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(54) IMPROVEMENTS IN OR RELATING TO A PORT RAMP
FOR ACCESS TO A ROLL-ON ROLL-OFF SHIP

(71) We, MACGREGOR INTERNATIONAL S.A., a Swiss Body Corporate of St-Jakobs-strasse 9, 4002 Basle, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates generally to a ramp for access to a roll-on roll-off ship or like floating vessel, permitting the unloading and loading of the ship through the said ramp, which provides a connection between a quay on a shore or a bank and the ship.

A number of types of such access ramps, which are installed in ports to permit the loading and unloading of ships, in particular roll-on roll-off ships are already known. Such ramps are either supported by floats or rigidly anchored to the bottom of the port. They suffer from several drawbacks, for a ramp supported by a float sinks more or less into the water depending on the load which it is supporting. Moreover, it oscillates more or less according to the movement of the waves. On the other hand a ramp bearing upon the bottom through pillars requires mechanical means of adjustment in height so as to follow the water level and the variations in draught. Such pillars, due to their spacing, make it necessary for the ramp to have precisely predetermined width at its ship end, where it must be widest to facilitate vehicle manoeuvring. They, in any case, interfere with free movement and, above all, preclude any possibility of lateral displacement allowing the ramp to be moved into axial alignment with the ship.

The invention seeks to provide an improved ramp for access to a ship or like floating vessel, in particular a roll-on, roll-off ship. Preferably the ramp is to be usable above the water at a height that is independent of the useful load carried by the ramp and is nevertheless apt to follow the draught

variations of a ship in process of loading or unloading, and which is also capable of following the variations in water depth caused by the tides, so that the height of the ramp above the water always corresponds to the height of the deck of the ship whatever the variations of the useful load supported thereby, the variations in draught and the variations of the tides.

The invention may also provide such an access ramp, which can be moved to a position of rest and moored along a quay and retained at a constant distance therefrom.

In a preferred form, the access ramp is pivotable about its anchoring point on the quay, so as to be arranged in a particular position depending on the dimensions and the locations of the particular ship concerned.

According to the invention there is provided a port ramp for access to a ship or like floating vessel, a first end of which is supported at a fixed point, for example on a shore or bank, by a quay, and the second end of which is supported by a float and is intended to be adjacent to the said ship to provide a connecting path between the quay and the ship allowing the loading and unloading of the ship over the said ramp, in which the float rigidly supports the said second end of the ramp and is associated with means for anchoring the float to the bottom remaining constantly attached to the float, the connection between anchoring means and the float being selectively adjustable in length and the maximum buoyancy of the float being greater or at least equal to the weight of the ramp added to a predetermined maximum useful load thereon, so that the float, in the working position of the ramp, occupies an over-submerged position in which it exerts on the anchoring means a tractive force equal to the said predetermined maximum value of the useful load of the ramp, the height of the latter above the

surface of the water thus being independent of the supported useful load, for any useful load value lower than the predetermined maximum value.

5 An advantage of such a ramp is that its height above the water surface can remain constant whatever the supported useful load so long as this useful load remains smaller than the tractive force exerted by the float on the moorings or anchoring blocks laid on the sea bed.

10 Preferably, the said float is ballastable and its maximum bouyancy is greater than the weight of the ramp and the moorings constituting the anchoring means, so that the float can assume a partially emerged position corresponding to a rest position of the ramp, and also permits the lifting of the said moorings.

15 Thus the ramp according to the invention, when not in use, can follow the variations in water level caused by tides.

20 The invention also relates to a method of use of the access ramp.

25 The invention will be better understood and other purposes, characterizing features, details and advantages of the latter will appear more clearly from the following explanatory description with reference to the appended diagrammatic drawings given solely by way of example illustrating two forms of embodiment of the invention and wherein:

30 Figure 1 is a side view of an access ramp according to the invention;

35 Figure 2 is a top view of the ramp shown in Figure 1;

40 Figures 3 and 4 illustrate the variations of the inclination of the ramp according to the invention according to variations in draught at a constant water level;

45 Figure 5 is a diagrammatic view of the ramp according to the invention in rest position;

50 Figure 6 shows the ramp in two different angular positions corresponding to ships of different sizes;

55 Figures 7, 8 and 9 diagrammatically illustrate means permitting mooring of the ramp in rest position on a quay, Figure 7 being a front sectional view of such means upon the line VII—VII of Figure 9, Figure 8 being a side view and Figure 9 being a top sectional view upon the line IX—IX of Figure 7;

60 —Figures 10 and 11 diagrammatically illustrate two modified forms of embodiment of the sliding vertical anchoring means; and

65 —Figure 12 is a diagrammatic end view of a modified form of embodiment of a ramp according to the invention.

There is therefore illustrated in the drawings, more particularly in drawings 1 and 2, a preferred form of embodiment of an access ramp according to the invention intended for the loading and unloading of a ship, e.g. a

roll-on roll-off ship, in a port.

The ramp 10 forms a kind of large-size bridge between a quay 11 and a ship 12 and comprises essentially a running path 13 for vehicles, the upper surface of which is provided with a non-skid coating, and at the ends of which are mounted flaps 14 and 15, respectively, each pivoted about a horizontal transverse axis, to ensure the continuity of the running surface 13 with the surface of the quay 11 and the corresponding surface of the ship 12.

The ramp 10 is provided with guard-rails or railings 16 along its longitudinal sides.

According to the invention, a first end of the ramp 10 is supported by the quay 11, at an appropriate location of the latter, by means of a pivot 17 permitting the pivoting of the ramp 10 about a vertical axis 18 passing through the medial longitudinal axis 19 of the ramp, and about a transverse horizontal axis 20, as shown in Figure 2.

At its other end or second end, the ramp 10 is supported by a float 21 to which it is rigidly connected by vertical poles or pillars 22 and oblique bars 23. This second end of the ramp is also associated with two moorings 24 carried by chains 25 passing through vertical passage-ways formed through the float 21 and within the vertical pillars 22 located under the front of the ramp, the said chains being connected to the piston rods of long-stroke hydraulic actuators 26 arranged longitudinally on either side of the ramp 10.

At its second end the ramp 10 is slightly greater in width and comprises a cabin 27 allowing the process of ship loading and unloading to be supervised and from which the ramp can be put into or out of operation as will be seen hereafter.

At the first end of the ramp are also provided two hydraulic actuators 28 arranged longitudinally on either side of the ramp 10 and the piston rods of which are connected to chains 29 whose ends are attached to the quay 11.

The float 21 is partially ballastable, i.e. its buoyancy may be caused to vary between a balance minimum value, the corresponding compartments of the float then being filled with water, and a maximum value at which the said compartments are practically completely filled with air under pressure. This maximum buoyancy of the float 21 is so selected as to be much greater than the total weight of the ramp 10 and the associated moorings 24.

The ramp 10 according to the invention is used in the following manner:

in the position of rest, the float 21 is partially submerged as shown in Figures 1 and 5, the moorings 24 have been raised by means of the actuators 26 pulling the chains 25, possibly equipped with "stoppers" so that the ramp can float above the surface of the

water through the medium of the float 21 and so follow the variations of the water level caused by the tides.

It will be noted that, in the case of small tides, the moorings 24 can remain laid on the sea bed, thus retaining the float 21 completely submerged.

The ramp is put into operation in the following manner:

the ramp being in its position of rest or out of operation, with the moorings 24 previously raised and the float 21 partially submerged, it is possible to cause it to pivot about the vertical axis 18 of the pivot 17 by means of the actuators 28 and the chains 29, the actuator 28 located on the side where the ramp must rotate pulling the associated chain 29, whereas the other actuator 28 releases a corresponding length of its chain 29. The ramp 10 can thus be caused to pivot to any position, as shown in Figure 6, according to the dimensions of the ship to be loaded or unloaded.

When the ramp 10 is thus set in the correct direction, the actuators 26 are operated to lower the moorings 24 until they rest on the sea bed, then the float 21 is ballasted to reduce its buoyancy to an appropriate value slightly higher than the total weight of the ramp 10 and of its predetermined maximum useful load, and thereafter the float is submerged to an adequate depth, as shown for example in Figure 3, by means of the actuators 26 which pull on the chains 25 of the moorings 24. Since the buoyancy of the float 21 is then inferior to the total weight of the ramp 10 and the moorings 24, it is understood that the float 21 can be completely submerged. In this manner, the Archimedeian thrust exerted by the water on the float 21 is constant whatever the depth of submersion of the float 21, which also means that the float 21 in the position shown in Figure 3, or in Figure 4, exerts a constant tractive force on the chains 25 connecting it to the moorings 24. During the loading or unloading of the ship 12 the useful load supported by the ramp 10 does not cause the latter to sink into the water to any degree so long as this useful load remains inferior to the predetermined maximum useful load.

Moreover, when a ship's own ramp is extended and caused to bear upon the ramp 10, it is possible to perform a partial unbalancing so as to compensate for the weight or the fraction of weight of the ship's ramp. If the load is such that it does not vary during the loading and unloading operations, the buoyancy of the float 21 can be readily adjusted accordingly and the tension in the chains can be adjusted to a value slightly lower than the nominal useful load as previously.

If the load supported by the ramp 10 is smaller than this predetermined maximum

load, the only effect of this load is that it causes a corresponding reduction in the tractive force exerted by the float 21 on the chains 25 of the moorings 24 without any variation of the height of the platform 10 above water level.

Means not shown on the drawings are provided to cause the actuators 26 to be controlled by the difference in level between the second end of the ramp 10 and the side of a ship 12 in process of loading or unloading. Indeed, when the ship 12 is completely loaded, its draught is important, as shown for example in Figure 3, and the length of the chains 25 extending between the float 21 and the moorings 24 is so adjusted by means of the actuators 26 that the flap 15 of the second end of the ramp 10 can reach approximately the level of the garage deck of the ship 12. As the unloading proceeds, the draught of the ship 12 diminishes, so that the ship rises little by little above the surface of the water, as represented in Figure 4. The difference in level between the second end of the ramp 10 and the unloading end of the ship 12 is monitored by detector or sensor systems (e.g. inclinometers) which so control the actuators 26 as to increase the length of the chains 25 and thus automatically compensate for the decrease in draught of the ship 12. Between the beginning and the end of the unloading of the ship 12, the ramp 10 thus passes progressively from the position shown in Figure 3 to the position represented in Figure 4.

In the case of ships provided with their own ramp, the detector device is of course placed on the latter.

The invention also provides means (not shown) permitting the buoyancy of the float 21 to be automatically increased by unbalancing the same in case the load supported by the ramp 10 should reach an emergency value close to the predetermined useful maximum load. It is understood that one only has to increase the buoyancy of the float 21 (the latter being completely submerged) to thus increase the value of the predetermined useful maximum load. These means may for example consist of a ballasting control system controlled by the value of the tension in the chains 25.

It will be also be noted that the ramp 10, due to its construction, can be resiliently twisted to a small degree so as to be adapted to the temporary list of the ship 12 by applying various tensile forces to the chains 25 by means of the actuators 26. Such adjustment can be obtained automatically by means of a control servo-system controlled for example by an inclinometer mounted on the ship.

There are also provided means permitting the mooring of the second end of the ramp 10 to a quay when the ramp is in the inoperative

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position shown in Figures 1 and 5, e.g. in the case of exposed ports.

One of such means is represented in Figures 7, 8 and 9.

It is constituted essentially by a horizontal transverse bar 30 mounted on the horizontal upper plate of the float 21 by means of brackets 31 and rotatable about its longitudinal axis by means of a driver 32 rotating bodily with the bar 30 and the end of the driver being articulated on the end of the vertical piston rod 33 of a hydraulic actuator 34 mounted on one side of the second end of the platform 10. The rod 3 is slidingly guided in rings carried by horizontal arms 35 mounted on a post or pillar 36 connecting the ramp 10 to the float 21.

The free end of the bar 30 extending beyond the float 21 is provided with a head 37 of rectangular shape adapted to co-operate with a substantially vertical slide guide or guide-path 38 carried by a vertical wall of the quay 11 extending longitudinally beside the ramp 10 (the quay 11 can be replaced by a dolphin or a simple post).

In a first position, the head 37 can enter the slide guide or guide-path 38 by passing through a vertical longitudinal slot of appropriate dimension provided in the said slide guide; and, after the head 37 is given a quarter of a turn, it remains confined within the slide guide while at the same time being allowed to slide vertically therein. The rotation of the bar 30 over a quarter of a turn is obtained by means of the actuator 34. In order to impart to the assembly some flexibility, the bar 30 is axially movable in its bearings, its movement being resiliently stopped by rubber damping means not shown in the Figure but mounted to act as stops.

The vertical wall of the quay 11 is also provided with skids, fenders or like protective means 39 against which the extreme front edge of the float 21 abuts.

Thus, when the ramp 10 is in inoperative position with the float 21 partially submerged and the anchoring blocks 24 raised, the ramp is brought anchoring to the portion of the quay 11 which extends parallel therewith, so that the head 37 of the bar 30 can be engaged into the slide guide or guide-path 38. The head 37 is then caused to be retained within the slide guide 38 by being given a quarter of a turn by means of the actuator 34. The ramp 10 is thus retained at a constant distance from the quay while at the same time being able to move vertically according to the water level variations caused by the tides.

If the ramp is to be moored to a post 50 (Figure 10), there is provided, according to a modified embodiment of the device of the invention, an auxiliary, small-size float 51 capable of rolling along the post 50 by means of four rollers 52. The float 51 is provided

with a short slide guide 53 identical with the foregoing slide guide 38 and permitting easy mooring despite slight differences in level between the float 21 of the ramp and the auxiliary float 51.

Should it be impossible to drive a post or pile at the selected location, use could be made instead, according to the invention (Figure 11), of two juxtaposed hawsers 55 suspended from the quay 11 by means of a gallows or the like 56 and weighted with a heavy block 57 not resting on the bottom. The weight of the block 57 is so calculated that its inertia is sufficient to preclude any considerable lateral displacement as a result of either traction or thrust exerted on the auxiliary float 51.

It will be noted, lastly, that in port or harbour areas that are poorly developed or insufficiently developed to receive deep-draught ships, use can be made of a ramp according to the invention, which is constituted by several units such as those represented in the drawings and placed end to end, the first end of the first unit resting on the quay and being secured thereto in the manner already described, the second end of the last unit reaching a location in the immediate vicinity of the ship to be loaded or unloaded, and each intermediate unit resting by its first end on the second end of the preceding unit and supporting on its second end the first end of the following unit.

Also to be noted is the fact that a ramp according to the invention is readily transferable from one location to another by floating and/or towing.

It will also be mentioned, by way of non limitative example, that a ramp according to the invention can have a useful width of 9 metres, a length of 50 metres and that it can support a maximum load of about 65 tons.

Illustrated in Figure 12 is a second form of embodiment of a ramp according to the invention, which is intended more particularly for use in ports where recurring siltings or chokings with sand are liable to bury the moorings or anchoring blocks used in the first form of embodiment illustrated in Figures 1 to 9.

In this case the means of anchoring to the bottom may consist not of displaceable moorings but of any system of permanent stationary anchoring of the chains 25 to the ramp. For example, such permanent stationary anchoring means may be constituted by poles or piles 40 fixedly driven into the sea bed 41 and substantially flush therewith, to which the chains 25 are attached permanently. For example, the piles 40 may be driven in by being struck above the surface of the water, and then severed in their submerged portion at a certain height, e.g. at about one metre above the bottom 41, to thereafter receive an underwater crown 42 of

concrete in which the ends of the chains 25 may be embedded or to which they may be fastened by any appropriate means.

The ramp 10 may thus either be connected to only two concrete crowns 42 arranged right below the ramp or slightly outwardly of the latter, both corresponding chains 25 then extending obliquely from the concrete crowns 42 to the float 21, thus allowing the ramp to slightly pivot on the quay about the vertical pivot axis 18 of its first end by imparting different degrees of tension to the chains 25, or, in an alternative embodiment represented in Figure 12, the ramp 10 may be associated through four chains 25 grouped in pairs with four permanent stationary anchoring means 42, respectively, transversely aligned on the sea bed 41, in groups of two. The distance between the stationary anchoring means 42 of each group may corresponding to the distance over which it is desired to swivel the second end of the ramp 10, and the ramp may be maintained in any particular position by imparting various tensions to both chains 25 of a same group.

Another device may be used to free the mooring blocks from the ground in which case they should be provided with a skirt of concrete or of steel to give their bottom the shape of a vault. To do this, it is sufficient to connect the vault portion thus formed to a centrifugal pump through the medium of a flexible pipe so as to exert a thrust several tens of times greater than the weight of the mooring block and thus easily free the block.

WHAT WE CLAIM IS:—

1. A port ramp for access to a ship or like floating vessel, a first end of which is supported at a fixed point, for example on a shore or a bank, by a quay, and the second end of which is supported by a float and is intended to be adjacent to the said ship to provide a connecting path between the quay and the ship allowing the loading and unloading of the ship over the said ramp, in which the float rigidly supports the said second end of the ramp and is associated with means for anchoring the float to the bottom remaining constantly attached to the float, the connection between the anchoring means and the float being selectively adjustable in length and the maximum buoyancy of the float being greater or at least equal to the weight of the ramp added to a predetermined maximum useful load thereon, so that the float, in the working position of the ramp, occupies an over-submerged position in which it exerts on the anchoring means a tractive force equal to the said predetermined maximum value of the useful load of the ramp, the height of the latter above the surface of the water thus being independent of the supported useful load, for any useful load value lower than the predetermined

maximum value.

2. A ramp according to claim 1, wherein the float is ballastable so that its buoyancy is adjustable.

3. A ramp according to Claim 1 or 2, wherein the said anchoring means consist of moorings or anchoring blocks connected to the float.

4. A ramp according to claim 3, wherein the mooring or anchoring blocks are connected to the float by chains.

5. A ramp according to claim 2, 3, or 4, wherein the maximum buoyancy of the float is greater than the weight of the ramp and of the moorings or anchoring blocks so that the float can occupy a position of partial submerision corresponding to an out-of-service position of the ramp and permits the raising of the said moorings or anchoring blocks.

6. A ramp according to claim 1 or 2, wherein the means for anchoring the float to the bottom are constituted by posts or piles fixedly driven into the bottom and connected to the float.

7. A ramp according to claim 6, wherein the posts or piles are connected to the float by chains.

8. A ramp according to any one of the foregoing claims, wherein the length of the connection between the float and the anchoring means is adjustable according to the water level and to the draught of the ship.

9. A ramp according to any one of the foregoing claims, wherein the first end of the ramp is pivotally mounted, at the said stationary point, about a transverse horizontal axis and about a vertical axis.

10. A ramp according to claim 9, wherein the angular position of the ramp about its vertical pivot axis is adjustable by means of fluid-operated actuators, and pulling on chains one end of which is anchored on the quay.

11. A ramp according to any one of the foregoing claims, wherein the anchoring means are connected to chains passing through passage-ways formed in the float and in vertical columns or pillars connecting the second end of the ramp to the float.

12. A ramp according to claim 11, wherein the chains are connected to fluid-operated actuators.

13. A ramp according to any one of the foregoing claims, wherein the second end of the ramp comprises securing means vertically slidable or displaceable on a substantially vertical displacement of the ramp to its out-of-service position according to the tide and maintaining the second end of the ramp at a constant distance from the quay.

14. A ramp according to claim 13, wherein the said means comprise a horizontal bar carried by the ramp and the lower end of which is provided with a rectangular head adapted to be engaged into a slot of a



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concrete in which the ends of the chains 25 may be embedded or to which they may be fastened by any appropriate means.

5 The ramp 10 may thus either be connected
10 to only two concrete crowns 42 arranged
right below the ramp or slightly outwardly of
the latter, both corresponding chains 25 then
extending obliquely from the concrete
crowns 42 to the float 21, thus allowing the
ramp to slightly pivot on the quay about the
vertical pivot axis 18 of its first end by
imparting different degrees of tension to the
chains 25, or, in an alternative embodiment
15 represented in Figure 12, the ramp 10 may be
associated through four chains 25 grouped in
pairs with four permanent stationary anchor-
ing means 42, respectively, transversely
aligned on the sea bed 41, in groups of two.
20 The distance between the stationary anchor-
ing means 42 of each group may correspond-
ing to the distance over which it is desired to
swivel the second end of the ramp 10, and the
ramp may be maintained in any particular
position by imparting various tensions to
25 both chains 25 of a same group.

Another device may be used to free the
mooring blocks from the ground in which
case they should be provided with a skirt of
concrete or of steel to give their bottom the
30 shape of a vault. To do this, it is sufficient to
connect the vault portion thus formed to a
centrifugal pump through the medium of a
flexible pipe so as to exert a thrust several
tens of times greater than the weight of the
35 mooring block and thus easily free the block.

WHAT WE CLAIM IS:—

1. A port ramp for access to a ship or like
40 floating vessel, a first end of which is
supported at a fixed point, for example on a
shore or a bank, by a quay, and the second
end of which is supported by a float and is
intended to be adjacent to the said ship to
provide a connecting path between the quay
45 and the ship allowing the loading and
unloading of the ship over the said ramp, in
which the float rigidly supports the said
second end of the ramp and is associated
with means for anchoring the float to the
50 bottom remaining constantly attached to the
float, the connection between the anchoring
means and the float being selectively adjust-
able in length and the maximum buoyancy of
the float being greater or at least equal to the
55 weight of the ramp added to a predetermined
maximum useful load thereon, so that the
float, in the working position of the ramp,
occupies an over-submerged position in
which it exerts on the anchoring means a
60 tractive force equal to the said predetermined
maximum value of the useful load of the
ramp, the height of the latter above the
surface of the water thus being independent
of the supported useful load, for any useful
65 load value lower than the predetermined

maximum value.

2. A ramp according to claim 1, wherein
the float is ballastable so that its buoyancy is
adjustable.

3. A ramp according to Claim 1 or 2, 70
wherein the said anchoring means consist of
moorings or anchoring blocks connected to
the float.

4. A ramp according to claim 3, wherein 75
the mooring or anchoring blocks are con-
nected to the float by chains.

5. A ramp according to claim 2, 3, or 4, 80
wherein the maximum buoyancy of the float
is greater than the weight of the ramp and of
the moorings or anchoring blocks so that the
float can occupy a position of partial submer-
sion corresponding to an out-of-service posi-
tion of the ramp and permits the raising of
the said moorings or anchoring blocks.

6. A ramp according to claim 1 or 2, 85
wherein the means for anchoring the float to
the bottom are constituted by posts or piles
fixedly driven into the bottom and connected
to the float.

7. A ramp according to claim 6, wherein 90
the posts or piles are connected to the float by
chains.

8. A ramp according to any one of the
foregoing claims, wherein the length of the
connection between the float and the anchor- 95
ing means is adjustable according to the
water level and to the draught of the ship.

9. A ramp according to any one of the
foregoing claims, wherein the first end of the
ramp is pivotally mounted, at the said 100
stationary point, about a transverse horizon-
tal axis and about a vertical axis.

10. A ramp according to claim 9, wherein
the angular position of the ramp about its
vertical pivot axis is adjustable by means of 105
fluid-operated actuators, and pulling on
chains one end of which is anchored on the
quay.

11. A ramp according to any one of the
foregoing claims, wherein the anchoring 110
means are connected to chains passing
through passage-ways formed in the float
and in vertical columns or pillars connecting
the second end of the ramp to the float.

12. A ramp according to claim 11, 115
wherein the chains are connected to fluid-
operated actuators.

13. A ramp according to any one of the
foregoing claims, wherein the second end of
the ramp comprises securing means verti- 120
cally slidable or displaceable on a substan-
tially vertical displacement of the ramp to its
out-of-service position according to the tide
and maintaining the second end of the ramp
at a constant distance from the quay. 125

14. A ramp according to claim 13,
wherein the said means comprise a horizon-
tal bar carried by the ramp and the lower end
of which is provided with a rectangular head
adapted to be engaged into a slot of a 130

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substantially vertical guide-path or slide carried by the quay and which, by being rotated over a quarter of a turn, is retained within the said guide-path while at the same time being allowed to slide therein vertically.

15. A ramp according to any one of claims 1,5,13 or 14, wherein the ramp is displaceable by floating and towing from one location to another.

16. A ramp according to any one of the foregoing claims, wherein the ramp comprises several identical units placed end to end, the first end of the first unit resting as mentioned above on a quay on the shore, the second end of the last unit being adjacent and connected to the ship, each intermediate unit resting by its first end on the second end of the preceding unit and supporting by its second end the first end of the following unit.

17. A method of using a floating ramp according to any one of claims 1 to 16, wherein the method comprises completely submerging the float and adjusting its buoyancy to such a value that it exerts on the means of anchoring to the bottom a tractive force at least equal to the predetermined maximum useful load of the ramp.

18. A method according to claim 17, wherein variations in water level caused by the tides and variations of the draught of the ship are compensated for by reducing or increasing the length of the connections between the float and the anchoring means.

19. A method according to claim 17 or 18, wherein, where anchoring means are constituted by anchoring blocks or moorings the anchoring blocks are raised by ballasting the float, the ramp is displaced about its vertical pivot axis to bring it to a desired angular position, the anchoring blocks are then lowered until they rest on the bottom, the float is submerged to the desired depth by reducing its buoyancy by means of ballasting and the chains connecting the ramp to the anchoring blocks are shortened, so that the submerged float exerts on the anchoring blocks a tractive force at least equal to the predetermined maximum useful load of the ramp.

20. A ramp substantially as described herein with reference to and as shown in the accompanying drawings.

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