July 23, 1929. R. A. KROPP 1,721,630

PROCESS OF MAKING NOZZLES

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Fig. 1.

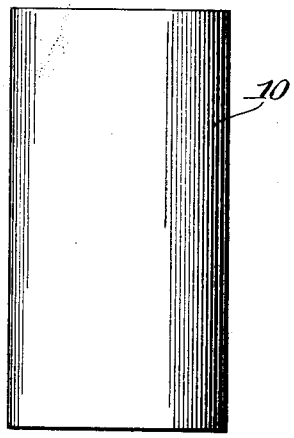


Fig. 3.

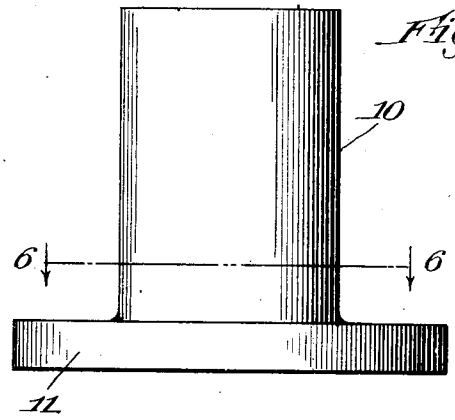


Fig. 2.

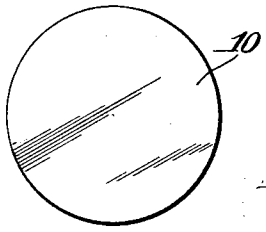


Fig. 4.

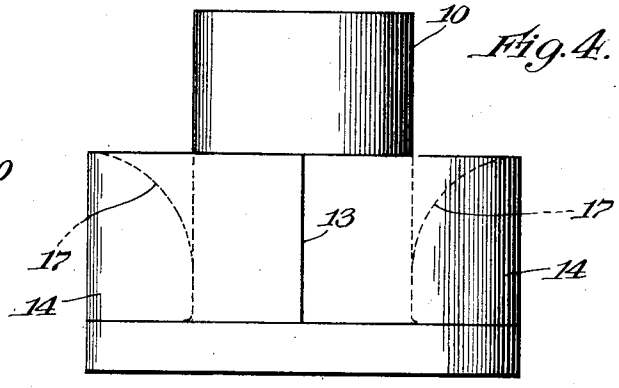


Fig. 6.

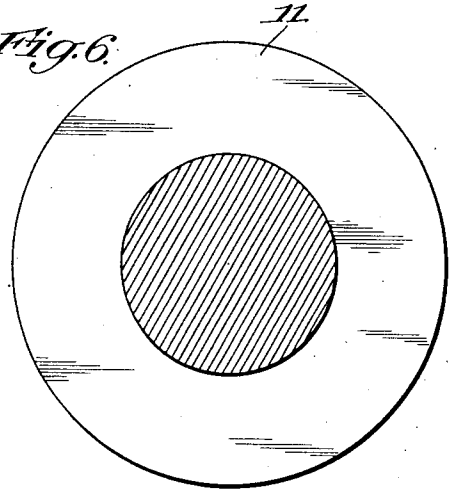
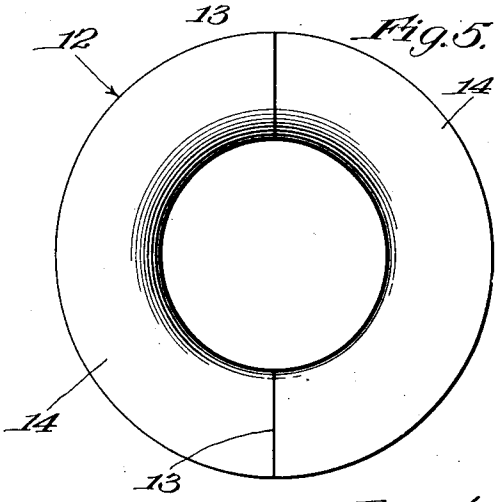


Fig. 5.



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PROCESS OF MAKING NOZZLES

Filed Nov. 4, 1926 2 Sheets-Sheet 2

Fig. 7.

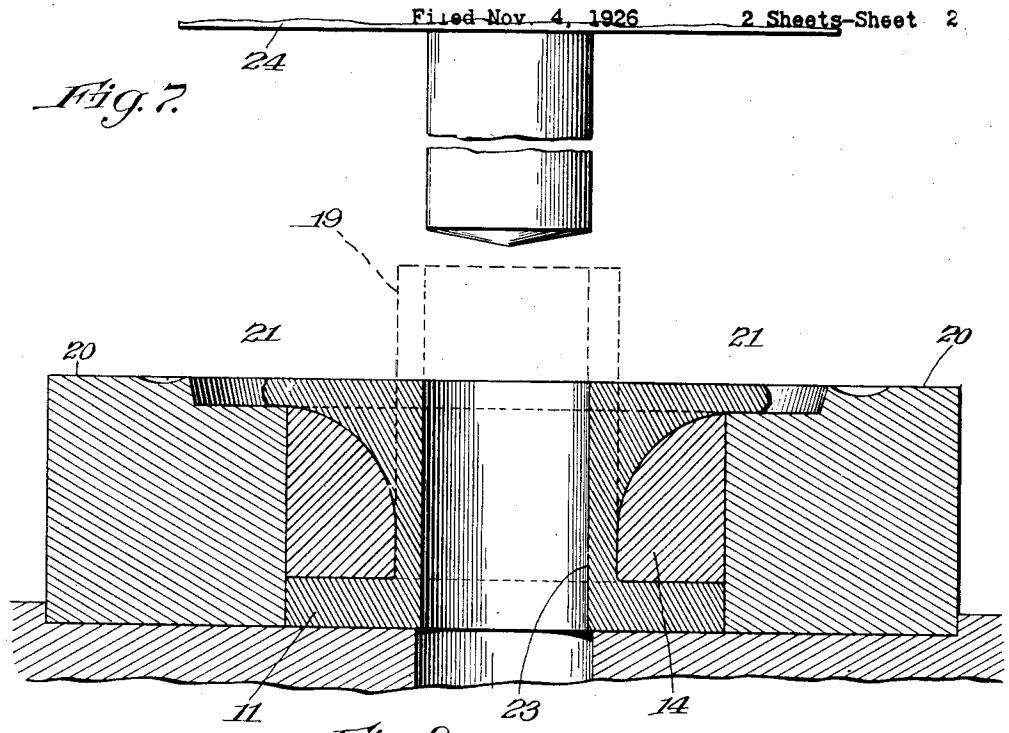
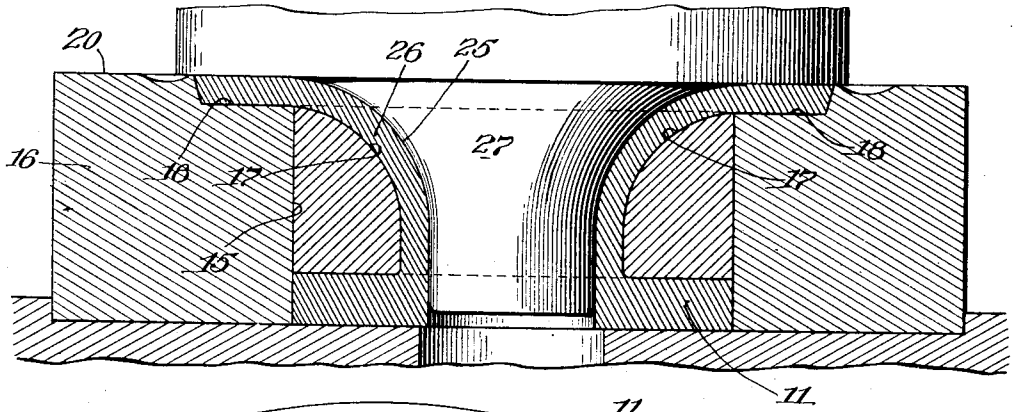


Fig. 8



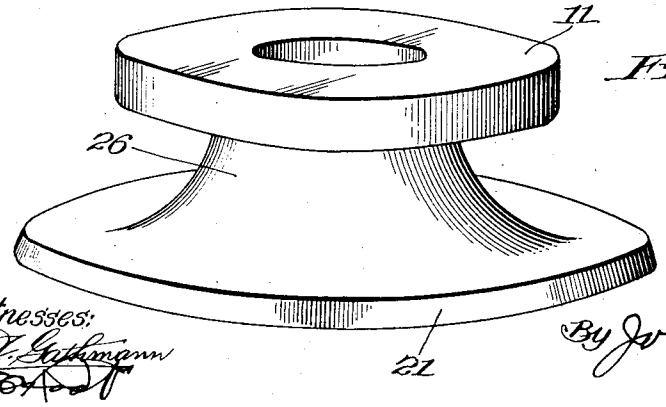


Fig. 9.

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UNITED STATES PATENT OFFICE.

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PROCESS OF MAKING NOZZLES.

Application filed November 4, 1926. Serial No. 146,077.

My invention relates to new and useful improvements in the process and means of making steam-boiler nozzles, particularly that class of steam-boiler nozzles employed in high-pressure service and which are of a seamless character possessing integral end flanges and a smooth unbroken interior surface.

The object of my invention is the provision of a process and means by which to manufacture steam-boiler nozzles of the class specified at low cost. It is also within the province of my invention to provide a process and means of producing a complete one-piece nozzle construction from a single blank or billet of steel, and one having a body portion which decreases in diameter on smooth curved lines, both internal and external, as it extends from the boiler attaching flange.

Other objects and aspects of my invention will appear hereinafter; and my invention embodies the steps whereby a single billet of steel is converted into a complete, one-piece nozzle of the character described, and it also involves the means which cooperate to the end of producing such nozzles in a rapid and economical manner.

My invention will be best understood by reference to the accompanying drawings, in which I have illustrated a practical embodiment of the means employed in carrying out my process, and in which

Fig. 1 represents a side elevational view of a blank or billet from which my nozzle is forged;

Fig. 2 is an end elevation thereof;

Fig. 3 is a side elevational view showing a flange produced on one end of the blank;

Fig. 4 is a side elevation showing the two-part center ring arranged upon the flanged billet;

Fig. 5 is a top plan view of the two-part center ring;

Fig. 6 represents a cross section taken on the line 6—6 of Fig. 3;

Fig. 7 represents a cross section and elevation, showing the flanged billet as it appears when placed in the main ring or die and showing also the protruding top of the billet smashed down into the center ring and main ring to produce a nozzle-shaped flanged end, and further showing the center hole which is pierced through the blank from one flanged end to the other flanged end, there also being included in this view a fragmental portion of a steam operated punch of the type suitable for piercing the center hole;

Fig. 8 is a vertical sectional view illustrating the punch by which the center hole is enlarged to produce the nozzle-shaped hole at the nozzle-shaped end of the blank; and

Fig. 9 is a perspective view of the completed steam-boiler nozzle.

In carrying out my invention, I employ a blank in the form of a cylindrical steel billet body 10 (Figs. 1 and 2), and on one end thereof there is forged a flange 11 (Figs. 3, 4 and 6), which ultimately serves in the finished article as the upper or top flange for making connection with the piping for the steam supply line.

The flanged billet body, after being heated to a suitable working temperature, preferably to a temperature of around 2000° Fahrenheit, is turned flanged end downward and a central ring 12, diametrically split along the lines 13 to provide portions 14, is set upon the flange 11 and about the body 10, whereupon the entire assembly is placed in an opening 15 in a main ring or die 16 (Figs. 7 and 8).

From an inspection of the drawings, it will be seen that the central ring 12, which in effect serves as a core, is of the same external diameter as the flange 11 and with said flange fits snugly within the opening 15 of the main ring 16; and it will further be observed that at a suitable distance above the flange 11, the inner periphery of the central ring 12 is formed with an upward and outward curve 17 that rounds into the bottom of an annular recess 18 formed in the top of the main ring 16 and about the center opening 15.

Now the billet body is of a length to protrude a distance, as shown by the dotted lines 19 in Fig. 7, above the main ring 16 when placed therein and contains material sufficient when smashed or hammered down, to fill up the entire space within the central ring 12 and within the recess 18 to the level substantially of the top surface 20 of the main ring. A steam-operated hammer is best employed to smash or hammer down the protruding part 19 of the billet body; and in Fig. 7, 21 designates a flange produced in recess 18 by striking downwardly on the top of the protruding part 19.

The next step in my process is to pierce the center hole 23 entirely through the billet body from the top end to the bottom end thereof. For this operation any suitable steam-operated punch may be employed, such a punch being fractionally illustrated in Fig. 7 and designated by the reference numeral 24.

The next and final step in the process is to produce the nozzle-shaped hole 25, which gradually decreases in diameter from the flange 21 and which results in the production of the nozzle shell 26 having an integral bottom flange 21 for connection with the boiler and an integral top flange 11 for connection with the steam supply line. The nozzle-shaped hole 25 is produced by means of a suitable steam-operated punch 27.

When cooled sufficiently to allow the operation, the forged nozzle is knocked out of the main ring and the central ring thereupon removed.

This process of forging steam-boiler nozzles is simple and easy and in practice it enables one-pieced nozzles to be manufactured rapidly and at low cost. Nozzles produced in accordance with my present invention may be reheated and bent to fit the arc of the boiler drum without being damaged or impaired with respect to their safety and reliability since there are no parts to become loosened.

Though I have described with considerable particularity of detail the preferred embodiment of my invention, yet it is not to be understood therefrom that the invention is limited to the particular embodiment described. Various modifications thereof in detail may be made by those skilled in the art without departure from the invention, provided, such modifications are effected within the scope of the appended claims.

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

1. The process of making nozzles which consists in first smashing down one end of a cylindrical billet body to produce a nozzle-shaped end thereon; in through piercing a straight bore in the billet body from its smashed-down end to the opposite end thereof; and in punching out a nozzle-shaped hole in the smashed-down end concentrically with the straight bore therein, said nozzle-shaped hole being punched to have a gradually decreasing diameter until it coincides with the diameter of the straight bore, substantially as described.

2. The process of forging a steam-boiler nozzle from a cylindrical billet body comprising in taking a ring die arranged to surround a portion of the billet body; applying a central ring between the ring die and the billet body, said central ring having an outwardly curving portion on its inner periphery to provide at one end an annular nozzle-shaped space about the billet body; smashing down the billet body into said nozzle-shaped space to provide a nozzle-shaped end; punching a central bore through the billet body from end to end; and enlarging said central bore within the nozzle-shaped end to provide a nozzle-shaped hole therein, substantially as described.

3. A process of making nozzles which consists in taking a body, forging a lower flange thereon, heating said body to a working temperature of approximately 2,000 degrees Fahrenheit, turning said body flange end downward, then confining a part of the lateral periphery of said body and all of the periphery of said flange, then smashing down the upper part of said body into a flared disc-like upper flange of a greater diameter than said lower flange, then punching a central substantially cylindrical bore through said body from end to end, and finally shaping and flaring said bore into nozzle configuration.

In testimony whereof I have signed my name to this specification.

ROY A. KROPP.