Dec. 25, 1928. 1,696,229

F. C. FANTZ

METHOD FOR FORMING FLANGES ON PIPES

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Fig. 1

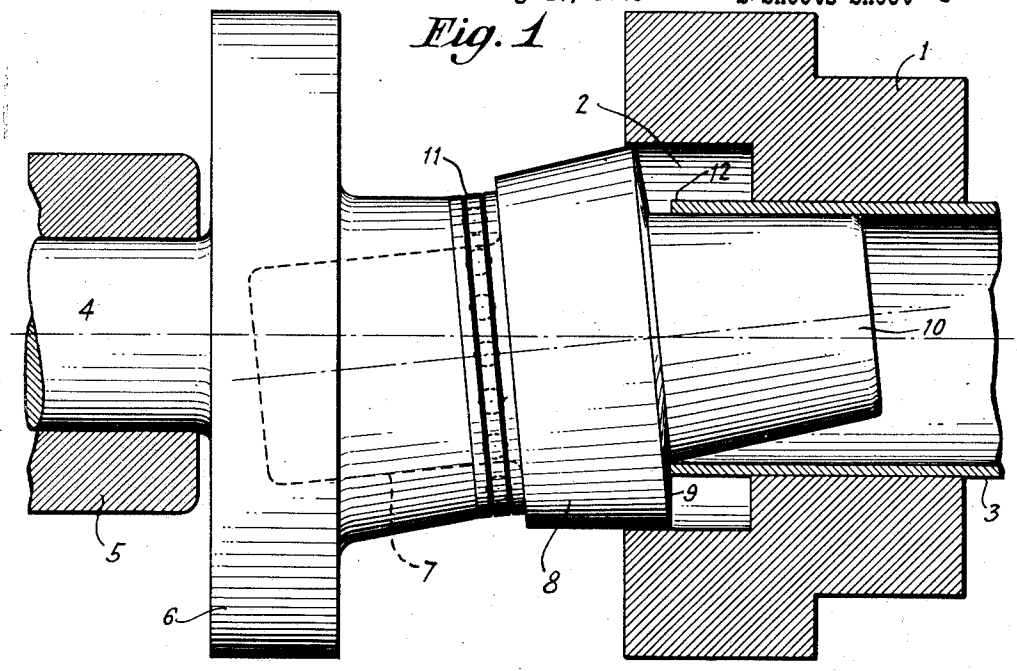
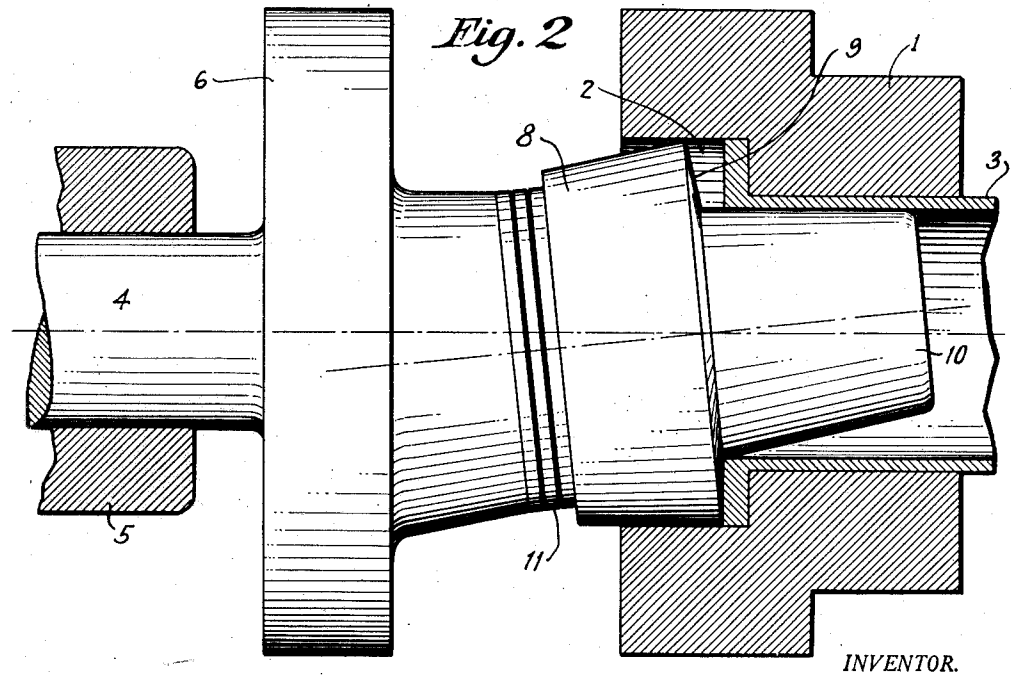


Fig. 2



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Fig. 3

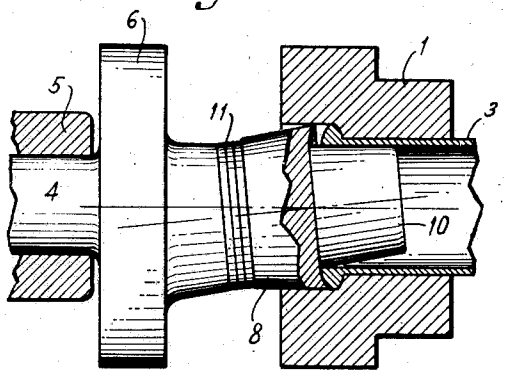


Fig. 4

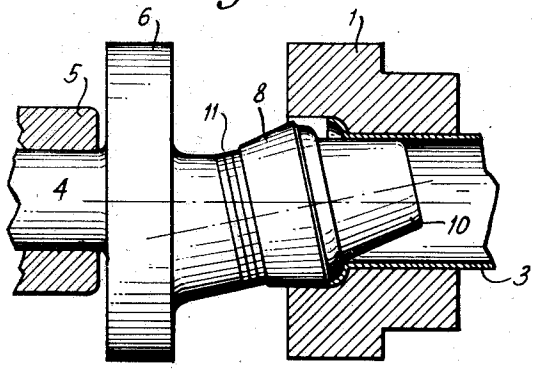


Fig. 5

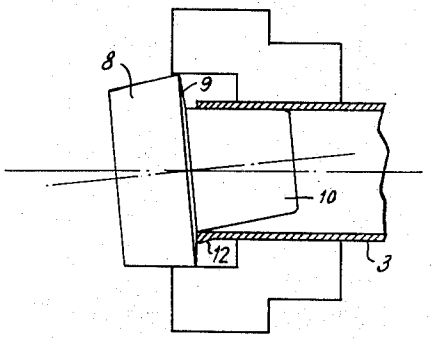


Fig. 6

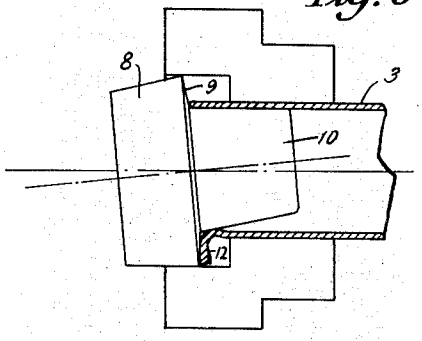


Fig. 7

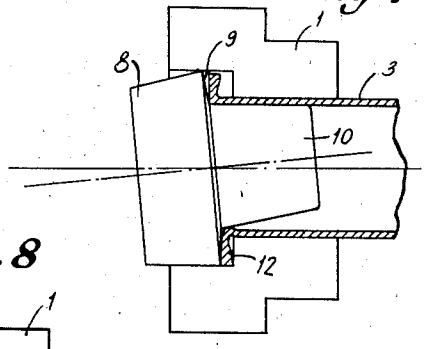
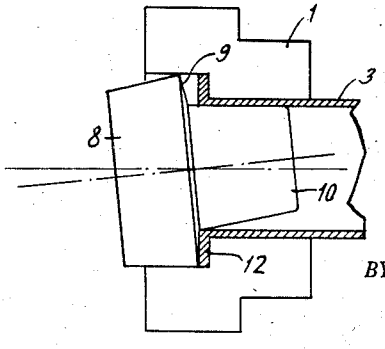


Fig. 8



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Patented Dec. 25, 1928. 1,696,229

UNITED STATES PATENT OFFICE.

FRED C. FANTZ, OF WEBSTER GROVES, MISSOURI, ASSIGNOR TO MIDWEST PIPING & SUPPLY COMPANY, INCORPORATED, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

METHOD FOR FORMING FLANGES ON PIPES.

Application filed August 17, 1926. Serial No. 129,742.

This invention is particularly advantageous in flanging pipes which are designed to carry fluids under high pressure, or combined pressure and temperature. It is well known that when the end of a tube is turned outwardly to flange it, there is a tendency to stretch the metal and correspondingly to weaken it, with the danger that it may fracture when subjected to high pressure under the strains resulting from temperature changes.

My method entirely overcomes this danger, and by its use a flange is formed on the pipe, or tube, which is of greater thickness than the tube wall.

It will be obvious to persons skilled in the art, from the hereinafter contained description, that my method is not confined to that particular class of tubes, but in addition to the ordinary kind of tubing, may also be used for rolling over the tops of tin cans and other shapes of light material, by designing the shape of the punch, or plunger, used, so that it will curl the thin material over instead of upsetting it.

Another difficulty in flanging tubes is the very great tendency of the walls to buckle under the applied pressure. Attempts have been made to overcome this by such methods as are employed in the patent to Lindberg, No. 1,421,507, in which a plurality of vertical and horizontal rollers are employed, the horizontal ones to roll out the buckled portion, and the vertical ones to roll back the flange. In following this method, the tube is first flared outwardly by the use of a conical roller, and then rolled to the shape of the die by the vertical rollers. This is objectionable, particularly in rolling out the buckled portions, because the rollers necessarily have to be extremely small when used on tubes of small diameter—say, under three inches—and the spindles supporting the rollers would, under such conditions, be too small to stand up under the work required of them. Even when this objection does not apply, such methods are further objectionable, in that they are expensive because of the necessity for constant renewal, by reason of the constant heating and consequent deterioration, of the spindles and bearings upon which the rollers turn.

My method has for its object to entirely dispense with rolling and with rollers, and to accomplish the desired result by kneading the heated tube into the required form. This tends to greatly increase the homogeneity of of the material, and also avoids the objectionable features always present when a method is used which employs rollers.

My invention has for its further object, to provide a method in which there is no rolling action at all, and, as a consequence, it can be used to form flanges upon any shape of tubes, not being limited to tubes of circular form.

For the purpose of illustrating a concrete embodiment of an apparatus utilizing my improved method, reference may be had to the drawings which accompany this specification, and which are hereunto attached and made a part hereof, in which

Fig. 1 shows an elevation view of my device, partially in section;

Fig. 2 shows another elevation view of my device, partially in section;

Figs. 3 and 4 show modified forms of my device, partially in section;

Figs. 5, 6, 7, and 8, show, diagrammatically, an exemplification of the manner of functioning of my device in its operation.

As shown in these drawings, I provide a die block 1, which is constructed of suitable material, and has formed in one side a recess 2, of the desired configuration for the flange which is to be formed upon the tube 3, only a fragmentary portion of the latter being shown.

Suitable means may be employed to clamp the tube 3 firmly in the die block 1, but as such clamping means are more or less standard and well known in the art, I have not illustrated them. In some cases, as will hereinafter appear, it may be found desirable to hold the flange forming device in a substantially stationary position, longitudinally, and to apply the pressure longitudinally to the tube. In some cases where it is desired to selectively advance the tube and plunger, this may be accomplished by my process.

A spindle 4 is provided, which may be mounted in a suitable bearing 5. This spindle 4 is rotated by means of any suitable driving mechanism (not shown, as obviously this forms no part of my invention).

Upon the spindle 4 is mounted a face plate 6; which has secured thereto the kneader, or plunger, 7. This plunger 7 is provided with an enlarged portion 8, the walls of which

taper inwardly towards the face plate 6. The face 9 of this enlarged portion 8 is shaped to conform to the shape and size of the desired finished flange portion of the tube 3. The kneader, or plunger, 7, is provided with an outwardly extending portion 10, the walls of which are tapered, so that in the position shown in Fig. 1 there will be a longitudinal line contact between the surface of the tapered portion 10 and the inner wall of the tube 3, and also between the face 9 and the end of the tube 3.

This kneader, or plunger, 7, is mounted so that the axis of the spindle 4 crosses the axis of the plunger 7 in substantially the plane where the tapered portion 10 joins the face 9 of the enlarged portion 8. It may be found desirable to provide a thrust bearing 11, of standard construction, intermediate the face plate 6 and the rear wall of the enlarged portion 8 of the kneader, or plunger, 7.

Having provided the apparatus thus far described, I shall proceed to describe the steps employed in my method. The end 12 of the tube 3 is heated to the desired temperature, and it is then placed in the die block 1 and held securely in position. The spindle 4 and plunger 7 are then moved forward, the kneader 7 being inserted in the tube 3, in the position shown in Fig. 1. Longitudinal pressure is then applied by further forward movement of the spindle 4, which has rotating means associated with it, or the driving means may be secured in any other of the well known mechanical means to permit longitudinal movement of a rotating part.

The rotation of the spindle 4 and the face plate 6 by the driving means, will impart a gyratory motion to the face 9 and the tapered member 10, of the kneader, or plunger, 7, about the substantially fixed center where the two axes, i. e., of the spindle 4 and the plunger 7, intersect.

The result of this motion is that the face 9 of the enlarged portion 8, due to the longitudinal pressure exerted upon it, upsets the heated end 12 of the tube 3, and since it has only a single line point contact, which is continually advanced, it kneads the heated metal into the configuration of the recess 2 in the die block 1.

The enlarged portion 8 should substantially, for all practical purposes, fill the opening or recess 2 in the die block 1, thus preventing any escape of the metal from the recess 2.

It will also be seen that since, owing to the angle of the kneader, or plunger, 7, it only makes a point contact with the work, the pressure is, consequently, applied only to a very small part of the periphery of the heated end 12 of the tube 3, at any one time. While the face 9 is working and kneading the material, the surface of the member 10 is contacting the inner wall of the tube 3 at a point diametrically opposite the point contacted by the face 9, thereby smoothing out any buckles that might have been formed in the tube 3, and actually kneading the material to the desired form and thickness.

Inasmuch as the kneader, or plunger, 7, does not revolve upon its own axis, nor with relation to the work or the tube 3, therefore my method can be employed to flange any desired shape of tube.

In the detail views, Figs. 5, 6, 7, and 8, I have shown the conditions of the tube 3 as it is kneaded or worked into the finished lap. In Fig. 5, I show the upsetting of the tube 3 to substantially the amount which it will stand before bending and coming in contact with the walls of the recessed portion 2 of the die block 1, which will prevent its flaring further or turning over. This portion of the tube 3 is then upset by a further advance of the plunger 7, by the longitudinal pressure exerted thereon, until it is forced, through the various stages shown, into the finished shape shown in Fig. 2.

I have described an apparatus in which the pressure is exerted upon the kneader, or plunger, 7, through the medium of the spindle 4 and the face plate 6. It will be obvious to persons skilled in the art, that it will be equally easy to have these parts stationary, longitudinally, and to apply the pressure to the tube 3, in which case, of course, the latter will be loosely held in the die block 1, to permit its advance as the flange is being kneaded.

In illustrating the embodiment of an apparatus adapted to carry out my process, and describing the manner in which my process is applied thereto, I have hereinbefore described the handling of a tube, the end of which has been heated. This would be preferable in cases where a hard metal, such as steel and its alloys, forms the tube, but in tubes made of soft metal, such as lead, copper, brass, etc., it is unnecessary to heat the end of the tube; and therefore I wish it understood that my process is not at all limited to the handling of a tube, the end of which is under a high temperature.

There will, of course, be a number of varieties of forms of apparatus which can be utilized to carry out my improved method, and I do not desire to be understood as limiting myself, in the slightest degree, to the apparatus shown, which, is, as stated, furnished solely for illustrative purposes.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is:

1. The method of flanging tubes of any conformation, which consists of applying pressure, simultaneously, by a common element rotating with a gyratory movement, to the end of the tube to upset said end, and to the inner wall of the tube to provide against buckling.

2. A method of flanging tubes of any shape, which consists in applying a gyratory movement to a pressure exerting element, said element simultaneously engaging the end of the tube and the inner wall thereof at a point opposite to the said end engagement.

3. A method of flanging tubes of any shape, which consists in applying a gyratory movement to a pressure exerting element, said element simultaneously engaging the end of the tube and the inner wall thereof at a point opposite to the said end engagement, and controlling and shaping the outward upsetting of the metal.

4. The method of upsetting a flange on a tubular article consisting in subjecting the edge of the article to a gradually increasing circumferential pressure increasing at the same rate and degree continuously around the circumference.

FRED C. FANTZ.