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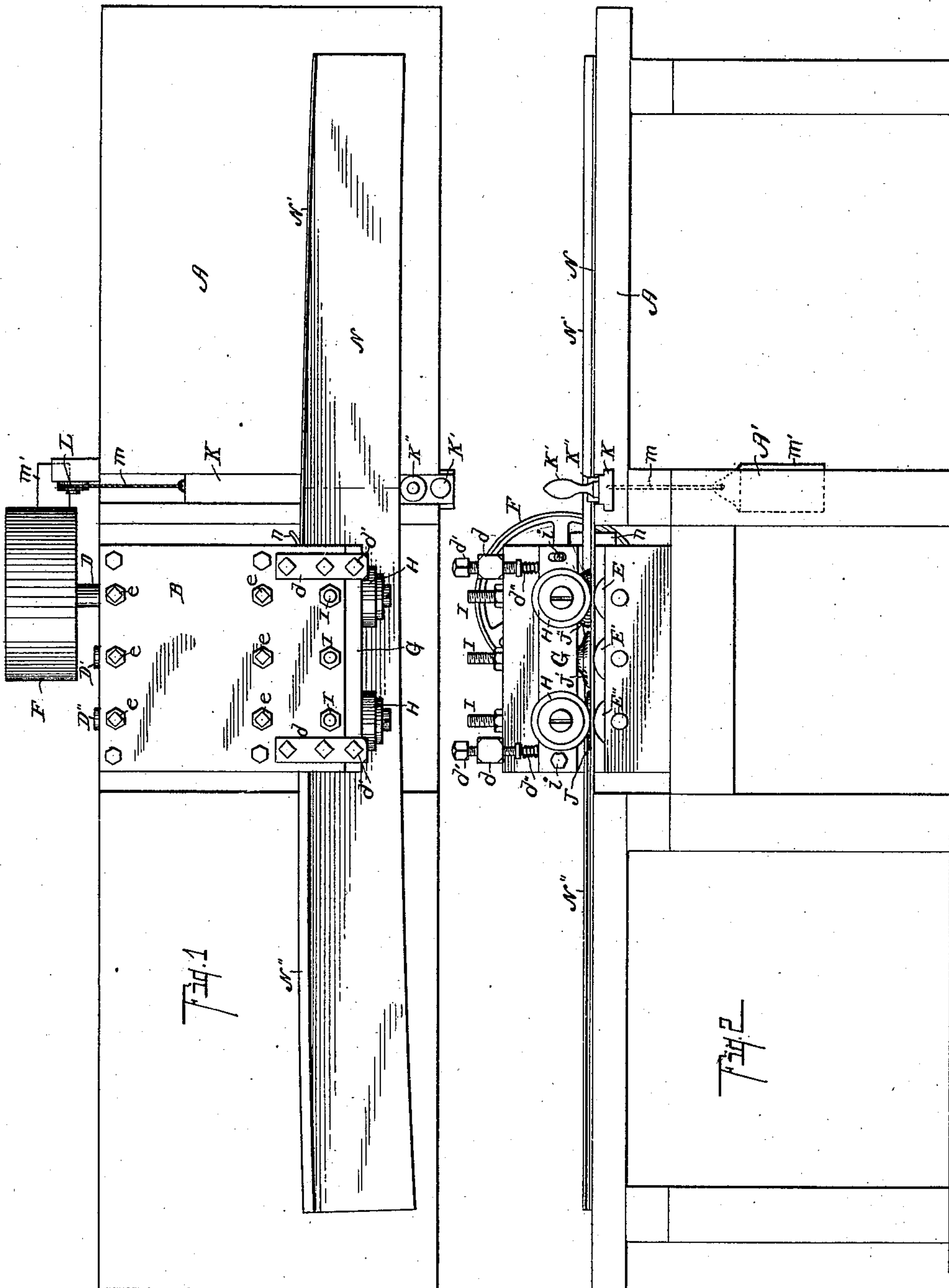
Patented Oct. 21, 1902.

A. E. CHAMBERS & L. H. BULLARD.
MACHINE FOR BENDING OR FLANGING SHEET METAL.

(Application filed June 6, 1902.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses:

R. E. Wood.
Chas. B. Earl

Inventors

Lewis H. Bullard & A. E. Chambers
By *Frederick L. Cappel*
Att'y.

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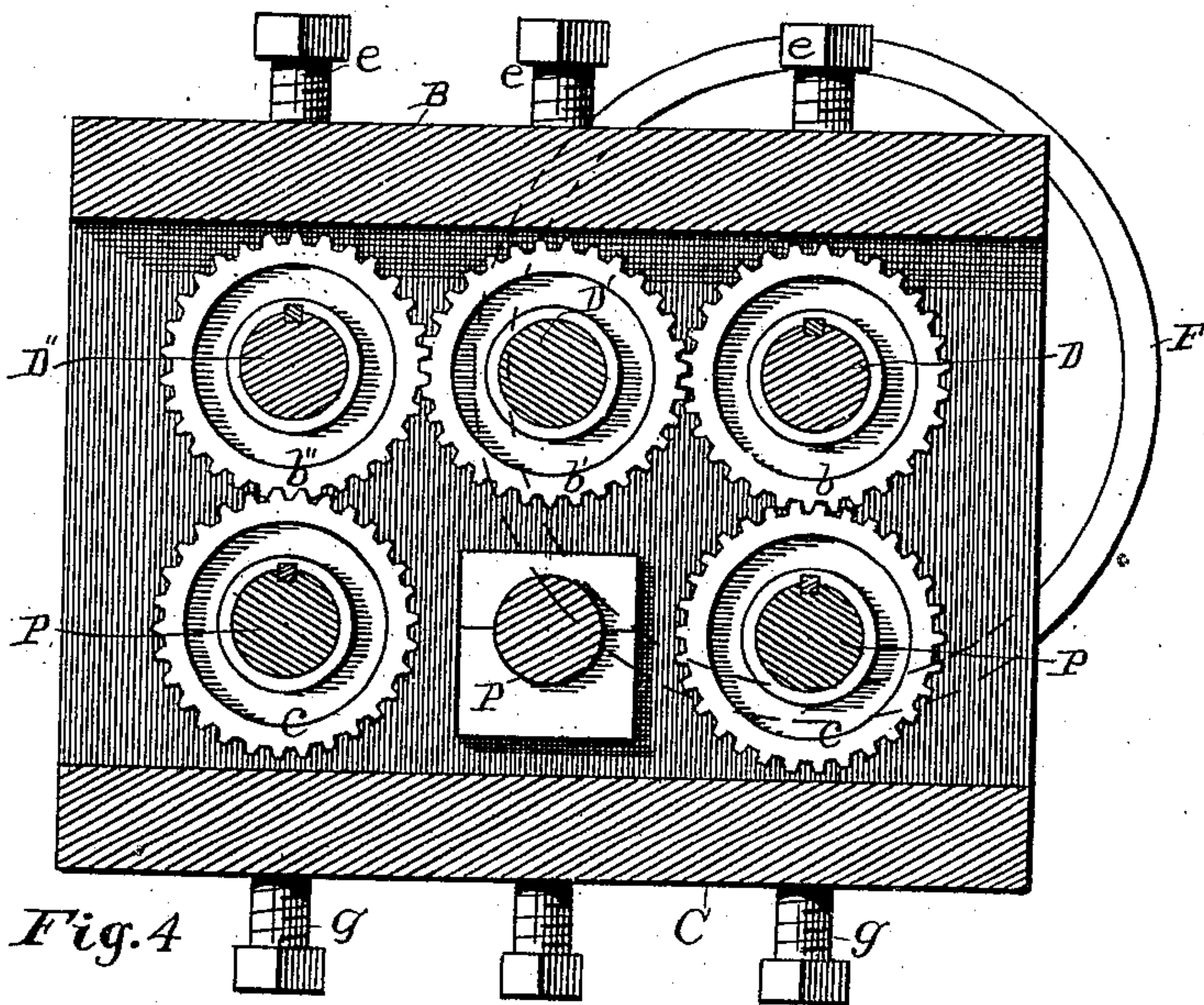
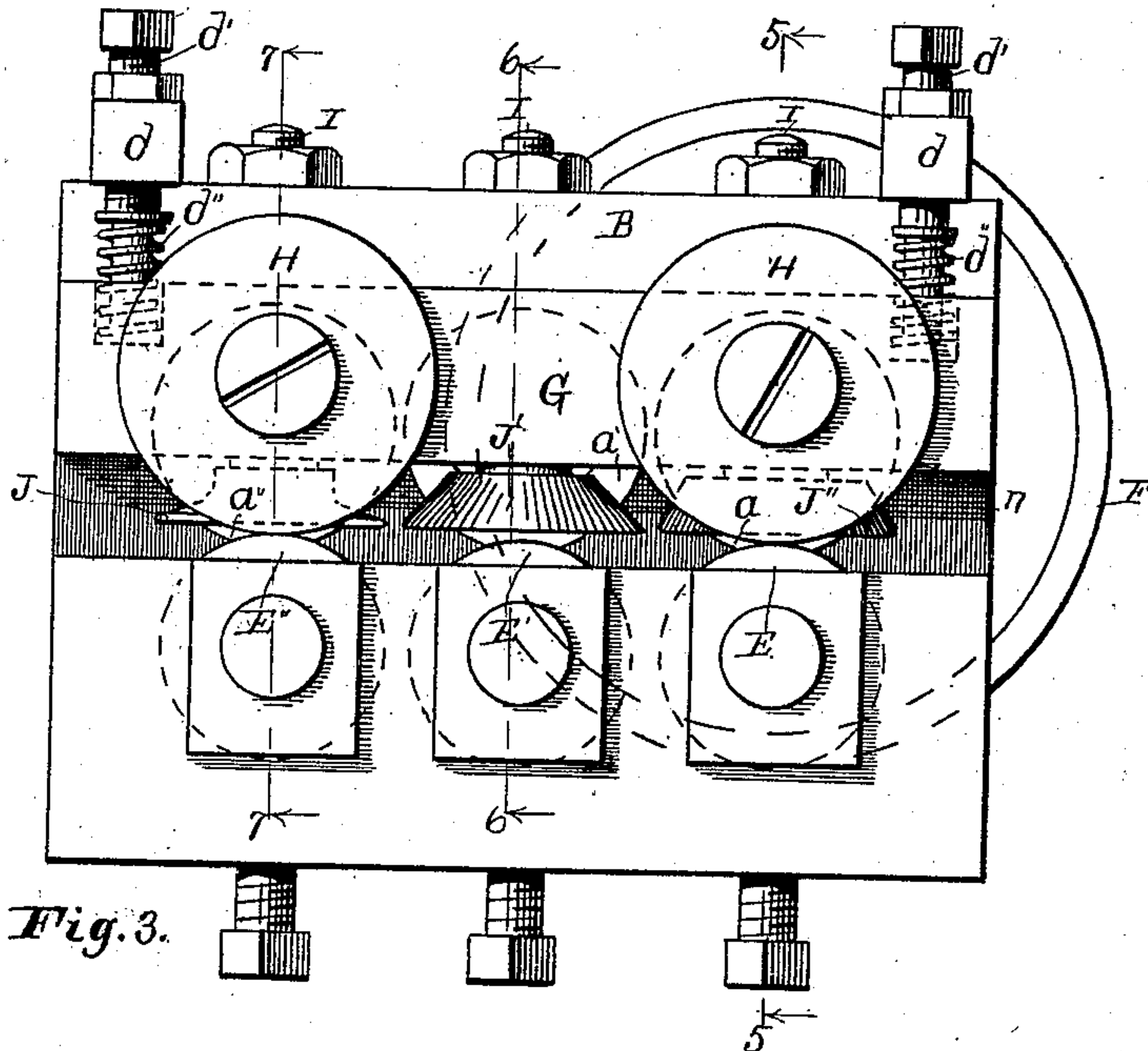
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3 Sheets—Sheet 2.



WITNESSES
Chas. E. Wisner
Chandler J. Bullard

INVENTORS
Lewis H. Bullard
A. E. Chambers

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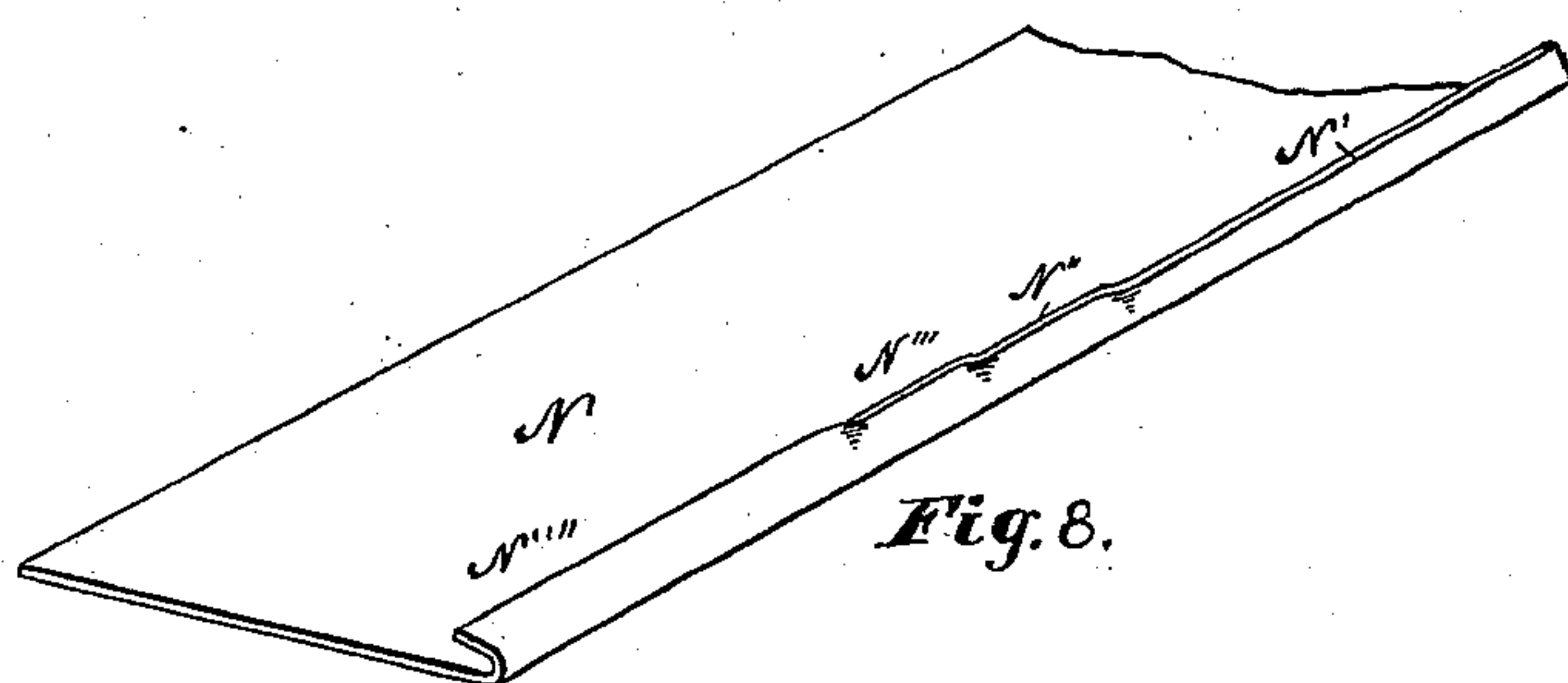
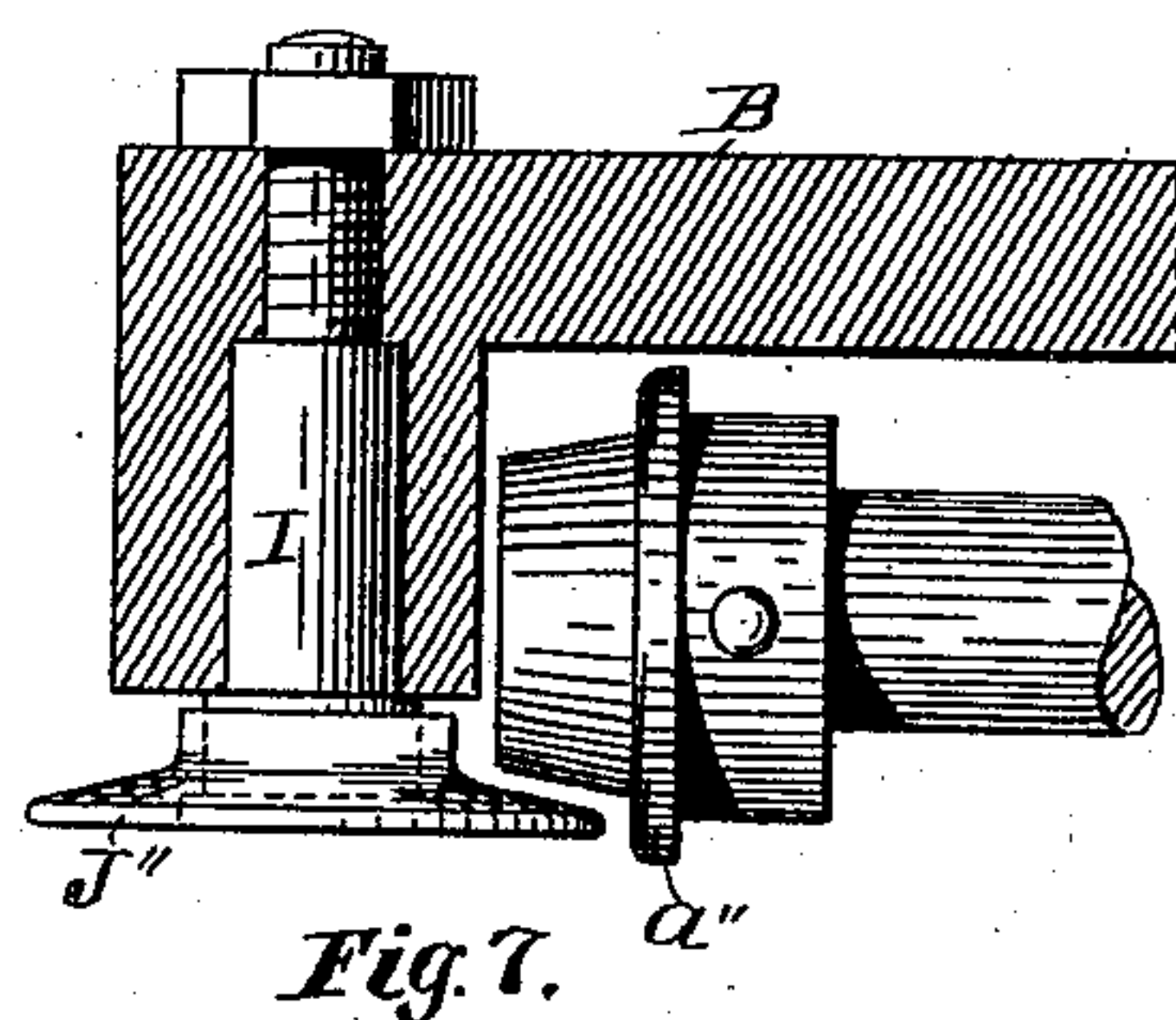
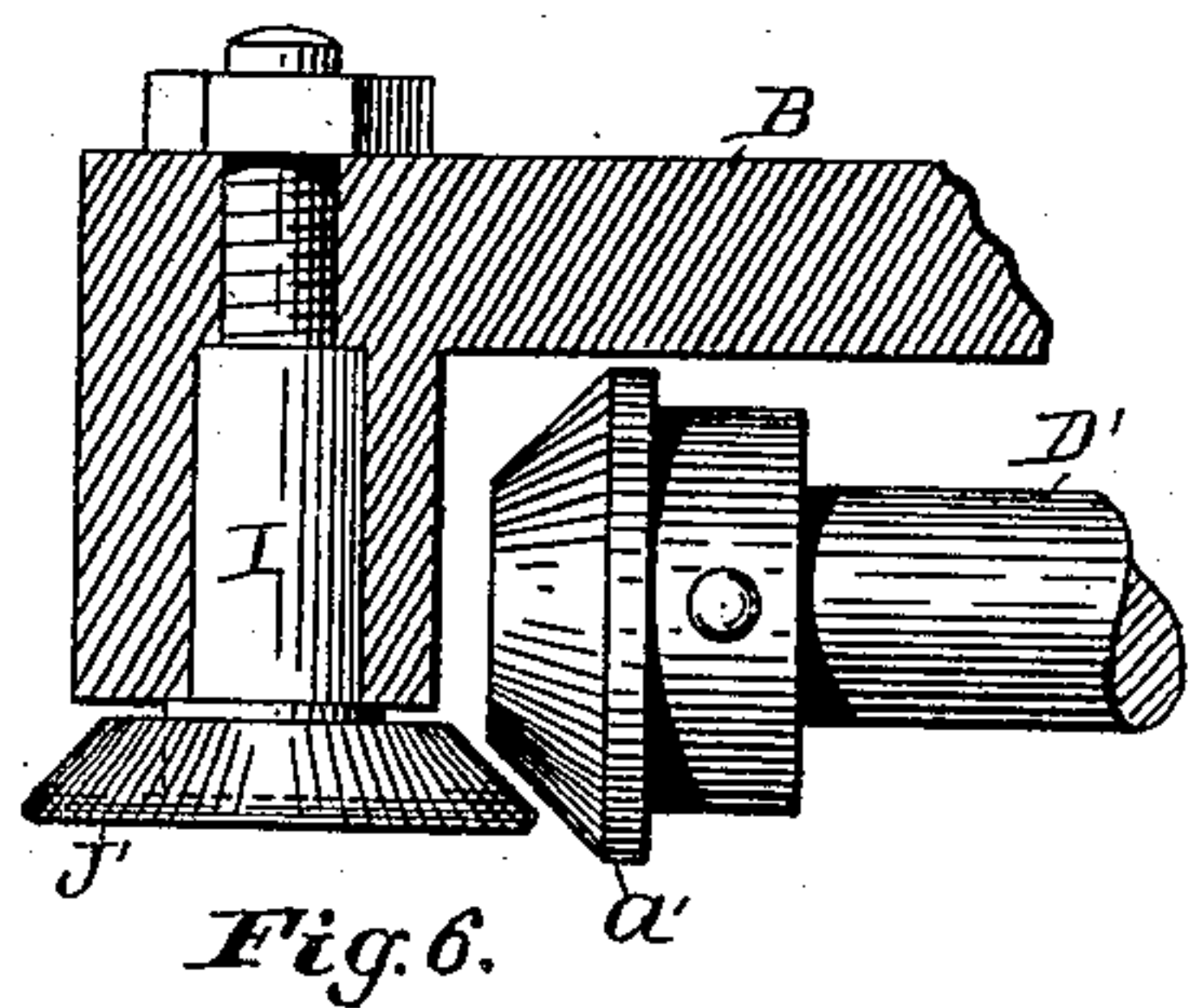
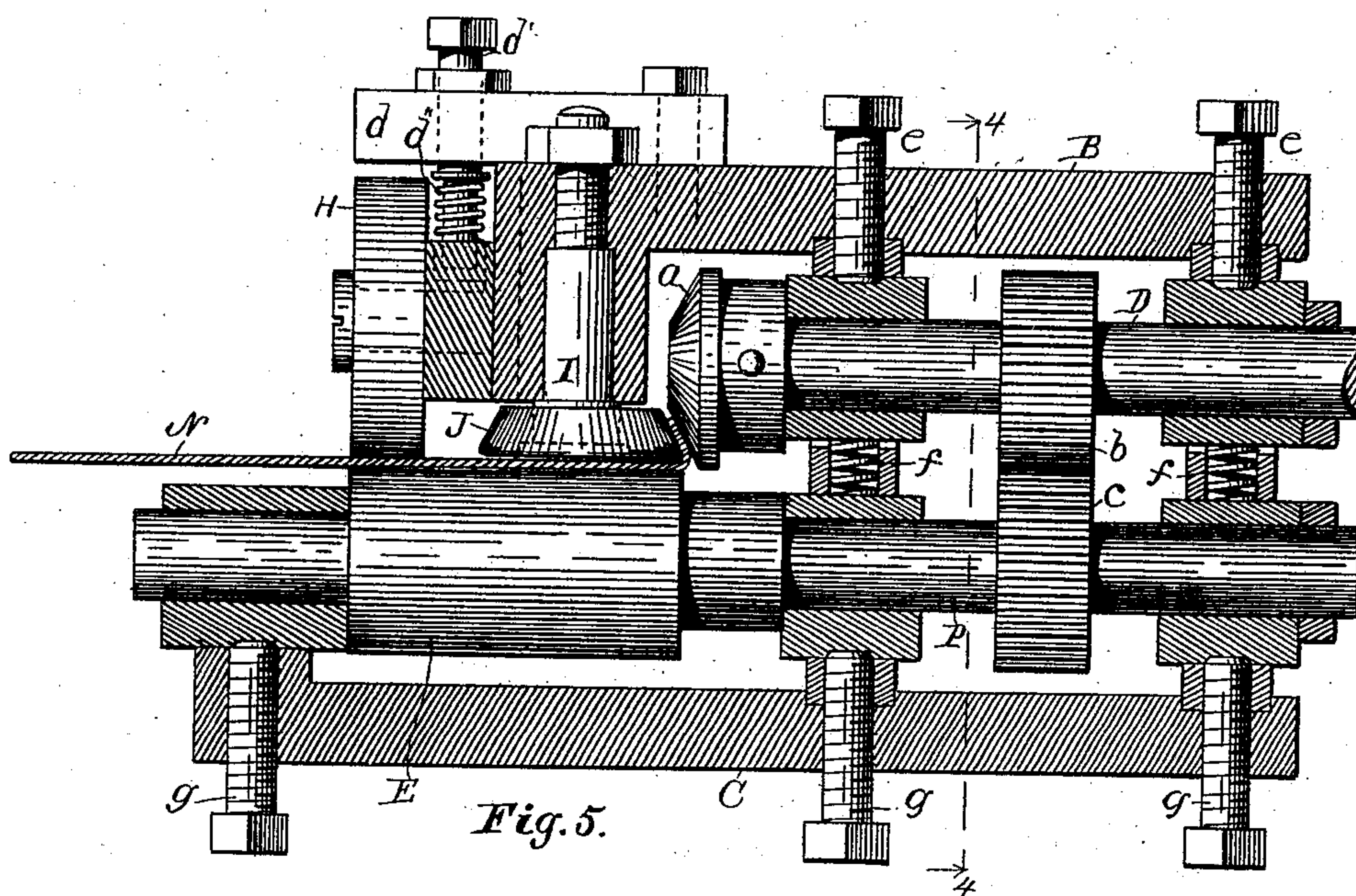
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(No Model.)

3 Sheets—Sheet 3.



WITNESSES

WITNESSES
 Chandler G. Bullock
 Edward P. Kramer.

INVENTORS

Lewis H Bullard
Albany

UNITED STATES PATENT OFFICE.

ARTHUR E. CHAMBERS AND LEWIS H. BULLARD, OF DETROIT, MICHIGAN, ASSIGNORS TO MICHIGAN STEEL BOAT COMPANY, OF DETROIT, MICHIGAN.

MACHINE FOR BENDING OR FLANGING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 711,472, dated October 21, 1902.

Application filed June 6, 1902. Serial No. 110,445. (No model.)

To all whom it may concern:

Be it known that we, ARTHUR E. CHAMBERS and LEWIS H. BULLARD, citizens of the United States, residing at the city of Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Machines for Bending or Flanging Sheet Metal, of which the following is a specification.

10 This invention relates to improvements in machines for bending or flanging sheet metal.

It relates more particularly to turning the edge of the same so that it is adapted for use in forming a seam. It is particularly adapted for use in connection with our machine for bending and flanging sheet metal filed concurrently herewith which forms the edge of the sheet metal into a right-angle flange, although it may be used for turning the edge of sheet metal which has already been flanged at a right angle by some other method.

The objects of the invention are, first, to provide a machine for bending or forming the flanged edge of sheet metal of irregular shapes or sheet-metal strips having regular or irregular curves so that it is adapted for use in forming a seam which is durable, compact, and simple in its construction and simple and easy to operate; second, to provide a machine for the purpose which is automatically adjustable to the variations of the formation of the edge of the metal to be operated upon; third, to provide a machine of the class described which can be readily adjusted to the varying thicknesses of the metal to be operated upon; fourth, to provide a machine for the purpose in which the metal formed or bent is gradually formed into the desired shape, so that the fiber of the metal is not destroyed thereby.

Further objects will definitely appear in the detailed description to follow.

We accomplish the objects of our invention by the devices and means described in the following specification.

The invention is clearly defined and pointed out in the claims.

A structure embodying the features of our invention is fully illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of a structure embodying the features of our invention, it being shown with a sheet of metal passing through the same. Fig. 2 is a front elevation view of the structure shown in Fig. 1. Fig. 3 is an enlarged end elevation view of the bending-machine proper removed from the support A to show the arrangement of parts. Fig. 4 is a detail cross-section view taken on line 4 4 of Fig. 5. Fig. 5 is an enlarged detail longitudinal sectional view taken on a line corresponding to line 5 5 of Fig. 3, showing the arrangement of the flanging or bending rolls *a* J. Fig. 6 is an enlarged detail sectional view taken on a line corresponding to line 6 6 of Fig. 3, showing the arrangement of the bending or flanging rolls *a'* J'. Fig. 7 is an enlarged detail sectional view taken on a line corresponding to line 7 7 of Fig. 3, showing the arrangement of the bending or flanging rolls *a''* J. Fig. 8 is a perspective view of a strip of metal as it appears when removed from the machine after having been passed part way through the same or while being operated upon.

In the drawings all of the sectional views are taken looking in the direction of the little arrows at the ends of the section-lines, and similar letters of reference refer to similar parts throughout the several views.

Referring to the lettered parts of the drawings, A is a table or support for the framework, which carries the bending apparatus, which is centrally located on the table.

B represents the framework of the bending apparatus. Supported in adjustable bearings in the framework B is a series of shafts D D' D''. The machine is driven by a pulley F on the shaft D. The shafts are geared together by the cog-gears *b b' b''*, the gear *b'* being an idler. On the inner ends of these shafts are the bending wheels or rolls *a a' a''*, the peripheries of the same being formed at varying angles, the purpose of which will be hereinafter pointed out.

Journalled in suitable bearings in the framework B, which bearings are preferably adjustable, is a series of feed and supporting rollers E E' E'', arranged to correspond with the bending-wheels *a a' a''*. These rolls serve

as feed-rolls and are operated by the gears *c*, which mesh the gears on the shafts *D D'*, (see Fig. 5,) the roll *E'* being an idler. Disk-like formers *J J' J''* are revolubly supported
 5 on vertical shafts *I* above the feed-rolls. The upper faces of these disks are formed or beveled at varying angles to correspond with the bevels on the peripheries of the wheels *a a' a''* and are adapted in conjunction therewith
 10 to gradually turn the edge of the sheet of metal fed through the machine into the desired form. These disks are free to revolve on their shafts, and they also serve as clamping and guiding means while the material is
 5 passing in under them.

As a further means of holding the sheet of metal to the feed and supporting rolls idlers *H H* are provided. These are mounted upon the beam *G*, which is adjustably secured to
 10 the frame of the machine by bolts *i*, engaging suitable slots in the same. Spring-pressure is put upon this beam by means of the coiled springs *d''*, mounted on the threaded rods *d'*, which pass through brackets *d* on
 5 the frame of the machine, as clearly appears in Figs. 1 and 2. These idlers serve to hold the metal to the feed-rolls, so that the same is fed along thereby. The guide *n* is provided for guiding the strip of metal into the
 10 machine in position to be engaged by the bending-wheels. The gearings for the shafts *D D' D''* are adjusted by means of the threaded bolts *e*, while the bearings for the feed and supporting rolls are adjusted by means
 5 of the threaded bolts *g*. By adjustment of these bearings the machine may be adjusted to different thicknesses of metal. Coiled springs, as *f'*, are provided between the bearings for the feed-rolls and the bending or
 10 flanging wheel shafts and for holding the same normally separate.

A guide *K*, which is adapted to reciprocate in a groove in the table *A*, is provided to hold the metal firmly against the guide *n* and to
 5 prevent its lateral movement while in the machine. This guide is provided with a roller *K''*, adapted to rest against the edge of the metal, and the handle *K'* for controlling it. This guide is held under constant tension by
 10 a weight *m'*, secured to it by the cord *m*, which passes over the pulley *L*.

In operation a strip of metal which has already been flanged, as at *N'*, is fed into the machine, when it will be engaged by the bend-
 5 ing-wheel *a* and the disk *J''* and in passing between them is turned into an angle of about one hundred and twenty degrees, as illustrated at *N''*, Fig. 8. It is then engaged by the second bending-wheel and shoe *a' J'* and
 10 turned to an angle of about one hundred and fifty degrees, as shown at *N'''*. It is then engaged by the third bending-wheel and shoe and turned into the position shown at *N''''*.

It is apparent that the angle at which the metal is bent or formed may be varied as desired by changing the angles of the bending-wheels and shoes. It is apparent that

the shoes hold the metal firmly against the feed-rolls while the same is being bent and prevent any buckling or kinking of the metal. 70
 The metal is also gradually turned into the desired shape, so that the fiber of the same is not injured.

We have illustrated and described our improved bending or flanging machine in detail 75
 in the form we believe to be most practical. We are, however, aware that it is capable of considerable variation without departing from our invention

Having thus described our invention, what 80
 we claim as new, and desire to secure by Letters Patent, is—

1. In a machine of the class described, the combination of a frame *B*; a suitable support as *A* therefor; shafts *D, D', D''*, supported in 85
 suitable adjustable bearings in said frame, said shafts being connected together by suitable gear; bending-wheels *a, a', a''*, with their peripheries beveled at varying angles on said shafts; feed-rolls, *E, E', E''*, arranged in a series to correspond with the shafts *D, D', D''* 90
 and supported in suitable adjustable bearings in said frame below said bending-wheels; springs *f*, between the bearings of said shafts and said feed-rolls to hold them normally 95
 separated; gear connections, *c*, between said shafts and feed-rolls; disk-like formers, *J, J', J''*, beveled on their upper faces at angles to correspond with the angles on the peripheries of said bending-wheels, revolubly supported 100
 above said feed-rolls on vertical shafts, *I*; press-wheels, *H*, adjustably supported above said feed-rolls and held normally toward the same by spring-pressure; a stationary guide, *n*, for guiding material to be operated upon 105
 into the machine; a tension-guide *K* for holding same in position in the machine; connections to suitable operative power; all coacting substantially as described.

2. In a machine of the class described, the 110
 combination of a frame *B*; a suitable support as *A* therefor; shafts *D, D', D''*, supported in suitable bearings in said frame, said shafts being connected together by suitable gear; bending-wheels, *a, a', a''*, with their periph- 115
 eries beveled at varying angles on said shafts; feed-rolls, *E, E', E''*, arranged in a series to correspond with the shafts *D, D', D''*, and supported in suitable bearings in said frame below said bending-wheels; springs, *f*, be- 120
 tween the bearings of said shafts and said feed-rolls to hold them normally separated; gear connections, between said shafts and feed-rolls; disk-like formers *J, J', J''*, beveled on their upper faces, at angles to corre- 125
 spond with the angles on the peripheries of said bending-wheels, revolubly supported above said feed-rolls on vertical shafts *I*; press-wheels *H*, supported above said feed-rolls and held normally toward the same by 130
 spring-pressure; a stationary guide *n*, for guiding material to be operated upon into the machine; tension-guide *K* for holding the same in position in the machine; connection

to suitable operative power, all coacting substantially as described.

3. In a machine of the class described, the combination of a frame B; a suitable support as A therefor; shafts D, D', D'', supported in suitable bearings in said frame; said shafts being connected together by suitable gear; bending-wheels, a, a', a'' , with their peripheries beveled at varying angles on said shafts; feed-rolls, E, E', E'', arranged in a series to correspond with the shafts D, D', D'' and supported in suitable bearings in said frame below said bending-wheels; gear connections between said shafts and feed-rolls; disk-like formers J, J', J'', beveled on their upper faces at angles to correspond with the angles on the peripheries of said bending-wheels, revolvably supported above said feed-rolls on vertical shafts I; press-wheels H, supported above said feed-rolls and held normally toward the same by spring-pressure; a stationary guide n , for guiding material to be operated upon into the machine; tension-guide K for holding the same in position in the machine; connections to suitable operative power, all coacting substantially as described.

4. In a machine of the class described, the combination of a frame B; a suitable support as A therefor; shafts D, D', D'', supported in suitable adjustable bearings in said frame, said shafts being connected together by suitable gear; bending-wheels, a, a', a'' , with their peripheries beveled at varying angles on said shafts; feed-rolls, E, E', E'', arranged in a series to correspond with the shafts D, D', D'', and supported in suitable adjustable bearings in said frame below said bending-wheels; springs, f , between the bearings of said shafts and said feed-rolls to hold them normally separated; gear connections between said shafts and feed-rolls; disk-like formers J, J', J'', beveled on their upper faces at angles to correspond with the angles on the peripheries of said bending-wheels, revolvably supported above said feed-rolls on vertical shafts I; press-wheels, H, adjustably supported above said feed-rolls and held normally toward the same by spring-pressure; connection to suitable operative power, all coacting substantially as described.

5. In a machine of the class described, the combination of a frame B; a suitable support as A therefor; shafts D, D', D'', supported in suitable bearings in said frame, said shafts being connected together by suitable gear; bending-wheels, a, a', a'' , with their peripheries beveled at varying angles on said shafts; feed-rolls, E, E', E'', arranged in a series to correspond with the shafts D, D', D'', and supported in suitable bearings in said frame below said bending-wheels; gear connections between said shafts and feed-rolls; disk-like formers J, J', J'', beveled on their upper faces at angles to correspond with the angles on the peripheries of said bending-wheels, revolvably supported above said feed-rolls on vertical shafts I; press-wheels H, supported above

said feed-rolls and held normally toward the same by spring-pressure; connection to suitable operative power, all coacting substantially as described.

6. In a machine of the class described, the combination of a suitable frame; shafts supported in suitable adjustable bearings in said frame; bending-wheels with their peripheries beveled at varying angles on said shafts; feed-rolls supported below said bending-wheels; gear connections for said shafts and feed-rolls; formers having their upper faces beveled at angles to correspond to the angles of said bending-wheels, revolvably supported above said feed-rolls; press-wheels under spring tension to hold the material operated upon to said feed-rolls; guides for guiding the metal to be operated upon into the machine and in position to be engaged by said bending-wheels and formers, substantially as described.

7. In a machine of the class described, the combination of a suitable frame; shafts supported in suitable bearings in said frame; bending-wheels with their peripheries beveled at varying angles on said shafts; feed-rolls supported below said bending-wheels; gear connections for said shafts and feed-rolls; formers having their upper faces beveled at angles to correspond to the angles of said bending-wheels, revolvably supported above said feed-rolls; press-wheels under spring tension to hold the material operated upon to said feed-rolls; guides for guiding the metal to be operated upon into the machine and in position to be engaged by said bending-wheels and formers; substantially as described.

8. In a machine of the class described, the combination of a suitable frame; shafts supported in suitable bearings in said frame; bending-wheels with their peripheries beveled at varying angles on said shafts; feed-rolls supported below said bending-wheels; gear connections for said shafts and feed-rolls; formers having their upper faces beveled at angles to correspond to the angles of said bending-wheels, revolvably supported above said feed-rolls; press-wheels under spring tension to hold the material operated upon to said feed-rolls, substantially as described.

9. In a machine of the class described, the combination of a suitable frame; shafts supported in suitable bearings in said frame; bending-wheels with their peripheries beveled at varying angles on said shafts; feed-rolls supported above said bending-wheels; gear connections for said shafts and feed-rolls; formers having their upper faces beveled at angles to correspond to the angles of said bending-wheels, revolvably supported above said feed-rolls, substantially as described.

10. In a machine of the class described, the combination of a suitable frame; shafts supported in suitable bearings in said frame;

bending-wheels with their peripheries beveled at varying angles on said shafts; feed-rolls supported below said bending-wheels; gear connection for said shafts and feed-rolls; formers having their upper faces beveled at angles to correspond to the angles of said bending-wheels, supported above said feed-rolls; substantially as described.

In witness whereof we have hereunto set our hands and seals in the presence of two witnesses.

ARTHUR E. CHAMBERS. [L. S.]

LEWIS H. BULLARD. [L. S.]

Witnesses:

C. G. BULLARD,

J. E. TISCHNER.