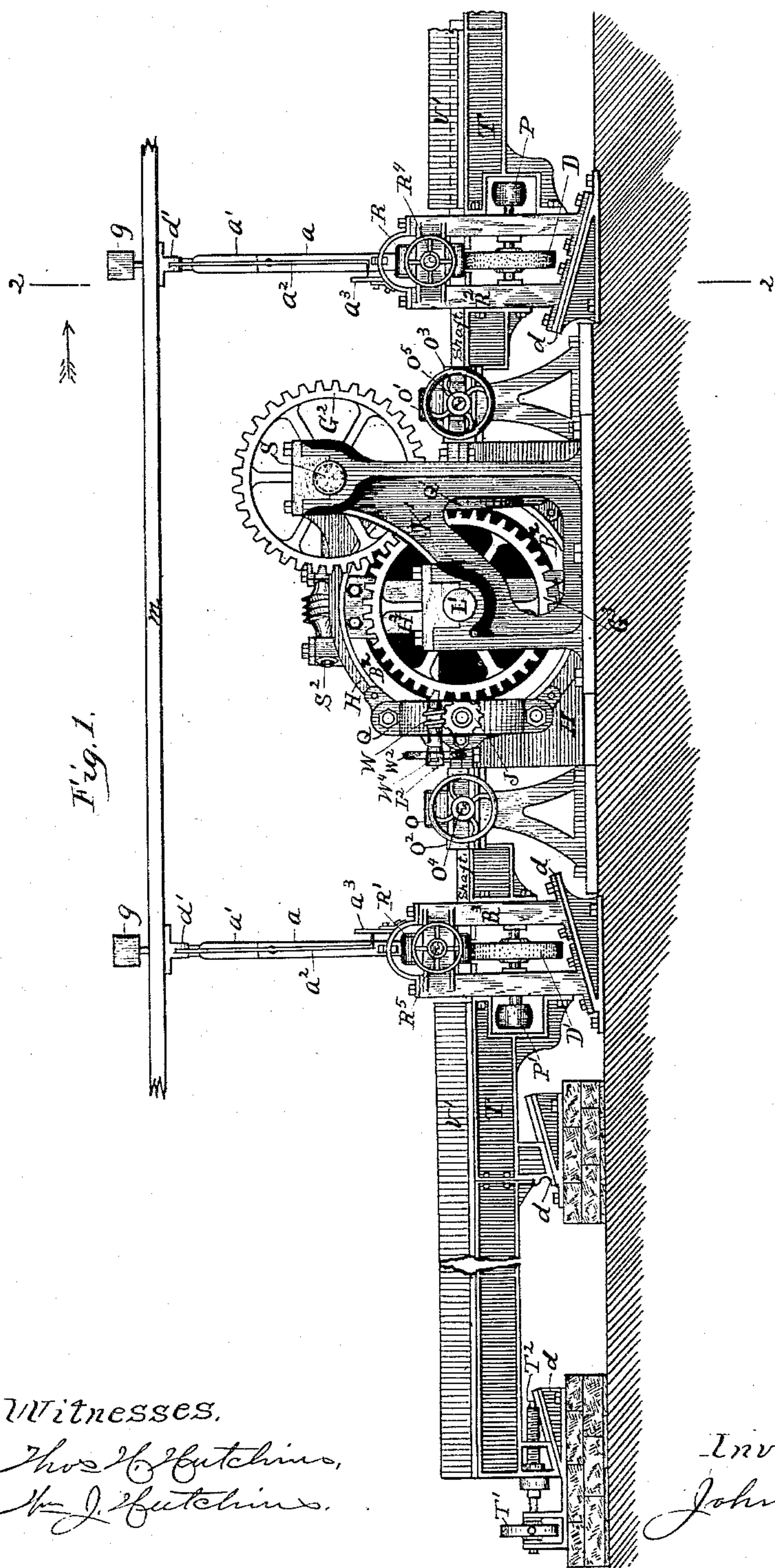


4 Sheets—Sheet 1.

MACHINE FOR STRAIGHTENING, GRINDING, AND POLISHING METAL BARS.
No. 387,971. Patented Aug. 14, 1888.

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Witnesses.

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Inventor.

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(No Model.)

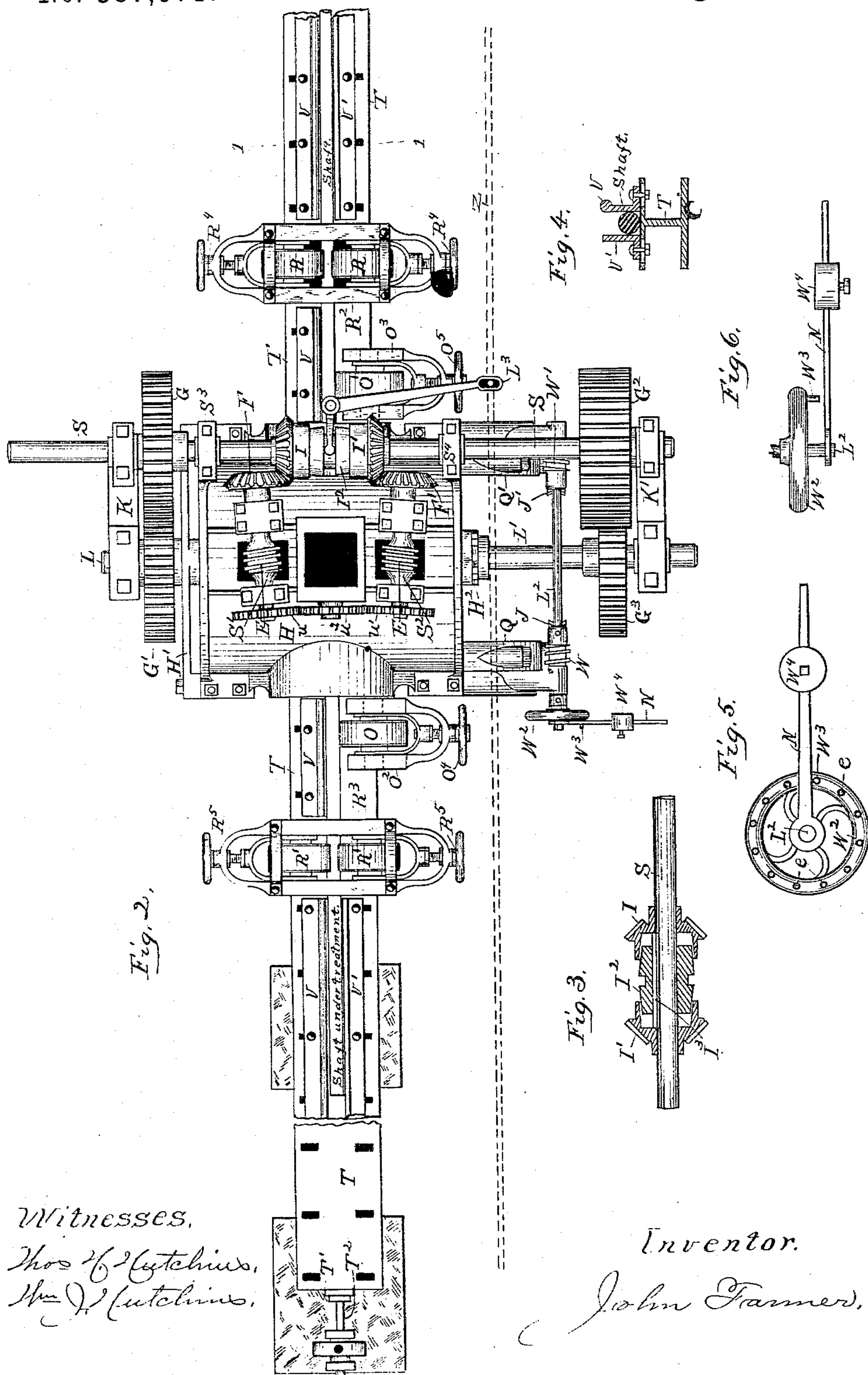
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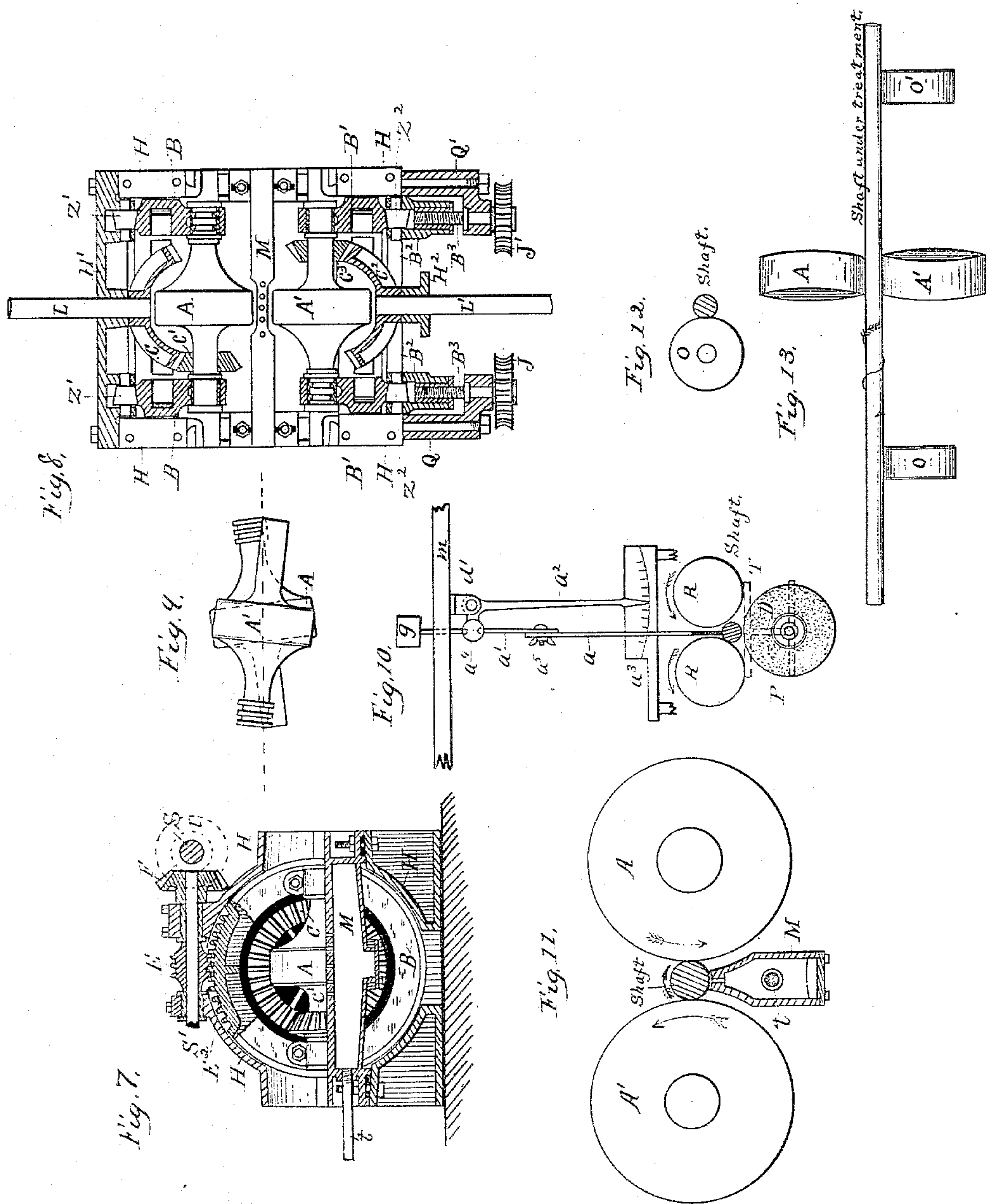
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Witnesses.
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(No Model.)

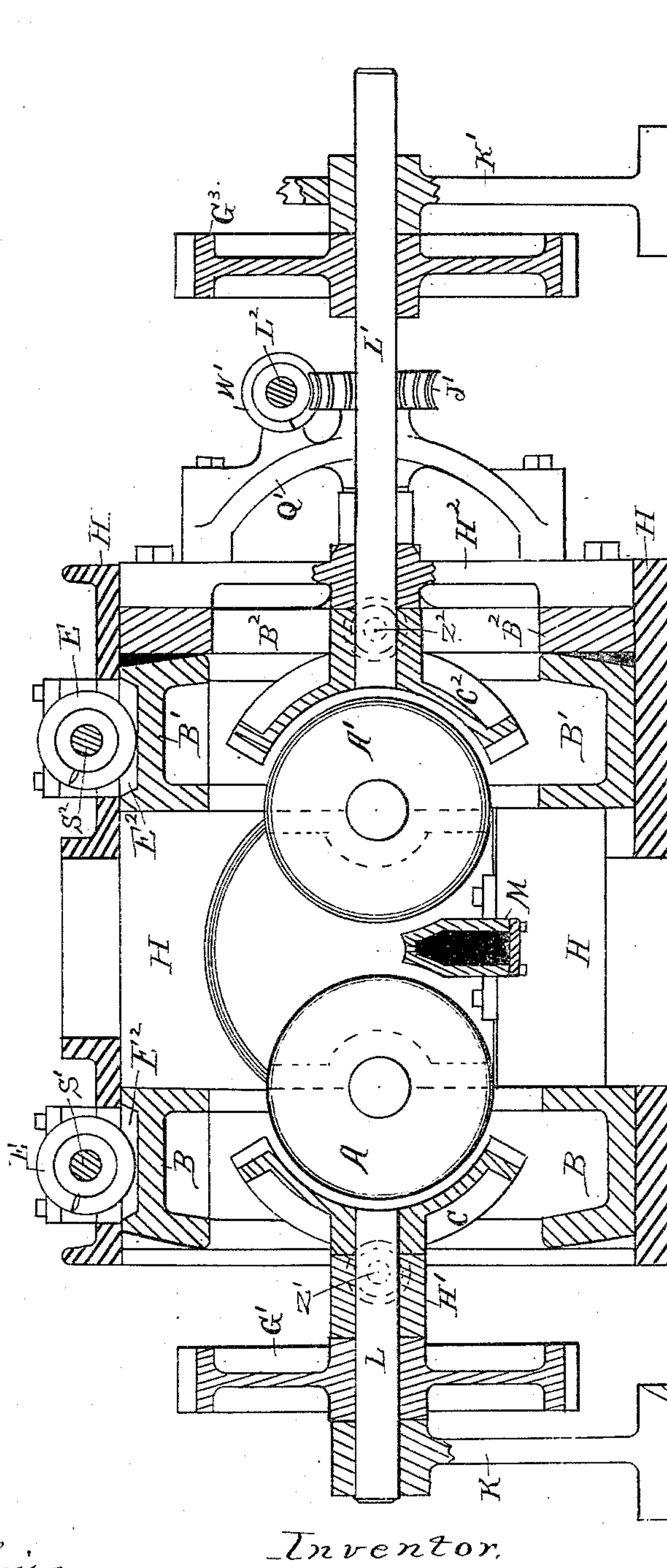
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UNITED STATES PATENT OFFICE.

JOHN FARMER, OF GLASGOW, COUNTY OF LANARK, SCOTLAND.

MACHINE FOR STRAIGHTENING, GRINDING, AND POLISHING METAL BARS.

SPECIFICATION forming part of Letters Patent No. 387,971, dated August 14, 1888.

Application filed April 30, 1887. Serial No. 236,612. (No model.)

To all whom it may concern:

Be it known that I, JOHN FARMER, a subject of the Queen of Great Britain, residing at Glasgow, in the county of Lanark, Scotland, have invented certain new and useful Improvements in a Machine for Straightening, Grinding, and Polishing Metal Bars, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain improvements in a machine for straightening, grinding, and polishing metal bars, and is designed to be used in a rolling-mill plant.

The construction and operation of said improvements are fully set forth and explained in the following specification and claims, reference being had to the accompanying drawings and the figures and letters of reference marked thereon, which form a part of this specification, in which—

Figure 1 is a side elevation of the machine. Fig. 2 is a top plan view of the same. Fig. 3 is a detail sectional view of the clutch mechanism of the machine. Fig. 4 is a cross-sectional view of the table and table-guides of the machine on line 1, Fig. 2, also showing a cross-section of a shaft as it would appear when resting on said table during the time it is under treatment in the machine. Figs. 5 and 6 are detail views of the lever and weight mechanism of the machine, for operating in conjunction with a pair of worms and worm-wheels and screws for automatically adjusting one of the feed-rolls of the machine during the operation of grinding and polishing a shaft. Fig. 7 is a central vertical cross sectional view of the lower body part of the machine and a similar sectional view of one of the worm and segment mechanisms of the upper part of the machine-body, a portion being broken away in the upper part of said view to show the toothed segment of the circular frame of the feed-roll. Fig. 8 is a central horizontal sectional view of the body of the machine and a face plan view of the feed-rolls which operate within the machine, said section being also on a line with the center of the shaft under treatment. Fig. 9 is a detail view of the feed-rolls of the machine, showing the manner in which they are adjusted when in operation in the machine. Fig. 10 is a detail view showing a side plan of one pair of

the guide-rolls and one of the polishing-wheels of the machine and their gage mechanism, taken on line 2 of Fig. 1, looking in the direction indicated by the arrow, the shaft-supporting table being shown by dotted lines, also showing a cross section of a shaft as it would appear under treatment. Fig. 11 is a detail side plan view of the two feed-rolls and a cross-section of the anvil-bar of the machine, also a cross-section of a shaft resting on said anvil-bar between said rolls as it would appear under treatment. Fig. 12 is a detail side plan view of one of the straightening-rolls of the machine, also a cross-section of a shaft engaged by said roll as it would appear under treatment. Fig. 13 is a detail plan view of the two feed-rolls and of the two straightening-rolls of the machine, also showing a shaft engaged by said rolls as it would appear under treatment; and Fig. 14 is a vertical central longitudinal sectional view of the planishing-machine, showing a side view of its planishing-rolls.

This machine consists of parts as follows: a main cylindrical body-frame cast in two parts, bolted together and provided with a suitable base to support it in a horizontal position. The sides of said frame are open to permit a shaft to pass transversely and horizontally through it. Each end of said frame forms a housing for a circular rotatable frame fitted therein, which frames respectively have boxed in them a feed-roll arranged one on either side of the center of the opening through said frame and facing each other. Suitable gearing mechanism is arranged to rotate said rolls continuously in one direction, and suitable bearings are arranged to support the shafting of said gearing mechanism.

An anvil-bar is adjustably arranged across said frame in a manner to support a shaft centrally between the face of said feed-rolls. A horizontal adjustable table with proper guides, and of the same plane of said anvil-bar, extends each way from the machine-frame on a line with said anvil-bar, for holding a shaft while under treatment. A pair of straightening-rolls are arranged, one near either end of said anvil-bar, in suitable housings, for operating, in conjunction with said feed-rolls, to straighten crooked shafting. A pair of guide-rolls and an emery grinding and polishing

wheel are arranged, a set on either side of the machine-frame, in suitable housings and on a line with the feed-rolls, for grinding to a gage and polishing the shaft under treatment, and each such set is provided with a point-scale indicating mechanism operated by the hard end of a bar resting on the shaft being treated, which mechanism registers the gage of said shaft.

The shaft or bar to be treated is placed on the table of the machine and fed forward to and between the feed-rolls, which engage it hard and roll it between their faces and feed it forward automatically by means of being set askew, one at an opposite angle from the other, and thus cause the shaft to roll spirally between them.

Worm and toothed segment mechanisms are arranged in the machine to rotate the feed-roll frames within their housings to skew said rolls oppositely, to cause said shaft to move in either direction, which can be shifted at the will of the operator.

Referring to the said drawings, H represents the body, frame, or case of the machine, cast in two parts and the two parts bolted together, as shown in Fig. 2, and provided with a suitable integral base, as shown in Figs. 1 and 7, for resting on a suitable foundation. B and B' are circular rotatable frames arranged one in either end of said frame H, which frame forms housings for said circular frames, as is shown in Figs. 1, 7, and 8.

A and A' are a pair of feed-rolls, arranged, as shown in Figs. 8 to 14, to face each other, and their shafts are journaled at each end in proper boxes arranged opposite each other on the sides of said rotatable frames. The shaft of roll A has secured on it the bevel-pinion C'.

C is a bevel gear-wheel, which meshes with pinion C' and is secured on shaft L, which is boxed in cross-bar H', secured across the end of frame H, and also in the bracket K, to support its outer end, and has secured on it the gear-wheel G', which meshes with gear-wheel G on drive-shaft S, which drive-shaft S is arranged across the upper part of the body H of the machine and supported in the boxes S' S', integral with said body, and in brackets K and K'. (See Figs. 1 and 2.)

Roll A' has secured on its shaft the bevel-pinion C', which meshes with bevel gear-wheel C' on shaft L', which shaft is journaled in cross-bar H', secured to the said frame B', and in bracket K', as shown in Figs. 1 and 2, to support its outer end, and has secured on it the gear-wheel G', which meshes with gear-wheel G' on drive-shaft S. The shaft L', gear-wheel G', and bevel gear-wheel C', which are secured to said shaft, together with frame B' and the inner bearing of said shaft, have lateral movement, as hereinafter described, and the gear-wheel G', which drives gear-wheel G', has a broad face to permit such lateral movement and prevent their getting out of mesh. The said feed-rolls A A' are rotated continu-

ously when the machine is in operation by means of said drive-shaft S through the medium of said gear mechanism. Said circular frames B and B' are each provided on their upper side with peripheral toothed segments E', as shown in Fig. 7, and immediately over said toothed segments and properly boxed on the top of the frame H, as shown in Figs. 1, 2, and 7, are arranged a pair of shafts, S' and S', having respectively the right and left threaded worms E and E', for respectively gearing with the toothed segments E' of said circular frames. Said shafts S' and S' have secured to them, respectively, the miter-gears F and F', which mesh, respectively, with the miter-gears I and I', which are loose on drive-shaft S.

I' is a friction-clutch, which is feathered on drive shaft S between said miter-gears I and I', as shown in Figs. 2 and 3, and is provided with an annular groove for the reception of the forked end of lever L', for shifting it laterally on said shaft. The hubs of said miter-gears I and I' are chambered on their side next said clutch for the reception of its tapered ends, to drive them by frictional contact therewith. The said circular frames B and B', with their feed-rolls attached, as shown, may be partially rotated by the drive-shaft S, through the medium of said clutch, worm, and segment mechanism, alternately in either direction within the limits of said segment-teeth, for the purpose of skewing said planishing-rolls in either direction, in the manner shown in Figs. 9 and 13.

The outer end of the forked lever L' may be connected to a long rod or bar, Z, (shown in dotted lines in Fig. 2,) passing along the whole length of the machine and tables, so that the machine may be controlled from any part.

The shafts S' S' are provided with spur-gears u and u' on their outer ends, having an intermediate idler spur-gear, u'', connecting them, so that both shafts may be rotated simultaneously from either miter-gear I and I' alternately.

B' is a non-rotatable circular frame set immediately back of frame B', and bears the friction-rollers Z' Z', which impinge against frame B'. A corresponding pair of friction-rollers, Z' Z', arranged in cross-bar H', impinge against the rear side of rotatable frame B, which rollers lessen the friction of the rotatable frames B B' when they are under pressure from the feed-rolls. Said frame B' is arranged to be adjusted laterally to or from frame B' through the medium of the screws B' B', boxed in the brackets Q Q' and screwing into boxes fixed in frame B', as shown in Fig. 8. Said screws are provided with the worm-wheels J J', geared with the worms W W' on shaft L', fixed in brackets Q Q', (see Figs. 1, 2, and 8,) and are rotated through the medium of said worm and worm-wheel mechanism from hand-wheel W'. Said screws are for the purpose of adjusting feed-rolls A' to or from feed-roll A, to accommodate said rolls to the sized shaft under treat-

ment. Fig. 5 shows the face of hand-wheel W^2 , and shows its rim provided with a series of screw-threaded pin-holes, e , for the reception of the removable screw-threaded pin W^3 .

5 N is a lever fulcrumed on shaft L^2 , and having weight W^4 at its outer end and resting on pin W^3 . This weight and lever mechanism is for the purpose of automatically turning up the screws B^3 B^3 to hold the feed-rolls A A' to
10 their work on a variable-sized shaft under treatment.

The pin W^3 may be placed in any one of the holes e to hold the lever in a horizontal position, as shown in said figure, to operate the
15 screws B^3 B^3 , as stated; but, if desired, the lever N may be disengaged from said pin, as shown in Fig. 6, so that said lever may hang from shaft L^2 , and not operate, as stated.

M is a hollow adjustable and interchangeable
20 anvil-bar arranged across and through said body H and between said feed-rolls in such manner as to support a shaft under treatment centrally between said rolls, and is capable of side adjustment by means of its slotted base, and may
25 have a vertical adjustment within certain limits by means of placing blocks under each end. This anvil is designed to be interchangeable for other anvils having faces of different widths, to accommodate it to shafts of different sizes
30 between said feed-rolls; and t is an inlet-pipe connected with said hollow anvil-bar for supplying it with water during the process of polishing a shaft, and perforations in the upper face of said bar permit the escape of water to
35 the feed-rolls and shaft under treatment.

T T are tables arranged one at either side of the machine and extending each way from and on a line with anvil-bar M and resting on inclined bases d , (see Fig. 1,) and are adapted
40 to be adjusted vertically and to the same plane of anvil-bar M by means of the screw T^2 , operating in a screw-threaded box of said table and rotated by means of the lever-wheel T^1 , secured on said screw and properly housed, as
45 shown in said Fig. 1. To the top of said tables are adjustably secured, by means of bolts in cross-slots of said tables, a pair of angle-iron guides, V V' , which guides are for the purpose of holding and properly guiding the
50 shaft under treatment, and are adjustable to accommodate them to any sized shaft. (See Fig. 4.)

O and O' are a pair of straightening-rolls arranged in adjustable bearings in the housings O^2 and O^3 , one at either side of the body H
55 of the machine, so that their axes will be on a line with the axes of the feed-rolls, and so arranged that their peripheries will engage a shaft under treatment, and are adapted to be
60 respectively adjusted laterally by means of screw and hand-wheel mechanisms O^4 and O^5 , as shown in Fig. 2. These rolls are for the purpose of operating in conjunction with the planishing-rolls for straightening crooked
65 shafts. (See Fig. 13.)

R and R' are guide-rolls, a pair arranged

one at either side of the body H in suitable sliding boxes in the housings R^2 and R^3 , and respectively have lateral adjustment by means of the screw and hand wheel mechanisms R^4 and R^5 , and are arranged in such manner that their lower faces are of the same plane as the table-tops T T , so that each pair will respectively engage a shaft under treatment as it lies on the table. (See Figs. 1, 2, and 10.)
70 Said sliding boxes and the devices for operating them are of the ordinary pattern, not involving any invention in themselves, and not necessary to be further illustrated or described.
80

D D' represent a pair of emery grinding and polishing wheels, arranged, respectively, in the housings R^2 R^3 in such manner as to engage and treat a shaft on its side opposite the angle between said guide-rolls. Said housings are respectively secured to said tables T , and are adjusted therewith in order to maintain the relative position of the said guide-rolls and emery-wheels with said tables. The shaft to be treated is entered in between the
85 rolls A A' , and is firmly gripped by one of the rolls, A' , being screwed tight up against it, so as to hold the shaft tight between the said two feed-rolls. On motion being imparted to the said rolls the shaft is drawn in between
90 them and fed out on the opposite side at a speed due to the angle given the feed-rolls. When the shaft has passed to the end and it is desired to roll it back for extra finish, the rolls are skewed or swiveled to the reverse
95 angle, and should it be desired to treat the shaft at any part for a time—say at the ends—to remove "bends," the rolls are worked around until their axes lie in the same horizontal plane.
100

The shaft or bar under treatment may be
105 rolled backward or forward any number of times, according to the kind of finish wanted. To polish the shaft under treatment bright, the emery-wheel D is pressed firmly against the shaft as it is being drawn spirally through
110 the machine by means of the feed-rolls A A' . The said emery-wheel is driven at high speed by a belt applied to the pulley P , fixed on its shaft. While the shaft is making a quick
115 revolution but slow traverse, the said emery-wheel grinds it bright. The shaft passes on through between the rolls A and A' until it enters between the opposite guide-rolls R' R' and the emery-wheel D' , which grinds and polishes that part of the shaft not ground and
120 polished by the emery-wheel D . When the part of the shaft polished and ground by emery-wheel D , and thus diminished in diameter, reaches the rolls A and A' , the roll A' is automatically moved tight against said portion of
125 the shaft by means of the lever, weight, worm, and screw mechanism before described.

The shaft can be treated to the same operation on coming back by means of skewing the rolls in the opposite direction, as stated.
130

In order to determine whether a uniform diameter is maintained in the shaft while un-

der treatment, the machine is provided with index-pointers a^2 , working over plates or cords a^3 , and are actuated by means of an adjustable rod composed of the parts a and a' , adjustably secured together by means of a thumb-nut and bolt, a^5 . The lower ends of said rods are made of hardened steel, or preferably fitted with a black diamond resting on the shaft being ground. Any variation in diameter of the shaft will cause the pointer to move to either side, which side movement, seen by the attendant, indicates to him the amount of necessary traverse and corresponding treatment of the bar or shaft by the emery-wheels to bring it to the required uniform diameter throughout its length. Weights g press on the top of the index-rod to keep it hard against the shaft; but springs may be used for said purpose, if desired. A rigid support, m , is created overhead to carry the fulcrum-bracket d' for the index-pointer.

The position of the index-pointer and card or plate may be altered from that shown to suit requirements, and the emery-wheels and

guide-rolls may be arranged in any suitable position to suit circumstances.

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

1. In the machine shown and described for treating metal bars, as specified, the combination of the feed-rolls $A A'$, rolls $R R'$, straightening-rolls $O O'$, grinding and polishing wheels $D D'$, table T , anvil-bar M , and index-pointer a^2 , having the adjustable rods $a a'$, substantially as and for the purpose set forth.

2. In the machine shown and described for treating metal bars, as specified, the combination of the feed-rolls $A A'$, rolls $R R'$, straightening-rolls $O O'$, grinding and polishing wheels $D D'$, table T , and anvil-bar M , substantially as and for the purpose set forth.

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