This invention relates to a device for securing the ends of a metal cargo strap in overlying relationship, applying a tension to the strap loop thereby formed, and locking the loop to maintain the tension. Thus generically stated, this invention is related to our copending application for patent Serial Number 164,946, filed September 15, 1950, and entitled Flange Tensioning and Joining Device for Strap Ends.

All ocean-going cargo vessels must be protected from damage by securing the cargo against movement caused by the rolling and pitching of the vessel. If the cargo is allowed to slide or shift about, in the hold, it may endanger the ship by shifting the center of gravity far to one side. During a storm or the running of a high sea, an unsecured cargo of fungible goods has been known to flow to one side of the hold causing the ship to list dangerously. Similarly, heavy pieces of cargo, such as machinery, may produce damage when the machinery slides about in the hold. The conventional provisions against such cargo shift involve the use of wide metal straps or bands. These straps may be secured between individual pieces of cargo and the hull ribs or deck cleats. With a fungible cargo, however, a different use is made of these straps. Thus, the hold is conventionally divided into two or more smaller semi-open compartments by constructing a temporary fore-and-aft baffle network along the approximate center line of the hold with spaced timbers. These timbers are set vertically on end and are secured to the hull ribs with the aforementioned metal straps. Thereafter, the fungible cargo is discharged into the hold over the network of timbers so that this temporary structure will divide the fungible mass and serve as a baffle network to inhibit lateral shifting thereof.

A conventional metal cargo strap is an elongate strip or band of steel approximately 2 inches wide and \( \frac{1}{4} \) inch thick. To construct a baffle network or secure a piece of cargo in place, this strap is threaded through the square eye in a ship clamp which is attached to the hull rib, stretched laterally across the hull, and secured about a piece of cargo or a timber baffle. Thereafter, the strap ends are joined in overlapping relationship by securing the same in a key or mandrel. Tension is then applied to the looped strap, as by winding the strap ends about the mandrel, and the tensioned strap is locked in place. Our invention is directed toward an improvement in a device for securing the ends of such a metal strap, applying a tension thereto, and locking the tensioned strap against unwinding movement.

In our copending application Serial Number 164,495, filed June 6, 1950, entitled Ship Clamp, we disclose and describe a ship clamp which will accommodate a metal strap and may be used in conjunction with our instant invention in the manner set forth above.

One object of our invention is to provide a coacting cylindrical mandrel having a slotted keyway for threading the ends of a strap therethrough and winding the strap thereabout and a keeper for locking the mandrel against movement after the strap is wound.

Another object of our invention is to provide a slotted mandrel with a cooperating keeper which is U-shaped and has one leg operatively engaged with the mandrel, one leg spaced therefrom in abutting relationship with the surface of a strap threaded through the mandrel, and a connecting section joining the termini of the legs.

A further object of our invention is to provide a non-circular tool-engaging periphery on each end of a mandrel so that either one or two workmen can wrap a metal strap thereabout so that one tool may be disengaged while a locking keeper is secured in place.

These and other objects and advantages of our invention will appear from the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a top elevation of our invention as it would appear to a person looking into a cargo hold from the deck of a ship;

Fig. 2 is a side view showing the overlying ends of a flexible metal strap locked in place by the keeper of our invention; and

Fig. 3 is an end view, partially in section and taken substantially on the line 3—3 of Figs. 1 and 2, showing the perpendicular toe protruding from one leg of our keeper member.

Our device is adapted to secure the ends 1 and 2 of a metal strap 3 in overlying relationship, as shown in Fig. 1. The principal joining and winding member therefore is an elongate cylindrical mandrel 4 having a slotted keyway 5 through the medial portion thereof. This keyway is dimensioned according to the dimensions of the metal strap to be employed and, by way of example, may be \( 3\frac{3}{8} \times \frac{1}{4} \) inches to accommodate a \( 2 \times \frac{1}{4} \) inch strap. Hexagonal tool-engaging peripheries 6 are formed on each end of the mandrel for receiving one or a pair of tensioning tools such as large bellcrank levers or socket wrenches. Concentric with each tool-engaging periphery 6, we recess a square female portion 7 in each end of the mandrel. The female portions 7 are adapted to
engage operatively a complementary square male portion 8 formed on the short leg of a U-shaped keeper 9. While we have shown, by way of example, a hexagonal tool-engaging periphery 6 and a square keeper male portion 8, it is obvious that these elements could as well be triangular, hexagonal, or any other non-circular or polygonal configuration so long as the tool or recess with which they cooperate are of a corresponding configuration. For example, if a force fit is to be effected between the female portion 7 and a male portion 8, it is possible that both portions could be circular in cross section and tapered to cause such a fit. Accordingly, the scope of our invention is commensurate with such diverse configurations.

The body of the keeper 9 is substantially U-shaped and includes a short leg which terminates in the male portion 8, a long leg 10, a connecting section 11, and a perpendicular toe 12. The two legs and the connecting section are adapted to lie substantially parallel to the plane of the strap 3 when engaged in the operative position shown in the drawings. The long leg 10 lies across one face of the strap 3 to abut thereupon and prevent the mandrel 4 from rotating. The long leg 10 is of further utility in that it terminates in the perpendicular toe 12. This toe 12 and the inner face of the long leg 10 abut the surface of the strap 3 and protrude across the edge thereof, respectively, to retain the keeper 9 in locking position. Thus, the toe 12 prevents the strap from slipping from beneath the long leg 10. The cross-sectional shape of the keeper 9 is best made non-circular but any desired shape may be employed.

In the operation of our invention, the strap 3 is threaded through the square eye in a ship clamp or cleat secured to a hull rib or the deck, is stretched laterally across the hold, and is threaded through the eye on a piece of cargo or around a perpendicular timber baffle. Thereafter, the ends 1 and 2 are threaded through the slotted keyway 5 in the mandrel 4 and a tensioning tool is applied to one or both ends of the mandrel over the tool-engaging peripheries 6. The mandrel is rotated by these tools so that the strap winds about the periphery of the mandrel 4 until the proper tension is brought to bear on the strap. Thereafter, one of the winding tools or cranks is withdrawn, and the keeper 9 is inserted in the mandrel and positioned with the male portion 8 engaging the female portion 7 and the long leg 10 lying across one face of the strap 3. The perpendicular toe 12 and long leg 10 thus lock the strap in place since the mandrel 4 cannot rotate relative to the strap 3 so long as the male portion 8 remains in operative engagement with the female portion 7.

In accord with the objects of our invention, we have provided a device for securing the ends of a metal strap in overlying relationship, applying a tension to the strap loop thereby formed, and locking the loop to maintain the tension. This device may be applied with either one or two tools and is useful in a variety of situations. It is of particular utility when used in conjunction with a flexible metal strap to prevent cargo shift in the hole of a ship.

We claim:

1. A device for locking the ends of a flexible strap in overlying relationship and applying a tension thereto, comprising an elongated cylindrical mandrel having a slotted keyway piercing the medial portion thereof for threading the ends of a strap therethrough, a non-circular tool engaging periphery on each end of said mandrel for receiving a pair of tensioning tools, and a U-shaped keeper including a short leg and a long leg joined by a connecting section, the terminal end of said short leg defining a non-circular male portion operatively engaged in a complementary non-circular female portion in the end of said mandrel concentric with one of said tool engaging peripheries, said long leg extending laterally across one face of one of said strap ends.

2. A device for locking the ends of a flexible strap in overlying relationship and applying a tension thereto, comprising an elongated cylindrical mandrel having a solid body except for an elongated slotted keyway which pierces the medial portion thereof to receive the ends of a strap in overlying relationship, a non-circular tool engaging periphery on each end of said mandrel for receiving a pair of tensioning tools, a square female recess formed laterally in one end of said mandrel concentric one of said tool engaging peripheries, and a U-shaped keeper of non-circular cross section including a short leg and a long leg joined by a connecting section, said short leg terminating in a square male portion operatively engaged in and complementary to said square female recess, said long leg lying substantially parallel to the plane of said strap ends and extending laterally across one face of one of said strap ends with a perpendicular toe protruding from the terminal end thereof a distance greater than the combined thickness of both said strap ends, said connecting section being spaced laterally out from said one tool engaging periphery to allow the application of a tensioning tool to said one periphery while said U-shaped keeper is in place.

WILLIAM A. MEIGHAN.
TIREY L. HUME.

REFERENCES CITED

The following references are of record 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>653,226</td>
<td>Forbes</td>
<td>July 10, 1900</td>
</tr>
<tr>
<td>2,389,777</td>
<td>Harris</td>
<td>Nov. 27, 1945</td>
</tr>
</tbody>
</table>