

Oct. 18, 1927.

1,645,971

C. H. RIEGEL

METHOD OF MAKING SHEET METAL BARRELS

Filed Aug. 25, 1922

4 Sheets-Sheet 1

Fig. 1.

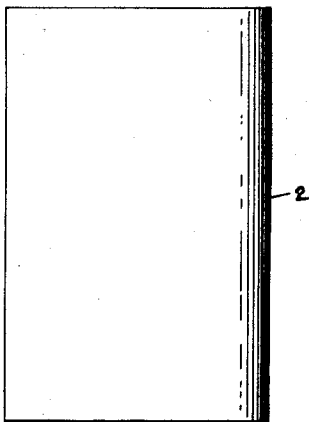


Fig. 2.

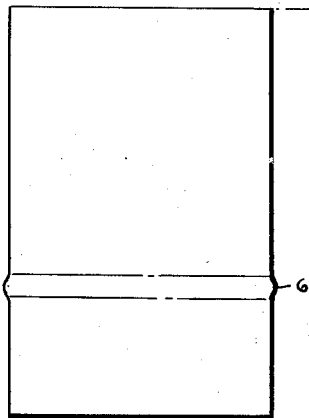


Fig. 3.

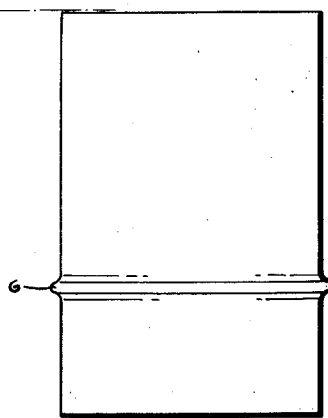


Fig. 4.

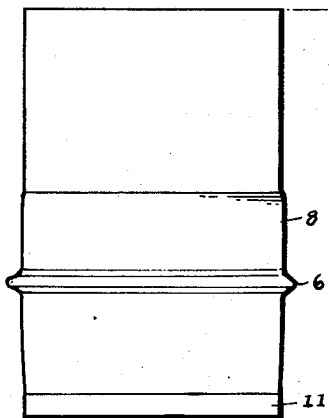
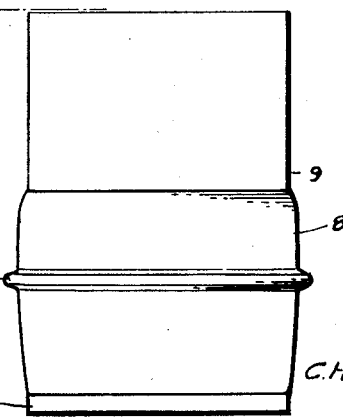


Fig. 5.



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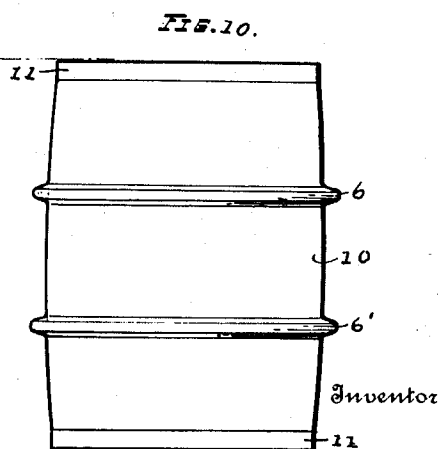
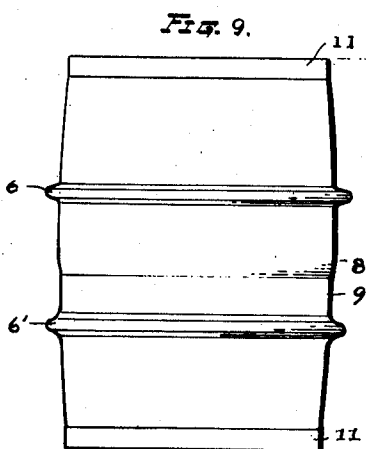
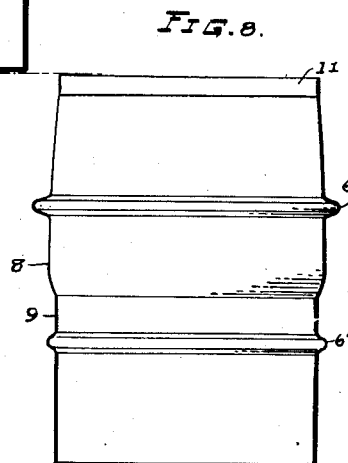
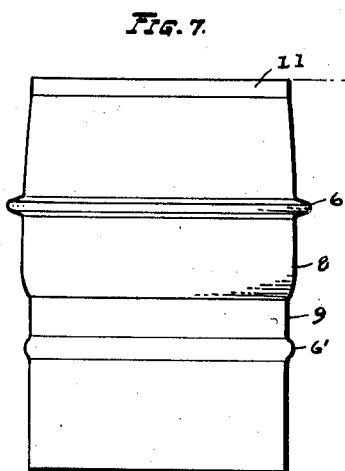
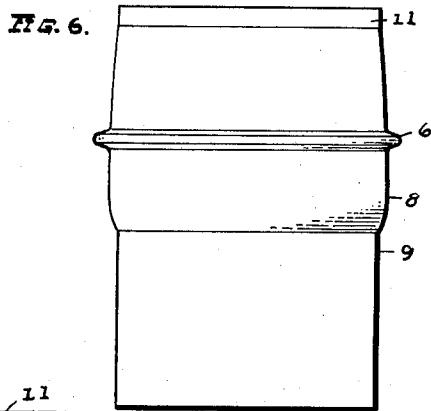
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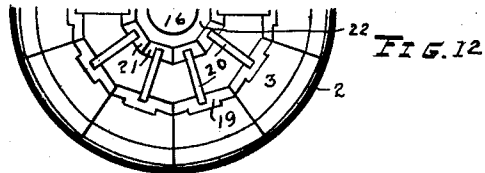
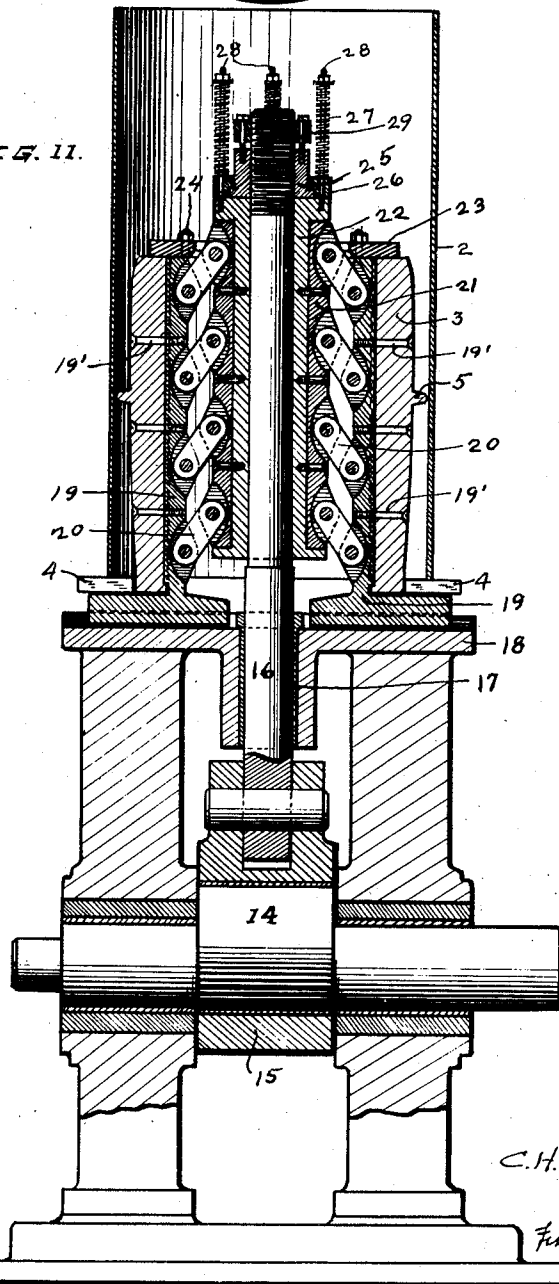


FIG. 11.



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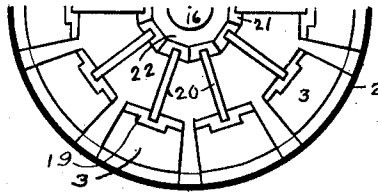
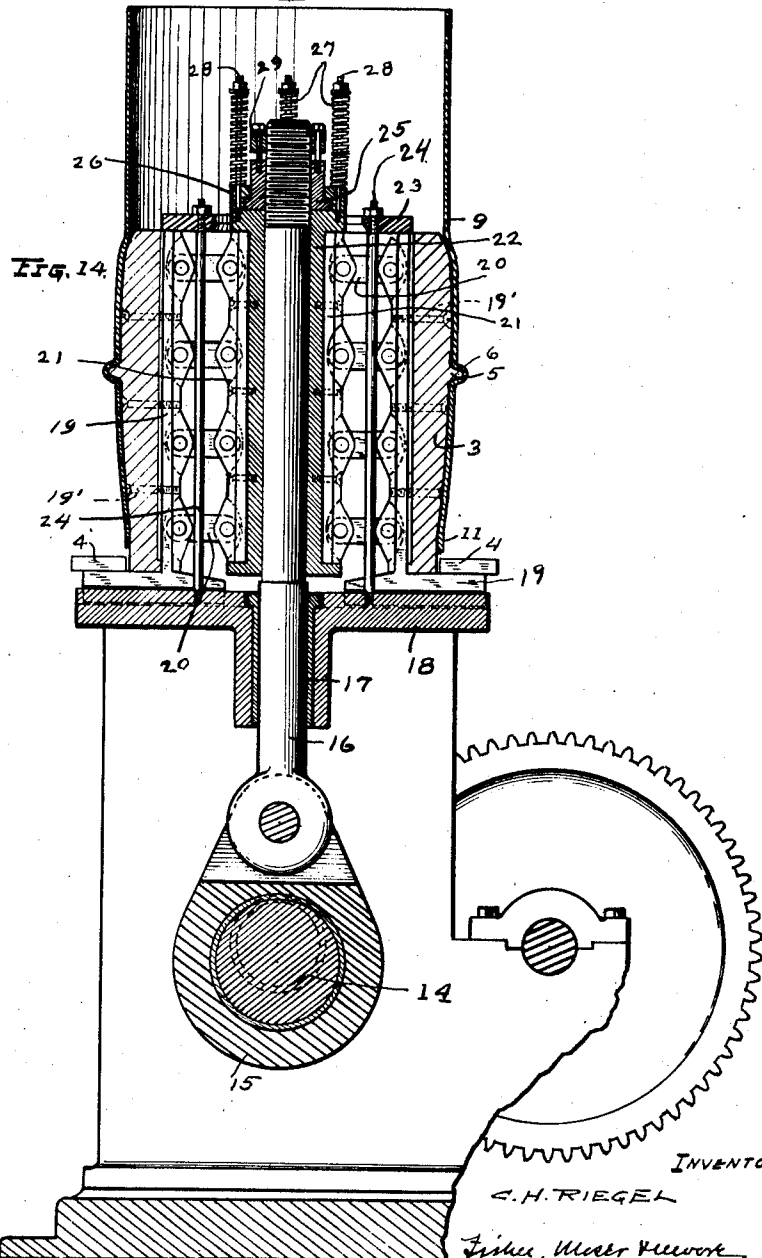


FIG. 13.



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METHOD OF MAKING SHEET-METAL BARRELS.

Application filed August 25, 1922. Serial No. 584,195.

My general object is to provide a rapid and efficient method of bilging a sheet steel cylinder and forming annular rolling hoops or corrugations therein, all substantially as herein shown and described and more particularly pointed out in the claims.

In the annexed drawings, Fig. 1 is a side view of a plain sheet steel cylinder before it is operated upon. Fig. 2 is a side view of the same cylinder with a single corrugation partly formed therein; and Fig. 3 a similar view showing the same corrugation in its next stage of development but not completed. Fig. 4 shows the same cylinder with the corrugation fully developed and the lower half of the cylinder partly bilged, and Fig. 5 is a side view similar to Fig. 4 but showing the lower half of the cylinder fully bilged. Fig. 6 is a side view of the bilged cylinder exactly as developed in Fig. 5 but with the bilged half uppermost as occurs when this partly finished product is inverted and sleeved for a second time over the contracted dies, and Fig. 7 is a side view of the same bilged half showing the beginning of the production of the second corrugation in the plain cylindrical half thereof. Fig. 8 is a side view illustrating a further development of the corrugation without change in the bilged half of the cylinder, and Fig. 9 shows the second corrugation practically completed and the lower half partly bilged. Fig. 10 is a side elevation of the completed product. Fig. 11 is a vertical section of a machine with which this method may be practiced, and Fig. 12 is a diagrammatic view showing one-half of the dies used in the machine and contracted within a plain cylinder. Fig. 13 corresponds to Fig. 12 but shows the dies and cylinder expanded. Fig. 14 is a sectional view of the machine at right angles to Fig. 11, but showing the dies expanded and the cylinder bilged and corrugated in its lower half.

The steel barrels in general use are usually provided with rolling hoops or bands between their ends which are either separate pieces secured to the body of the barrel or rolled outwardly from the body stock in the form of an annular corrugation or rib. The depth or distance to which this corrugation may be rolled outwardly is necessarily limited to avoid rupturing the stock or weakening the body. In rolling these corrugations it is also difficult to produce acute bends and salient corrugations of acutely

tapering form without weakening the stock, and therefore the annular corrugations are made relatively shallow and rounded or curved obtusely. Furthermore, the cylinders embodying such round rolled corrugations are straight and not bilged, the matter of bilging being in itself quite a difficult operation, and this difficulty is increased where annular rolling ribs or corrugations are also to be made in the bilged portion of the body.

The present method is not only capable of producing a bilged body but it also permits very salient rolling ribs or corrugations in the bilged portions of the body to be made without rupturing or weakening the stock, and the work is accomplished very rapidly, conveniently and cheaply. Thus, a flat steel sheet is rolled and welded together longitudinally to produce a perfectly straight hollow cylinder 2, the length and diameter of the cylinder being somewhat less overall than the product finally made therefrom. The cylinder is sleeved vertically over a set of segmental expanding dies 3 arranged in a circle, and seated upon rests 4 in a definitely fixed position longitudinally in respect to the dies. However the dies 3 are relatively much shorter than the cylinder, their upper ends extending only a short distance above and beyond the transverse median line of the cylinder when the cylinder is properly seated upon the rests 4. In this position of parts the dies are drawn together and form a perfect circle and their outer working faces are tapered and have straight base ends for a short distance to provide a straight chime end for the barrel. The larger upper ends of the dies are rounded or curved lengthwise thereof for a short distance to produce a round annular swell at the middle of the cylinder during bilging operations, and each die is also provided with a transverse rib 5 having steeply-inclined tapering sides and a rounded edge and this rib projects a substantial distance beyond the curved bilging portions of the die to produce a very prominent and relatively deep annular corrugation 6 in the bilged portion of the cylinder a substantial distance back from the end edge thereof.

Two such corrugations 6 are formed one at a time in the cylinder, and when the first corrugation is partly formed the step of bilging or tapering the cylinder begins.

Thus in sleeving the plain cylinder over the dies the circle of ribs 5 space the cylinder apart from the curved bilging portions of the dies as shown in Fig. 11. All of the 5 dies in the circle are then forced gradually outward in equal degree, and the ribs 5 expand the stock annularly in gradually increasing degree but only in the immediate zone of the rib until a single corrugation or 10 bead 6 of the desired form is nearly completed. As the corrugation is produced the cylinder is drawn shorter longitudinally, and the cylinder is further shortened as its diameter is increased over a greater area 15 which occurs when the bilging portions of the dies engage the walls of the cylinder upon the completion of the corrugation and expand the cylinder above and below the corrugation, first at its middle opposite the 20 thicker portions of the dies above ribs 5 and then successively from the corrugation toward the bottom end of the cylinder opposite the tapering portions of the dies. In brief the expanding movement of the dies first 25 forms a corrugation and then bilges one-half or a little more than one-half of the cylinder while stretching the corrugation to a larger diameter, the metal flowing or drawing in toward the corrugation from both 30 ends of the cylinder during these proceedings.

The dies are then contracted and withdrawn from contact with the partly bilged cylinder. This frees the ribs 5 from the cor- 35 rugation and permits the partly bilged cylinder to be removed from the dies. The half finished cylinder is then inverted and the plain straight end sleeved over the dies in the same position of rest as originally. 40 The dies are then again expanded and the same operations repeated to form a second corrugation 6' and bilge the cylinder in its other half. When the upper ends of the dies engage the cylinder beneath the rounded 45 swell 8 which was left in the cylinder at the completion of the first bilging step the straight portion 9 above the second corrugation is expanded gradually until the rounded swell or abrupt bend 8 is eliminated 50 and a smoothly bilged section or band 10 is produced between two salient V-shaped corrugations 6 and 6', substantially as shown in Fig. 10. The completed cylinder tapers to a smaller diameter from the said corruga- 55 tions to narrow straight band portion 11 at the ends. These straight portions 11 facilitate end seaming and heading operations in producing a barrel, and such operations may be effected in any suitable or well known 60 way.

The dies are expanded and collapsed by the rotation of an eccentric 14 within an eccentric strap 15 having a pivotal connection with a push and pull rod 16 supported 65 vertically within a bearing 17 in a base plate

18. A series of upright die-supporting members 19 are slidably mounted upon plate 18 and the dies removably secured by screws or bolts 19' to the upright members 19 which are pivotally connected by short links 20 to 70 pivot bars 21 affixed radially upon a long sleeve or collar 22 on rod 16. A flat holding ring 23 for the movable members 19 is secured by the tie bolts 24 to base plate 18, and the upper end of the pull and push rod 75 16 is screw-threaded and provided with a shouldered nut 25 adapted to secure collar 22 removably and adjustably upon said rod. A rabbeted ring 26 surrounds the nut, and a series of coiled springs 27 bear down upon 80 the ring and cushion the upward stroke of the rod and uplift of the collar in collapsing the dies initially. The springs 27 are held in place by bolts 28 fixed to the collar which is free to slide upwardly on the bolts 85 and the nut. A lock nut 29 may also be used for adjusting nut 25.

At the beginning of operations the eccentric is on a dead center in respect to the pivot connection with rod 16. During the first 90 quarter rotation of the eccentric, the movement of the rod downwardly is gradually accelerated; then in the next quarter of rotation the movement of the rod downwardly is gradually slackened which slackens the 95 movement of the dies outwardly in corresponding degree during the interval that bilging of the cylinder actually proceeds and until the maximum diameter of expansion is reached. The gradual slowing up of the 100 dies is still further fostered by the action of the links in straightening out from their upwardly-inclined position to a horizontal dead-center position, especially during the final arc movement of the inner end of the 105 links, and during this final movement the maximum of power is applied most efficiently.

What I claim, is—

1. A method of making a corrugated steel 110 barrel body, consisting in expanding a sheet metal cylinder by drawing the stock from the end of the blank cylinder into a localized zone near one end thereof until a salient rolling corrugation is produced; in expanding 115 the corrugated half of the cylinder to a larger diameter on tapering lines beginning at the middle of the cylinder and proceeding toward the salient corrugation and end; and in repeating the same steps in the opposite half of the cylinder, whereby a bilged 120 barrel body having a spaced pair of salient rolling ribs is produced.

2. A method of making a steel barrel 125 body, consisting in forming an annular outwardly-extending rolling corrugation in a straight sheet-metal cylinder back from one end thereof by displacing the stock from the end of the blank cylinder towards said rolling corrugation to be formed; in stretching 130

the material involved in said corrugation and in the areas contiguous thereto and at each side to a larger diameter from approximately the middle of the cylinder to one end thereof, leaving an annular offset at the middle of the cylinder; in forming a second annular outwardly-extending corrugation in the straight undeveloped half of the cylinder; and in stretching the second corrugation and straight half to a larger diameter corresponding to the development in the opposite half and eliminating the annular offset at the middle of the cylinder.

3. A method of making a steel barrel body, consisting in applying an internal pressure annularly in a narrow zone in a sheet-metal cylinder and drawing the stock from the end of said cylinder toward this zone until a salient rolling rib is produced; then in continuing this pressure in this zone and at each side of the rib in contiguous areas thereto until the said cylinder has been expanded to a larger diameter; and then repeating said steps in another portion of the cylinder.

4. A method of making a steel barrel body, consisting in applying an internal pressure uniformly at a plurality of radial places first in a narrow zone near one end of a sheet-metal cylinder until a salient annular rolling rib is produced; then in continuing said pressure in said zone at each side of said rib in adjacent areas to the middle of

the cylinder and toward one end of the barrel on tapering lines until said cylinder has been expanded over approximately one half thereof; and then in repeating said ribbing and expanding steps in the undeveloped portion of said cylinder until a symmetrical barrel body having a pair of rolling ribs is produced.

5. A method of making a corrugated barrel body, consisting in applying pressure uniformly at equidistant radial places in a narrow zone internally of a sheet-metal cylinder and drawing the stock from the end of said cylinder towards said zone until a salient annular rib is formed therein and the cylinder is contracted in length, and subsequently repeating said operation in another portion of the cylinder.

6. A method of making a corrugated barrel body, consisting in applying a graduated pressure uniformly at equidistant radial places in a narrow zone internally of a plain sheet-metal cylinder and stretching the material involved in said zone while contracting the length of the cylinder until a salient annular rib is formed in one plain end portion of the cylinder, and then repeating said operation in the opposite end portion of the cylinder.

In testimony whereof I affix my signature.

CLARENCE H. RIEGEL.