This invention relates to improvements in lever-bolt drum closures, that is to say lever means for expanding a closing ring to place it over the cover flange and for contracting the ring to pull its ends toward each other, along with bolt and nut means for further contracting the ring to drum sealing position.

This invention provides means for closing rings which is old and well known. Such a means may be operated rapidly and is convenient for the consumer since by its use a cover may be removed and replaced quickly when a portion of the contents of a drum are to be withdrawn and the drum again closed. Ring actuating means of this kind are not suitable for certain purposes however, because such means cannot be relied upon to satisfactorily seal drums in all cases. If the dimensions of a drum or a closing ring vary to some extent from the intended dimensions, as may readily happen, the lever and ring may not compress the gasket sufficiently to effect the desired seal. A lever operated ring therefore may seal in some cases and not in others, and when the material to be shipped is subject to deterioration when exposed to air or moisture, the uncertainty of this type of closure is obviously objectionable.

For materials requiring tight seals it is common to close the drums by a bolt and nut type of seal, such for example as is disclosed in Patent 2,606,565, issued November 1, 1954, to Leo A. Willen and myself, because variations in dimensions may be compensated by varying the extent to which the bolt is threaded into the nut. This type of closing ring as previously constituted also has disadvantages however. It is not easily adjusted to a position where the bolt may be inserted preparatory to drawing it up to sealing condition. Sometimes the ring is put in place on the drum and tapped with a wooden mallet at various places along its periphery to bring its ends into juxtaposition. The ends may also be brought together by employing a ring closing tool, as disclosed in Patent 2,555,195, issued to Leo A. Willen and myself on May 20, 1951. A second difficulty with this type of closure is that when portions of the contents of a drum are to be removed on different occasions, it is time consuming to turn the bolt to release it from the nut and to reinsert the bolt and draw it up again after the cover is replaced.

In the present invention the shortcomings of both of the above described ring closing devices are overcome and their good points utilized. In operating my closure the ring may be placed in position and quickly drawn up by the lever to hold the ring ends together while the bolt is being threaded into the nut for completing the contraction of the ring and sealing the cover, the link and lever mechanism comprising a lost motion (pin and slot) connection which permits the bolt and nut action.

When the consumer desires to begin using the container the ring is unscrewed the bolt, after which the ring may be expanded sufficiently to permit the removal of the drum cover, that is by manipulation of the lever and link mechanism. If the contents are to be used up within a relatively short time the bolt may be discarded and the lever and link alone employed for expanding and contracting the ring. The lever and link are sufficient to hold the cover in place, though not sufficient to effect a seal between it and the drum.

One of the objects of the invention therefore is the provision of a closure having a lever and link mechanism for quickly contracting the ring to a preliminary closing position and bolt and nut means for completing the contraction of the ring and sealing the cover to the drum.

Another object is the provision of means of the character described which is self-contained and requires no tools other than an ordinary wrench for setting up or releasing it.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawing in which:

Fig. 1 is a fragmental plan view showing the closing ring being applied to the cover of a drum.

Fig. 2 is a similar view showing the parts in the intermediate stage of the closing operation.

Fig. 3 is still another similar view showing the parts in the final stage of the closing operation.

Fig. 4 is a fragmental elevational view on a larger scale, the parts being shown in fully closed position.

Fig. 5 is a detail cross-sectional view of the ring taken substantially on the line 5—5 of Fig. 4.

Fig. 6 is a cross-sectional view of the drum, cover and closing ring, the view being taken substantially on the line 6—6 of Fig. 4, and

Fig. 7 is a fragmental elevational view looking in the direction indicated by arrow 1 of Fig. 4.

In the drawing a steel drum is indicated at 10. It is provided with a beaded rim 11, as is common in such containers. A cover or lid 12 is so formed as to extend downwardly into the drum.
somewhat below the level of rim 11, as is also common in containers of this sort. The cover is provided with a flange 13 which overtops the rim 11 throughout its extent. This flange is preferably curved in cross-section as shown and receives a soft rubber or resilient gasket 14 which serves to seal the cover to the drum when the flange 13 and rim 11 are drawn together with sufficient force. A split closing ring 15 of G-shape in cross-section is employed to hold the cover in place and to compress the gasket 14 for sealing the joint between the drum and cover. The foregoing parts are conventional.

A ring built in accordance with the present invention comprises a pair of ears 16, one on each side of the split in the ring. These ears, which are preferably welded to the ring, are spaced a short distance from its ends and project inwardly from the upper part of the ring a short distance toward the center of the cover. To the inwardly projecting portion of one of the ears there is pivoted at 17 one end of a lever 18, which may be relatively short as compared with the lever of the conventional lever and link mechanism since it is not called upon to exert heavy pressure.

To the other ear 16 there is pivoted at 19 a link 20 which preferably is formed of two strips of metal, one on either side of the inwardly projecting part of the ear 16. The two strips of this link also straddle the lever 18 and are joined by a pin 21 which extends through a slot 22 in the lever. A strip of metal 23 welded to the ring extends inwardly and is provided with a downward hook so that the lever 18 when in the position of Figs. 2 and 3 may be held against swinging inwardly. In the illustrated embodiment the lost motion connection is a pin end slot connection which is preferred because of its simplicity. However the means for providing lost motion may be employed if desired. Furthermore it will be observed that a fixed pivot may be substituted for the illustrated pin and slot connection 21, 22 and a lost motion connection substituted for either of the illustrated pivotal connections 17 and 18, if being necessary only that after the lever means is operated to bring the ring ends into juxtaposition as illustrated in Fig. 2 the lost motion means shall be such as to permit the ring ends to be pulled close together.

An extreme difficulty of the ring adjacent the ears 16 is the position 23, 25' is welded to the ring. If extends downwardly somewhat below the level of the ring where it is formed into a loop 26, 26'. When the ring is closed or approximately closed these loops are disposed in alignment. Loop 26' carries a sheet metal sleeve 27 which is bent over at one end to form a flange 22. At the other end it embraces a castellated nut 29 which bears against the end of the loop. The sleeve 27 at the end remote from the flange 28 is forced into the castellated slots 30 as indicated in Fig. 6. The sleeve is slotted at 24 to clear the lug 28', see Fig. 7. Thus the nut 22 is held against movement with respect to loop 26', both longitudinally and rotationally. A bolt 32 may be removably mounted in the loops 25, 25'. It has a head 23 of larger transverse dimensions than the internal diameter of the loop 25 so as to have a firm bearing against that loop. Its Shank may be rotateably mounted in the nut 22.

Operation.—When a cover 12 carrying a gasket 14 is to be sealed to the drum, the ring 10 expanded as shown in Fig. 1 is placed over the flange 13 of the cover. The operator then grasps the hand lever 16 and swings it around from the Fig. 1 position to that of Fig. 2, causing the lever to project beneath and engage the hook on the strap 33. This means the lever 18, the end of slot 22 nearest pivot 17 to pull against pin 21 on link 20 and draw the ends of the ring toward each other, about as indicated in Fig. 2. This contracts the ring sufficiently to engage the rim 11 and flange 13 at all points, so that the ring firmly locks over the surface of the drum.

The pin 21 is now at the left end of slot 22 as viewed in Fig. 2. The loops 26, 26' are now rather close together and in alignment. The shank of bolt 32 may now be pushed through loop 26 and loop 26' until its contacts nut 23. It can then be threaded into the nut manually and tightened with a wrench applied to the head 33. The ends of the ring are thereby pulled toward each other until a strong resistance to further rotation indicates to the operator that the gasket 14 has been well compressed and the joint between the drum and its cover sealed. The contents of the drum are then fully protected against deterioration.

The final closing stage pulls the ears 16 toward each other and the pin 21 in the link 22 moves toward the right while the slot 22 in lever 18 moves toward the left. When the bolt has been drawn through the gap 23, 25' the link 20 carries the right hand end of slot 22. Without the slot and pin connection or its equivalent, the ring could not have been closed by the bolt because the final movement would have been prevented by a fixed pivotal connection between the lever and the link.

When the drum is delivered to a consumer it may be opened by the removal of the bolt first and by the operation of the hand lever second, as will be obvious. If the contents are to be used a portion at a time the bolt is discarded. The ring may then be expanded to the condition illustrated in Fig. 1 and the ring and cover lifted off the drum. When the required amount of material has been taken out of the drum it may be closed by replacing the cover and returning the lever to the position of Fig. 2. These operations and closing operations are quickly performed without tools of any kind, and yet the cover is locked in place when the drum is closed.

Having thus described my invention, I claim:

1. In a drum closure having a sealing gasket, a split ring adapted when contracted to form a cover into gasket compressing position, a lever one end of which is articulated with one end of said ring and a link articulated with the other end thereof, said link and lever being articulated to each other at a point intermediate the ends of the lever, one of said articulated connections being a lost motion connection, and a pair of lugs attached to the ends of said ring, said lugs carrying aligned loops, whereby said lever may be operated to draw the ends of the ring toward each other sufficiently to permit the insertion of a bolt through said loops, after which the bolt may be tightened to bring the ends into sealing position while the lost motion connection permits relative movement between the lever and link.

2. In a drum closure having a sealing gasket, a split ring adapted when contracted to form an end closure into gasket compressing position, an ear attached to the side of the split therein, a lever pivoted at one end to one ear and a link pivoted to the other, a pin and slot connection between the link and the lever intermediate the ends of the lever, and a pair of lugs attached to the ends of said ring,
said lugs carrying aligned loops, whereby said lever may be operated to draw the ends of the ring toward each other sufficiently to permit the insertion of a bolt through said loops, after which the bolt may be tightened to bring the ring ends into sealing position while the pin end slot connection permit relative movement between the link and lever.

3. A drum closure as defined in claim 2, wherein the slot of said pin and slot connection is so positioned that one end thereof will bear on the pin to draw the ring ends toward each other when the lever is thrown to closing position and wherein the slot is of a length sufficient to permit the necessary movement of the pin therein while the ring ends are drawn into drum sealing position by said bolt.

4. In combination, an open-ended drum provided with a beaded rim, a cover having a flange adapted to overlie said rim, a resilient gasket interposed between said rim and flange, a split ring of C shape in cross section adapted when contracted to cam said rim and flange toward each other and compress said gasket, an ear attached to the rim on each side of the split therein, a lever one end of which has an articulated connection with one ear and a link having an articulated connection with the other ear, an articulated connection between the link and lever intermediate the ends of the lever, one of said articulated connections being a lost motion connection, a pair of lugs attached to the ends of said ring, said lugs carrying aligned loops, and bolt and nut means adapted to cooperate with said loops for drawing said lugs close together, whereby the lever may be operated to draw the ring ends toward each other for locking the cover to the drum and whereby the bolt may then be threaded into the nut to contract the ring into gasket compressing position for effecting a seal.

5. In combination, an open-ended drum provided with a beaded rim, a cover having a flange adapted to overlie said rim, a resilient gasket interposed between said rim and flange, a split ring of C shape in cross section adapted when contracted to cam said rim and flange toward each other and compress said gasket, an ear attached to the ring on each side of the split therein, a lever one end of which has an articulated connection with one ear and a link having an articulated connection with the other ear, an articulated connection between the link and lever intermediate the ends of the lever, one of said articulated connections being a lost motion connection, a pair of lugs attached to the ends of said ring, said lugs carrying aligned loops, and bolt and nut means adapted to cooperate with said loops for drawing said lugs close together, whereby the lever may be operated to draw the ring ends toward each other for locking the cover to the drum and whereby the bolt may then be threaded into the nut to contract the ring into gasket compressing position for effecting a seal.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,011,044</td>
<td>Fetter</td>
<td>Aug. 13, 1935</td>
</tr>
<tr>
<td>2,049,848</td>
<td>Lockhart</td>
<td>Aug. 4, 1936</td>
</tr>
<tr>
<td>2,108,407</td>
<td>Lockhart</td>
<td>Feb. 15, 1938</td>
</tr>
<tr>
<td>2,486,565</td>
<td>Kojan et al.</td>
<td>Nov. 1, 1949</td>
</tr>
<tr>
<td>2,523,659</td>
<td>Tucker</td>
<td>Sept. 26, 1950</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>435,228</td>
<td>Great Britain</td>
<td>Sept. 17, 1935</td>
</tr>
<tr>
<td>547,831</td>
<td>Great Britain</td>
<td>Sept. 14, 1942</td>
</tr>
</tbody>
</table>