(No Model.) 8 Sheets—Sheet 1.

A. & F. SCHNEIDERLOCHNER.

MACHINERY FOR THE MANUFACTURE OF EYE BARS.

No. 361,188. Patented Apr. 12, 1887.

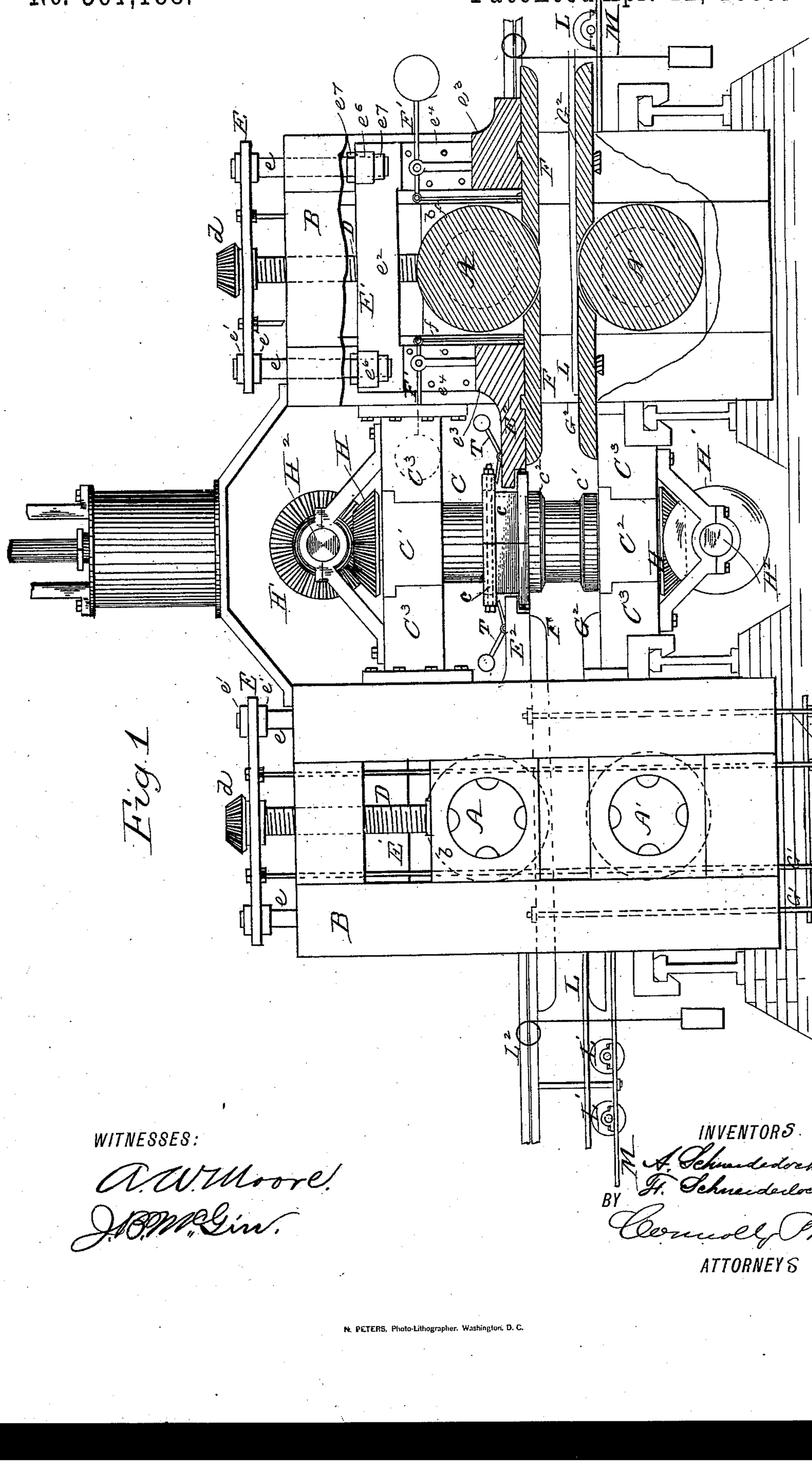

Fig. 1

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MACHINERY FOR THE MANUFACTURE OF EYE BARS.

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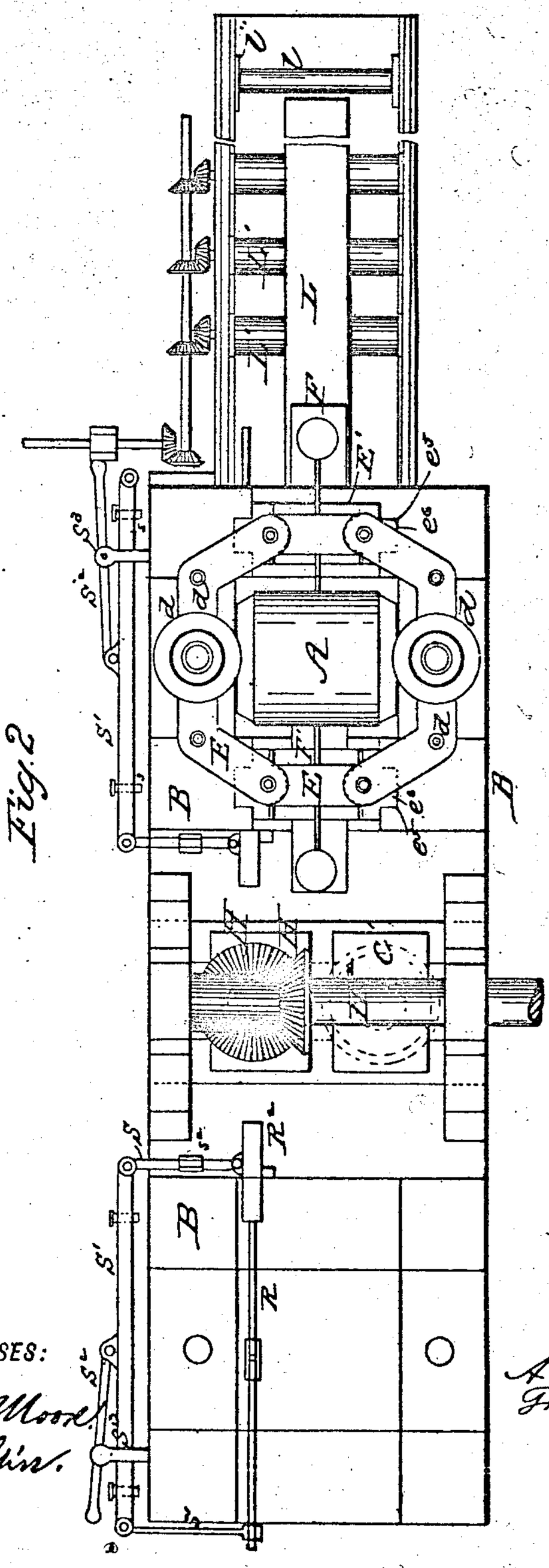

Fig. 2.

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MACHINERY FOR THE MANUFACTURE OF EYE BARS.

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Fig. 3

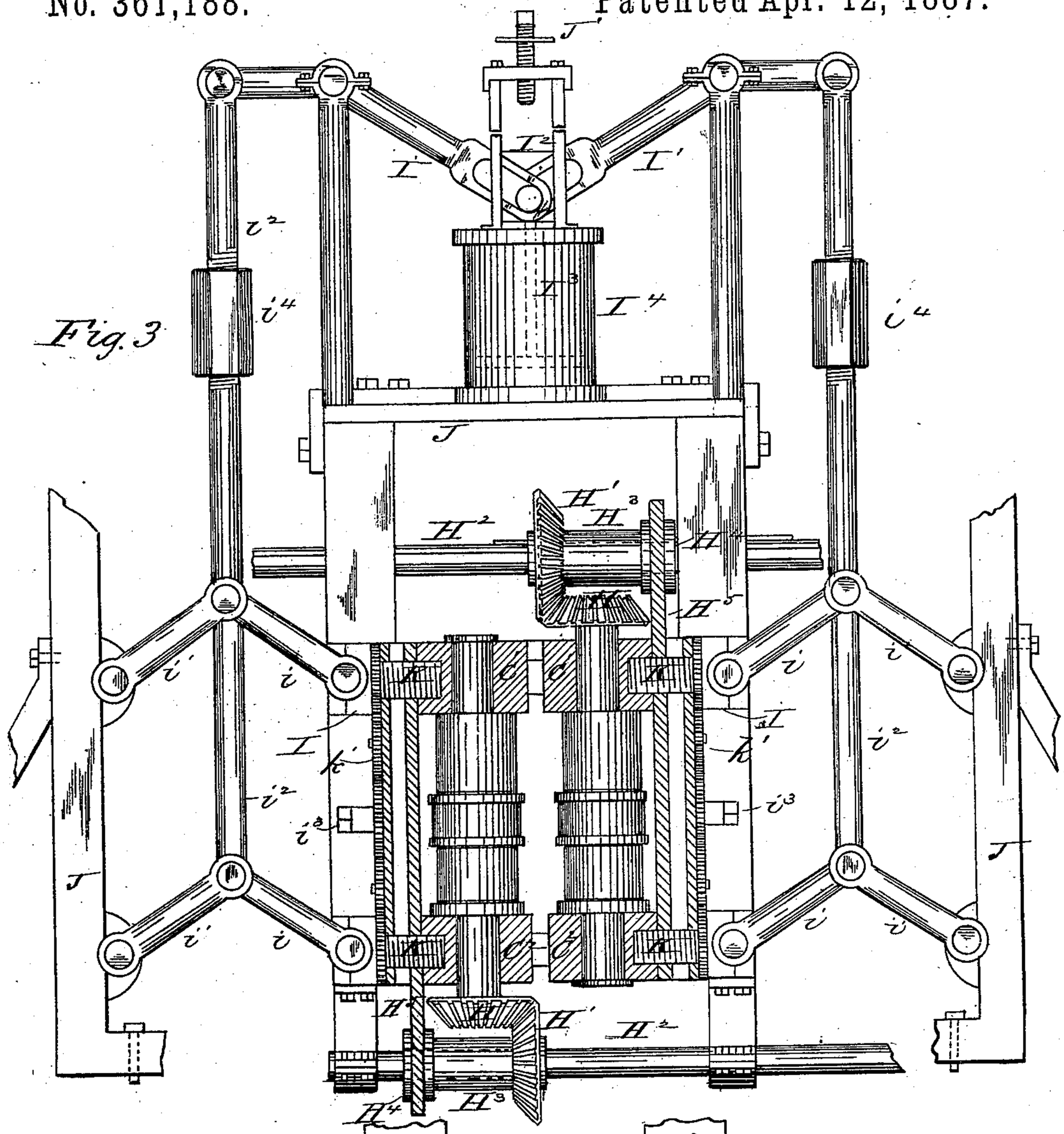
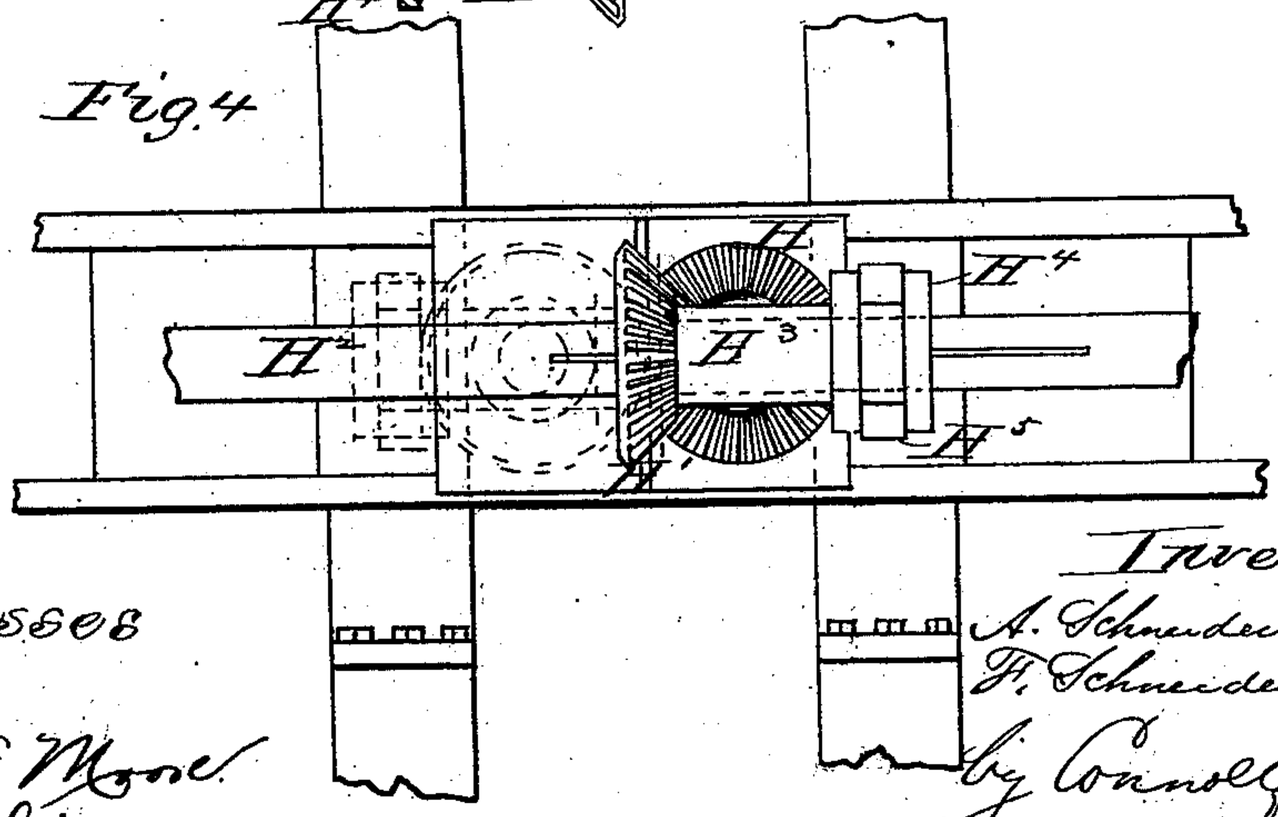


Fig. 4



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(No Model.) 8 Sheets—Sheet 4.

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MACHINERY FOR THE MANUFACTURE OF EYE BARS.

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Fig. 5

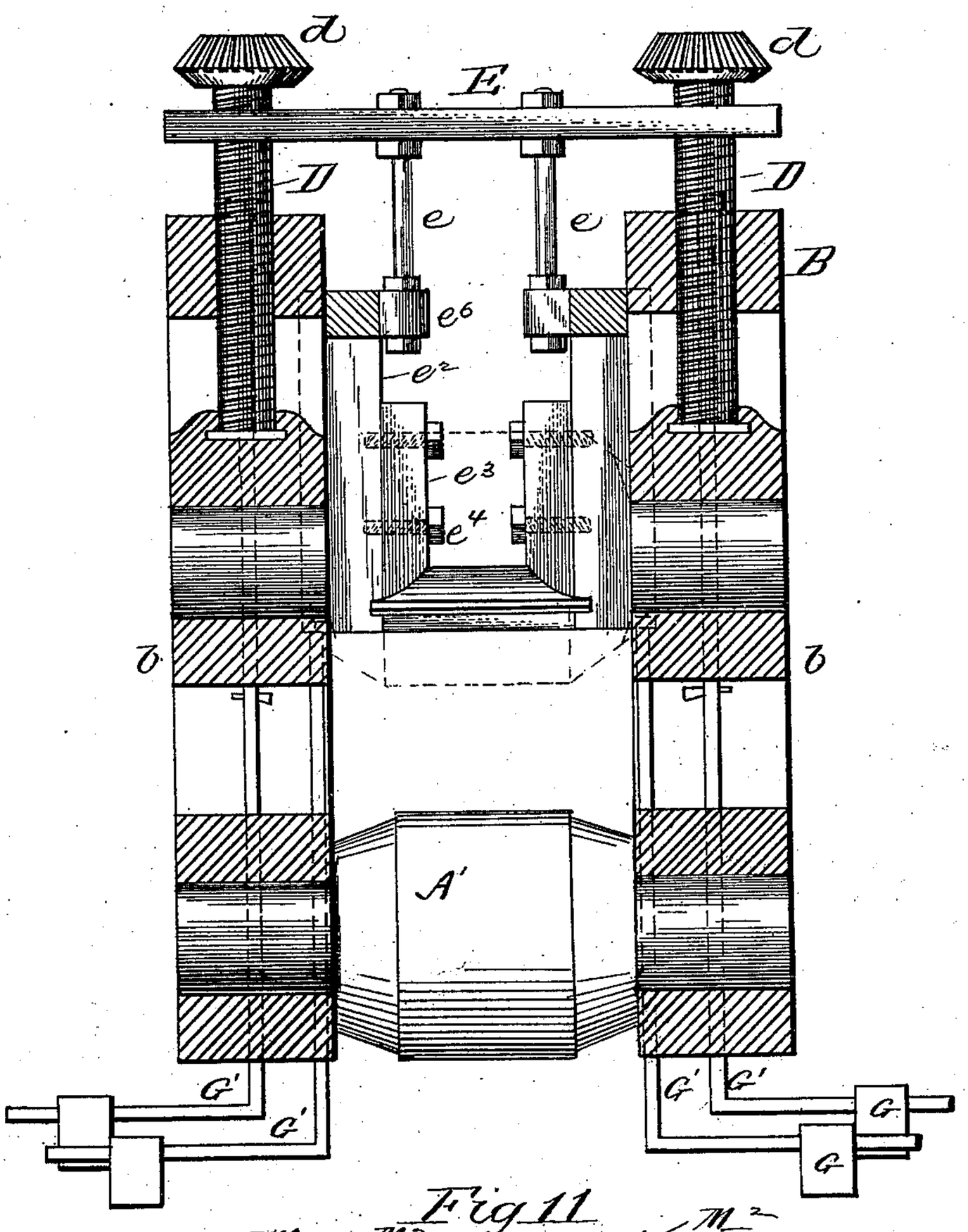
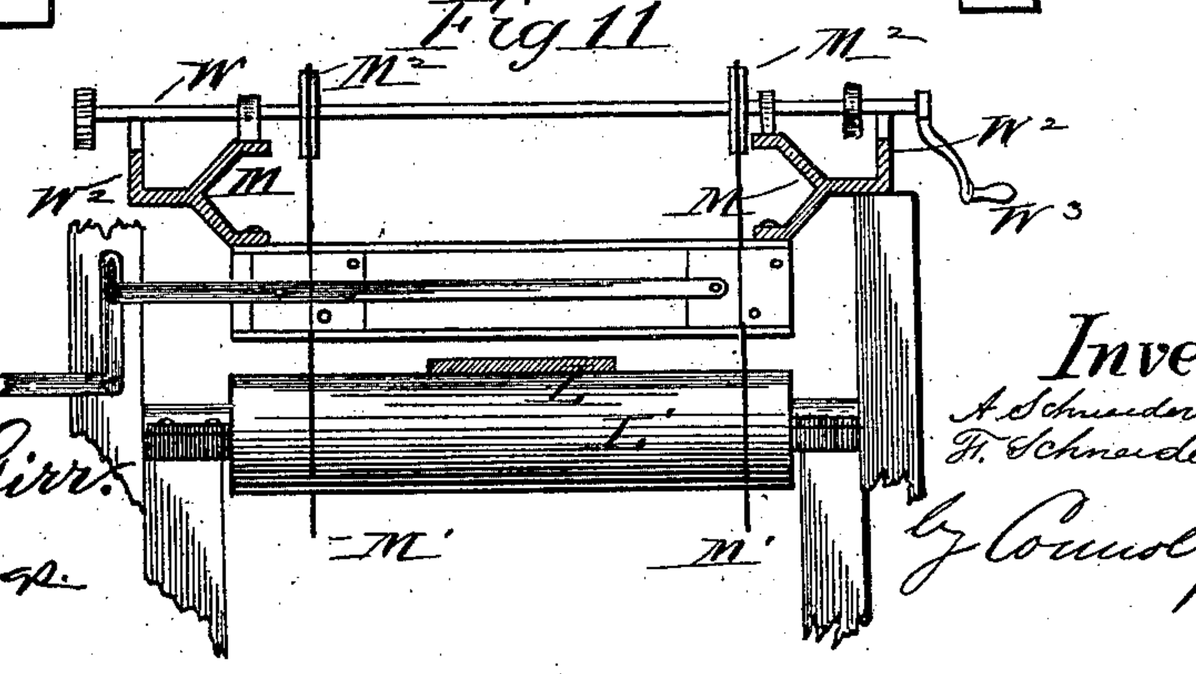


Fig 11



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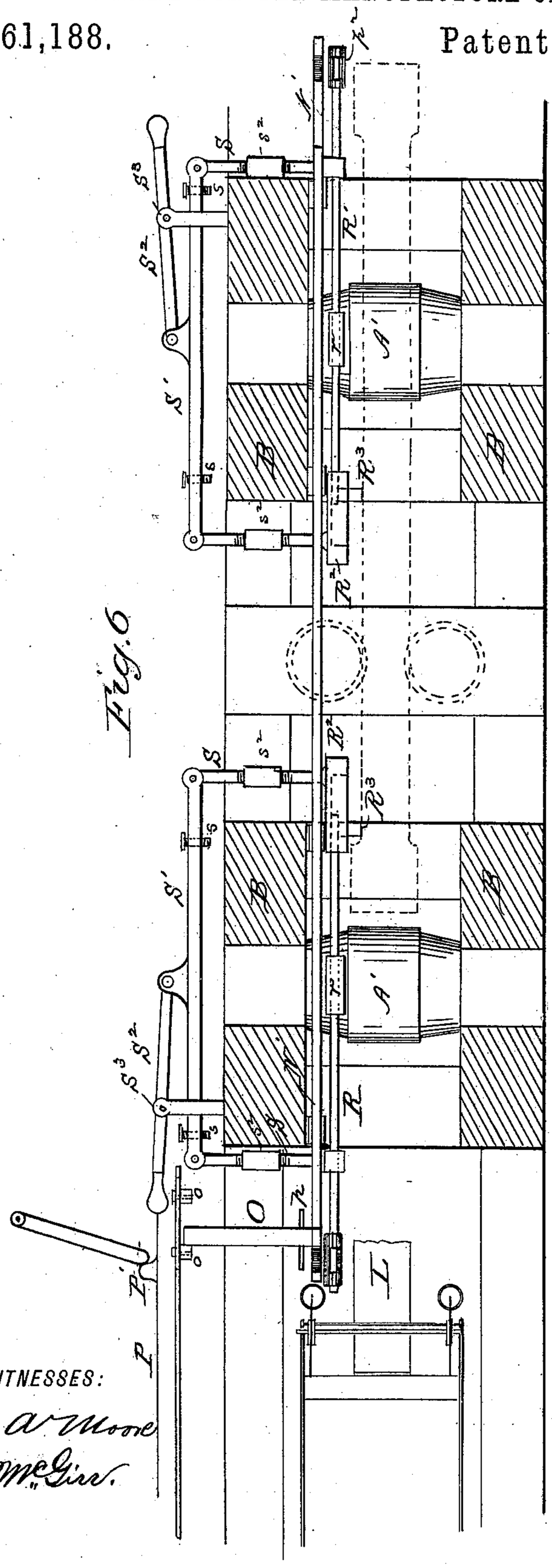

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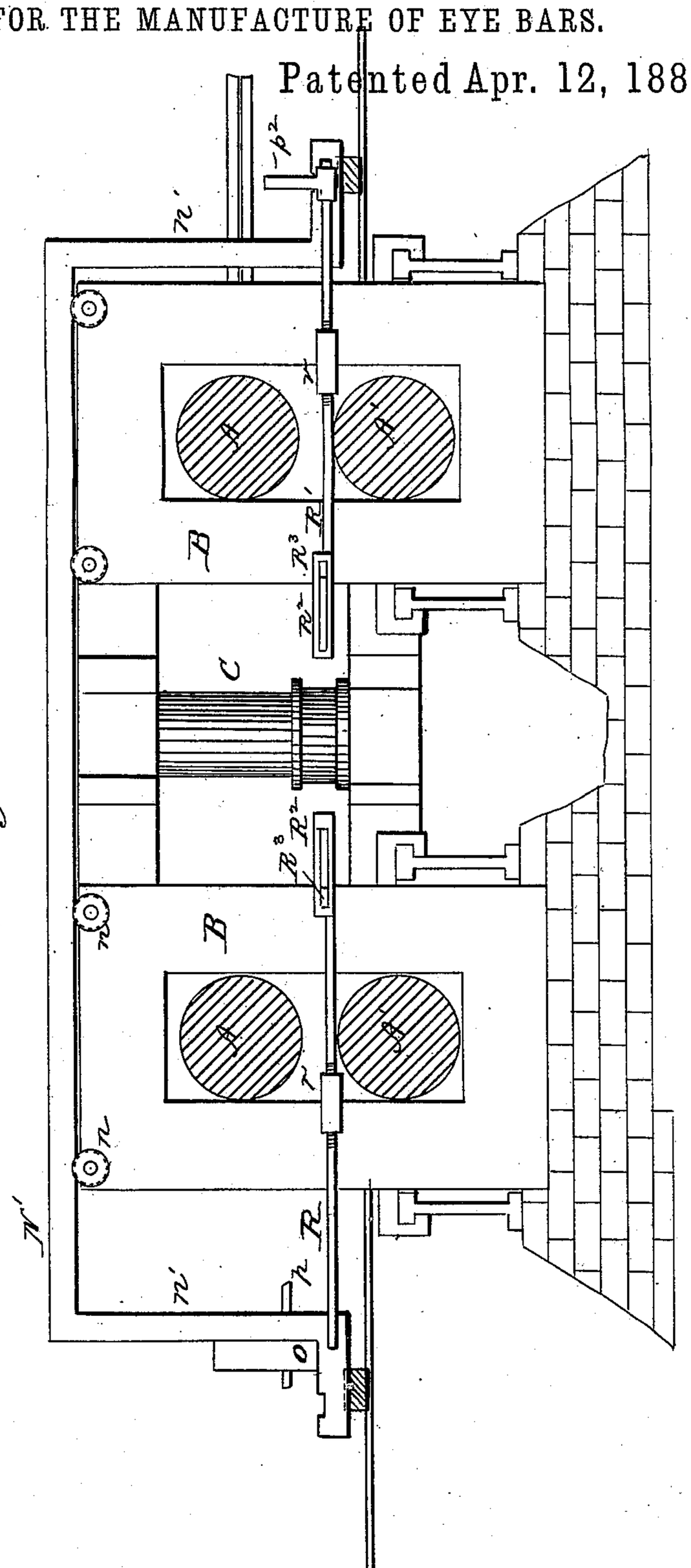

Fig. 1.

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MACHINERY FOR THE MANUFACTURE OF EYE BARS.

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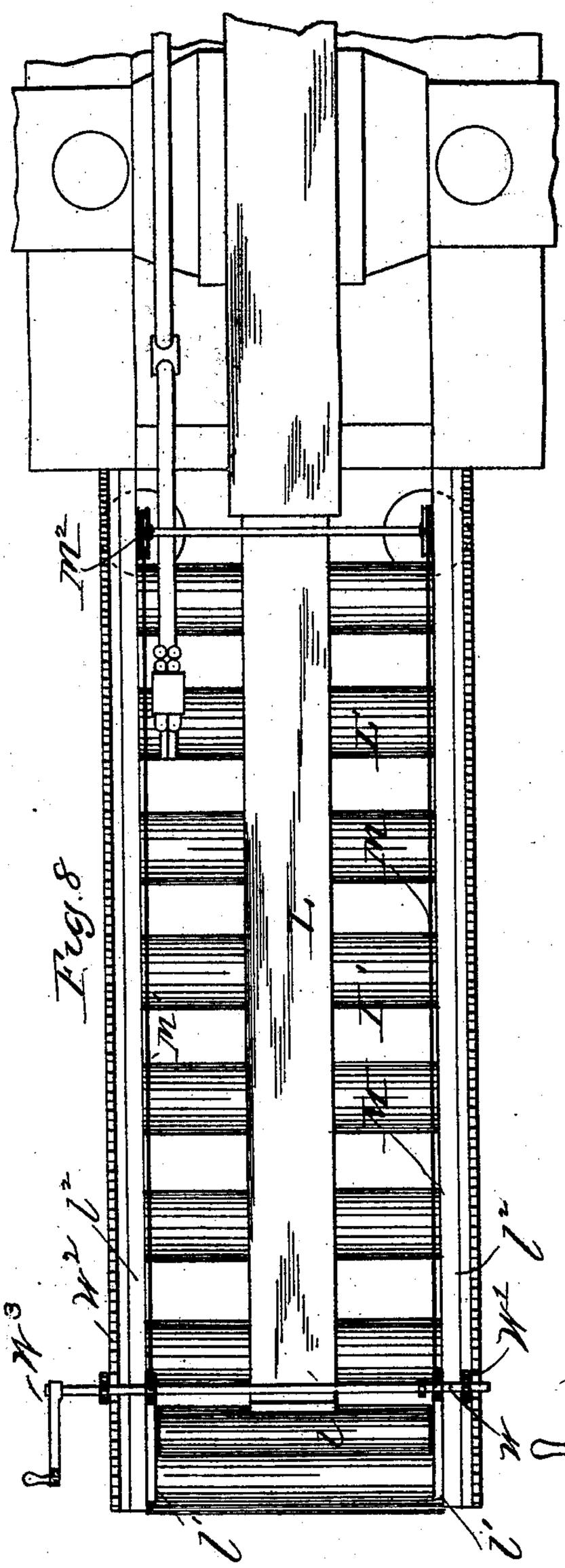

Fig. 8.

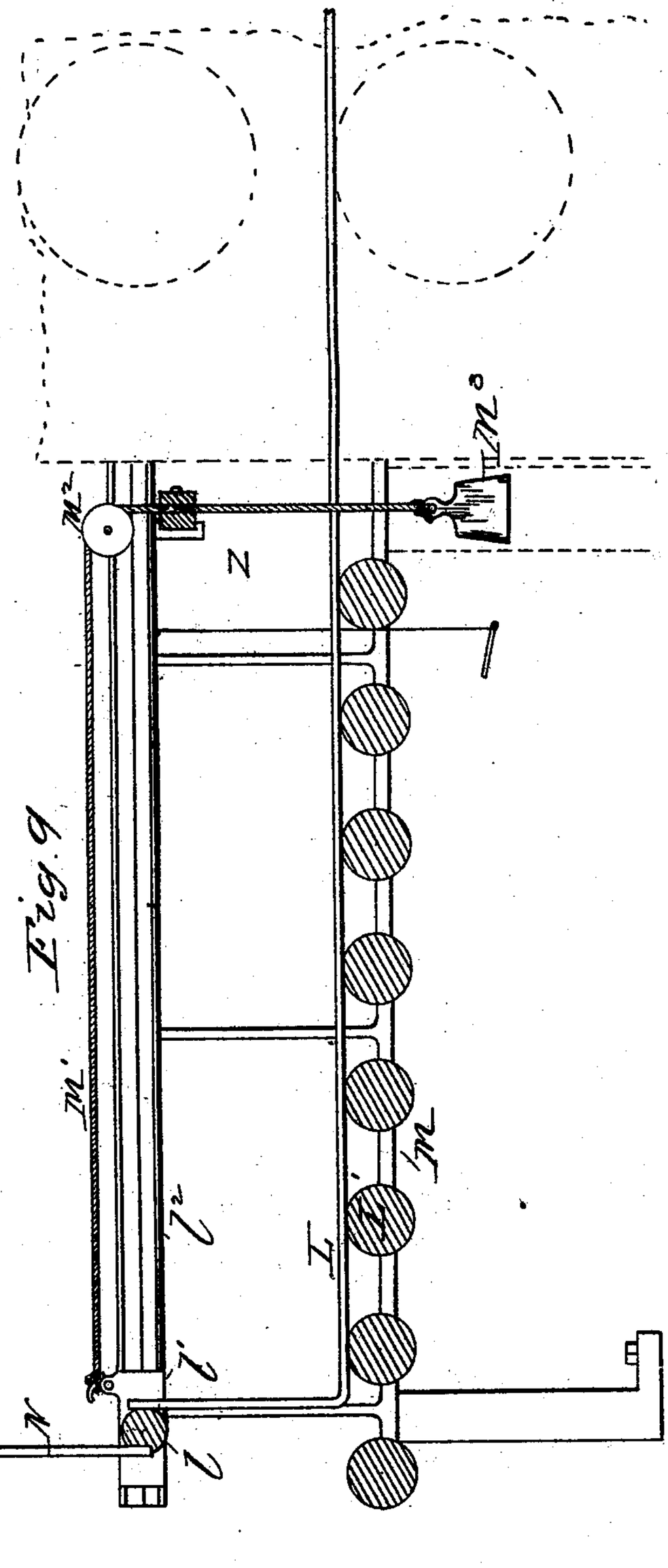

Fig. 9.

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MACHINERY FOR THE MANUFACTURE OF EYE BARS.

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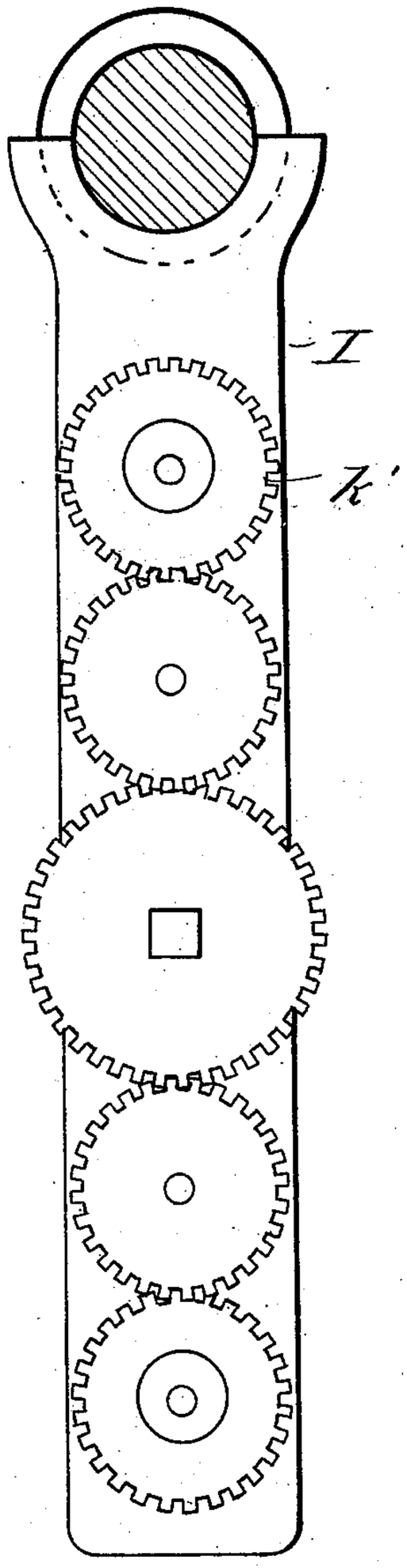
Fig. 10



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UNITED STATES PATENT OFFICE.

ANTONY SCHNEIDERLOCHNER, OF MILLVALE, AND FRANK SCHNEIDERLOCHNER, OF PITTSBURG, PENNSYLVANIA.

MACHINERY FOR THE MANUFACTURE OF EYE-BARS.

SPECIFICATION forming part of Letters Patent No. 361,188, dated April 12, 1887.

Application filed September 9, 1886. Serial No. 213,122. (No model.)

To all whom it may concern:

Be it known that we, ANTONY SCHNEIDERLOCHNER and FRANK SCHNEIDERLOCHNER, citizens of the United States, residing, respectively, at Millvale and Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Machinery for the Manufacture of Eye-Bars; and we do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification.

This invention has relation to the manufacture of eye-bars for bridges, and has for its object the provision of novel methods and mechanical appliances for producing eye-bars in an expeditious and economical manner, and without in any way impairing the tensile strength or quality of the iron.

In the manufacture of eye-bars it has heretofore been customary to first shape and reduce the shank by forging or otherwise, and then, after reheating, to form or weld the heads or eye parts. The effect of these separate operations has been to destroy the uniformity and homogeneous property or quality of the iron, rendering it of insufficient strength at the eyes or heads and uneven in its structure, thus greatly impairing the value and efficiency of the bars and rendering their sustaining and resisting qualities uncertain.

Our invention contemplates the manufacturing of eye-bars by a continuous process of rolling, wherein the blank is reduced to the proper dimensions, and the shank contraction and head or eye enlargement formed in and by one continuous operation and by reciprocating passes between horizontal and vertical rolls.

Our invention accordingly consists in the novel steps or processes of rolling, shaping, and gaging, hereinafter described, and in the novel construction and arrangement of mechanical appliances for carrying said invention into practical effect.

The apparatus embodying our invention comprises, essentially, two sets of horizontal rolls and an intermediate pair of vertical rolls, the former being employed in reducing the blank to proper thickness, while the latter serve to diminish the bar laterally, so as to form the shank.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of the principal feature of the rolling apparatus with appurtenant parts. Fig. 2 is a plan view of the same, omitting certain parts of the superstructure. Fig. 3 is a vertical transverse section through the housing or supports of the vertical rolls and to one side of the mechanism, whereby the latter are adjusted. Fig. 4 is a plan view of that portion of the mill wherein are situated the vertical rolls. Fig. 5 is a transverse vertical section through the housings of one pair of horizontal rolls. Fig. 6 is a horizontal section or skeleton view of the mill, showing the mechanism for gaging the length of the pass and causing a reversal of the operations. Fig. 7 is a skeleton view or vertical longitudinal section through the mill to further illustrate the features shown in Fig. 6. Fig. 8 is a plan view, and Fig. 9 a vertical longitudinal section, of one of the feed-tables, located at either end of the mill, upon which the blanks are laid and fed to the mill. Fig. 10 is a detail view of train of gearing for adjusting the vertical rolls. Fig. 11 is a vertical transverse section through frame of feed-rollers.

The "mill" or apparatus embodying our invention is operated by any appropriate reversing-engine, and as the rolls perform their work of reducing and shaping the bars the engine is automatically reversed at the end of each pass, the length or duration of these passes being gaged and controlled so that the bar will be not only of the proper shape, but of the proper dimensions and proportions.

In the drawings, A A A′ A′ designate the horizontal rolls, suitably mounted in housings B B, and arranged in pairs, one roll above the other. The two pairs are located a sufficient distance apart to accommodate the vertical rolls C C, situated between the housings of the horizontal rolls.

Of the horizontal rolls the lower roll of each pair is journaled in stationary bearings, while the upper roll is mounted in vertically-sliding boxes or blocks *b b*, which allow said upper

rolls to be raised and lowered according to the progress of the work.

The upper rolls, A A, are lowered and raised through the medium of the vertical adjusting-screws D, which pass through threaded openings in the upper part of the housings and carry beveled pinions *d d*, through which power is communicated from suitable power-shafts and engaging-pinions. The lower ends of the screws D are swiveled in or upon boxes or blocks *b b*, so that the latter move with the screws.

The two screws D of each upper roll are connected above the housings by a metallic skeleton frame, E, of octagon shape, and connected to said frame by nuts *e'* are the elongated bolts or rods *e e*, which depend between the sides of the housings and are secured at their lower ends to an adjustable frame, E', the purpose of which will be hereinafter explained. The frame E' is composed of four ⊔-shaped sections, e^2 e^2 e^3 e^3. The sections e^2 are inverted or ⊓-shaped and straddle the axis of the upper roll, while the sections e^3 lie with their horizontal portions parallel with the axis. The legs or limbs of section e^2 are bolted to the limbs of sections e^3, as shown at e^4. The inner surfaces of the housings are grooved, as shown at e^5, to receive the tongues e^6 on the corresponding surfaces of the sections e^2, which slide up and down according as the upper roll is adjusted. On their inner surfaces and at their upper portions the sections e^2 e^2 are formed with bosses e^6, to receive the supporting-rods *e*, which are secured thereto by nuts e^7. The boxes of the upper rolls and the frames E' are thus coupled together, so as to insure uniform and steady conjoint action. The guides F F, below the upper rolls, are supported against the under surfaces of the frame E' by means of weighted levers F' F', fulcrumed upon the sections e^3 of the frames E', and connected to said tables by vertical pivoted connecting-rods *f f*.

To relieve the weight of the upper rolls and of the frames E', counterbalancing-weights G are employed and connected with the levers thereof, made through suitably-arranged rods G' G', coupled to the frames E' E' E E, as shown. The lower rolls are provided with the stationary guides G^2 G^2, supported by the housings or framing of the mill. The vertical rolls C C, situated between the two pairs of horizontal rolls, are journaled in adjustable blocks or boxes C' C^2, which are supported by and adapted to slide between guides C^3, secured to and between the housings of the horizontal rolls.

The vertical rolls are provided with flanged adjustable collars *c c*, by which the vertical depth of the pass between them is regulated, such adjustment being effected automatically, and according as the bar or blank is reduced in thickness by the horizontal rolls. These collars are respectively embraced by yokes, each made in two sections, bolted together as shown.

Each vertical roll is provided with a stationary flange, *c'*, at its base, and the pass for the shank of the bar is between the collar or flange *c'* and the flange c^2 on the base, and forming a part of the sliding collar *c*. The flanges *c' c²* are slightly beveled, to facilitate the passages of the bar and reduce the abruptness of the angles thereof.

The adjustment of the collars *c c* is effected through the medium of the frames E', the inner sections, e^3, of which are formed or provided with extensions E^2, which engage with the flanges of said collars, and which, when the frames E' are raised or lowered, correspondingly raise and lower the collars, thus always maintaining correspondence and uniformity in depth between the passes through the respective rolls, in order to prevent the collars on the vertical rolls from sagging or binding. When it is necessary to adjust the upper horizontal rolls separately, weighted levers T, supported on extensions E^2, are employed to sustain said collars in horizontal position under all conditions.

The vertical rolls are operated through the medium of beveled gear-wheels H H', and in order to admit of the use of sufficiently large gear-wheels, while allowing the rolls to be adjusted close together, we place one of the pinions, H, upon the upper end of one roll and the other pinion upon the lower end of the other roll, and drive each roll from a separate horizontal shaft, H^2. If the pinions were both on the upper or lower ends of the vertical rolls, it would be necessary to use comparatively small pinions, which would lessen the power, and these would have to have small shafts, which would necessarily be weak and inefficient.

The lateral adjustment of the vertical rolls requires certainty and delicacy of operation, and the requisite movement is obtained by the use of the appliances shown in Fig. 3.

As before stated, the vertical rolls have their bearings in sliding or adjustable blocks C' C^2, by the movement of which the rolls are brought toward or separated from each other. The guides which carry these blocks also support the upright adjustable frames I I, to which are pivoted near their upper and lower ends the toggle-arms *i i*, matching the arms *i' i'*, and pivotally connected to the vertical rods or beams i^2 i^2. The arms *i' i'* are pivoted to stationary frames J. The beams i^2 at their upper ends are linked to the levers I' I', which are slotted lengthwise at their inner ends and coupled to the head piece or slide I^2 of a piston-rod, I^3, the piston of which works in a vertical steam-cylinder, I^4, located upon a frame, J, above the vertical rolls, as shown. By the rise and fall of the piston, the play of which may be regulated by adjusting-screw J', the admission of steam to the cylinder being under perfect control, motion is communicated through the several connections to the rods i^2, and from them through the toggles to the frames I I, moving the latter inwardly or out-

wardly, according to the direction of movement of the piston. The slides or frames I I are connected to the bearing-blocks C' C^2 by the horizontal set-screws K K, which fit threaded sockets in the blocks and operate so as to cause said blocks to move with frames I I. The frames or slides I I have journaled to them each a train of gear-wheels, k' k', each train or set consisting, say, of five wheels in vertical line, with their axes horizontal. The screws K K are keyed to the outmost wheels of the train, and turn with the latter, so as to admit of an adjustment of the vertical rolls independently of that obtained through the movement of the toggles and their connections. The middle wheel of each train has a square arbor, i^3, to receive a key or crank, by which, when necessary, the train is operated and the vertical rolls adjusted. The purpose of this adjustment will be hereinafter explained.

The gearing by which the vertical rolls are driven is necessarily adjusted to correspond with that of the rolls, and hence the gears H' upon the horizontal shafts H^2 are secured to sleeves H^3, having grooved collars H^4 to receive the forked ends of vertical bars H^5. The horizontal shafts are splined or feathered, and the sleeves H^3 correspondingly grooved, so that these parts turn together, notwithstanding the sleeves are free to move lengthwise of the shafts. The bars H^5 are each secured to an upper and lower bearing-block, C' C^2, of one vertical roll, and move with said blocks, so that as the latter are adjusted the proper relation of the intermeshing gears will be maintained.

The rods i^2 i^2 are each divided in two, and the members connected by a double nut, i^4, by which the rods may be lengthened and shortened when it is desired to change the normal position of the frames I, or regulate the adjustment or lateral movement of the vertical rolls to suit the various dimensions of the eye-bars to be produced.

It will be understood that the depth of the "break-in," or the amount of diminution or reduction to be given to a blank in order to produce the shank, will generally depend on the length, width, and other dimensions of the blank, while in other cases bars or blanks of the same or a given length and width will have to be differently and variously reduced. If, for instance, the width of the blank be, say, fourteen inches, and it is required to reduce it by breaking-in or rolling laterally, so as to have a shank of, say, seven inches, then the vertical rolls will have to be adjusted gradually from an extreme separation of fourteen inches to the minimum distance apart of seven inches; or, in other words, each vertical roll will have a lateral progression or movement of three and a half inches inwardly. Now, the amount or distance which the roll so moves will depend upon the adjustment of the rods i^2 i^2 with reference to the toggles. When the vertical rolls are at the outer extremity of their lateral movement, the rods i^2 are raised, the piston is at the bottom of the cylinder, and the toggles are raised at their inner ends or points of connection with the rods i^2 i^2, the angle at which the toggles stand depending upon the length to which the rods i^2 i^2 are adjusted.

The stroke of the rods i^2 i^2 is just sufficient to bring the toggles in horizontal lines, and, being always the same, the lateral movement of the frames I and of the vertical rolls will depend upon the angle of the toggles at the beginning of the stroke—that is to say, the more abrupt the angles of the toggles with the rod i^2 the greater will be the lateral movement of the vertical rolls. It will be understood from this that if from a lateral movement of the vertical rolls of, say, three and a half inches, it is desired to increase the movement to, say, four or five inches, then the rods i^2 must be shortened, while if it is desired to reduce this lateral movement to, say, three or two inches, then the rods i^2 must be lengthened. The adjustment of the rods i^2 does not, however, in any way affect or regulate the lateral dimensions of the shank of the eye-bar, as with such adjustment the limit of inward movement of the rolls would remain always the same, and no matter how deep the break-in might be the shank would be of a given width—that is, say, seven inches. Now, in order to regulate this inward movement so that the shank may be rolled to any required width, notwithstanding the width of the bar, it is necessary to have an independent adjustment, and this is provided for by the use of the trains of wheels and their connections, as with these the rolls may be so adjusted as to come as close together as required. Thus, as will be seen, if from the conditions already described in diminishing a bar from fourteen to seven inches it is desired to reduce to, say, five inches or less, the trains of wheels are operated, and while the toggles are at their horizontal positions, the length of the rods i^2 remaining as before, the rolls are moved toward each other until the distance between their working surfaces is five inches or less, as the case may be. The shank would then be rolled to a width of five inches, the break-in on either side would be, say, three and a half inches, and the condition would be proper for the reduction of a bar of five inches by three and a half inches with ends three and a-half inches by twelve inches.

In rolling or reducing a bar or blank it is fed in from either end of the mill between the first pair of horizontal rolls, and in its reduction is reciprocated automatically until the full amount of reduction is obtained, the horizontal rolls first reducing the bar in thickness, after which the vertical rolls reduce it laterally between the heads or eyes in forming the shank. In making its passes the bar during the preliminary stage lies between the two gages L L. These consist of flattened bars of suitable length, one at either end of the blank, resting or riding on anti-friction rolls L' L', mounted in suitable framing, M, at the ends of

the mill. The outer extremities of the gages L L are turned up and fastened to transverse bars *l l*, which are journaled to slides *l'*, moving in guides *l²*, elevated on either side above the ends of the rolls L'. Ropes or chains M' M' are connected to the bars *l*, and, passing over pulleys M², carry counterbalancing-weights M³, which tend to draw said bars toward the mill and thus keep the ends of the gages L L against the ends of the eye-bar blank. As the latter is reduced it necessarily lengthens, and the gages adapt themselves to this elongation. While the gages L L, which are thinner than the blank, are being utilized they pass, respectively, to and fro between the horizontal rolls. These gages are only utilized at the beginning of the operation and until the bar is sufficiently broken-in to produce the shank on the eye-bar, after which they are drawn out from the mill and, by means of the levers N attached to the bars *l*, are raised up out of the way, the bar *l* turning on its journals in the slides *l'*.

In producing the automatic reciprocation of the blank, which is fed by the action of the rolls, it is necessary to reverse the engine at the end of each pass, and this reversal is accomplished, first, through the action of the gages L, and afterward through the action of other gages, which will be presently described.

N' designates a frame or bent bar, which extends over the mill lengthwise and to one side, and is mounted on rollers *n*. This frame has depending limbs *n'*, and one of these limbs is connected to a laterally-extending horizontal bar or arm, O, located beyond one of the housings of the horizontal rolls. A slide, P, located at a suitable distance from the mill and carrying a tappet or beveled block, P', is employed as the medium through which the lever of the engine is operated to cause the latter to reverse motion at proper intervals—*i. e.*, just at the completion of each pass. The slide P is operated from and by the frame N' and the bar or arm O, which latter at its extremity plays between the adjustable stops or blocks *o*, attached to the slide P.

Now, when the gages L are being utilized at the termination of each pass, one of the bars *l l* comes in contact with the adjacent limb of the frame N' and moves the latter, thus moving the arm O against one of the studs *o*, causing the slide P to be shifted, and the engine-lever thereby thrown over, whereby the engine is reversed. The operations of the mill are at once reversed and the blank and gages caused to make a return pass. When this is being completed, the frame N' is shifted in the opposite direction from that above described, and thus a counter reversal of the engine takes place.

Instead of having the bars *l* come in direct contact with the limbs of the frame N', the latter may be provided with horizontal adjustable pins *p*, and by adjusting the latter the periods of reversal nicely regulated. The blocks *o* are adjustable for a similar purpose.

As the blank during the reducing operation speedily increases in length, the gages L L soon become inefficient. They must be so adjusted at first that the reversals will take place while the vertical rolls are at a sufficient distance from the ends of the blank to leave the heads or eye parts intact, but are only used until the bar is reduced to the required width to form the shank, after which other gages are brought into use. The latter consist, essentially, of the horizontal rods R R', located between the horizontal rolls outside the working-surfaces of the latter, and so constructed and arranged that their inner ends play in recesses in blocks R² R². To the inner ends of the rods R R' are attached fingers or studs R³ R³, which project through slots in the faces of said blocks. The latter are located between the horizontal and vertical rolls, as shown, and are supported upon the inner ends of the bars S S, pivotally connected with horizontal beams S' S'. A lever, S², is connected to the center of each beam S', and has its fulcrum in a post, S³, so that by moving such lever the beam and the blocks may be moved into or out of position. They are in position—*i. e.*, in the way of the eye-bar—only after the gages L L have been disposed of. Screws *s s*, in the beams S', are used to limit the inward movement of the latter, and further adjustment is provided for by making the connections S S each in two threaded pieces coupled together by a take-up nut, *s²*. The rods R R' are also made each in two threaded sections coupled together by take-up nuts *r r*, by means of which the rods may be nicely adjusted to suit the length of the eye-bar and the period at which the reversals are to take place. Now, when the rods R R' and their connections are brought into requisition, the bar has been diminished to the width of the shank. The passes then being continued, the shoulder at one end of the eye-bar comes in contact with one of the fingers R³, and pushes the gage-bar a short distance. A connection having been previously made between the rod R and the frame N', by means of the pivoted dogs *p²*, attached to said rods, the movement given to the latter is taken up by the said frame and communicated to the slide P, so that at every pass the engine and consequently the operation of the mill is reversed. The gage R R' is adapted to all the conditions of the blank until its reduction is complete, as it operates correctly and at proper periods, while the eye-bar gradually elongates when the heads of the eye-bar come in contact with the gage, so that the heads remain intact—*i. e.*, without any lateral diminution.

The gage-bars L are drawn forward and backward when required either to bring them into proper relation with the eye-bar or to facilitate the displacement of the gages by means of the shafts W, carrying the adjustable pinions W', which engage with racks W² on the

guides l^2 when required. These shafts are attached to the bars l, so that when turned by means of their cranks W^3 they travel backward or forward, the pinions being in engagement with the racks. These shafts and pinions are only necessary for the withdrawal of the guides, as the weights and ropes serve to draw the gages forward. When not in action, the pinions are thrown out of gear with the racks.

A brake, Z, of any suitable character, is attached to the frame of the feed-table, and is employed to obtain a purchase on the ropes when it is desired to hold the gage and bar in any stationary position.

After the bar has been properly rolled, so as to produce the shank, it is laid upon a straightening-bed, allowed to cool, and the length then measured off and marked, after which the ends are reheated to a moderate degree, and the heads are cut or punched to give them their proper shape and dimensions. The heads are then placed in a suitable die or press and finished, so as to remove the fins, angles, or irregularities, and render all the surface smooth and even at the same time the eye is punched out.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an organized machine or rolling-mill for the manufacture of eye-bars, the combination, with two sets of horizontal rolls, of an intermediate set of vertical rolls adapted to roll and shape the shank of the eye-bar, one or more gages, and mechanism, substantially as described, for automatically reversing the operation of the mill at the completion of each pass.

2. In an organized machine or rolling-mill for the production of eye-bars, the combination, with two sets of horizontal rolls, of an intermediate set of vertical and laterally-adjustable rolls for the reduction of the shank of the eye-bar, with mechanism, substantially as described, for simultaneously moving said rolls inwardly, as set forth.

3. In an organized machine or rolling-mill for the production of eye-bars, the combination, with the horizontal rolls, one of which is adjustable, of a vertically-moving frame located between the housings of each pair of rolls, movable boxes or blocks in which said adjustable roll is journaled, screw-shafts and pinions through which said boxes or blocks are raised and lowered, a frame connecting said screw-shafts and supported thereby, and screw shafts or bolts connecting the two frames, whereby the latter are moved to correspond with the adjustment of the roll, substantially as described.

4. In an organized machine or rolling-mill for the production of eye-bars, the combination, with the horizontal rolls and with the vertical rolls for diminishing or rolling the shanks of said eye-bars, of flanged adjustable collars on said vertical rolls, and shifting mechanism connecting said collars with the devices through which the upper horizontal rolls are adjusted, whereby the adjustment of the latter and the movement of the collars are effected conjointly, as set forth.

5. In an organized machine or rolling-mill for the production of eye-bars, the combination, with the horizontal rolls and the laterally-adjustable vertical rolls having adjustable collars, as set forth, of mechanism, substantially as described, for automatically adjusting said collars to a height corresponding to that of the upper horizontal rolls.

6. In a machine or rolling-mill for the production of eye-bars, the combination, with vertical rolls adapted to form the shank of said bars, of sliding or movable blocks or boxes to which said rolls are journaled, sliding frames to which said boxes are connected, a steam-cylinder and piston from which power is transmitted to said frames, and intermediate mechanism comprising linked rods or levers and toggle-arms, substantially as described, whereby the movement of the piston effects the lateral movement of the frames and of both the vertical rolls simultaneously, for the purpose set forth.

7. In a rolling-mill, the combination, with laterally-adjustable vertical reducing-rolls, of mechanism for feeding said rolls predetermined distances, and mechanism for adjusting said rolls, so that said feed shall be within definite and variable limits, substantially as described.

8. In a rolling-mill, the combination, with laterally-movable vertical reducing-rolls journaled in sliding boxes, of correspondingly-movable feeding-frames coupled to the piston of an engine, and a system or systems of toothed gearing and adjusting-screws carried by or mounted on said frames, whereby said rolls may be adjusted to move within prescribed limits and through a prescribed field, as and for the purpose set forth.

9. In a rolling-mill, the combination, with vertical reducing-rolls, of a horizontal power-shaft for each roll and intermediate beveled gearing, the pinion for each roll being, respectively, on opposite ends, whereby a closer adjustment of the rolls may be obtained and larger pinions employed, substantially as set forth.

10. In a machine or rolling-mill for the production of eye-bars, the combination, with the reducing and shank-forming rolls, of primary gages, and reversing mechanism for regulating the travel of the eye-bar in the preliminary stages of the reducing operations, said gages being capable of displacement when not in requisition, substantially as set forth.

11. In a machine or rolling-mill for the production of eye-bars, the combination, with the vertical shank-reducing rolls and a longitudinally-moving frame, through which the engine is reversed and counter reversed, of a secondary gage constructed substantially as de-

scribed and adapted to be brought into position so that the shouldered portions of the eye-bar will alternately come in contact therewith, whereby as each pass is being completed the engine will be automatically reversed and the operations of the mill correspondingly reversed.

12. In a machine or rolling-mill for the production of eye-bars, the combination, with the rolls and the primary gages, of a series of rolls upon which said gages travel, and by which the blank or eye-bar is supported in being fed to the mill, a transverse bar or frame to which said gage is connected outside the mill, sliding blocks to which said transverse bar is pivoted, so that the gage may be lifted and lowered, guides in which said blocks move, and ropes or chains, pulleys, and weights, whereby the transverse bar and gage are drawn inwardly, substantially as described.

13. In a rolling-mill, the combination, with the horizontal rolls, of which the upper roll is adjustable, and with an adjustable frame located between the housings and coupled to the boxes of said roll, of a guide-table supported at the bottom of said frame by means of weighted levers attached to the latter, substantially as described.

In testimony that we claim the foregoing we have hereunto set our hands this 6th day of September, 1886.

ANTONY SCHNEIDERLOCHNER.
FRANK SCHNEIDERLOCHNER.

Witnesses:
A. A. MOORE,
THOS. A. CONNOLLY.