

989,380.

V. J. MAYO.
METAL BENDER.
APPLICATION FILED MAY 21, 1909.

Patented Apr. 11, 1911.

4 SHEETS—SHEET 1.

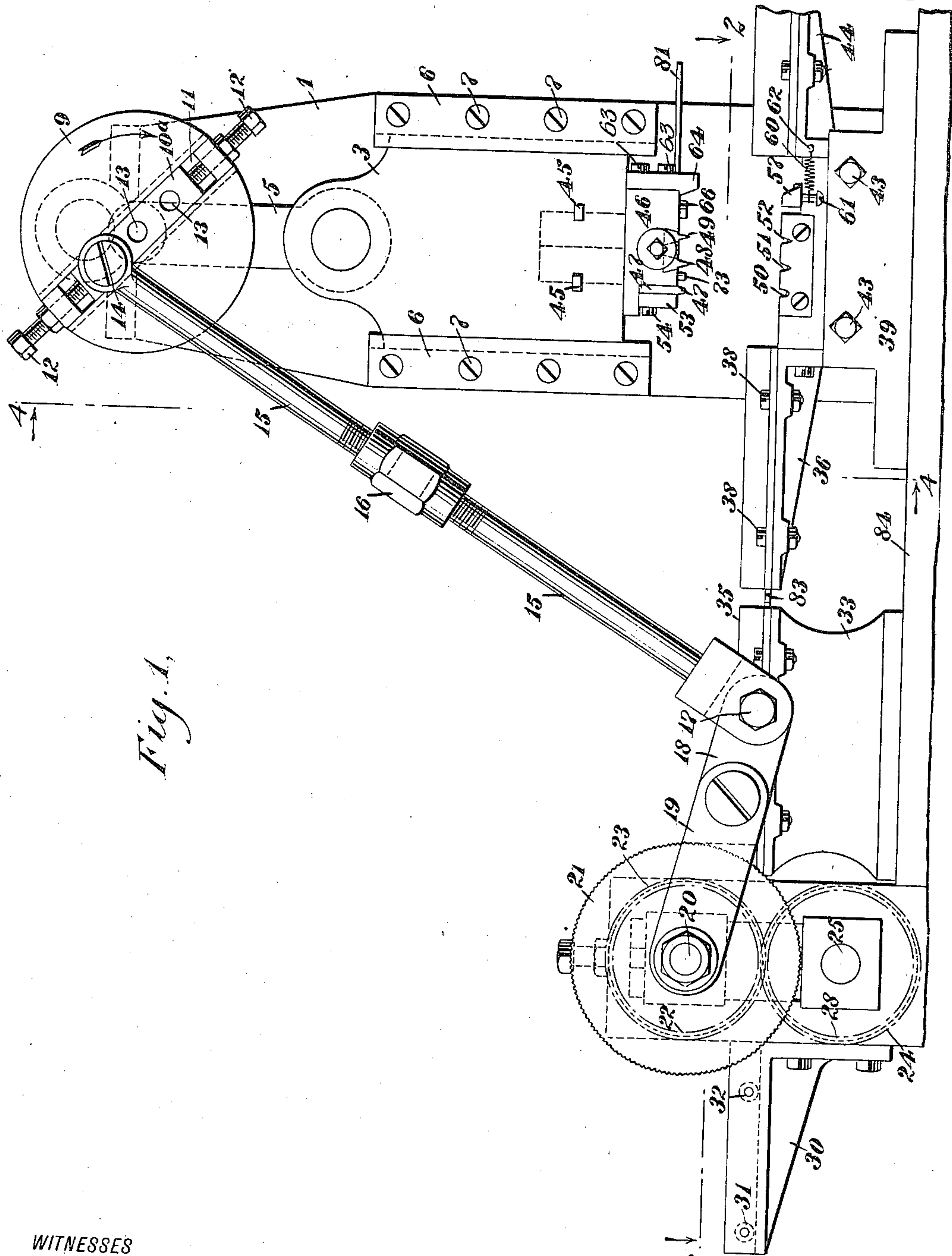


Fig. 1.

WITNESSES

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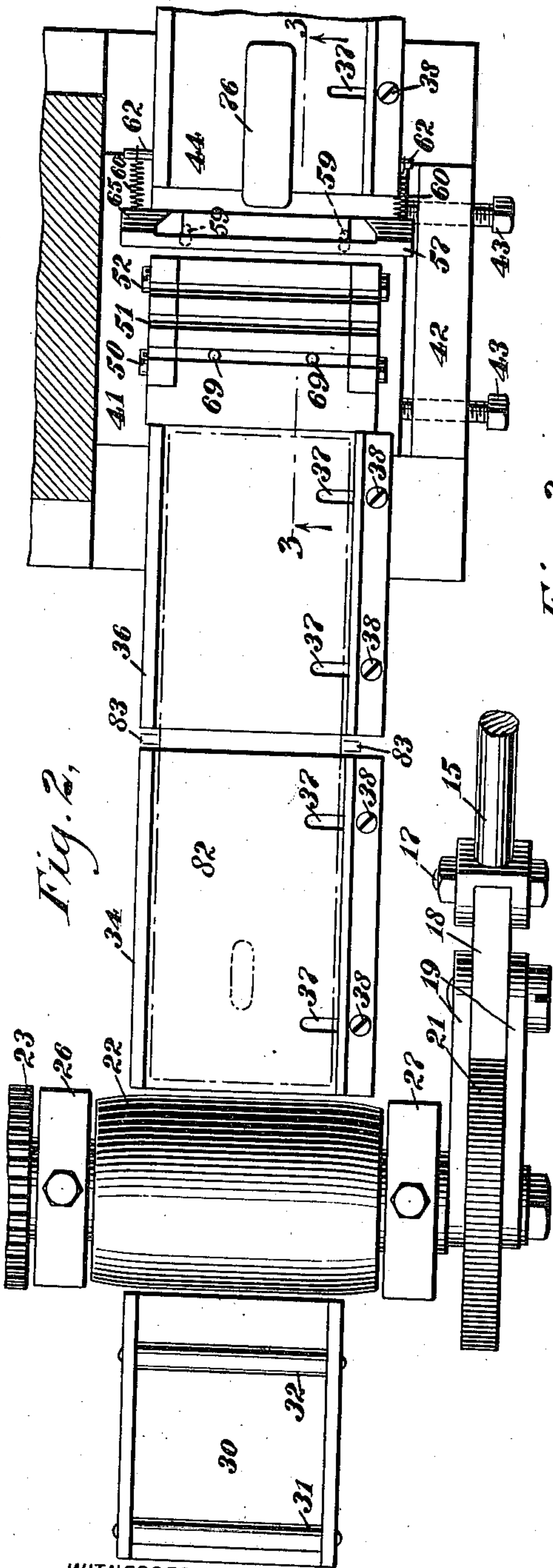
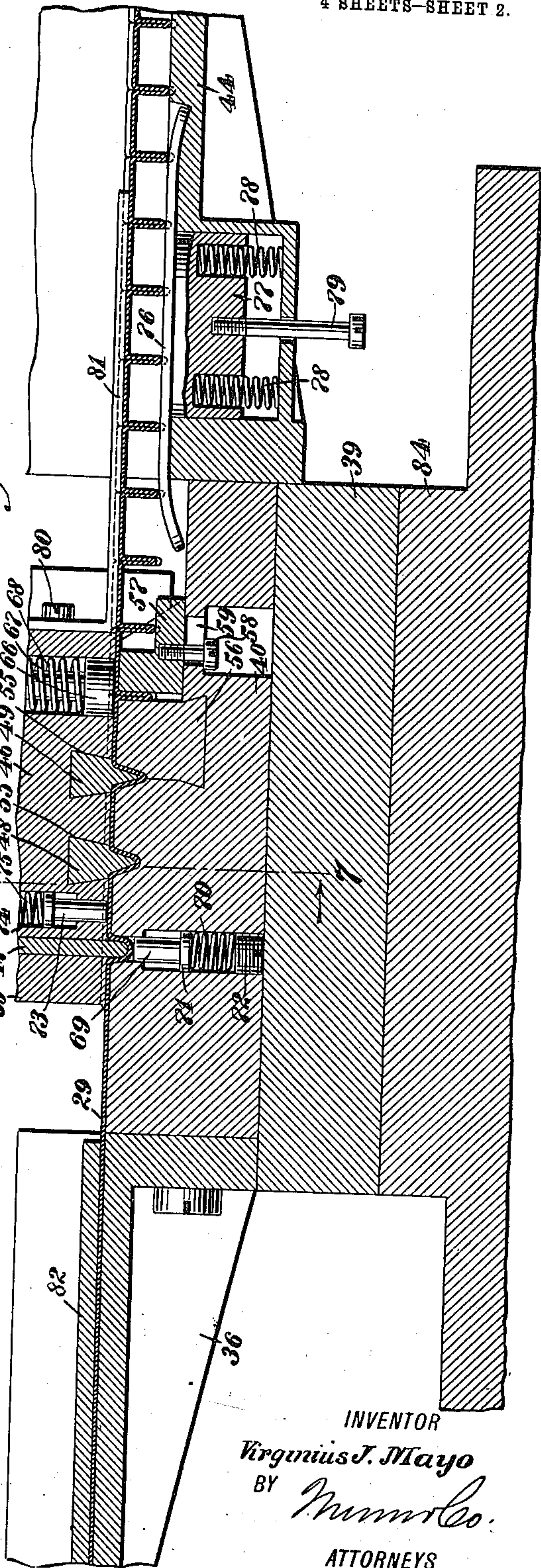


Fig. 3,



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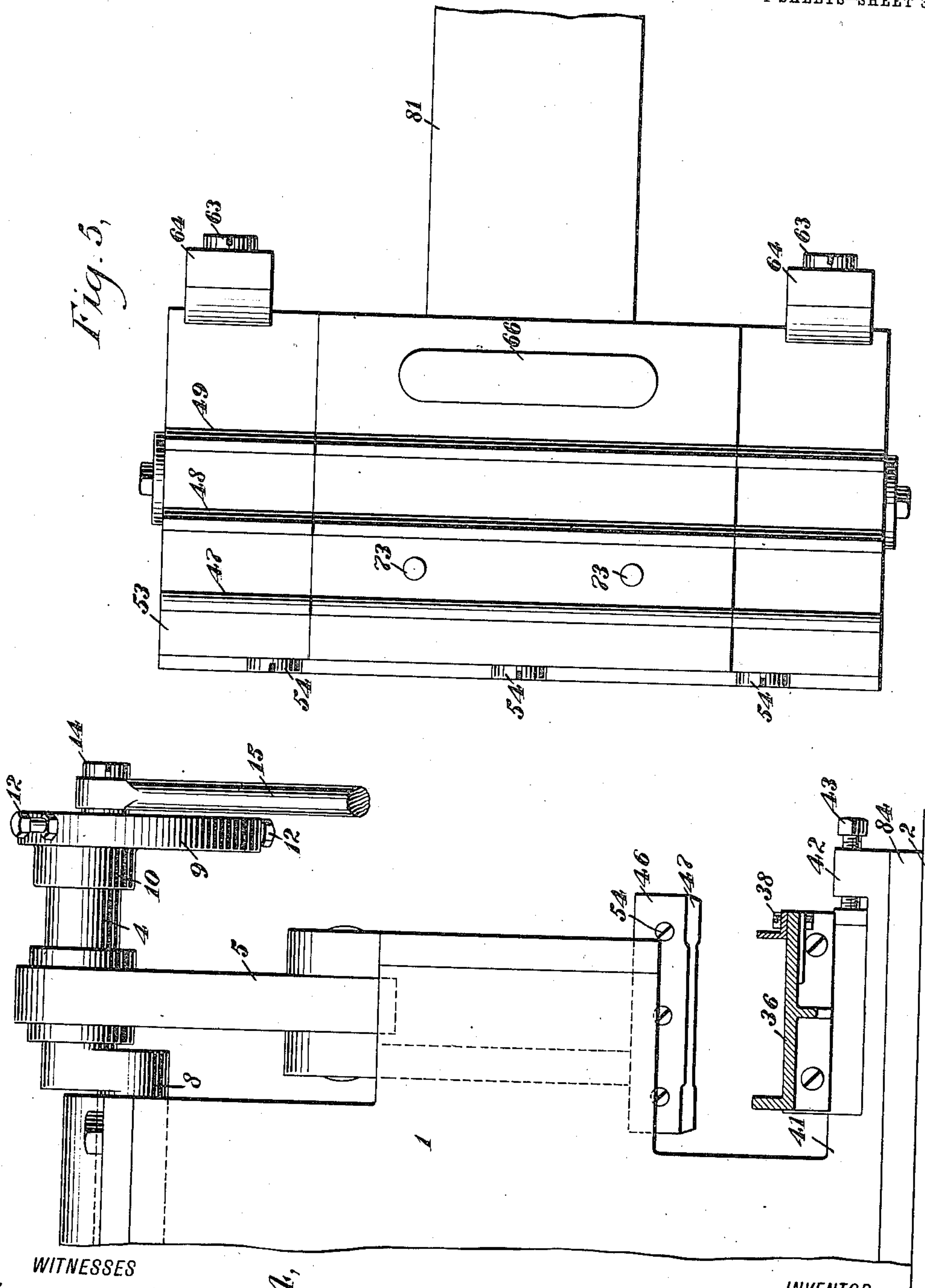
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4 SHEETS—SHEET 3.



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Fig. 4.

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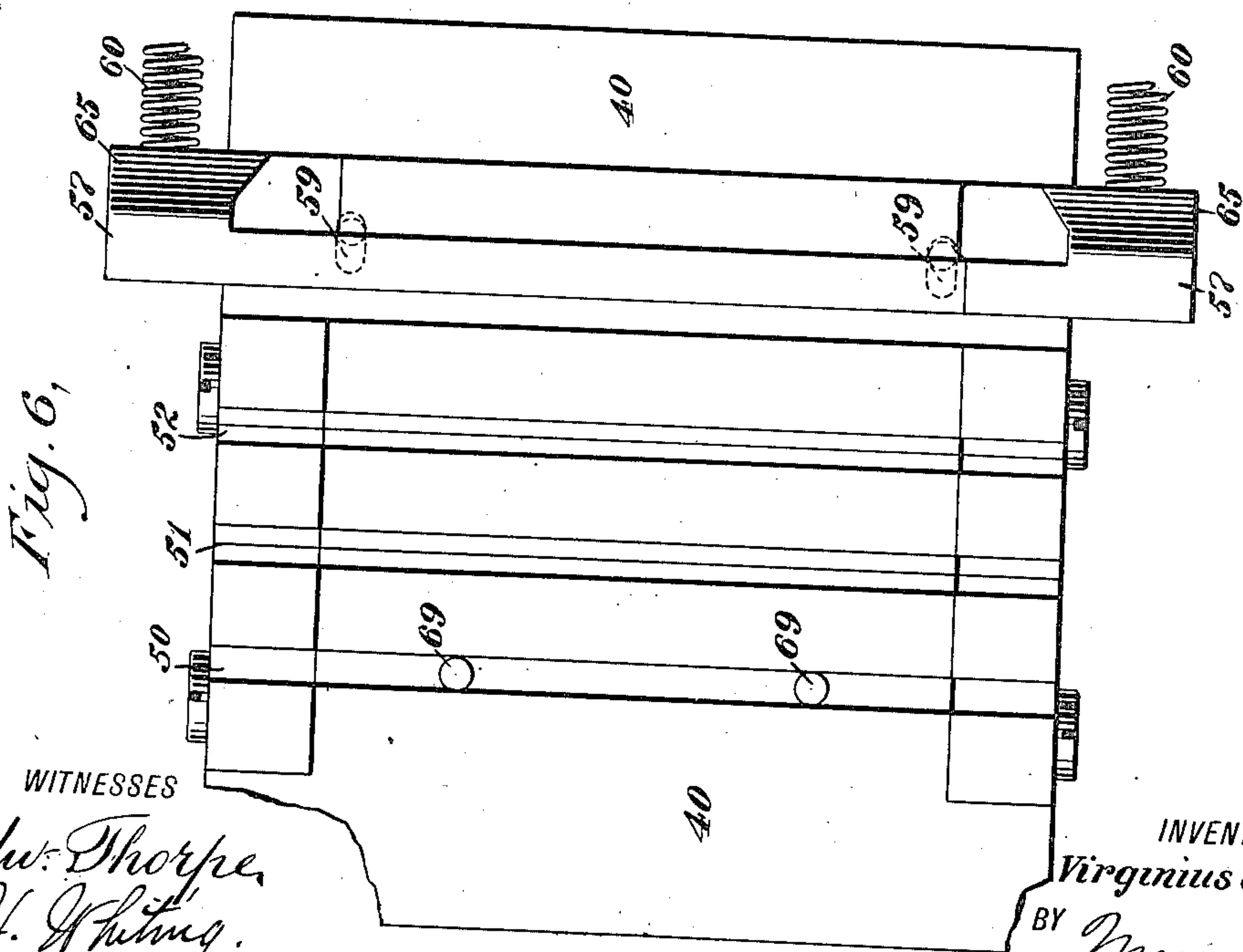
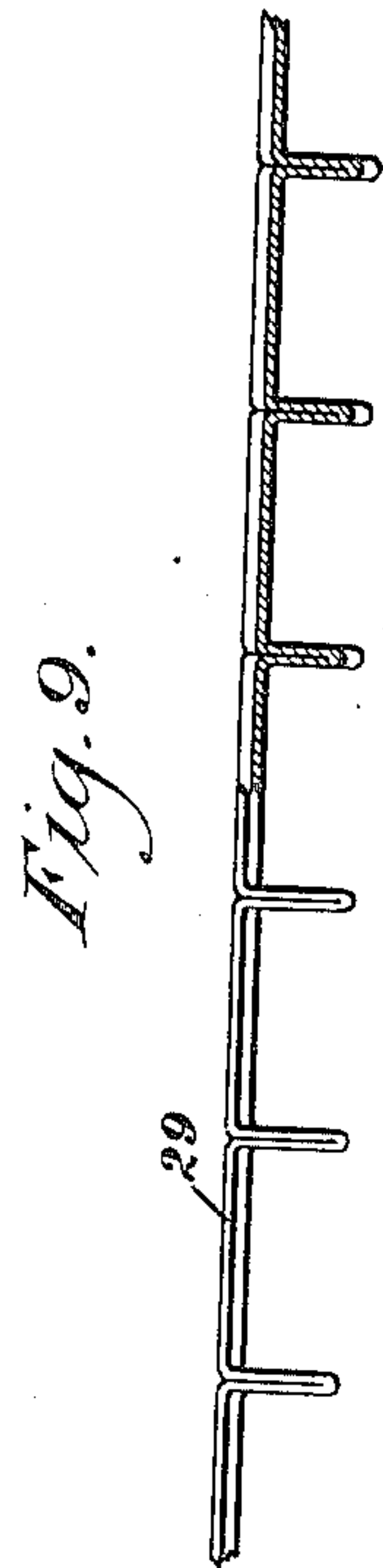
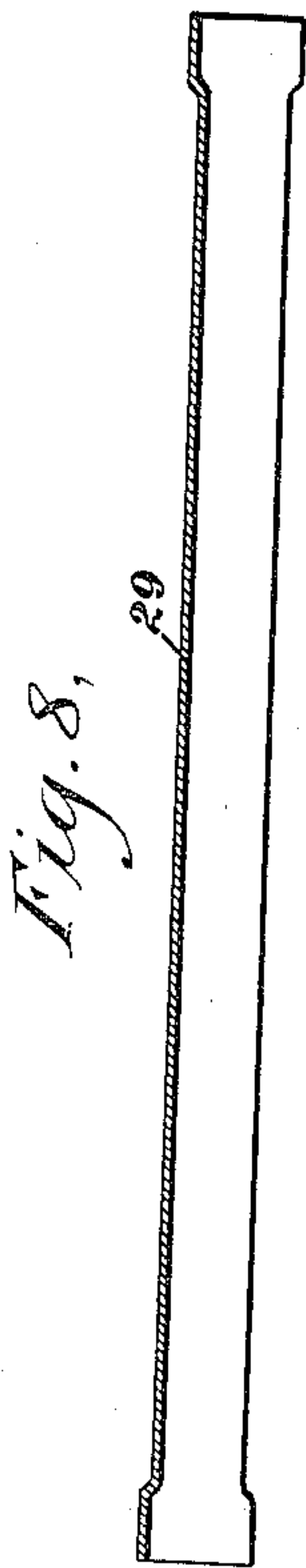
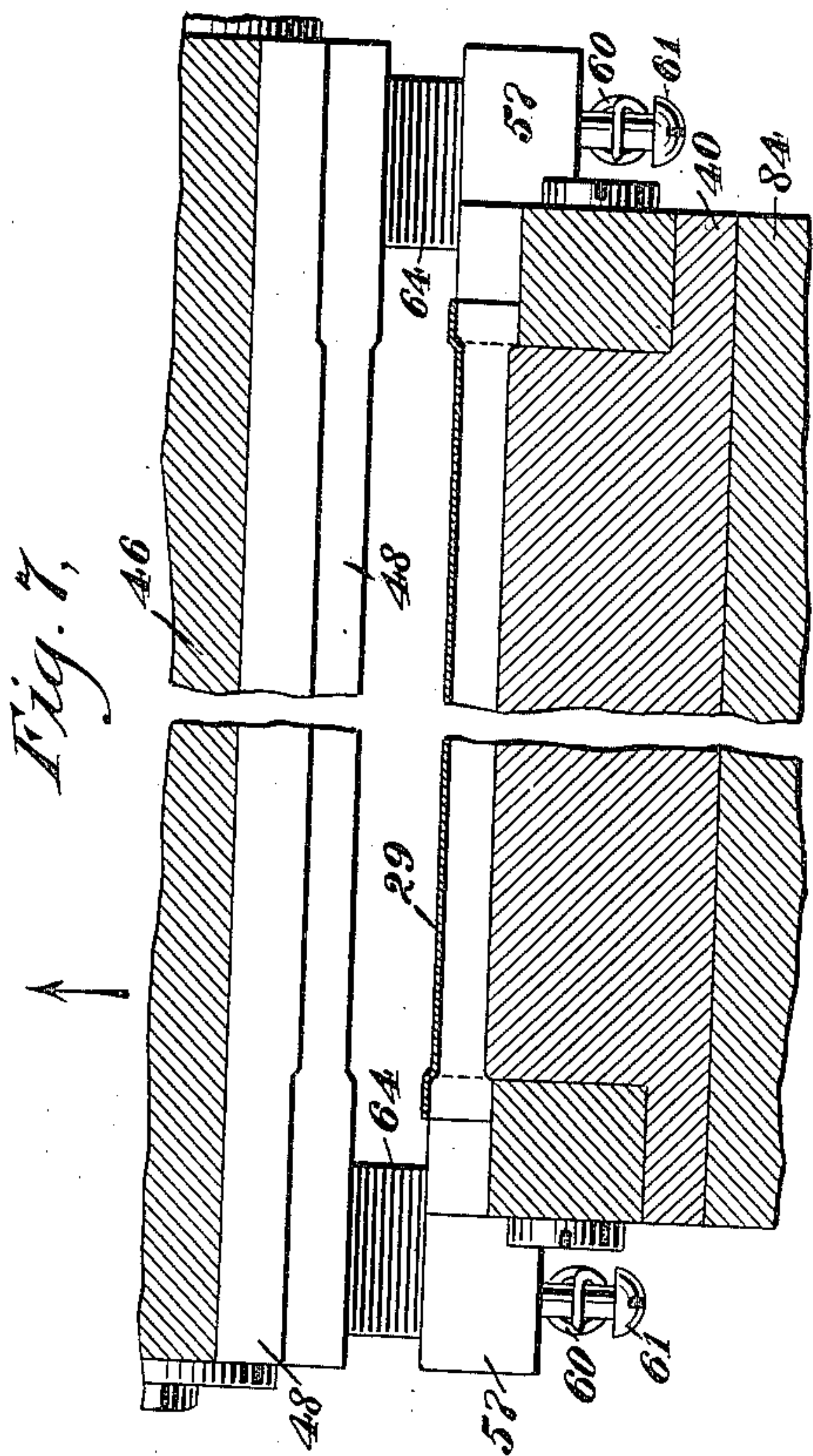
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4 SHEETS—SHEET 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

VIRGINIUS JULIAN MAYO, OF NEW HAVEN, CONNECTICUT.

METAL-BENDER.

989,380.

Specification of Letters Patent.

Patented Apr. 11, 1911.

Application filed May 21, 1909. Serial No. 497,494.

To all whom it may concern:

Be it known that I, VIRGINIUS J. MAYO, a citizen of the United States, and a resident of New Haven, in the county of New Haven and State of Connecticut, have invented a new and Improved Metal-Bender, of which the following is a full, clear, and exact description.

This invention relates to a machine adapted to bend and plait a strip of metal and also to form one or more offsets in said strip of metal.

This invention is an improvement on the device shown in my co-pending application, Serial No. 486,909, filed March 31, 1909, and differs therefrom by providing means for forming one or more offsets in a strip of metal.

The object of this invention is to provide a device which will be simple in construction and rapid and accurate in its operation.

The invention consists in the construction and combination of parts, to be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a side elevation of my device; Fig. 2 is a plan view, partly in section on the line 2—2 in Fig. 1; Fig. 3 is an enlarged vertical section on the line 3—3 in Fig. 2; Fig. 4 is an end elevation, partly in section, on the line 4—4 in Fig. 1; Fig. 5 is an enlarged bottom view of the die; Fig. 6 is an enlarged top view of the die-bed; Fig. 7 is a vertical section on the line 7—7 of Fig. 3; Fig. 8 is a transverse section through the strip of metal which has been plaited and offset; and Fig. 9 is a view of the enlarged strip of metal after it has been plaited and offset, showing part in longitudinal section.

Referring more particularly to the separate parts of the device, 1 indicates the supporting frame of a stamping machine, which may be of any suitable form, having preferably a bed 2, on which a die may be placed, and a reciprocating slide 3, to which may be fastened a die, and which is adapted to be driven by means of a crank 4 through the connecting link 5, which is suitably pivoted to the crank 4 and the slide 3. This slide 3 is guided in any suitable manner in

the frame 1, as by guiding strips 6, which are secured to the frame in any suitable manner, as by means of set screws 7. The crank 4 is driven from the shaft 8, which in turn is driven in any suitable manner, as by means of a belt or motor.

A disk 9 is secured to the crank 4 in such a manner that it will run true, as if it were directly connected to a continuation of the shaft 8. This is done by means of a hollow boss 10, which is placed eccentrically on the back of the disk 9, which is for the purpose of driving the feed that advances the sheet of metal to be bent and plaited.

A wedge-shaped adjusting block 10^a is slidably engaged in the wedge-shaped slot 11 in the disk 9, and has bearing on the ends thereof adjusting screws 12, which are engaged in screw-threaded openings in the disk 9, and are adapted to reciprocate the wedge-block 10^a back and forth in the slot 11, so as to give an adjustment to the driving connection with the feed, to be described.

The adjusting block 10^a has a plurality of openings 13 therein, in which is adapted to be fastened in any suitable manner, a pivot-screw 14, which in turn secures a connecting link 15 to the adjusting block 10^a. The connecting link 15 is formed in two parts, having threaded ends which are joined by a turn-buckle 16, so as to adjust the length of the connecting link. Pivoted to the connecting link 15 in any suitable manner, as by means of a pin 17, is a dog 18, which is also pivoted to suspending links 19, which are in turn pivoted to the extension of a shaft 20. Adapted to be engaged by the dog 18 is a disk 21, rotatably secured to the shaft 20 and preferably having its periphery serrated, so as to form a good gripping surface for the toe of the dog 18. Secured to the shaft 20 in any suitable manner is also a feed roller 22, which has its outer ends slightly beveled off so as to form a crown at the center, thus creating a tendency of a strip of metal to keep near the middle thereof. Also secured to the shaft 20 is a gear 23, which meshes with a gear 24 secured on a shaft 25 parallel to the shaft 20, and which is suitably journaled in bearings on vertical supports 26 and 27. The shaft 25 has secured thereto a feed roller 28, which is adapted to co-act with the roller 22, to feed between them a strip of metal to be bent and plaited. The strip of metal.

which is designated by the numeral 29 is adapted to feed from any suitable support, such as a reel (not shown), over a guide 30, on which are retaining guide rollers 31 and 5 32, to the feed rollers 22 and 28. The strip of metal to be bent and plaited passes between the feed rollers 22 and 28 and over a suitable guide 33, which is of any suitable form, preferably having upwardly-extending flanges 34 and 35, one of which (35) 10 is adjustable relative to the other by slot-and-pin connections 37, 38, so as to allow for different widths of metal. The sheet of metal then passes from the guide 33 to 15 another guide-bed 36, which is similar to 33, being adjustable as to width by any suitable means such as slot-and-pin connections 37 and 38 and supported on the frame by any suitable means, to the die-bed support 20 39. The strip of metal to be bent passes from the guide 36 over a female die or die-bed 40, which is supported on the die-bed support 39 in any suitable manner, preferably being held between upwardly-extending flanges 41 and 42, the latter having 25 screw-threaded perforations therein which are engaged by clamping screws 43, which in turn clamp the die-bed 40 on the support 39. Extending from the opposite side of the die-bed support 39 and suitably secured thereto is a guide 44, which is similar to a 30 certain extent to the guide 36, and is adapted to lead the metal away from the machine after it has been plaited.

35 The die-bed in this device differs from that in my co-pending application, in that it has one or more of its side edges slightly raised from the body portion of the die-bed, and also preferably separable there 40 from. The die-bed has a plurality of grooves 50, 51 and 52 therein, which extend transversely of the die-bed, and in the case of the groove 50, is somewhat deeper where the groove crosses the raised edge or edges. 45 This increase in depth is preferably equal to twice the amount the side edge is raised above the die-bed 40. The depth of the grooves 51 and 52 in the separable side edges may be the same depth as the groove 50 in the body of the die, or slightly deeper. 50

Supported in the slide 3 in any suitable manner, as by means of bolts 45, and adapted to co-act with the die-bed 40 is a die 46 55 having one or more of its side edges recessed to co-act with the raised side edges on the die-bed. Said die 46 has punches 47, 48 and 49 suitably secured thereto, which are adapted to co-act with the grooves 50, 51 and 52 60 in the die-bed 40. The punches 47, 48 and 49 preferably have one or more of their ends of slightly greater depth than the body portion of the punch. These punches and grooves are so arranged that they co-act with the die and die-bed to form first, a blunt 65 bend in a strip of metal, one or more of the

ends of which are slightly deeper than the body of the groove and at the same time offset one or more of the side edges of the strip of metal from the body of the strip, the bend 70 in the strip of metal being accentuated by each of the successive pairs of grooves and dies. In order to accomplish this, the punch 47 and the groove 50 are rounded in form, and the punch 48 and the groove 51 somewhat sharper than the preceding pair, and, 75 finally, the punch 49 and the groove 52 still sharper than the preceding pair. The punch 47 extends the full width of the die, to which it is fastened in any suitable manner, as by means of a clamp plate 53, through which 80 extend holding screws 54, which are adapted to pass clear through the punch 47 and into screw-threaded openings in the die 46. The punches 48 and 49 are secured in any 85 suitable manner to the die 46, as by means of a wedge-shaped slot arrangement, as shown in detail in Fig. 3, and are of a form such that the bottom edge is a sharp ridge from which slope upwardly, sides which 90 terminate in angle-bends, as at 55. The groove 52 has its bend formed in a separate cross-bar 56, which extends between the separable side edges. This is done so that the groove 52, which has the sharpest angle of the three, may be kept accurately to the same 95 height and width without having to renew the whole die-bed. The bar 56 is secured in any suitable manner to the die-bed 40, as by means of a dovetailed slot and groove arrangement, and also furnishes a surface 100 which is adapted to co-act with a plait-former 57. The plait-former 57 is of any suitable form, but preferably consists of a cross rod having a surface adapted to co-act with the facing surface of the cross-bar 56 105 and ends of the separable side edges, and slidably engages the die-bed 40 in any suitable manner, as by means of pins 58 which slide in suitable slots 59 in the die-bed 40, which has a concavity and openings in its 110 lower surface through which access may be gained to these screws 58 to place and replace them. The plait-former 57 is adapted to slide back and forth the length of the slots 59, and is normally held away from the 115 bar 56 by means of springs 60, which engage screws 61 on opposite ends of the plait-former, yieldingly holding it to the pins, which are suitably secured to the guide frame 44. 120

Suitably secured to the die 46 at opposite ends thereof, as by means of screws 63, are cams 64, which are adapted to co-act with the cam-surfaces 65 on the ends of the plait-former 57 and thus force the plait-former 125 57 against the action of the springs 60, so that the bend of metal formed by the grooves and punches on the die-bed and die will be crimped up and formed into a plait. The bend of metal formed by the punches 130

and grooves is forced into the space between the bar 56 and the plait-former 57 by means of a plunger 66 which is slidably supported in a concavity in the under surface of the die 46, and has a rod 67 extending into the concavity which is surrounded by a spring 68 that engages the upper surface of the plunger 66 and tends to force it out from the die. This plunger 66 is held in any suitable manner within the concavity in the under surface of the die 46, so that it will not be forced all the way out, but will be extended to a point where its lower surface will be level with the lower edge of the punch 49. This plunger 66 thus tends to yieldingly force the bend formed by the punches and grooves in between the plait-former 57 and the bar 56 and hold it there until the plait is formed.

Directly below the groove 50 and adapted to extend upwardly into said groove are a plurality of clearing pins 69, which are adapted to reciprocate in openings in the bottom of the groove 50 and are normally pressed upward by means of springs 70 which bear on the under surface thereof, but are prevented from being forced entirely up into the groove by means of a retaining rim 71 on the lower end of the pin 69. The pins 69 and the spring 70 fit in cylindrical grooves in the under surface of the die, and are held therein by any suitable means, such as a closing screw 72. The spring-pressed pins 69 serve to force the bend of metal out of the groove 50 when the die 46 has been raised after its downward stroke, thus permitting the strip of metal 29 to be advanced to its next position, where the bend which came out of the groove 50 coincides with the next groove 51. The die 46 also has pins 73, which are similar to the pins 69, having retaining flanges 74 and extending springs 75. The clearing pins 73 serve to force the metal strip 29 away from the face of the die 46, permitting it to be advanced by the feeding rollers 22 and 28.

In order to clear the plait formed between the die 46 and the plait-former 57, there is provided on the guide-bed 44 a clearing plate 76, which is bent down at its ends so as to form a good guiding surface, and has a downwardly-extending lug 77, which engages a suitable concavity in the guide-bed 44, and is adapted to be reciprocated therein against the action of the springs 78, and is prevented from being ejected from the concavity by any suitable means, such as retaining pins 79. Any other suitable means may be substituted for these springs and pins, such as a single spring and a single pin, the object being merely to form a surface which will lift up the plaited strip of metal when the die 46 has been raised after its downward stroke. Secured to the die 46 in any suitable man-

ner, as by means of screws 80, is a right-angle member 81 to be designated as the keeper, which has a horizontally-extending arm, which is adapted to co-act with the clearing-plate 76, so as to grip the plaited strip between them and prevent it from curling up.

Shown in dotted lines in Fig. 2, and in full lines in Fig. 3, is a plate 82, which is adapted to be laid on top of the strip of metal to hold it in place and to prevent it from being covered with oil. It has on its edges, about the center, a pair of lugs 83 which project through the space between the guide 33 and the guide 36, and prevent the plate 82 from being fed forward with the strip of metal.

The die-bed support 39, the guide-way 30 and the upright supports 26 and 27 for the feed rollers are all supported in any suitable manner on the bed-plate 84, which is secured in any suitable manner to the bed 2 of the stamping-frame.

In the operation of the device, a strip of metal is conveyed from any suitable means, such as reels (not shown) to the guide-way 30 between the bottom thereof and the guide rolls 31 and 32, from which it passes between the feed rollers 22 and 28, which are adapted, by reason of their connection with the crank 4, to intermittently feed the strip of metal over the guide 33 and the guide 36 to a position between the die-bed 40 and the die 46. Here the metal is subjected to the stamping and punching action of the grooves and punches and the offset side edges. The strip of metal thereby, at the first stroke of the die, has one or more of its side edges offset from the body of the metal, and also has a U-shaped groove or blunt bend formed therein, which has one or more of its ends of greater depth than the body of the groove. On the return stroke of the slide 3, the clearer 69 for the die-bed and the clearer 73 on the die remove the strip of metal from the grooves and punches. While the slide 3 is being raised and ready to return, the feed rollers 22 and 28 have been revolved a sufficient amount to advance the U-shaped bend in the strip of metal from its position over the groove 50 to a position over the groove 51. Here, on the return stroke of the die 46, the bend in the metal is sharpened somewhat by the punch 48. The slide 3 again withdraws the die 46, and the clearers 69 and 73 again force the strip of metal away from the die-bed and the die, and in the meantime the feed rollers again advance the strip of metal the same amount as before, bringing the V-shaped bend formed by the V-shaped groove 51 and the punch 48, over the groove 52, which is also V-shaped and has an angle somewhat sharper than the groove 51. On the down stroke of the die 46, the V-shaped

groove in the metal is subjected to the action of the groove 52 and the punch 49, where its angle is somewhat sharpened. The grooves 51 and 52 and the punches 48 and 49 are preferably so arranged that one or more of the side edges receive the greater amount of the stamping action, so that the metal will be extended the amount offset in the first groove 50. On the withdrawal of the die 46 by the slide 3, the metal is again forced from the die-bed and die by means of the clearers 69 and 73, and also again advanced by the feed rollers 22 and 28 the same amount as before, bringing the V-shaped bend over the space between the cross bar 56 and the plait-former 57. On the downward stroke of the die 46, the plunger 66 forces the bend downward into a position where its sides are between the facing surfaces of the bar 56 and the plait-former 57. The downward stroke of the die 46 also brings the cams 64 in contact with the cam surfaces 65 on the plait-former, forcing the plait-former toward the bar 56 and thereby forming the bend in the metal into a plait. By the term "plait", it is not desired to limit it to a bend in the metal being at right-angles to the plane of the metal and having its sides in intimate contact throughout the entire length. The plait may be formed by merely forcing the outer edges of the plait together, leaving a space between the sides thereof, and the plait may also be formed at an angle to the plane of the sheet of metal other than a right-angle. The strip of metal is thus formed with one or more offset side edges, and corrugated by means of the die and die-bed, and the corrugations thus formed bent into plaits having one or more of their ends of greater depth than the body of the plait. The operation is continuous, forming a series of plaits at an angle to the plane of the sheet of metal, and at the same time forming an offset in one or more of the side edges of the strip of metal.

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

1. In a device of the class described, the combination with a support, of a plait-former adapted to form a plait in a strip of metal, and a die connected to said former, and means adapted to offset one or more of strip of metal.

2. In a device of the class described, the combination with a support, of mechanism adapted to form a plait in a strip of metal, and pressure means adapted to form one or more offsets in said strip of metal.

3. In a device of the class described, the combination with a support, of mechanism adapted to form a plait in a strip of metal, and means adapted to offset one or more of the side edges of said strip of metal.

4. In a device of the class described, the combination with a support, of mechanism adapted to form a plait in a strip of metal, and pressure means adapted to offset one or more of the side edges of said strip of metal.

5. In a device of the class described, the combination with a support, of pressure means adapted to form a plait in a strip of metal, and pressure means adapted to offset one or more of the side edges of said strip of metal.

6. In a device of the class described, the combination with a support, of mechanism adapted to form a plait in a strip of metal, and means adapted to increase the depth of one or more of the ends of said plait.

7. In a device of the class described, the combination with a support, of mechanism adapted to form a plait in a strip of metal, and pressure means adapted to increase the depth of one or more of the ends of said plait.

8. In a device of the class described, the combination with a support, a mechanism adapted to form a series of plaits in a strip of metal, and means adapted to offset one or more of the side edges of said strip of metal.

9. In a device of the class described, the combination with a support, of mechanism adapted to form a series of plaits in a strip of metal, and pressure means adapted to offset one or more of the side edges of said strip of metal.

10. In a device of the class described, the combination with a support, of mechanism adapted to form a plurality of plaits in a strip of metal, and pressure means adapted to offset both of the side edges of said strip of metal.

11. In a device of the class described, the combination with a support, of mechanism adapted to form a plait in a strip of metal, means adapted to offset one or more of the side edges of said strip of metal, and means adapted to increase the depth of one or more of the ends of said plait.

12. In a device of the class described, the combination with a support, of mechanism adapted to form a plait in a strip of metal, pressure means adapted to offset one or more of the side edges of said strip of metal, and pressure means adapted to increase the depth of one or more of the ends of said plait.

13. In a device of the class described, the combination with a support, of mechanism adapted to form a series of plaits in a strip of metal, means adapted to offset one or more of the side edges of said strip of metal, and means adapted to increase the depth of one or more of the ends of said plaits.

14. In a device of the class described, the combination with a support, of mechanism adapted to form a series of plaits in a strip of metal, pressure means adapted to offset one or more of the side edges of said strip of

metal, and pressure means adapted to increase the depth of one or more of the ends of said plaits.

15. In a device of the class described, the combination with a support, of mechanism adapted to form a plurality of plaits in a strip of metal, pressure means adapted to offset both of the side edges of said strip of metal, and pressure means adapted to increase the depth of both ends of said plaits.

16. In a device of the class described, the combination with a support, of mechanism adapted to form a plait in a strip of metal, means adapted to form an offset in one or more of the side edges of said strip of metal, and means adapted to lengthen said plait at one or more of its ends by an amount substantially double the amount of said offset.

17. A die, comprising a body portion, and a plurality of punches for said die each of said punches having one or more of their ends of greater depth than the body thereof.

18. A die, comprising a body portion having one or more recessed side edges, and a plurality of punches each of said punches having one or more of their ends of greater depth than the body thereof.

19. A die-bed, comprising a grooved body portion, and one or more separable side edges secured to said body portion and extending above the top surface of said body portion.

20. A die-bed, comprising a body portion having a groove therein, and one or more side edges having a groove therein substantially in alinement with said groove in said body portion, but of greater depth.

21. A die-bed, comprising a body portion having a groove therein, and one or more separable side edges having a groove therein substantially in alinement with said groove in said body portion, but of greater depth.

22. A die-bed, comprising a body portion having a plurality of grooves therein, and one or more separable side edges having a plurality of grooves therein substantially in alinement with said grooves in said body portion.

23. In a device of the class described, the combination with a female die having one or more raised side edges and having a groove therein extending at an angle to said raised side edges, of a male die having one or more recessed side edges adapted to cooperate with said side edges of said female die having a punch therein extending at an angle to said recessed-side edges.

24. In a device of the class described, the combination with a female die having one or more separable raised side edges, of a male die having one or more recessed side edges adapted to cooperate with said side edges of said female die.

25. In a device of the class described, the combination with a grooved die-bed having

one or more raised grooved side edges, of a die for said die-bed having one or more recessed side edges, and a punch for said die having one or more of its ends of greater depth than the body of the punch.

26. In a device of the class described, the combination with a die-bed having a groove of greater depth at one or more of its ends, of a die, and a punch for said die having one or more of its ends of greater depth than the body of the punch, said punch being adapted to cooperate with said groove to form a bend in a strip of metal of greater depth at one or more of its ends.

27. In a device of the class described, the combination with a die-bed having a plurality of grooves therein, of a die, and a plurality of punches for said die adapted to cooperate with said grooves, each of said punches having one or more of its ends of greater depth than the body of the punch.

28. In a device of the class described, the combination with a die-bed having a plurality of grooves therein, of one or more raised side edges for said die-bed having grooves therein substantially in alinement with said grooves in said die-bed, a die for said die-bed having one or more recessed side edges, and a plurality of punches on said die, each of said punches having one or more of its ends of greater depth than the body of the punch.

29. In a device of the class described, the combination with a die-bed having a plurality of grooves therein, of one or more separable side edges for said die-bed having grooves therein substantially in alinement with said grooves in said die-bed, a die for said die-bed having one or more recessed side edges, and a plurality of punches on said die, each of said punches having one or more of its ends of greater depth than the body of the punch.

30. In a device of the class described, the combination with a die-bed having a plurality of grooves therein, of one or more separable side edges for said die-bed having grooves therein substantially in alinement with said grooves in said die-bed, a die for said die-bed having one or more recessed side edges, a plurality of punches on said die, each of said punches having one or more of its ends of greater depth than the body of the punch, and a plait-former adapted to cooperate with said die and said die-bed.

31. In a device of the class described, the combination with a support, of mechanism adapted to form a series of corrugations in a sheet of metal, means adapted to form said corrugations into plaits, and means adapted to offset one or more of the side edges of said sheet of metal.

32. In a device of the class described, the combination with a support, of means adapted to form a blunt bend in a sheet of

metal, means adapted to accentuate the angles of said bend, means adapted to form said bend into a plait, and pressure means for offsetting one or more of the side edges of said strip of metal.

33. In a device of the class described, the combination with a support, of mechanism adapted to form a series of corrugations in a sheet of metal, means adapted to form said corrugations into plaits, and pressure means for offsetting one or more of the side edges of said strip of metal.

34. In a device of the class described, the combination with a support, of means adapted to form a series of blunt bends in a sheet of metal, means adapted to accentuate the angles in said bends, means adapted to form said bends into a series of plaits, and means adapted to offset one or more of the side edges of said strip of metal.

35. In a device of the class described, the combination with a support, of mechanism adapted to form corrugations in a sheet of metal, means adapted to sharpen said corrugations, mechanism adapted to form said corrugations into plaits, and means adapted to form an offset in one or more of the side edges of said sheet of metal.

36. In a device of the class described, the combination with a corrugator, of a plait-former, means adapted to feed a sheet of metal to said corrugator, and pressure means adapted to form an offset in one or more of the side edges of said sheet of metal.

37. In a device of the class described, the combination with a die-bed having a groove therein, of a die, means on said die adapted to co-act with said groove to bend a sheet of metal, means on said die and said die-bed adapted to form an offset in said sheet of metal, and means operated by said die adapted to form plaits in said sheet of metal.

38. In a device of the class described, the combination with a die-bed having grooves therein, of one or more raised side edges on said die-bed, a die having one or more re-

cessed side edges adapted to co-act with said raised side edges on said die-bed, a plurality of punches on said die adapted to co-act with said grooves to form corrugations in a sheet of metal, means for forming said corrugations into plaits, and means for clearing said sheet of metal from said grooves.

39. In a device of the class described, the combination with a die-bed, of a die, means on said die adapted to form an offset in said sheet of metal, means on said die adapted to form corrugations in said sheet of metal, and means co-acting with said die adapted to form said corrugations into plaits.

40. In a device of the class described, the combination with a die-bed having a series of grooves therein, the angles of each successive groove being sharper than the groove next preceding, of raised side edges for said die-bed, a die for said die-bed having recessed side edges, punches on said die having raised ends adapted to co-act with said grooves, and means for actuating said die.

41. A die, comprising a body portion, and a plurality of punches, each of said punches being sharper than the punch next preceding and each of said punches having one or more of its ends of greater depth than the body thereof.

42. In a device of the class described, the combination with a support, of pressure means adapted to form a blunt bend in a sheet of metal, pressure means adapted to accentuate the angle of said bend, pressure means adapted to form said bend into a plait, and pressure means adapted to form an offset in one or more of the side edges of said sheet of metal.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

VIRGINIUS JULIAN MAYO.

Witnesses:

WM. A. WRIGHT,

JOHN F. FABIAN.