

No. 818,453.

PATENTED APR. 24, 1906.

J. KRÜGER.

MACHINE FOR CUTTING UP OR MITERING FLANGED METAL BEAMS
OR GIRDERS.

APPLICATION FILED MAY 10, 1905.

4 SHEETS—SHEET 1.

Fig. 1.

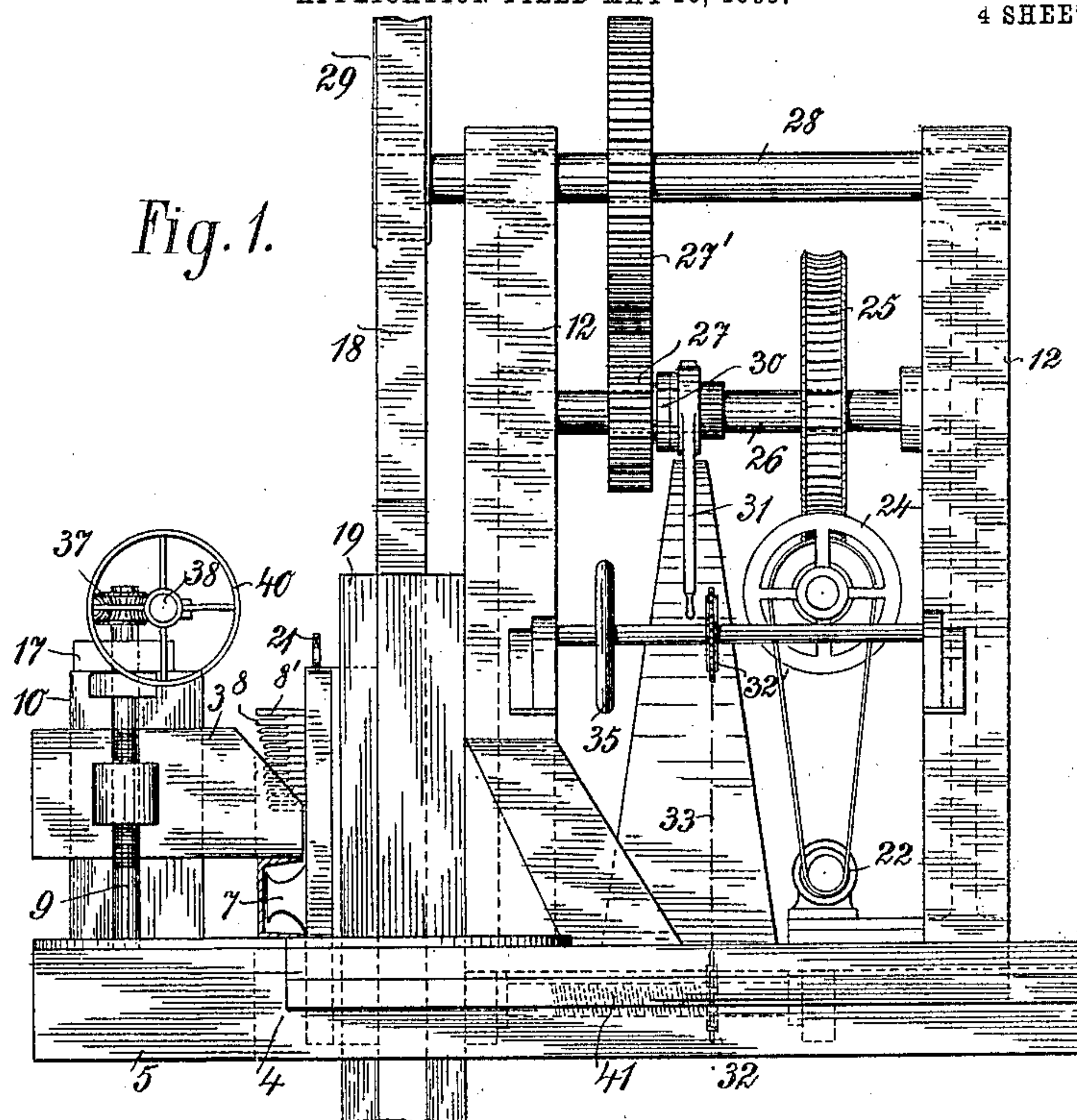
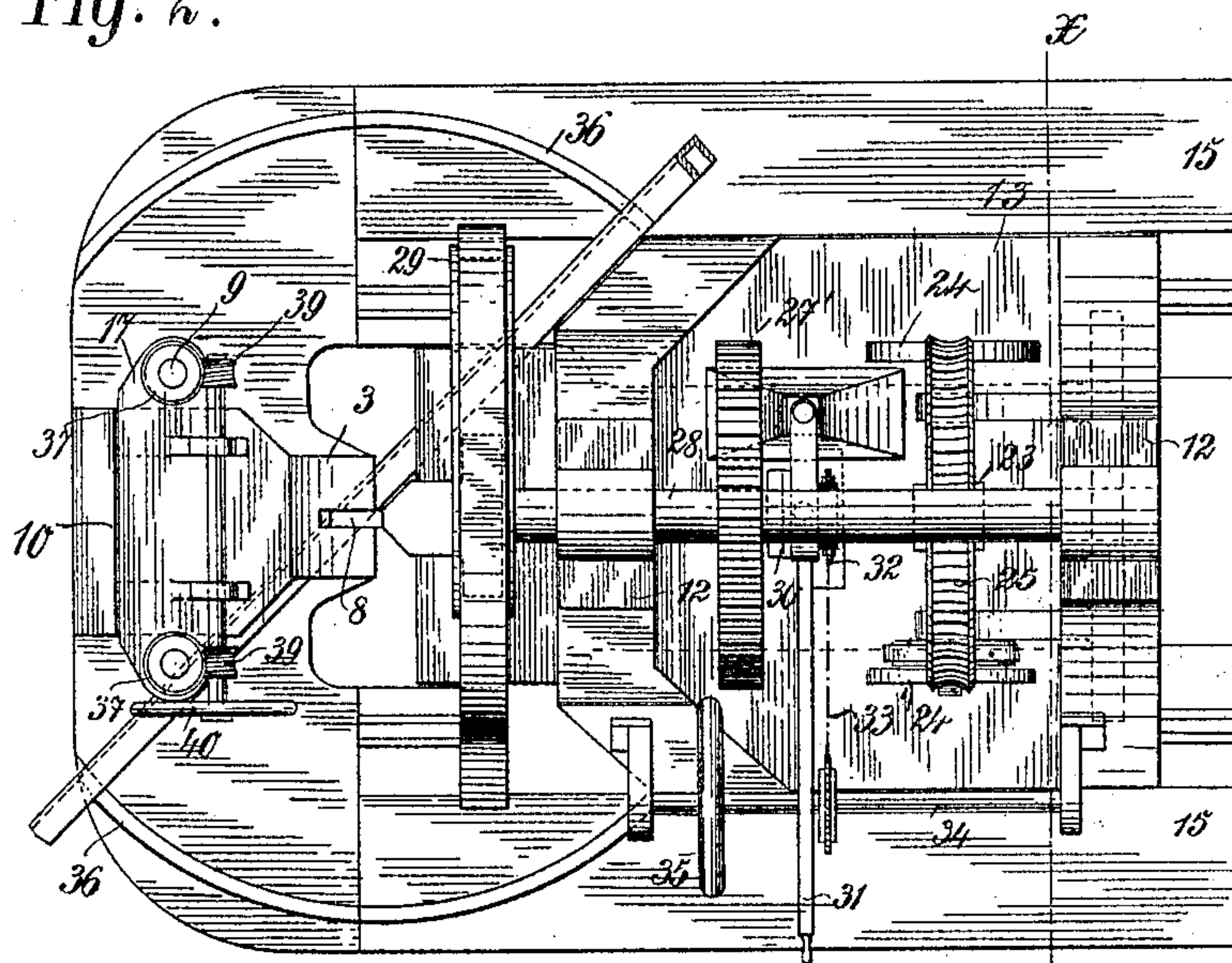


Fig. 2.



Witnesses.

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4 SHEETS—SHEET 2.

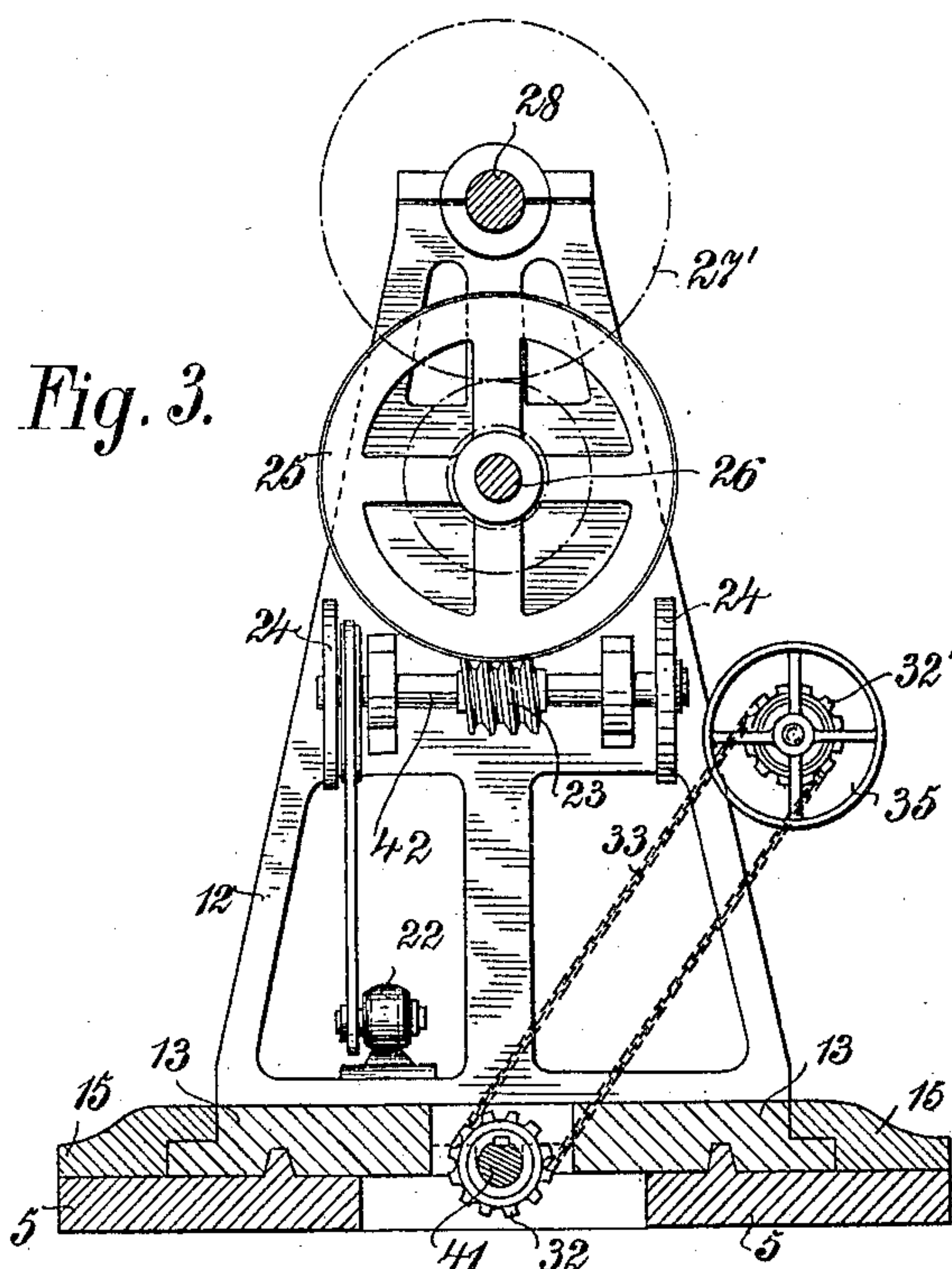
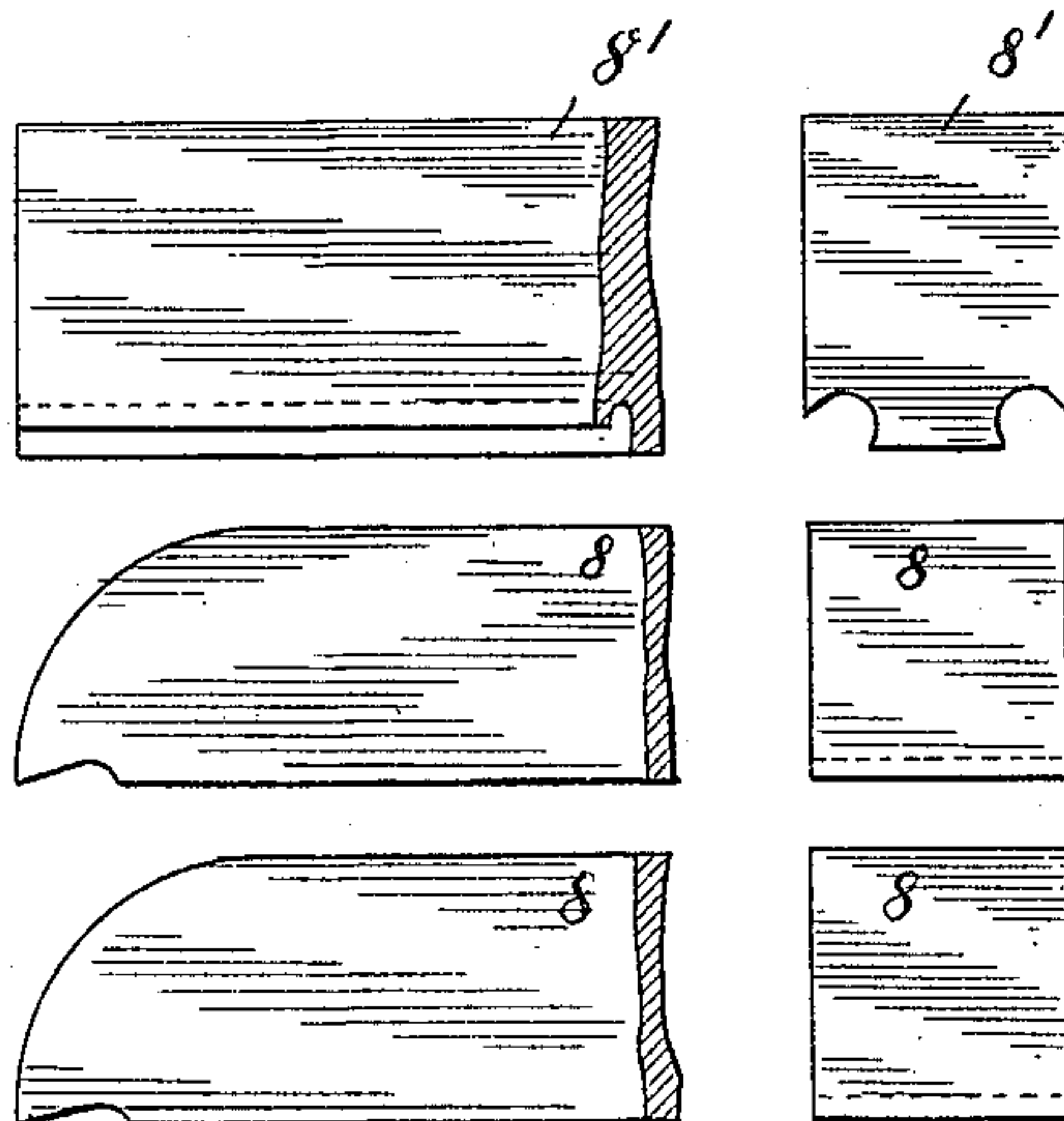


Fig. 8.

Fig. 9.



Witnesses.

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4 SHEETS—SHEET 3.

Fig. 4.

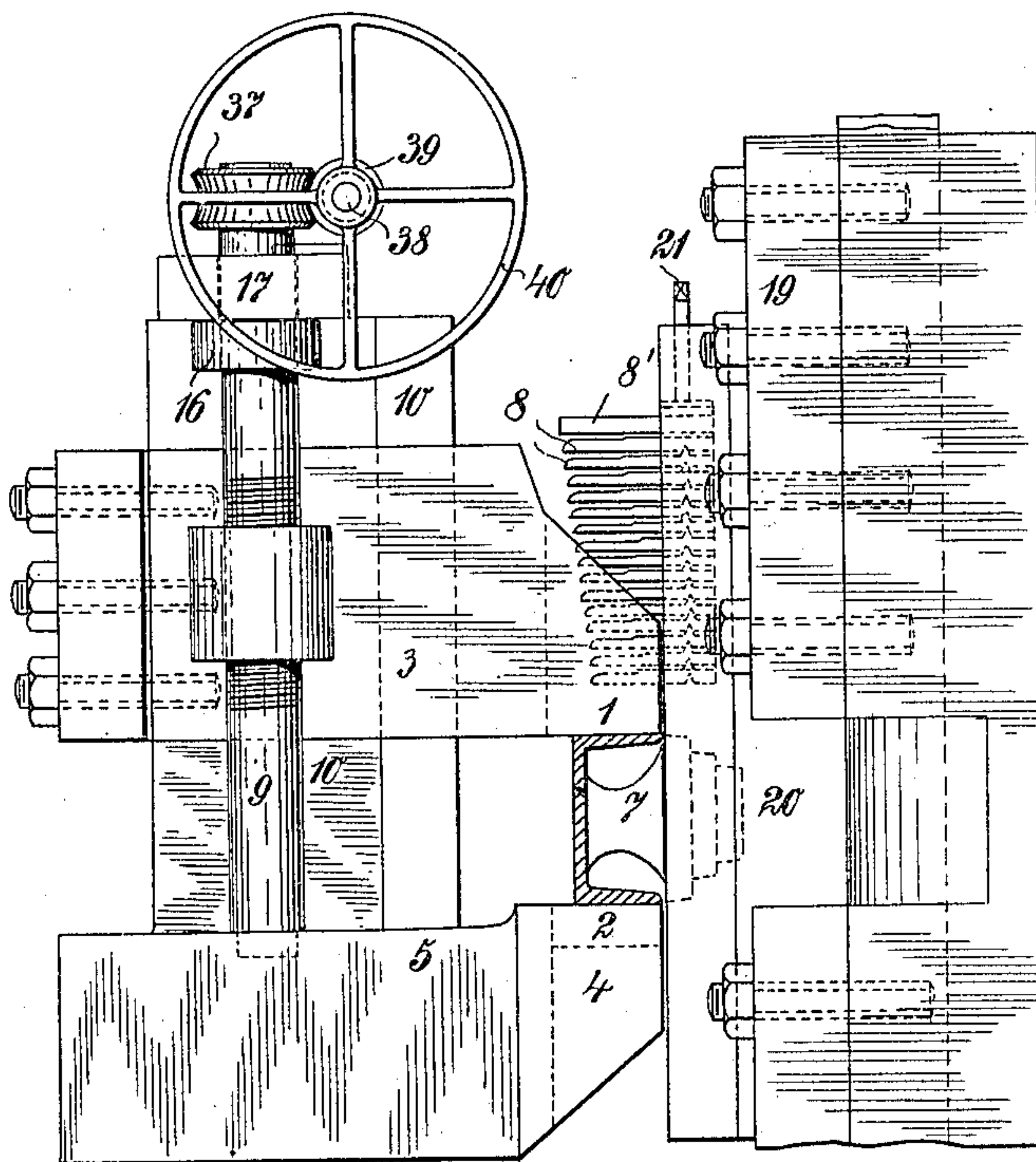
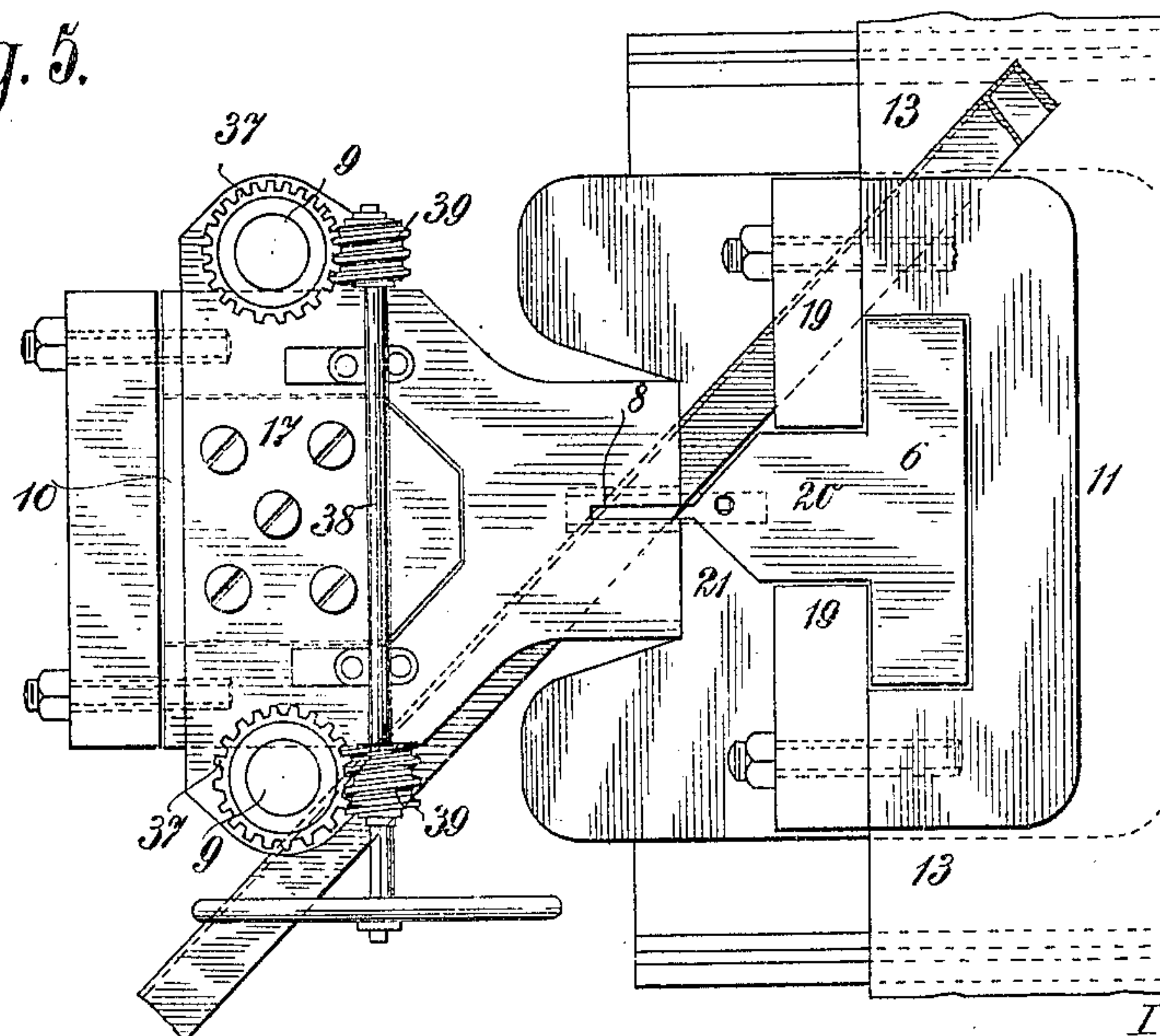


Fig. 5.



Witnesses.

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4 SHEETS—SHEET 4.

Fig. 7.

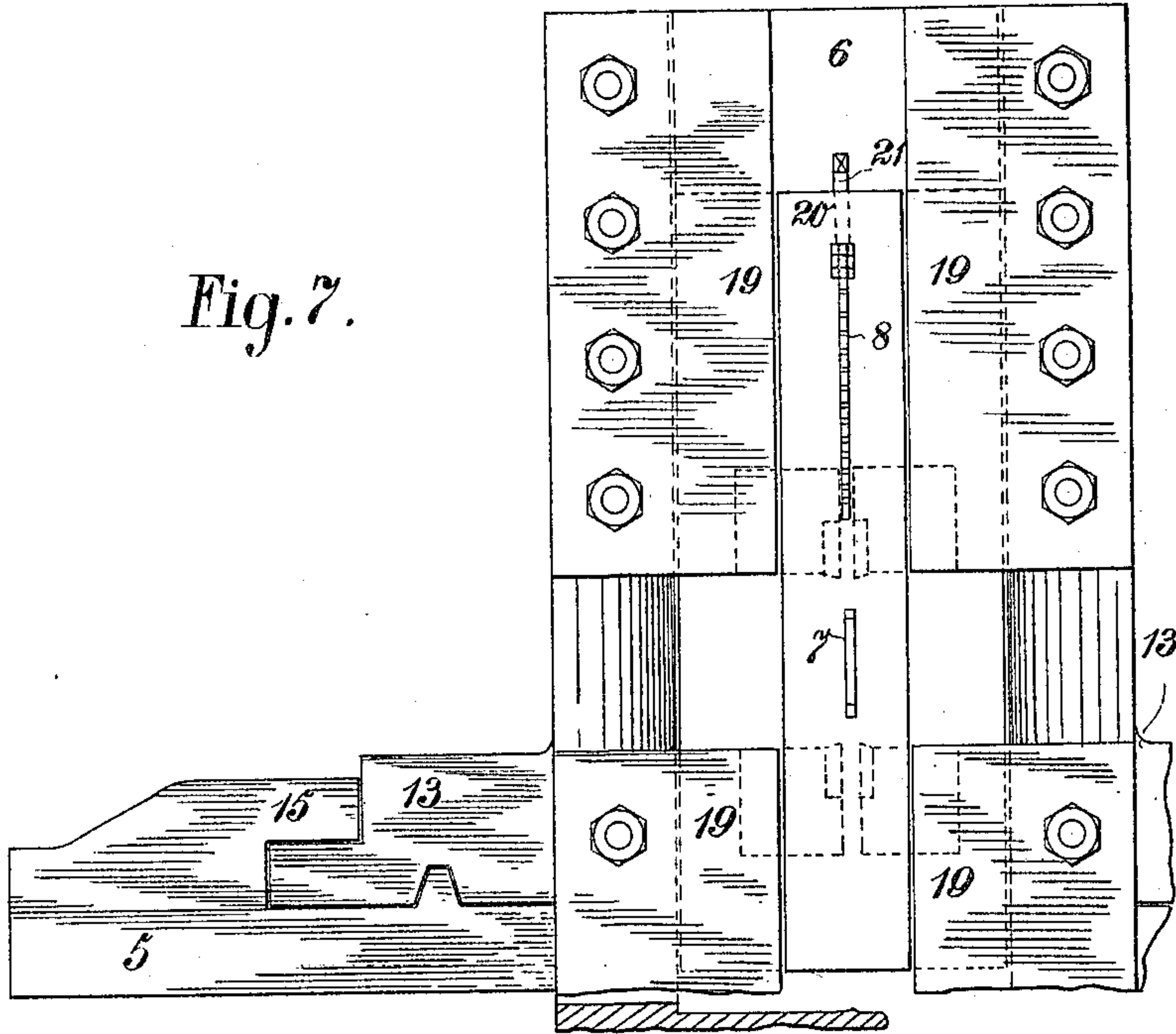
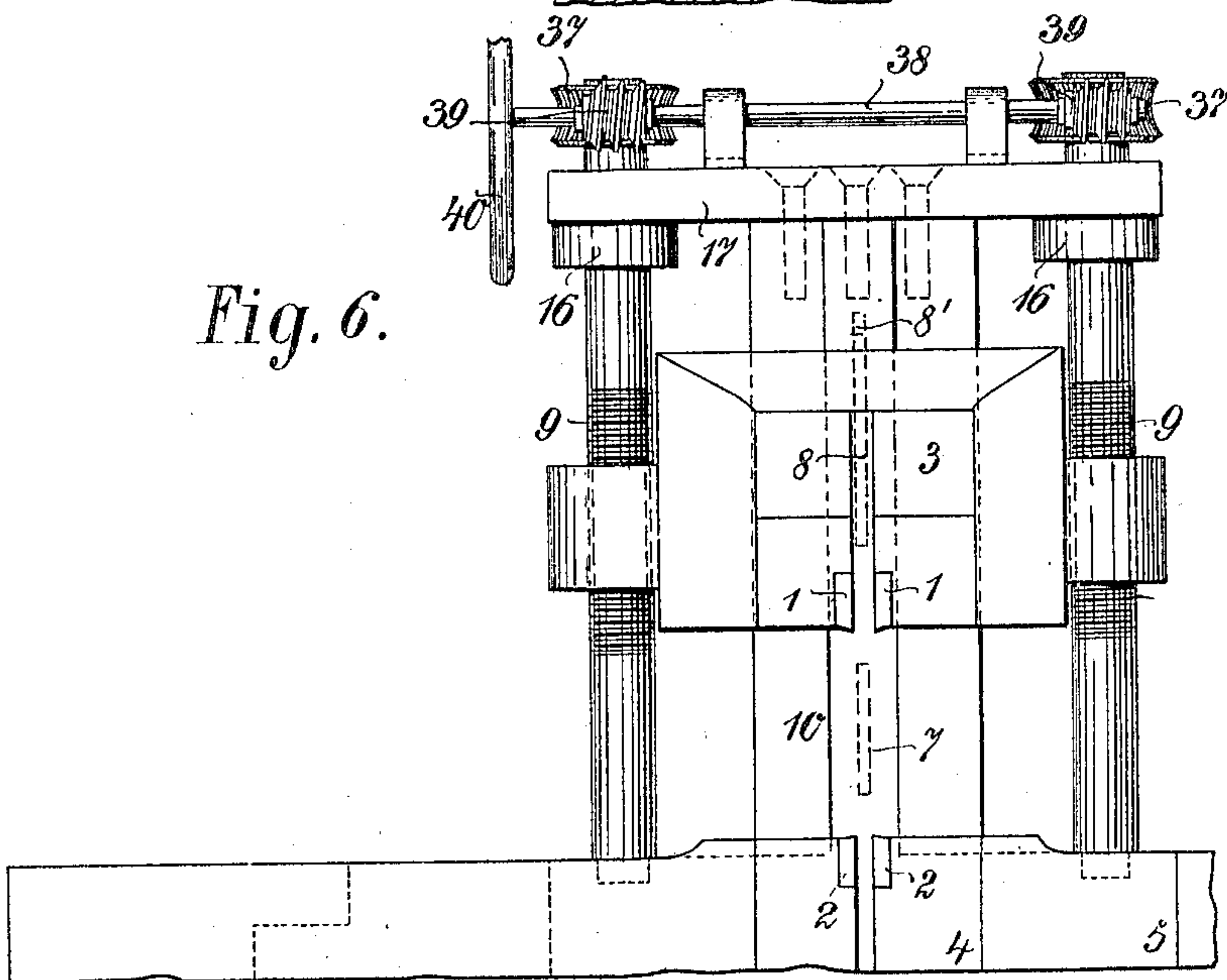


Fig. 6.



Witnesses.

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UNITED STATES PATENT OFFICE.

JOHANNES KRÜGER, OF STETTIN, GERMANY.

MACHINE FOR CUTTING UP OR MITERING FLANGED METAL BEAMS OR GIRDERS.

No. 818,453.

Specification of Letters Patent.

Patented April 24, 1906.

Application filed May 10, 1905. Serial No. 259,783.

To all whom it may concern:

Be it known that I, JOHANNES KRÜGER, a subject of the King of Prussia, German Emperor, residing at 55 Deutschestrasse, in the city of Stettin, in the Kingdom of Prussia and Empire of Germany, have invented certain new and useful Improvements in Machines for Cutting Up or Mitering Flanged Metal Beams or Girders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to figures of reference marked thereon, which form a part of this specification.

This invention has relation to a machine for cutting up or mitering flanged metal beams or girders.

A characteristic feature of my invention lies in the combination of a suitable vise or clamping devices with a tool-stock carrying cutters and means to so move the stock as to cause one of the cutters to act on the flange or flanges and other cutters to act on the web of a flanged metal beam held by the clamping devices with its web parallel to the line of motion of the cutters, whereby beams may be cut substantially at any angle.

A further characteristic feature of the invention lies in the combination of a die-cutter with a plurality of planing-bits and means to move the die-cutter so as to act on the flange or flanges of the beam and the planing-bits to act successively on the web of the beam.

A further characteristic feature of the invention lies in the combination, with the planing-bits, of a smoother-bit to smoothen the surfaces of the cut in both web and flanges of the beam.

The invention also resides in means for clamping the beam to be cut, in mechanism for imparting to the cutter-die and planers the required movements relatively to the profile of the beam, and in mechanism for moving the cutters toward and from the clamping devices; but that my invention may be fully understood I will describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation, Fig. 2 a plan, and Fig. 3 a vertical section on line *x x* of Fig. 2, of a machine embodying my invention. Fig. 4 is a fragmentary side elevation, and Fig. 5 a fragmentary plan view of parts

of the machine. Fig. 6 is a right-hand elevation of the beam-clamping devices; Fig. 7, a left-hand end elevation of the cutter and planing devices and their support and guides, and Figs. 8 and 9 show parts of the planing-bits and smoother-bit in side elevation and in end elevation, respectively, Figs. 4 to 9 being drawn to an enlarged scale.

To the bed-plate 5 of the machine at the left end thereof are secured two holders or stocks 4 4 for the lower knife-edge clamping-jaws 2 2, Figs. 4 and 6, while the upper knife-edge clamping-jaws 1 1 are secured to a holder or stock 3, that is adjustable vertically on a standard 10 by means of two screw-spindles 9, stepped in the bed-plate and having a collar 16 abutting against the under side of an abutment and guide-plates 17, bolted to said standard 10. The spindles 9 project above plate 17 and carry a worm-wheel 37 at their upper end in gear with worms 39 on a cross-shaft 38, mounted in bearings on plate 17, said shaft carrying a hand-wheel 40 for rotating the shaft in one or the other direction, and thereby moving the stock 3 toward or from the stock 4, so that beams of different widths of web may be firmly clamped between the jaws 1 1 and 2 2.

In order that a beam to be cut may be readily positioned between the clamping-jaws to be cut at any desired angle, I form on or secure to the bed-plate 5 on each side of the standard 10 a segmental rail 36, Fig. 2, whose upper face is flush with the edges of the fixed clamping-jaws 2 2.

The bed-plate 5 of the machine has formed thereon or secured thereto a suitable track on which a base-plate 13 is adapted to be moved toward and from the clamping devices, said base-plate being securely held against lateral displacement by guide-rails 15, Figs. 1, 3, 5, and 7. This movement of the base-plate is effected by means of a screw-spindle 41, carrying a sprocket-wheel 32, connected by chain 33 to a sprocket-wheel 32' on a shaft 34, carrying a hand-wheel 35, Figs. 1, 2, and 3.

On the base-plate 13 are secured two standards 12 12 and the guides 11 for the tool-stock 6, which is of substantially T shape in cross-section, said guides embracing the tool-stock from the rear on three sides and, together with the front guides 19 19, guiding the stock in its vertical movements. The web 20 of the tool-stock 6, projecting beyond the front guides 19, is wedge-shaped in cross-

section and is adapted to be moved into and out of the space between the two pairs of clamping-jaws 1 1 and 2 2, Figs. 4 and 5, and to the apex of the tool-stock is secured the
 5 cutter-die 7 and a series of planing-bits 8 8', said bits being arranged stepwise, the upper planing-bit 8' being a smoother-bit and projecting slightly beyond the bits 8, as more clearly shown in Figs. 1 and 4.

10 The cutter-die 7 and bits 8 8' may be removably secured to the tool-stock in any well-known or desired manner and may be held in their relative position by means of a tightening-screw 21. The cutter-die 7 has
 15 an upper and lower cutting edge and is of slightly less width than the slots or spaces between the lower and upper clamping-jaws 1 1 and 2 2, and the planing-bits 8 are of the same width as the cutter 7, except the upper
 20 smoother-bit 8', which is of greater width, so that its lateral cutting edges may smoothen the surfaces cut by the cutter-die 7 and bits 8.

The tool-stock 6 receives its vertical movement from an eccentric 29, whose strap 18 is
 25 connected to said stock, the eccentric 29 being driven from any suitable motor, preferably an electric motor 22, on the base-plate 13, the driving-shaft of said motor being connected by pulleys and belt to a cross-shaft
 30 42, carrying two fly-wheels 24 and a worm 23 in gear with a worm-wheel 25 on a shaft 26, on which is loosely mounted a pinion 27, adapted to be thrown into and out of gear
 35 with a gear-wheel 27' by means of a shifting-lever 31, actuating a suitable clutch-coupling 30. The gear-wheel 27' is secured to a shaft 28, which carries the eccentric 29, connected to the tool-stock 6, above referred to, said
 40 shafts 26 and 28 having their bearings in standards 12, Fig. 1.

In order that the beam to be cut may be adjusted to a given angle, the tool-stock guides 11 and 19 are suitably recessed so as
 45 to accommodate beams of the greatest width of web, as will be readily understood and as shown in Figs. 4 and 7 and in Fig. 5 by a beam to be cut.

The operation of the machine in cutting up
 50 a U-beam, for instance, is as follows: The upper clamping-jaw stock 3 is first moved through the medium of the screw-spindles 9 9 from the lower clamping-jaw holder 4 to admit of the clamping of the beam with its
 55 flanges in horizontal planes facing the cutter 7, while the base-plate 13, carrying the cutting-tools, is moved away from the clamping devices a suitable distance. The beam is now secured in the desired position by lower-
 60 ing the upper clamping-jaw holder 3 to firmly clamp the beam between the knife-edge jaws 1 1 and 2 2, and the cutter 7 is moved forward into the space between the flanges of the beam until it contacts with the web. The
 65 driving-pinion 27 is now geared to the gear-

wheel 27', that drives the eccentric to raise the tool-stock 6, the upper edge of cutter 7 cutting through the upper flange of the beam between the upper clamping-jaws 1 1. When
 70 the tool-stock has reached the limit of its upward movement through the action of the eccentric 29, said movement is reversed, and the lower edge of the cutter 7 cuts through the lower flange of the beam between the lower
 75 clamping-jaws 2 2, and simultaneously therewith the planing-bits 8 begin to cut through the vertical web of the beam, said bits acting successively to gradually increase the depth of cut until the last of the bits 8 finally
 80 finishes the cut and severs the beam, the smoother-bit 8' following to clear the cut of both flanges and web and smooth the surfaces. When the tool-stock reaches the limit of its downward movement, the smoother-plane bit 8' will be below the lower clamp-
 85 ing-jaws 2 2, both flanges and web being cut through and planed smooth. The tool-stock 6 begins its upward movement, and as soon as its lower edge has moved above or clear of the lower clamping-jaws 2 2 its
 90 further movement is arrested by throwing the pinion 27 out of gear with the wheel 27'. The beam may now be removed and another secured in position, and the described operations repeated. By properly positioning
 95 the beam in the clamp it may obviously be cut at any angle.

The time during which the tool-stock 6 rises may be and in practice is utilized to
 100 raise the upper clamping-jaw holder 3 and to move the tool-stock away from and back to the clamping-jaws, as above described, so that another beam may be inserted and clamped into position by the time the tool-holder has reached its normal position.
 105

Of course it is understood that the bed-plate 13 is suitably apertured to admit of the movements of the stock.

The cutting of beams of other profile than
 110 U-beams varies but little from that described, the movements of the tool-stock being the same. In cutting L-beams, for instance, the web and flange, the latter lying on the lower clamping-jaws 2 2 under the cutter-die 7, are
 115 both cut during the downward movement of the tool-stock. In cutting I-beams the operation is the same as in cutting U-beams, except that the tool-stock 6 is fed forward toward the clamping-jaws after the two
 120 flanges on one side and the web have been cut through to cut through the flanges on the opposite side of the web. In cutting Z-beams one of the flanges and the web may be
 125 cut through during the downward movement of the tool-stock and the latter fed forward to cut through the other flange on the upward movement of said stock, the surfaces of the flange last cut through being smoothed
 130 on the next downward movement of the stock, or by reversing the beam in the clamp

the flange on one side of the web may be cut through during the upward movement of the tool-stock and the web during the downward movement, and as the cutter-die clears the opposite flange it is moved forward to cut the same on its next downward movement.

It will of course be readily understood that the planing-bits may be secured to the tool-holder below the cutter 7, the sequence of the movements of the tool-holder being in this case reversed. Furthermore, it will also be obvious that provisions may be made either on the segment-rails 36 or some other convenient point on the bed-plate 5—as, for instance, suitable graduations—to admit of the ready adjustment of the beam to be cut relatively to the cutter and planers to cut the beam at any desired angle.

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

1. A machine such as described, comprising a vertically to-and-fro movable tool-stock, superposed cutters carried thereby and clamping devices to clamp the beam to be cut, one of said cutters adapted to act on the flange or flanges and the others on the web of said beam.

2. A machine such as described, comprising a vertically to-and-fro movable tool-stock, superposed cutters carried thereby, clamping devices to hold the beam to be cut at any angle to the cutters, one of said cutters acting on the flange or flanges of the beam and the others on the web thereof.

3. A machine such as described, comprising oppositely-situated pairs of clamping-jaws, a vertically-movable tool-stock, a cutter mounted in the stock and coöperating with the jaws to cut a beam held therein in any horizontal angle, said cutter operated to cut the flanges, and planers also mounted in the stock to cut the web after the flanges have been cut and passing through the cut in the flanges.

4. In a machine such as described, the combination of clamping devices; with a tool-stock, a cutter-die, planing-bits, and a smoother-bit carried by said stock and suitably spaced thereon, and means to move the stock to cause the cutter-die to act on the flange or flanges and the planer-bits on the web of a flanged metal beam held by the clamping devices with its web parallel to the line of motion of the stock, said planing-bits arranged to act successively on said web and

said smoother-bit arranged to act last on the proximate surfaces of the cut in both flange, or flanges, and web.

5. In a machine such as described, the combination of clamping devices with a tool-stock, suitably-spaced cutting-tools carried thereby and means to reciprocate the stock and cause one of the tools to act on the flange or flanges and the other on the web of a flanged metal beam held by the clamping devices with its web parallel to the line of motion of the cutters.

6. In a machine such as described, the combination of clamping devices, with a tool-stock, suitably-spaced cutting-tools carried thereby, means to move the stock toward and from the clamping devices and means to reciprocate the stock in a plane at right angles to the plane of the aforesaid movement and cause one of the tools to act on the flange or flanges and the other tools on the web of a flanged metal beam held by the clamping devices with its said web parallel to the line of motion of the cutters.

7. A machine such as described, comprising oppositely-positioned pairs of clamping-jaws to hold a beam in any horizontal angle with its web substantially upright, a tool-stock, means to move it both vertically and horizontally, a tool carried thereby positioned opposite the center of the web, said tool coöperating with and passing between the upper clamping-jaws to cut a top flange and coöperating with and passing between the lower clamping-jaws to cut a bottom flange.

8. In a machine such as described, the combination of a bed-plate and clamping devices thereon; with a base-plate movable on said bed-plate toward and from said clamping devices, vertical guides on said base-plate a tool-stock vertically movable in said guides and carrying cutting-tools, and mechanism on the base-plate to reciprocate the tool-stock to cause one of the cutting-tools to act on the flange or flanges and the other cutting-tools to act in succession on the web of a flanged metal beam and pass through the cut made by the cutter for the flanges.

In testimony that I claim the foregoing as my invention I have signed my name in the presence of two subscribing witnesses.

JOHANNES KRÜGER.

Witnesses:

HANTS VON HILLEBRAND,
FRITZ MÜLLER.