This invention relates to improvements in swimming pool construction, and more particularly to outdoor swimming pools.

At least two major problems in the construction of outdoor swimming pools are solved by the present invention.

One of these problems concerns the provision of a leak-proof connection between relatively flexible sheet metal side walls and a concrete bottom. Hereinbefore, the sheet metal panels have been anchored into the concrete bottom by securing the ends of reinforcing rods or mesh directly to the lower margins of the panels embedded within the concrete. During pouring of the concrete, however, it is necessary for the workmen and cement finishers to walk upon the bottom with a consequent disturbance of the reinforcing steel. Such disturbance is inconceivable; that is, as the concrete of the bottom itself is concerned. However, the connections of the reinforcing steel with the panels causes vibrations, pull, pumping action, reciprocal movement, and like disturbances in the attached panel margins tending as the cement gels to break the cementitious bond of the concrete with the embedded panel margins. In consequence, leaks are often found to be present at the joint between one or more of the side wall panels and the concrete bottom, undetectable until the pool is filled, and then requiring costly repair work to cure.

A second major problem in building swimming pools is that of excess subsurface water in the bottom of the excavation which interferes with construction work, and which may subsequently build up undesirable upwardly thrusting pressures on the concrete slab bottom of the pool.

Another important object of the present invention is to provide a new and improved sheet metal and concrete bottom pool construction wherein effective anchorage of the sheet metal panels in the concrete bottom is attained while such panels remain free from any attachment to the reinforcing steel in the concrete bottom, thus avoiding any disturbance of the embedded margins of the panels during the construction activities involving pouring and finishing of the concrete of the bottom.

Still another object of the invention is to provide simplification in the construction of outdoor swimming pools.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of a preferred embodiment thereof taken in conjunction with the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view through a swimming pool structure embodying features of the invention;

Figure 2 is an enlarged fragmentary sectional elevational detail view taken substantially on the line II—II of Figure 1 but showing the excavation and soil water drain structure before the metal work for the pool is installed within the excavation;

Figure 3 is a fragmentary top plan view of one corner of the pool excavation showing the metal work of the pool in place therein ready for pouring of the concrete bottom; and

Figure 4 is a vertical sectional elevational detail view taken substantially on the line IV—IV of Figure 3.

Referring to Figure 1, an outdoor swimming pool is constructed in situ within an excavation 7 dug in the ground. Essentially, the swimming pool comprises a concrete bottom 8 and a sheet metal side wall structure 9. This side wall structure is made up of a plurality of sheet metal panels 10 which are preferably, though not necessarily vertically corrugated, with their vertical side margins overlapping (Fig. 3) with suitable sealer 11 sealing the lapped joint.

All of the side wall panels 10 are secured together in pool side wall relation by a metal framework comprising a plurality of tiers of circumferential frame bars 12 to which the panels are secured at their overlapping marginal joints by means such as bolts 13. Secured to the horizontal frame bars 12 are vertical supporting and anchor bars 14, which in an economical and convenient form comprise suitable diameter reinforcing steel rods secured to the outer sides of the frame bars 12 as by means of respective tie wires 15. At their lower ends, the rods 14 are desirably driven into the ground in the bottom of the excavation 7 for stabilizing and anchorage purposes.

During erection of the metal-work for the swimming pool, the vertical frame rods 14 serve to support the side wall metal-work properly centered within the excavation 7 and with the lower edges of the side wall panels 10 at a proper elevation above the bottom of the excavation to enable a suitable mesh-work of reinforcing rods 17 to be installed for reinforcing the concrete bottom 8. On the other hand, if preferred, the bottom reinforcing rods 17 may be installed in the bottom of the excavation before the side wall metal-work is installed. In either event, the lower edges of the panels 10 are supported in spaced relation above the bottom reinforcing rods 17, the spacing being such as to avoid any transmission of vibration or panel-moving forces to the lower margins of the panels 10. However, such elevation of the lower edges of the panels 10 is below the desired top surface level of the concrete bottom 8 so that the lower margins of the panels 10 will be adequately embedded and bonded in watertight relation within the concrete of the bottom 8.

In order to reinforce an outer marginal upwardly projecting reinforcing flange 18 of the concrete bottom 8 (Fig. 1), about the perimeter of the pool side wall structure 9, the outer end portions of the reinforcing rods 17 project outwardly beyond the side wall perimeter and have upwardly extending reinforcing terminals 19, providing reinforcement for the upwardly projecting margin of the concrete bottom.

In order to provide solid anchorage of the lower embedded marginal portions of the side wall panels 10 in the concrete bottom 8, reinforcing projections 20 are provided on the lower embedded margins of the panels. In the present instance, the projections 20 are in the form of generally L-shaped anchor bolts extending through respective apertures 21 provided therefor in the panel margin and having heads 22 engaging the outer sides of the panel margins, while the shanks of the bolts pro-
ject inwardly a substantial distance to downwardly projecting relatively short anchoring terminals 23 on the inner end portions of the bolts. In a typical installation, it has been found desirable to use anchoring bolts of one-half inch diameter and about twelve inches in length.

By having the anchor bolts 24 projecting inwardly, maximum anchorage of the lower margins of the panels 10 is attained not only against upward displacement from the concrete bottom, but also against outward displacement such as might be induced by freezing of water in the pool. As a matter of fact, this anchorage of the lower margins of the panels 10 in the concrete bottom relieves the upstanding reinforcing and supporting flange 18 of the concrete bottom from strains imposed by freezing water against the wall panels, since the anchor bolts distribute a substantial percentage, at least, of the strain to the concrete of the bottom 8 inside of the pool perimeter.

During construction of the pool and especially during pouring and finishing of the concrete bottom 8, there is practically no likelihood of the anchor bolt projections 20 on the lower embedded margins of the panels 10 from being disturbed. Therefore, the lower margins of the panels become thoroughly intimately bonded to the cement of the concrete bottom 8 and a thoroughly waterproof joint is provided. Since the bottom reinforcing rods 17 are free from contact with the side wall panels 10, and are free from contact with the reinforcing framework including the vertical rods 21, an amount of inwardly projecting reinforcing rods 17 during pouring and finishing of the concrete will have any disturbing effect on the cement gel embedding the lower margins of the wall panels 10 and the concrete can therefore set in perfect bonded engagement with the panel margins.

In order to solve the problem of subsoil water in the excavation 7, especially during erection of the swimming pool, but also after erection and in order to avoid undesirable heaving pressure from such water, 1 provide a sub-excavation recess 25 (Figs. 1 and 2) in at least the lowest portion of the excavation 7 and fill the same with coarse gravel 27 to the level of the lower face of the concrete bottom 8 to provide a collection sump. Within the body of gravel 27 a drain tile duct 28 is disposed. Within one end of the drain tile duct 28 the end of a pump-out conduit 29 is disposed having its inlet end protected by a screen 30 to keep out coarse material. The pump-out conduit may be a plastic pipe such as a polyethylene soil pipe and is directed to the top of the excavation where a suitable pump 31 driven by a prime mover such as a motor 32 pumps water through the conduit 29 from the drain tile duct 28. Where there is constant water seepage into the excavation, the pump 31 may be kept going until the pool has been completely finished, the pump-out conduit 29 then being closed in the back fill of the excavation around the pool walls. Where the ground water level situation is not severe, the discharge end of the conduit 29 may be buried in the back fill. However, where desirable the conduit 29 may remain exposed at its discharge end for continuous or interval pumping out of accumulated ground water under the pool. In any event, the ground water collecting sump 25 under the pool continues to serve a useful purpose in preventing or at least greatly minimizing de
evitations, of locally said areas of ground water pressure on the pool bottom 8.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

1. claim as my invention:
   1. In a swimming pool construction, a concrete bottom, a sheet metal panel side wall structure comprising generally vertical panels sealingly joined along their vertical edges, the lower margins of the panels being embedded in the concrete bottom substantially above the lower side of the bottom, the outer margin of the concrete bottom projecting outwardly beyond the panels and having an upwardly extending flange, reinforcing rods in the concrete bottom passing the lower edges of the panels in spaced relation therebelow and projecting outwardly beyond the panels, said rods having end portions thereof projecting laterally in reinforcing relation within said flange, and anchor bolts in the lower margins of the panels spaced above said rods and projecting to a substantial length inwardly in anchoring relation within the concrete bottom, said anchor bolts having on their inner ends laterally projecting anchoring terminals, whereby said anchor bolts maintain the anchorage of the lower margins of said sheet metal panels against not only upward displacement but also against outward displacement from the concrete bottom especially as may be induced by freezing of water in the pool.

2. A swimming pool construction as defined in claim 1, wherein the projecting end portions of the rods within said flange extend laterally upwardly in spaced relation opposite the lower margins of the panels.

3. A swimming pool construction as defined in claim 1, wherein said laterally projecting inner ends of the anchor bolts extend downwardly toward but in spaced relation to the bottom reinforcing rods.

4. A swimming pool construction as defined in claim 1, wherein the laterally projecting end portions of the rods extend upwardly in spaced relation opposite the lower margins of the panels, and the laterally projecting anchoring terminals of the anchor bolts extend downwardly toward but are in spaced relation to the reinforcing rods.

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