Sept. 3, 1940. W. D. WESTON 2,213,574

MEANS FOR FORMING BRANCH NOZZLES ON PIPES

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Fig. 1.

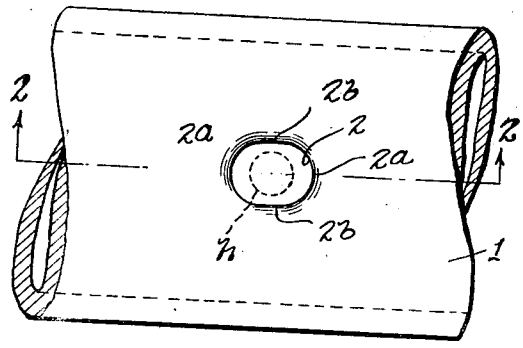


Fig. 2.

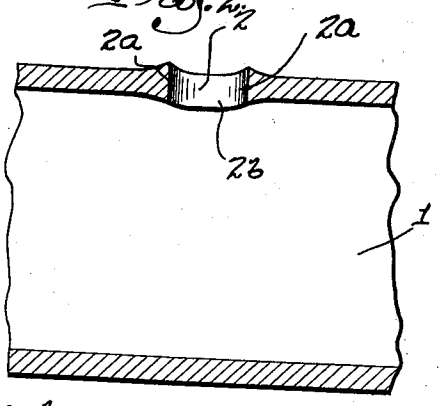


Fig. 3.

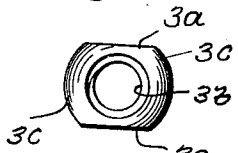


Fig. 4.

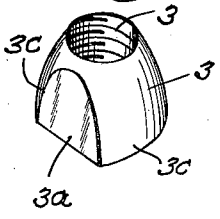


Fig. 5.

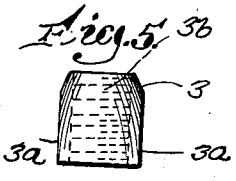


Fig. 6.

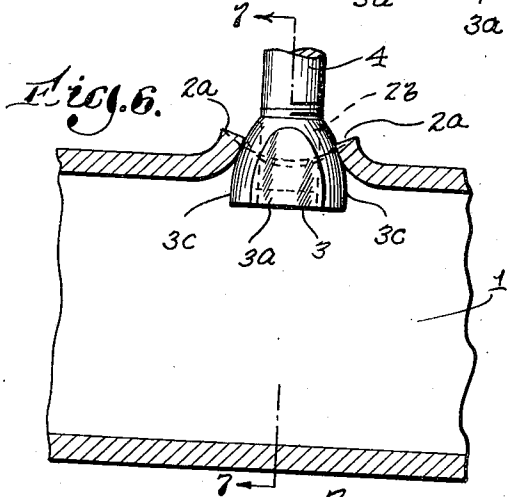


Fig. 7.

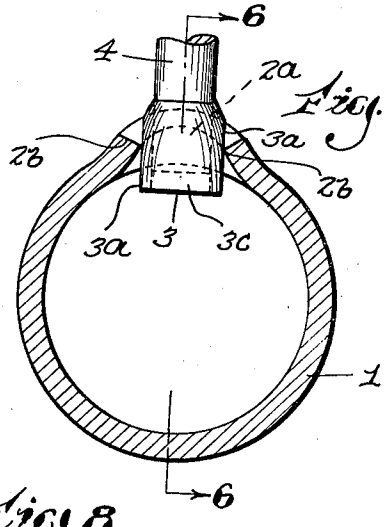
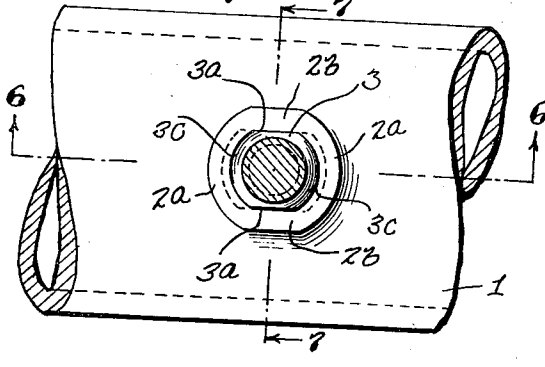


Fig. 8.



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Sept. 3, 1940. W. D. WESTON 2,213,574

MEANS FOR FORMING BRANCH NOZZLES ON PIPES

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Fig. 9.

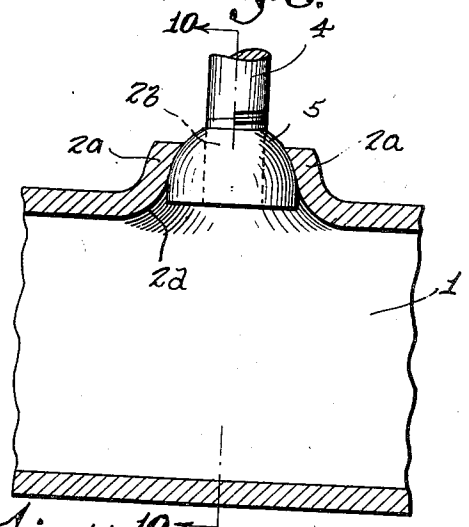


Fig. 10.

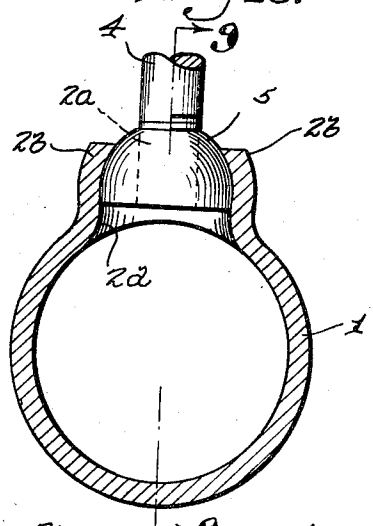


Fig. 11.

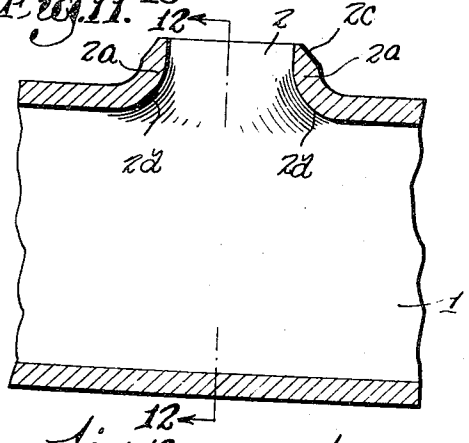


Fig. 12.

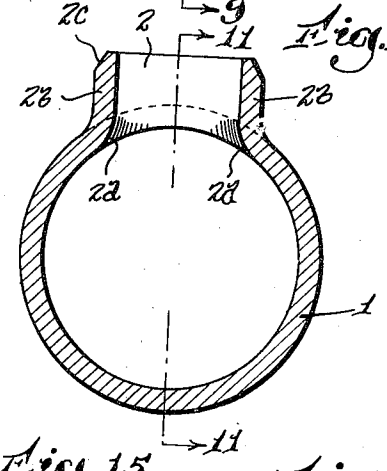


Fig. 13.

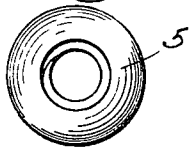


Fig. 14.

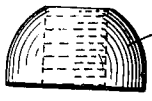


Fig. 15.

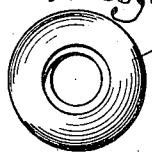


Fig. 16.

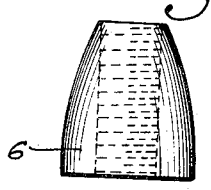


Fig. 17.

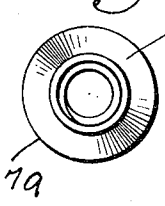
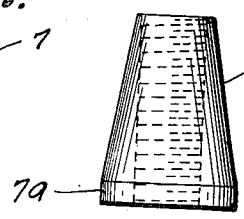


Fig. 18.



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Patented Sept. 3, 1940

2,213,574

UNITED STATES PATENT OFFICE

2,213,574

MEANS FOR FORMING BRANCH NOZZLES ON PIPES

William D. Weston, Warren, Ohio, assignor to General Fire Extinguisher Company, Providence, R. I., a corporation of Delaware

Original application November 8, 1934, Serial No. 752,050. Divided and this application November 19, 1936, Serial No. 111,673

2 Claims. (Cl. 153—21)

This invention relates to means for forming branch nozzles on pipes.

It is an object of the invention to provide means whereby a branch nozzle, free from cracks and splits, having a wall of substantially uniform thickness, and a smooth-curved entrance, may be formed simply and inexpensively from the material of the pipe itself.

The best modes in which I have contemplated applying the principles of my invention are shown in the accompanying drawings, but these are to be taken as merely illustrative for it is intended that the patent shall cover by suitable expression in the appended claims whatever features of patentable novelty exist in the invention as a whole.

In the drawings:

Figure 1 is a plan of a section of a pipe showing how an opening may initially be formed where the branch nozzle is to be located;

Figure 2 is a longitudinal section, as on line 2—2 of Figure 1;

Figures 3, 4 and 5 are a plan, a perspective and a side view respectively of an improved forming tool suitable for practicing one of the steps in my improved method;

Figure 6 is a longitudinal section, as on line 6—6 of Figures 7 and 8, showing the result during the first drawing step of the method;

Figure 7 is a transverse section, as on line 7—7 of Figures 6 and 8;

Figure 8 is a plan view of Figure 6;

Figure 9 is another longitudinal section showing the result during another drawing step;

Figure 10 is a corresponding transverse section as on line 10—10 of Figure 9;

Figures 11 and 12 are longitudinal and transverse sections as on lines 11—11 and 12—12 of each other showing the finished work;

Figures 13 and 14 are plan and side views respectively of the forming tool shown in Figures 9 and 10;

Figures 15 and 16 are plan and side views respectively, of another forming tool; and

Figures 17 and 18 are plan and side views respectively of still another forming tool.

Referring now more particularly to the drawings, the pipe 1 is at the outset cut in some convenient manner to provide a hole *h* shown in dotted outline in Figure 1. This hole is appreciably smaller than the opening to be ultimately formed and may be cut round as shown or may be of somewhat elliptical configuration. A suitable swaging tool (not shown) is next used to enlarge the hole and form a substantially elliptical opening 2 with its longer or major axis parallel to the longitudinal axis of the pipe. This enlargement of the hole by the swaging tool necessarily effects a thickening or reinforcing of the edge of the opening as clearly seen in Figure 2. The pipe is now prepared for the drawing operations.

The first drawing step is accomplished by means of a forming tool 3 such as is shown in Figures 3, 4 and 5. This tool is of novel design, being approximately semi-spherical or ovoid, but having opposed flat sides 3*a*. A central threaded hole 3*b* is provided so that a rod 4 may be engaged with the tool through the opening in the pipe wall. If the pipe is made of brass, bronze, copper or other non-ferrous material it may be worked cold but if made of iron, steel or the like metal, the region in the vicinity of the opening may be heated until suitably ductile before the tool is forced outward through the opening.

It is a feature of the invention to effect this initial drawing step with the tool disposed with its flat sdes 3*a* parallel to the longitudinal axis of the pipe. This is important because as the tool enters the opening 2 and begins its drawing operation on the pipe, the greatest force is necessarily exerted by the curved faces 3*c* against the sides 2*a* of the opening which may be said to lie along or transverse of the longitudinal axis of the pipe, near the ends of the major axis of the elliptical opening. Accordingly the material in these portions of the pipe is more sharply turned outward than is the material at the sides 2*b* near the ends of the minor axis of the opening. Although the latter material is also turned outward, the turning is not nearly so abrupt because of the natural curvature of the pipe wall at the sides. The flat sides 3*a* of the tool also permit the material in contact therewith to stretch as the opening is enlarged thus relieving the tendency of the material at the ends to stretch and thin and possibly split. As a result, the size of the opening is primarily increased along its major dimension, such stretching as does occur to any appreciable extent taking place along the sides of the opening where the flat faces of the tool offer less resistance thereto. When the tool is finally withdrawn the wall of the nozzle will be partly formed, being substantially elliptical with somewhat flattened sides parallel to the major axis and with curved sides near the ends of this axis.

Another forming tool is now inserted in the pipe, such as the tool 5 shown in Figures 9, 10,

13, 14. This tool is semi-spherical except for a truly cylindrical zone at its bottom which is of the same size as that of the desired branch nozzle. This tool may likewise be engaged by a rod 4, as previously described. If the pipe is of ferrous material the already partly formed nozzle and the pipe wall adjacent thereto may be again sufficiently heated for the operation of the tool thereon. As this semi-spherical tool is drawn outward its curved surface operates on all sides of the opening but more so on the sides 2*b* near the ends of the minor axis. These sides are forced outward and away from the center of the opening to effect a more rapid increase of the minor axis than occurs along the major axis. As the tool is finally withdrawn the opening is truly round and of the same size as the desired branch nozzle.

During the final drawing step the walls of the nozzle may be somewhat reduced in thickness, but it is a feature of the invention that whether so reduced or not the wall as a whole is of substantially uniform thickness. The outer edge of the nozzle may be machined to give a finished beveled edge 2*c* as shown in Figures 11 and 12, which is particularly suitable for the welding thereto of a branch pipe.

When it is desired to increase the length of the nozzle so that its finished edge 2*c* will stand out farther from the normal wall of the pipe, forming tools such as are shown in Figures 15 to 18 may be used during the final drawing operation instead of the semi-spherical tool of Figures 9, 10 and 13, 14. The tool 6 of Figures 15 and 16 is called a "bullet-shape" tool for obvious reasons, being shaped much like the curved nose of a bullet. The tool 7 of Figures 17 and 18 is a frustrum of a cone terminating in a short cylindrical portion 7*a* at the base. Both of these tools are of appreciably greater length than the semi-spherical tool and are so designed in order that the spreading of the opening may occur more gradually and the drawing out of the material be more pronounced. This results in the finished nozzle being longer, with a somewhat thinner but still substantially uniformly thick wall.

A decided advantage gained by the invention is that the entrance 2*d* to the nozzle from the interior of the pipe is a rather gently curving smooth surface. This is conducive to smooth flow avoiding to a marked extent the eddying and resistance to flow heretofore deemed objectionable in branch nozzles.

The means shown as illustrative of the invention have been represented and described in connection with a nozzle of smaller diameter than that of the pipe, but it is to be understood that nozzles of the same diameter as that of the pipe may be produced by using forming tools of larger size than those disclosed herein.

This application is a division of my co-pending application, Ser. No. 752,050 filed November 8, 1934, which has now become Letters Patent 2,065,915 dated December 29, 1936.

I claim:

1. A drawing tool for forming an external branch nozzle on a pipe which comprises a body to be drawn from inside the pipe through a hole in the pipe wall of smaller size than that of the body, and a drawing element adapted to extend through said hole and engage said body; the said body having an ellipsoidal operating surface with opposed flat sides thereon.

2. A drawing tool for forming an external branch nozzle on a pipe which comprises a body to be drawn from inside the pipe through a hole in the pipe wall of smaller size than that of the body, and a drawing element adapted to extend through said hole and engage said body; the said body having an ellipsoidal operating surface with opposed flat sides thereon, the distance between opposed curved surfaces being greater than the distance between the flat sides.

WILLIAM D. WESTON.