Nov. 3, 1931. W. KLEITZ 1,830,397

CONCRETE MOLDING APPARATUS

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Fig. 1.

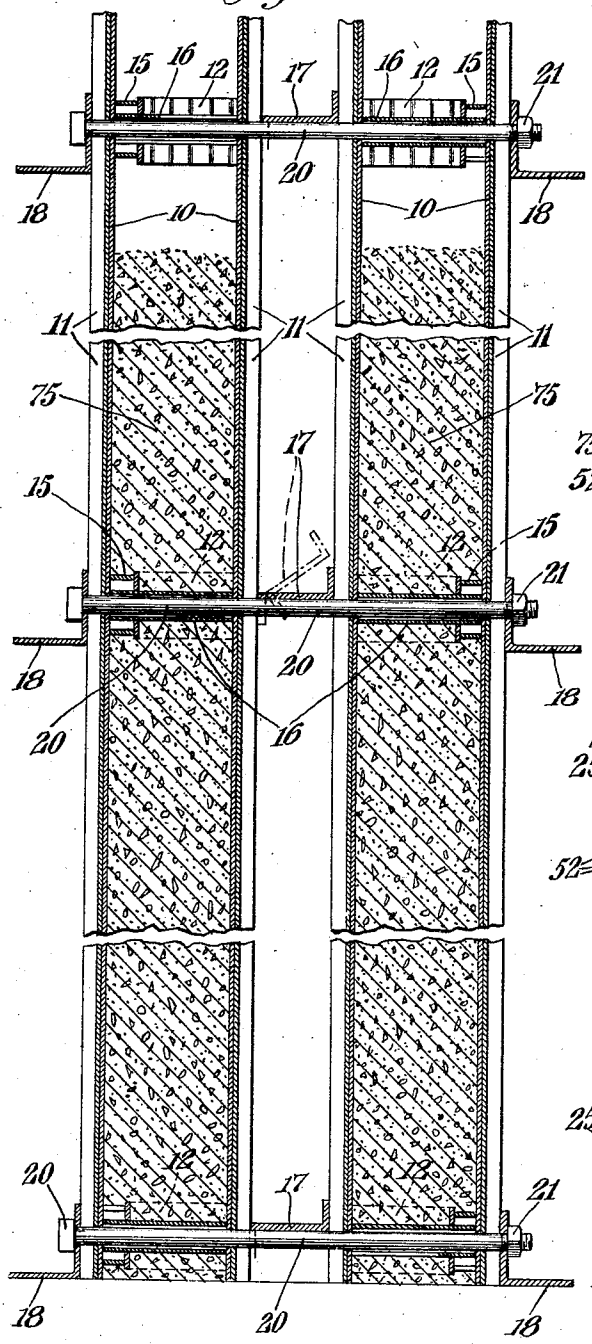

Fig. 2.

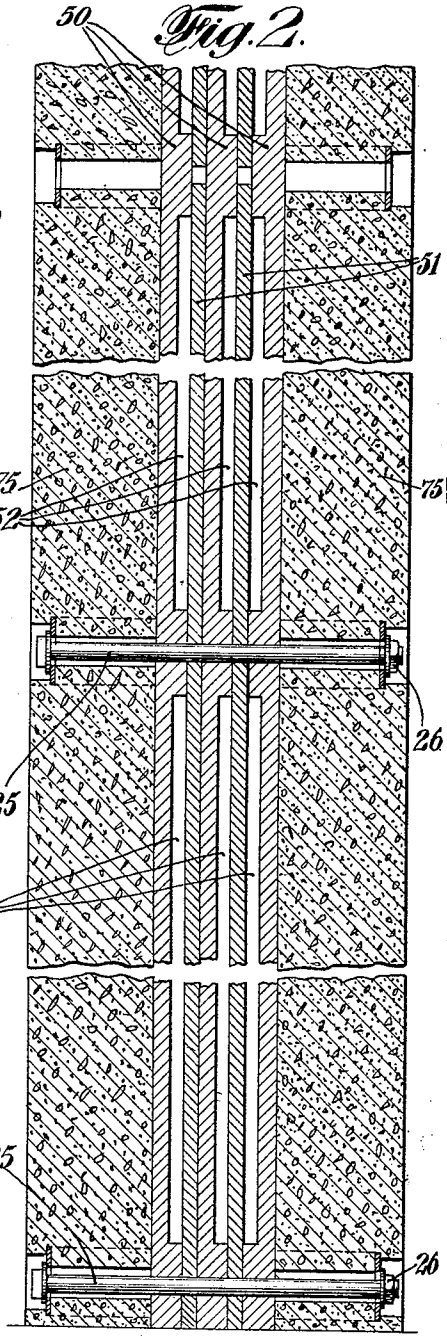

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Fig. 3.

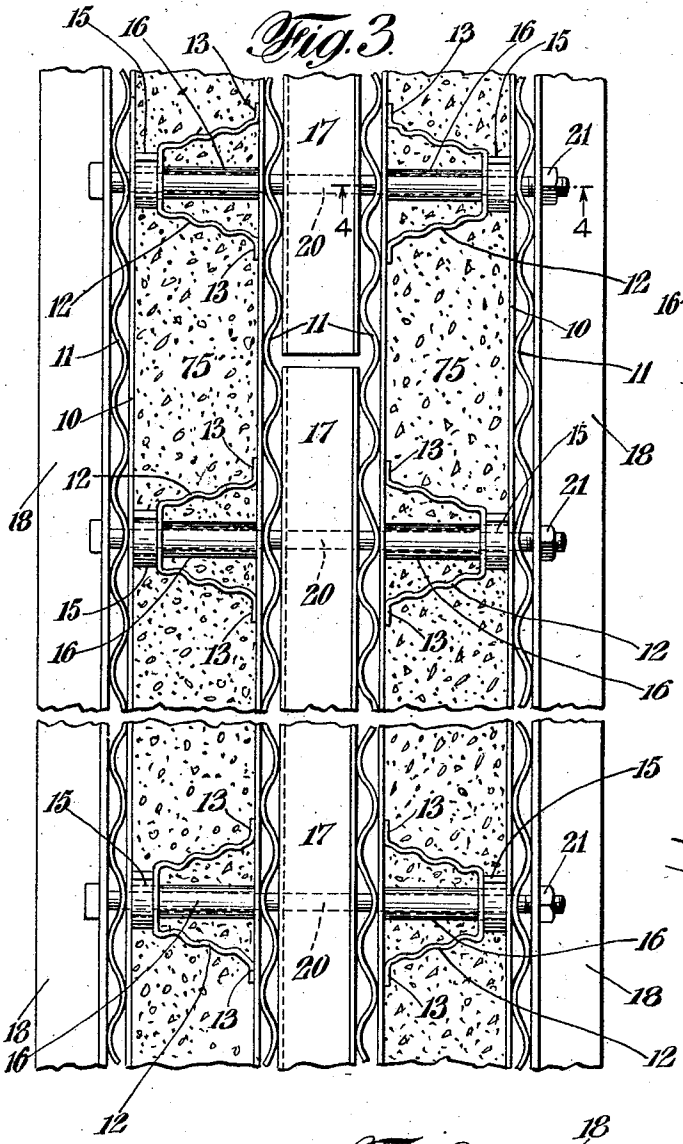

Fig. 4.

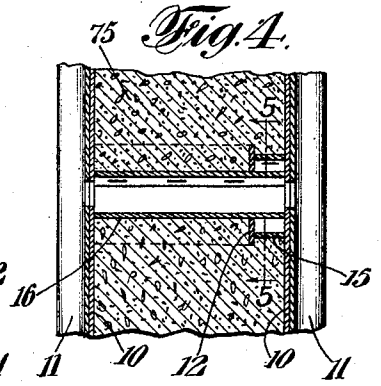

Fig. 5.

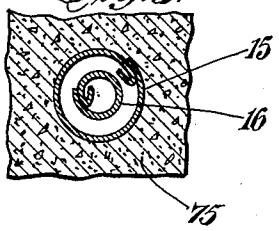

Fig. 6.

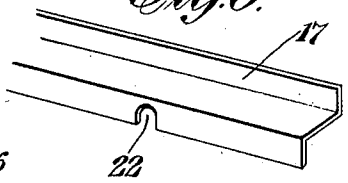

Fig. 7.

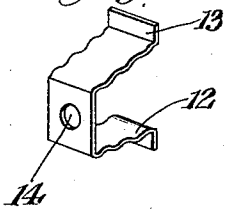

Fig. 8.

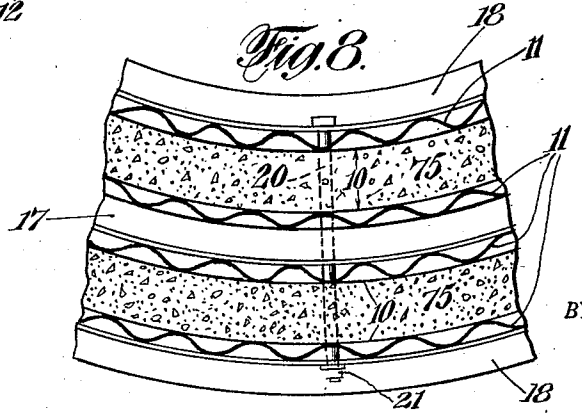

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Fig. 9.

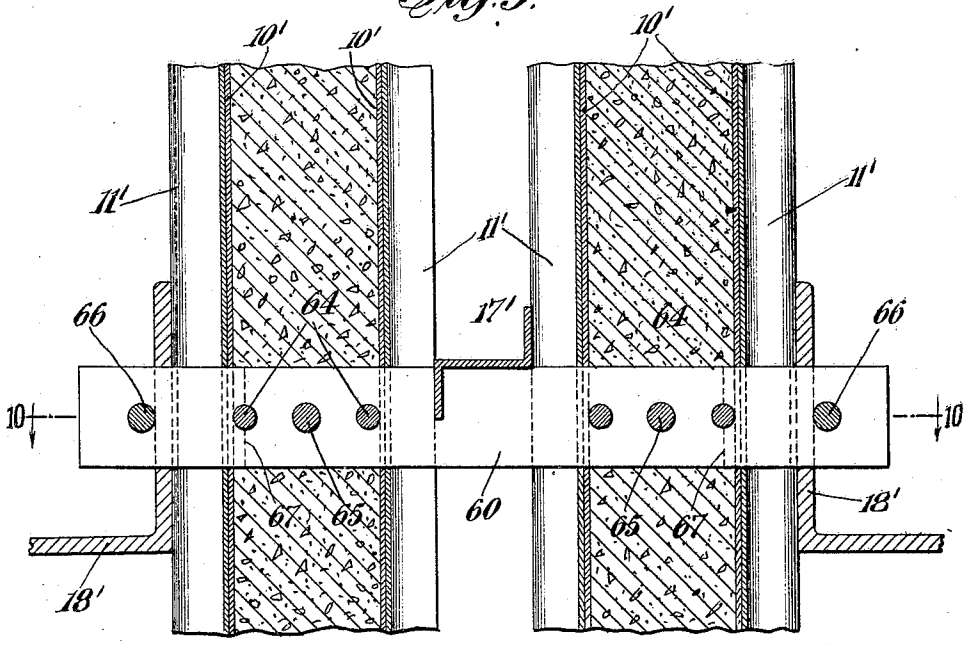
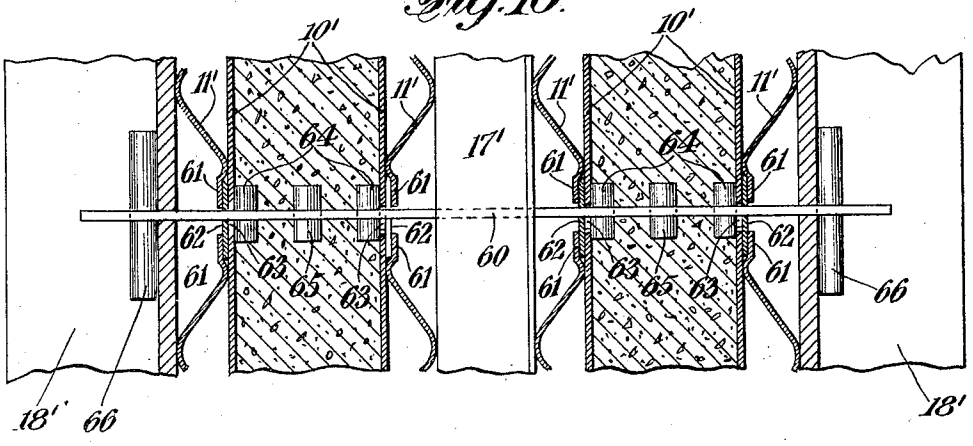


Fig. 10.



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UNITED STATES PATENT OFFICE

WILLIAM KLEITZ, OF ALBANY, NEW YORK

CONCRETE MOLDING APPARATUS

Application filed September 3, 1927. Serial No. 217,323.

This invention relates to concrete molding apparatus and more particularly to apparatus for the molding of poured concrete walls, floors, partitions and other like structures.

An object of the invention is to provide molding apparatus designed to enable the pouring of hollow or double concrete walls, floors, partitions and other like structures.

According to the invention, use is made of molds spaced apart and rigidly held in such spaced relation until the concrete poured in the molds has become sufficiently hardened to permit the removal thereof. Use is made in the invention of permanent spacing and reinforcing members and also of covered bracing members applied after the molds have been removed.

Other features and objects of the invention will become apparent by reference to the following detailed description read in the light of the accompanying drawings, wherein

Figure 1 is a view in vertical section illustrating an embodiment of the invention;

Fig. 2 is a similar view of the same structure with the molding apparatus removed, and with the spacing and insulating members in place;

Fig. 3 is a top plan view of the structure illustrated in Fig. 1;

Fig. 4 is an enlarged fragmentary section taken on the lines 4—4 of Fig. 3 with the connecting bolt removed;

Fig. 5 is a view in section taken on the lines 5—5 of Fig. 4;

Fig. 6 is a fragmentary perspective view of one of the spacing elements utilized in the invention;

Fig. 7 is a perspective view of one of the reinforcing and spacing yokes;

Fig. 8 is a plan view illustrating the application of the invention to the formation of a curved solid or hollow wall;

Fig. 9 is a fragmentary side elevation of a modified arrangement of the invention, and

Fig. 10 is a sectional elevation taken on the lines 10—10 of Fig. 9.

In carrying out the invention, use is made of a plurality of plates 10 which may be of sheet metal of the desired thickness, length and breadth. As before stated, the invention is especially applicable to the formation of walls, floors, partitions and other like structures, but, for the sake of brevity, such structures are hereinafter termed walls, and it is to be understood that the use of such term in the specification and claims is not to be considered a limitation of the invention. On one side of each of the plates 10 is secured a plate 11 which may be either a corrugated plate or any other deformed plate, but, for the purposes of illustration, such plates are herein illustrated as corrugated. These plates may be secured to the plates 10 in any desired manner such as by spot welding or by any other suitable means.

In the practice of the invention, use is made of a plurality of spacing and reinforcing yokes 12 preferably corrugated as shown and having flanged ends 13 and an opening 14 as illustrated. Use is also made of a number of rings 15 and a plurality of sleeves 16. Rings 15 and sleeves 16 are so constructed as to permit contraction radially whereby they may be removed from the hardened concrete at the proper time during the process of wall formation. For this purpose, the edges of each of these members overlap and the inner edge of each is bent back upon itself to provide a recess for the reception of a suitable tool for contracting the member. A number of Z-bars 17 and angle bars or wales 18 or other suitable support are utilized in the invention in the manner to be hereinafter explained in detail.

Having described the component parts utilized in carrying out my invention, the operation and use of the same is as follows. A number of the plates 10 having the corrugated backing 11 are placed in position as indicated in Figs. 1 and 3. In order that the plates between which the concrete is to be poured may be spaced apart, the yokes 12 are so positioned that the flanges 13 thereof rest against one of the plates 10. At the same time, the sleeves or collars 16 are so positioned as to extend through the openings 14 in the yokes 12. To further accomplish the purposes of spacing, the rings 15 are placed between those portions of the yokes having the openings 14 therein and the plate 10 op-

posite the plate against which the flanges 13 rest. A suitable bolt 20 passing through an opening in one of the wales 18 and having its head resting thereagainst passes through openings in the plates 10 and 11 in such a manner as to be completely encircled by the collar 16. The opposite end of bolt 20 passes through a similar wale 18 and a nut 21 is employed for securely holding the various parts in their correct position.

Since it is desired that the walls to be formed shall have a space therebetween, use is made of the Z-bars 17 having a number of openings 22 spaced at intervals along one of the flanges thereof. Such bars are spaced between the inner plates 11 in such a manner that the openings 22 rest over the bolt 20 to permit the flat portion of the Z-bar to seat on the bolt. When adjusted as shown in the drawings, these Z-bars serve to space the respective pairs of plates from each other.

Having tightened the nut 21 to the extent necessary to hold all of the parts firmly, concrete 75 may be poured into the space between the respective plates 10. After the concrete has become sufficiently hardened, it is desirable that the plates be removed for further use. To accomplish this, advantage is taken of the deformed or corrugated plates 11 which are spaced apart by the bars 17. Due to these corrugations, a suitable tool may be utilized for dislodging the bars 17 as illustrated in Fig. 1 to permit their removal. Any desired tool may be used for this purpose, the only requirements being that the tool be so shaped as to pass between one of the flanges of the Z bar and a depression in the corrugated plate 11.

Having removed Z-bars 17, the bolts 20 are withdrawn, permitting the removal of plates 10 with their accompanying plates 11. Since both the rings 15 and the sleeves 16 are capable of being contracted radially, a suitable tool may be utilized for contracting these members and for causing their removal from the concrete. It should be noted at this point, however, that the yokes 12 remain embedded in the hardened concrete. The removal of rings 15 and sleeves 16 leave openings in the concrete which may be used for the reception of a bolt 25 for permanently holding the walls in spaced relation. As shown in Fig. 2, the head of the bolt 25 rests against one of the yokes 12 while the nut 26 on the other end thereof rests against a corresponding yoke. In order that the two sections of concrete may be permanently held in spaced relation and further in order to provide a more perfect insulation, use is made of the following arrangement. Before the permanent bolts 25 are placed in position a number of continuous spacing strips 50 extending from top to bottom of the structure and of any desired width and thickness are placed in position. The strips are preferably of width substantially equal to the head of yoke 12 and for convenience are provided before insertion between the concrete sections with holes for the passage therethrough of bolts 25. Between the respective spacing strips are placed boards 51 of any desired composition, such being well known to the art, having their edges joined together in any suitable manner to provide a continuous dividing wall of extent equal to that of the concrete walls. These boards for the sake of convenience may also be provided before installation with holes for the passage of bolts 25. For the purpose of providing a continuous air passage between the respective layer of composition boards a portion of each of the spacing strips 50 is cut away as indicated at 52. The air passage so produced serve to better insulate the structure than has been found to be true with an arrangement consisting of a number of separate air chambers. After the bolt 25 has been placed in position, the remainder of the opening furnished by the withdrawal of rings 15 may be filled with concrete to preserve the continuity of surface of the wall.

In the event it is found undesirable to make use of permanent bolts the embodiment illustrated in Figs. 9 and 10 may be used especially for light structures. This arrangement is composed of flat plates 10′ and deformed plates 11′ as in the structure previously described. In this structure parts corresponding to those hereinbefore described are given the same reference characters with the addition of a prime to each numeral. Instead of the bolts 20, use is made of relatively thin metallic tie bars 60 provided with a number of holes for the reception of pins. In order that the sections of forms 10′ with their deformed plates 11′ may be connected together each edge of the deformed plates 11′ is bent as indicated at 61 whereby a spline 62 may be inserted between the bent portion 61 and plate 10. Splines 62 are of the same length as the plates 10′ and are provided with upset portions 63 of thickness equal to that of plates 10′. The splines and their upsets are recessed at intervals to accommodate the tie bars 60, such recesses extending inwardly from one edge thereof to such a distance that the recesses in the upsets are of depth approximately equal to the thickness of the tie bars.

Before the forms are assembled for use it has been found advisable to insert pins 64 and 65 in holes extending through the tie bars. Referring now to Fig. 10 the upper pairs of forms 10′ are first placed in the vertical position. The bars 60 are then spaced along the edges of the forms and positioned by slipping the spline 62 under the shoulders 61 in such a manner that the tie bars are seated in the recesses in both the splines and the upsets thereon. It will be noted by refer-

ence to this that the edges of the upper forms 10′ and 11′ rest substantially against the tie bars 60. The lower form 10′ may then be positioned and held in place by permitting the previously free edges of the splines to slide under the shoulders 61 of these forms until the edges of forms 10′ closely approach the edges of upsets 63. Thus the openings between the edges of the forms 10′ is closed by splines 62 and their upsets 63. Z-bars 17′ are placed as shown to properly space the pairs of forms while wales 18′ having apertures therein are placed against the outer forms 11′ and held in place by pins 66. Concrete may then be poured into the forms and permitted to harden sufficiently for the removal of the forms. After the forms have been removed the protruding portions of the tie bars 60 may be broken off, such procedure being facilitated by previously scoring or otherwise weakening the bar at the points indicated by dotted lines 67. If so desired the pins 64 may be removed and the openings left thereby filled with concrete to preserve the continuity of surface of the walls. Since the tie bars remain in the concrete and are prevented from being withdrawn in either direction by pins 65, they serve to hold the walls properly permanently spaced. If it is desired suitable insulating material may be inserted between the walls in any desired manner.

It is to be understood that the present invention is not to be limited by the illustrated embodiments but is to be limited only to such structures and arrangements as are defined by the following claims.

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

1. A mold of the character described, including units composed of molding plates and deformed backing plates thereon, said parts being arranged in two pairs of said units spaced apart and adapted to receive concrete poured between the molding plates of each pair of units, and spacers located between the pairs of units and engaging the deformed backing plates, said spacers comprising Z-bars and adapted to be removed by the insertion of a tool through a space provided by the deformed backing plates.

2. A molding apparatus of the character described, comprising two pairs of plates spaced apart, deformed backing plates secured to the first-mentioned plates, yokes between the plates of each pair, sleeves within and passing through the yokes, collars between the yokes and the plates, and members securing said parts together, said sleeves and collars adapted to be removed after the molding operation for the accommodation of securing bolts and nuts thereon.

3. A molding apparatus of the character described, comprising two pairs of plates spaced apart, corrugated backing plates secured to the first-mentioned plates, yokes between the plates of each pair, sleeves within and passing through the yokes, collars between the yokes and the plates, and members securing said parts together, said sleeves and collars being radially contractile whereby they may be contracted and removed from the wall for the accommodation of securing bolts.

4. A molding device of the character described, including two pairs of plates spaced apart and adapted to receive poured concrete between each pair, corrugated plates secured to the backs of the first-mentioned plates, yokes located between the pairs of plates, sleeves within and passing through the yokes, collars between the ends of the yokes and the first-mentioned plates, angle bars outside of the outside corrugated plates, holding bolts projected through said last-mentioned bars, all of said plates and through the sleeves, collars and yokes, and nuts on the ends of said bolts.

5. A molding apparatus of the character described, including two pairs of plates spaced apart and adapted to receive poured concrete between each pair, corrugated plates secured to the backs of the first-mentioned plates, yokes located between the pairs of plates, sleeves within and passing through the yokes, collars between the ends of the yokes and the first mentioned plates, angle bars outside of the outside corrugated plates, holding bolts projected through said last-mentioned bars, all of said plates and through the sleeves, collars and yokes, nuts on the ends of said bolts, and spacers comprising Z-bars capable of removal or displacement by the insertion of a tool along a corrugated plate.

6. In apparatus of the character described the combination comprising two pairs of molding plates, removable rods extending through said plates, means supported by said rods for spacing said pairs of molding plates, parts between the plates of each of said pairs of plates supported by said rods and substantially perpendicular to said rods which are adapted to remain embedded in concrete poured between the plates of said pairs of plates, and collars between said parts and the outer molding plates of said pairs of plates having substantially greater diameter than said rods.

7. In apparatus of the character described the combination comprising two pairs of molding plates, removable rods, means for spacing said pairs of plates supported by said removable rods, parts between the plates of each of said pairs of molding plates adapted to remain embedded in concrete poured between the plates of said pairs of plates and having portions thereof which are substantially parallel to said molding plates and which have holes therein through which said rods pass, means for maintaining said parts

at predetermined distance from the inner plates of said pairs of molding plates and collars between said parts and the outer plates of said molding plates having substantially greater diameter than said rods.

8. In apparatus of the character described for making hollow cementitious forms, the combination comprising two pairs of molding plates, means for spacing one pair of molding plates from the other pair of molding plates, means for spacing the plates of each pair from each other, means for maintaining between the plates of each of said pairs of plates opposite parts adapted to be embedded in concrete poured between the plates of said pairs of plates, a portion of said parts being substantially parallel to said molding plates and having a hole therein, removable means for making holes registering with the holes of said parts in concrete poured between said parts and the inner molding plates of said pairs of plates and means for making holes having a larger diameter than the holes in said parts in concrete poured between said parts and the outer molding plates of said pairs of plates.

9. In apparatus of the character described for making hollow cementitious forms, the combination comprising two pairs of molding plates, means for spacing said molding plates, a part adapted to be embedded in concrete poured between the plates of said pairs of molding plates having a hole therein, means for maintaining said part in position, removable means for making in concrete poured between the inner surface of said part and an inner molding plate of said pairs of plates a hole registering with the hole in said part and means for preventing poured concrete from covering outer surface of said part adjacent the hole in said part.

In testimony whereof, I have signed my name to this specification.

WILLIAM KLEITZ.