Oct. 2, 1945. A. W. MOORE ET AL 2,385,830

MOLD AND METHOD FOR CASTING ELECTROLYTIC CELLS

Filed Dec. 4, 1941 3 Sheets-Sheet 1

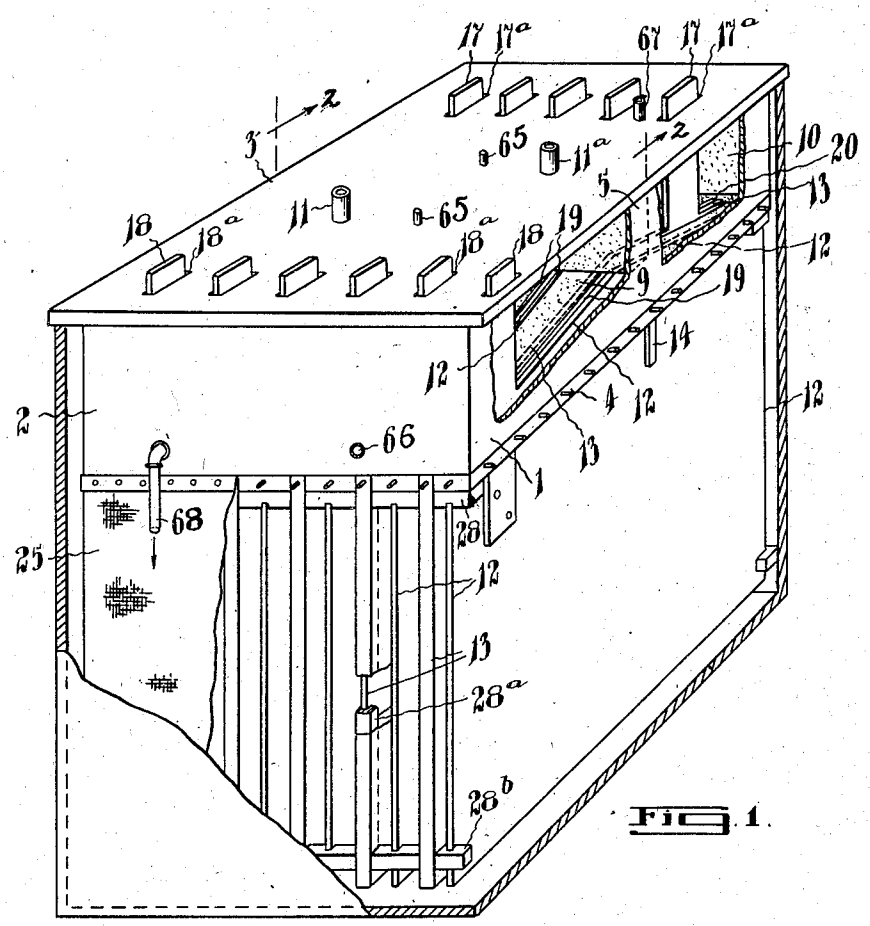


Fig. 1.

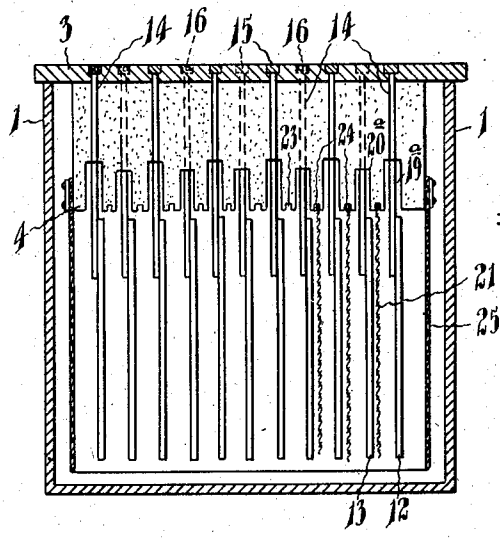


Fig. 2.

Inventors
A. W. Moore
F. B. Moran
H. L. Christian
D. D. Morris
By J. Harold Jackson
Atty

Oct. 2, 1945. A. W. MOORE ET AL 2,385,830

MOLD AND METHOD FOR CASTING ELECTROLYTIC CELLS

Filed Dec. 4, 1941 3 Sheets-Sheet 2

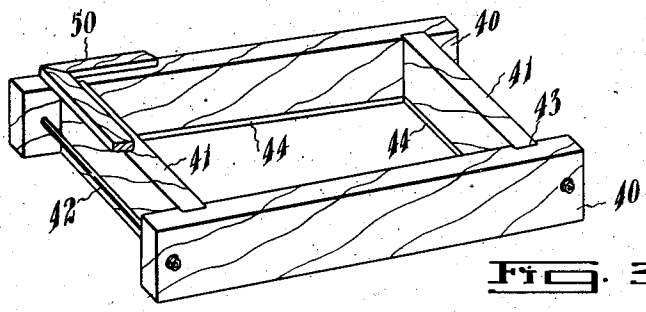


Fig. 3.

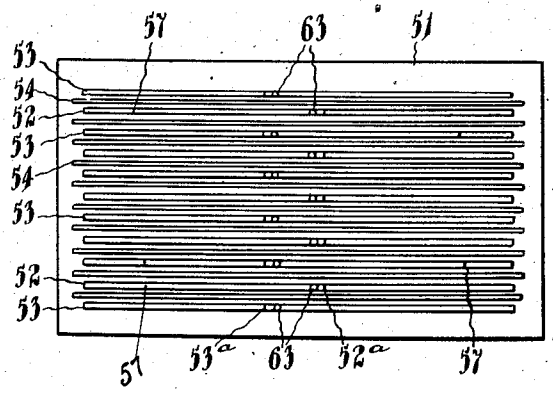


Fig. 4.

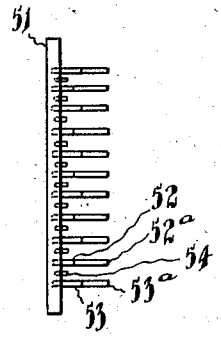


Fig. 7.

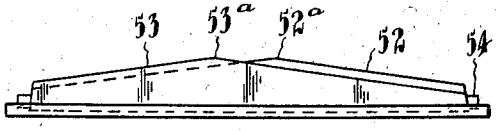


Fig. 5.

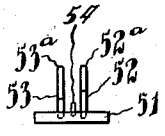


Fig. 6.

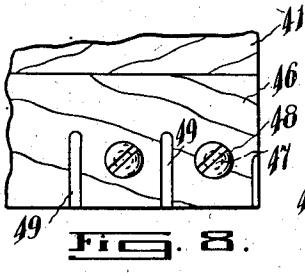


Fig. 8.

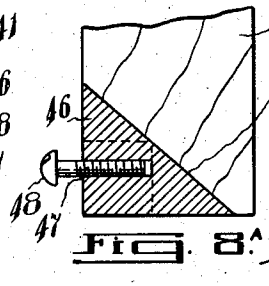


Fig. 8A.

Inventors
A. W. Moore
F. B. Moran
H. L. Christian
D. D. Morris
By
Atty.

Oct. 2, 1945. A. W. MOORE ET AL 2,385,830

MOLD AND METHOD FOR CASTING ELECTROLYTIC CELLS

Filed Dec. 4, 1941 3 Sheets-Sheet 3

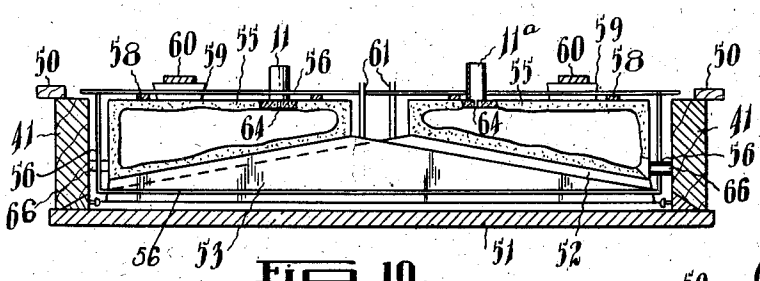


Fig. 10.

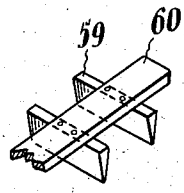


Fig. 9.

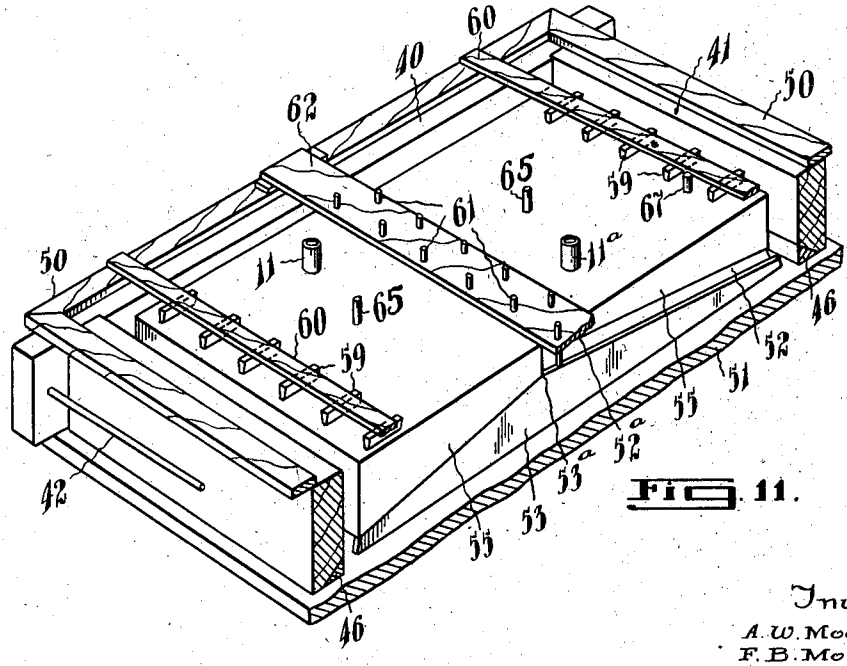


Fig. 11.

Inventors
A. W. Moore
F. B. Moran
H. L. Christian
D. D. Morris
By
Attys

Patented Oct. 2, 1945 2,385,830

UNITED STATES PATENT OFFICE

2,385,830

MOLD AND METHOD FOR CASTING ELECTROLYTIC CELLS

Alexander Whiteside Moore and Frank Benjamin Moran, Trail, British Columbia, Herbert Louis Christian, Rossland, British Columbia, and Darcy Drummond Morris, Calgary, Alberta, Canada, assignors to The Consolidated Mining and Smelting Company of Canada, Limited, Montreal, Quebec, Canada, a company of Canada

Application December 4, 1941, Serial No. 421,656

10 Claims. (Cl. 25—130)

This invention relates to a method and apparatus for the manufacture of combined gas collectors and cell covers for electrolytic cells of the tank type.

In a co-pending application Serial No. 276,158, a combined gas collector and cell cover for electrolytic cells of the tank type is disclosed. The cell cover incorporates, in a unitary casting, the gas collecting chambers for the separate collection of the gases resulting from the electrolytic decomposition of solutions. The cell cover is cast of non-conductive material and includes side walls, end walls, a top, and a bottom, forming a chamber therebetween. A gas-tight partition extends from the bottom to the top of the chamber thereby dividing the chamber into two gas collecting chambers. Alternate positive and negative electrodes are suspended from the cover. Ports and inverted channels are formed in the bottom of the cell cover, each port being aligned with an inverted channel. Each port and the inverted channel with which it is aligned is located over an electrode. Each port and its respective channel meet and terminate immediately below the gas-tight partition in such a manner that the ports above the positive electrodes extend into one of the gas collecting chambers and the ports above the negative electrodes extend into the other of the gas collecting chambers. Provision is also made to prevent intermixing of the gases evolved at the positive and negative electrodes during electrolysis.

In casting hollow structures, particularly those of cement or concrete, provision must be made for removing the core, or internal mould, which forms the hollow in the casting after the casting has solidified. In casting a structure of the type described hereinabove, a problem is encountered in removing the cores which form the gas collecting chambers in the casting, after the casting has solidified. Several expedients were followed, such as, for example, by leaving in the castings, openings large enough to provide for the removal of the solid cores used for forming the gas collecting chambers, each opening subsequently being sealed by a cover cemented in place to form a unitary structure. The weakest points in a casting made by this method were found to be along the joints where the openings had been sealed and the resulting structure was found to be not entirely satisfactory in use.

One of the principal objects of this invention is to provide an arrangement of mould and core parts whereby the combined gas collectors and cell covers for electrolytic cells of the tank type can be cast in one piece without lines or points of weakness.

A further object of the invention is to provide an arrangement of mold and core parts which is readily assembled and disassembled and which can be separated readily from the finished solidified casting.

A clear understanding of the objects of the present invention, and the manner in which they are attained, may be had from the following description and accompanying drawings, in which:

Figure 1 is a perspective view, partly in cross-section and partly cut away, of a combined gas collector and cell cover for electrolytic cells of the tank type constructed in accordance with the present invention;

Figure 2 is a cross sectional end elevation of the cell cover, taken along the line 2—2, Figure 1; the section being taken through the cathode supporting rods;

Figure 3 is a side elevation, slightly in perspective, of the side and end forming framework of the wooden form used in the manufacture of the cell cover;

Figure 4 is a top plan view of the bottom of the mould with the gas channel and groove forming cores assembled;

Figure 5 is a side elevation showing the alternate positions of the oxygen and hydrogen gas channel forming cores;

Figure 6 is an end elevation of the gas channel forming cores shown in Figure 5;

Figure 7 is an end elevation showing the gas channel and groove forming cores in place;

Figures 8 and 8*a* are detail views of the bevelled strip assembly;

Figure 9 is a detail of the electrode port forming cores;

Figure 10 is a cross-sectional side elevation showing the assembled form with the fusible cores for forming the gas collecting chambers in place; and

Figure 11 is a perspective view showing the form and cores set up, ready to receive the concrete.

Like reference characters refer to like parts throughout the specification and drawings.

The combined gas collector and cell cover, illustrated in Figures 1 and 2, is particularly applicable for use in conjunction with an electrolytic cell of the tank type in which hydrogen and oxygen, resulting from the electrolytic decomposition of water, are separately collected in a high state of purity.

The cell cover is cast in one piece of non-con-

ductive material, such as concrete, and is formed with side walls 1, end walls 2, a top 3 and a bottom 4 forming a chamber therebetween divided approximately midway of its length, by the gas-tight partition 5, into two gas collecting chambers.

The top 3 of the cell cover is slightly larger in area than the area enclosed by the upper rim of the cell tank and protrudes beyond the sides and ends thereof to form a flange which rests uniformly upon the upper rim of the tank.

The gas-tight partition 5 divides the interior of the cell cover into the hydrogen collecting chamber 9 and the oxygen collecting chamber 10. The hydrogen chamber 9 is made preferably slightly longer than the oxygen chamber 10 in order to accommodate the cathodes, the number of which, in the preferred modification of our invention, exceeds by one the number of anodes. The gases collected therein are withdrawn through pipe couplings 11 and 11*a* respectively to their respective gasometers.

The negative and positive electrodes, 12 and 13 respectively, are suspended from the cover 3 and are secured thereto by means of vertical supporting rods 14. The lower ends of rods 14 are suitably welded or riveted to their respective electrodes, as shown in Figure 2, while the upper ends are threaded and extend upwardly through openings 15 provided for that purpose in partition 5. When the electrodes are drawn into position, their upper edges are prevented from touching the bottom of the cover by means of detachable saddles or spacers 28, which are placed at each end of the upper edge of each electrode. The electrodes are drawn tightly into place by means of nuts and washers 16 acting upon the threaded upper portions of rods 14. These nuts and washers 16 are countersunk in the upper surface of the top 3 of the cover. When the electrodes are in place, we prefer to cover the countersunk nuts and washers 16 with a mixture, such as cement grout, to provide the top of the cover with a smooth uniform surface.

Gas ports 19 and 20 and inverted channels 19*a* and 20*a* are formed in the underside of the bottom of the cell cover, each gas port being aligned with an inverted channel. A gas port 19 and an inverted channel 19*a* with which it is aligned is located over each cathode 12 and a gas port 20 and an inverted channel 20*a* with which it is aligned is located over each anode 13. Each gas port and its respective channel meet and terminate immediately below the gas-tight partition in such a manner that the ports 19 above the cathodes extend into the hydrogen collecting chamber 9 and the ports 20 above the anodes extend into the oxygen collecting chamber 10.

Each port 19 and 20 extends substantially along the full width of the bottom of its respective gas collecting chamber, and the inverted channel which it meets and with which it is aligned extends substantially along the full width of the bottom of the other gas collecting chamber.

In the preferred modification of the invention described and illustrated herein, the floor of each of the gas collecting chambers 9 and 10 slopes uniformly downwardly from the base of the vertical gas-tight partition 5 along the width of each chamber to the base of the outer wall of that chamber.

The ceiling of each inverted channel is formed parallel to the sloping floor of the gas collecting chamber directly above it, extending from the corner of the electrode immediately beneath it to the point below the gas-tight partition 5, at which point the channel opens into the gas port with which it is in alignment. The vertical cross-section of each inverted channel, therefore, is greatest at the section where the gas flow through that channel is greatest, namely, at the section above the centre of each electrode where the channel immediately thereabove opens into the gas port with which it is in alignment. The gases in channels 19*a* and 20*a* flow in opposite directions before being discharged through ports 19 and 20 into chambers 9 and 10, respectively. It will be understood, of course, that this feature of the invention can be applied in other modifications such as where the floors of chambers 9 and 10 and the ceilings of channels 19*a* and 20*a* are formed horizontally.

In our preferred and other modifications, the bus-bars 17 are passed through tapered slots 17*a* provided in the top 4 of the cover and are riveted or welded to the positive electrodes 13. We have found it most convenient to pass the bus-bars 17 through the oxygen compartment and downwardly through the ports 20 to contact the anodes directly beneath those ports. Similarly, the bus-bars 18 are passed through ports 19 to be joined to the negative electrodes 12. When the assembly is completed, the tapered slots 17*a* and 18*a* are made gas-tight by sealing around the bus-bars, preferably with a cement grout.

A nipple 65 extends through the top of the cover into each of the gas collecting chambers. These nipples are normally closed to prevent the escape of gas but may be used to withdraw gas samples from the respective chambers. The pipe 67 extends through the cover into the electrolyte in one of the chambers and serves to indicate when the level of the electrolyte has fallen below a predetermined level.

In the preferred embodiment of our invention described and illustrated herein, we enclose each of the positive electrodes completely with a porous diaphragm 21, preferably formed of such material as woven asbestos cloth. Grooves 23 are formed in the underside of the bottom 4 of the cell cover and extend along its entire length and are spaced parallel to, on each side of and substantially equidistant from the channels 20*a*. The top edge of each of the asbestos diaphragms is tightly wedged into the appropriate grooves 23 by means of iron strips 24. No diaphragms surround the cathodes but an asbestos skirting 25, fastened around the bottom edges of the cover by means of iron straps, extends downwardly to a point just above the bottom of the cell tank.

Spacers or saddles 28 serve to separate the upper edge of each electrode from the bottom of the concrete cover and spacers or insulating strips 28*a* are also provided on the vertical edges of the enclosed electrodes. The strips 28*a* may be fastened to the electrodes by means of clip fasteners and are of sufficient width that when the diaphragm material is wrapped tightly around them, they aid in shaping the diaphragm bags and also serve to prevent these bags from touching the electrodes. The spacers 28*b* are provided at the bottom of the vertical edges of each electrode to prevent the electrodes from swinging.

Provision is also made for circulating the electrolyte in the cell. A form of circulating device is illustrated in Figure 1 and comprises a cou-

pling 66, one end of which extends through the end wall of the gas collecting chamber below the level at which it is desired to maintain the electrolyte in that chamber, and the other end is joined to pipe 68. The other end of pipe 68 extends downwardly into the main body of the electrolyte. It is preferred to have two or more circulating devices leading from the end wall of each of the gas collecting chambers 9 and 10 to maintain proper circulation of the electrolyte which would otherwise tend to become progressively more highly concentrated in the gas collecting chambers and less concentrated in the other parts of the cell.

It has been found that concrete, preferably reinforced, is an ideal material for use in the construction of the cell cover described hereinabove. While a number of different mixtures of cement and aggregate may be used, it is preferred to use a mixture composed of one part of Portland cement to one part of quartz sand, which gives a dense, hard and strong concrete. In constructing the cell cover, a reinforcing framework is used, made up of steel rods of approximately ¼" diameter, which are spot welded and completely covered by the concrete. The method and apparatus for the manufacture of this cell cover is described in detail hereinafter, particular reference being made to Figures 3 through 11 of the drawings.

The concrete cover is cast in one piece using an arrangement of forms and cores which is readily disassembled after the casting has solidified and which is readily separable from the casting after solidification.

The rectangular side-forming framework is illustrated in Figure 3 and includes the side members 40 and end members 41 secured together by tie bolts 42. The side and end members are preferably joined in mortise and tenon joints as indicated at 43.

The bottom inside edge of each side and end member 40 and 41 is bevelled, as indicated at 44, to receive a removable strip of wood 46. Each bevelled strip 46 is drilled along its length to form substantially equally spaced aligned holes 47 in which are received the aligned bolts 48, as shown in Figure 8, the heads of which project outwardly from the strips and which, ultimately, are imbedded in the finished casting.

Between the holes 47, vertical slots 49 are formed in the strips 46 in the end members 41. Each of the slots 49 in one end strip 46 is in alignment with a corresponding slot in the opposite end strip. The slots are preferably equally spaced and the number is dependent upon the number of individual electrodes to be enclosed by the diaphragm bags.

A collar 50, shown in part in Figure 3, is built around the top periphery of the frame members 40 and 41 and extends outwardly therefrom to form the flange on the top 3 of the cell cover.

The bottom forming member 51, on which the side forming frame rests, is preferably slightly longer and wider than the frame and may be detachably secured to the underside of the members 40 and 41. The bottom 51 is preferably formed of wood of sufficient thickness to support the weight of the forms, cores and casting.

The gas channel forming cores 52 and 53 and the cores 54 for forming the grooves, into which grooves the asbestos diaphragm bags 21 are wedged in the finished casting, are secured to and extend upwardly from the upper surface of the bottom 51.

Each of the gas channel and groove forming cores 52, 53, 54, as illustrated in Figures 4 and 7, is preferably made of wood and covered with a thin sheet of zinc in order that it may be easily withdrawn from the casting after it has solidified.

The gas channel and groove forming cores are formed with flat bases which are wedged into slots formed in the upper surface of the bottom member 51, as shown in Figure 5. These slots extend between the end members 41.

For the purpose of description, the cores 52 are identified as the oxygen gas channel forming cores and the cores 53 are identified as the hydrogen gas channel forming cores.

Each of the cores 52 and 53 is tapered uniformly from a maximum height, indicated by the numerals 52a and 53a, located at a point approximately two-fifths of its length from the end which forms the gas port. In setting up the gas channel forming cores, the ends are alternately reversed so that all the high points 53a are in alignment closer to one end of the bottom member 51 and the high points 52a are in alignment closer to the opposite end.

Each of the groove forming cores 54 is spaced approximately midway between each pair of gas channel forming cores.

If desired, and particularly when it is desired to form very narrow gas channels, the channel forming cores may be made of low temperature fusible material, such as paraffin wax.

The surfaces of the bottom forming and side forming members exposed to the concrete are treated with Vaseline or like non-saponifiable material to prevent adherence of the concrete. The side forming frame is then lowered on to the bottom form with the ends of the groove forming cores 54 fitting snugly into the slots 49.

The gas collecting chambers are formed by means of low temperature fusible cores 55, such as paraffin wax cores, which are moulded into the desired shape as described in detail hereinafter. Each fusible core 55 rests on the alternate gas channel forming cores at its respective end of the mould such that the high points 52a and 53a of the channel forming cores form openings in the finished casting extending into the respective chamber immediately above, as illustrated in Figures 10 and 11.

As illustrated in Figure 11, one of the fusible cores 55 is made somewhat longer than the other in order to form a hollow chamber of a size sufficient to accommodate the cathodes, the number of which, in the preferred modification of our invention, exceeds by one the number of anodes.

The fusible cores may be held in position by short nails or brads 57, extending upwardly from the upper surface of the gas channel forming cores 52 and 53, upon which the respective fusible cores rest. We prefer to place the brads 57 on the outermost cores.

A reinforcing structure 56, preferably made up of one-quarter inch mild steel rods, as illustrated in Figure 10, is lowered into the mould form simultaneously with the gas collecting chamber forming fusible cores.

The reinforcing structure 56 is supported on small blocks 58, formed of a material such as that sold under the trade name "Transite," which are placed on the top of the wax cores in such a manner that, after casting, the reinforcing structure is completely imbedded in the concrete.

The V-shaped slots 17a and 18a in the top of the cover, through which the electrode connections pass, are formed by zinc covered wooden

wedge shaped core members 59. Each set of these cores is attached to a wooden strip 60, as illustrated in Figure 9. Two sets of wooden strips 60 with attached cores are extended transversely between the side members 40, one set approximate to each end thereof. The number of cores in each set corresponds to the number of positive or negative electrodes to be suspended from the cover. All the cores 59 rest uniformly on the fusible cores 55 so that the slots, formed by these cores, open into the gas collecting chambers in the finished cover.

Openings in the top of the cover for the electrode hangers are formed by iron rod cores 61. These cores are supported by a template 62 which, in turn, is supported by the side members 40. The lowermost ends of the cores 61 are preferably tapered uniformly to a relatively small diameter to fit into the holes 63, shown in Figure 4, formed in the gas channel forming cores.

The pipe couplings 11 and 11*a* are provided in the top of the cover for the separate withdrawal of the gases from the respective gas collecting chambers and for cleaning the interior of the chambers. The lower ends of the couplings are pressed to a slight extent into the fusible core immediately below. The couplings may be held in fixed position by a template carried by the side members 40.

The couplings 66 are placed horizontally and held in place between the end members 41 and the fusible cores, preferably close to the bottom of the chamber forming cores.

In Figure 11 are shown nipples 65 and the pipe 67 which are in the form of short pieces of pipe, the lower ends of which are pressed to a slight extent into the fusible core immediately below. The nipples may be held in fixed position by a template carried by side members 40. These nipples are used subsequently for the purpose of withdrawing gas for analysis from the gas collecting chambers. In the operation of the electrolytic cell, the pipe 67 serves to indicate to the operator when the level of the electrolyte in the cell has fallen below a predetermined level.

We have found, when using solid fusible cores, that unless the heat, which is generated during the setting of the concrete, is removed by sufficient cooling, the fusible cores tend to expand and crack the concrete. We have overcome this difficulty by using fusible cores of hollow construction and have found that these hollow fusible cores expand inwardly without causing excessive stresses in the concrete.

In instances where the fusible core is in the form of a hollow shell, as illustrated in Figure 10 and described in detail hereinafter, it is preferred to have each of the couplings 11 and 11*a* extend a short distance into the shell of each core. Each coupling communicates with an opening extending into the interior of the shell to provide for the relief of any pressure on the walls of the cores resulting from the expansion of the air in the interior of the cores due to the heat evolved during the setting of the concrete.

The assembled form is ready to receive the concrete, during the pouring of which a vibrator (not shown) is alternately clamped on each end member 41 to facilitate the flowing of the concrete and to prevent the formation of air spaces, thereby resulting in a dense, strong structure free from points of weakness.

The concrete may be worked and levelled during the early setting period and the iron cores 61 may be rotated to loosen them in order to permit their easy removal when the concrete has solidified. When the concrete has solidified, the side and end frame members 40 and 41 may be removed and after the setting period has elapsed, the casting may be lifted from the bottom form 51.

The fusible cores 55 are removed by heating the casting to a temperature above the melting temperature of the core. When using a paraffin wax core, we prefer to immerse the casting in a bath of cold water, the temperature of which is then raised to about 158° F. The casting is maintained at this temperature for a period of time sufficient to permit the wax to melt and escape through one or more of the openings communicating with the gas collecting chambers.

When the bulk of the wax has been removed, the residual wax remaining in the hollow interior may be removed by means of live steam injected thereinto preferably facilitated by submerging the casting in a bath of hot water. After the wax has been removed, the casting may be cured in the usual manner.

It has been found that a core, or internal mould, of sufficient tensile strength to withstand the weight of the material cast around it, can be formed of material which is fusible at a relatively low temperature, such as paraffin wax, which is readily fusible at a relatively low temperature, and when in liquid form, is highly fluid and easily removable from the chambers formed in the casting through orifices which are provided in the castings to gain access to the hollow interior.

It has been found that a core formed of a high grade paraffin wax having a melting point of from 133° F. to 163° F. is very satisfactory but it will be clearly understood that equally satisfactory results can be obtained from other materials having relatively low melting points and relatively high fluidity when in the molten state.

The fusible core is very easily formed by pouring the molten material, such as paraffin wax, into a mould of suitable shape formed in a collapsible core box which may be constructed of wood or of other suitable material. The core box is preferably constructed in such a manner as to be easily disassembled when the core has set. The surface of the mould in the core box is preferably formed of material such as zinc or treated in such a manner as to present a surface to which the wax does not adhere. In this respect, the surface of the mould so exposed to the wax should be of a nature as to retain its original form when the core box is assembled and when exposed to the heat of the molten wax poured into it.

The mould in the assembled core box is filled with molten wax and then cooled, preferably by submerging the core box in cold water until the wax has solidified and hardened. The core box then may be disassembled and the fusible core removed from the mould.

The core, prior to use, is usually trimmed to remove any irregularities at its corners and its surface and is then ready for use.

In casting concrete, heat is developed during the setting. Solid fusible cores are not ordinarily affected by this heat unless the volume of concrete poured is such that the amount of heat developed would tend to cause deformation of the core before the concrete had set, in which case provision would have to be made to maintain the core at a temperature below that at which such deformation would occur. As noted

previously, the fusible cores should have a relatively low melting temperature, but the melting temperature must be above the formation temperature of the casting, that is, above the temperatures encountered during pouring and setting of the casting.

A furthr advantage results from the use of hollow, rather than solid, fusible cores, in that appreciable economy in core material is effected when the cores are produced in quantity. The hollow cores may be made by limiting the period of time of solidification of the wax in the cold water. As the wax hardens from the outside towards the centre, the core box is cooled for a period of time sufficient to solidify a substantial layer of wax, thereby forming a shell in contact with the mould. The molten wax in the centre of the core may be poured out through an opening left in the shell for that purpose. The core box is then disassembled in the usual manner, the opening in the shell is covered with a moulded wax plate which is sealed in place with molten wax, and the core is ready for use. While awaiting use, the cores are usually stored in cold water.

In using a hollow fusible core, as described hereinabove, it is usually advisable to make provision for relieving the pressure in the interior of the core. This pressure is caused by the expansion of the air due to the heat developed during the setting of the concrete. It has been found that openings 64, as shown in Figure 10, extending through the shell of each hollow core and communicating with couplings 11 and 11a, act as air release vents and serve to prevent any increase in the pressure within the hollow core.

It will be understood that modifications of the preferred embodiment of our invention may be made by others skilled in the art, in the light of the teachings herein, without departing from the scope of the invention as defined in the appended claims.

What we claim as new and desire to protect by Letters Patent of the United States is:

1. A mould and core construction for casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprises a bottom forming member, parallel and alternately spaced channel and groove forming cores supported by said bottom member and extending upwardly therefrom, spaced apart side and end forming members supported by said bottom member and enclosing said parallel cores, and fusible cores supported by said channel forming cores, said fusible cores having a relatively low melting temperature which is above the formation temperature of the casting, and detachable cores extending upwardly from said fusible cores above the uppermost surface of the resulting casting.

2. A mould and core construction for casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprises a bottom forming member, parallel and alternately spaced channel and groove forming cores detachably secured to said bottom member and extending upwardly therefrom, spaced apart side and end forming members supported by said bottom member and enclosing said parallel cores, and fusible cores supported by said channel forming cores, said fusible cores having a relatively low melting temperature which is above the formation temperature of the casting, and detachable cores extending upwardly from said fusible cores above the uppermost surface of the resulting casting, and reinforcing means supported by said fusible cores.

3. A mould and core construction for casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprises a bottom forming member, parallel and alternately spaced channel forming fusible cores and groove forming solid cores supported by said bottom member and extending upwardly therefrom, spaced apart side and end forming members supported by said bottom member and enclosing said parallel cores, and fusible cores supported by said channel forming cores, said fusible cores having a relatively low melting temperature which is above the formation temperature of the casting, and detachable cores extending upwardly from said fusible cores above the uppermost surface of the resulting casting.

4. A mould and core construction for casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprises a bottom forming member, parallel and alternately spaced channel and groove forming cores supported by said bottom member and extending upwardly therefrom, spaced apart side and end forming members supported by said bottom member and enclosing said parallel cores, and hollow fusible cores supported by said channel forming cores, said hollow fusible cores having a relatively low melting temperature which is above the formation temperature of the casting, and detachable cores supported by said side forming members and extending downwardly and terminating at said channel forming cores, and at least one hollow core extending upwardly from each of said hollow fusible cores and communicating with an opening extending into the interior thereof thereby providing an unobstructed opening extending from the hollow interior of the fusible core to the atmosphere.

5. A mould and core construction for casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprises a bottom forming member, parallel and alternately spaced channel and groove forming cores supported by said bottom member and extending upwardly therefrom, each of said channel forming cores sloping uniformly upwardly from each end to a point spaced apart a predetermined distance from the central vertical axes of said cores, said channel forming cores being alternately positioned whereby the highest points of one set of alternately spaced channel forming cores are in alignment on one side of the central vertical axes of the said cores and the highest points of the other set of alternately spaced cores are on the other side of said vertical axes, spaced apart side and end forming members enclosing said parallel cores, and spaced apart fusible cores supported by said channel forming cores, a fusible core being supported by the highest part of each set of said cores and extending the full width thereof, said fusible cores having a relatively low melting temperature which is above the formation temperature of the casting, and detachable cores extending upwardly from said fusible cores above the uppermost surface of the resulting casting.

6. A mould and core construction for casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprises a bottom forming member, parallel and alternately spaced channel and groove forming cores supported by said bottom member and extending upwardly therefrom, spaced apart

side and end forming members supported by said bottom members and enclosing said parallel cores, and two spaced apart fusible cores supported by said channel forming cores, a fusible core being positioned on each side of the central vertical axes of said parallel cores and extending the full width thereof, said fusible cores having a relatively low melting temperature which is above the formation temperature of the casting, and cores extending upwardly from said fusible cores above the uppermost surface of the resulting casting, and detachable cores supported by said side forming members and extending downwardly between the fusible cores and terminating at said channel forming cores.

7. A mould and core construction for casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprises a bottom forming member, parallel and alternately spaced channel and groove forming cores supported by said bottom member and extending upwardly therefrom, spaced apart side and end forming members supported by said bottom member and enclosing said parallel cores, and fusible cores supported by said channel forming cores, said fusible cores having a relatively low melting temperature which is above the formation temperature of the casting, detachable cores supported by the side forming members and extending downwardly and terminating at said channel forming cores, cores extending upwardly from said fusible cores, and at least one core extending horizontally from each fusible core to the end forming member adjacent thereto.

8. The method of casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprise erecting, on a base, a plurality of parallel and alternately spaced, upwardly extending channel and groove forming cores, and supporting, on the parallel channel forming cores, fusible cores having a relatively low melting temperature which is above the formation temperature of the resulting casting, enclosing the parallel cores with a form of predetermined height above the fusible cores, filling the form with concrete and permitting the concrete to solidify, removing the form and parallel cores, and heating the casting to a temperature above the melting temperature of the fusible cores, and removing the molten core material through openings in the casting.

9. The method of casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprises erecting, on a base, a plurality of parallel and alternately spaced upwardly extending channel forming fusible cores and groove forming solid cores, and supporting, on the parallel channel forming cores, chamber forming fusible cores having a relatively low melting temperature which is above the formation temperature of the resulting casting, enclosing the parallel cores with a form of predetermined height above the chamber forming fusible cores, filling the form with concrete and permitting the concrete to solidify, removing the form and parallel solid cores, and heating the casting to a temperature above the melting temperature of the said fusible core material, and removing the molten core through openings in the casting.

10. The method of casting, in one piece, a combined gas collector and cell cover for electrolytic cells of the tank type which comprises erecting, on a base, a plurality of parallel and alternately spaced, upwardly extending channel and groove forming cores, and supporting, on the parallel channel forming cores, hollow fusible cores having a relatively low melting temperature which is above the formation temperature of the resulting casting, enclosing the parallel cores with a form of predetermined height above the hollow fusible cores, filling the form with concrete and permitting the concrete to solidify, removing the form and parallel cores, and heating the casting to a temperature above the melting temperature of the fusible cores, and removing the molten core material through openings in the casting.

ALEXANDER WHITESIDE MOORE.
FRANK BENJAMIN MORAN.
HERBERT LOUIS CHRISTIAN.
DARCY DRUMMOND MORRIS.