O. E. McMAHON.

FORM FOR CONCRETE WORK.

APPLICATION FILED APR. 25, 1908.

933,327.

Patented Sept. 7, 1909.

2 SHEETS—SHEET 1.

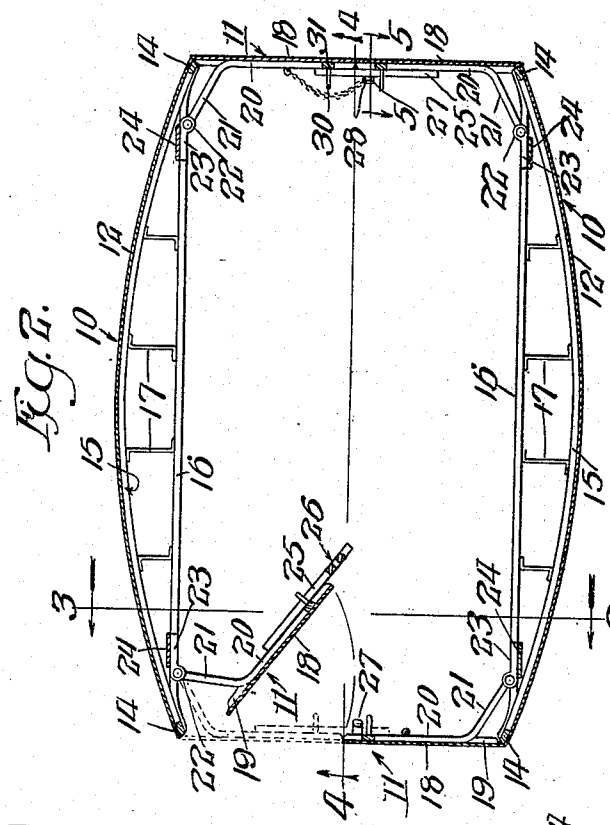

FIG. 2.

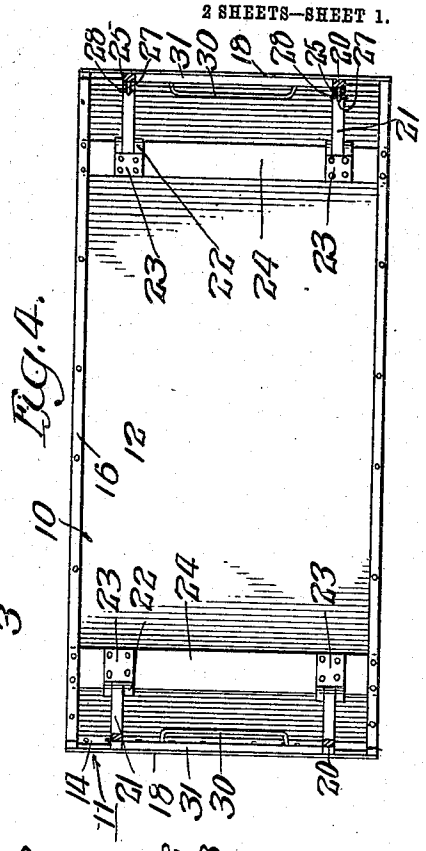

FIG. 4.

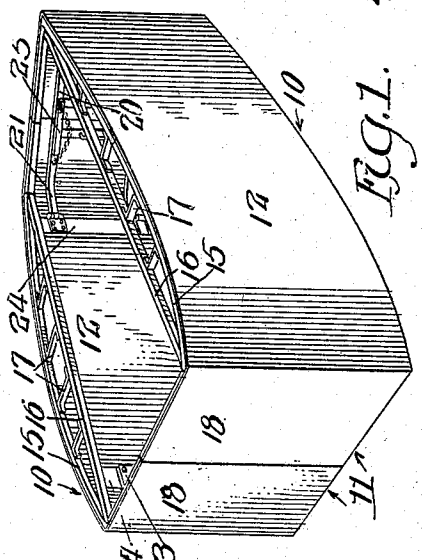

FIG. 1.

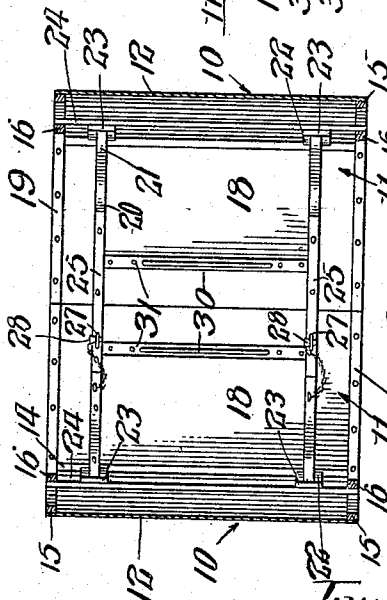

FIG. 3.

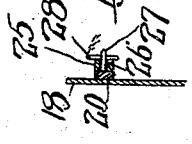

FIG. 5.

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2 SHEETS—SHEET 2.

Fig. 7.

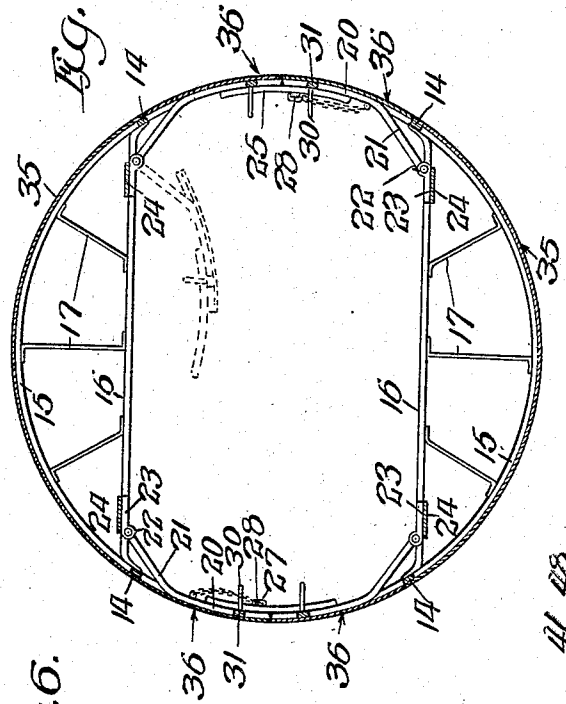


Fig. 8

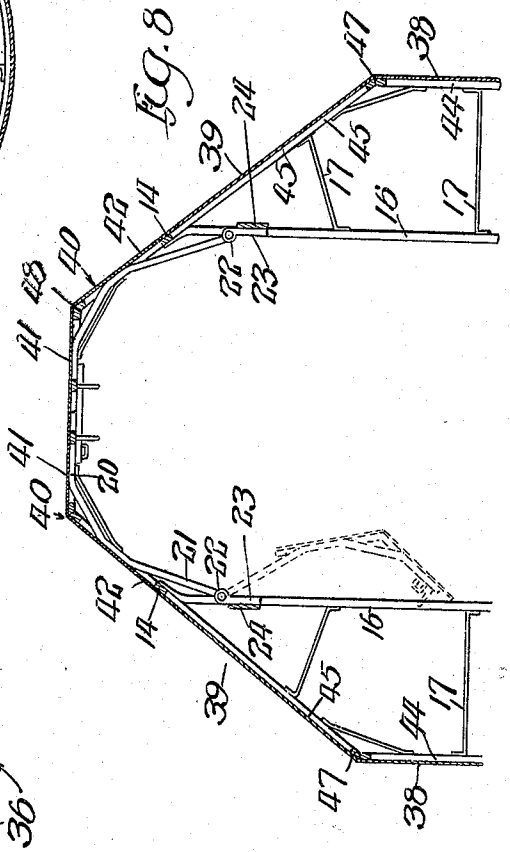
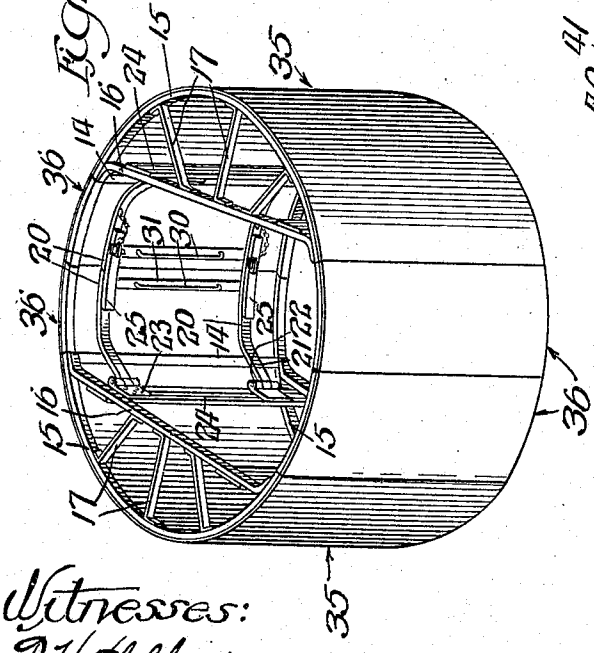


Fig. 6.



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FORM FOR CONCRETE WORK.

933,327. Specification of Letters Patent. Patented Sept. 7, 1909.

Application filed April 25, 1908. Serial No. 429,139.

To all whom it may concern:

Be it known that I, OWEN E. McMAHON, a citizen of the United States, and a resident of Elgin, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Forms for Concrete Work; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in mold forms for constructing concrete or cementitious walls of underground vaults, cisterns, or the like, and refers more specifically to an improved form designed for supporting the vertical walls of such vaults or cisterns while the plastic material of which the walls are composed sets or hardens after such material has been molded in the space between the form and the vertical walls of the excavation.

Among the objects of my invention is to provide a light, portable form for this purpose which is strong and durable and which, when set up for use, provides a continuous wall between which and the earthen wall of the excavation in which the vault or the like is constructed the plastic material is molded, and is capable of being folded or collapsed to bring the parts thereof into small compass so that they may be readily handled and may be removed from a finished vault or cistern having an opening in the top wall thereof of considerably less dimensions than the horizontal dimensions of the vault or cistern.

A mold form embodying my invention embraces, in general terms, two separate main or side vertical sections and shorter vertical sections or flaps which are hinged to the ends of the main sections to swing toward and from the inner or adjacent sides of the latter. The said hinged sections or flaps, when in their outermost positions, constitute portions of the continuous outer wall or surface of the form and are provided at their free margins with locking devices by which the parts of the form are locked rigidly together when assembled. When the form is not in use the hinged sections or flaps are folded inwardly against the inner sides of the main or side sections thereof so that one side of said form with its hinged sections or flaps thus folded occupies but little more space than the main or side section itself. The said side sections and their hinged flaps or wings are preferably made of light sheet metal and reinforcing light skeleton frames which brace the form walls against external pressure. The hinges between the hinged sections or flaps and the main or side members of the form are located a distance inside of the ends of the main sections and at or exterior to the planes of the vertical meeting or abutting lines of the walls of the side members and hinged sections, so that when the sections or flaps are swung inwardly to collapse the form the margins of said flaps adjacent to their hinges move directly away from the set molded walls, thereby providing clearance between said hinged margins of the flaps and said walls as to avoid contact between the same as the flaps are swung inwardly.

As shown in the drawings:—Figure 1 is a perspective view of a mold form embodying my invention. Fig. 2 is a horizontal sectional view thereof. Fig. 3 is a transverse section, taken on line 3—3 of Fig. 2. Fig. 4 is a longitudinal section, taken on line 4—4 of Fig. 2. Fig. 5 is a detail section, taken on line 5—5 of Fig. 2. Fig. 6 is a perspective view of a circular mold form embodying my invention. Fig. 7 is a horizontal section thereof. Fig. 8 is a horizontal, sectional view of one end of still another modification.

The form shown in Figs. 1 to 5, inclusive, is designed for use in the construction of an oblong vault or like inclosure having flat end walls and curved side walls Said form consists, in general terms, of two oppositely located main or side sections 10, 10, each provided at its ends with hinged flaps or sections 11, 11 which are hinged to and carried by said main or side sections. As herein shown each side section is provided at each end with a hinged flap or section, each end of the form, when assembled for use, being composed of the two hinged flaps of corresponding ends of the side sections, and said flaps meeting at the longitudinal center of the form to provide a continuous end wall. This particular arrangement may, however, be varied. The flaps are hinged to the side sections in a manner to swing inwardly

toward and lie against the inner sides of said main or side sections. The said main or side sections consist mainly of sheet metal walls 12, 12 which are reinforced by inner skeleton frames to which the sheet metal walls are attached. The end flaps likewise consist mainly of sheet metal plates 18. The use of this material is advantageous, inasmuch as it is not subject to expansion and warping in the presence of water, and because also such material avoids the excessive weight and cumbersome dimensions found in wooden form structures. The supporting or reinforcing frame for each of said side sections comprise upright posts 14, 14, one at each end of each section, and upper and lower bars 15, 16 extending between and attached at their ends to the posts. The frame bars 16 extend directly between the posts while the frame bars 15 conform to the curvature of the walls 12 and are attached to the upper and lower marginal parts thereof. The inner and outer frame bars are connected by braces 17, 17 extending between and attached at their ends thereto in the manner shown in Figs. 1 and 2. The said inner and outer frame bars 15 and 16 connected by the braces 17, as shown, provide a trussed frame which gives great strength to the form as a whole.

The metal plates 18 constituting the end flaps or sections are stiffened at their upper and lower margins by reinforcing bars 19, 19. They are hinged to the supporting frames of the side sections a distance inside the ends of said side sections by means of horizontal straps or bars 20, 20 which are attached to the inner sides of the sheet metal plates near their upper and lower ends. The said straps are turned inwardly at their outer ends to form offset bracket arms 21, 21 which are pivotally connected or hinged to the side section frames at or exterior the plane of the vertical meeting lines of the side and end walls of the form. As herein shown the said bracket arms 21 are formed at their ends with eyes which are mounted between the hollow lugs 22, 22 of hinged members 23, 23 which are mounted on vertical plates 24, 24, attached at their upper and lower ends to the inner members 16 of the supporting and reinforcing frame. With the hinges between the end flaps and side sections arranged as shown, it will be evident that the margins of said flaps adjacent to the hinges will move away from the end margins of the side or main sections of the form when said flaps are swung inwardly, as shown in Fig. 2, and thus provide ample clearance between said end flaps and the formed or set walls. The said hinged flaps or sections 11 are fastened together, when swung outwardly, by locking devices carried by the free margins thereof which are made as follows: One of said flaps of each pair carry horizontal locking bars 25, one near its upper end and the other near its lower end, and said locking bars extend beyond the flaps which carry the same and are adapted to overlap the other flaps. The locking bars are provided in their extended portions with openings 26 (Fig. 5) adapted to receive staples 27 fixed to the flaps which the locking bars overlap. Said staples extend through the notches 26 and locking pins 28 passing through the inner ends of the staples lock the parts together. As herein shown said locking bars are fixed to the hinge straps 20 of said swinging flaps. Said hinged flaps may be provided with handles 30, 30 by which they may be swung inwardly and outwardly. The handles are herein shown as attached to vertical bars 31, 31 fixed to the inner sides of the sheet metal plates of the flaps.

In Figs. 6 and 7 are shown a form designed for use in constructing the vertical wall of a circular vault, cistern or the like. The essential features of the construction therein shown are essentially the same as those shown in Figs. 1 to 5, inclusive, said form comprising two main or side sections 35, 35 and swinging flaps 36, 36, one hinged to each end of each side section. Inasmuch as the details of construction of the supporting and reinforcing frame and the means for hinging and locking the swinging sections or flaps thereof are essentially the same as those described in connection with Figs. 1 to 5, inclusive, like parts of the two forms of construction bear the same reference characters.

In the construction shown in Fig. 8, a further variation of contour is shown, employing, however, the essential features of construction heretofore described. In said latter construction, the outer walls of the side sections consist partially of parallel side portions 38, 38 and tapering converging portions 39, 39, and the end flaps or sections 40, 40 each consist of a straight transverse portion 41 and an inclined portion 42 which, when the flap is in its closed position, lies in the plane of the adjacent inclined portion 39 of the associated main or side section. The outer members 44, 45 of the supporting and reinforcing frame which are attached to the parallel and converging walls of the side portions are attached at their adjacent ends to posts 47, 47 located at the junction of the straight and inclined walls of the side sections, and constituting parts of said frames. The outer ends of the inclined or converging side members of the frame are attached to posts 14 which bear the same relation to said frame as do the posts 14 shown in the previously described constructions. The said outer members 44, 45 of the skeleton frame are rigidly connected with the inner members 16 thereof by braces 17, as in the con-

structions previously described. The hinged flaps or sections are provided at the junctions of their transverse and inclined portions 41, 42, respectively, with posts 48 to which the sheet metal portions of said flaps are attached. In other respects the construction of the form shown in Fig. 8 is substantially the same as that described in connection with Figs. 1 to 5, inclusive, and like parts bear the same reference characters.

No provision has been made in the form described for constructing the bottom or top walls of the vault or the like, and it will be understood that said walls may be constructed in any usual or preferred manner. The parts of the form described are placed, when in a collapsed or folded condition, in the excavation in which the vault or the like is to be constructed, either before or after the bottom wall or floor is formed therein. After the side sections are properly located in the excavation the hinged sections or flaps are swung outwardly and locked together, thereby locking the entire form rigidly together. The concrete or cementitious material with which the vertical wall of the vault is to be formed is thereafter poured into the space between the walls of the form and the walls of the excavation and is molded therein to form the wall of said vault. Said form remains in position until the molded wall material has set or hardened sufficiently to support itself, after which the form is removed. In removing the form the swinging flaps or sections are unlocked one from the other and are swung inwardly against the inner sides of the main or side sections. In these positions of the two main parts of the form they may be readily withdrawn from the set vault wall and removed from the vault.

In each of the three forms of construction illustrated it will be observed that the end portions of the main section, to which the flaps are connected, are deflected inwardly so as to give to said main section concave or equivalent shape, and that the pivotal axes of the hinged joints connecting the said flaps with the end margins of said main section are located at a distance inwardly from the said end margins of the main section; the result of this construction being that, as the free ends of the flaps are swung inwardly, the margins thereof which meet the end margins of the main section will, at the beginning of their movement, be carried inwardly away from the surface of the concrete resting against the same.

In the construction shown in Fig. 2, wherein the curvature of the main section is relatively slight, and the end flaps when in position for use are at right angles to a plane passing through the end margins of said main section, the said pivotal axes of the flaps are located at a considerable distance inward from the end margins of the main section, and near the wall of the said main section, this location of the said pivotal axes bringing them laterally outside of the plane referred to, so that in the inward swinging movement of the flaps their hinged margins will have movement in a direction inwardly and away from the inner surface of the formed concrete wall; it being manifest that, if the said pivotal axes were located inside of the plane referred to, the hinged edges of the flaps would move outward and toward instead of away from such inner surface of the concrete wall. The same conditions exist in the construction shown in Fig. 7, wherein the main section has a much greater curvature, and the flaps constitute curved continuations of the wall of the main section; it being manifest that in this instance also the pivotal axes of the hinged flaps are at a distance inwardly or toward the center of the main section from the end margins of the said main section, although in this instance said pivotal axes are at a greater distance from the wall of said main section, as is permitted by the greater curvature of the main section.

In the construction shown in Fig. 8 in which the end portions of the main section are flat, and inwardly deflected with respect to the middle portion thereof, and the hinged edges of the flaps form straight continuations of the said end portions of the main section, the pivotal axes of the flaps are similarly located at a distance inwardly from the end margins of said main section, with the same result as hereinbefore stated.

I claim as my invention:—

1. A mold form for the purpose set forth, comprising a main section, the ends of which are inwardly deflected and which is composed of an outer sheet metal wall and an inner reinforcing frame, the central part of said frame being at a distance inwardly from the central part of the wall and the ends of said frame being attached to the inwardly deflected ends of the wall, and folding sheet metal flaps hinged to the ends of the main section and adapted to swing toward and from the inner side of the latter, the hinged connection between said folding flaps and the main section comprising straps attached to the inner side of the sheet metal flaps and extended at their ends to form bracket arms which are pivoted to the frame of the main section, at a distance inwardly from the ends of said frame, and which are attached to said sheet metal wall.

2. A mold form for the purpose set forth, comprising a main section, the ends of which are inwardly deflected and which is composed of an outer sheet metal wall and an inner reinforcing frame having longitudinal frame bars, the central part of said bars being at a distance inwardly from the cen-

tral part of the wall and the ends of said bars being attached to the wall near its end margins, and folding sheet metal flaps hinged to the ends of said main section and adapted to swing toward and from the inner side of the latter, the hinged connections between said folding flaps and the main section comprising straps attached to the inner sides of the sheet metal flaps and extended at their ends to form bracket arms which are pivoted at their ends to the said longitudinal frame bars of said main section at points located at a distance inwardly from the ends of said bars which are attached to said sheet metal walls.

3. A mold form for the purpose set forth, comprising a main section the ends of which are inwardly deflected and which is composed of an outer sheet metal wall, and an inner frame having upright posts attached to the sheet metal wall near its end margins, and longitudinal frame bars attached at their ends to said upright posts, and upright plates attached to said longitudinal frame bars near the ends of the same, and folding sheet metal flaps hinged to the ends of the main section adapted to swing toward and from the inner side of the latter, the hinged connections between said folding flaps and the main section comprising straps attached to the inner sides of the sheet metal flaps and extended to form bracket arms which are pivoted at their ends to the said upright plates.

4. A mold form for the purpose set forth, comprising a main section, the ends of which are inwardly deflected and which is composed of an outer sheet metal wall, and a reinforcing frame, the latter consisting of a plurality of vertically separated, longitudinal frame bars extending between and attached to the inwardly deflected ends of the main section, said frame bars being rigidly connected with the intermediate parts of the wall by braces, the folding flaps being also made of sheet metal, and hinged connections between said flaps and the main section comprising straps attached to the inner sides of said flaps and having their end portions deflected inwardly to form bracket arms, said bracket arms being pivoted at their ends to the reinforcing frame of the main section at a distance inwardly from the ends of said frame and from the end margins of the sheet metal wall of said main section.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 22nd day of April A. D. 1908.

OWEN E. McMAHON.

Witnesses:
LOUIS ROTHSTEIN,
H. F. VOLSTORFF.