This invention relates to shipping apparatus. More particularly, the invention relates to apparatus facilitating the shipment of liquid commodities in metal drums on the decks of vessels or the surfaces of vehicles.

Industrial commodities in metal drums are frequently transported by sea-going vessels or by various land vehicles. Lower rates and greater convenience result if such shipments are made using the drums as deck cargo. In all such cases, the containers should be securely fastened to the deck for obvious safety reasons. The rigidity of fastening requirements varies somewhat with the character of the drum contents. For hazardous chemical materials, a high degree of care is required. Thus, when such commodities are shipped as deck cargo, extensive lashing arrangements are required, which substantially increase the cost of shipment in this general manner. Similar considerations apply when drums are shipped on flat bed trucks or freight cars.

An object of the present invention is to provide new and novel devices whereby drums can be efficiently and cheaply secured to the decks of sea-going vessels and safely shipped as deck cargo, but without the necessity of "custom-applied" lashing fastening, laboriously applied to a specific shipment. A more particular object is to provide, in combination with a deck of a vessel or other transportation vehicle, devices for assembling transport drums as an upstanding unitized group of drums, said assembly cooperating with the deck proper to establish a secured shipping assembly. Preferably, the drums are grouped in quartets, but the invention is also readily applicable to groups of 3, 5 or 6 drums, positioned in a generally symmetrical pattern.

The details of the apparatus of the invention and of its best mode of use will be clear from the description hereinafter and from the accompanying figures, wherein:

FIG. 1 is a plan view showing a typical quartet of drums affixed to a vessel deck and secured in place as a unitary assembly by the apparatus of the present invention;

FIG. 2 is a sectional elevation view of the assembly of FIG. 1, taken at a section AA and,

FIG. 3 is a detailed illustration of a fastening rod forming an element of the invention,

FIG. 4 is a plan view of a tie-down element which is a typical illustration of one component of an embodiment of the invention,

FIG. 5 is a sectional elevation view of the tie-down element shown in plan by FIG. 4,

FIG. 6 is a plan view of an upper fastening member or element, this particular embodiment being in the form of a cross shaped member, and

FIG. 7 is a further illustration of details of a particular embodiment of the invention having additional advantages.

In all forms of the invention, several elements are employed in conjunction with the deck of the carrier vessel or vehicle. The apparatus includes means attached to and associated with the deck, capable of receiving the lowestmost chime of a drum standing on end. Means are supplied for each drum and are positioned to engage the drums in a symmetrical pattern, in the case of the preferred embodiment using a quartet of drums, an approximately square pattern is provided. The chimes or roll hoops usually abut, but this is not essential.

At the center of the square (or other figure), or approximately the center of the square, established by the drum group is a tie-down element. The tie-down element can be of several designs. In the preferred form, the tie-down element is provided with a slip engaging socket for receiving the end of a tie rod, which tie rod forms an additional element of the apparatus. An upper fastening member surrounds the assembly and engages, from the top, at least a portion of each of the upper chimes of four drums arranged as already described. Engagement is by recesses in the fastening member for individually slipping over or receiving at least a portion of each chime of each drum. The upper fastening element also has a hole or other feature therein for engaging the previously mentioned tie rod, and fastening means associated with the tie rod, such as a conventional bolt, is provided to apply tension to the rod, thus causing downward pressure on the upper fastening member and applying pressure to each of the drum members.

Referring to FIG. 1, a top plan view of four drums 41, 42, 43, 44, in position on a plane surface or deck portion 11 is shown. Said drums in this embodiment have chimes 121, 122, 123, 124, at the upper ends thereof. The drums are also provided with roll hoops or rings 131, 132, 133, 134, which rings are in tangent relation one to the other, when the drums are arranged in position as shown. It will be clear from the description following, that actual engagement tangentially is not absolutely essential to the primary purposes of the apparatus, but permits the greatest utility with respect to the use of deck space. An upper fastening member 15 is shown, having recesses 161, 162, 163, 164 therein on its lowermost surface which recesses engage the upper chimes 121, 122, 123, 124, respectively of the drum quartet members.

The operative relationship and the additional components of the apparatus are further illustrated by FIG. 2, being an elevation section view AA of the assembly shown in plan by FIG. 1. Referring to FIG. 2, two drums 41, 42, are shown at least in part. A tie-down element 21 is shown welded to the deck 11. Chime engaging means 251, 252, are provided to receive the lowermost rims or chimes 131, 132, of the members of the drum quartet. In this embodiment the chime engaging means 251, 252, are in the form of a pair of small angle clips welded or otherwise rigidly affixed to the deck member 11 to engage individually at least a portion of the lower chime of each of the drums. The upper fastening member 15 is shown in place, recesses 161, 162, engaging individually the upper chimes 121, 122, of each of the drum quartet members 41, 42. A tie rod 31 is provided, said rod engaging and being retained by the tie-down element 21 by engaging means hereafter described, and projecting through a hole 17 in the upper fastening member 15, and engaging a threaded fastening element or nut 32, whereby downward tension can be applied against the upper fastening member 15, tensioning the fastening rod 31, and applying downward pressure on the individual drums 41, 42, 43, 44.

It will be immediately clear from the geometry of the assembly, particularly from FIG. 2, that the drum quartet members are assembled into a rigid assembly affixed to the deck end incapable of being tipped or displaced, in any direction. Thus, lateral movement of the drums is prevented by the chime engaging means 251, 252, one for each drum. Tipping of any individual drum, or of the quartet of drums is prevented by the downward thrust applied by the upper fastening member 15 in conjunction with the positive engagement of the upper chimes of the drums by the engaging recesses of the upper fastening member 15.

Further details of the fastening rod 31 are given in
FIG. 3, which is an elevation of a typical embodiment of such a rod. The fastening rod includes a central portion, and an expanded lower terminal portion 33, preferably in the form of a square segment for operative engagement with the tie-down element 21, and having an upper terminal portion 34 provided with threads for engaging a threaded nut as previously described.

The details of a preferred tie-down element 21 are given by FIG. 4, which is a plan view of a typical embodiment thereof, and FIG. 5 which is a sectional elevation thereof. Referring to FIG. 4, the tie-down element 21 is shown in plan view affixed to the deck portion 11 by welding thereto appropriate fastening arrangements. A throat 22 is provided extending from the margin of the tie-down element 21 to the center, and of such a size as to accommodate the fastening rod.

Referring to FIG. 5, this is a section BB of the tie-down element illustrated in plan by FIG. 4. The throat portion 22 is immediately above the larger recess portion 23, which is in the form of a square cross-section aperture, of a size to easily accommodate the terminal square portion 33 of the fastening rod element 31. A lip 24 is provided on the outer-most portions immediately adjacent the throat, said lip members engaging the margin of the aforementioned square end portion 33 of the fastening rod 31, and preventing lateral displacement. The vertical dimension of the space between the lower extremity 20 of the lip 24, and of the deck 11 surface is ample to allow ready entrance of the square nut portion 33 of the fastening rod 31.

Further details of a typical upper fastening member 15 are given by FIG. 6, which is a plan view of the normally lowermost surface of the upper fastening member 15 of the embodiment described. Referring to FIG. 6, the upper fastening element is in the form of a cross having branches 16a, 16b, 16c, 16d, one of the individual branches of the drum quartet of a finished assembly. At the terminus of the branches of the fastening member are the aforementioned recesses 16e, 16f, 16g, these being slots having a slight arcuate configuration for engaging the upper chimes of the drums. A hole 19 is provided at the center of the fastening member, for receipt of the upper end of the fastening rod 31.

When the apparatus above described is employed, quartets of drums are readily positioned in place and rigidly assembled into units which, as already described, are safely affixed to a vessel deck or vehicle surface and in such a manner that lateral displacement and/or tipping are fully prevented, even during rough weather or rough handling.

In the embodiment above described, it will be seen that, when the apparatus is not in use, that minor projections above the deck surface will exist. If these periods are extensive in duration, slight tripping hazards may be introduced with respect to the personnel. A further refinement of the invention includes all the elements already described plus supplemental elements whereby said tripping hazards are eliminated and yet the adequate functioning of the structure is not subverted in any extent. The details of such a modification are shown in FIG. 7, illustrating a further refinement adjacent the elements affixed to a deck, such as the tie-down element 21 and the lower chime engaging means 25a, 25b.

Referring to FIG. 7, a partial section of the apparatus is shown, including the deck portion 11, the tie-down element 21, and the lower chime engaging means 25a, 25b. Supplemented the aforementioned elements are grate elements 41, these having a vertical dimension corresponding approximately to the dimensions of the above mentioned tie-down element 21 and chime engaging members 25a, 25b. Suitable apertures (not shown) are provided in the grate elements for receiving the lower chime portions, which chimes are operatively engaged for purposes of retention, by the chime engaging means 25a, 25b. In addition, a small aperture 42 is provided adjacent the tie-down element 21, to permit lateral movement of the square end 33 of a fastening rod 31, to the interior of the tie-down element 21. It will be clear that the upper surface of the grating 41 thus provides a uniform level surface in cooperation with the tie-down elements 21 and the chime engaging elements 25a, 25b, to amount to a slight elevation of the main surface of the deck 11, thus providing a new walking surface 42 for ship personnel, without danger of tripping because of protrusion of the structural elements of the invention. The grate is readily fastened to the deck material by tack welding or similar retaining means.

It will be apparent that the improvement or benefit obtained by the embodiment illustrated by FIG. 7 can also be realized in other equivalent ways. For example, the chime engaging means and the tie-down member can be machined out the deck material, rather than being separate components attached thereto. In another variation, the lower chime receiving means, and the tie-down element, are removable from the deck, being secured by appropriate threaded fasteners when in use.

It will further be apparent that, instead of four drums, the drums can be arranged in other configurations of at least three, and more than four, drums per group. Quartets are the much preferred grouping, however, in order to secure the most uniform resistance in all directions to upsetting. When three drums are employed, of course, the upper fastening member has recesses for engaging the chimes of three drums in a triangular pattern.

When five or six drums are grouped, they are positioned in approximate regular pentagons or hexagons. On the other hand, when six or eight drums are to be secured in a unit, it is feasible to arrange such assemblies as multiple quartets, a pair of drums in one quartet being a common pair also functioning in the adjacent quartet.

Numerous additional variations of the apparatus of the invention above described and illustrated will be apparent to one skilled in the art.

What is claimed is:

1. Apparatus for deck loading a group of at least 3 chimed drums in standing position including:
   (a) a deck portion;
   (b) chime engaging means equal in number to the number of drums to be secured thereby, said means being attached to said deck portion (a), each means being adapted to receive at least a portion of the bottom chime of one standing drum without engaging the drum head and to laterally register the drum when a drum is resting squarely on the deck portion (a), said means being positioned relative to each other on said deck portion (a) so as to provide an essentially uniform plan configuration for the drums when secured thereby;
   (c) a tie-down element attached to said deck portion (a) at about the center of said plan, said tie-down element being adapted to receive an enlarged end of a tie-rod, hereafter defined, and to laterally position said end when upper tension is applied to the tie-rod;
   (d) a unitary upper fastener member having recesses therein equal in number to the number of drums to be secured, the recesses being in a lateral plan corresponding to the plan of the chime engaging means (b) and the member being adapted to provide downward pressure on the upper extremity of the chime of each drum engaging means (b) without engaging the head or side wall of the drum;
   (e) a tie-rod for connecting the upper fastening member (d) and the tie-down element (c), said tie-rod including an enlarged lower end segment for engaging the tie-down element (c) in fixed lateral position with remainder of the lower chime engaging means 25a, 25b.
   (f) fastening means for tensioning the tie-rod (e) between the tie-down element (c) and the upper fastening member (d) and thereby adapted to concurrently
apply downward pressure to each of the drums to be secured; and
(g) a grate means attached to said deck portion (a) for providing a foot-traffic plane, said grate means being provided with cut-out portions to accommodate the chime engaging means (b), the tie-down element (c), and the enlarged lower end segment of the tie-rods (e), said grate means having a height sufficient to prevent protrusion of said chime engaging means (b) and tie-down element (c) but a height insufficient to engage the head surfaces of the drums to be secured.

2. Apparatus for securing a group of at least three chimed drums in an upright and lateral position, said apparatus including in combination:
   (a) a deck portion;
   (b) chime engaging means equal in number to the number of drums to be secured in a fixed spaced apart relationship, each of said means being attached to said deck portion (a) and positioned relative to each other to realize the desired fixed spaced apart relationship of the drums to be secured, said means being further defined in that each is adapted to receive at least a portion of the bottom chime of a drum in an upright position without engaging the head of the drum;
   (c) tie-down means attached to said deck portion (a) and positioned among the chime engaging means (b), said tie-down means being adapted to receive one end of a tie-rod means, hereinafter defined, and to laterally position and secure said tie-rod means when under tension;
   (d) unitary upper fastener means having recesses therein equal in number to the number of drums to be secured, the recesses being of a depth insufficient to allow contact with the head of a drum when secured thereby and being spaced apart in conformity with the spaced apart relationship of the drums to be secured upright between said fastener means and chime engaging means (b), said fastener means being further defined in that it is adapted for connection to the tie-rod means, hereinafter defined;
   (e) tie-rod means having one end adapted for connection to said tie-down means (c) and its other end adapted for fastening to said unitary upper fastener means (d);
   (f) fastening means for placing said tie-rod means (e) under tension whereby drums when positioned between said fastener means (d) and said chime engaging means (b) are restrained; and
   (g) grate means attached to said deck portion (a) for providing a foot-traffic plane, said grate means being further defined in that it has cut-out portions to accommodate said chime engaging means (b), said tie-down means (c), and the end of said tie-rod means (e) for connection to said tie-down means (c), said grate means having a height sufficient to prevent protrusion of said chime engaging means (b) and said tie-down means (c), but a height insufficient to engage the head surface of a drum to be secured.

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