

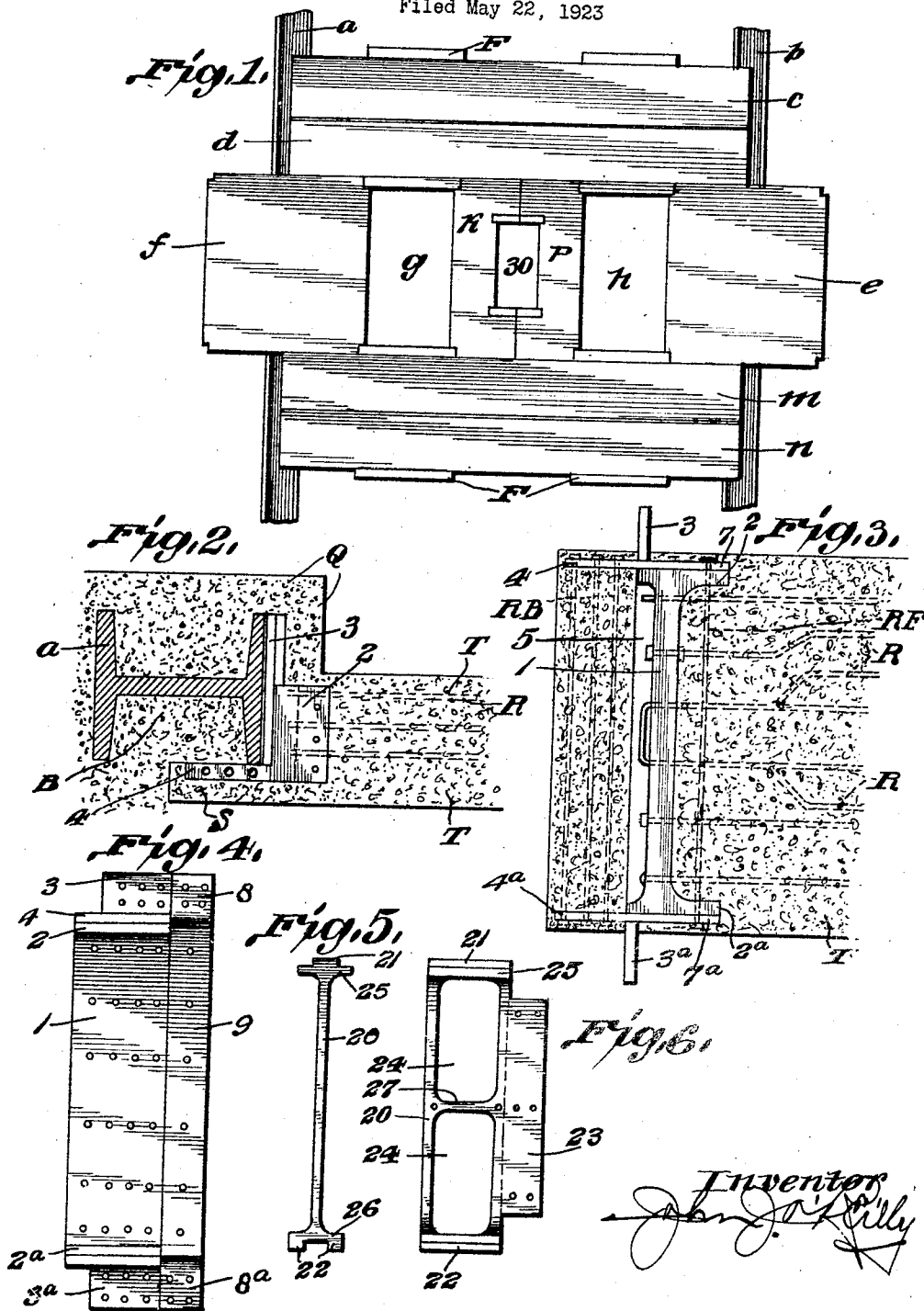
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MASONRY AND CONCRETE WALL AND BEAM CONSTRUCTION

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MASONRY AND CONCRETE WALL AND BEAM CONSTRUCTION.

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To all whom it may concern:

Be it known that I, JOHN JAMES O'REILLY, a citizen of the United States, and resident of the borough of Bronx, in the county of Bronx and State of New York, have invented certain new and useful Improvements in Masonry and Concrete Wall and Beam Construction, of which the following is a specification.

This invention relates to a method or process of fabricating, manufacturing and erecting re-inforced concrete walls, partitions, slabs, beams, girders, etc., with integral facings of any natural or artificial mineral, stone, cementitious, plastic or other finish, without the use of forms except as hereinafter mentioned, and in units suitable for transportation and erection at a building site distant from the point of manufacture, in a manner similar to that used at present for structural steel, and has for its object to render the fabrication, manufacture, transportation and erection of said walls, partitions, slabs, beams, girders and other units more expeditious, dependable, safer and among other things cheaper by minimizing the amount of skilled labor necessary to obtain the end desired. The product of the process or method is herein-after referred to as fabricated concrete.

One method illustrated herein pertains to curtain wall construction employing structural steel columns and girders with fabricated concrete walls and floor beams, although the columns and girders may likewise be of fabricated concrete.

The second method illustrated herein-after refers to bearing wall construction with fabricated concrete walls and floor beams, but the floor beams used in the latter type of construction may be of wood or any other material generally used for the purpose.

Referring to the accompanying drawings in which,

Fig. #1 shows a part elevation of the exterior wall.

Fig. #2 is a plan showing the method of connecting a fabricated concrete spandrel beam to a structural steel column.

Fig. #3 is a side elevation of the column connecting member.

Fig. #4 is a front elevation of the column connecting member.

Fig. #5 is an end elevation of the wall connecting member.

Fig. #6 is a side elevation of the wall connecting member.

In Figure #1 (a) and (b) are structural steel columns, (c), (d), (m) and (n) are fabricated concrete spandrels, (e), (f), (k) and (p) are fabricated concrete wall section units. (F) is a window sill or lintel. (g), (h) and (30) are window openings.

In Figures 2, 3 and 4 (1) is the column connection member, (2) and (2^a) are the top and bottom flanges of the column connection member, (3) is the upper leg of a connection angle fastened to (2) in the shop and to the column in the field, (7) is the lower leg of the same angle, (4) is a section of the upper leg (2) turned at right angles to act as a support for the cantilevered section of the spandrel extended to the center of the column (a). (3^a), (4^a) and (7^a) are the reverse of (3), (4) and (7) at the lower part of the spandrel. (B) is the exterior haunch of the column (a). (Q) is the outline of the fireproofing around the inner face of the column (a). (r) is the outline of the top and bottom of the fabricated concrete spandrel. (R) is the re-inforcing used in the fabricated concrete unit which may vary as desired. (5) is the hollow space in the back of the column connection member to be sealed after the re-inforcing is in position. (8) and (8^a) are the upper and lower splices of the inner connection plate (9). (S) is the cantilevered portion of the spandrel extending to the center of the column, which is supported by the top and bottom flanges (4) and (4^a) through which run the tie rods (R.B.).

In Figures 5 and 6 (20) is a part section of an I beam cut away as shown at (24) to form a bond with the fabricated concrete. (21) is the connection blocking and (22) is the connection toothing. (23) is an extended flange for a floor beam connection.

Similar numerals and letters refer to similar parts throughout the several views.

It is intended to make a complete wall of units similar to (c), (d), (e), (f), (h), (p), (m) and (n), etc., and to form openings similar to (g), (h) and (30) into which window frames may be inserted, and the method to be employed to make one of these units and to erect same is somewhat as follows:

The spandrel beam (m) is first designed according to the best engineering practice in the same manner as an ordinary reinforced concrete beam with the spacing and placing of the re-inforcing as desired and using any type of re-inforcing necessary to give the proper cross section of metal throughout, with provision for taking care of any and all stresses in the span. The column connection members for each end of the spandrel are then made to meet the specific condition, likewise the wall connection members with or without extended flanges (23) as desired. The window sills and lintels are included as part of the adjoining spandrel to insure fireproofing of the steel around the opening, and in this case would consist of the two sills for openings (g) and (h). The re-inforcing is cut, shaped, tied, etc., in the usual manner for re-inforced concrete work, the longitudinal members passing through the holes or apertures provided for them in the wall connection members and also through the holes provided in the face of the column connection member (1). The ends of the re-inforcing are then sealed in the chamber (5) in the back of the column connection member with molten metal or otherwise in such a manner that they are held rigidly in position without loss of tensile strength, or they may be bolted, riveted or looped through as shown in Figure #3 or they may be tied, welded or otherwise fastened. The column connection members are then bolted to the rigid arms of a traveling hoist in such a manner that they are held in a perfectly true position.

A flat platform having been provided on which is laid a heavy paper with the brick and joints or other material marked out in pattern in full size. The brick or other facing material which is made as nearly the thickness of ordinary wall tile as possible are laid in position to form the bond, and a curb form built around the unit with the top open. The joints (if there are any) are then grouted in with mortar and immediately a thin layer of concrete is poured over the upper face of the mass. The traveler bearing the reinforcing, etc., is then placed in the proper position over the mass and the balance of the concrete poured to give any thickness of wall desired. Membranous or integral waterproofing or damp-proofing

materials may be introduced in the body of the wall at any stage of the proceedings providing it does not break the bond to a greater degree than deemed advisable, or the wall may be made hollow by building in hollow material or by building in collapsible forms which may be removed after the concrete is set, or otherwise. Furring anchors or furring material may be built into the inner face of the wall. Masonry or any substance similar to concrete, or any fireproof material which will harden under the application of heat, or by drying out of the moisture contained therein, may be used as concrete where mentioned above, and the re-inforcing may be a fabricated steel frame running continuously through the fabricated concrete unit. The inner surface of the unit may be plastered or stuccoed or finished in any manner desired, or it may be left in the rough concrete state. Lunette shaped eye bolts are built into the upper part of the unit, for lifting in transportation and erection, in such a manner that they may be easily removed where they project beyond the wall.

To meet the requirements of different building codes the brick or other facing material may be made of varying thicknesses to give a better bond through the wall, or they may be cut away or built out in the back to allow the concrete to make a better bond with them, or each brick, or stone or other unit may be made of a number of smaller pieces huddled together with well defined joints forming the outline or pattern or bond as desired, in which event if the latter method be adopted the particles of brick, stone or other material act as an aggregate in the concrete and the wall cannot be classified structurally as veneered. Wood grounds or anchors may be built into each unit for the purpose of fastening copper or other material. If any stone susceptible to polishing such as granite or marble be used for a facing it may be polished either before it is built into the unit or after the concrete has set. The balance of the wall for an entire building, including the parapets, etc., may be made in a similar manner, that part of the wall which is to be erected between two spandrels and two window openings and which will be hereinafter referred to as a wall panel (f) (h) (p) (e) being made with wall connection members only unless it occurs directly in front of a column in which case re-inforcing rods will be left projecting beyond the inner face of the unit to be built into the concrete or masonry fireproofing back of the column.

In bearing wall construction the fabricated concrete units are made in essentially the same manner as for curtain wall construction except that different thicknesses of wall may be used in the same structure and

ordinary stirrup irons or other supporting members may be built into the wall units for supporting wood floor beams or other dependent or tying in bodies. Where the spandrels support the floor load they will of course be designed with the necessary strength.

Architectural or other projections or reveals in the face of the wall may be formed by means of a recessed or raised panel on the platform when fabricating the unit, with special re-inforcing being provided where the projection or reveal is considerable compared to the thickness of the wall.

Where it is desirable to use more than two spandrels between the wall panels of one floor and the wall panels of the floor above the intermediate spandrel or spandrels may be flush on top and on the bottom without sills or lintels.

Where a decided projecting pilaster effect is desired at the columns for architectural reasons, a continuous series of panels may be used from grade to roof to conform with the desired width of the pier or pilaster and with provisions for special reinforcing to project beyond the inner face of the wall to be wrapped around the structural column and built in with the fire-proofing in the back of the column as explained previously, and in that event the spandrels would stop at either end of the column and the cantilevered member (S) with the flanges (4) and (4^a) and the rods (R B) would be omitted.

Where small windows such as bathroom windows occur in conjunction with larger window openings (30) Fig. 1 the smaller windows are treated as apertures in the wall panel unit in which case the sills and lintels and possibly the window frames and sash are built into the panel or panels and the concrete around the opening re-inforced accordingly.

The top and bottom flanges (2) and (2^a) of the column connection member are designed to withstand the torsion and other stresses at and near the point where the concrete and the connection member are joined and the view shown in Fig. 3 shows only a simple method of accomplishing this for a small span, but where deemed necessary these members (2) and (2^a) and the rest of the column connection will be enlarged and extended and changed as to shape and design and may be fabricated instead of being made in one piece, especially where it is possible to use re-inforcing other than rods and bars; in fact, they (2) and (2^a) may be dispensed with altogether, or they may be projected through the length of the spandrel from one connection member to the other, and in the latter case the re-inforcing may be secured to the flanges only instead of to the web. Where the face of the web adheres to the

concrete as shown in Fig. 3 it may be roughened by any practical means such as scoring with a lathe, or by burning with an acetylene torch, or by welding or otherwise fastening suitable pieces of material to the face thereof; one very practical means being to heat the connection plate to point below fusing and pressing particles of brick or similar material partly into the metal leaving enough projection to give a very rough surface to which the concrete may adhere. The rods (R F) extending through the flanges Fig. 3 and tied to the reinforcing also tend to secure the concrete to the column connection member.

The ways and means of securing the column connection to the column in the field will be varied as the conditions warrant, the general idea being to provide an upper and inner connection flange (3) and (9) for a top spandrel; an inner connection (9) for an intermediate spandrel, and a lower and inner connection (3^a) and (9) for a lower spandrel, designed as to size, strength, number of bolts or rivets or other means of connection and arrangement to suit each specific condition, but the spandrel may be hung and supported entirely outside or inside the column or other support. Other sizes and dimensions throughout will likewise vary to suit each condition; the units may all be suspended vertically or diagonally from structural steel spandrel beams or other supports and the units may be fabricated and erected in smaller or larger units and in different arrangements than indicated on the drawings Fig. 1.

At the corners of the building the wall spandrels are extended and mitred or toothed and the wall panels at the corners are made with sufficient return on both faces to form a rigid corner.

The materials used and the proportions of each will be dependent on each specific requirement, but non-corrosive metals will be employed where possible with due allowance for prevention of electrolysis. Struts or supports other than metal columns or spandrals may be used for supporting all or part of the wall.

In forming the wall panel units the wall connection members (20)—(21)—(22)—(25)—(26) Figs. 5 and 6 are intended to extend through the unit from top to bottom and may be as long as desired, running with the length of the wall, or at right angles thereto as shown in Fig. 6 and will have as many apertures such as (24) Fig. 6 as desired, providing sufficient allowance is made for bonding between the concrete and the tie members (27) Fig. 6 and they may be secured to the re-inforcing by any practicable means so as to supplement each other. The tongue or blocking member (21) on top of the wall connection member is designed to

fit into the groove or toothing (22) in the bottom of the next higher unit, to form a slip joint connection, but where desired two units may be bolted or otherwise fastened together by cutting away the concrete around the top and bottom flanges at (25) and (26) Figs. 5 and 6 and patching same after the fastening in the field is complete. The same general result may also be obtained without extending the wall connection member (20)—(21)—(22)—(25)—(26) through the unit from top to bottom; in other words by making it in two parts to save material.

The fabricated concrete floor beams will be made in the same general way as the wall spandrels, except that they may or may not be faced, and the connection member will be arranged to suit the different connection conditions. They will be erected in a manner similar to the present practice for erecting structural steel beams, the exposed metal at the connection being fireproofed after erection in the field. The fabricated concrete spandrels may not necessarily be designed to support the floor beams where it is desirable to use additional structural steel spandrels or other separate supporting members.

After delivery at the building site, the structural steel or supports having been erected, the fabricated concrete units will be erected in a manner similar to the present practice for structural steel.

A series of spandrels are first erected which are then coated on top with a bed of mortar upon which is set the wall units, they in turn being covered on top with a bed of mortar and braced in position until the spandrels above are in position. The column connection members may be temporarily bolted or permanently fastened in position as they are erected and the exterior haunch (B) of each column is filled up with suitable material as the work progresses.

In erecting a bearing wall the ends of the spandrels are fastened together, the structural column being omitted, but in some cases a continuous metal strut will be erected in lieu of the column to stiffen the wall, and for wind bracing, and for other obvious reasons. The rest of the erection will proceed generally as outlined for curtain wall construction. The connection at the ends of the spandrels on the inner face of the wall will be fireproofed after erection in a manner similar to the method used for fireproofing the back of the columns or struts (Q) Fig. 2.

Parapet walls will be erected in a manner similar to the rest of the wall. Where door openings or other large openings occur metal struts and cross pieces will be erected to form auxiliary columns. The temporary lifting lunettes are removed where they project beyond the wall as each unit is erected.

After erection the wall may be washed down, joints pointed and small repairs made as is customary with masonry work.

Objectionable straight joints at the connections may be hidden by pointing up some of the joints with colored mortar to match the wall facing material.

It can be readily seen from the above that I have provided a new and unique method of fabricating and erecting re-inforced concrete units with integral or veneered facings or finishes that will enable one familiar with the trade to erect a complete superstructure for a building or any other structure where this method or process is practicable for the purpose, whether of curtain or bearing wall or re-inforced concrete construction or a combination of any of them, using solely fabricated concrete units, or by using fabricated concrete units in conjunction with any other materials used in building construction, and that the adoption of my method would materially lessen the dangers, uncertainties and delays accepted as part of the present day method of construction, would practically eliminate waste, and likewise eliminate scaffolding, falsework, hand labor and weather delays would standardize production, quality and costs and reduce the element of gambling in estimating to a minimum. The nature of building is of necessity so varied that no rigid rule as to details of construction would have universal application; architectural, engineering and other designs and conditions would have to be met in each individual case and no attempt has been made to enumerate in detail the endless variety of materials and methods that could be employed to overcome individual cases without changing the general idea of the methods and processes outlined in this petition which would remain fundamentally the same; namely, units of practicable size and of nearly universal application suitable for erection without employing highly skilled hand labor—veneered or integral facings and finishes; solid metal to metal connections fastened to the units without loss of strength to the members involved; provision for waterproofing, weatherproofing, fireproofing and preventing corrosion; efficient quantity production without material damage to forms or equipment and without the use of highly skilled hand labor and the saving of expensive materials such as metals, brick, stone, etc., by using the minimum of each supplemented by the use of commoner materials which is made possible by the unique method of fabrication.

I claim:

1. A building construction panel unit, comprising a frame structure, layers of reinforcing material carried thereby spaced from the inner and outer faces of the frame and from each other, concrete molded in said

frame between and on the outer sides of said reinforcing members, and means on the frame for securing a unit in the building wall.

5 2. A building construction panel unit, comprising a frame having side and end members, layers of reinforcing members having their ends extending to the sides and
10 ends of the frame arranged in spaced relation to each other and the inner and outer faces of the frame, concrete molded in said frame between and on the remote sides of
15 said reinforcing members, and means on the frame for securing the unit in the building wall.

3. A building construction panel unit, comprising a frame having side and end members, layers of reinforcing members
20 having their ends extending to the sides and ends of the frame arranged adjacent to the inner and outer faces of the frame, a finishing face comprising blocks or particles of

finishing material fitted together and extending in one of the faces of the frame outside of the re-enforcing members, and concrete molded in said frame between and on the remote sides of said reinforcing members and in the interstices between the finishing parts to hold them in place.

4. A building construction panel unit, comprising a frame having side and end members, layers of reinforcing material having their ends extending to the sides and ends of the frame arranged adjacent to the inner and outer faces of the frame, concrete
35 molded in said frame between and on the remote sides of said reinforcing members, and an overlaid facing on one side of the panel integrally united with the concrete molded
40 in the frame construction.

Signed at New York city, in the county of New York and State of New York, this 14th day of March, A. D. 1923.

JOHN JAMES O'REILLY.