Feb. 25, 1930. J. H. TAYLOR 1,748,402

PROCESS OF MAKING NOZZLES

Filed June 26, 1925

Fig. 1.

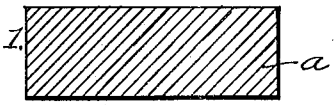


Fig. 2.

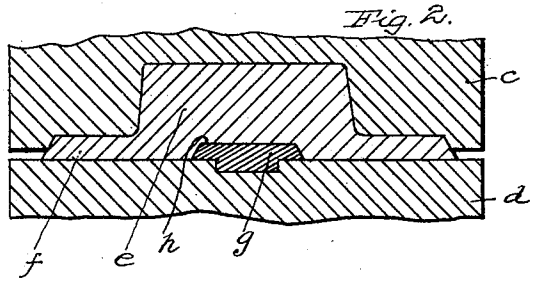


Fig. 6.

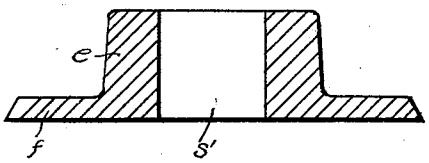


Fig. 3.

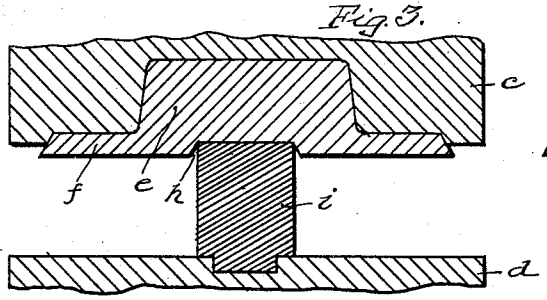


Fig. 7.

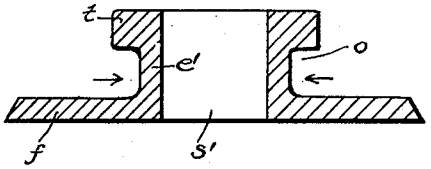


Fig. 4.

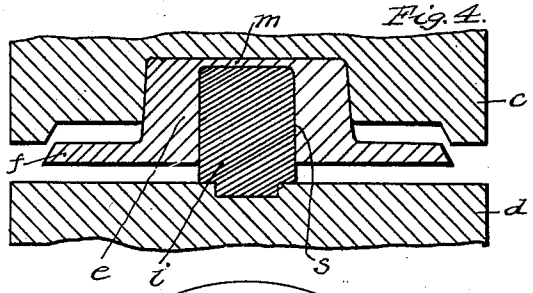


Fig. 8.

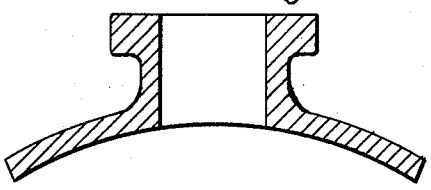
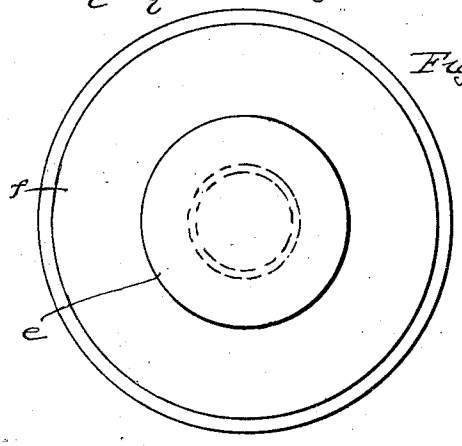


Fig. 5.



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UNITED STATES PATENT OFFICE

JAMES HALL TAYLOR, OF CHICAGO, ILLINOIS

PROCESS OF MAKING NOZZLES

Application filed June 26, 1925. Serial No. 39,794.

My invention relates to nozzles such as are commonly used in connection with steam boilers and the like, and contemplates a new and improved process of making them.

In the accompanying drawing the successive figures illustrate the successive steps in the process of my invention, although it will appear that the precise order of the steps, at least as to some of them, may be varied, and the appended claims have been drawn accordingly. The figures are all cross-sectional views, with the exception of Figure 5, which is a plan view of the billet in the form shown in Figure 4.

In the drawings:

Fig. 1 is a cross-sectional view through a billet from which a nozzle is to be made;

Figs. 2, 3 and 4 are cross-sectional views through the dies and the billet, illustrating successive steps of my process;

Fig. 5 is a plan view of the billet, partially formed into a nozzle, shown in Fig. 4;

Fig. 6 is a cross-sectional view through the partially formed nozzle of Fig. 5, after it has been completely pierced;

Fig. 7 is a cross-sectional view through the partially formed nozzle after the upper flange has been formed thereon;

Fig. 8 is a cross-sectional view through the completed nozzle, showing the lower flange shaped to fit a boiler or like structure.

The billet of wrought metal, from which the nozzle is to be formed, is shown at *a*. This billet is heated to a working heat and, as shown in Figure 2, formed between dies *c* and *d* into a circular body *e* having a flange *f* at the bottom thereof. A die block *g* disposed in the center of the face of the lower die *d* forms a central depression *h* in the bottom of the body *e*. In this first step, the body *e* is formed to the diameter of the eventual upper flange of the completed nozzle. The central depression *h* is formed as part of the step of providing a through central opening as will be clear presently.

When the above described operation has been performed, an elongated die-block *i* is substituted for the die-block *g* on the lower die, the partially formed billet placed thereon, as shown in Figure 3, and the dies made to approach each other as indicated in Figure 4. In this action, the metal tends to flow laterally, but is so confined by die *c* that its only avenue of flow is downward between die *c* and die block *i*. Consequently, the metal flows counter to the movement of the die-block *i*, as will be clear from the illustration, the body *e* being thus elongated to the proper length, the flange leaving contact with the die *c*, and a nearly through central opening *s* formed, only the thin wall *m* remaining at the top of the central opening.

Figure 5 is a plan view of the billet formed to this point.

The next step in the process is to remove the thin wall *m*, resulting in the formation illustrated in Figure 6, with the through central opening *s'*.

The next step in the process is to form the peripheral groove *o*, whereby an integral structure comprising an upper flange *t*, a lower flange *f*, and a connecting neck *e'* is formed, as shown in Figure 7. This groove is preferably formed by inserting a mandrel in the opening *s'* and applying rolling dies moving toward the axis as indicated by the arrows, and the billet may be properly confined between dies to insure the form of the flanges. In this action the billet may lengthen slightly and the action illustrated in Figure 4 may, therefore, be calculated to make allowance accordingly, so that the finished product will be of the right length. The groove *o* may also be formed by cutting in a lathe, in which event the nozzle length is finally determined in the formation illustrated in Figure 4.

The last step in the process is to bend the lower flange into cylindrical form, as shown in Figure 8, so that it may properly fit the boiler or the like to which it is to be secured.

I claim:

1. The process of forming nozzles which comprises first forming a circular body with a flange at one end, then forming a depression in the center of said body substantially through the same, and thereby causing said body to lengthen, then forming a peripheral groove in said body by reducing it adjacent said flange to form a neck, leaving an opposing flange of the diameter of the original cir-

cular body, and removing the metal at the end of said depression to form a through opening.

2. The process of forming nozzles which comprises first forming with male and female dies a circular body with a flange at one end, then forcing a die into the center of said body while in said female die alone to form a deep central depression and thus securing an extending action lengthening said body, removing the remaining metal closing said depression to form a through opening, and thereafter forming a peripheral groove in said body adjacent said flange to form a neck and an opposing flange.

3. The process of forming nozzles which comprises first forming a flange on a circular body of the diameter of an ultimate opposing flange, then forming a depression in the center of said body nearly through the same and thereby causing said body to lengthen, then forming a peripheral groove in said body by reducing it adjacent said first named flange to form a neck and said opposing flange, and removing the metal at the end of said depression to form a through opening.

4. The process of forming a nozzle which comprises forming a body with a central hub and a flange at one end, then substantially piercing the body and simultaneously extruding the hub, then reducing the hub adjacent the flange to form a neck with a smaller opposing flange, and completing the piercing of the body.

5. The process of forming a nozzle from a block which comprises die pressing the block to flow the metal into a central hub and a laterally extending flange, said flange being substantially finished by said operation, then substantially piercing and extruding the hub and flange to form the hub to substantially its final outer diameter, then reducing the hub to leave a second flange on the outer end of the hub, and completing the piercing to form a through opening.

In witness whereof, I hereunto subscribe my name this 10th day of June, 1925.

JAMES HALL TAYLOR.