

No. 717,178.

Patented Dec. 30, 1902.

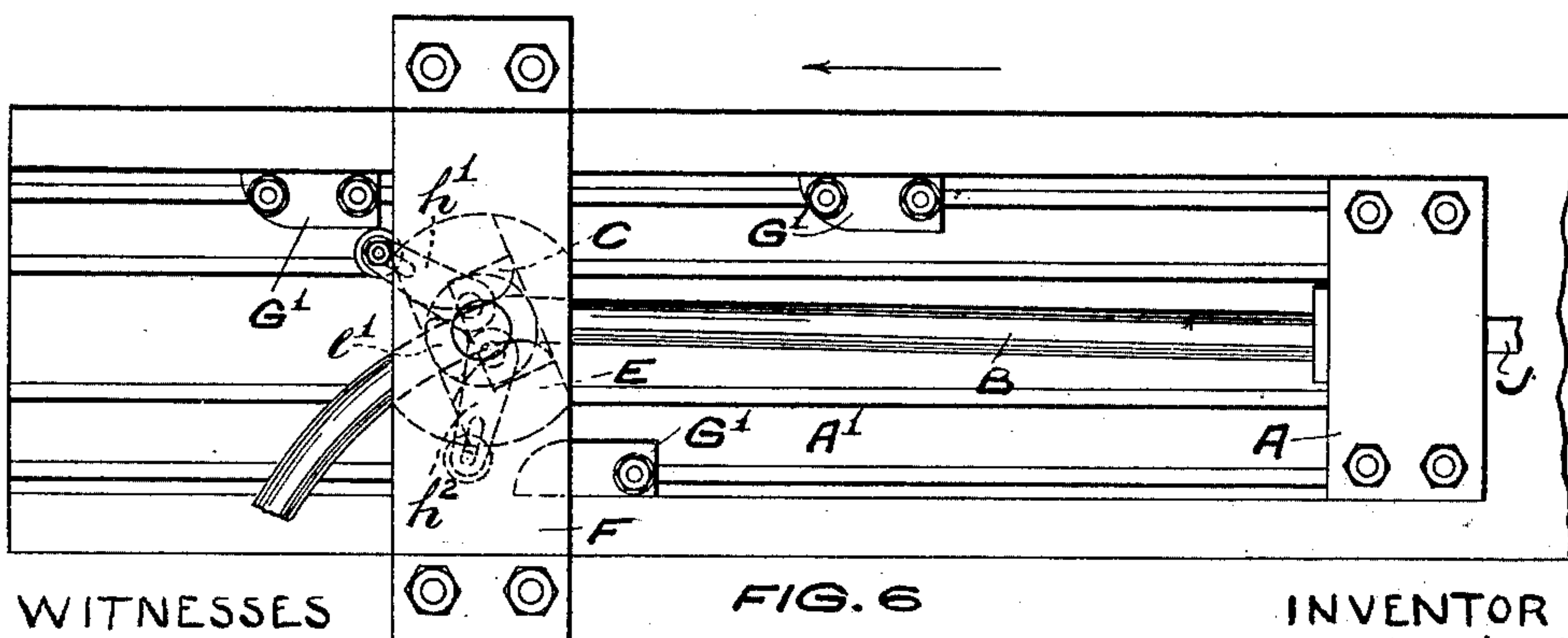
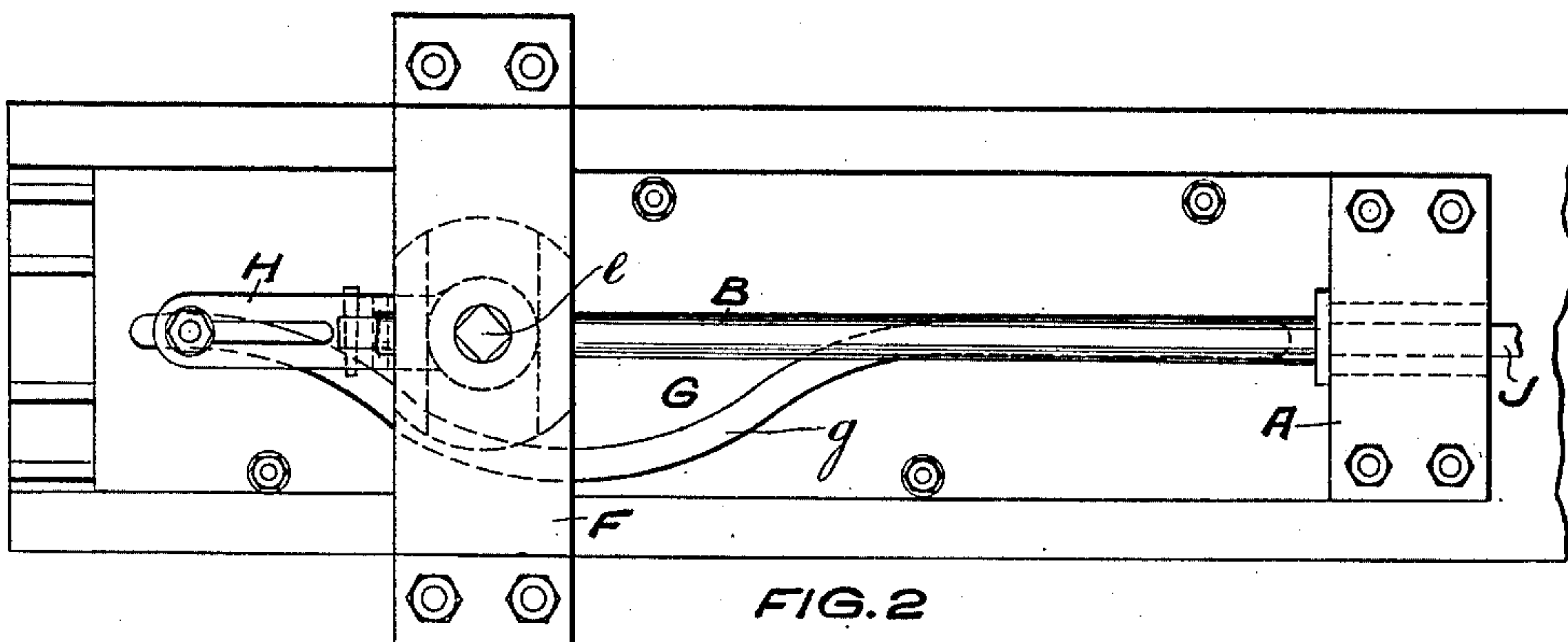
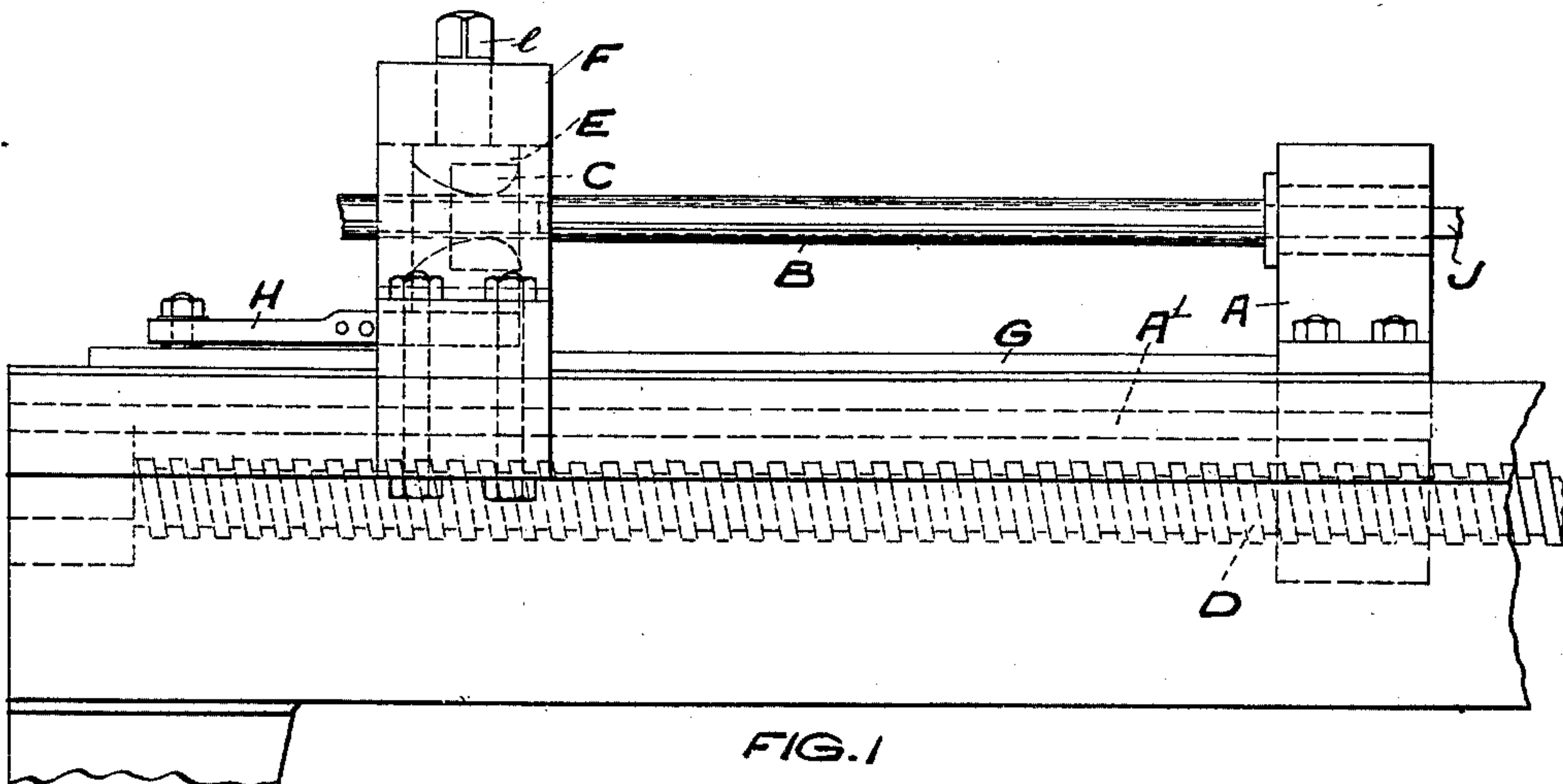
J. EARLE.

MANUFACTURE OF CURVED TUBES, PIPE COILS, OR THE LIKE.

(Application filed Oct. 14, 1902.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES

H. M. Kuehn
J. M. Dorring

FIG. 6

INVENTOR

John Earle

By *Richard J. [Signature]*
ATTORNEYS

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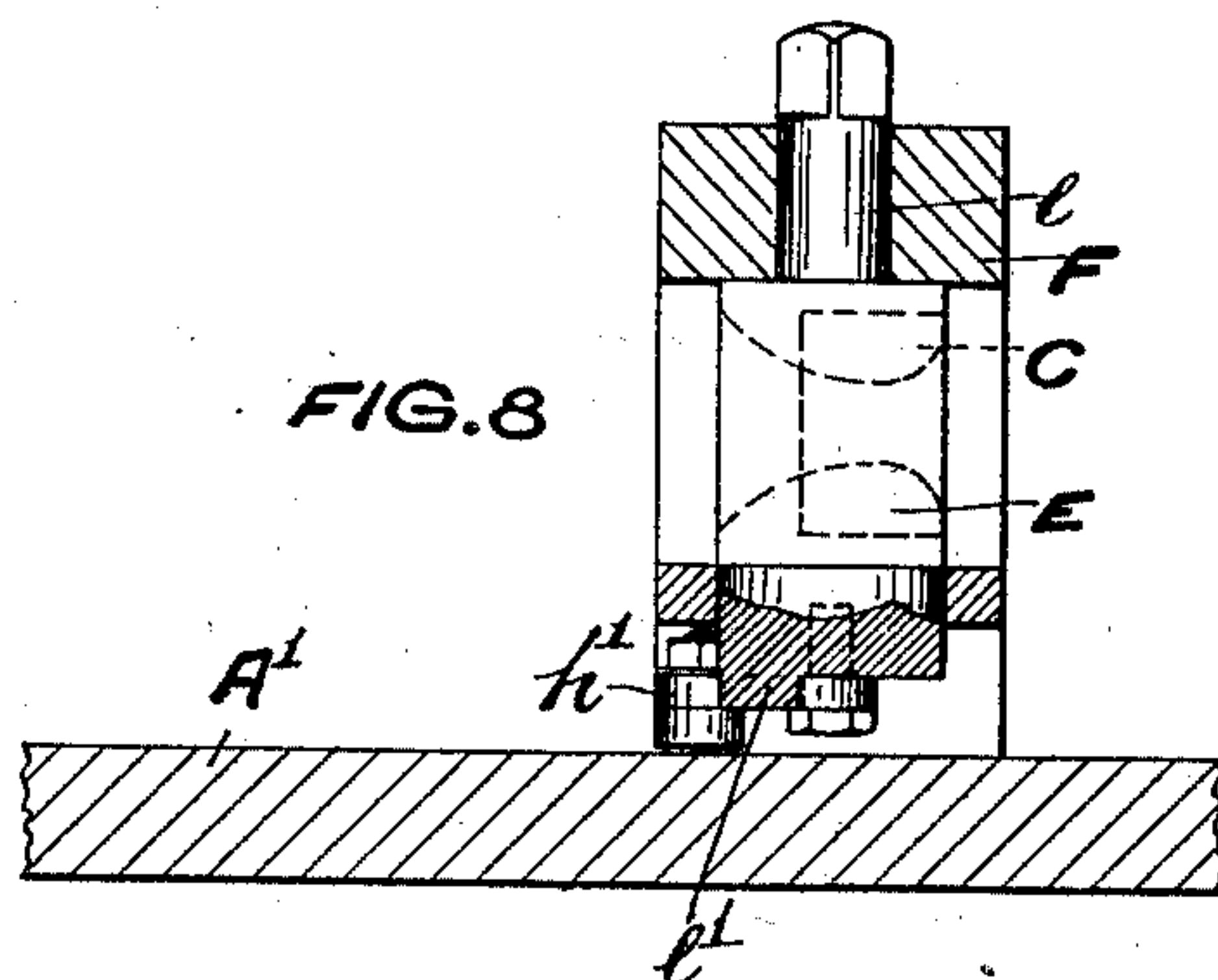
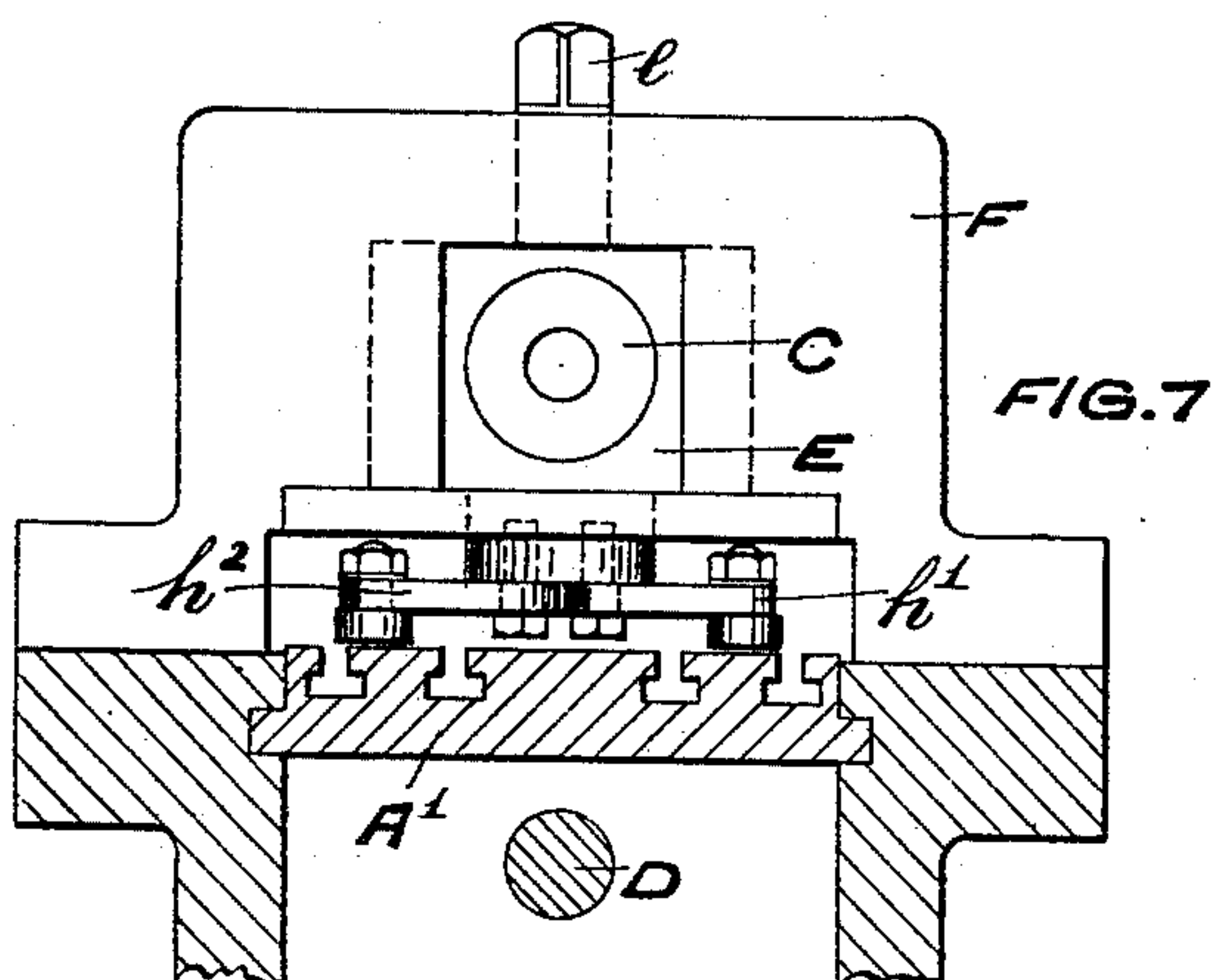
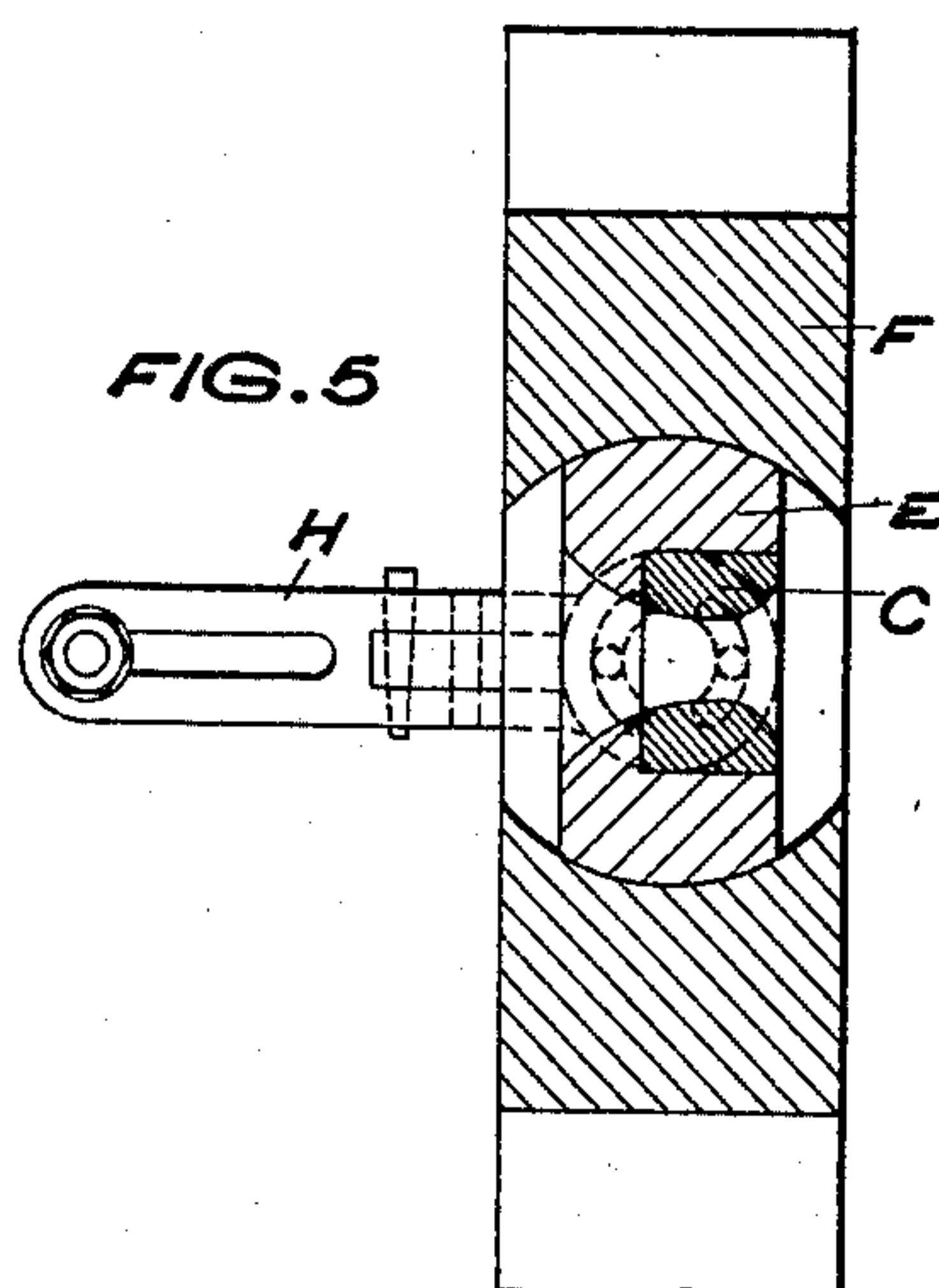
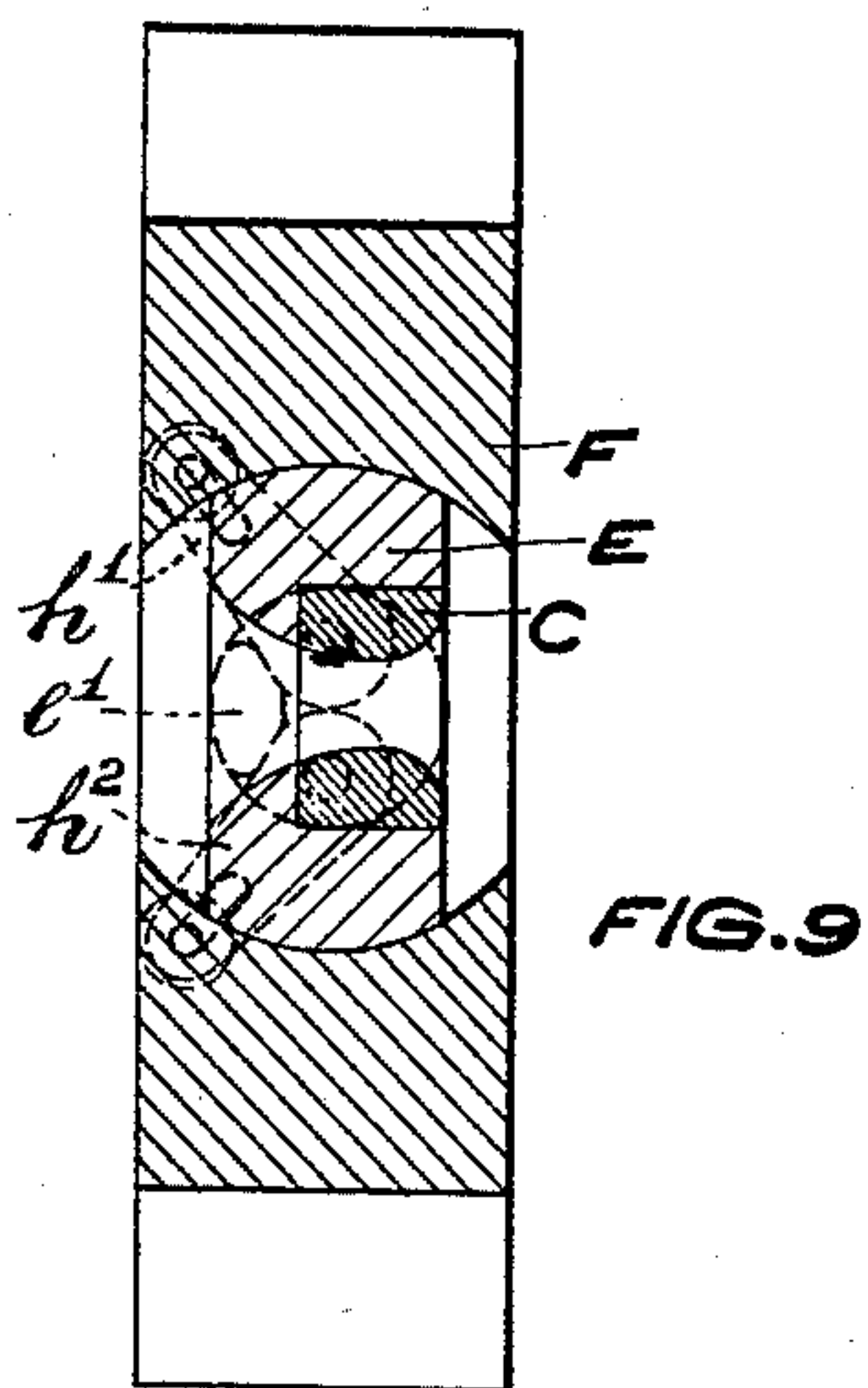
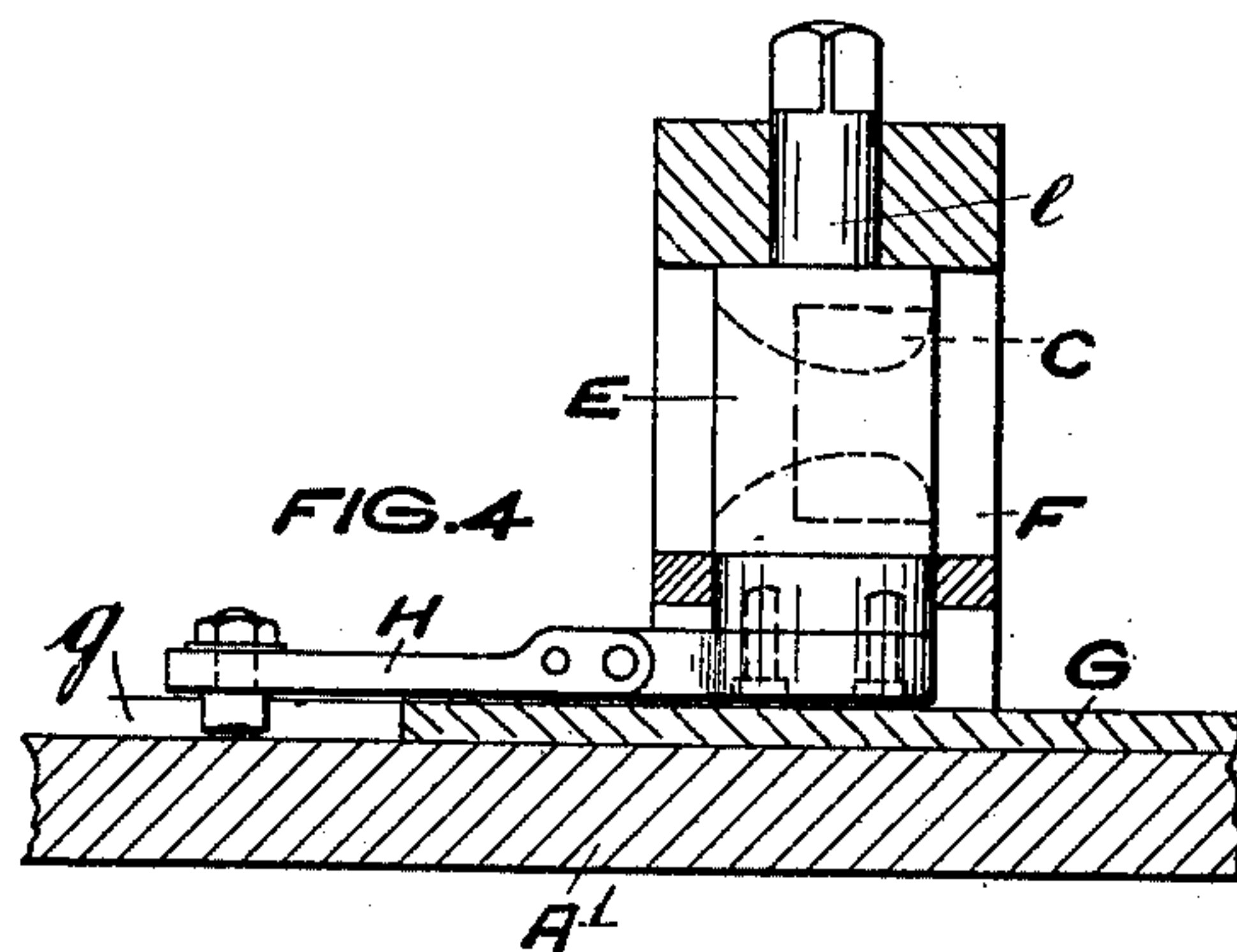
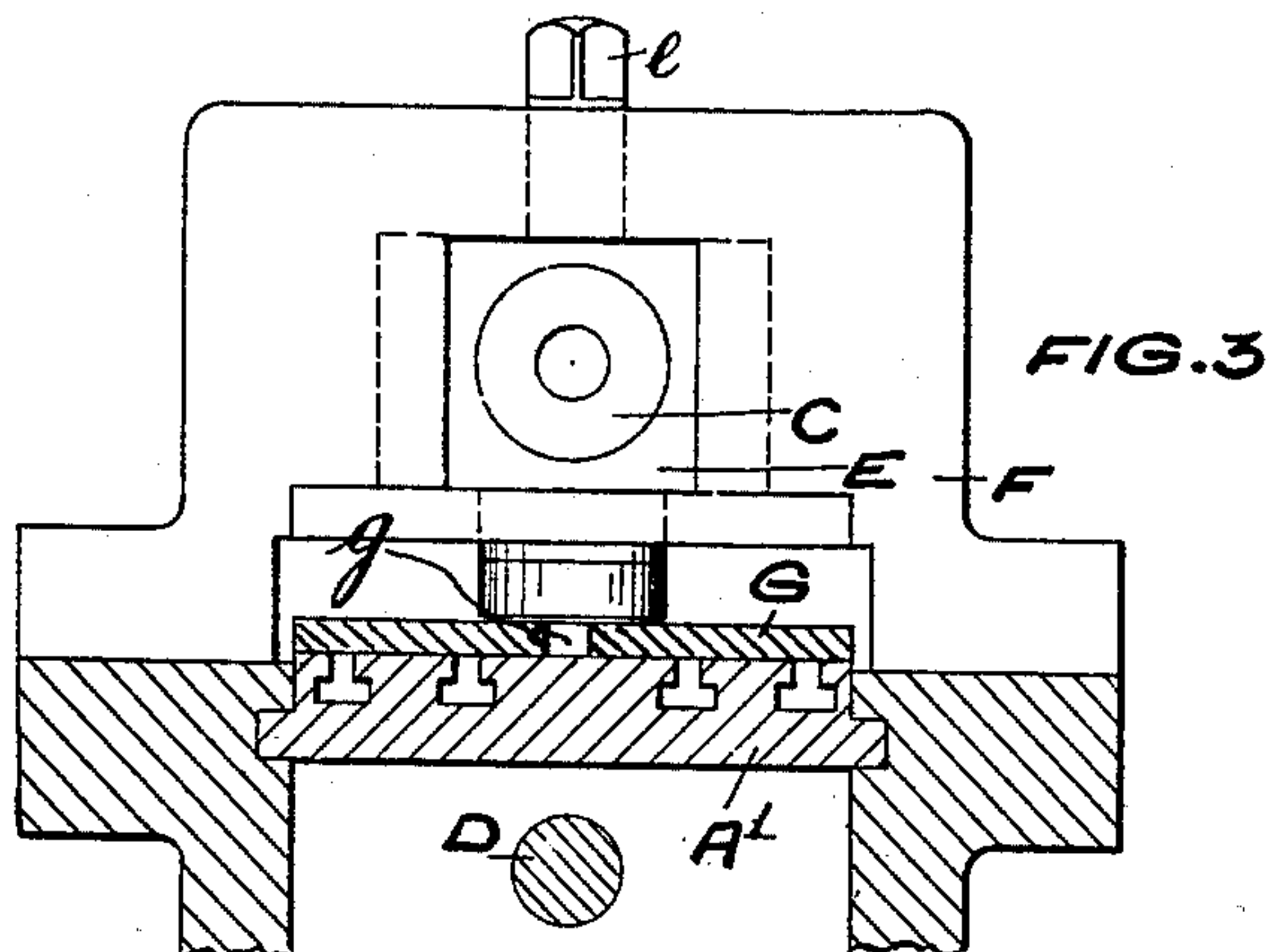
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MANUFACTURE OF CURVED TUBES, PIPE COILS, OR THE LIKE.

(Application filed Oct. 14, 1902.)

(No Model.)

2 Sheets—Sheet 2.



WITNESSES
J. M. Thibault
J. M. Dowling

INVENTOR

John Earle
By *Richardson*
ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN EARLE, OF BIRMINGHAM, ENGLAND.

MANUFACTURE OF CURVED TUBES, PIPE-COILS, OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 717,178, dated December 30, 1902.

Application filed October 14, 1902. Serial No. 127,252. (No model.)

To all whom it may concern:

Be it known that I, JOHN EARLE, a subject of the King of Great Britain and Ireland, residing at Heath street south, in the city of Birmingham, England, have invented certain new and useful Improvements Relating to the Manufacture of Curved Tubes, Pipe-Coils, or the Like, (for which I have filed an application in Great Britain, No. 2,432, bearing date 10 January 30, 1902,) of which the following is a specification.

It is well-known that in the drawing of straight tubes the dies must be set accurately in alinement with the direction of motion of the tubes passing through them. If the respective longitudinal center lines of the die and the moving tube form an angle with each other, a lateral winding or deflecting action is imposed upon the tube, which consequently becomes distorted from the straight-line form.

My invention comprises the utilization of the aforesaid well-known winding or deflecting action for the bending of cased tubes and brass, iron, steel, and other tubes to the curved form required for various purposes and for the production of pipe-coils and the like, whereby I am enabled to improve the finish of such articles and to manufacture the same in a more expeditious and economical manner than by the ordinary bending or like processes now in use.

Referring to the two accompanying sheets of explanatory drawings, Figure 1 is a side elevation, and Fig. 2 a plan, representing a portion of a machine as constructed and arranged in accordance with my invention. Figs. 3, 4, and 5 illustrate in sectional end elevation, sectional side elevation, and sectional plan, respectively, and to a larger scale than that of the Figs. 1 and 2, the arrangement of the die and of the parts for effecting an oscillatory or angular movement of the same. Fig. 6 is a plan of a machine such as shown at Figs. 1 and 2, but with a modified arrangement of pattern-former. Figs. 7, 8, and 9 illustrate in sectional end elevation, sectional side elevation, and sectional plan, respectively, and to a larger scale than that of Fig. 6 the arrangement of the die-operat-

ing parts employed with the pattern-former 50 shown in the said Fig. 6.

The same reference-letters in the different views indicate the same or similar parts.

In the application of my invention, as shown at Figs. 1 to 5, inclusive, for the manufacture of curved top rails for bedsteads or of curved tubes for other purposes I employ a machine somewhat similar to those employed for ordinary tube-drawing, but arrange the moving saddle A to push or press the tube B through the die C instead of to draw it through in the more usual manner. The said saddle A is secured to a sliding bed A', which is operated, preferably, by the action of a screw, as D. The die C is placed within a holder E, which is free to move about a vertical axis with respect to the containing-housing F in order to adjust the die to the required angle with the center line of the tube for imparting the desired amount of bending action to the said tube as it is forced through the die. For the automatic adjustment of the die as a tube passes through the same to give the varying curvature that may be required at different parts of such tube I employ a pattern-plate or former G, fixed to the aforesaid sliding bed A' of the machine and having a slot g, made to the required curved form of the finished tubes. The said slot engages an arm or lever H, projecting from the die-holder E, so that as the former or pattern-plate G moves with the saddle A and bed A' the lateral movement imparted to the arm H by the curved slot g gives the gradual oscillatory movement to the die-holder E for the adjustment of the die C to the required angle. Instead of a curved slot, as aforesaid, I sometimes make one of the longitudinal edges of the pattern-plate to the necessary curved form to impart the oscillatory or angular movement to the die-holder. To prevent buckling or distortion of the tube B as it is forced through the die C, I provide any suitable means for stiffening or staying. One arrangement comprises a mandrel-like or internal supporting-bar, as J, which passes through the moving saddle A. One end of the said bar is attached to a support fixed

beyond the outermost position of the saddle A, while the opposite end terminates just short of the die, as illustrated at Fig. 1. Such mandrel-like bar, while it effectually supports or stiffens the tube during its advance onto the die, does not obstruct the bending action set up on the portion of the tube passing through the die. To permit of ready disconnection of the die-holder projecting arm or lever from the slot *g* in the pattern-former G, I hinge the fore part of the said arm to the after part, as shown at Figs. 1, 2, 4, and 5. The die-holder E has a projecting stem-like part *e*, whereby the complete device may be readily turned by a spanner or otherwise to any required position.

The modified type of pattern-former illustrated at Figs. 6 to 9, inclusive, comprises a series of striking or abutment pieces, as G', which are fixed along the moving bed A' at positions corresponding to the changes in the direction of the curvature to be imparted to the tube B. The die-holder E is provided with a pair of projecting arms or levers, as *h'* *h*², which respectively abut against or strike the pieces G', arranged along the opposite sides of the moving bed A'. The die-holder remains at the angular position to which it is adjusted by one of the pieces G' until it is removed from such position and set at a different angle by the next succeeding abutment-piece. The said levers *h'* *h*² are pivoted upon the die-holder E, as illustrated; but the projecting part *e'* prevents them from turning on their pivots and independently of the holder when engaged by the pieces G' on the movement of the bed A' in the operative direction indicated by the arrow. When the bed moves in the return direction, the levers *h'* *h*² can be turned on their pivots, so that they may not be engaged by the pieces G'.

For the manufacture of pipe-coils, spirals, and the like I preferably employ a die-holder having its periphery formed as a worm-wheel or having a worm-wheel secured thereto and with the die arranged within it at the required angle. In gear with such wheel is a worm, driven in any convenient manner, by which the required uniform or varying rotation is imparted to the wheel for the automatic angular adjustment of the longitudinal center line of the die in relation to the longitudinal center line of the advancing tube to cause the latter to issue from the die in the required coiled, spiral, or like form. In the production of bent or curved cased tubes, such as tubes of iron with an outer brass casing, the die is preferably made of such a size as to effect the closing of the case tightly upon the iron simultaneously with the bending of the complete or composite tube.

I do not limit myself to the particular mechanism hereinbefore referred to, but employ any suitable and ordinary means for the ad-

justment of the die relatively to the tube and for the movement of the latter through the die.

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

1. A machine for the manufacture of curved tubes, pipe-coils and the like, consisting in part of a die having its center line variable with respect to the line of advance of the tube to be operated upon, substantially as set forth.

2. In machines for the manufacture of curved tubes, pipe-coils and the like, the combination with a movable bed and a saddle secured to the said bed, of a fixed housing and a die mounted within the said housing angularly movable with respect to the line of advance of the bed, substantially as set forth.

3. In machines for the manufacture of curved tubes, pipe-coils and the like, the combination consisting of a movable bed, a saddle and a pattern-former secured to the said bed, a fixed housing, a die and a die-holder mounted within the said housing angularly movable with respect to the line of advance of the bed, and an arm projecting from the said die-holder engaging with and receiving an angular motion from the said pattern-former, substantially as set forth.

4. In machines for the manufacture of curved tubes, pipe-coils and the like, the combination consisting of a movable bed, a saddle and a pattern-former secured to the said bed, a fixed mandrel-like supporting-bar projecting through the said saddle, a fixed housing, a die and a die-holder mounted within the said housing angularly movable with respect to the line of advance of the bed, and an arm projecting from the said die-holder engaging with and receiving an angular motion from the said pattern-former, substantially as set forth.

5. In machines for the manufacture of curved tubes, pipe-coils and the like, the combination consisting of a movable bed, a saddle and a pattern-former secured to the said bed, a screw engaging with and imparting motion to the bed, a fixed mandrel-like supporting-bar projecting through the said saddle, a fixed housing, a die and a die-holder mounted within the said housing angularly movable with respect to the line of advance of the bed, and an arm projecting from the said die-holder engaging with and receiving an angular motion from the said pattern-former, substantially as set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

JOHN EARLE.

Witnesses:

EDWARD MARKS,
JOHN MORGAN.