

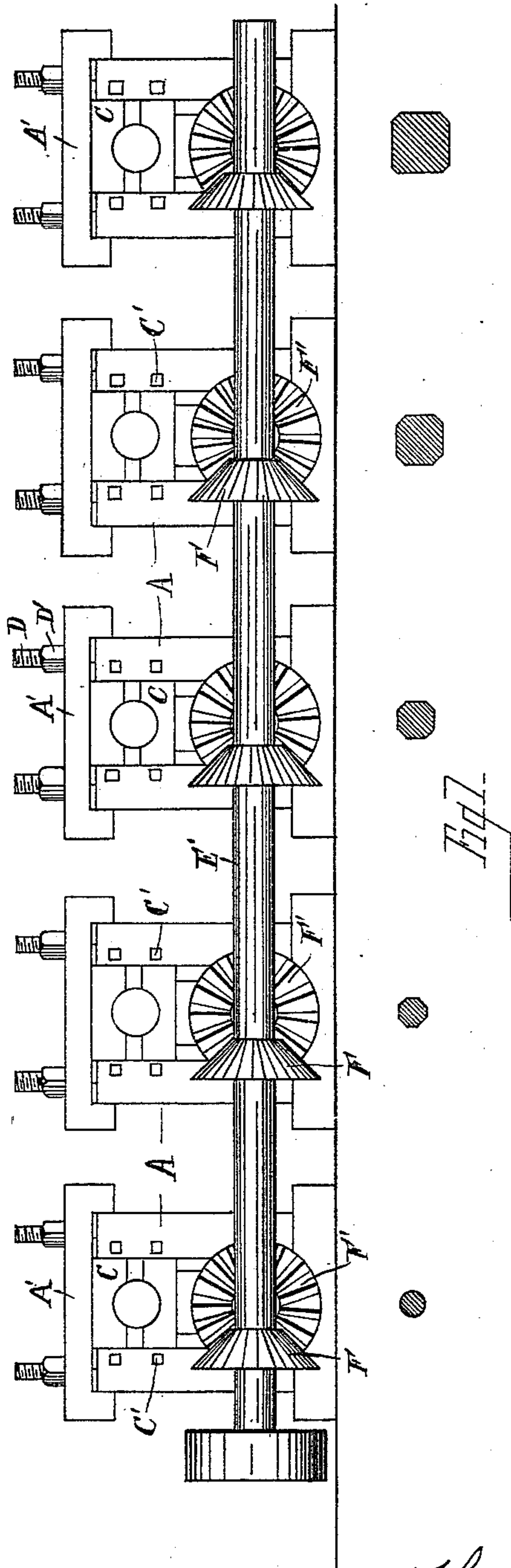
(No Model.)

3 Sheets—Sheet 1.

T. REED & J. ROWLEY.
ROLLING MILL.

No. 420,100.

Patented Jan. 28, 1890.



WITNESSES

Carroll J. Webster
Anna J. Lehanery

INVENTORS

Thomas Reed
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By William Webster
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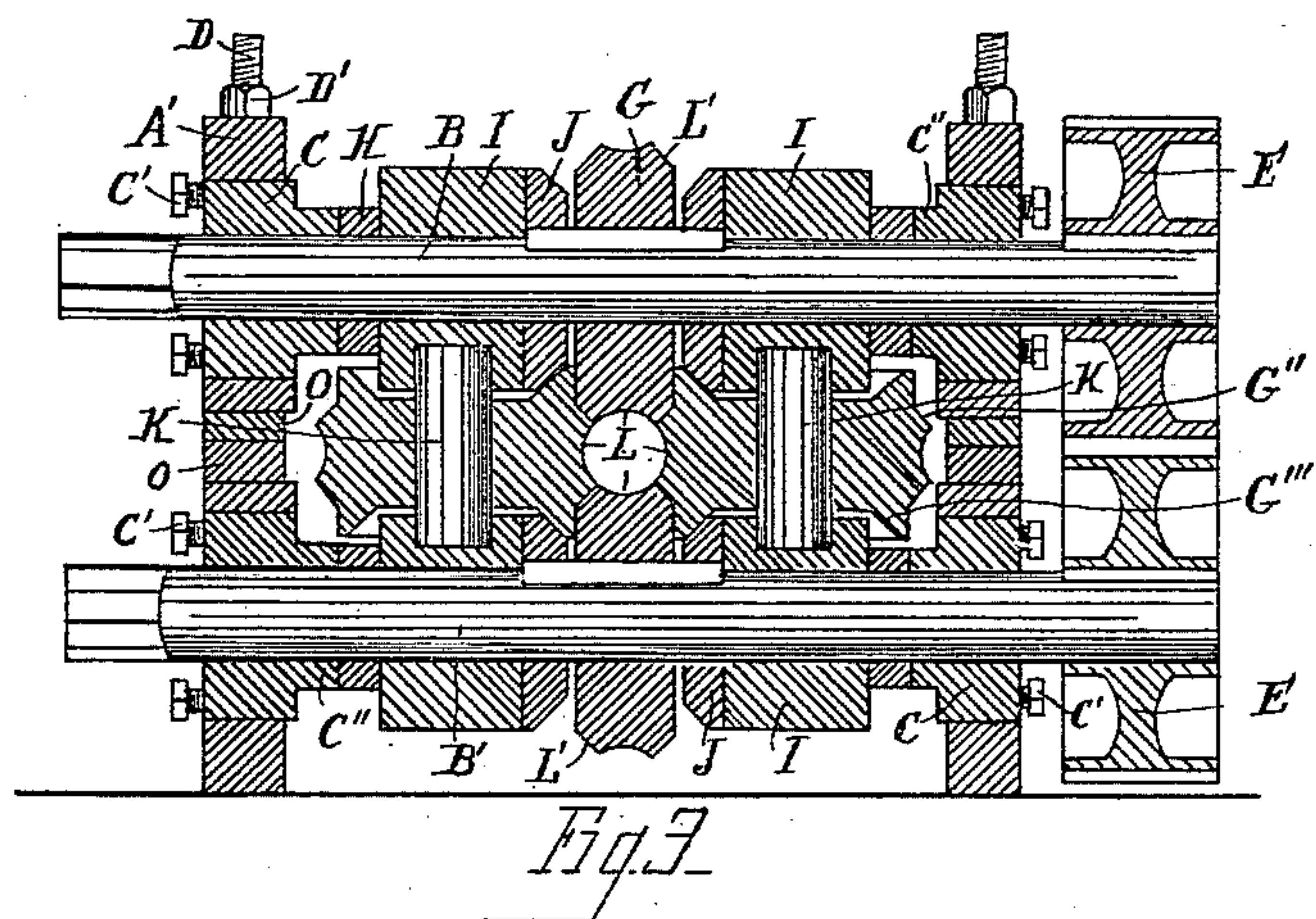
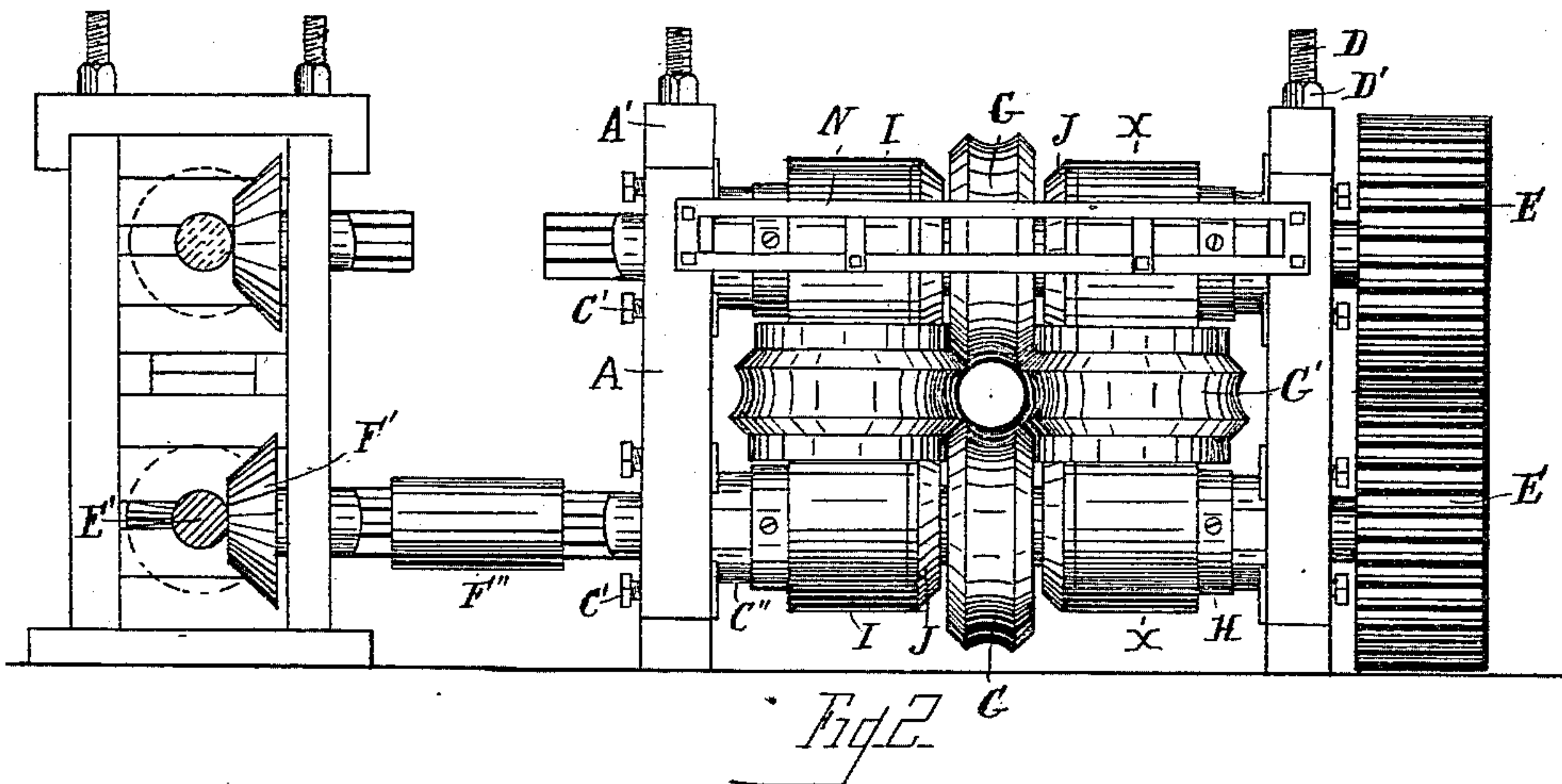
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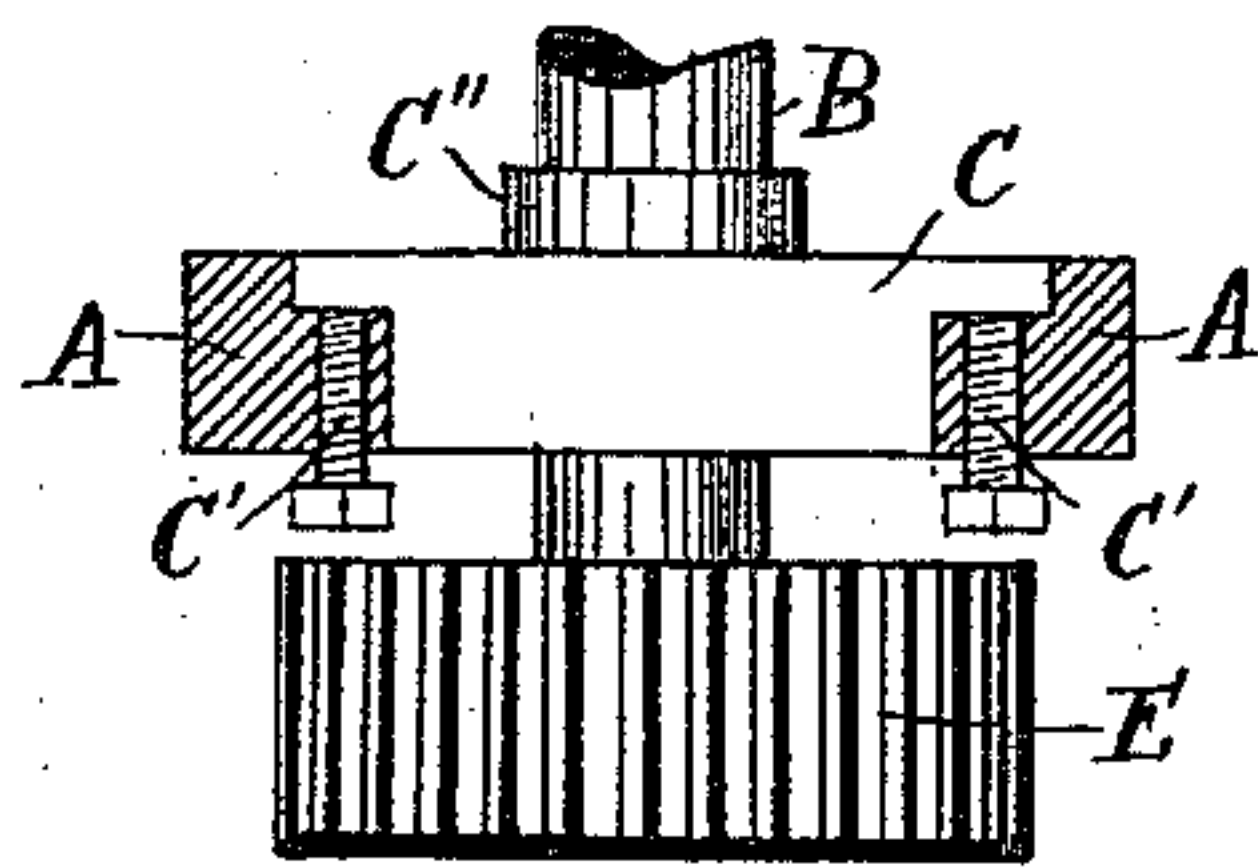


Fig. 4.

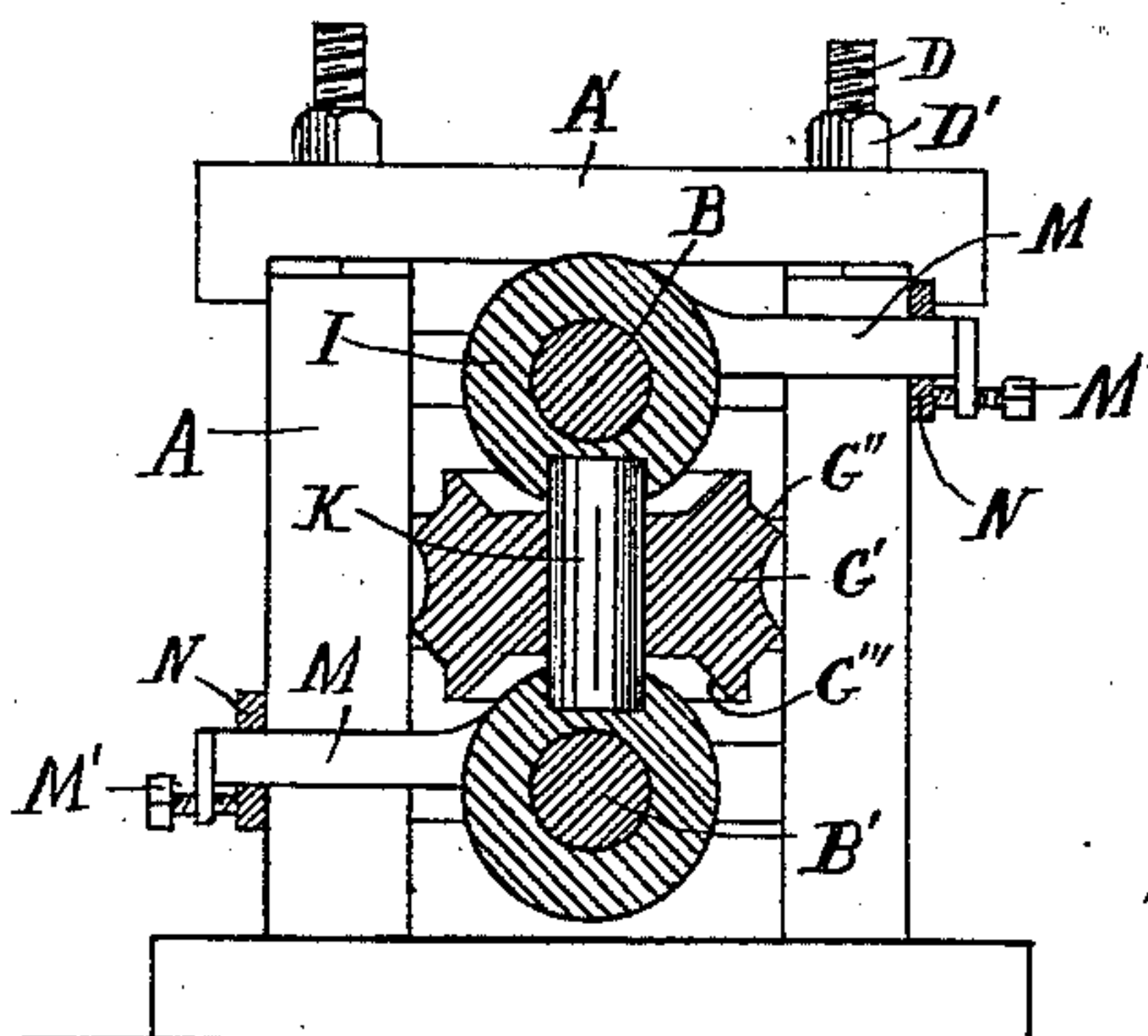


Fig. 5.

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UNITED STATES PATENT OFFICE.

THOMAS REED AND JOHN ROWLEY, OF TOLEDO, OHIO.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 420,100, dated January 29, 1890.

Application filed September 13, 1889. Serial No. 323,881. (No model.)

To all whom it may concern:

Be it known that we, THOMAS REED and JOHN ROWLEY, citizens of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Rolling-Mills; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to 10 which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

15 Our invention relates to a rolling-mill, and has for its object to construct a mill with removable and insertible dies whereby to form a bar of metal of any desired form from a pile or billet by a succession of reductions 20 through shaping-dies secured upon journals having a coincident axial plane, whereby the metal is compressed upon all sides at the same time while being reduced to the desired shape.

25 A further object is to provide a complete mill whereby the operation of forming a bar from a pile or billet shall be continuous, thereby rendering it impossible to produce a finished bar without necessitating reheating 30 or handling the same.

A further object is to drive a series of vertical and horizontal dies, each of which forms a segment or portion of a pass, through which the metal is shaped, with the axial center of 35 the journals or shafts upon which the dies are mounted in the same vertical plane.

A further object is to provide the peripheral frictionally-contacting sides of the driver and driven rolls that one set of dies may be 40 removed and another substituted, thereby allowing for forming a bar or plate of any desired size or form by simply arranging dies upon the journals or shafts of a segmental contour, to form when properly joined a pass 45 of the desired shape.

A further object is to provide means for compensating for wear upon the journals or shafts.

50 The invention consists in the parts and combination of parts hereinafter described, and pointed out in the claims.

In the drawings, Figure 1 is a side elevation of a series of pairs of rolls such as shown in elevation and section in Figs. 2 and 3, respectively, arranged side by side and receiving motion from a power-shaft geared therewith, this arrangement being a complete system by which to roll a pile, billet, ingot, &c., into a finished product by a continuous passage through dies of decreasing area, each 55 die approximating more nearly the desired form, as shown in the view beneath each roll, of a cross-section through the metal after having passed the same. Fig. 2 is a front elevation of a complete set of rolls or dies, showing 60 also the power-shaft and coupling-connection of the same with the shaft of the wall. Fig. 3 is a longitudinal vertical section of the same through the center thereof, with the power-shaft and housing omitted. Fig. 4 is 65 a detail view showing the housing for the shafts, with the annular projection thereon, and means for moving the same longitudinally upon the shaft. Fig. 5 is a transverse section through the mill on line *x x*, Fig. 2. 70 75

A designates a rectangular frame, in which are journaled an upper and lower shaft B B', respectively, in housings C, movable longitudinally of the journal by means of set-screws C', tapped through the frame and 80 bearing against the housings. The housings are also movable vertically upon the inner sides of the upright posts of the frame, and are held in adjustment by means of cap-plates A' of the frame, through which bolts 85 D pass, upon which are screwed nuts D', which bear upon the cap-plates. Each shaft is provided with a pinion E, which intermesh and cause a uniform revolution of the shafts, the lower shaft being illustrated as receiving 90 power from a main shaft E', upon which are keyed bevel-gears F, which intermesh with bevel-gears F', coupled with shaft B' by means of coupling F'', it being understood that, if desired, for the purpose of driving three hori- 95 zontal shafts, the shaft B may be the one coupled with shaft E'.

G and G' designate, respectively, a series of vertical and horizontal dies or rollers, four comprising a set to form a complete die, the 100 vertical rollers G being secured upon the shafts B and B' by means of a feather and

key, and are caused to move in the same vertical plane by means of annular projections C'' upon the housings C, which bear against collar H upon the shaft, each collar bearing against a sleeve I, loosely mounted upon the shaft, and bearing against a conical collar J, secured to the shaft in a manner to revolve therewith by means of the feather and key which secure the dies in position.

K designates short vertical shafts journaled in the sleeve-bearings I at right angles to shafts B and B', and upon which are mounted loosely horizontally-movable dies G', the axis of the vertical dies being in a coincident vertical plane with the axis of the vertical dies G. Dies G are formed with a groove L, centrally of the width of the same, of any desired form in cross-section. As shown in Fig. 1, by the cross-sectional view of the bar they may vary from a filleted square of any size to receive a pile, billet, ingot, or bloom to a true circle of any diameter. The outer edges L' are preferably mitered to cause each die to closely join to prevent forming a fin upon the bar, thereby obviating one great objection to the present form of rolling.

Each horizontal die G' is formed with a central groove corresponding with the groove in the dies G, and with a mitered portion G'', corresponding with the miter L' of dies G. Centrally of the diameter of the dies G' is formed a perforation through which the shafts K are passed, thereby allowing the dies to revolve upon shafts K, and the shafts K by being loosely journaled in the bearings in the sleeve I, whereby, should the die become fast upon the shaft, the shaft may revolve in its bearings radially from the perforation in the dies G'. The upper and lower faces are flat for a diameter corresponding to the width of the sleeve I, and from this point to the outer diameter are formed with an incline or miter bearing G''', corresponding to the incline or miter bearing of collar J, whereby said dies are frictionally driven by said collar, any degree of friction being produced by tightening the nuts D' upon cap-plates A'.

M designates arms either formed integral or secured to the sleeve-bearings I and extending to cross bars or rests N, secured across the framing, the arms M of the upper bearings I extending in opposite directions to those of the lower bearing, each arm being provided with a set-screw M', which bears against the bar or rest N, whereby any variation from a true vertical line in the shafts K by reason of wear caused by lateral pressure upon the dies may be compensated for by tightening the set-screws to cause the arms to move the bearings in a horizontal line.

O designates insertible blocks upon which the housings rest, the blocks being of a thickness to allow the shafts B and B' to be drawn together sufficiently to cause the desired friction of the miter-bearings G''' and J.

In Fig. 1 we have shown the manner in which a series of mills are connected and driven by

a common shaft, and in said view each mill represents a pair of horizontal rolls and a pair of vertical rolls constructed, arranged, and operated exactly as shown in Figs. 2 and 3.

By reference to Fig. 2 it will be seen that when it is desired to employ three shafts, as B B', and form two series of passes by duplicating the dies G', the coupling F'' may be connected with the shaft of the upper bevel-gear F and the shaft B, in which instance the shaft E' is journaled in the upper housings. This arrangement, being well known in the art, needs no further description.

In operation, in a mill intended to produce metal bars of different sizes and forms, there are provided dies of series to perform the different character of work, each die being of the same general form and contour, with the exception of the groove L, which forms the segment of a pass. By this arrangement a mill may be readily equipped for any character of work by providing the same with the series of sets of dies to form passes of the desired shape.

The removal of one set of dies and substitution of another are accomplished in the following manner: Nuts D' of the bolts D upon the side of the frame upon which gears E are keyed are loosened. The nuts D' upon the bolts D of the opposite side of the frame are removed, and the cap-plates also removed. The housings are now taken out and collars H, the adjustable bearings I, and collars J removed from the shafts, together with the vertical dies G, shafts K and dies G' having been previously removed. When dies G, having the desired form of groove L, are placed upon shafts B and B', the bearings, together with dies G', having the desired groove, being placed in position when the housings are adjusted upon the shafts, the cap-plates are placed in position, and the nuts D' screwed thereon, as has been heretofore described.

It will be seen that there can be as many series of dies forming passes employed as is necessary to form the desired bar or plate from a pile, billet, ingot, or bloom by a continuous passage, thereby dispensing with the necessity of passing the metal through from fifteen to twenty passes, as is now necessary, thereby dispensing with much of the labor and requiring less workmen.

Another advantage is in the character of the product, as by reason of the metal passing through the dies having passes of decreasing area, and as illustrated in Fig. 1, when forming a round bar from a rectangular pile or billet, reducing the same to a filleted square by compression upon all sides, and then forming the same into an octagon, and finally to a round, the grain or fiber is greatly improved by reason of the elongation of the metal being produced while being compressed from all sides into the desired shape.

By reason of the arms M and their attachment with the bars or rests N, any wear upon

shafts K or dies G' can be compensated for by adjusting the set-screw M'.

What we claim is—

1. In a rolling-mill, the combination, with a frame having the horizontal shafts journaled therein, of dies keyed upon the said shafts, and collars having beveled edges also keyed thereon and adapted to move in unison with the said dies, vertical shafts arranged in the same vertical plane as the horizontal shafts, and dies mounted on said vertical shafts adapted to contact with and be revolved by the collars keyed upon the horizontal shafts, as and for the purpose set forth.

2. In a rolling-mill, the combination, with a frame having the horizontal shafts journaled therein, of vertical dies keyed upon the said shafts, adjustable sleeves mounted upon the shafts on each side of the dies, the vertical shafts journaled between the said sleeves, and the horizontal dies loosely mounted thereon, substantially as shown and described.

3. In a rolling-mill, a frame, upper and lower shafts journaled therein and geared to move in unison, one of the shafts receiving motion from a power-shaft by means of a coupling connecting the two, a shaping-die removably secured upon each shaft, adjustable sleeves upon each shaft, vertical shafts journaled therein having shaping-dies journaled thereon, and friction-collars keyed upon the horizontal shafts bearing upon the vertical dies, as and for the purpose set forth.

4. In a rolling-mill, a frame, horizontal shafts journaled therein, dies secured to the shafts, adjustable sleeve-bearings upon the shaft upon each side of the dies, vertical shafts journaled in the said bearings, dies journaled upon the vertical shafts, each of the dies be-

ing formed with miter edges and with segmental formations of a contour to form a pass of the desired shape when the miter edges are in contact with the vertical rolls, and friction-collars keyed upon the horizontal shafts, adapted to mesh with and revolve the horizontal dies, as and for the purpose set forth.

5. In a rolling-mill, a frame, horizontal shafts journaled therein in vertical alignment, adjustable sleeve-bearings upon the shaft, in which are journaled vertical shafts in an axial line with the horizontal shafts, shaping-dies upon the horizontal and vertical shafts, in combination with arms extending from the adjustable sleeve-bearings and movably connected with the frame, whereby a lateral movement of the arms will cause a lateral adjustment of the vertical shafts, as and for the purpose set forth.

6. The herein-described mill for rolling a bar of metal from a pile, billet, ingot, or bloom, comprising a series of frames, each of which is provided with a series of horizontal and vertical dies formed with segmental formations of a contour to form a pass, each series of dies of each succeeding frame forming a pass of less diameter than the preceding series, the passes being in direct line with the movement of the metal bar, as and for the purpose set forth.

In testimony that we claim the foregoing as our own we hereby affix our signatures in presence of two witnesses.

THOMAS REED.
JOHN ROWLEY.

Witnesses:

WILLIAM WEBSTER,
THOS. J. ROWLEY.