Oct. 4, 1960 R. W. BENNETT, JR 2,954,645

METHOD AND APPARATUS FOR ERECTING SWIMMING POOLS

Filed Sept. 25, 1957 2 Sheets-Sheet 1

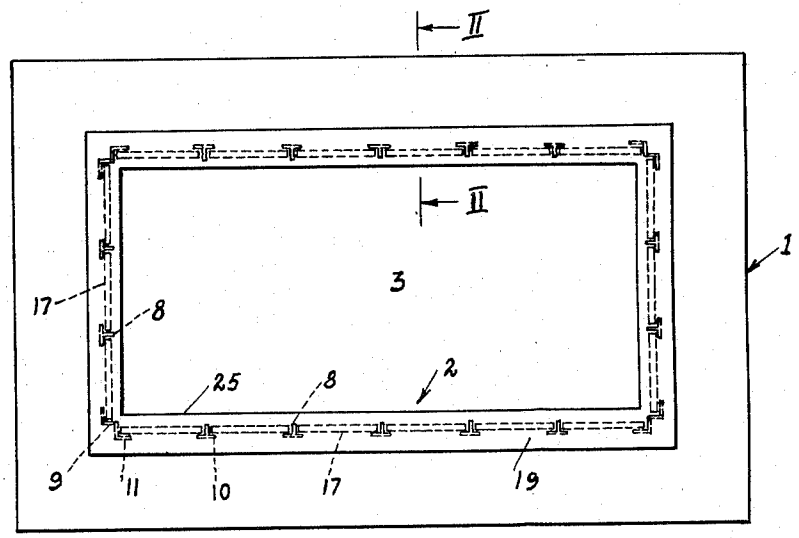



Fig. 1.

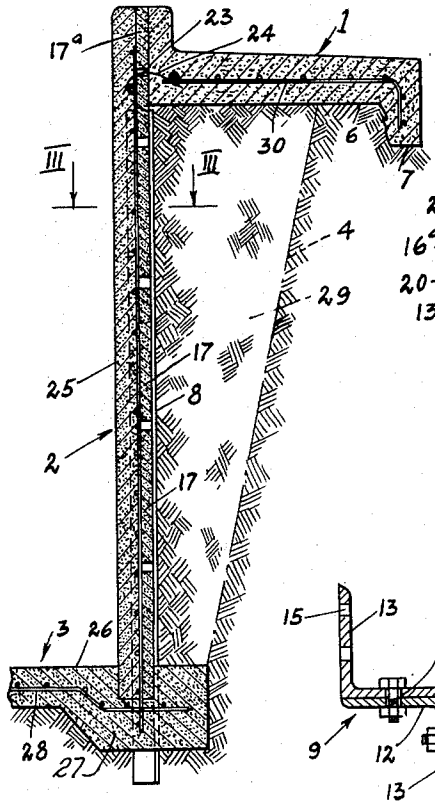



Fig. 2.

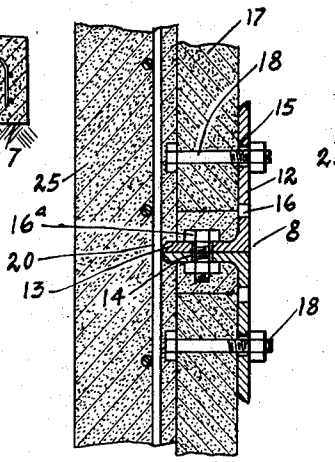



Fig. 3.

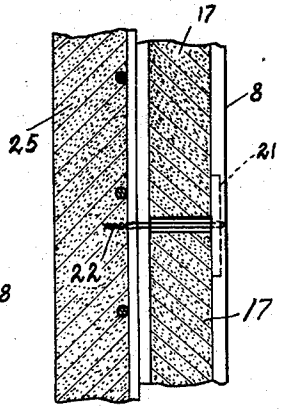



Fig. 4.

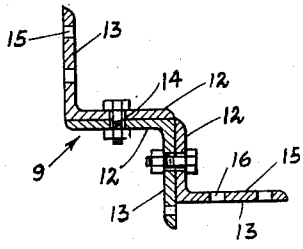



Fig. 5.

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METHOD AND APPARATUS FOR ERECTING SWIMMING POOLS

Filed Sept. 25, 1957 2 Sheets-Sheet 2

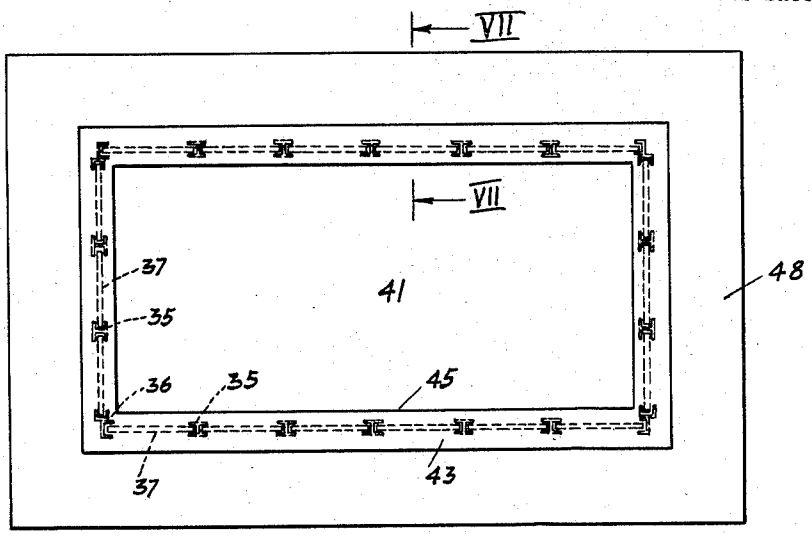



Fig. 6.

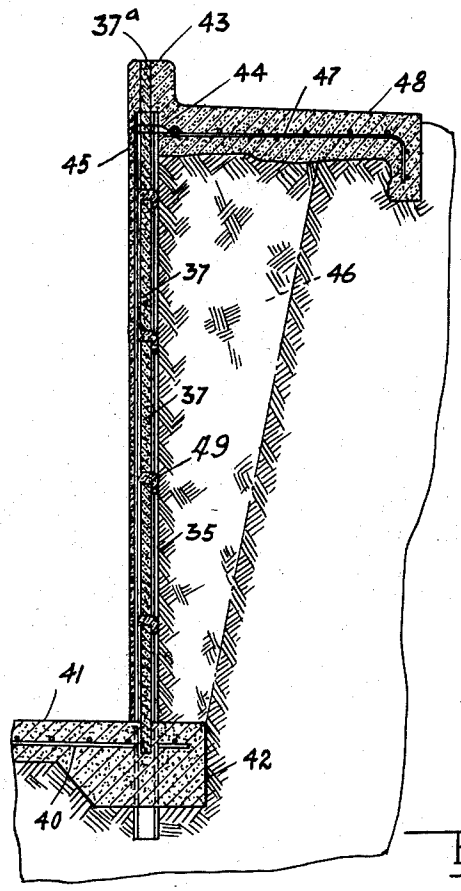



Fig. 7.

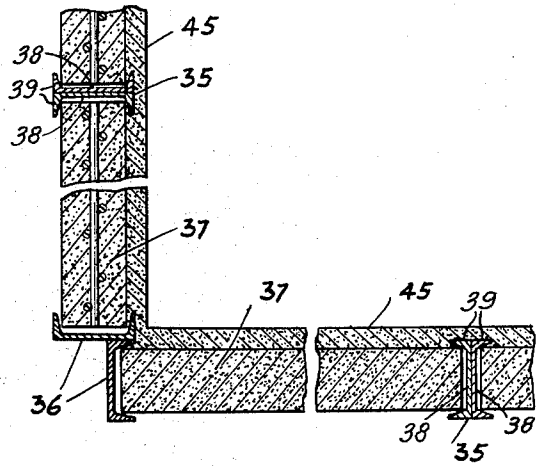



Fig. 8.

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# METHOD AND APPARATUS FOR ERECTING SWIMMING POOLS

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The present invention relates to concrete swimming pools and more particularly to a novel, economical pool comprised of a monolithic enclosing wall erected in part with precast concrete panels held in place by supports, with the panels and supports incorporated into the said wall. The wall is integrally tied into a pool bottom wall and top apron whereby the monolithic enclosing wall spans between the pool bottom and apron resisting hydrostatic pressure from the inside of the pool when filled with water and earth pressure when empty.

The present invention distinguishes over prior art constructions erected in part from precast concrete panels by use of relatively small panels which are easily handled manually in erection, are temporarily held in place by supports called struts to provide a form upon which an integral interior facing is applied and about which an integral footing and apron are cast in situ forming fixed spaced supports between which the wall extends as a beam in resisting internal and external pressures.

An object of the invention is to provide a monolithic pool structure, assembled on the job with precast panels and pre-formed panel supports requiring no temporary forms and eliminating the usual caulking required to make such precast panel pools water tight.

Another object of the invention is to provide a relatively low cost permanent monolithic structure which can be quickly and economically erected with a minimum of time and labor without the usual temporary forms customarily employed in erecting concrete swimming pools.

These and other objects will be made apparent from the following description, in which the drawing forming a part thereof comprises:

Fig. 1 showing a plan view of the integral monolithic pool of the invention;

Fig. 2 shows a cross section through the pool apron, side wall and bottom wall taken on the lines II—II of Fig. 1;

Fig. 3 shows an enlarged section taken on the lines III—III of Fig. 2 illustrating a preferred manner of assembling the precast panels to the vertical struts, the reinforcement for the concrete and the facing concrete;

Fig. 4 shows an enlargement of the pool wall at the juncture of two of the precast panels and application of the reinforced facing to the panels and struts;

Fig. 5 shows in enlarged detail a preferred form of corner strut;

Fig. 6 shows a plan view of a modified form of the invention;

Fig. 7 shows a cross section through the pool wall, apron and bottom wall taken on the line VII—VII of Fig. 6; and

Fig. 8 shows in enlarged detail a corner of the pool wall illustrating the manner of placing the precast panels between the struts.

Referring now in general to Figs. 1 to 5 inclusive of the drawings, the structure shown therein is adapted to swimming pools wherein the bottom of the pool may be



in a single plane as shown or may be in different planes to provide a shallow depth of water at one end as desired. The pool shown in these figures comprises a monolithic enclosing wall secured adjacent the top and bottom thereof by an apron and a pool bottom respectively, so that the wall acts as a fixed beam spanning the space between the apron and pool bottom. The structure disclosed has adequate strength for this purpose when the walls are from six to eight feet in height. The precast panels hereinafter described may be of any desired size, but to make them convenient for handling manually with a minimum of labor, I prefer to make them about one inch thick by about 1'2" wide and about 4'8" long containing reinforcements to withstand erection stresses only. The struts or panel supports to which the panels are bolted may be of any suitable construction. I prefer to assemble them from rolled angles but any other light steel shape of similar section can be used. Such angles are convenient for the purpose in that they are purchased with suitable holes spaced throughout the length of each flange of the angle to permit bolting the panels thereto and bolting the angles **12** and **13** together to form various shapes as shown in Figs. 3 and 5 of the drawings. The steel mesh reinforcement applied over the entire interior face of the vertical wall is a commercially available wire mesh reinforcement customarily used in such concrete structures and referred to commercially as of 2 x 16—6/10 mesh. The facing of concrete applied over the mesh is about 1⅝ inches thick for walls of a height stated and may be applied as plaster or sprayed on with a cement gun. Such detail dimensions of the structure are by way of illustration only and it is to be understood that other dimensions may be used if desired and are not intended to be limitations on the invention.

Referring now in detail to Figs. 1 to 5 inclusive the pool is comprised of an apron portion **1**, a peripheral wall portion **2** and a bottom portion and footing **3**, all united to form a monolithic structure of sufficient strength to resist internal water pressure when the pool is filled with water and ground pressures when the pool is empty. Preparatory to erecting the pool an area slightly larger than the pool bottom is excavated and preferably provided with inclined side and end walls **4**. In the area where the width of pool apron overlaps the excavation, a suitable excavation as at **6** and **7** is provided to receive the apron.

Erection struts **8** are uniformly spaced within the bottom of the excavation to define the periphery of the pool side and end walls. At the corners of the pool are erected the corner struts **9**. As shown in dotted lines on Fig. 1 of the drawings, these struts **8** and **9** have flanges **10** and **11** respectively disposed parallel to the walls to be erected. The struts **8** are of substantially T-shape or of any other suitable construction. One convenient means for forming these struts **8** is shown in Fig. 3 of the drawings, wherein special angles are used. These angles have a leg **12** and a longer leg **13** with holes **14** spaced longitudinally of the leg **13** and holes **15** and **16** spaced longitudinally of the leg **12**. These angles may be conveniently bolted together to form various shapes as the T-shape in Fig. 3 and the substantially W-shape in Fig. 5. Obviously any light steel shape which is rolled or welded together to form the struts **8** and **9** may be substituted for the angles. These struts **8** and **9** are conveniently driven into the ground at the bottom of the excavation and may have suitable temporary lateral bracing extending from the faces **10** and **11** thereof to the adjacent walls of the excavation, where conditions necessitate their use. As shown in Fig. 2 of the drawings the vertical height of the struts **8** and **9** are such that the tops thereof terminate beneath the underside of the apron **1**.

Upon the flanges **12** of the struts **8** and **9** and extending

between the adjacent members are the precast concrete panels **17** which need only be reinforced sufficiently to withstand erection stresses. These panels are bolted in place by means of suitable bolts **18** extending through the panel **17** and the adjacent flange **12**. Preferably the panels **17** are spaced vertically a small amount for a purpose hereinafter discussed. As shown in Fig. 2 of the drawings, the upper panel **17***a* extends above the struts **8** to about the height of the curbing **19** about the pool. The panels **17** and **17***a* are then placed so as to define the side and end walls of the pool.

Over the inside face of the side and end walls of the erected panels is placed a steel mesh reinforcing **20**. As shown in Fig. 3 of the drawing, the reinforcing mesh **20** is secured in place over the face of the panels. One convenient way of doing this without further drilling of holes through the panels would be to place a stop **21** behind the panels **17**, at the horizontal spacing between them, and extend a wire around the stop **21** and the vertical wires of the steel mesh to rigidly secure the reinforcing mesh in position. As shown in Fig. 2 the steel mesh preferably extends below the bottom panels **17** of the side and end walls further serving to tie the side walls to the bottom wall and footing. At the upper end of the side wall the openings **23** are drilled through panels **17***a* at spaced intervals longitudinally of the panel and tie wires extended through the openings **23** with the inner ends of the tie wires **24** wrapped about the steel mesh **20**. After the panels **17** and reinforcing mesh **20** have been so placed, a facing of concrete **25** is applied continuously over the side wall and end wall panels **17** so as to form a continuous surface about the inner face of the panels forming the pool walls.

As shown in Fig. 2 of the drawings, the outer periphery of the pool bottom extends outwardly of the struts **8** and **9** and extends upwardly so as to overlap the bottom portion of the precast panels **17** and facing **25**. Prior to casting the bottom slab **26** and the footing **27** thereof, reinforcements **28** are placed in the bottom of the pool and footing. After the slab **26** and footing **27** are cast a unitary structure of pool bottom and side walls is provided. The exposed outer faces of the joints between vertically disposed panels **17** may be pointed from the outer faces of the pool wall so as to close such joints. Back fill **29** of any suitable material is then placed about the outer faces of the side and end walls up to the level of the bottom face **6** of the apron **1**. Steel mesh reinforcing **30** is then placed in the area to be occupied by the apron and the tie wire **24** is attached thereto. The apron is then cast as an integral member enclosing the pool walls to complete the pool. By reason of the tie wires **24** connecting the reinforcing mesh **20** and **30** the side and end walls of the pool are integrally tied in with the apron **1**.

The primary function of the struts **8** and **9** are to provide temporary support for the precast panels **17** until the reinforcing mesh **20** is secured in place and the facing of concrete **25** is applied to complete the monolithic structure of side and end walls of the pool. Initially the struts **8** and **9** may supply some strength to the walls, but as the struts are exposed to corrosion from the surrounding earth or other fill I prefer not to rely upon them for assistance to the walls in resisting internal and external pressures thereon.

Referring now to Figs. 6 to 8, wherein is shown a modification of the invention, the struts **35** and **36** are utilized as active structural members and the panels **37** are reinforced to resist external and internal stresses upon the pool walls between the struts. The struts deliver the reactions from their trapezoidal loading to the footing and apron.

When erecting a swimming pool as in Figs. 6 to 8, an excavation is made as hereinbefore described, the corner struts **36** are erected and the struts **35** are evenly spaced between them to define the pool side and end walls. These struts may be of any suitable construction to provide support for the panels **37**. As shown in the drawings, the struts may be formed of channel sections. Thus struts **35** are comprised of channel sections each having a web portion **38** and flanges **39**. The webs **38** may be secured together by any suitable means, such as welding, bolts or other fastening means. Obviously a rolled structural shape or welded construction such as an H or an I beam may be substituted for the built up construction described. The corner struts **36** may also be formed of such channel sections as shown in Fig. 8 with a flange **39** of one channel secured in any suitable manner to one end portion of the web **38** of the other channel to form a modified Z-section as shown. Struts **35** and **36** may be driven into the ground in erection and when erected may, if necessary, be temporarily laterally braced during placing of the panels. The length of such struts is such as to extend upwardly into the apron **48**.

The panels **37** are preferably of a uniform length, width and thickness, except possibly the end-most panels which may be cut to a reduced size in those cases where the dimensions of the pool walls are not multiples of the panel sizes. Since most private swimming pools are of six feet to eight feet in maximum depth, I have found that panels 2" thick x 14" wide x 4'8" long are suitable and are sufficiently light in weight to be conveniently handled. The panels may be made of different dimensions where desired provided they are of sufficient strength to resist the internal and external pressures thereon while transmitting such loads between the struts. In the present modified form of the invention the panels are reinforced by any suitable means, which may be mesh or rods **37***a*. The flanges of the struts are spaced a sufficient distance to receive the thickness of the panel between them and the webs of adjacent struts are likewise spaced to receive the length of the panels **37**. The panels are not otherwise secured to the struts. In erecting the pool walls it is preferable to insert spacers **49** between vertically adjacent panels, such spacers may conveniently be about ⅜" in thickness and preferably do not extend the full length of the panels. As shown in Fig. 7, the panels extend above the top of the struts **35**, **36** and also extend into the footing.

After the wall panels are placed between the struts about the periphery of the pool walls, suitable reinforcing **40** is placed and the pool bottom **41** with its footing **42** is cast in situ. As shown in Fig. 7 the struts **36** and **37** preferably protrude below footing **42** into the bottom of the excavation. At the upper ends of the struts **36**, **37** the top panels **37'** extend above the struts to the top of the pool curb **43**. The panels **37'** are drilled between the struts to provide passage of tie wires **44** and a continuous facing **45** of cement plaster is placed over the inner faces of the panels **37** and struts **35**, **36**. After placing such facing **45** it is desirable to also fill the spaces between vertically adjacent panels. Back fill **46** is then applied about the outer faces of the panels and struts. No special material need be used for back fill. After the back fill is placed, reinforcement **47** is placed and the ends of wires **44** are twisted around a cross bar of such mesh **47** and strut **35** to tie the apron to the side and end walls. The apron concrete **48** is placed continuously around the pool walls completing the pool. This provides a monolithic, jointless structure comprising pool walls, pool bottom and footing, and pool apron. The panels **37** extending horizontally between the vertical struts **35** and **36** transmit internal and external pressure to the struts. The struts being fixed at both ends in the apron and pool bottom respectively, transmit the reactions from their trapezoidal loading to the pool bottom and apron.

Both forms of the invention have been described and certain details of construction have been specified in specific dimensions by way of examples. It is to be understood, however, that various modifications in the details

of construction will suggest themselves to those skilled in the art and may be made without departing from the inventive concept disclosed and I do not intend to be bound thereby, except as where made necessary by the scope of the appended claims.

I claim:

1. A monolithic swimming pool disposed within a suitable excavation comprising a plurality of upright struts spaced evenly about the pool defining the periphery of the side and end walls of the pool, a plurality of precast concrete wall panels disposed in fixed vertical alignment between each pair of adjacent struts for the desired height of the pool side and end walls, each said wall panel having bearing engagement at each end thereof upon the struts between which the panel extends, a continuous facing of concrete applied over the entire exposed inner faces of the pool wall panels and struts converting same into a monolithic structure, a pool bottom wall between said pool side and end walls, a footing enclosing the pool bottom and the lower portions of the struts, said bottom wall and footing being of reinforced concrete cast in situ and extending below and above the horizontal plane of the bottom of the adjacent pool side and end wall panels, the lower portions of the wall panels being embedded in the bottom wall and footing, back fill placed about the outer faces of said pool side and end walls to a level below the top of the said walls, and a continuous apron of reinforced concrete enclosing the exposed outer face of the top of said side and end walls and overlying said back fill, said apron reinforcement being structurally tied to the adjacent portions of said pool side and end walls so that the side and end walls function as beams fixed at opposite ends to the apron and to the footing in resisting external and internal pressure on said walls.

2. The swimming pool as defined in claim 1, wherein the inner face of the assembled wall panels are covered by metal reinforcement which is tied to the wall panels for reinforcing the continuous concrete facing applied over the inner faces of the wall panels and the struts.

3. The swimming pool as defined in claim 2 wherein the wall panels, reinforcement and concrete facing comprise an integral unit of sufficient strength spanning the space between the pool apron and pool bottom wall resisting all internal and external forces acting on the pool side and end walls.

4. The swimming pool as defined in claim 3 whereby the reinforced concrete facing applied to the inner face of the pool side and end walls extends into the pool bottom wall and footing.

5. The swimming pool as defined in claim 3 wherein the said struts terminate below the horizontal plane of the pool apron.

6. The swimming pool as defined in claim 3, wherein the side and end wall panels are in vertically spaced alignment and the horizontal spaces between the adjacent vertically disposed panels are pointed from the outer face of the wall to fill same.

7. In a concrete swimming pool of the character described, in combination, vertically disposed laterally spaced struts defining the outer periphery of the pool side and end walls, precast reinforced concrete panels disposed between pairs of adjacent struts and held thereby in fixed lateral relation thereto to form part of the pool side and end walls, a pool bottom wall and footing cast in situ enclosing the lower portions of said struts and said wall panels, a continuous concrete apron cast in situ enclosing the outer faces of the upper end of said wall panels and struts, and a continuous facing of cement applied over the inner faces of the said wall panels between the top thereof and the pool bottom wall, said continuous facing being of sufficient thickness to cover the inner faces of said struts.

8. The swimming pool as defined in claim 7 wherein a plurality of the precast concrete panels are disposed in vertical alignment between adjacent struts, the reinforcements embedded in each said side and end wall panel as cast extends the length thereof between the struts enabling each said panel to resist internal and external forces thereon between said struts, and the top most panel of each side and end wall extends to the top of said apron.



9. The swimming pool as defined in claim 8 wherein the said struts function as upright beams fixed at opposite ends to the pool bottom footing and the apron respectively, and the side and end wall panels are fixed between opposing faces of each pair of struts in vertical alignment and transmit transverse stresses thereon to the adjacent struts.

10. The swimming pool as defined in claim 9 wherein the pool apron and pool bottom wall with its footing are of reinforced concrete, the upper ends of the struts are tied to the apron reinforcement, the precast side and end wall panels between each pair of struts are retained in fixed vertically spaced alignment, and the spacing between said side and end wall panels are pointed from the outer face of the pool walls.

11. In a swimming pool of the character described, in combination, vertically disposed laterally spaced strut members spaced about the periphery of the pool side and end walls, each said struts having portions extending parallel to the plane of the wall defined thereby, a plurality of vertically spaced precast concrete wall panels extending transversely between adjacent struts of the side and end walls in overlapping engagement with said strut portions and retained thereby against lateral displacement from external and internal pressures on said pool walls, a pool bottom wall and footing enclosing the lower portions of said side and end wall panels and struts, an integral facing applied continuously over the inner faces of said side and end wall struts and panels above said pool bottom wall integrally uniting the struts and panels into a pool monolithic side and end wall structure, and a continuous reinforced concrete apron cast about the upper peripheral portion of said pool wall structure at the outer face thereof with said apron reinforcements tied into said wall structure.

12. The swimming pool as defined in claim 11 wherein the said struts are of substantially T-shaped in cross section.

13. The swimming pool as defined in claim 11, wherein the facing applied over the inner face of the pool side and end wall panels and the struts is of reinforced concrete, and the reinforcement of said facing is tied to said wall panels to provide said monolithic side and end wall structure as an integral concrete wall fixed at opposite vertical ends of the pool bottom wall and pool apron for resisting internal and external forces applied to said wall structure.

14. The swimming pool as defined in claim 11 wherein the wall struts are provided with spaced vertical portions disposed in planes parallel to the vertical planes of the pool walls to receive the ends of the panels between said portions, and the struts have their vertical end portions fixed within the pool bottom wall and pool apron respectively.

15. A method of erecting concrete swimming pools using precast concrete panels as part of the pool side and end walls, comprising the steps of providing a suitable excavation to receive the pool with the top of the completed pool disposed adjacent ground level, erecting a plurality of precast concrete wall panels in fixed relation between laterally spaced supports to define the pool side and end wall within the excavation, coating a continuous reinforced concrete facing upon the inner faces of the said side and end wall panels and supports forming a monolithic wall structure embodying said wall panels and supports, casting in situ a reinforced concrete pool bottom enclosing the bottom portions of said monolithic wall structure, back filling about the outer faces of said monolithic wall structure, and casting in situ upon the back fill

a continuous reinforced concrete apron at ground level enclosing the top of said monolithic pool wall structure in fixed relation thereto.

16. The method as defined in claim 15 wherein the monolithic wall structure extends above the top planes of the wall panel supports and the said apron is applied in a horizontal plane including the top portions of said supports.



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