

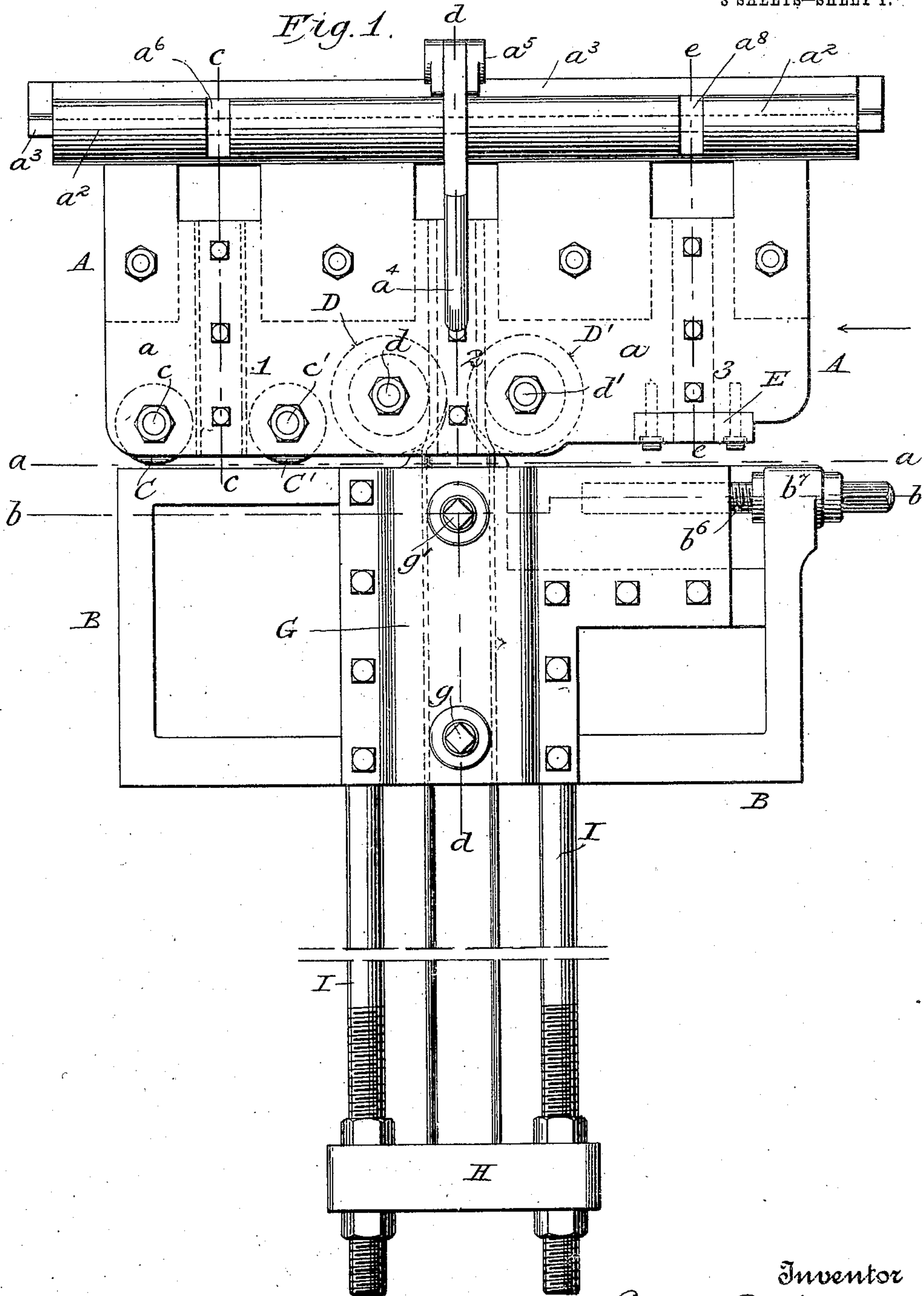
No. 841,949.

PATENTED JAN. 22, 1907.

E. EINFELDT.
APPARATUS FOR SHAPING METAL BARS.

APPLICATION FILED NOV. 9, 1904.

3 SHEETS—SHEET 1.



Witnesses
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A. W. Kennedy

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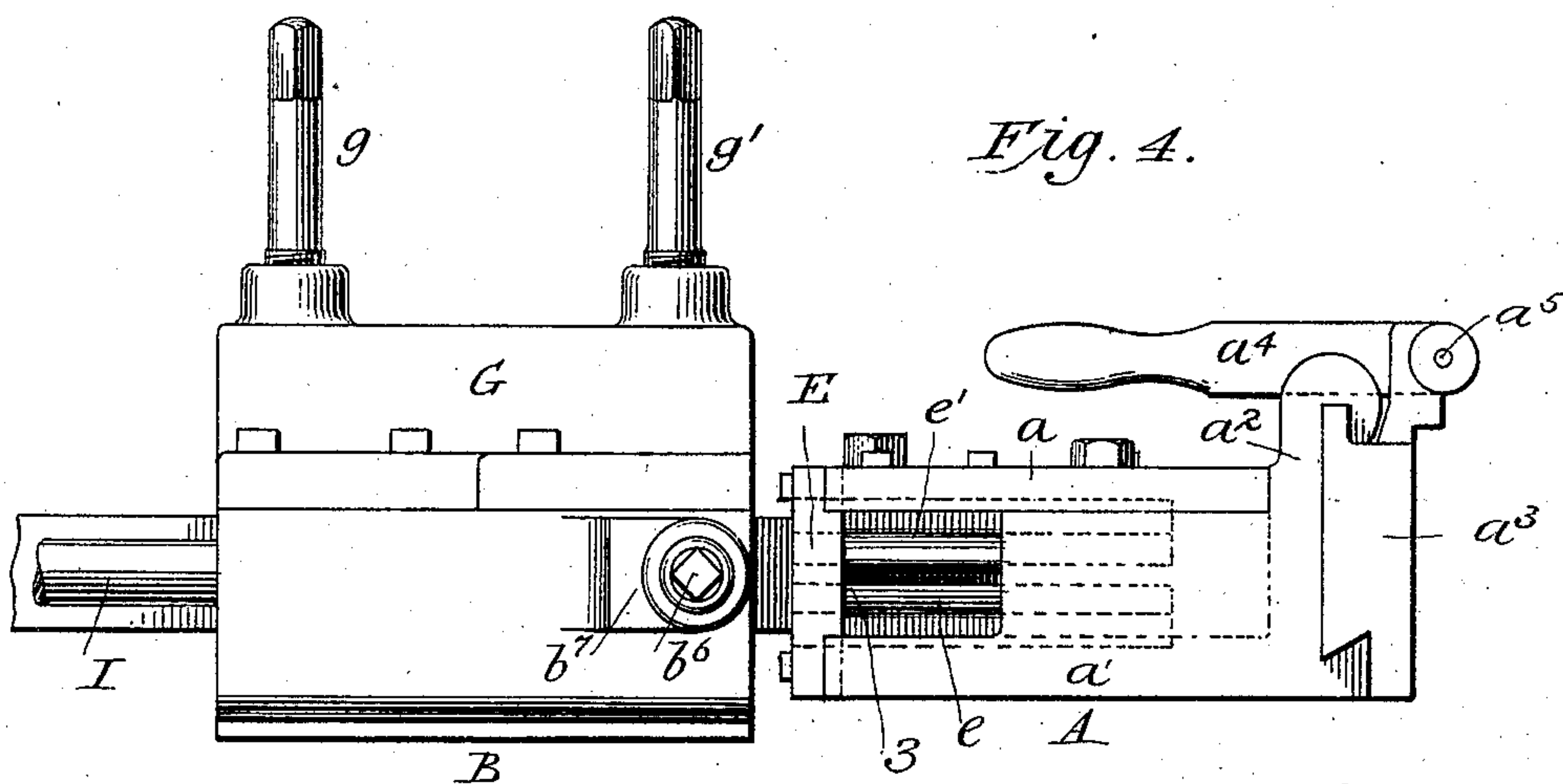
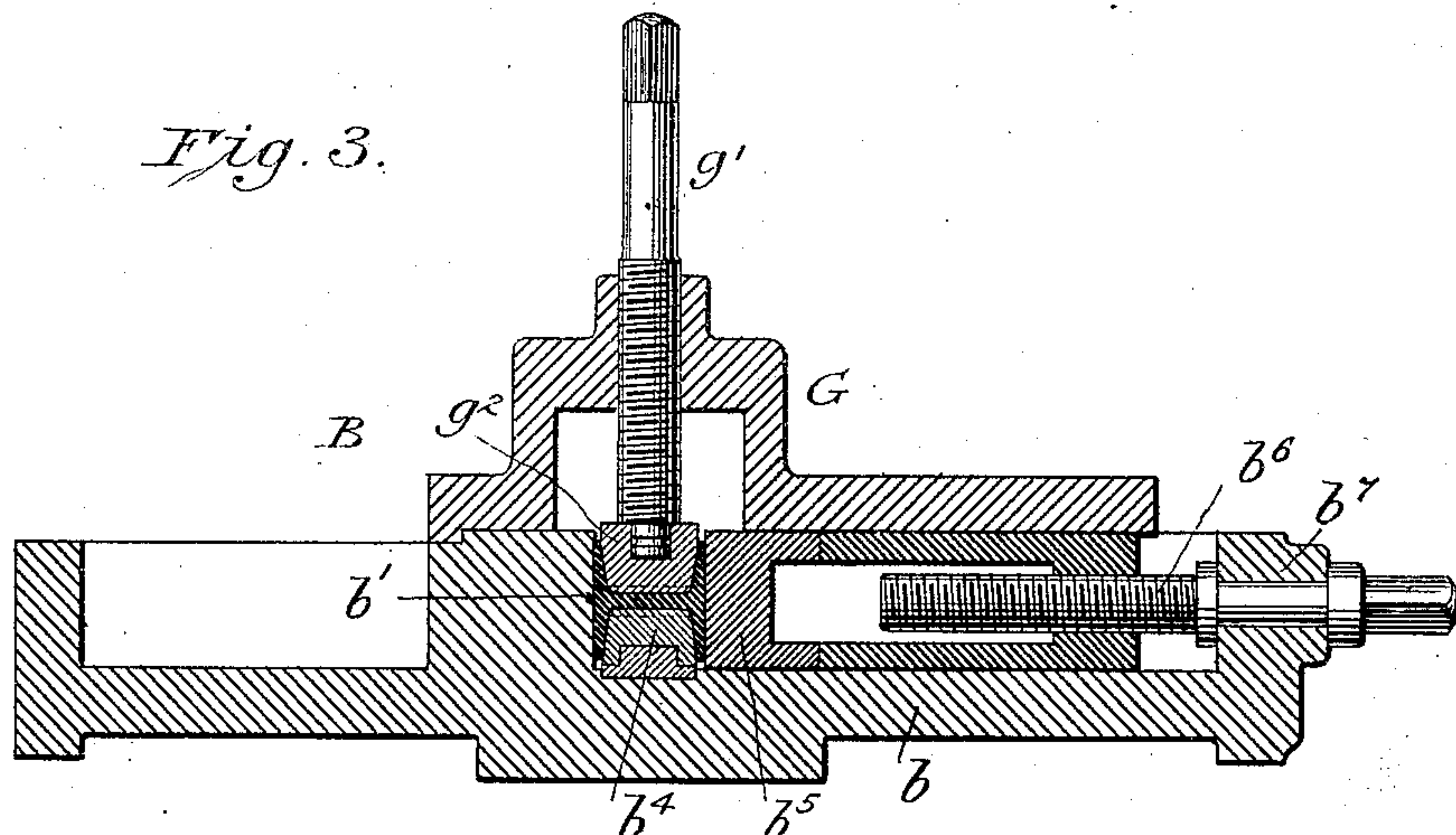
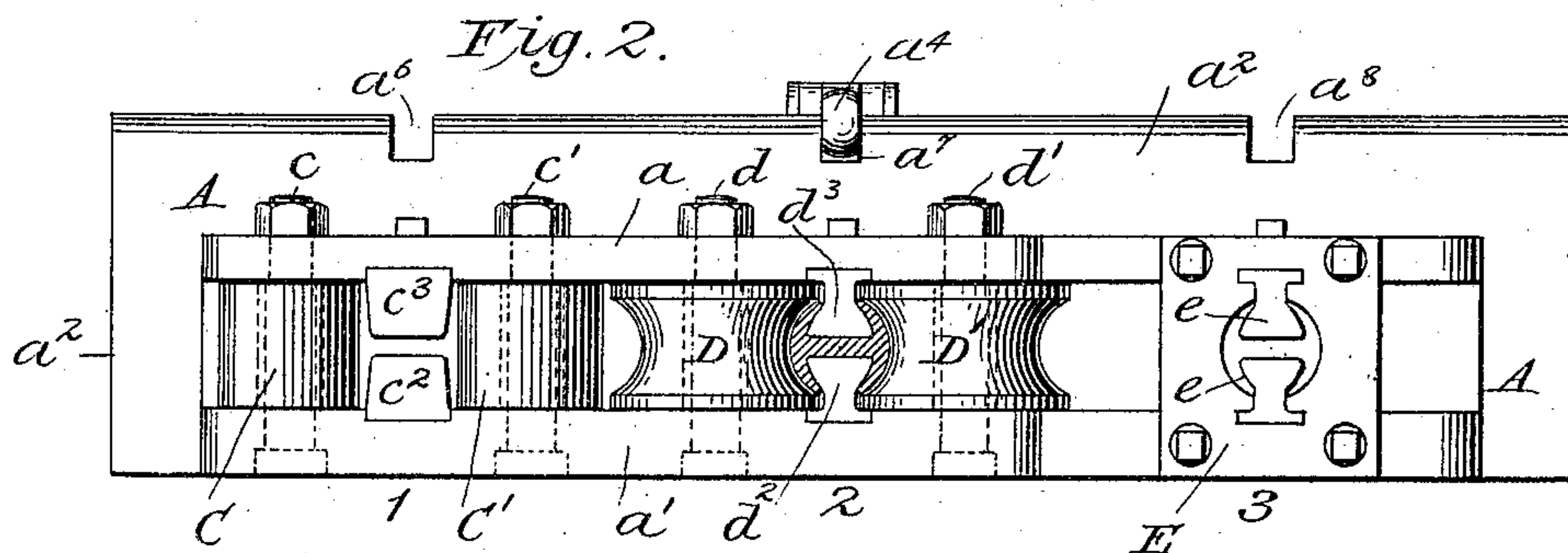
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3 SHEETS—SHEET 3.

Fig. 5.

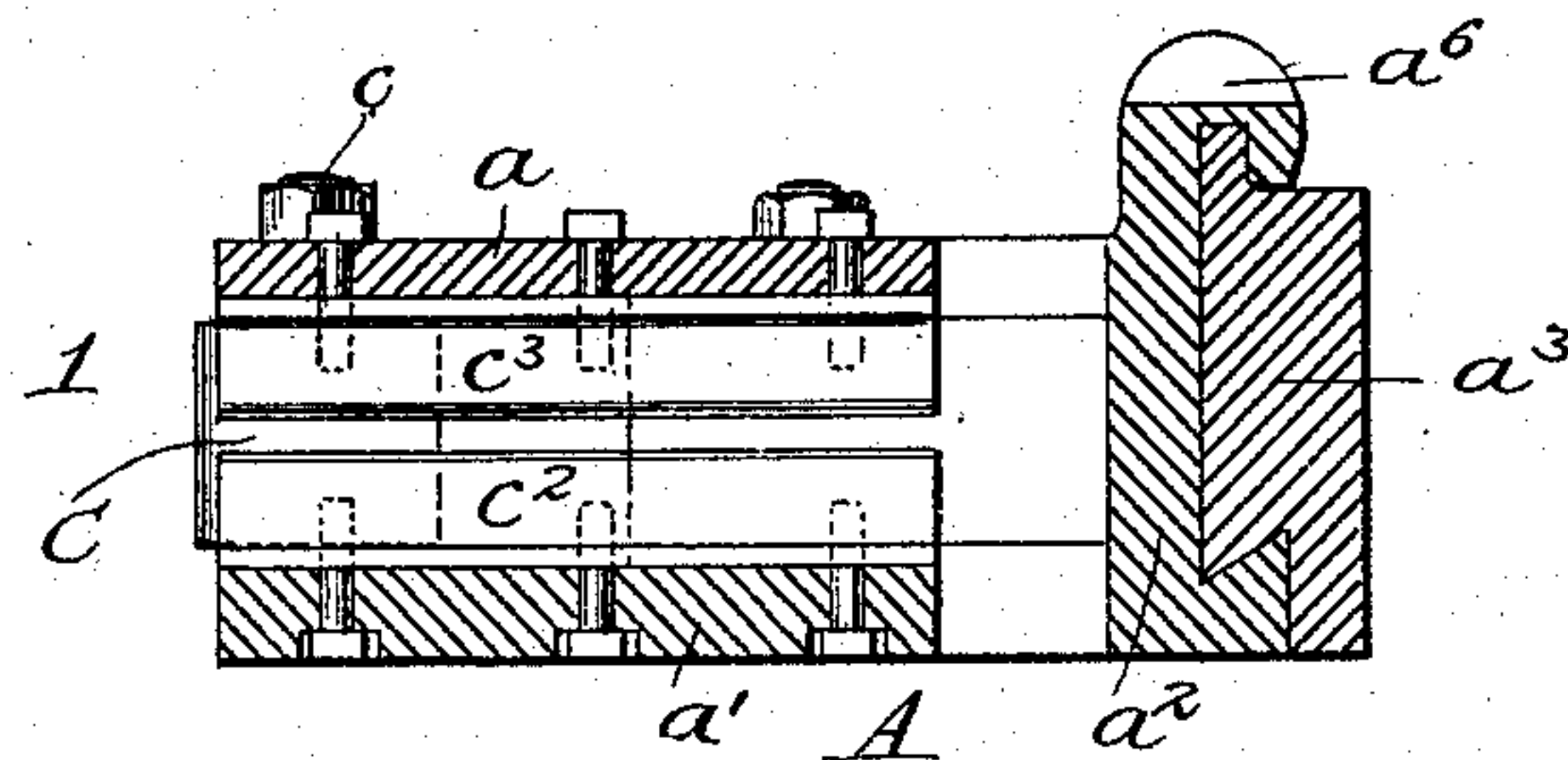


Fig. 6.

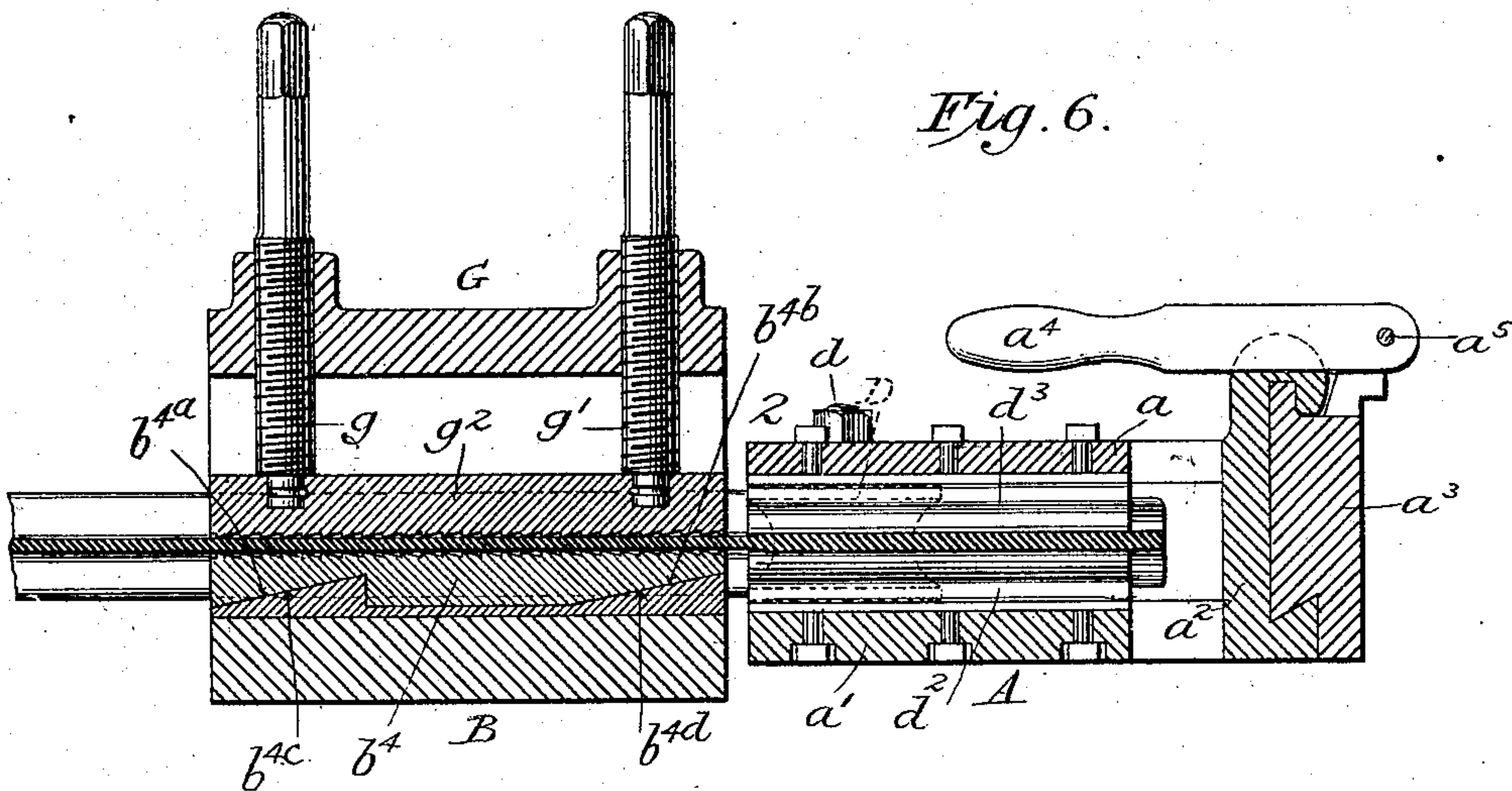


Fig. 7.

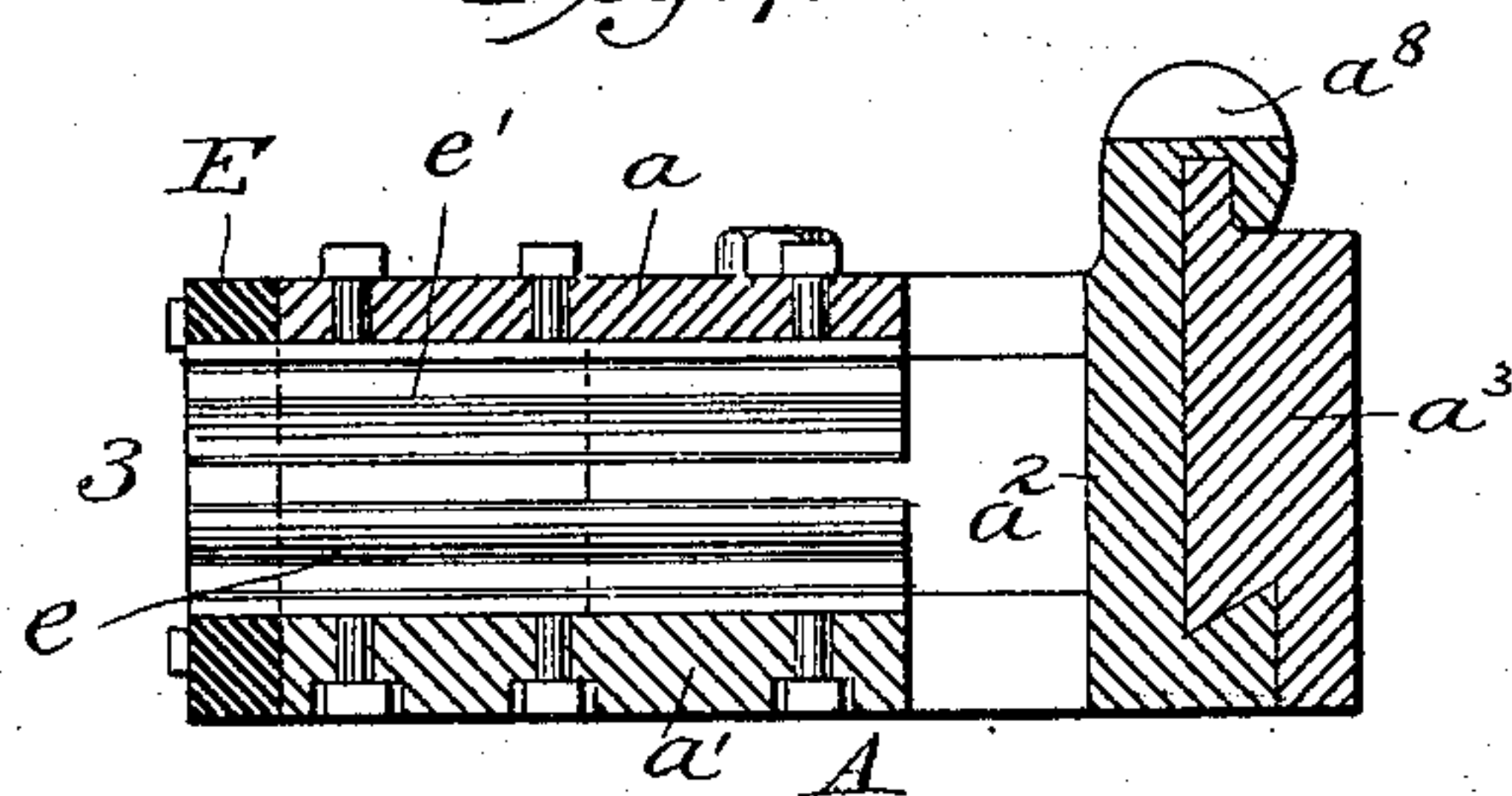


Fig. 8.

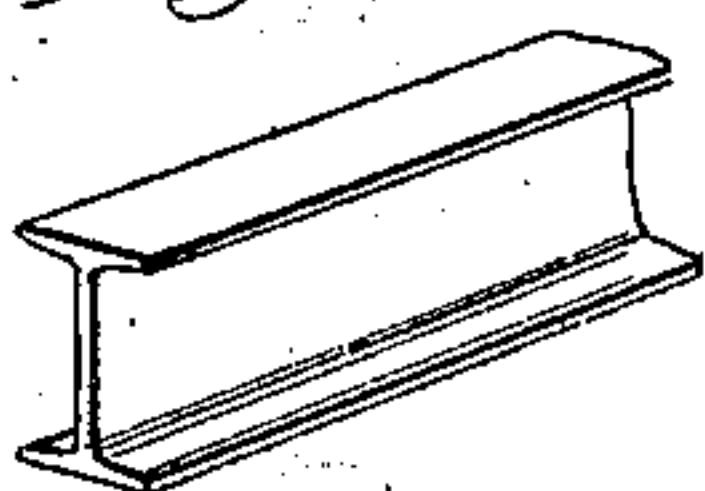


Fig. 11.

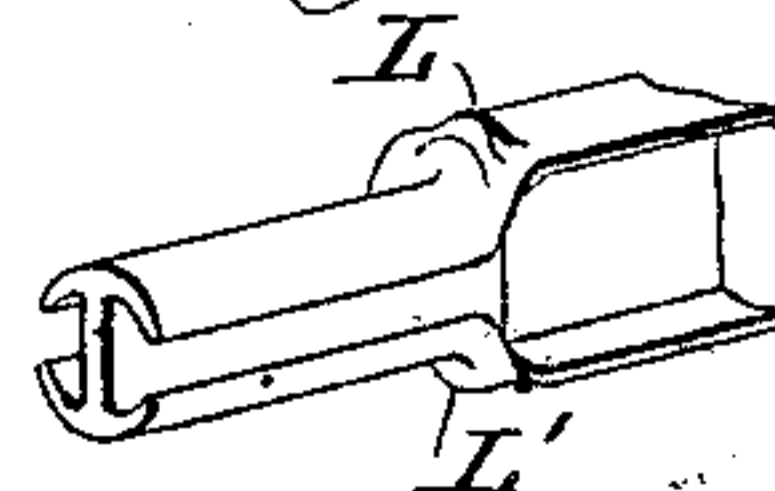


Fig. 9.

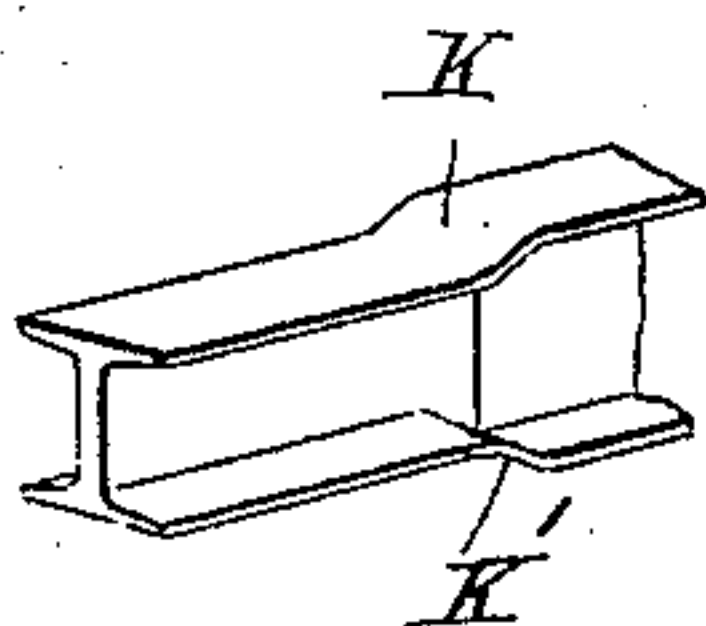
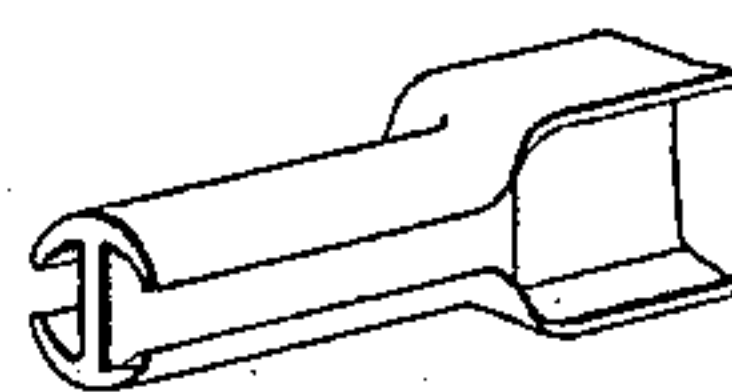


Fig. 10.



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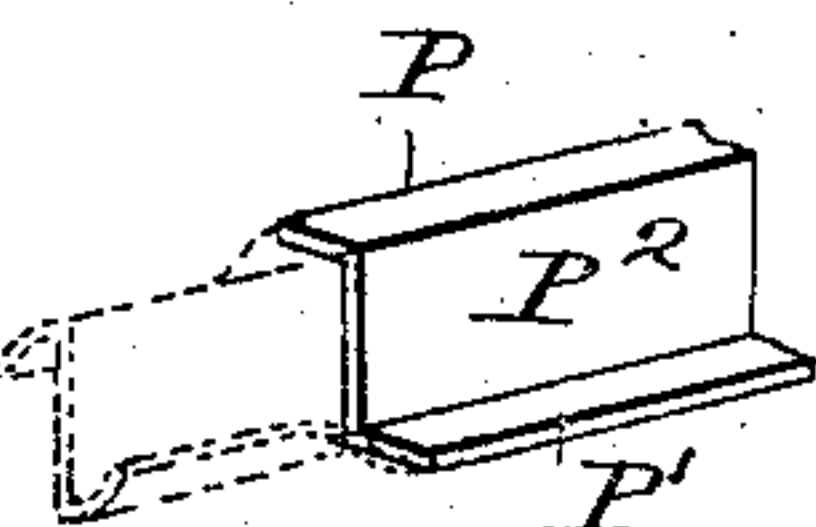


Fig. 12
 by

Inventor
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 Attorney.

UNITED STATES PATENT OFFICE.

EMIL EINFELDT, OF DAVENPORT, IOWA, ASSIGNOR TO BETTENDORF
METAL WHEEL COMPANY, A CORPORATION OF IOWA.

APPARATUS FOR SHAPING METAL BARS.

No. 841,949.

Specification of Letters Patent.

Patented Jan. 22, 1907.

Application filed November 9, 1904. Serial No. 232,054.

To all whom it may concern:

Be it known that I, EMIL EINFELDT, of Davenport, county of Scott, and State of Iowa, have invented a new and useful Improvement in Apparatus for Shaping Metal Bars, of which the following is a specification.

This invention relates to the shaping of metal bars for the production more particularly of metal axles in which the bearing-spindles are integral continuations of the body of the axle; and the invention consists of mechanism of improved construction adapted to act on the blank and give to it the desired form.

My improved mechanism is adapted to act on the end of a flanged bar or beam, preferably of **I** form in cross-section, and it operates, first, to compress the blank laterally, so as to reduce it in height, then to bend the flanges into cylindrical or substantially cylindrical form to produce a bearing-surface to serve as the wheeled spindle, and, finally, to upset the bar endwise to form a shoulder at the junction of the same with the body of the bar, which shoulder serves to receive the end thrust of the wheel.

In the accompanying drawings, Figure 1 is a top plan view of my improved mechanism. Fig. 2 is a transverse vertical section on the line *a a*. Fig. 3 is a similar view on the line *b b*. Fig. 4 is a side elevation looking in the direction of the arrow. Figs. 5, 6, and 7 are longitudinal sectional views on the lines *c c*, *d d*, and *e e*, respectively, through the several dies. Fig. 8 is a perspective view of the blank which is acted on. Figs. 9, 10, and 11 are perspective views showing the cross-section of the blank in its different stages of formation. Fig. 12 is a perspective view showing a modified form of blank.

Referring to the drawings, my machine embodies as its main features three shaping-dies 1, 2, and 3, to the action of which the blank is successively subjected, the die 1 acting to compress the blank laterally and reduce it in height, the die 2 acting to bend the flanges of the blank inward toward each other to form a bearing surface or spindle, and the die 3 acting to upset the bar endwise to form a shoulder at the junction of the same with the body of the bar.

For convenience of description I will refer to the die 1 as the "reducing-die," the die 2 as the "bending-die," and the die 3 as the

"upsetting-die." These three dies are situated side by side in a horizontal line in a frame or die-head A, adapted to be moved horizontally and to be held in different positions to bring the respective dies into operative relation to the projecting end of the blank, which blank is firmly held in a clamping-head B, fixed against transverse movement, but adapted to be reciprocated to and from the die-head in order that the end of the blank may be entered into the die which for the time being is in operative position. It is apparent, however, that this arrangement of the parts may be reversed and the die-head be caused to reciprocate to and from the clamping-head, or the clamping-head may be shifted transversely with reference to the die-head to present the blank to the different dies.

The die head or frame consists of upper and lower frame-plates *a a'*, between which the several dies are mounted, which plates are connected at their rear ends to a vertical transversely-extending plate *a²*, grooved in its rear face to receive a fixed guiding-bar *a³*, by which the die-head is sustained and on which it slides horizontally to bring the different dies into position, the head being locked in its different positions by means of a forwardly-extending locking-lever *a⁴*, pivoted, as at *a⁵*, to the fixed guiding-bar and adapted to enter notches *a⁶*, *a⁷*, and *a⁸* in the upper edge of the vertical plate *a²*.

The reducing-die is situated at the left of the die-head and comprises two vertical cylindrical opposing pressure-rolls C C', mounted between the frame-plates at the front of the same on vertical slots *c c'*, sustained by said plates. These rolls are adapted to bear along the outer faces of the flanges of the blank, and the space between them is somewhat less than the height of the blank, the result being that when the latter is entered and forced in between the rolls it will be compressed laterally and reduced, and the web of the blank will be thickened.

Coöperating with the two reducing-rolls are two fixed mandrels *c² c³*, extending between the rolls and rearwardly the full depth of the die-cavity, the mandrel *c²* being bolted to the lower frame-plate and projecting upwardly and the mandrel *c³* being bolted to the upper frame-plate and projecting downwardly. These mandrels are of such cross-

sectional form that a space will be left between their adjacent faces corresponding to the thickness of the web of the blank after it has been thickened by the pressure-rolls, into which space the web is received as the flanges of the blank are acted on by said rolls. At their outer sides the mandrels offer a bearing-surface for the inner faces of the flanges of the bar, and conjointly they maintain the internal form of the blank and prevent the same from buckling or bending while the pressure-rolls are acting.

The bending-die 2 is situated next the reducing-die and comprises two opposing bending-rolls $D D'$, having their peripheral surfaces concaved so as to conjointly present a circular pass and adapted to act on the flanges of the reduced end of the blank when the latter is forced between the rolls and bend the flanges inward toward each other. These rolls are mounted between the frame-plates at the front on vertical studs $d d'$, sustained by said side plates, and cooperating with the rolls are two mandrels $d^2 d^3$, extending between the rolls and for the full depth of the die-cavity, the mandrel d^2 being bolted to the lower frame-plate and projecting upwardly, while the mandrel d^3 is bolted to the upper frame-plate and projects downwardly. They are of such cross-sectional form that a space will be left between their adjacent faces corresponding to the thickened web of the blank, and at their outer sides they offer a bearing-surface for the inner curved faces of the bent flanges. As in the first instance described, these mandrels act to preserve the internal form of the blank and are formed to cooperate with the blank after the flanges have been bent, and they thus prevent the buckling or bending of the end of the blank while the bending-rolls are acting.

The upsetting-die 3 is situated next the bending-die, and it comprises a vertical die-plate E , bolted to the front of the two frame-plates and provided with a circular opening of a diameter to receive the rounded end of the blank after it has been subjected to the action of the bending-die. Two mandrels $e e'$ of a form similar to the mandrels $d^2 d^3$ extend the full depth of the die-cavity and have their forward ends extending into the opening in the die-plate, so that they present, in connection with the die-plate, a pass or die-opening corresponding in form to the cross-sectional form of the blank after it has been acted on by the bending-die. The upsetting action of this die is effected by the die-plate E , which when the sloping surfaces of the flanges, caused by the reduction of the end of the blank, encounter the die-plate the blank will be arrested by the plate, and the further movement of the body of the blank will upset the metal of the sloping surfaces at the outer face of the die-plate and throw up two abrupt shoulders at this point.

The reciprocating clamping-head B in which the blank is held and by which its end is presented to the action of the several dies consists of a base-plate b , formed with a longitudinally-extending vertical bearing-surface b' , against which the flange at one side of the blank is adapted to bear, which blank is held firmly against the bearing-surface b' by means of a clamping-block b^5 , mounted in guides at the front of the clamping-head, so that its inner face will engage and abut against the vertical flange of the blank. The blank is acted on by the clamping-screw b^6 , extending through an upward projection b^7 on the base-plate and having its inner end engaging the outer end of the block. The under side of the web of the clamped bar rests on a block b^4 , roughened, so as to grip the web, and formed on its under side with upwardly and forwardly inclined surfaces b^{4a} and b^{4b} , adapted to cooperate with similarly-inclined surfaces b^{4c} and b^{4d} , projecting upward from the base-plate, the purpose of which will presently appear. This block is of a cross-sectional form to fit between the inner sides of the flanges of the bar, so as to afford firm support to the same. Resting on the upper side of the web is a block g^2 , having its under side roughened to grip the web and of a cross-sectional form to fit between the inner sides of the flanges. The block g^2 is acted on by two vertical bolts g , tapped through an upward extension on the cap-plate. As a result of the construction described when the bar is seated in place on the lower block b^4 and the screws $g g'$ are tightened up the web will be gripped and held firmly between the roughened faces of the two blocks, and when screw b^7 is tightened up its clamping-block b^5 by acting on the outer flange of the bar will force the same firmly and bind its inner flanges against the bearing-surface b' , by which means the bar will be held firmly and rigidly in position. Any tendency of the bar to withdraw forwardly from between the clamping-surfaces when the clamping-head is moved back to withdraw the end of the bar from the dies will act by reason of the inclined cooperating surfaces to force the block b^4 upward and cause its roughened face to grip the web of the bar, and thus serve to more effectually hold the same.

By the means described the blank to be acted on is held firmly, with the end which is to form the bearing-spindle and which is to be acted on successively by the different dies projecting beyond the face of the clamping-head, the rear end of the blank being afforded a bearing and given firm support by means of a cross-plate H , firmly mounted on the ends of two longitudinally-extending bars I , connected with and carried by the clamping-head.

In the operation of the mechanism described the flanged blank, preferably of the

form represented in Fig. 8, is firmly clamped in the reciprocating head, with the end to be shaped projecting forward. The die-head is adjusted laterally to bring the reducing-die into operative position, in which position the head is held by the locking-lever α^4 . The clamping-head is now advanced to enter the end of the blank between the reducing-rolls, and as the blank is forced between them the rolls will subject it to great lateral pressure in the direction of the web which connects the flanges, which action will reduce the height of the blank uniformly throughout the length of the portion acted on, as shown in Fig. 9, leaving at the junction of the reduced end and the body of the blank two sloping shoulders K K'. The clamping-head is now retracted to withdraw the blank from the die. The die-head is adjusted laterally to bring the bending-die into operative position, and it is locked, as before, by the lever. The clamping-head is again advanced, and the reduced end of the blank is forced in between the bending-rolls, which as the blank advances will curve and bend the flanges inward toward each other, as clearly indicated in Fig. 10, thus giving to the end of the blank a general circular contour. The clamping-head is again retracted to withdraw the blank from the bending-die, whereupon the die-head is shifted to bring the upsetting-die into action and is held in this position by the locking-lever. The clamping-head is now advanced for the third time and the rounded reduced end of the blank entered into the pass or die cavity formed conjointly by the die-plate G and the two cooperating mandrels. The advancing movement of the blank is continued in the die-cavity until its further advance is arrested by the sloping shoulders K K' encountering the die-plate, whereupon and on the further forcible movement of the body of the blank against the die-plate the metal of the blank will be upset at the junction of the reduced end with its body portion and two abrupt shoulders L L' will be thrown up at the inner end of the reduced portion of the blank and against the outer face of the die-plate. The operations are now completed, and the clamping-head is retracted to withdraw the finished article, when the latter may be removed from the head. It will be observed that as a result of these several operations the blank is, first, compressed laterally and reduced in height, which results in a thickening and reinforcing of the same; secondly, the reduced end of the blank is subjected to further lateral pressure, and the flanges bent and curved inward to present a general circular outline; thirdly, the reduced rounded end at the junction with the body of the bar is subjected to end-wise pressure and the metal of the same upset, so as to form abrupt shoulders where the round end joins the body of the bar.

It is to be particularly observed that in the practice of my improved method as exemplified in the operation of the mechanism described there is no drawing out or stretching of the metal, but at all times the portion acted on is subjected to a compressing and upsetting action from the outside, and the internal form is preserved and buckling or bending prevented by fixed internal supports.

While in the drawings I have shown the blank of I form in cross-section and have illustrated and described the shaping mechanism, as adapted to act on a blank of this form, it will be understood that the invention is applicable as well for shaping flanged bars of other cross-sectional forms. For instance, as shown in Fig. 12, the blank may be of Z form, consisting of two longitudinal flanges P P', extending in opposite directions from the ends of a connecting-web P². The mechanism would require but a slight and obvious change in order to reduce and round the end of the bar to form a bearing-spindle, as indicated by dotted lines in said figure.

Having thus described my invention, what I claim is—

1. In a mechanism for shaping bars having longitudinal flanges and a central connecting-web, a bending-die comprising opposing concave faces adapted when the flanged bar is entered therein to bend the opposing flanges inward toward each other; in combination with fixed mandrels extending inward toward each other into the space bounded by the concave faces of the die, said mandrels having their inner faces flat, and adapted to bear at the opposite sides respectively of the web of the bar, and having their side faces convex and adapted to bear respectively against the inner curved faces of the bent flanges.

2. In a machine for shaping metal bars, a die head or frame comprising opposing frame-plates; in combination with pressure-rollers mounted between the frame-plates and separated to form a pass for the bar to be acted on; and opposing mandrels, fixed to the inner sides of the frame-plates respectively and extending inward toward each other between the rollers and with a space between their adjacent faces.

3. In a machine for shaping bars, the combination of a transversely-extending guiding-bar, a die-head sustained by said bar and movable transversely thereon and comprising upper and lower frame-plates with a space between them, a plurality of shaping-dies arranged side by side between said plates, the said die-head being formed with a plurality of notches, a locking device carried by the guiding-bar and adapted to engage the said notches, and a clamping-head adapted to hold the bar to be shaped.

4. In a machine for shaping metal bars, the combination of a die-head, a clamping-

head adapted to hold a flanged bar, said head provided with a longitudinally-extending bearing-surface against which one flange of the bar bears, a coacting clamping-plate adapted to bear against the opposite flange of the bar, means for urging said clamping-plate against the bar, a longitudinally-extending block sustained by the head and projecting upwardly between the inner sides of the flanges of the bar and bearing against the web of the same, a coöperating opposing longitudinal block extending downwardly between the inner sides of the flanges of the bar and bearing against the upper side of the web, and means for binding the last-named block against said web.

5. In a machine for shaping metal bars, the combination of a die-head having a die adapted to receive the end of the bar to be shaped, a clamping-head formed with oppos-

ing surfaces adapted to act on the outer sides of the flanges of the bar, said clamping-head being provided with an inclined surface, a block b^4 provided on its under side with an inclined surface coöperating with that on the head, the said block extending upwardly between the inner sides of the flanges of the bar and bearing against the web of the same, and an upper coöperating block g^2 carried by the head and extending downwardly between the inner sides of the flanges of the bar against the upper side of the web of the same.

In testimony whereof I hereunto set my hand, this 1st day of November, 1904, in the presence of two attesting witnesses.

EMIL EINFELDT.

Witnesses:

M. LOUISE DODGE,
ANDREW NEILSON.