

No. 638,806.

Patented Dec. 12, 1899.

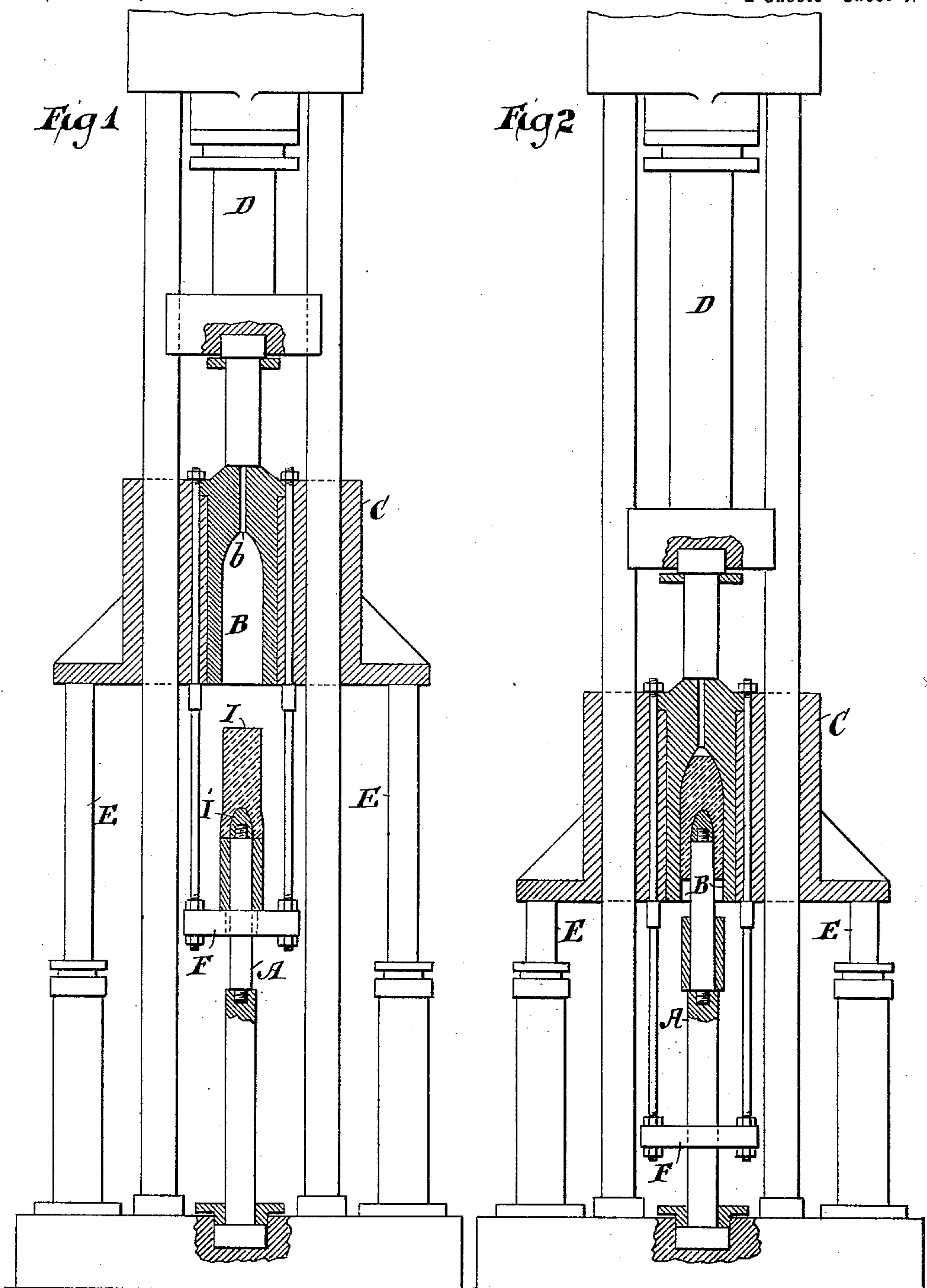
E. F. HOLINGER.

ART OF PIERCING SOLID BILLETS FOR PRODUCING HOLLOW METALLIC OBJECTS.

(Application filed Sept. 23, 1899.)

(No Model.)

2 Sheets—Sheet 1.



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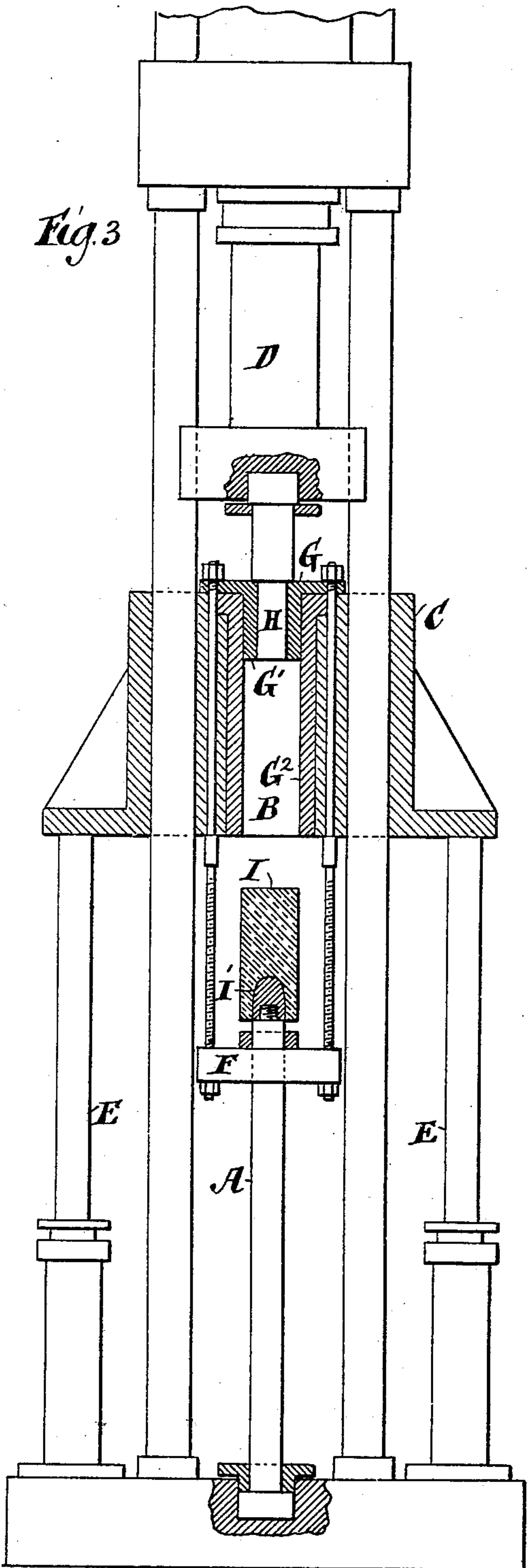
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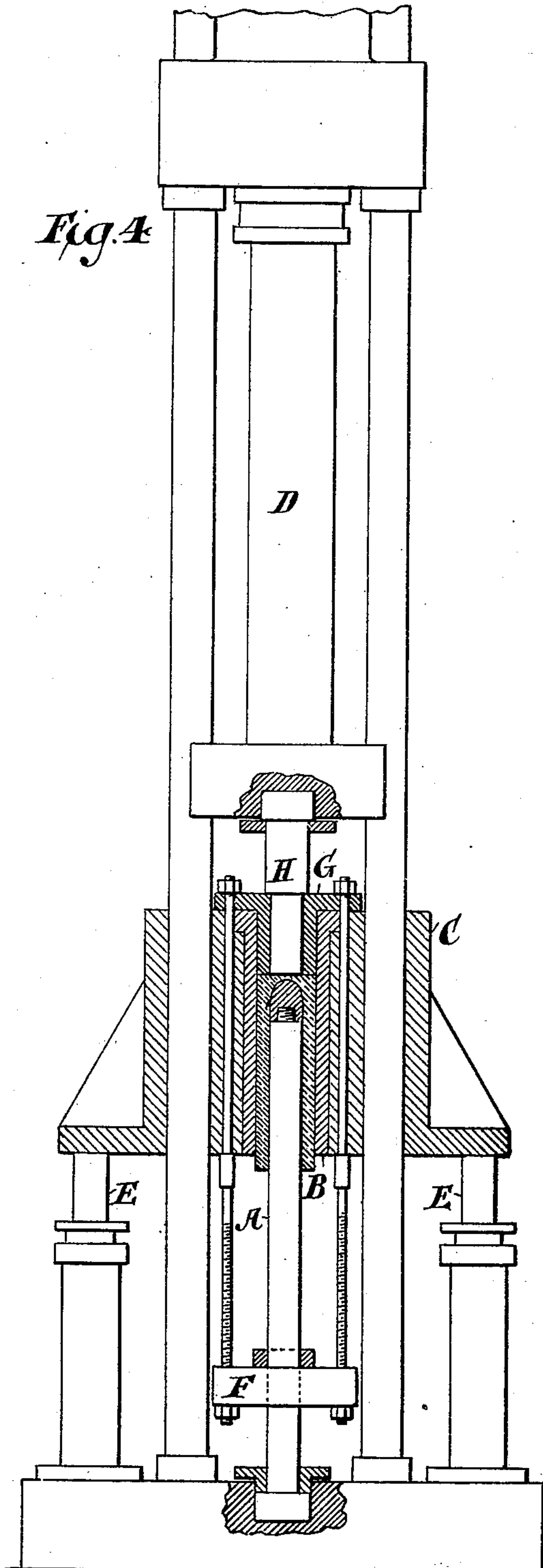
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Fig. 3



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Fig. 4



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UNITED STATES PATENT OFFICE.

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ART OF PIERCING SOLID BILLETS FOR PRODUCING HOLLOW METALLIC OBJECTS.

SPECIFICATION forming part of Letters Patent No. 638,806, dated December 12, 1899.

Application filed September 23, 1899. Serial No. 731,400. (No model.)

To all whom it may concern:

Be it known that I, EMIL F. HOLINGER, a citizen of the United States, residing at McKeesport, in the county of Allegheny, State of Pennsylvania, have invented a certain Improvement in the Art of Piercing Solid Billets for the Production of Hollow Metallic Objects, of which the following is a specification.

This improvement relates to the art of manufacturing hollow objects by piercing suitably hot solid metallic billets. The practice heretofore has been to employ a matrix for containing the billet and either a movable plunger or a movable piercing-punch for administering to the solid billet the endwise pressure required to displace and compel the metal to flow into the annular space between the punch and the wall of the matrix.

The object of the present invention is to diminish the power required to effect the piercing operation, and this object is accomplished by making an upright piercing-punch the stationary or passive member of the piercing-couple and a reciprocating matrix the active member of the piercing-couple. The terms "active" and "passive" are herein employed because the movable matrix actively administers to the billet the endwise downward thrust which the stationary punch passively opposes.

The present method embraces in detail the following steps, to wit: first, the formation in one end of the billet of a recess suitably conforming in shape and size to the shape and size of the apex of the punch; secondly, the deposit of the thus-recessed end of the billet upon the upper end of the punch, whereby the billet is sustained and centralized with relation to the central longitudinal axis of the matrix; thirdly, the application to the matrix of the necessary power to enable it to descend and envelop and administer to the billet the downward pressure required to effect the piercing operation, and, finally, the elevation of the matrix and the subsequent stripping of the hollow product from the punch to which the hollow product usually adheres in consequence of its shrinkage when cooling.

The invention is practiced in the manufacture of the shells of projectiles by the use

of the apparatus shown and described in my pending application, serially numbered 706,366, in which case the upper end of the matrix is shaped to correspond to the conoidal point of the projectile and is also practiced in the production of tube-blanks by the use of the apparatus shown and described in my pending application, Serial No. 714,644, or in any other case in which the matrix has within its upper end a bushing or its equivalent for bearing upon the outer edge of the top of the billet and, in conjunction with a cylindrical plunger contained within the bushing, administering to the billet the pressure required to force the metal downward around the piercing-punch.

The accompanying drawings, illustrating two forms of piercing apparatus suitable for the practice of the invention, are as follows:

Figure 1 is an elevation, partly broken out and partly in section, of piercing apparatus of the kind shown in my pending application, Serial No. 706,366, showing the recessed billet deposited upon the upper end of the punch preparatory to being acted upon by the solid-headed matrix employed for manufacturing the shells of projectiles. Fig. 2 is a view representing the apparatus shown in Fig. 1 at a stage in the operation in which the billet is partially pierced and its upper end partially reduced to the conoidal shape of the upper end of the matrix. Fig. 3 is an elevation, partly broken out and partly in section, of the piercing-press for producing tube-blanks shown and described in my pending application, Serial No. 714,644, showing the recessed billet deposited upon the upper end of the piercing-punch beneath the matrix. Fig. 4 is a view of the parts shown in Fig. 3, showing the piercing operation nearly completed.

As the piercing-presses shown in the drawings are fully illustrated and described in my said pending applications, in which they are made the subjects of claims, it is not necessary to herein refer to them otherwise than in such general terms as will indicate the employment of the present invention when they are used for their respective purposes.

Each of the two forms of piercing-presses shown in the drawings employs a stationary upright piercing-punch A, a vertically-recip-

rocating matrix B, a matrix-carriage C, a hydraulic ram D for forcing the carriage and the matrix downward to deliver the working stroke upon the billet, hydraulic pistons E E
5 for elevating the carriage and matrix after the conclusion of the piercing operation and by means of the stripper F stripping the hollow product from the punch. In each case the billet I has its lower end provided with
10 the recess I', adapting it for deposit upon the apex of the punch.

In the projectile press, as shown in Figs. 1 and 2, the matrix has a solid upper end conoidally shaped to correspond with the pointed end of the projectile and provided with the
15 usual vertical aperture or vent-hole b.

In the press for making tube-blanks, as shown in Figs. 2 and 3, the matrix has inserted in its upper end the bushing G, presenting at its lower end the annulus G' for bearing upon the outer edge of the top of the billet and in conjunction with the lower end of the cylindrical ram H, contained within the bushing G, administering to the billet the
20 downward thrust by which the metal is made to envelop the upper part of the punch by flowing into the space between the punch and the wall G² of the matrix.

It is to be understood that the practice of
30 the method constituting the present invention is involved in the use of any form of piercing apparatus in which the billet is deposited upon the upper end of a stationary upright piercing-punch and is acted upon by
35 a descending matrix adapted to administer the required downward pressure upon the whole of or upon any part of the upper end

of the billet, whereby the direction of the flow of the displaced metal which elongates the hollow product is the same as the direction of
40 the descending stroke of the matrix.

What is claimed as the invention is—

1. The improvement in the art of piercing solid billets for the production of hollow metallic objects, which consists first, in forming
45 a suitable recess in one end of the billet; secondly, in depositing the recessed end of the suitably-heated billet upon the upper end of a stationary piercing-punch; thirdly, in forcing downward upon the billet a matrix adapted to administer to the upper end of the
50 pressure tending to force the hot metal to envelop the upper portion of the punch by flowing into the annular space between the same and the wall of the matrix, and finally, in stripping the hollow product from the punch.

2. The improvement in the art of piercing solid billets for the production of hollow metallic objects which consists in supporting a hot billet upon the upper end of a stationary
60 upright piercing-punch and in then forcing downward upon the billet a suitable matrix and thereby administering to the upper end of the billet the pressure required to force the hot metal to envelop the upper portion of
65 the punch by flowing into the annular space between the punch and the wall of the matrix, whereby the originally solid billet is elongated and transformed into a hollow object.

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Witnesses:

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