

(No Model.)

H. AIKEN.  
PROCESS OF MANUFACTURING AXLES.

No. 415,403.

Patented Nov. 19, 1889.

FIG.1.

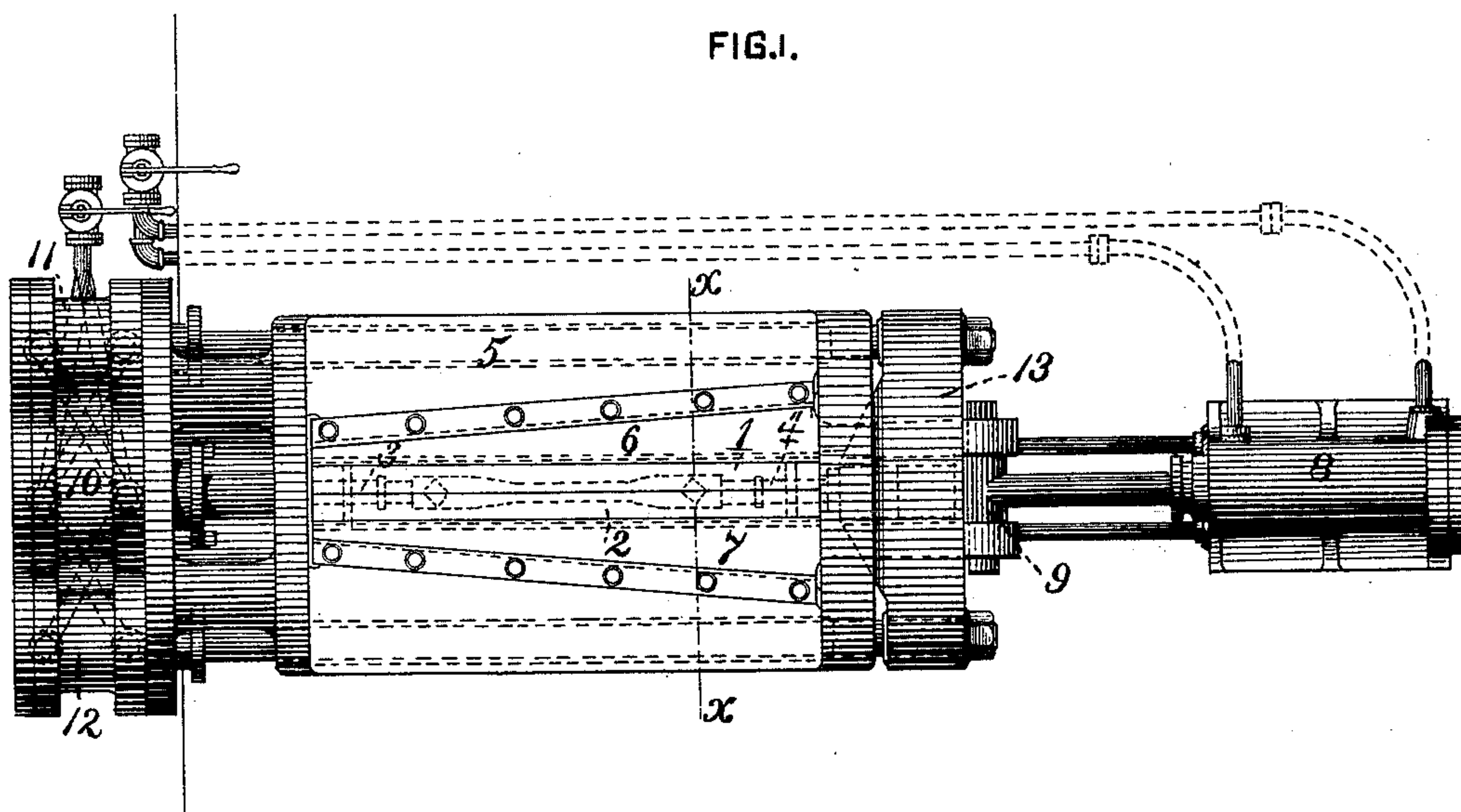


FIG.2.

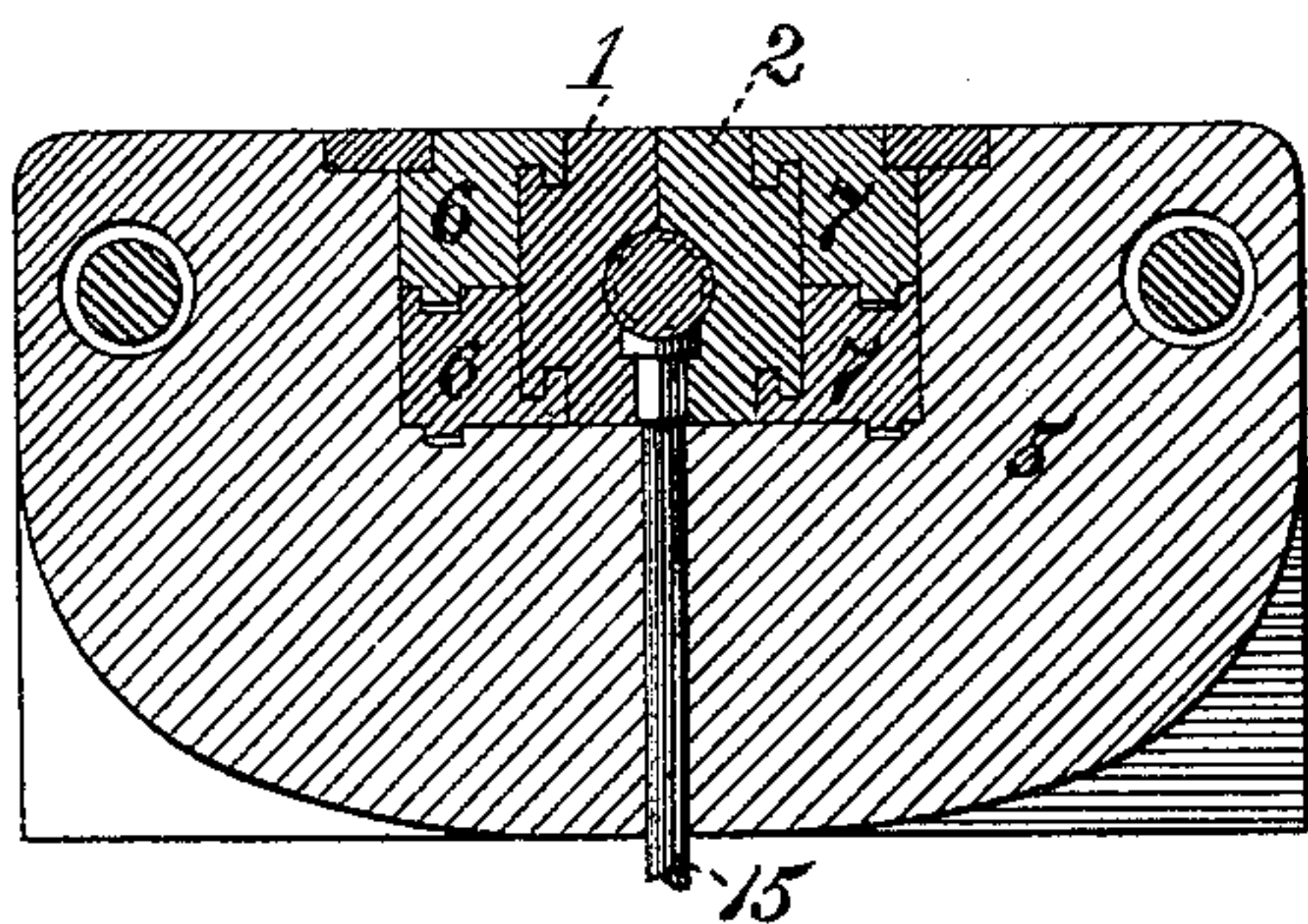


FIG.3.

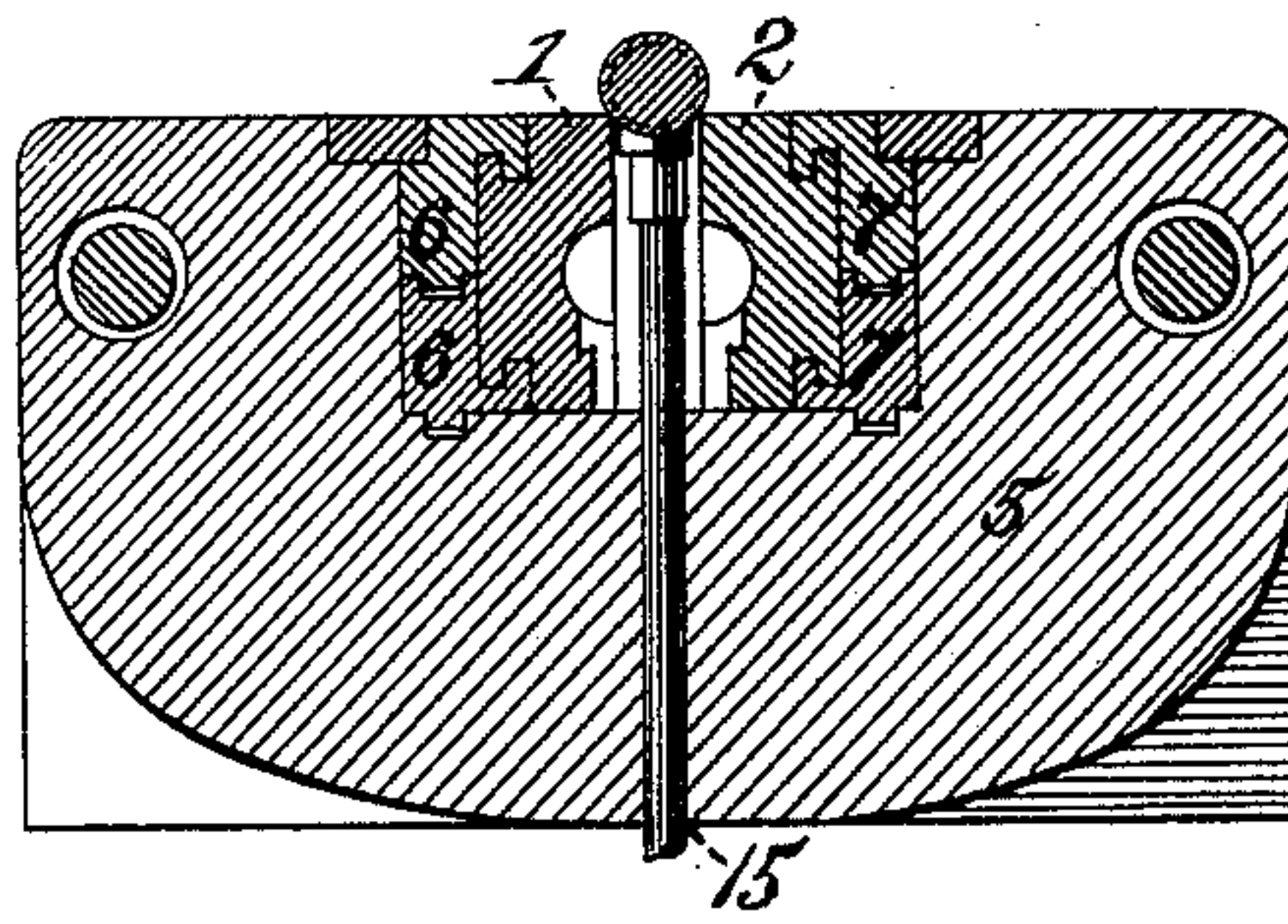
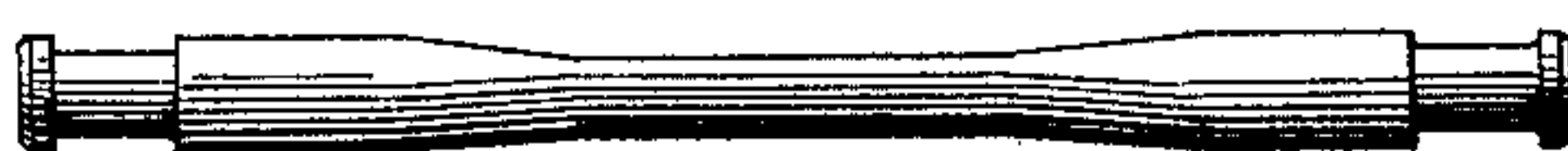


FIG.4.



FIG.5.



WITNESSES:

Danwin S. Wolcott  
J. E. Gaither

INVENTOR,

Henry Aiken  
by George H. Christy  
Att'y.



# UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF HOMESTEAD, ASSIGNOR TO CARNEGIE, PHIPPS & COMPANY, (LIMITED,) OF ALLEGHENY COUNTY, PENNSYLVANIA.

## PROCESS OF MANUFACTURING AXLES.

SPECIFICATION forming part of Letters Patent No. 415,403, dated November 19, 1889.

Application filed June 27, 1889. Serial No. 315,738. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY AIKEN, a citizen of the United States, residing at Homestead, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in the Process of Manufacturing Axles, of which improvement the following is a specification.

The invention described herein relates to certain improvements in the process of manufacturing axles for vehicles, such as railway-cars, &c. Heretofore in the manufacture of such axles it has been customary to produce by rolling or hammering an ingot or billet of a sectional area somewhat greater than the sectional area of the largest part of the axle to be produced and of such a length as will afford sufficient metal in the subsequent treatment thereof to produce an axle of the desired length. This billet is then reduced by forging to the desired dimensions and shape, and the car-wheel seat and the journal portion of the axle are finished in a suitable lathe. This operation involves not only a great deal of hard labor, but also the loss of considerable time and material, and also involves the frequent reheating of the billets, which is detrimental to the metal.

The object of the invention herein is to provide for the formation of the entire axle as regards the general size and shape thereof, the size and shape of the car-seat bearing, and the approximate size and shape of the journal-bearing; and to this end the invention consists in the method hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a plan view of an apparatus adapted for the practice of my invention. Figs. 2 and 3 are transverse sections on the line *xx*, Fig. 1, the forming-dies being shown closed in Fig. 2 and open in Fig. 3. Fig. 4 is a view in elevation of the blank in which the axle is to be formed, and Fig. 5 is a similar view of the completed axle.

In the practice of my invention I provide a blank A of approximately uniform diameter throughout its entire length, preferably equal to or perhaps slightly less than the diameter of the smallest part of the finished axle, and

of a length longer than that of the finished axle by an amount sufficient to afford the necessary metal required in forming the larger parts of the axle, as will be hereinafter described. This blank, which can be produced by rolling in a suitable mill or in any other suitable manner, is heated until the metal becomes sufficiently plastic to permit of its being upset, and is then placed in the matrix formed in the dies 1 and 2. This matrix corresponds to, as regards its several dimensions and shape, the axle to be made, and at the ends of said matrix are formed passages, as represented in dotted lines in Fig. 1, for the movement of the upsetting-plungers 3 and 4. The dies 1 and 2 are arranged in a recess in a frame 5, and are operated to and from each other by means of wedges 6 and 7, which are shifted longitudinally in the frame 5 by the piston of a hydraulic cylinder 8, connected thereto by means of a cross-head 9, as shown in Fig. 1. The plungers 3 and 4 are operated by hydraulic cylinders 10, 11, and 12, the cylinders 11 and 12 having their piston-rods connected to a cross-head 13 at one end of the machine, said cross-head having the plunger 4 connected thereto, and the cylinder 10 having its piston connected to the plunger 3. The cylinders 10, 11, and 12 are so proportioned that the power exerted by the cylinder 10 is equal, or approximately so, to that exerted by both cylinders 11 and 12, and they are so connected to a fluid-pressure supply as to permit of their simultaneous and equal operation, as will be readily understood. After the blank has been heated and placed within the matrix of the dies the latter are closed together by means of the wedges 6 and 7. Fluid-pressure is then admitted into the cylinders 10, 11, and 12, thereby forcing the plungers 3 and 4 inwardly and upsetting the ends of the blank held within the dies, and causing the metal of said blank to expand outwardly, completely filling the matrix and reducing the blank in length to or approximately to the length required in the finished axle. The dies are then opened by the operation of the wedges and the finished axle raised from between the dies by means of vertically-movable rods having their ends suitably shaped to support the axle and work-



ing between the open dies. After the finished axle has been removed another heated blank is placed in position in the dies, which are then closed and the blank upset, as hereinbefore described.

It will be readily understood by those skilled in the art that by suitably proportioning the matrices of the dies an axle having the desired shape and dimensions in the several parts when cold can be quickly and easily shaped in the manner above described.

No claim is made herein to the construction and combination of the several devices shown and described with more or less particularity, as the same, in so far as they may present patentable features, will form the subject-matter of an application, Serial No. 294,497, filed December 24, 1888; nor do I wish to be understood as limiting myself in the practice of my invention to any particular form or construction of apparatus, as the several steps hereinbefore described may be effected by apparatus other than that shown and described.

The principal characteristic of this invention is the formation of a finished axle from a blank of a length greater than that of the axle to be formed by end compression, whereby the blank is reduced in length and enlarged laterally at its ends and portions intermediate of the ends.

It is not necessary in the practice of my invention that both ends should be operated on

at the same time, it being practicable and within the scope of my invention to treat, in the manner hereinbefore described, one end of the axle at a time.

I claim herein as my invention—

1. As an improvement in the art of manufacturing axles, the herein-described method, which consists in subjecting a blank of greater length than the axle to be formed to end compression or upsetting, thereby at once both reducing the blank in length and enlarging its end or ends and intermediate portions, substantially as set forth.

2. As an improvement in the art of manufacturing axles, the method herein described, which consists in forming a blank of a uniform cross-sectional size approximately equal to the smallest sectional size of the axle to be formed—i. e., at its middle portion—and of a length greater than that required in such axle, and then by an upsetting operation reducing such blank in length and simultaneously enlarging its ends and intermediate portions to the shape and dimensions required, substantially as set forth.

In testimony whereof I have hereunto set my hand.

HENRY AIKEN.

Witnesses:

W. B. CORWIN,  
DARWIN S. WOLCOTT.