Dec. 17, 1968 D. A. JOHNSON 3,416,268

SWIMMING POOL BACKWALL FORMING METHOD AND STRUCTURE

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Fig. 1.

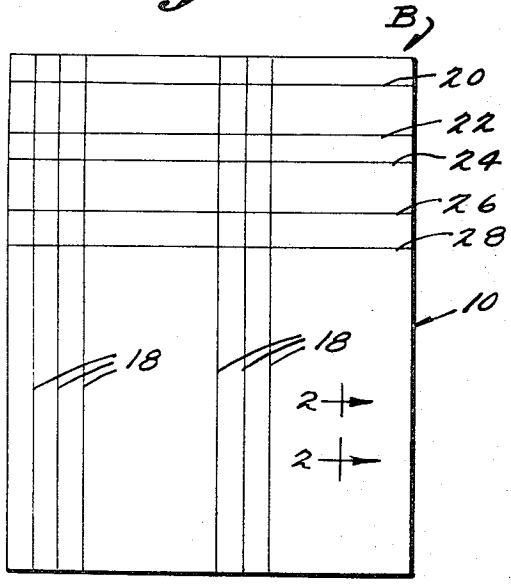

Fig. 3.

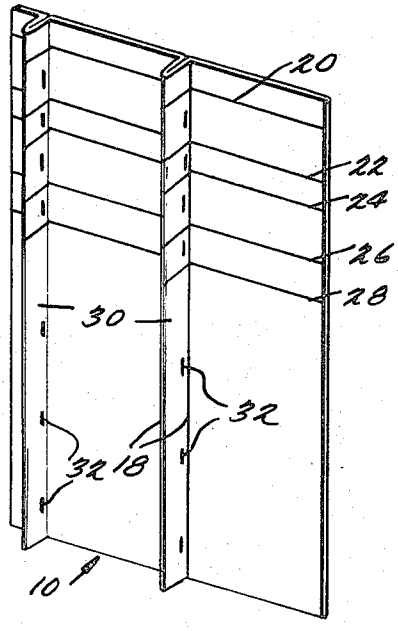

Fig. 4.

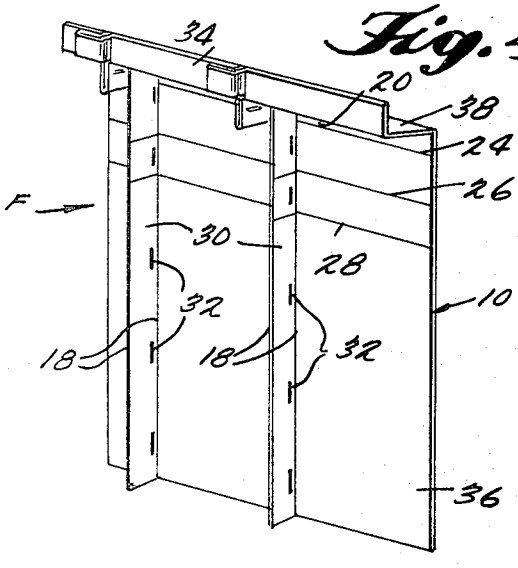

Fig. 2.

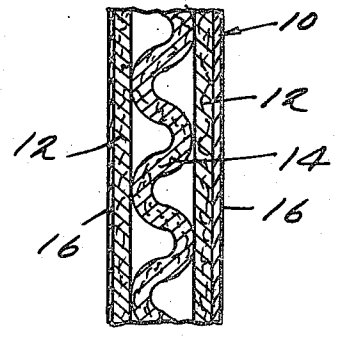

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Fig. 5.

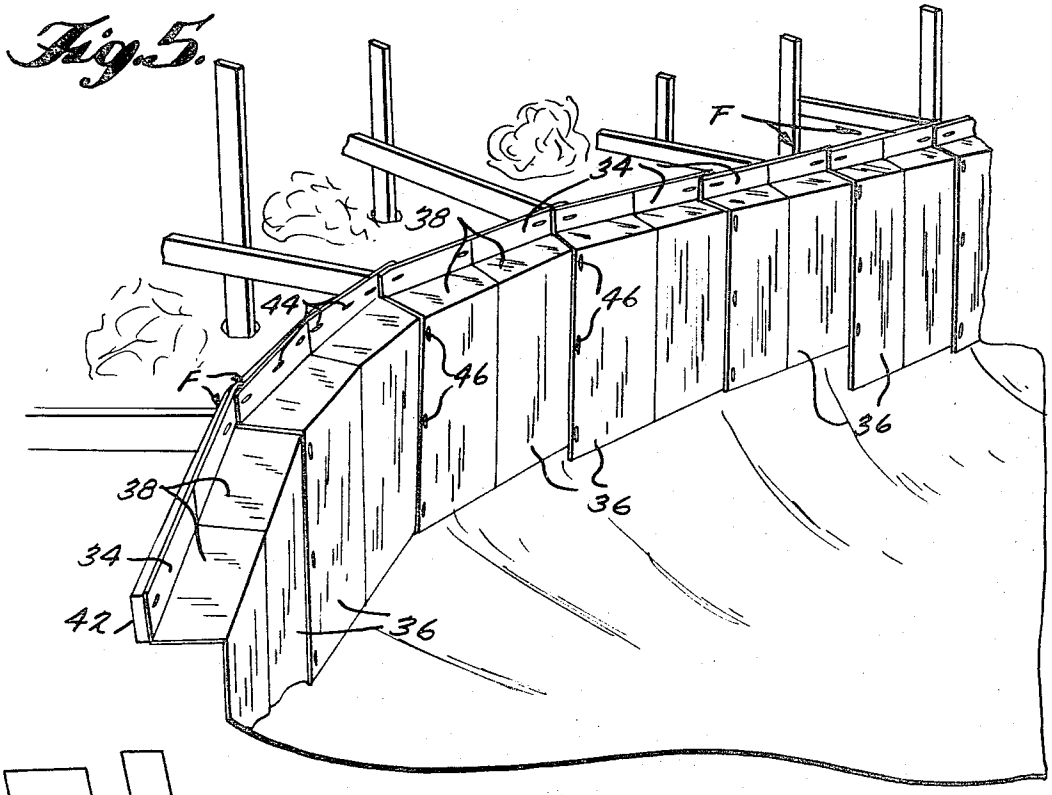

Fig. 6.

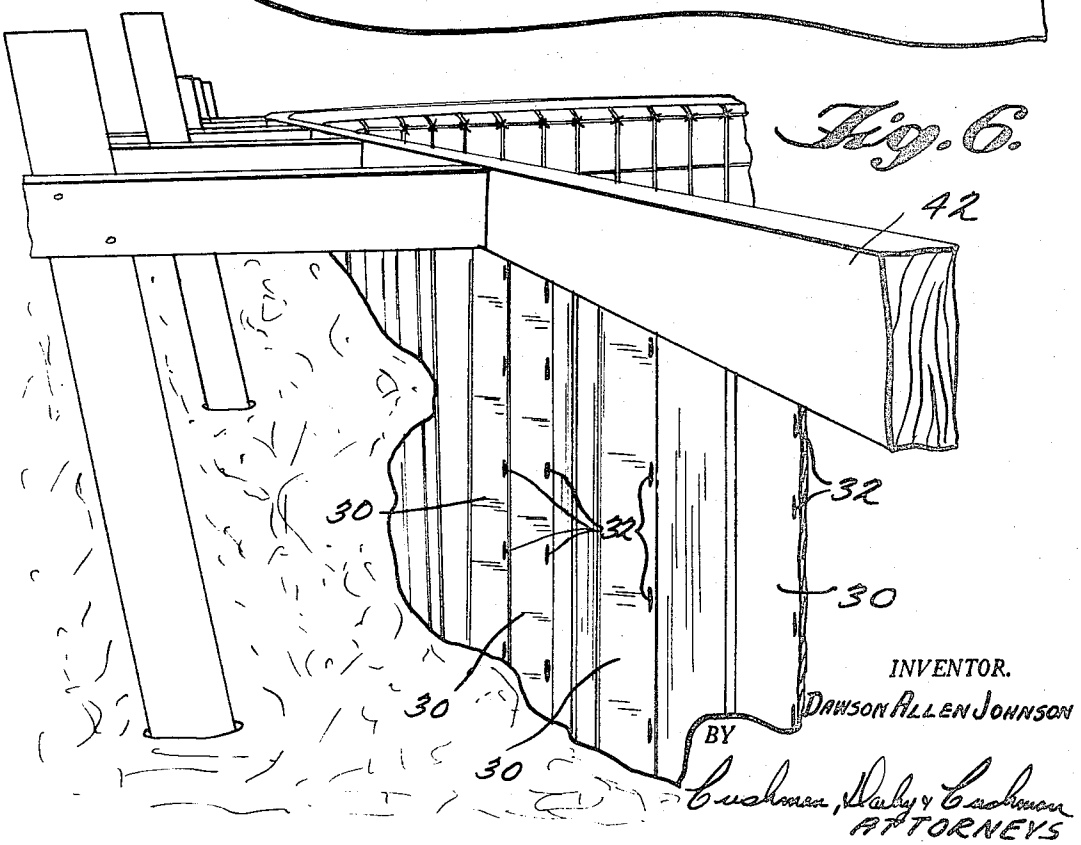

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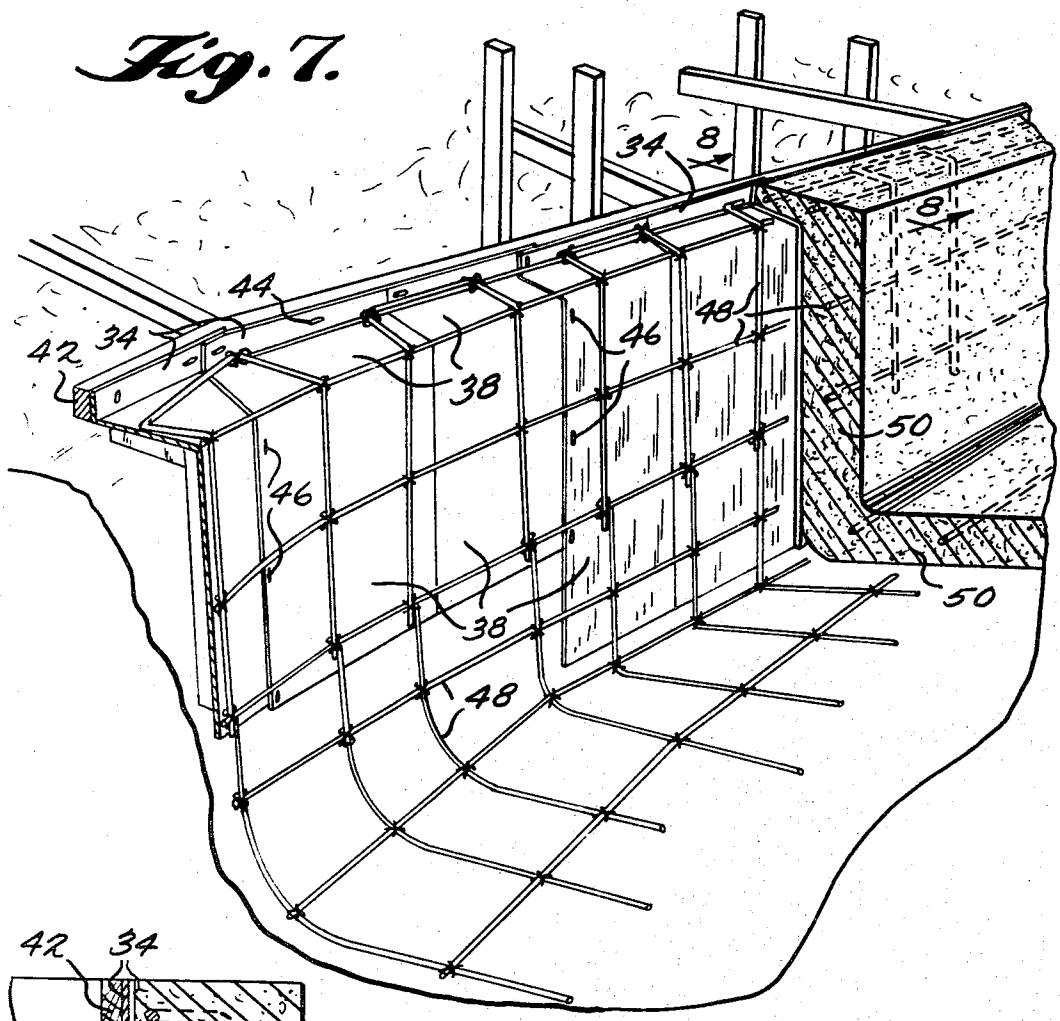
Fig. 7.



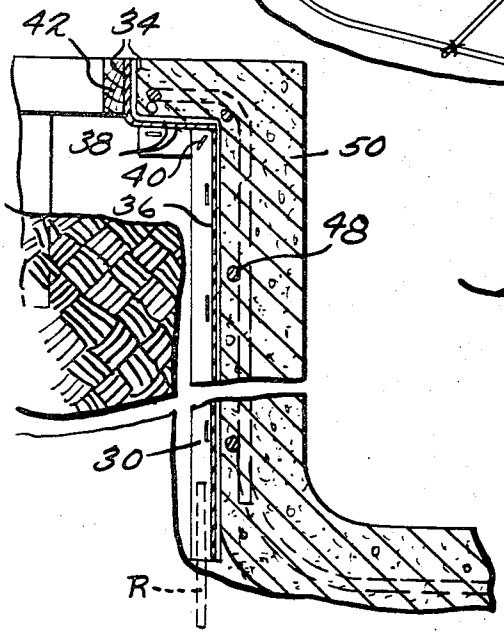


Fig. 8.

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SWIMMING POOL BACKWALL FORMING METHOD AND STRUCTURE

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11 Claims. (Cl. 52—169)

ABSTRACT OF THE DISCLOSURE

The specification discloses a blank adapted to be erected into a form for use as a backing member in constructing the vertical wall of a swimming pool by blowing cementitious material thereon. The blank is made of a flat, rectangular sheet of corrugated cardboard having opposite flat surfaces thereof coated with a film of water impervious material, the sheet being provided with a first plurality of straight strengthening strut defining fold lines formed therein parallel to one pair of parallel edges of the sheet and a second plurality of straight beam defining fold lines formed therein perpendicular to the first plurality of fold lines, the strengthening strut fold lines including two sets of three fold lines, the lines of each set being spaced apart a distance subtsantially less than the space between adjacent lines and the three fold lines of each set defining elongated rectangular strengthening strut sections adapted to be disposed in back-to-back coextensive relationship and to be secured in such relationship by staples or other fastening means. The straight beam defining fold lines being spaced adjacent an edge of the sheet to provide the top of the form when in use and including two spaced fold lines defining therebetween an intermediate section which, when erected, extends at an angle between two parallel sections defined by the fold lines and the adjacent parallel edges of the sheet respectively. In constructing a swimming pool backwall in accordance with this invention, a plurality of erected forms are secured together in side-by-side relation with adjacent vertical marginal edge portions in overlapping relation. A network of metal reinforcing members are positioned inwardly of the erected and secured-together forms and then a layer of cementitious material is blown onto the forms in surrounding relation to the network of metal reinforcing members and allowed to harden. The forms of corrugated material then form a part of the erected wall.

This invention relates to the construction of swimming pools and more particularly to an improved method of constructing a vertical wall of a swimming pol or the like embodying the erection of a plurality of forms from a plurality of flat cardboard blanks and the assembly of the forms into a backing construction onto which a cementitious material is shot or blown to form the main portion of the wall.

The construction of the walls of a swimming pool by blowing or shooting a cementitious material, such as gunite or the like, around a network of metal reinforcing members is well-known. In some instances, where soil conditions are particularly stable, it is possible, after excavating and erecting the pool beam and securing the network of metal reinforcing members in place, to shoot the gunite directly onto the excavated wall and around the network of reinforcing members to form the main portion of the vertical walls of the swimming pool.

However, in many areas where soil conditions are unstable and subject to cave-in, it is necessary to provide a backing construction onto which the gunite is shot. Even in stable soil conditions where the contour of the land is such that the vertical walls of the pool extend above the normal level of the ground, some sort of a backing construction must be provided against which the gunite is shot.

Various sheeting materials such as plywood, plasterboard, Masonite, and the like have been proposed as a backing material, but in general it has been the practice heretofore to utilize a paper-backed metal wire lath as a backing material. However, this type of backing material is not entirely satisfactory because of its inherent flexibility and because of its relatively high cost. The flexibility of wire lath reinforced paper-backing sheets does not allow for accurate control of wall thickness and in operation presents two specific problems. First, unless the backing material is installed so as to be held against flexing outwardly by the excavated wall itself or otherwise, it will move outwardly toward the wall or bulge outwardly as the gunite is shot, resulting in the formation of a thicker wall than is necessary to provide proper structural strength, thus substantially increasing the cost of the gunite material utilized in the overall construction. Second, if a cave-in should occur in the wall of the excavation, the wire lath paper-backed material flexes inwardly toward the network or reinforcing members so that when the gunite is shot, that portion of the wall adjacent the cave-in will not have sufficient thickness for proper structural strength, thus resulting in structural failures.

Accordingly, it is an object of the present invention to provide an improved method of constructing a vertical wall of a swimming pool or the like which overcomes the disadvantages of the prior practices set forth above by providing for the accurate control of wall thicknesses so as to insure adequate thickness throughout for proper structural strength with a minimum of cementitious material. Tests of the present invention have shown that in particular a great saving in the amount of gunite required in comparison with that required by previous methods can be achieved without sacrificing in any way the essential structural strength needed.

Another object of the present invention is the provision of a novel method of constructing a vertical wall of a swimming pool or the like in which a cementitious material is blown or shot around a network of metal reinforcing members embodying the improved steps of erecting a plurality of individual backing forms from a plurality of flat cardboard blanks and assembling the erected forms into a backing construction onto which the cementitious material is shot to form the wall construction.

Another object of the present invention is the provision of a flat form blank made of an inexpensive material and constructed so as to be quickly and easily erected into a relatively rigid form for use as a backing member in the construction of a vertical wall of a swimming pool or the like.

Another object of the present invention is the provision of a backing form of the type described which is simply and economically erected from an inexpensive blank and which is effective in operation to provide sufficient rigidity to insure a proper and controlled thickness in the pool wall finally constructed.

Still another object of the present invention is the provision of a vertical wall construction for a swimming pool or the like embodying a plurality of assembled backing forms, constituting a part of the wall construction when completed, which is simple and inexpensive to assemble during the construction of the wall and which provides for the accurate control of the thickness of the wall in the final construction.

These and other objects of the present invention will become more apparent during the course of the following detailed description and appended claims.

The invention may best be understood with reference to the accompanying drawings wherein an illustrative emobdiment is shown.

In the drawings:

FIGURE 1 is an elevational view of a flat form blank embodying the principles of the present invention;

FIGURE 2 is an enlarged fragmentary sectional view taken along the line **2—2** of FIGURE 1;

FIGURE 3 is a perspective view of the blank shown in FIGURE 1 illustrating the same in an intermediate stage of erection;

FIGURE 4 is a view similar to FIGURE 2 illustrating the completed form erected from the flat blank shown in FIGURE 1;

FIGURE 5 is a fragmentary perspective view illustrating the assembly of the backing construction of the present invention as viewed toward the interior surface thereof;

FIGURE 6 is a fragmentary perspective view illustrating the backing construction of the present invention as viewed toward the exterior surface thereof with the network of metal reinforcing members secured in operative position with respect thereto;

FIGURE 7 is a view similar to FIGURE 5 illustrating the completion of the construction of the vertical wall of the pool; and

FIGURE 8 is a sectional view of the completed vertical wall construction of the present invention taken along the line **8—8** of FIGURE 7.

Referring now more particularly to FIGURE 1 of the drawings, there is shown therein a flat form blank, generally indicated at **B**, which embodies the principles of the present invention. The blank B is formed of a sheet of conventional corrugated cardboard **10**. As best shown in FIGURE 4, the cardboard sheet includes the usual outer plys **12** of kraft paper between which are sandwiched a corrugated ply of kraft paper **14**. Preferably, the exterior surfaces of the sheet **10** are coated with a film **16** of water-impervious material, such as wax, synthetic resin, or the like.

Formed in the sheet **10** are two sets of three relatively closely spaced straight fold lines **18** extending to opposite edges of the sheet. As shown, the fold lines are disposed perpendicular to the direction of extent of the corrugations of the sheet **10**, although they may be disposed parallel to the corrugations as well. In addition, a plurality of irregularly spaced fold lines **20**, **22**, **24**, **26**, and **28** are formed in the sheet perpendicular to the fold lines **18** and, as shown, parallel to the direction of extent of the corrugations.

The purpose of the fold lines **18** is to assist in the erection of the blank B into a three-dimensional relatively rigid form F, as shown in FIGURE 4. In erecting the blank B in accordance with the method of the present invention it is contemplated that the blank would be folded along the fold lines **18**, preferably at the factory as a pre-assembly. It will be understood that each set of three fold lines **18** define two elongated strut sections which, when folded together, form a strengthening strut or rib **30** extending from one edge of the sheet **10** to the opposite edge thereof. Preferably, these strengthening struts are factory pre-assembled by securing the inner edges of the adjacent strut sections together, as by staples **32** or the like, in an automatic stapling machine. In such pre-assembly for purposes of shipment the strengthening ribs are formed so as to lie parallel with the adjacent surface of the sheet. The strengthening struts are subsequently moved outwardly during erection. A blank in this initial stage of erection is illustrated in FIGURE 3. It will be understood, however, that the erection of the strengthening structs may take place in the field by folding the flat sheet along lines **18** and securing the strut sections together, as by staples or the like.

The perpendicular fold lines are provided for the purpose of defining the depth and thickness of the pool beam. Any combination of two of the five fold lines may be employed for this purpose. For example, where it is desired to construct the pool beam of a relatively shallow depth and a relatively narrow width, as shown in FIGURE 4, the final erection of the blank into a form F would be accomplished by cutting the strengthening struts **30** along the fold lines **20** and **22** and then folding the sheet along these fold lines so as to provide an upper vertically extending panel portion or section **34**, a lower vertically extending main panel portion or section **36** and an integral intermediate panel portion or section **38** extending at an angle between the upper and lower panel sections. The angle of extent of the intermediate panel portion **38** with respect to the upper and lower panel portions may be varied to suit the particular pool beam requirements.

In the embodiment shown in FIGURES 1 through 4, the intermediate panel section **38** extends at right angles to the upper and lower panel sections. It will also be noted that the portion of the strengthening strut adjacent the fold line **22** in the folding operation will overlap each other and in the erection of the blank into the form F, preferably these overlapping portions of the strengthening strut are secured together by any suitable means, such as a staple **40** or the like (see FIGURE 8).

While any desired number of fold lines may be provided in various positions of spaced relation in the preferred embodiment shown, illustrative dimensions will now be described. The flat blank is preferably of a size such as four feet-by-four feet or four feet-by-five feet, the five foot dimension extending in a direction parallel with the strengthening struts **30**. The fold lines **18** are spaced apart approximately three inches so that when erected they form strengthening struts having a width of three inches, one strengthening strut being spaced from the adjacent edge of the sheet by three inches and the two strengthening struts provided being spaced apart sixteen inches.

The fold line **20** is provided at a point three inches from the adjacent edge of the sheet and the fold lines **22**, **24**, **26**, and **28** are spaced from the adjacent fold line six, three, six, and four inches respectively.

It can be seen that with this arrangement the depth of the beam may be conveniently three, nine, or twelve inches and the width may be conveniently anywhere from three to nineteen inches depending upon the depth and the angular disposition of the intermediate panel portion **38**.

In practicing the method of the present invention, a plurality of blanks B are erected, in the manner indicated above, into forms F as shown in FIGURE 4 beginning either with a flat blank as shown in FIGURE 1 or preferably a pre-assembled blank as shown in FIGURE 3. A plurality of forms F are then assembled into a backing construction, in accordance with the present invention, and as best shown in FIGURE 5. In this regard, it is, of course, not essential that all of the forms be erected before beginning assembly. It is within the contemplation of the present invention that each form may be successively assembled into the backing construction as it is finally erected or alternatively, all of the forms may be erected prior to assembly or any convenient combination thereof.

It will be understood that, prior to the assembly of the backing construction, in accordance with conventional practice, the site upon which the pool is to be erected is first excavated and, also in accordance with conventional construction, around the perimeter of the excavation a pool beam **42** is constructed. The backing construction is assembled to the beam member **42** by securing successive froms F in lapped relation with respect to each other with the upper panel sections **34** secured to the inner surface of the beam member, by any suitable means such as staples **44** or the like, as shown in FIGURE 5. In securing the upper panel sections **34** to the beam member **42**, the adjacent strengthening strut portions are folded over adjacent to the surface of the upper panel sections although if desired they may be cut off. The lower portion of the lower panel sections **36** are then suitably anchored to the ground as by a steel rod R or the like (see FIGURE 8), driven into the ground and engaged

within the lower portion of a strengthening strut. Alternatively, the lower portion of the lower panel sections may be anchored by means of wooden stakes or the like stapled to the strut.

In the embodiment of the forms F shown, the strengthening struts are provided in offset relation to the symmetrical axis of the sheet. Thus, when the successive forms are assembled, the marginal edge of the form adjacent the generally centrally located strut will overlap the opposite marginal edge portion of the adjacent form F. Preferably, the adjacent overlapping portions of the forms are secured together during the assembly procedure by any suitable means such as stapes **46** or the like.

After the backing construction has been assembled in the manner set forth above, the remaining procedures for constructing the wall in accordance with the present invention are generally conventional. For example, next, a network of metal reinforcing members **48** are suitably secured, in conventional fashion, within the space defined immediately inwardly of the backing construction. After the network of reinforcing members have been properly positioned, a cementitious material **50** of suitable consistency is pneumatically applied in conventional fashion by shooting the same against the backing construction to a thickness sufficient to surround the network of reinforcing members. During this operation, in accordance with conventional practice, the interior surface of the cementitious material is trowled to provide either a finished surface or a surface suitable for the application of ceramic tiles, or other surfacing material of a desired construction, also in accordance with conventional practice.

It thus can be seen that when a vertical wall is constructed in accordance with the present invention, the backing construction assembled from forms F provides sufficient rigidity so as to prevent bulging in the thickness of the wall as the cementitious material is pneumatically applied. Moreover, this rigidity in the assembled backing construction is sufficient to hold the wall of the excavation against cave-in under most conditions. Consequently, in accordance with the present invention, accurate control of the thickness of the wall is achieved thus resulting in a saving in the cementitious material employed while insuring adequate structural strength throughout.

The rigidity which is essential to this control is provided primarily by the strengthening struts **30** of the forms F. In the embodiment shown, each form F is provided with two strengthening struts **30**. The number of struts provided is dependent upon the width of the blanks which in the preferred embodiment is four feet. In general, it can be stated that the struts should be provided at intervals of from between 12 inches to 24 inches to achieve the desired rigidity, a preferred specific spacing being 16 inches.

The corrugations of the sheet of the blank B in the embodiment shown run perpendicular to the struts **30** and provide for strength in a perpendicular or horizontal direction. This strength, however, is such as to permit the forms to be bent to conform with slight curvatures in the perimeter of the pool. In some instances where a relatively small radius of curvature is encountered it may become necessary to cut or notch the upper and intermediate sections at several points so that the main section can be bent at these points to conform with the desired curvature as the backing construction is assembled. The securement of the bent forms to the main beam member **42** and to the adjacent forms serves to retain the curvature in such individual forms.

It thus will be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing specific embodiment has been shown and described only for the purpose of illustrating the principles of this invention and is subject to extensive change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

It is claimed:

1. A form for use in constructing a swimming pool or the like comprising a sheet of corrugated cardboard having opposite surfaces thereof coated with a film of water impervious material, said sheet having spaced pairs of contiguous elongated rectangular sections folded together in coextensive back-to-back relation, means for securing each pair of sections together to define a pair of transversely spaced strengthening struts, said strengthening struts being cut in a direction transverse to the elongated extent thereof at corresponding positions spaced substantially nearer one end thereof than the other, said sheet being folded at an angle along a first line extending perpendicular to said struts and intersecting said cuts in a direction to overlap the portions of said struts adjacent each cut, means for securing the overlapping portions of each strut together, said sheet being folded at an angle generally equal to the fold angle along said first line along a second line disposed parallel to said first line between the latter and the adjacent parallel edge of said sheet in a direction opposite to the fold along said first line.

2. A form as defined in claim **1** wherein the corrugations of said sheet extend perpendicular to said struts.

3. A vertical swimming pool wall comprising a backing construction including a plurality of generally rectangular forms, each of said forms being erected from a sheet of corrugated cardboard folded to provide a relatively short vertically extending upper panel section, a main relatively tall vertically extending lower panel section, and an intermediate panel section extending at an angle between said upper and lower sections, said forms being secured together with adjacent vertical marginal edge portions in overlapping relation, said forms also providing a plurality of horizontally spaced strengthening struts disposed outwardly of said backing construction and extending vertically throughout said lower sections and throughout said intermediate sections, said strengthening struts being formed by folding and securing together in back-to-back relation contiguous elongated rectangular sections of said sheets, a film of water impervious material on the interior surface of said backing construction, a network of metal reinforcing members inwardly of said film and a layer of blown and hardened cementitious material surrounding said network of reinforcing members and engaging said film.

4. A vertical swimming pool wall as defined in claim **3** wherein said film of water impervious material is provided as a coating on the interior surface of each sheet, each sheet also having its opposite surface coated with a film of water impervious material.

5. A blank adapted to be erected into a form for use as a backing member in constructing a vertical wall of a swimming pool by blowing a cementitious material thereon comprising a flat rectangular sheet of corrugated cardboard consisting of a single ply of corrugated kraft paper sandwiched between outer plys of kraft paper, said outer plys having the outer surfaces thereof coated with a film of water impervious material, said sheet having a first plurality of straight strengthening strut defining fold lines formed therein parallel to one pair of parallel edges of said sheet, and a second plurality of straight beam defining fold lines formed therein perpendicular to said first plurality of fold lines, said first plurality of fold lines including two sets of three fold lines, the lines of each of said sets being spaced apart a distance substantially less than the space between adjacent lines of said sets, the three fold lines of each set defining elongated rectangular strengthening strut sections adapted to be disposed in back-to-back coextensive relation when said sheet is erected into a form by folding along said last mentioned lines, said second plurality of fold lines being spaced adjacent an edge of said sheet adapted to provide the top of the form when in use and including two spaced fold

lines defining therebetween an intermediate section which, when said sheet is erected into a form by folding along said last mentioned lines, extends at an angle between two parallel sections defined by said two fold lines and the adjacent parallel edges of said sheet respectively.

6. A blank as defined in claim 5 wherein the corrugations in the corrugated ply of said cardboard sheet extend parallel with said second plurality of fold lines.

7. A blank as defined in claim 5 wherein said second plurality of fold lines includes a number of fold lines greater than two so that any two may be selectively employed to vary the relative sizes of the intermediate and parallel sections.

8. A blank as defined in claim 5 wherein said two sets of fold lines are positioned substantially closer to one parallel edge of said sheet than to the other.

9. A particularly erected blank adapted to be fully erected into a form for use as a backing member in constructing a vertical wall of a swimming pool by blowing a cementitious material thereon comprising a sheet of corrugated cardboard consisting of a single ply of corrugated kraft paper sandwiched between outer plys of kraft paper, said outer plies having the outer flat surfaces thereof coated with a film of water impervious material, said sheet having spaced pairs of contiguous elongated rectangular sections folded together in coextensive back-to-back relation, means for securing said pairs of sections together to define a pair of transversely spaced strengthening struts, said sheets having a plurality of spaced fold lines formed therein extending in a direction perpendicular to said struts in a position substantially nearer one end thereof than the other, said plurality of fold lines including two spaced fold lines defining therebetwen an intermediate section which, when said sheet is fully erected into a form by folding along said last mentioned lines, extends at an angle between two parallel sections defined by said two fold lines and the adjacent parallel edges of said sheet respectively.

10. A partially erected blank as defined in claim 9 wherein the corrugations of the corrugated ply of said sheet extend perpendicular to said struts.

11. In a method of erecting a vertical wall of a swimming pool or the like by blowing a cementitious material around a network of metal reinforcing members, the improvement which comprises the steps of initially erecting a plurality of backing forms from a plurality of sheets of corrugated cardboard having opposite surfaces thereof coated with a film of water impervious material, and securing said forms together in side-by-side relation in proper position at the site to provide a rigid backing construction against which the cementitious material is blown around the network of metal reinforcing members, each of said forms being erected by folding a flat sheet of corrugated cardboard along two spaced sets of three lines defining two pairs of spaced contiguous elongated rectangular sections such that the elongated sections of each pair are disposed in back-to-back coextensive relation, securing each pair of elongated sections in said back-to-back relation to form a pair of spaced elongated strengthening struts, cutting said strengthening struts at corresponding positions substantially nearer one end than the other, folding said sheet along a first line extending perpendicular to said struts and intersecting said cuts in a direction to overlap the portions of said structs adjacent each cut, securing the overlapping portions of each strut together, and folding the sheet at an angle generally equal to the fold angle along said first line along a second line disposed parallel to said first line between the latter and the adjacent parallel edge of the sheet in a direction opposite to the fold along said first line.

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U.S. Cl. X.R.

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