

W. B. GODDARD.
METAL BILGE BARREL FORMING MACHINE.
APPLICATION FILED OCT. 13, 1911.

1,086,593.

Patented Feb. 10, 1914.

2 SHEETS—SHEET 1.

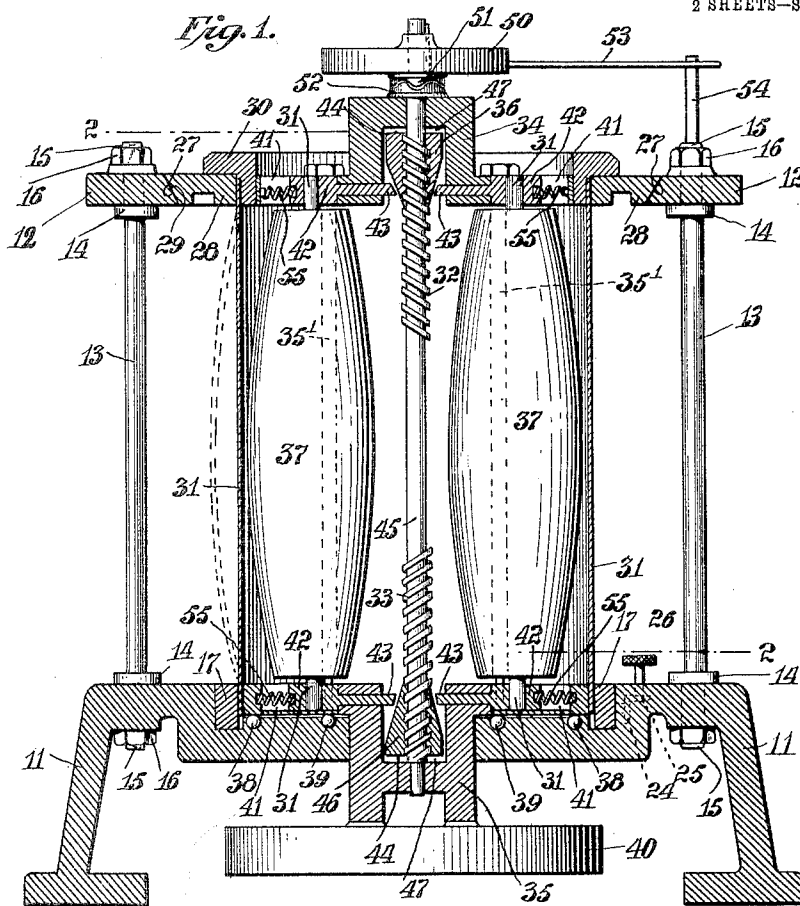
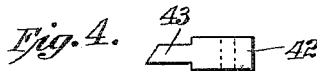
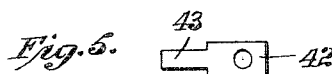
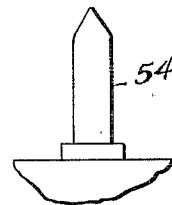


Fig. 6.



Attest:
Carl A. Lohr
Carl A. Lohr

William B. Goddard
Inventor:
by *W. H. Dornum*
Atty

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2 SHEETS—SHEET 2.

Fig. 2.

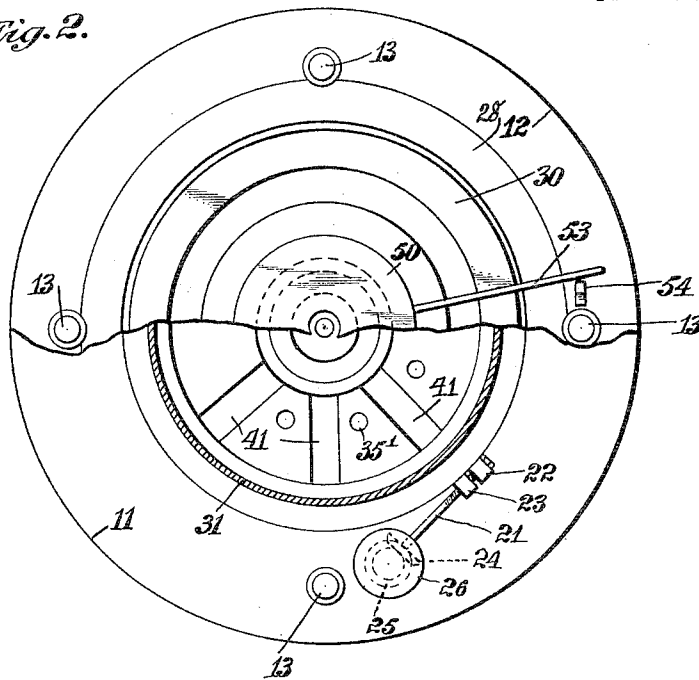
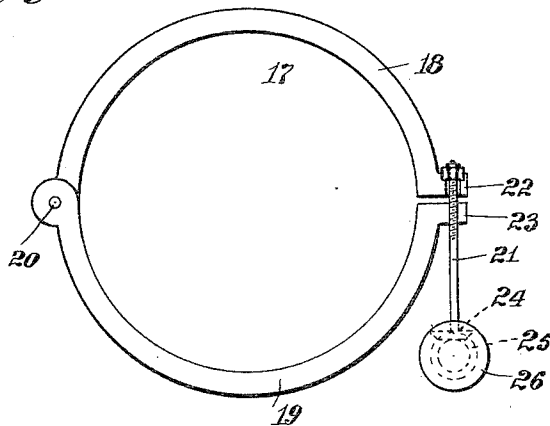


Fig. 3.



Attest:
Carl A. Lohr
Carl A. Lohr.

William B. Goddard
Inventor:
by *Thos H. Conners*
Atty

UNITED STATES PATENT OFFICE.

WILLIAM B. GODDARD, OF NEW YORK, N. Y.

METAL-BILGE-BARREL-FORMING MACHINE.

1,086,593.

Specification of Letters Patent.

Patented Feb. 10, 1914.

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To all whom it may concern:

Be it known that I, WILLIAM B. GODDARD, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Metal-Bilge-Barrel-Forming Machines, of which the following is a specification.

This invention relates to machines for forming the body portions of metal bilge-barrels.

Heretofore, in expanding a cylindrical sheet-metal blank to the desired bilge-shape, the expanding pressure has been directly applied to the inside walls of the blank, as by subjecting liquid confined therein to pressure and providing an outside mold or matrix to limit the expansion and determine the ultimate configuration of the blank. In other machines of this character, an internal expandible former is employed which, when in its expanded condition, has an external configuration which conforms to the desired configuration of the bilge-barrel body, the metal being stretched to the desired configuration by the expansion of said former.

It is well known that sheet metal may be more safely, uniformly and satisfactorily stretched or drawn to a desired form by a rolling operation, which more gradually applies and better distributes the forces, than by any other known process, such as employing stamps or dies, wherein these forces are directly applied, more unequally distributed and act more quickly, thus tending to fracture or otherwise impair the quality of the metal in the blank.

When it is considered that in forming the body portion of a metal bilge-barrel from a cylindrical blank, the blank must be inserted in the machine with the expanding former inside thereof and removed from the machine after the blank has been expanded to the desired bilge-shape, in view of the configuration of the formed bilge-barrel body, the difficulties attendant upon the construction of a machine for expanding the blank by a rolling process will be apparent.

The principal object of the present invention is the provision of a comparatively simple yet sufficiently powerful and dependable machine for forming these bilge-barrel bodies by a rolling process.

My invention will be more readily under-

stood by reference to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a vertical central section of a machine embodying my invention; Fig. 2 is a partly plan and partly sectional view of the machine, the section being taken substantially on the line 2—2 of Fig. 1; Fig. 3 is a detail plan view of the preferred form of clamping ring, hereinafter described; Fig. 4 is a side view and Fig. 5 a top view of one of the journal boxes which form the guiding numbers for the rollers, as hereinafter described, and Fig. 6 is a detail side elevation of a part shown in Fig. 1, to which I shall hereinafter refer.

Referring now to the drawings in detail, numeral 11 designates a suitable supporting base for the machine, this base being preferably of substantially the configuration shown and supporting an annular top plate or ring 12 by means of the standards or rods 13. Each of these standards or rods 13 is provided with a collar 14 and threaded ends 15 which pass through suitable apertures in the base 11 and the annular plate 12, respectively, whereby they may be suitably secured by nuts 16. The plate 12 is thereby rigidly and firmly secured at a suitable distance above the base 11. The upper surface of the base 11 is provided with a suitable concentric depression adapted to receive the clamping-ring 17 which is normally of such diameter as to receive the lower end of the cylindrical sheet-metal blank 31 which it is desired to expand to the desired bilge-shape. As more clearly shown in Fig. 3, this clamping ring may consist in two semi-circular parts 18 and 19, hinged or pivoted together at 20, and connected at their free ends by means of a threaded pin or shaft 21 passing through apertures in the lugs 22 and 23 on said members 18 and 19, the aperture in lug 23 being threaded for engagement by the threaded portion of pin 21. In order to conveniently rotate this pin or shaft 21, I have shown a pair of intermeshed beveled gears 24 and 25, the former being mounted upon said pin or shaft and the latter suitably connected to a hand-wheel 26, located at any convenient point exterior of the positioned blank. This clamping ring and the means for operating the same are of common and well-known construction and operation, and it will be apparent that the natural elasticity on the

metal may be relied upon for expanding and contracting the same, thereby eliminating the necessity for the provision of the hinge or pivot 20.

5 The interior face or edge 27 of the annular plate 12 is beveled for the reception of a ring 28, the exterior face or edge 29 of which is correspondingly beveled, whereby
10 said ring is supported from the annular plate 12. The interior face or edge of the ring 28 is cylindrical and of a diameter to snugly fit around the upper end of the blank to be formed. This ring 28 is designed to exteriorly support the upper end of the
15 blank, and for interiorly supporting this blank I employ an annular member 30, of preferably inverted L-shaped cross-section, which fits into the upper end of the blank with its horizontally-disposed portion projecting over and supported by the ring 28.

It will now be apparent that I have provided a frame for supporting the blank and holding the ends thereof in a fixed position and against expansion during the operation
25 of expanding the major middle portion of the blank.

The interior forming or expanding mechanism comprises a revoluble frame, consisting of an upper member 34 and a lower
30 member 35, said members being secured to and held at a proper distance from each other by a plurality of bolt-rods 35'. These bolts are so spaced apart as to provide space for the proper mounting of the rollers 37 37.
35 In addition to being journaled in the base 11, the lower member 35 of the revoluble frame is provided with ball bearings, preferably two sets of balls 38 and 39 being interposed between the upper horizontally
40 disposed portion of said member and said base, with proper grooves or ball-races. The revolving frame as a whole is thus supported by the base 11, and may be revolved by the pulley 40 secured to the lower member 35 and suitably connected by belt to any
45 convenient source of power.

The rollers 37 37 are of greatest diameter at the middle thereof and gently curved to a circle of smallest diameter at the ends, this
50 curvature corresponding to the desired curvature of the bilge-barrel body to be formed. The axles 31 31 of these rollers are journaled in boxes 42 42, each pair of correspondingly-positioned journal boxes providing bearings for one of the rollers. These
55 journal boxes are slidably mounted in radially-disposed grooves 41 41 in the upper and lower members 34 and 35. In the normal or unexpanded condition of the interior
60 former, these journal boxes 42 are located in proximity to the inner end of the radial slots 41 41 and the rollers 37 are thus in the position shown in Fig. 1.

For radially moving the rollers 37 in an
65 outward direction in the slots 41 and there-

by obtaining the radial expansion of the former as a whole, the journal boxes 42 are provided with inwardly-directed extensions 43 passing through corresponding slots or
70 openings in the central parts of the upper and lower revolving plates 34 and 35. A vertical shaft 45 extends axially through the revolving frame and is journaled in the upper and lower members 34 and 35. This shaft 45 is provided with right-and-
75 left screws 32 and 33, at the upper and lower ends thereof, respectively, these screws passing through correspondingly-threaded and preferably cone-shaped wedge-blocks 36 and 46 vertically slidable in rectangular shaped chambers 47 47 formed in the members 34 and 35, respectively. The
80 base 44 of each of these cone-shaped wedge-blocks 36 and 46 is of rectangular configuration, whereby said blocks are held against rotation in the chambers 47. It will be apparent that upon rotation of the shaft 45, the wedge-blocks 36 and 46 will be forced toward or away from each other, according to
85 the direction of rotation of said shaft. The extensions 43 of the journal-boxes 42 are beveled at their ends to correspond to the conical surfaces of the wedge-blocks against which they impinge whereby upon downward movement of the upper cone 36 and
90 upward movement of the lower cone 46, the journal boxes 42 will be caused to move outwardly in the slots 41, thereby radially separating the rollers 37 and causing the expansion of the interior former.

The shaft 45 is further provided with means for intermittently rotating the same relatively to the members 34 and 35, during the continuous rotation of the frame and rollers constituting the interior former, in
105 order to automatically force the wedge-blocks toward each other, for the purpose set forth, and at a proper relative velocity. This intermittent rotation may be accomplished in various ways. For instance, I
110 have shown in the drawings a wheel 50 mounted upon the upper end of the shaft 45 to rotate therewith but having a limited vertical movement independent thereof. The shaft 45 is journaled in comparatively tight
115 bearings whereby, in the absence of opposing forces other than friction, it will be yieldingly rotated with the rotating frame. Secured to the lower face of the wheel 50 is a double ratchet 51, cooperating with an
120 oppositely positioned double ratchet 52 secured to the upper face of the member 34, augmenting the yielding frictional forces tending to drive the shaft 45 with said frame by overcoming the normal frictional
125 forces of opposition and serving to elevate the wheel 50 when rotation of the latter is checked during continued rotation of said frame. The wheel 50 is further provided with a horizontal arm 53 extending radi- 130

ally therefrom and adapted upon rotation of said wheel to impinge against the post or stop 54 mounted upon the stationary frame of the machine. As stated, I prefer to make the bearings for the shaft 45 in the revolving frame somewhat tight fitting which, in connection with the friction generated by the pressure of the ends of the extensions from the journal-boxes against the wedge-blocks and by the cooperating double-ratchets, will cause said shaft to rotate, under normal conditions, with the revolving frame.

The wheel 50 being keyed to the shaft 45, it will be apparent that when rotation of the wheel is checked by the arm 53 impinging against the post 54, rotation of the shaft 45 will also be checked and the revolving frame will continue its movement independently of said shaft. The wedge-blocks 36 and 46, rotating with said revolving frame, will now rotate on said shaft and be drawn toward each other by the screws 32 and 33, as described. The wheel 50 being held against rotation during continued rotation of the member 34, the ratchet 52 will continue its rotation relative to the now stationary ratchet 51, the latter being elevated by the inclined faces of the teeth, and the post or stop 54 is of such height that when the wheel 50 has been raised in this manner through a distance which approximates the height of the teeth in the ratchets, the arm 53 will clear the top of the post 54 and the wheel 50 thus be permitted to continue its rotation under yielding forces with the member 34 after a definite interval of time. It will be apparent that in this manner I have provided for a periodical relative rotation between the shaft and the revolving frame which automatically forces said wedge blocks toward each other and thus has the effect of automatically extending the internal former from time to time. The top of the post 54 may be beveled, as shown in Fig. 6, to facilitate the passing of the arm 53 thereover, and the wheel 50 should be loose enough upon the shaft 45 to insure its return to normal position under action of gravity when the arm 53 has cleared the post 54.

The threads 32 and 33 upon the ends of the shaft 45, which actuate the wedge-blocks 36 and 46, and the distance between the teeth of the ratchet wheels 51 and 52 may be so designed as to impart any desired degree of relative rotation to the shaft 45 during the temporary engagement of the arm 53 with the stop or post 54, and thereby any desired degree of expansion, within certain limits, of the interior former during each revolution thereof. An expansion from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch for each revolution of the former has been found to be desirable for the purpose of my invention. In case a greater or

smaller expansion is desired, however, my present machine may be easily adjusted by substituting a different pair of ratchet wheels, a greater number of teeth in these wheels resulting in a smaller degree of expansion and a smaller number of teeth resulting in a greater degree of expansion of the interior former during one revolution thereof.

To mount a blank within the machine for the expanding operation, the ring 30 is first removed, after which the ring 28 may be similarly removed thus providing an annular opening between the upper plate 12 on the stationary frame and the upper member 34 on the revolving frame. The metal blank 31 may then be positioned, as shown in full lines in Fig. 1 of the drawings, the lower end of the blank fitting into the clamping ring 17. This clamping ring 17 now contracted by means of the hand-wheel 26 and the blank thus secured to the stationary frame and firmly held against rotation therein. The ring 28 and the ring 30 are now placed in their proper positions, the former fitting exteriorly and the latter interiorly the upper end or chine of the blank. After the metal blank has been thus mounted in the machine, the revolving frame for the interior expansible former is revolved through the pulley 40 from any convenient source of power. During each revolution of the revoluble frame, the arm 53 will come into contact with the stop 54 and the intermittent relative rotation of the shaft 45 effected during the continuous rotation of the expansible former. After a sufficient number of revolutions of the revolving frame, the rolls 37 of the interior former will be in their most expanded condition and the metal blank will have the desired bilge-shape, as indicated by the dotted lines in Fig. 1 of the drawing.

In order to remove the finished blank from the machine, the direction of revolution of the frame is reversed, which will cause intermittent relative rotation of the shaft 45 and said frame in a reverse direction, thus intermittently forcing the wedge-blocks 36 and 46 apart and to their initial positions in substantially the same manner as the same were forced toward each other, the post 54 being beveled on both sides, as shown. Interposed between the journal boxes 42 and the outer end of the radial slots 41, are springs 55, which are held in position by the seats or pockets provided in said journal-boxes and the ends of said radial slots. By action of these springs, the journal-boxes 42 are pressed in inwardly against the cones 46, and the journal-boxes are therefore under yielding forces tending to return them to initial positions, thereby radially retracting the rolls and contracting the expander as a whole when the direction

of revolution of the revolving frame is reversed. The machine is then stopped, the ring 28 and ring 30 removed, and the clamping ring 17 expanded, whereupon the finished blank may be withdrawn and a new blank inserted for a repetition of the above operation.

In the foregoing description I have embodied one preferred form of my invention, but I do not desire to limit myself thereto, as I am aware that modifications may be made therein without departing from the principle or sacrificing any of the advantages of the invention.

I claim as new and desire to secure by Letters Patent:

1. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a forming roller suitably mounted within said blank in relatively fixed longitudinal positional relation thereto, and means for revolving said roller and at the same time gradually increasing the radius of revolution thereof.

2. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a forming roller suitably mounted within said blank, the lateral contour of said roller being that of the desired lateral contour of the formed blank, and means for revolving said roller and at the same time gradually increasing the radius of the revolution thereof.

3. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a series of forming rollers suitably mounted within said blank in relatively fixed longitudinal positional relation thereto, and means for revolving said rollers and at the same time gradually increasing the radius of revolution thereof.

4. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a forming roller suitably mounted within said blank in relatively fixed longitudinal positional relation thereto, means for revolving said roller, and means for periodically increasing the radius of revolution during operation thereof.

5. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a series of forming rollers suitably mounted within said blank in relatively fixed longitudinal positional relation thereto, means for revolving said rollers, and means

for periodically increasing the radius of revolution during operation thereof.

6. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a revoluble internal former adapted to expand said blank to the desired bilge shape by pure rolling contact, and means for revolving and expanding said former.

7. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a revoluble internal former the lateral contour of the plane of revolution of which is the same as the desired lateral contour of the formed blank, and means for revolving and expanding said former.

8. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a revoluble frame within said blank, a series of forming rollers mounted in said frame, the lateral contour of each of said rollers being the same as the desired lateral contour of the formed blank, means for revolving said frame, and means for automatically imparting bodily movement to said rollers radially with respect to the axis of said frame during revolution thereof.

9. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a revoluble frame within said blank, a series of forming rollers mounted in said frame, the lateral contour of each of said rollers being the same as the desired lateral contour of the formed blank, means for revolving said frame, and means for intermittently imparting bodily movement to said rollers radially with respect to the axis of said frame during revolution thereof.

10. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of an interior former, said former comprising a series of rollers the lateral contour of each of which is the same as the desired lateral contour of the formed blank, means for revolving said former within said blank, and means for expanding said former, said expanding means being actuated intermittently by said revolving means.

11. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a revoluble frame within said blank, a series of forming rollers journaled in said frame and adapted to contact with the interior wall of said blank, the lateral

contour of each of said rollers being that of the desired lateral contour of the formed blank and said rollers being journaled in bearings radially slidable in said revolving frame, means for revolving said frame, and means acting against said slide bearings to impart bodily movement to said rollers in a direction away from the axis of said frame during revolution thereof.

12. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly securing said blank at the ends thereof only, of a revoluble frame within said blank, a series of forming rollers mounted in said frame and adapted to contact with the interior wall of said blank, the lateral contour of each of said rollers being that of the desired lateral contour of the formed blank and said rollers being journaled in bearings radially slidable in said frame, means for revolving said frame, a pair of wedge blocks adapted to act against said slide bearings and force the latter outwardly as said wedge-blocks are moved toward each other, and means for automatically actuating said wedge-blocks during revolution of said frame.

13. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly supporting said blank through the ends thereof only, of a revoluble internal former, and means for expanding said

former during revolution thereof, said expanding means being actuated by revolution of said former.

14. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination, with means for rigidly supporting said blank through the ends thereof only, of a revoluble internal former, and means for expanding said former during revolution thereof, said expanding means being intermittently actuated by revolution of said former.

15. In a machine for forming a bilge-barrel body from a cylindrical sheet-metal blank, the combination with means for suitably supporting said blank, of a revoluble frame within said blank, a series of forming rollers journaled in bearing blocks radially slidable in said frame, a shaft rotatable independently of said frame, but normally rotating therewith, a pair of wedge blocks threaded upon said shaft and adapted to actuate said bearing blocks, said wedge blocks rotating with said frame, and means for intermittently checking rotation of said shaft.

In testimony of the foregoing, I have hereunto set my hand in the presence of two witnesses.

WILLIAM B. GODDARD.

Witnesses:

CARL A. LOHR,

P. FRANK SONNEK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."