

March 15, 1949.

K. H. STEHR

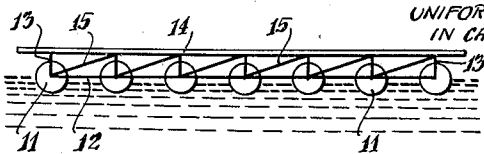
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WATERBORNE SWIMMING POOL

Filed Nov. 7, 1944

3 Sheets-Sheet 1

Fig. 1



UNIFORMLY LOADED
IN CALM WATER

Fig. 1A

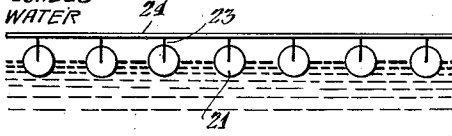
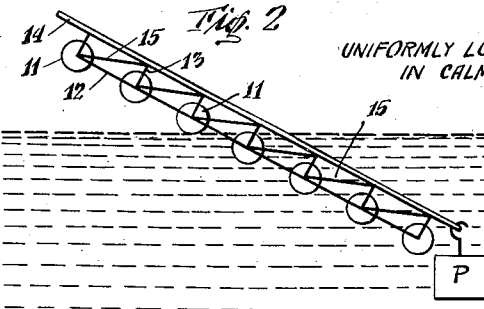


Fig. 2



UNIFORMLY LOADED + LOAD P
IN CALM WATER

Fig. 2A

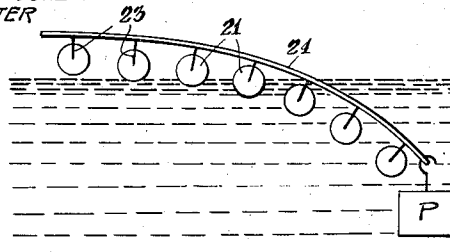
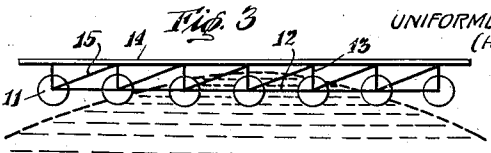


Fig. 3



UNIFORMLY LOADED IN ROUGH WATER
(HOGGING CONDITION)

Fig. 3A

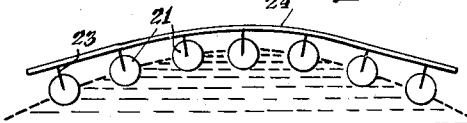
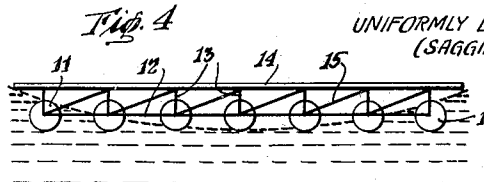


Fig. 4



UNIFORMLY LOADED IN ROUGH WATER
(SAGGING CONDITION)

Fig. 4A

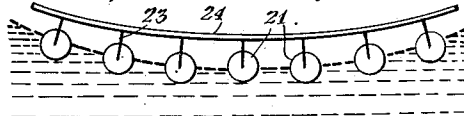
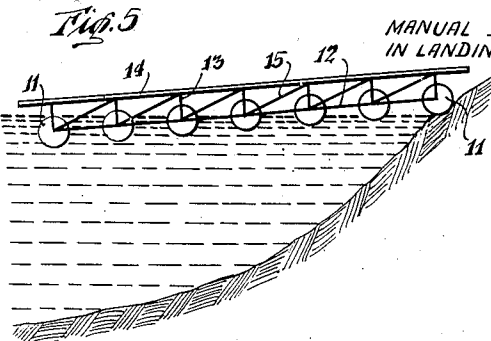
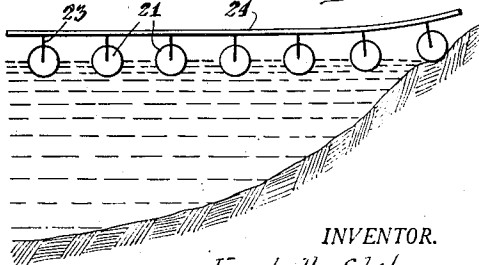


Fig. 5



MANUAL DRY DOCKING
IN LANDING OPERATION

Fig. 5A



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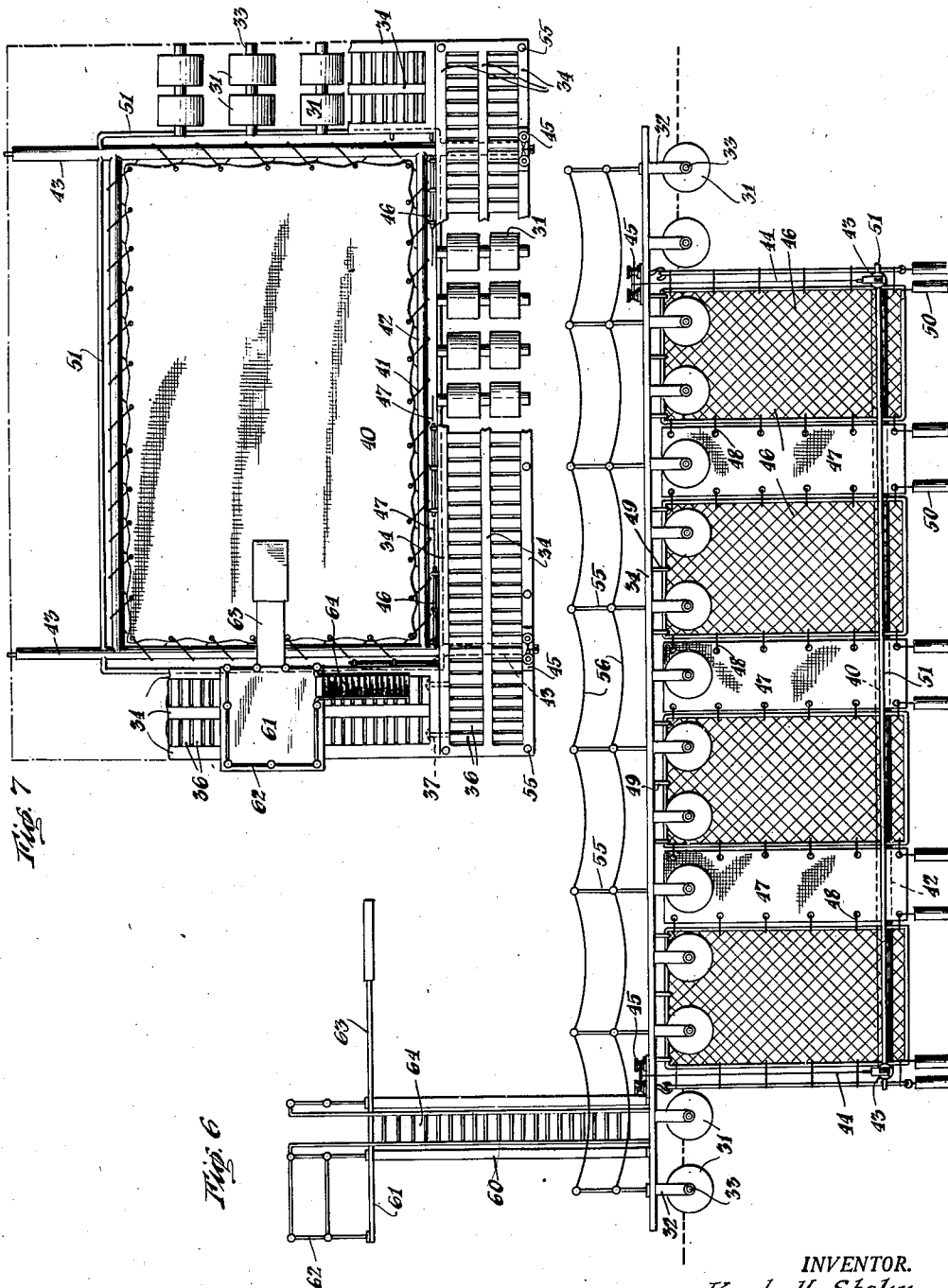
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WATERBORNE SWIMMING POOL

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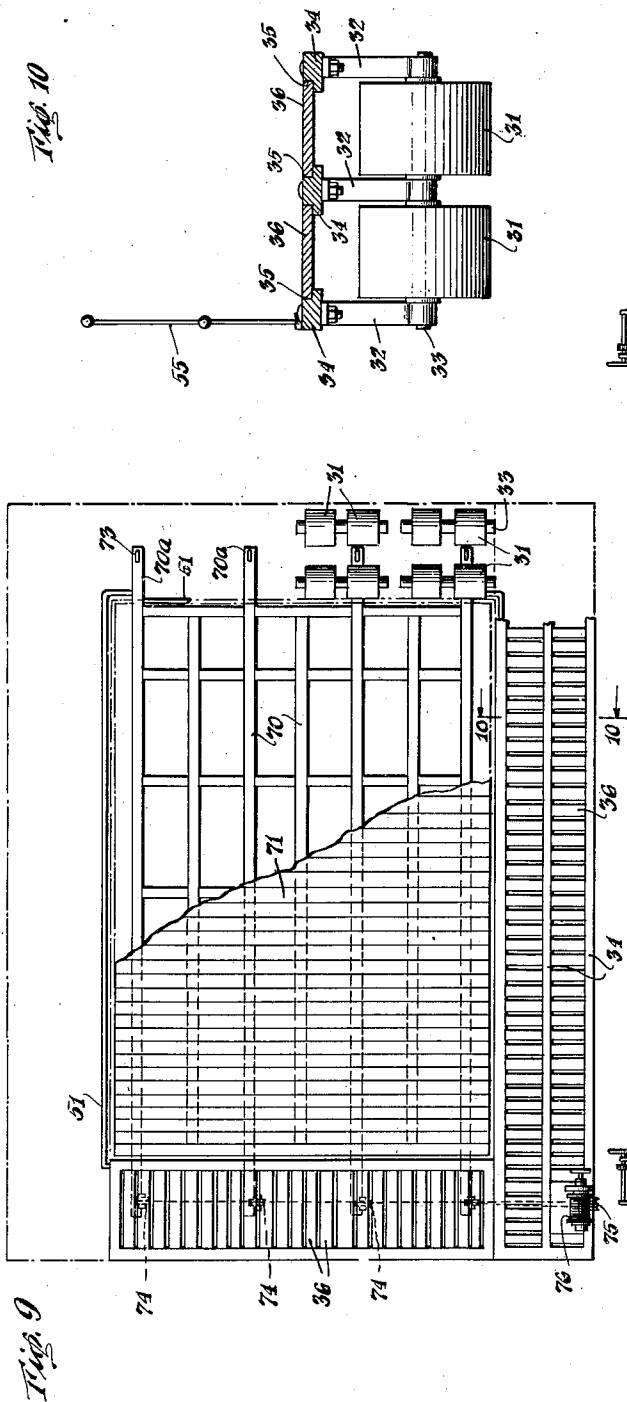
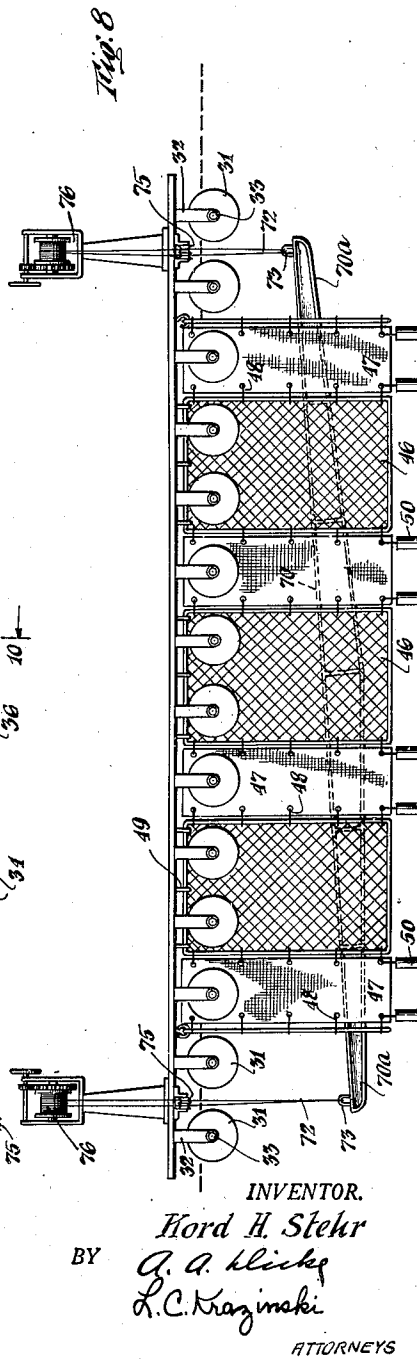
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WATERBORNE SWIMMING POOL

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UNITED STATES PATENT OFFICE

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WATER-BORNE SWIMMING POOL

Kord H. Stehr, Brooklyn, N. Y.

Application November 7, 1944, Serial No. 562,331

7 Claims. (Cl. 4-171)

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This invention relates to an improved flexible waterborne carrier and has for an object to provide a waterborne carrier which is supported by a plurality of floats connected together by flexible resilient means so that the relationship of the floats to each other may be changed when different forces are applied to the several floats so that the carrier may adapt itself to different conditions of loading and support.

Another object is to provide a waterborne carrier so constructed and arranged that it may be distorted by normal exterior forces, such as eccentric loads and/or waves, to conform in part to the differential action of such forces.

Another object is to provide a waterborne carrier comprising a plurality of floats connected together by resilient means such as a deck or an apron surrounding a swimming pool.

Another object is to provide such a resilient waterborne carrier comprising a plurality of rows of floats, all of said floats being connected by means of a flexible deck or apron, said floats being separated both longitudinally and transversely to permit displacement thereof relative to each other whether the flexure occurs longitudinally or transversely.

Another object is to provide landing floats, swimming floats, and swimming pools embodying a plurality of floats connected only by resilient means.

A further object is to provide a swimming float supported by floats connected only by resilient means, the sides of the swimming compartment being formed of non-rigid material so as not to interfere with the flexing of the structure resulting from waves or eccentric loading.

Another object is to provide such a swimming pool having a rigid personnel-supporting floor so supported from the flexible float-supported carrier as not to prevent the flexing thereof.

Other objects are to provide such a carrier whether in the form of a landing float, swimming float, or swimming pool, with cylindrical floats so supported relative to the float connecting means that the floats may serve as rollers when the carrier is to be removed from the water.

Further objects and advantages of this invention will be apparent from consideration of the specification as illustrated by the accompanying

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drawings illustrative of the invention, in which drawings:

Figs. 1 and 1A illustrate schematically respectively a rigid carrier and a flexible resilient carrier uniformly loaded in calm water;

Figs. 2 and 2A illustrate respectively the same carriers in calm water, showing the combined effect of the application of a uniformly distributed load and an eccentric load;

Figs. 3 and 3A show respectively said carriers in rough water at the moment they are perched upon the crest of a wave, viz., in hogging condition;

Figs. 4 and 4A show respectively the same carriers in rough water but in the trough of a wave, viz., in sagging condition;

Figs. 5 and 5A show respectively the same carriers in a landing operation;

Fig. 6 illustrates a practical application of the invention in the form of a swimming pool shown in elevation;

Fig. 7 is a plan view of the device of Fig. 6, certain parts being cut away;

Fig. 8 is an elevation of a modified form of swimming pool embodying the invention;

Fig. 9 is a plan view of the form of Fig. 8, certain parts being shown broken away;

Fig. 10 is a cross-sectional view taken along the line 10-10 of Fig. 9, looking in the direction indicated by the arrows.

Heretofore it has been the usual practice in designing waterborne carriers such as ships, landing floats, swimming floats, and swimming pools, to provide maximum rigidity so that the carrier or vessel will be distorted as little as possible by the application of differential external forces, such as the forces developed by waves and eccentric loading. To this end, adequate longitudinal and transverse bracing was introduced. This added to the weight of the vehicle and in accordance with the discoveries of the applicant, introduced certain disadvantages from the standpoint of stability. The applicant has discovered that by securing buoyancy by means of a plurality of floats and connecting said floats by relatively flexible resilient means, important advantages can be attained. These advantages will become apparent from a study of Figs. 1 to 5 illustrating a rigidly constructed float-type carrier under various conditions and the corresponding

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Figs. 1A to 5A illustrating a flexible resilient carrier made in accordance with applicant's invention under the same conditions.

In Figs. 1 to 5, 11 indicates a plurality of floats shown for convenience as cylindrical in cross-section. They are shown connected together by links 12 and connected by struts 13 with a deck 14. Furthermore, diagonal braces 15 are provided, as shown, to form a truss structure giving maximum rigidity to the structure supported by the floats.

Figs. 1A to 5A show applicant's invention schematically in which a plurality of floats 21 are connected by struts 23 to a flexible resilient deck 24. The deck is intentionally made flexible and no braces are provided. For this reason and because the floats are spaced so that they do not interfere when they move toward each other, the entire structure is permitted to be distorted in response to differential forces acting thereupon. It is to be understood that there may be a plurality of rows of floats 11 and 21, in which event, the structure of Figs. 1A to 5A will have flexibility, not only longitudinally of the carrier but also transversely. However, a consideration of the longitudinal flexibility will be sufficient to illustrate the invention.

There is no substantial difference between the situation as shown in Figs. 1 and 1A. The water is shown as calm and the loading is uniform and of such an amount that the floats are submerged to their centers, the loading comprising the weight of the structure itself plus a uniformly distributed applied load. A difference in action becomes apparent however under the conditions shown in Figs. 2 and 2A. In these cases the loading includes for purposes of illustration a weight P which applies an eccentric load near one of the carrier. In the case of the rigid carrier, Fig. 2, the two rearmost floats have completely left the water and therefore are no longer capable of adding any buoyancy to the carrier. Their lifting effect must be taken by the other floats, four of which are shown fully submerged, and the other a little less than one-half. This carrier is entirely unstable and will capsize under the action of load P. This is apparent from the fact that further depression of the forward end will not result in displacement of more water. Downward motion of the first four floats will not add to buoyancy, so that the inescapable result is that the structure will continue to move in a clockwise direction and will capsize.

However, in the flexible resilient construction, as shown in Fig. 2A, the flexibility permits the rearmost floats to remain in the water and therefore to provide at least a part of the buoyancy. None of the floats is completely out of the water. Further depression of the forward part of the carrier would result in submerging more of the floats, and therefore increase the displacement. Therefore a point of stability is reached and capsizing does not occur.

The results depicted in Figs. 2 and 2A have been proved by experiment. Rigid and resilient structures of the same weight have been built and loaded as indicated. With a certain eccentric loading P the flexible structure assumed the shape shown in Fig. 2A. The structure did not capsize but was capable of supporting additional weight. The rigid structure, on the other hand, capsized when loaded eccentrically in the same manner and to the same extent. Mathematical analysis shows the same result. While the analysis is rather difficult and complicated it

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shows that the resilient carrier, as loaded in Fig. 2A, still has a positive righting moment whereas the rigid structures has no righting moment whatever and will therefore capsize.

This characteristic of applicant's flexible resilient carrier is very important in boat landing floats, swimming floats, and floating swimming pools. In the case of rigid structures, if the users of such floats or swimming pools are attracted to one end or one side thereof capsizing may readily take place before the users can move back to the higher parts thereof and thus restore the righting moment. This may result in submerging the occupants and possibly causing loss of life. In the case, however, of applicant's flexible resilient structure sufficient stability remains to assure the safety of the occupants. In the case of the flexible structure, the deck at its loaded end assumes a larger angle relative to the horizontal with relatively small eccentric loading. This slope serves as a warning to users and causes them to move toward the other end of the structure long before capsizing could possibly take place.

The flexible construction also has important advantages in rough water. Thus, in the hogging condition shown in Figs. 3 and 3A, the rigid structure is balanced on the tip of a wave, the two end floats being completely out of the water and the three middle floats being almost entirely submerged, whereas the second and sixth floats are each about one-eighth submerged. It is obvious that a slight advance of the wave will cause the structure to oscillate violently about its medial horizontal transverse axis. This sudden acceleration adds greatly to the discomfort of passengers thereon and may be sufficient to cause submergence of one end and capsizing. On the other hand, as is shown in Fig. 3A, the flexible carrier will adapt itself to a large extent to the profile of the wave. The end floats are still in the water, being raised only slightly due to the reaction of the resilient deck, but they still contribute greatly to the displacement and therefore to the buoyancy. As the wave passes on, there is no violent pitching of the carrier which readily accommodates itself to the change of the wave form by which it is supported at the moment. There is therefore no tendency toward capsizing as the wave moves forward.

A similar advantageous result of the resilient structure in the sagging condition is illustrated in Figs. 4 and 4A. The rigid structure of Fig. 4 cannot accommodate itself to the wave form so that the end floats are completely submerged and the middle floats carry no load. The load they would normally carry must therefore be carried by the other floats. It will be seen that the ends of the deck are even with the water. As the wave progresses there would be little tendency for the end to lift since the end float is already completely submerged. The wave would therefore pass over the deck and possibly wash away its occupants or cargo. On the other hand, the flexible resilient carrier, as shown in Fig. 4A, will substantially adapt itself to the wave form. The end floats are submerged only partly and as the wave progresses, the buoyancy of the end float is sufficient to lift the carrier and prevent swamp-

ing. It will be further noted that the flexible carrier provides a greater freeboard in each instance. Thus, in Fig. 3, there is very little freeboard near the center of the rigid carrier whereas the corresponding Fig. 3A shows substantially

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almost normal freeboard at that point of the flexible carrier. Similarly, Fig. 4 shows zero freeboard at both ends whereas Fig. 4A shows only a very slight diminution of the freeboard.

Further advantages will occur in landing operations, as appears from Figs. 5 and 5A. If the rigid carrier of Fig. 5 is grounded on a beach, as shown, it will be tilted about a fixed point, causing the rear float to be entirely submerged. It is difficult to lift such a carrier further onto the beach since it is necessary to lift half of the weight of the carrier. However, a flexible resilient carrier, as shown in Fig. 5A, will react differently. Due to the flexing of the deck 24, only a portion of the forward part of the carrier need be lifted, the other part thereof being supported by the buoyancy of the floats.

Attention is now directed to Figs. 6 to 10 showing a practical application of the characteristics outlined generally in the schematic illustrations described above. Said figures illustrate two modified forms of floating swimming pool. Such pools are used in lakes and rivers where the bottom, due to rocks or mud, is unsuitable for swimming. In some cases such pools are necessary to keep sharks, barracuda, and other dangerous water life, away from the swimmers.

Such pools are usually anchored near the shore and properly moored in place, being connected to the shore also by a gangplank or the like.

In said figures, the numeral 31 indicates a plurality of floats which may be of any form but, as illustrated, are cylindrical and are pivotally supported so that they may serve as rollers when the structure is to be beached. These floats are supported by struts 32, which are preferably three in number (see Fig. 10). Passing through holes in the lower ends of said struts is a shaft 33 which serves as a trunnion. The upper ends of the respective struts 32 are bolted as by bolts 33 to a corresponding number of resilient stringers 34. These are preferably cut away, as shown at 35, to receive the floor boards 36. It will be noted that in this form of construction only the stringers 34 resist bending of the structure. These are made of such material and dimensions as to give the desired resiliency to the deck structure made up of said stringers and the floor boards 36. Referring to Figs. 6 and 7, there are two of these deck structures forming the sides of the swimming pool there shown whereas two shorter similar structures are bolted thereto as by bolts 37, indicated in dotted lines in Fig. 7. These bolts are removed when the structure is to be disassembled and stored. The longitudinal deck structures may therefore be beached, during which operation the floats act as rollers to facilitate moving of the structure. It will be noted that in the form shown in Figs. 6 and 7, the axes of the rollers 31 forming part of the end deck structure are at right angles to the axes of the rollers 31 in the longitudinal deck structure. This permits the end pieces to be drawn out of the water lengthwise.

On the other hand, in the form shown in Figs. 8 and 9, the floats 31 located under the ends of the swimming pool there shown have their axes parallel to the axes of the float 31 located under the side deck structure. This form of construction is contemplated where the swimming pool is to be beached and drawn from the water as a unit rather than after disassembly as is contemplated in the form shown in Figs. 6 and 7.

Referring now more particularly to the form of Figs. 6 and 7, it will be noted that this form is

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intended for use by good swimmers. The depth is such that the user would never stand on the bottom. The bottom 40 may therefore be made of canvas, netting, or other flexible material, attached as by lacing 41 to a rectangular frame 42 which may be formed with lateral extensions 43 to the ends of which are attached supporting lines 44, the upper ends of which may be attached to bits 45. By adjusting the length of the lines 44, the location of the bottom 40 may be varied as desired. The sides of the pool are preferably enclosed by flexible material made in part, at least, of netting. In the form shown, the sides are comprised of net sections 46 with which are shown interspersed canvas sections 47, the netting and canvas being connected by lacing ropes 48. The upper ends of the side pieces are supported from the inner stringer 34 as by eyes 49 fastened into the bottom edges thereof. The bottom edges of the side members 46 and 47 may, if desired, be secured to the rectangular frame 42 but it is preferred, as shown in Figs. 6 and 7, not to secure them thereto but to have them pass on the outside of said rectangular member and held taut by a plurality of weights 50. To secure the sides 46, 47 close to the rectangular frame 42, bars 51 are preferably provided secured to the rectangular frame 42. The slot between the rectangular frame 42 and the bars 51 serves to receive the sides 46, 47. By means of this construction, the bottom 40 may be raised and lowered, as desired, while the sides remain taut, due to the action of the weights 50.

It will be seen that the four deck structures described form a walk or platform around the pool. In order to prevent users falling off the outer edge of the platform, a series of stanchions 55 are preferably provided attached to the outer stringers 34. These stanchions are connected by a plurality of life-lines 56 made of rope, cable, chain, or other material. It will be noted that these are arranged rather loosely so as not to interfere with the flexing of the structure so that the structure may bend in the direction indicated in Figs. 2A and 3A, where required. As shown in Figs. 6 and 7, a diving platform may be provided for. This may comprise standards 60 carrying a platform 61 surrounded by a railing 62 and serving as a support for a diving board 63. A stair or ladder 64 is provided to give access to the platform.

Figs. 8 and 9 illustrate a modified form of swimming pool which may be either a separate structure, as shown, or may be attached to the end of the structure shown in Figs. 6 and 7. The swimming pool of Figs. 8 and 9 is intended for non-swimmers. In this form, the user's weight is at times supported on the floor of the pool which therefore is made rigid. Such a floor may comprise longitudinal joists 70 to which are attached floor boards 71 forming the floor of the pool. In the form shown, seven joists are employed. Four of these are formed with extensions 70A on each end, through which extensions the floor is supported by means of cables 72 attached to eyes 73 attached to the ends of the extensions 70A. In the form shown, four such cables are used at each end. These cables pass over pulleys or sheaves 74 located directly above the eyes 73 (Fig. 9) and then run horizontally under the floor boards 36 and thence over a pulley or pulleys 75 at the extreme edge of the deck structure and thence upwardly to a winch 76. One such winch is provided at each end of the pool so that by adjusting the respective winches the depth of

the pool may be varied as desired to accommodate the age and skill of the users.

It will be noted that although the floor 70, 71 is formed rigidly it is connected to the deck structure only near its ends so that the rigidity of the floor does not in any way interfere with the flexing of the deck structure. It is, of course, to be understood that stanchions 55 and life-lines 56 (not shown) would also be provided. The sides may be formed as in the form shown in Figs. 6 and 7, viz., by means of net sections 46 and canvas sections 47 held in place against the sides of the floor as by means of rods 51 between which and the edge of the floor the side members are arranged. The extensions 70A of the floor joists must extend through the end members of the side enclosure. This is best accomplished by having the juncture between adjacent sections arranged in line with the extensions 70A so that the floor may be raised and lowered without interfering with the side members. In order to prevent a user from falling out into the deep water in which such swimming pools are usually moored, through the slit between adjacent sections of the end walls above the joist extensions 70A, temporary lacing may be employed at that point to close said slits after the height of the floor has been adjusted, if desired.

In order to remove the structure of Figs. 8 and 9 from the water as for winter storage, the device may be disassembled but, if preferred, removal may be accomplished without disassembly. To do this, the winches 76 are operated to raise the floor as high as possible, this being sufficiently high to bring the bottom edges of the joists 70 above the bottom edges of the rollers 31. The entire structure may therefore be drawn bodily up a suitable beach, the weight being supported upon the floats 31 which serve as wheels during this operation.

It is clear that the invention may also find application as a swimming float, boat landing float, life raft, or as a lighter for transporting cargo, and other uses thereof will be apparent.

It will be noted that the constructions shown and described will serve admirably to accomplish the objects stated above. It is to be understood, however, that the constructions disclosed above are intended merely as illustrative of the invention and not as limiting as various modifications therein may be made without departing from the invention as defined by a proper interpretation of the claims which follow.

What is claimed is:

1. A waterborne swimming pool comprising a plurality of floats, a flexible resilient deck member supported by said floats, a supporting member carried by each of said floats and connected to said flexible resilient member, said flexible resilient member serving as the only connection between the float supports, means forming a swimming enclosure comprising side walls and a floor having edges, supporting means for said floor connected to said deck member for supporting said floor at various distances below said deck member, confining rods spaced from the edges of said floor so as to provide slots around said edges, said side walls being formed of flexible material and provided with weights for holding said side walls taut, said walls passing through said slots formed between the floor and said confining rods, so that said floor and walls form an enclosed swimming compartment.

2. A waterborne swimming pool comprising a plurality of floats, a flexible resilient deck member

supported by said floats, a supporting member carried by each of said floats and connected to said flexible resilient member, said flexible resilient member serving as the only connection between the floats, means forming a swimming enclosure comprising bottom and side walls, said bottom comprising a rigid structure supported from the flexible resilient deck only by flexible supporting means so as not to interfere with the flexibility of the deck.

3. A waterborne swimming pool comprising a plurality of floats, a flexible resilient deck member supported by said floats, a supporting member carried by each of said floats and connected to said flexible resilient member, said flexible resilient member serving as the only connection between the floats, means forming a swimming enclosure comprising flexible side walls and a bottom, said bottom comprising a rigid floor structure including joists having extensions beyond the floor area and extending through slits in the flexible side walls, and flexible supporting cables attached to said extensions, whereby said floor structure is connected to the deck in such a manner as not to interfere with the flexibility of the deck.

4. A waterborne swimming pool comprising a plurality of floats which are normally only partly submerged, a deck member supported by said floats, a supporting member carried by each of said floats and connected to said deck member, means forming a swimming enclosure comprising bottom and side walls, said side walls being flexible and said bottom comprising a rigid structure supported from the deck, together with means for lifting said floor to a point where it is all above the lowermost parts of said floats so that the structure may be withdrawn from the water and stored while resting on said floats.

5. A device in accordance with claim 4 in which the floats are horizontal cylinders axially journaled to said supporting members so that they may serve as wheels while the structure is withdrawn from the water.

6. A waterborne swimming pool comprising a plurality of floats, a supporting member carried by each of said floats and each connected to a deck member supported by said floats, said floats being of such buoyancy as to be normally partly submerged, said connecting deck member being flexibly resilient to such an extent as to yield substantially to the action of waves upon the floats and also to the effect of changes in the extent and location of live loads, said supporting members being connected to said deck member only at isolated parts so as not to interfere with the flexibility of the deck, said deck member being formed with an opening adapted to accommodate a swimming enclosure comprising flexible side walls and a bottom, said bottom being connected to the deck member only by flexible supporting means so as not to interfere with the flexibility of the deck.

7. A waterborne swimming pool comprising a deck member supported by floats, said deck member being so formed as to surround an open area, means forming a swimming enclosure located in said open area comprising side walls and a floor having edges, supporting means for said floor connected to said deck member for supporting said floor at various distances below said deck member, confining rods spaced from the edges of said floor so as to provide slots around said edges, said side walls being formed of flexible material hung from said deck member and provided with weights at

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their bottom edges for holding said side walls taut, said walls passing through said slots formed between the floor and said confining rods, so that said floor and walls form an enclosed swimming compartment.

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