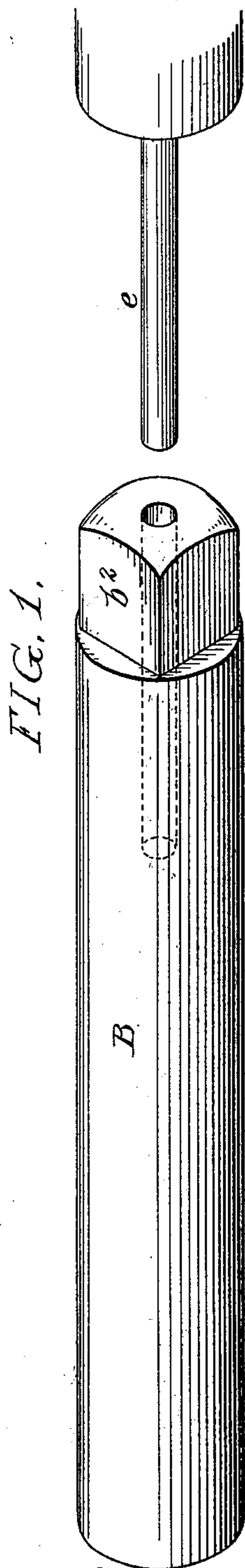


(No Model.)

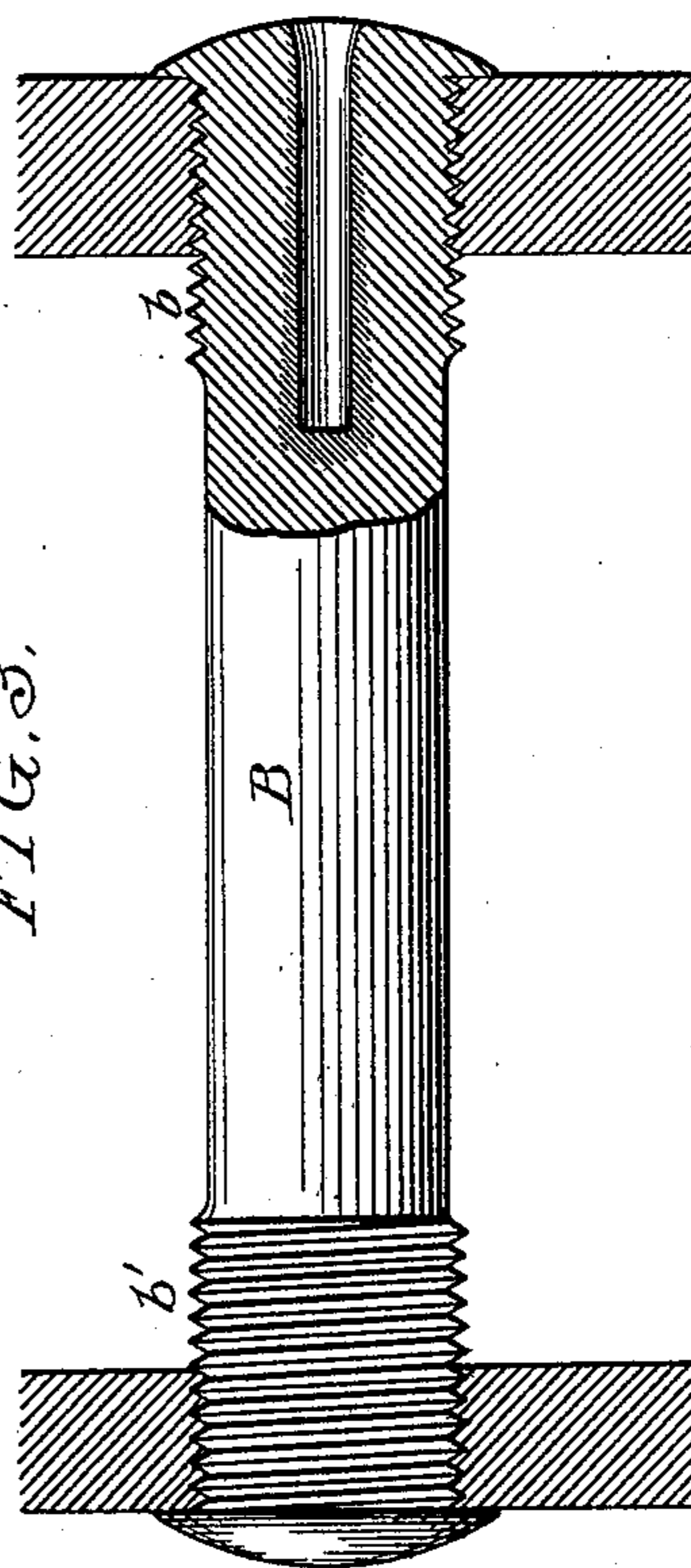
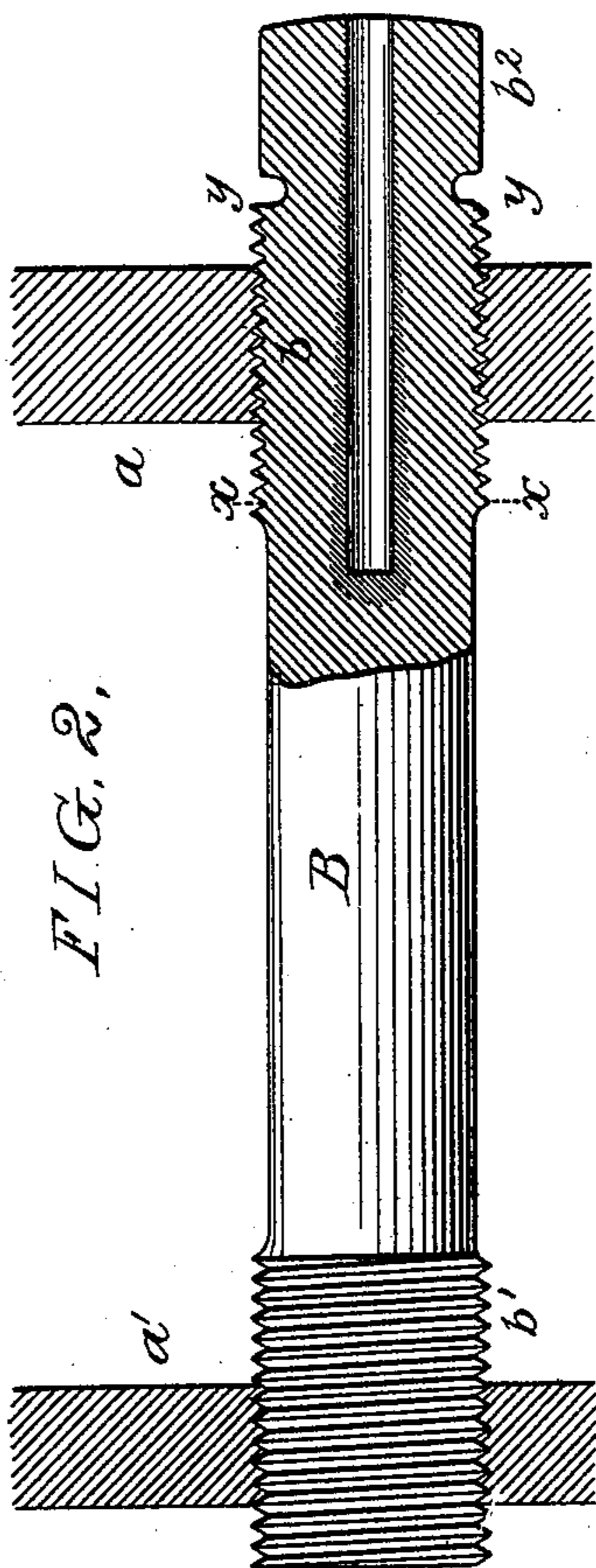
J. JOHNSON & W. V. LUKENS.  
STAY BOLT.

No. 602,402.

Patented Apr. 12, 1898.



Witnesses:  
Will. A. Bann.  
Charles DeCoe.



Inventors:  
Justus Johnson and  
William V. Lukens,  
by their Attorneys,  
Howson & Howson

# UNITED STATES PATENT OFFICE.

JUSTUS JOHNSON AND WILLIAM V. LUKENS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO BURNHAM, WILLIAMS & CO., OF SAME PLACE.

## STAY-BOLT.

SPECIFICATION forming part of Letters Patent No. 602,402, dated April 12, 1898.

Application filed March 8, 1897. Serial No. 626,479. (No model.)

*To all whom it may concern:*

Be it known that we, JUSTUS JOHNSON and WILLIAM V. LUKENS, citizens of the United States, and residents of Philadelphia, Pennsylvania, have invented certain Improvements in Stay-Bolts, of which the following is a specification.

Our invention relates to improvements in the manufacture of stay-bolts for boilers, especially the short stay-bolts used to connect the inner and outer walls of that portion of a boiler around the fire-box and used especially in the construction of locomotive-boilers.

The object of our invention is to make a cavity in one end of the stay-bolt without materially weakening the same to allow for the escape of water should the stay-bolt break when in position, and thus indicate the break.

In the accompanying drawings, Figure 1 is a perspective view of a stay-bolt, illustrating our invention and showing the tool for making the cavity. Fig. 2 is a view, partly in section, of the stay-bolt after being placed in position in the boiler and before being cut off and riveted; and Fig. 3 is a view, partly in section, showing the finished stay-bolt in the boiler.

In the manufacture of boilers, especially those of the locomotive type, where the fire-box is surrounded by a portion of the boiler, the outer and inner walls  $a\ a'$  are tied together at intervals by stay-bolts B. These stay-bolts are made from round bars of metal, as shown in Fig. 1, having one end squared or many sided, so that they can be turned by a wrench. Two threads  $b\ b'$  are cut in the stay-bolt and the central part reduced below the depth of the screw-threads. The threaded section  $b'$  of the stay-bolt is screwed into an opening in the front plate A and then screwed into an opening in the inner plate  $a'$ . The second thread  $b$  is screwed into the plate  $a$  as the section  $b'$  is being screwed into the plate  $a'$ , so that the two plates are held together in proper position by the threads on the bolt B. The bolt is turned by means of a wrench adapted to the head  $b^2$ .

In the event of the stay-bolt breaking, owing to strains, it will invariably break back of the front plate  $a$  and usually near a point on the line  $x\ x$ , and in order to allow for the escape of water, so as to indicate the break, a cavity

is formed in the end of the said bolt extending beyond this point. We form this cavity, preferably, prior to the cutting of the thread on the bolt and at the same time that the head  $b^2$  is being formed by forcing a plunger-die  $e$  into the head end of the bolt while heated, and this die will force its way into the bolt, condensing the metal around the opening. This plunger-die is forced into the bolt to the depth required, and when removed the bolt is ready to have the screw-threads cut upon it and its central portion turned down, as shown in Fig. 2.

After the bolt is in position in the boiler the head  $b^2$  is separated from the body of the bolt on the lines  $y\ y$ , the annular channel around this point being formed to act as a guide for the operation. After the head is removed the two ends of the bolt are riveted over the plates of the boiler and a tapered mandrel is introduced in the cavity to flare the outer end, as shown in Fig. 3.

Thus we are enabled to quickly and cheaply manufacture stay-bolts with cavities in the end for the purpose described without materially weakening the bolt, as we remove no metal from it, the metal being displaced by the die as it is forced into the headed bolt. Consequently the metal around the cavity is denser than at any other portion of the bolt.

In some instances both ends of a bolt may have cavities formed therein. This depends, however, upon the construction of the boiler.

We claim as our invention—

1. As a new article of manufacture, a stay-bolt having a deep cavity in one end, the walls of said cavity being denser than the main body of the bolt, substantially as described.

2. A stay-bolt having a screw-threaded section at each end and also having a head at one end, and a deep cavity formed in one end of the stay-bolt, the walls of said cavity being denser than the main body of the bolt, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JUSTUS JOHNSON.  
WILLIAM V. LUKENS.

Witnesses:

GEO. H. SIMPKINS,  
SAMUEL M. VAUCLAIN.