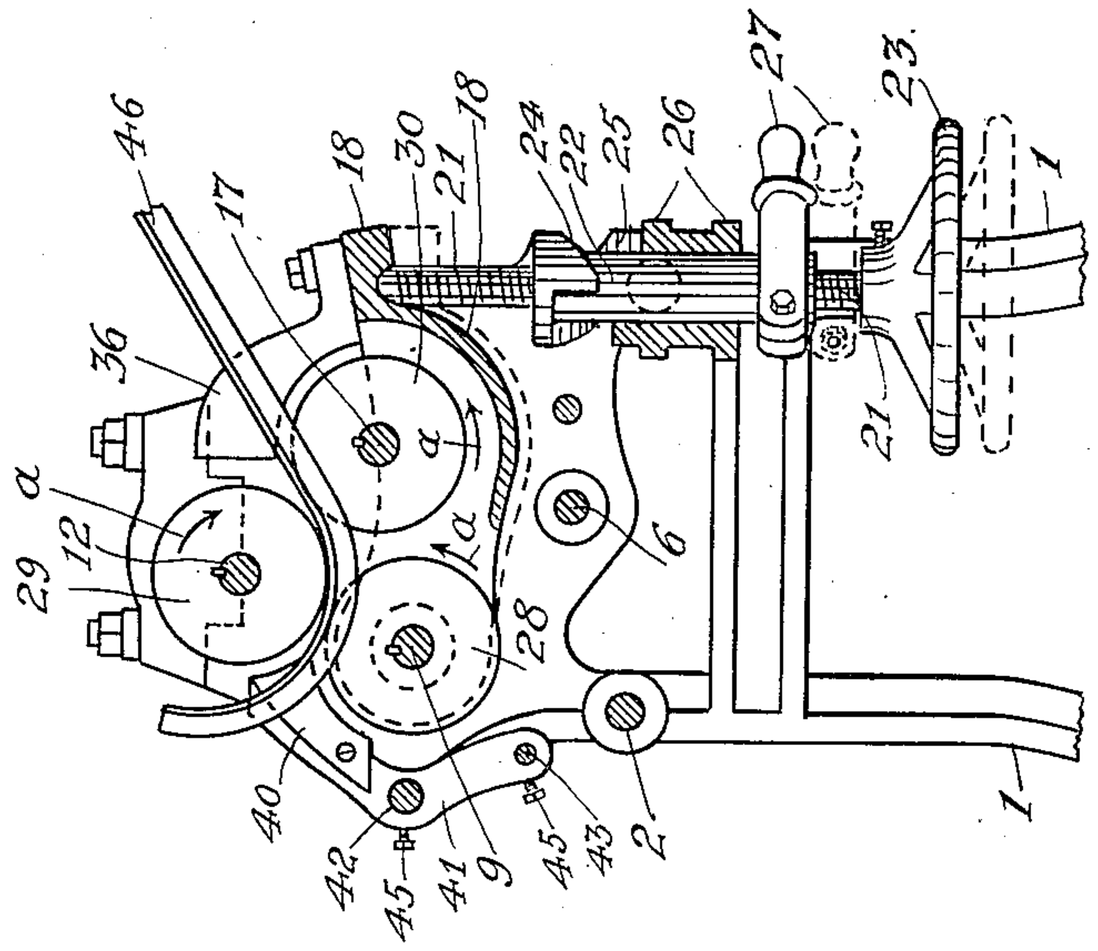

Fig 6

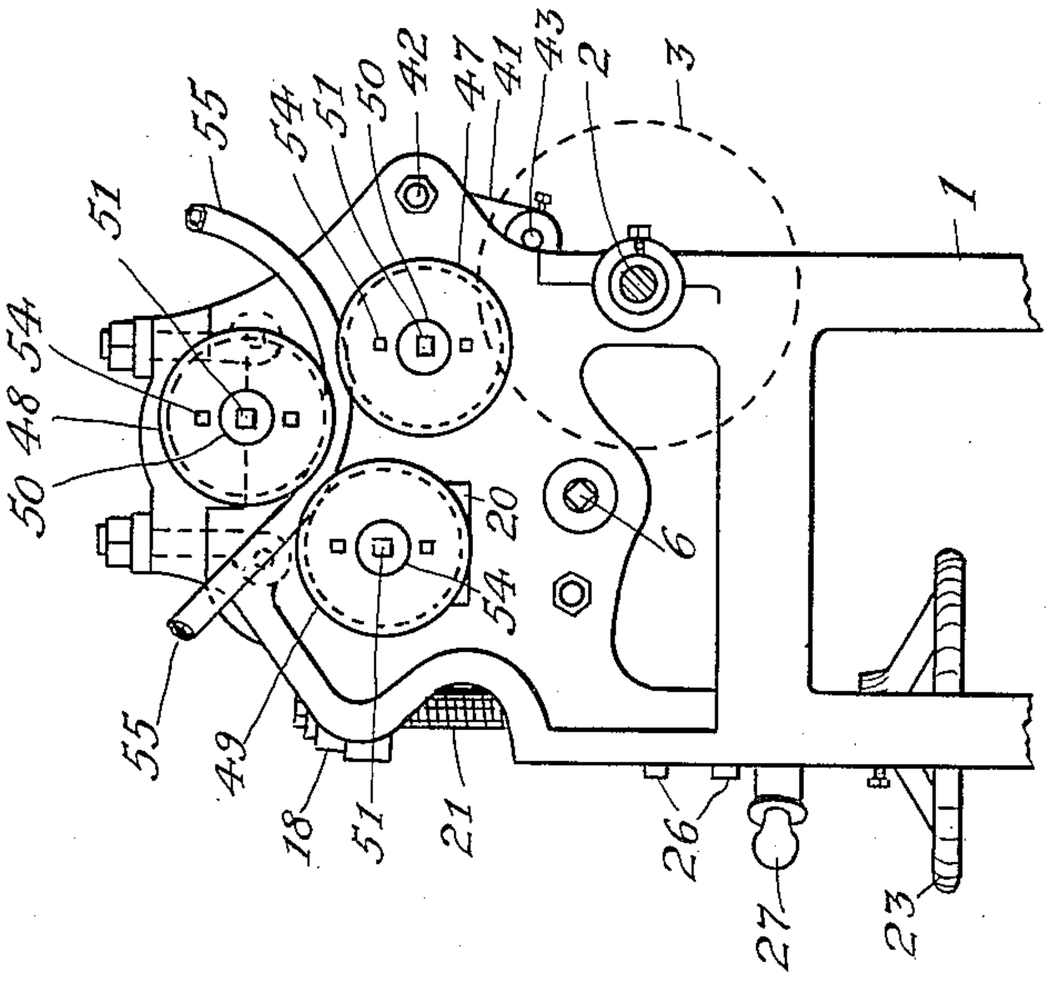

Fig 3

Witnesses:
Theo. Laguard.
H. G. Bowman.

Inventor:
John E. Erickson.
By P. T. Sunckel
his Attorney.

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4 SHEETS—SHEET 3.

Fig. 4.

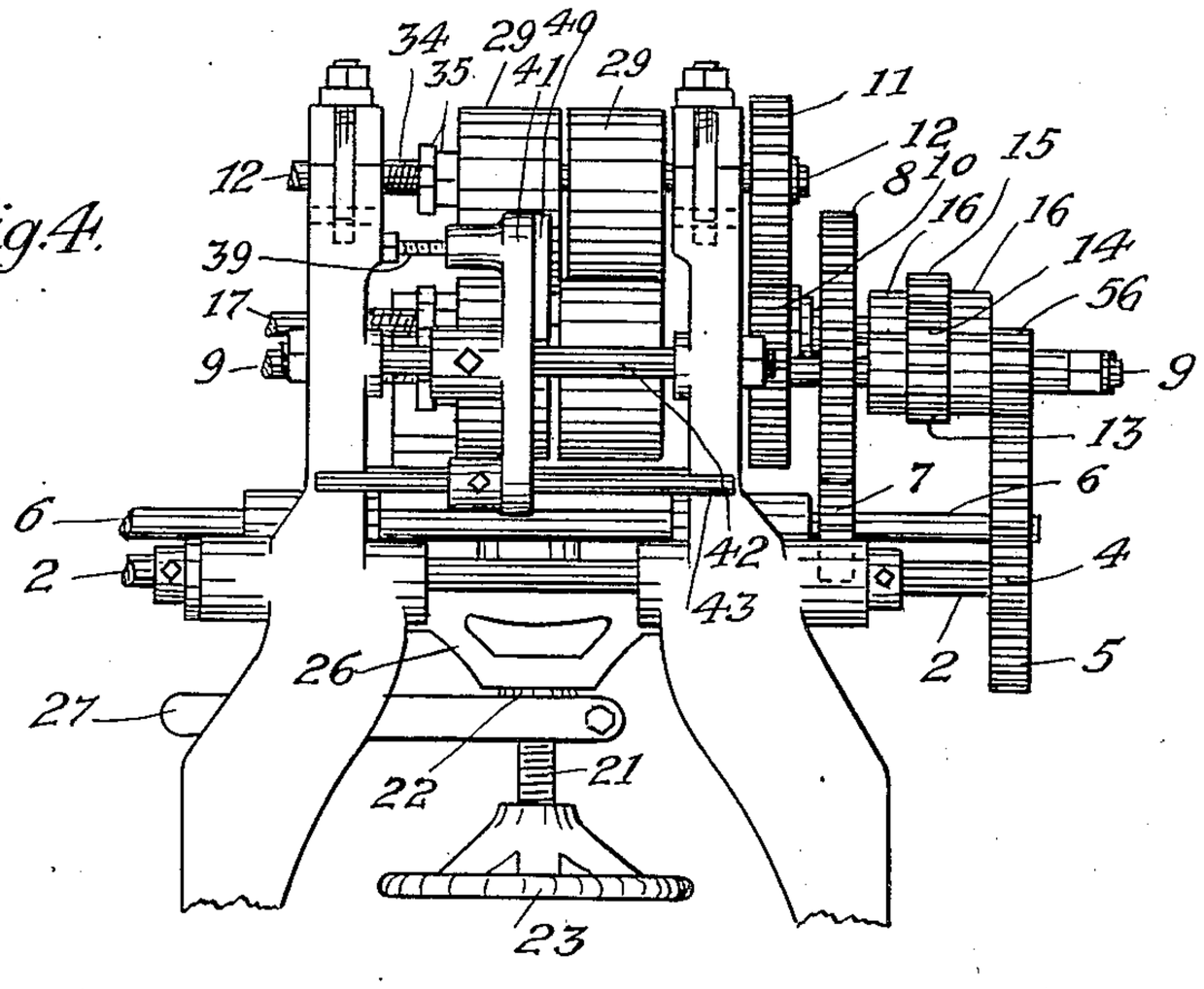
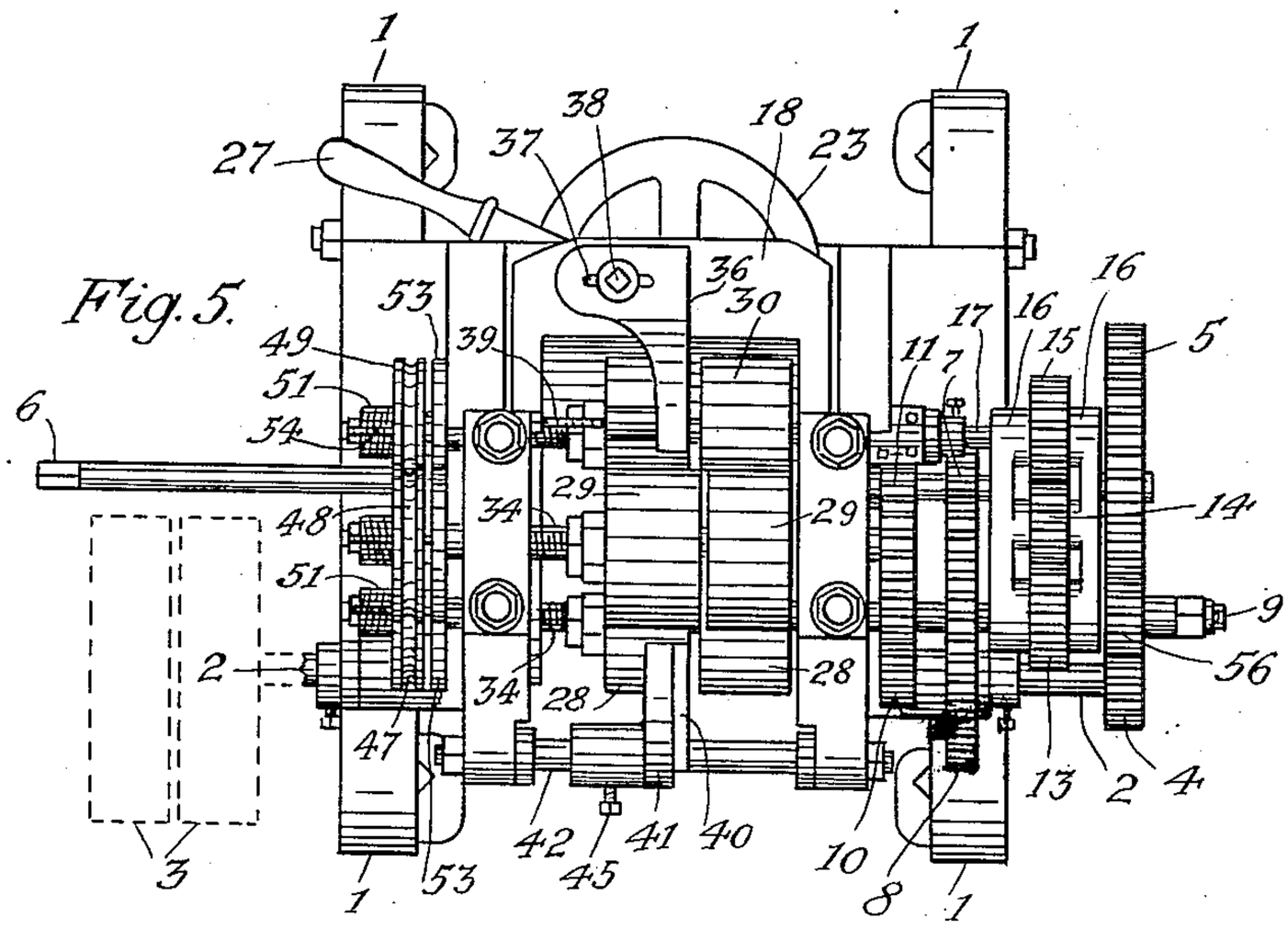


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 7.

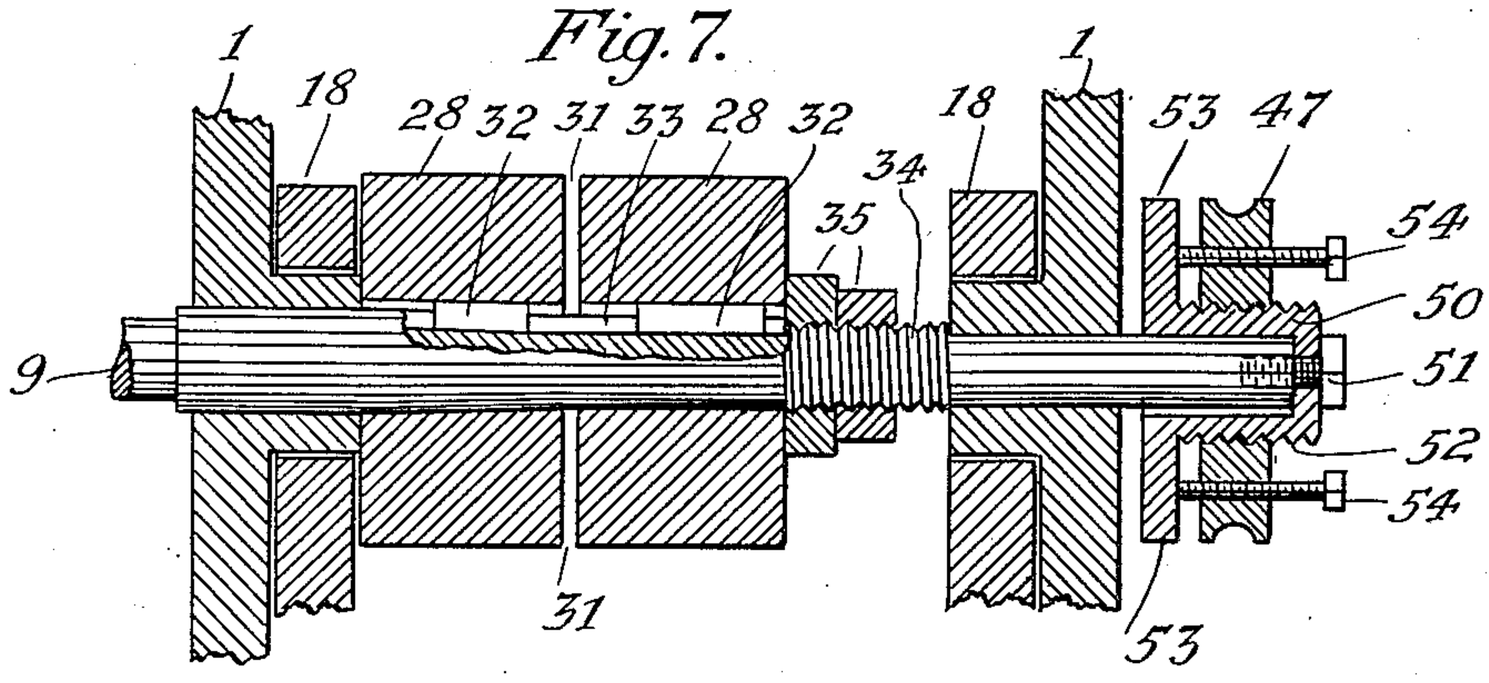


Fig. 8.

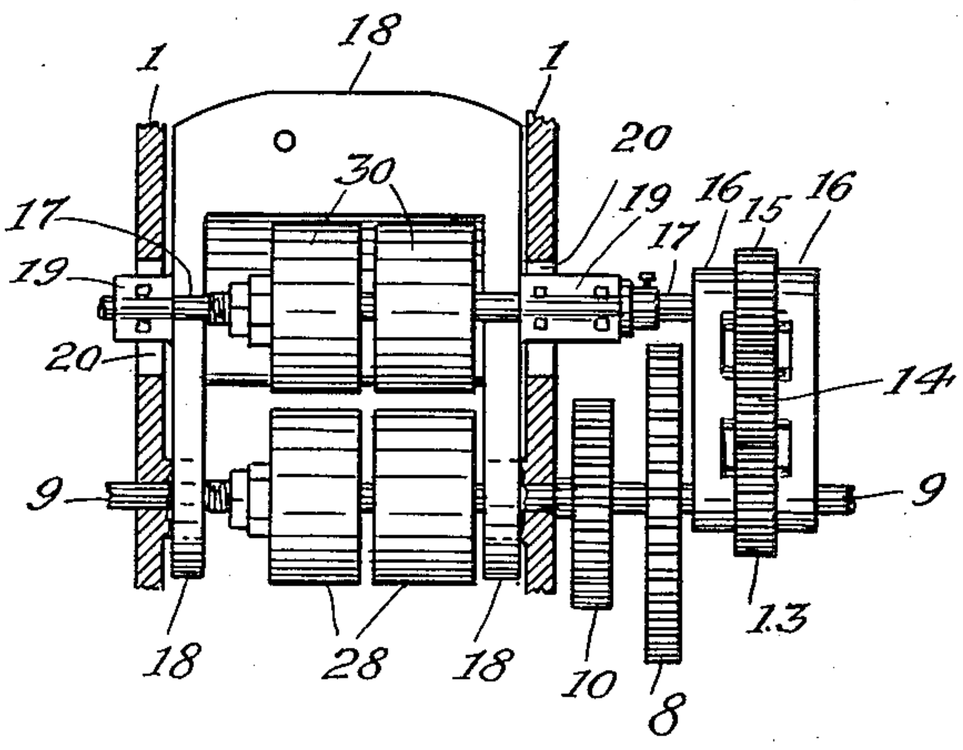
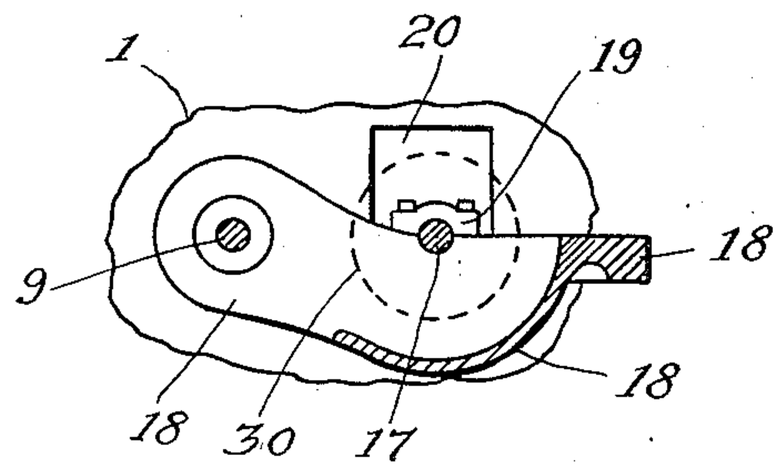


Fig. 9.



Witnesses:
Thos. Lagaard.
H. A. Bowman.

Inventor:
John E. Erickson.
By O. N. Gunckel
his Attorney.

UNITED STATES PATENT OFFICE.

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

METAL-BENDING MACHINE.

965,171. Specification of Letters Patent. Patented July 26, 1910.

Application filed December 11, 1909. Serial No. 532,596.

To all whom it may concern:

Be it known that I, JOHN E. ERICKSON, a 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 Metal-Bending Machines, of which the following is a specification.

My invention relates to metal-bending machines.

The object of the invention is to produce an improved angle-bar or pipe bending machine provided with adjustable rolls for varying the curvature of the bends.

My improvements are illustrated in the accompanying drawings in which—

Figure 1 is a front elevation of a metal-bending machine embodying my improvements. Fig. 2 is a side elevation of the same, viewed from the left of Fig. 1. Fig. 3 is also a side elevation, viewed from the right of Fig. 1. Fig. 4 is a rear elevation of the same. Fig. 5 is a plan view. Fig. 6 is a vertical section on the irregular broken line *z*—*z* of Fig. 1. Fig. 7 is an enlarged longitudinal section of a pair of the adjustable rolls, their shaft, and parts connected therewith. Fig. 8 is a plan view of the yokes or supports for the adjustable rolls, and Fig. 9 is a sectional detail of one of the yokes.

In the drawings the main frame of the machine is designated by the numeral 1; the driving-shaft by 2, and the belt-pulleys by 3. On the shaft 2 is a pinion 4 which engages a spur-wheel 5 on a shaft 6; and a pinion 7 on the latter shaft meshes with a gear-wheel 8 on a shaft 9. A second gear-wheel 10 on the shaft 9 engages a corresponding gear-wheel 11 on a shaft 12. All of these shafts are journaled in suitable boxes provided on the main frame 1.

On the shaft 9 is a gear-wheel 13 that meshes with an idler gear 14 and the latter in turn engages a gear 15. The journal bearings for the idler 14 and gear 15 are supplied by a yoke 16 that is pivotally supported at its inner end on the shaft 9. The gear 15 is fast on the outer portion of a shaft 17 which it drives; and the inner portion of this shaft is also mounted on a yoke 18 which, like the yoke 16, is pivotally supported by the shaft 9. The journal-boxes 19 for the shaft 17 are provided on the yoke 18, and slots 20 in the frame 1 allow the latter yoke, and the parts it supports, to be swung up and down in an arc of which the shaft 9 is the center, for the purpose of adjusting the position of the rolls carried by the shaft 17 with respect to those carried by the shaft 12.

The means for raising and lowering the shaft 17 are the following: The free end of the yoke 18 is supported on the end of an upright adjusting screw 21 that turns in a threaded sleeve 22, and a hand-wheel 23 on the lower end of the screw enables it to be easily turned to adjust the free end of the yoke as desired. On the top portion of the sleeve are formed inclined surfaces or cams 24 that engage with corresponding inclined surfaces 25 provided on a transverse member 26 of the frame. A hand lever 27 fast to the lower end of the sleeve enables it to be turned to cause the sleeve cams 24 to slide on the fixed cam surfaces 25 for quickly raising or lowering the yoke to move the rolls carried by the shaft 17 to and from operative positions. So that, when a portion of an angle-bar or pipe has been bent and it is desired to have the remainder or a portion straight, the shaft 17 can be quickly lowered to the horizontal plane of the shaft 9 and thus avoid further bending of the bar or pipe in passing it onward between the rolls. This lowering of the parts is indicated by broken lines in Fig. 6.

Each of the shafts 9, 12, and 17 carries a pair of rolls, indicated respectively by the numerals 28, 29, and 30, the rolls of each pair being separated from each other a suitable distance (indicated at 31, in Fig. 7) to provide space to receive the flange of an angle-bar. The rolls are prevented from turning on their shafts by splines 32 and grooves 33, but they are capable of sliding for adjustment on the shafts. A portion 34 of the shaft (see Fig. 7) adjacent to one of the rolls is threaded and provided with an adjusting nut or nuts 35 for limiting the sliding of the adjoining roll and regulating the width of the space 31 between the rolls. The spaces 31 between the rolls 28 and 30 are in alinement, while that between the rolls 29 is slightly out of vertical alinement with the other two spaces, in order that the angle-bar surface opposite the base of the flange which enters the spaces between the two lower sets of rolls will bear against one of the upper rolls instead of being in line with the space between them.

For guiding an angle bar and holding it

in proper position relative to the initial rolls 30 a guide 36 is provided on the yoke 18, and is made slidable laterally thereon by means of an elongated slot 37 in the base of the guide and a screw 38. The movement of the guide in direction away from the slot is limited by an adjusting screw 39 the head of which is stopped by contact with the top portion of the frame 1 when the guide is moved sufficiently in that direction. And for guiding the angle-bar with respect to the slot between the rolls 28 a guide 40 is provided on the upper portion of a guide-carrier 41 which is fulcrumed on a rod 42 that is connected to the frame 1. The lower portion of the carrier is supplied with a rod 43 that bears against the rear surface of the frame 1 to resist the outward movement of the guide under pressure. The guide is slidable on the rods 42 and 43 and its lateral movement away from the roll slot is limited by means of a screw 44 in the same manner as the guide 36 is limited in movement by the screw 39. The carrier may be secured to the rods 42 and 43 by set-screws 45.

The rolls are placed in triangular arrangement, the rolls 29 being above and slightly in front of the rolls 28, and the adjustable rolls 30 in front and slightly above the level of the rolls 28, and the gearing is adapted to revolve the rolls in the directions indicated by the arrows *a*, and at equal speed. In use an angle-bar 46 (see Fig. 6) is placed on the rolls 30 with its flange in the space or groove 31 and fed to the rolls 28 and 29, the flange entering the groove or space 31 between the rolls 28 and the web of the bar contacting with the faces of the rolls 29; and the bar will be bent by the coöperation of the three pairs of rolls to the curvature corresponding with relative positions of the rolls. To increase or diminish the curvature it is only necessary to move the rolls 30 toward or away from the rolls 29 by means of the adjusting screw 21. If it is desired to bend only a portion of the bar, when such portion has passed between the rolls, the rolls 30 can be lowered to the level of the rolls 28 by throwing the hand-lever 27, and thereafter the remainder of the bar will be fed horizontally onward between the rolls and not be bent.

In place of the pairs of rolls I may use in each instance a similar roll having a groove adapted to receive the angle-bar flange in the same manner that it is received in the space 31 between the rolls of each pair, and I mean to include such construction in my claims; but I deem it preferable to employ the pairs of rolls as set forth.

For bending pipes the shafts 9, 12, and 17 are respectively provided at their ends opposite the gearing with grooved rolls 47, , and 49. As these rolls are on the same shafts as those for bending angle-bars obviously their rotation, adjustment, etc., are effected by the same means and in the same way as the latter rolls. The grooved rolls are detachably connected to their respective shafts by means of sleeves 50 (see Fig. 7) that are splined thereon and held in place by screws 51 entered in the shaft ends. The sleeves have screw-threads 52 and circular flanges 53, and the grooved rolls are adapted to be screwed onto the threaded sleeves and held in place by set-screws 54 the ends of which contact with the sides of the flanges 53.

In use, a pipe 55 may be bent by means of the rolls 47, 48, and 49, as indicated in Fig. 3, in the same manner as an angle-bar is bent by the rolls 28, 29, and 30, and the degree and extent of the bending regulated in the same way. By offsetting the roll 49 with respect to the rolls 47 and 48, so that the groove of the former will be out of alinement with the grooves of the other two rolls, the pipe can be bent in a spiral course. Furthermore, the grooved rolls in coöperation with the sleeve flanges 53 may be utilized for bending their angle-bars, by inserting the flange of the bar in the space between the sides of the rolls and the flanges and having the web of the bar bear against the face of the roll or the flange.

In addition to the means shown for driving the machine by power it may be operated by hand by attaching a crank to the end of the shaft 6 or the shaft 9. By turning the shaft 6 and thereby rotating the pinion 7 it can be operated slowly and by turning the shaft 9 and with it a pinion 56 that engages the gear 5, the machine can be operated with a little more speed.

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

1. In a machine for bending angle-bars, pairs of rolls in triangular arrangement, those of each pair being separated by a space sufficient to receive the flange of the angle-bar, a movable carrier for the initial pair of rolls, means for adjusting the carrier to vary the position of the initial rolls relative to the other rolls for regulating the degree of the bending, a guide supported by said carrier for directing the course of the bar relative to the initial rolls, and mechanism for driving all of the rolls to feed the bar onward, substantially as set forth.

2. In a machine for bending angle-bars, pairs of rolls in triangular arrangement, those of each pair being separated by a space sufficient to receive the flange of the angle-bar, a movable carrier for the initial pair of rolls, means for adjusting the carrier to vary the position of the initial rolls relative to the other rolls for regulating the degree of the bending, a guide supported by

said carrier for directing the course of the bar relative to the initial rolls, a guide mounted on the machine frame for guiding the bar with respect to the other rolls, and mechanism for driving all of the rolls to feed the bar onward, substantially as set forth.

3. In a metal-bending machine, rolls in triangular arrangement for engaging and bending the material, a carrier for the rolls at one of the angles, means for adjusting the carrier to vary the position of the rolls it supports relative to the other rolls for regulating the curvature of the bending, adjusting means for regulating the annular arrangement of the rolls to vary the degree of bending, a guide supported by said carrier for directing the course of the bar relative to the initial rolls, and mechanism for driving all of the rolls to feed the bar onward, substantially as set forth.

4. In a machine for bending angle-bars, pairs of rolls in triangular arrangement, the rolls of each pair being splined to their respective shafts and adapted to be separated from each other by a space sufficient to receive the flange of the angle-bar, gears for driving the initial rolls, a yoke carrying the gears pivotally mounted on the shaft of one of the other pairs of rolls, a second yoke pivoted on the same shaft for supporting the initial rolls and their shaft, and an adjusting screw for raising and lowering said yokes to vary the position of the initial rolls relative to the other rolls, substantially as set forth.

5. In a machine for bending angle-bars, pairs of rolls in triangular arrangement, the rolls of each pair being splined to their respective shafts and adapted to be separated from each other by a space sufficient to receive the flange of the angle-bar, gears for driving the initial rolls, a yoke carrying the gears pivotally mounted on the shaft of one of the other pairs of rolls, a second yoke pivoted on the same shaft for supporting the initial rolls and their shaft, an adjusting screw for raising and lowering said yokes to vary the position of the initial rolls relative to the other rolls, and means for raising and lowering the screw without turning it for moving the initial rolls to and from operative position, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses this 26th day of November, 1909.

JOHN E. ERICKSON.

Witnesses:
P. H. GUNCKEL,
H. A. BOWMAN.