

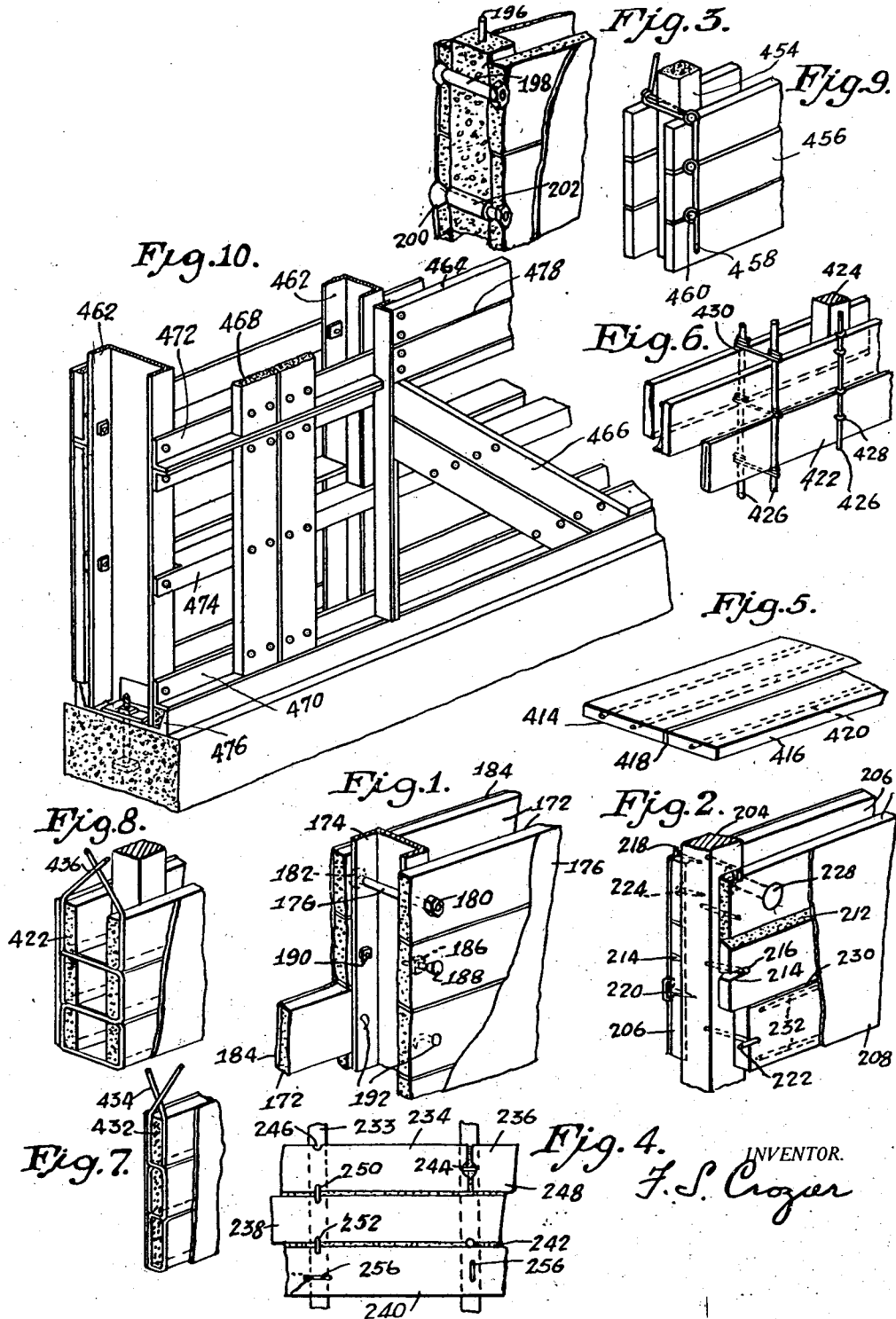
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CONCRETE WALL AND STRUCTURE

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CONCRETE WALL AND STRUCTURE.

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This invention relates to walls and structures, especially frame buildings in which concrete boards and other lumber units made of ordinary wet mix Portland cement concrete are used in combination with a supporting framework. The units are usually provided with elements for facilitating their fastening to the frame. The units may be reinforced, ornamented, or provided with roughened surfaces if desired.

Preferably my concrete boards are approximately of the same thickness, width and length as wooden boards.

The elements provided for facilitating the fastening of the lumber in place are sometimes metallic devices and sometimes are merely holes, slots, notches, or indentations in the concrete. Sometimes the perforations are metal lined and they may be countersunk to accommodate heads of bolts or other fasteners. When a nailable frame such as wood studding is used I prefer to make the boards or other lumber units of cinder concrete into which nails can be driven after the concrete has set and hardened and to secure the units to the wall or structure by the aid of screws or driven fasteners that preferably go through the unit in contact with the concrete thereof. Other means can be used for fastening the concrete units together or to the structure, including cementitious mortar, stucco, concrete etc. put between or upon the units or upon a sheathing composed of the units at least in part. Metallic rods, bars or wires may be set vertically against the face of the said sheathing and secured thereto or to the units thereof or to the frame or supporting elements of the wall or structure or to another sheathing on the other side of said elements, the rods, bars or wires and exposed metal fasteners preferably being covered by or embedded in stucco or other cementitious mixture. The rods, bars, or wires help reinforce and strengthen the entire wall and tie its elements strongly and permanently together and prevent any uneven settling that might crack the concrete lumber units. Usually ordinary fence wire can be used. When desired it can be put in the wall vertically, horizontally or otherwise, twisted around nails or other fasteners that are driven through or between the concrete units composing the sheathing or otherwise secured to the wall or structure or elements thereof, the wire when desired be-

ing threaded through perforations or indentations in the units or the sheathing or sheathings. In some walls or structures I prefer to use wires to form a woven fabric composed in part of concrete boards or other lumber or cementitious units woven together with or by the aid of wires to form a wall, partition, floor or roof sheathing, covering or structure, or two such sheathing faces of a wall or partition tied together with or by the aid of such wires or other means preferably woven around at least some of the cementitious units of one or both sheathing faces and/or the frame elements. In other cases I prefer to use a flat metallic bar or angle iron set vertically against the face of the cementitious sheathing units and secured to the wall or to the frame or supporting element by bolts or other means, the bar or angle iron being preferably covered by the stucco or other cementitious coating.

Another important feature of my improvement is special supports for the sheathing or cementitious units thereof, such supports being used when desired, being preferably rigidly attached to the frame or other element of the wall or structure to which such support transfers at least part of the weight of the sheathing or of some of its heavy concrete units which rest on the supports. The supports are usually metallic, for example, angle irons set horizontally in or against the wall or structure with their flanges extending outwardly to make a shelf on which to rest the edge or ends of the cementitious boards or other units. When desired the units can be bolted or otherwise fastened to the vertical web of the angle iron which preferably is long enough to engage two or more vertical frame or supporting elements of the wall or structure and to which the angle iron supports are bolted. When desired similar supports can be used in floors, roofs and ceilings in a little different way in combination with the cementitious units and frame elements.

Preferably I use a channel iron or other metallic supporting element placed horizontally on top of and secured to the foundation of the building or structure and on which rest and to which is anchored the vertical frame of the wall or structure. This channel projects each way far enough so that the sheathing units can rest thereon thus distributing and equalizing the weight of the

sheathing and preventing cracking thereof when the foundation settles. In some buildings instead of having masonry foundation extending from the concrete footing at the bottom of the cellar to or above the surface of the land, I prefer to dispense entirely with such foundation, starting the frame and sheathing on the concrete footing. In that case I prefer to use asphalt or other water excluding means in connection with such footing and on the part of the sheathing that is below the surface of the land, the concrete boards or planks comprising the exterior sheathing of the wall below the surface of the land preferably being thicker and/or reinforced. This form of construction simplifies, expedites and cheapens building, particularly inexpensive bungalows and other homes.

When the frame element of a wall or structure is iron or steel, for example, steel channel-iron I prefer to use a threaded bolt, screw or other threaded metallic fastener having a head larger than the stem of the bolt to secure the lumber units thereto, although other fastening means can be used as desired in any wall or structure to facilitate the fastening of units to the structure. Preferably the fastener extends through a hole in the flange of the channel iron and through the unit in contact therewith to tie them together. When desired a bolt or other fastener is extended through both flanges of the channel and through a concrete sheathing of units on each side of the channel to fasten both sheathed faces of the wall to the channel. To prevent moisture following the bolt through the wall I prefer to use two bolts, one for each flange and its sheathing. In some cases I fasten the two sheathing faces together with means that does not go through or attach to the frame or any supporting element. The face concrete is different from that composing other parts of some kinds of my boards.

For the better class of houses I make the frame more or less of fabricated structural steel which I prefer to build with my special features to facilitate the use of my concrete lumber units, so such units may be used when desired for sheathing walls, partitions, roofs, floors and ceilings. While the concrete boards forming a wall sheathing may be used vertically or diagonally I usually use them horizontally, cementing their edges and ends together to thereby form one great monolithic sheet or overcoat for a house and on which a stucco coat of any color or texture or character, or other ornamental covering say concrete lumber strips preferably resembling the painted wooden strips used to subdivide or ornament the stucco coating on a building may be placed. These strips and other ornamental units used can be made and hardened in advance and then

fastened to the concrete board wall or sheathing or to the stucco thereon by or with the aid of cementitious means. Usually I make the ornamental lumber strips in situ on or against the wall in removable forms placed against the face of the wall. Concrete of the desired color and character is put in the form and struck or smoothed off and given the desired face form, texture or design and finish, this being spread preferably on the stucco coating before it is fully hardened, the form being removed as soon as practicable. Other kinds of ornaments can be made on the wall in a similar way when and where desired. Cinder or other particles I embed but leave in view in face of some boards.

My improved wall, when made with a metallic frame and two sheathed faces of concrete boards cemented together, the sheathing being covered with a water-proofed stucco or other moisture excluding coating, will shield and protect the metal frame against fire and the elements.

Referring to the accompanying drawings, in which several embodiments of the invention are illustrated,

Figs. 1, 2, 3, 4, 6, 8, 9 and 10 show various types of walls.

Fig. 5 shows how a large board is made from a plurality of small boards.

Fig. 7 shows reinforced sheathing.

Considering the drawings in detail, Fig. 1 is a cross-section view of a wall built of my concrete sheathing boards 172 attached by metal fasteners to steel channel studding or uprights 174, stucco being put on the outer concrete boards and plaster on the inner concrete boards, the edges of the concrete boards preferably being cemented together with concrete or other cementitious mixture. Several kinds of fastener means for attaching the concrete boards to the steel studding, joists or rafters are shown. 176 is a bolt that extends through fastener hole 178 in each of the two opposite concrete boards, one in the outer and the other in the inner sheathing course, and through two holes punched or drilled through the two webs of channel 174. 180 is a threaded nut on bolt 176, preferably at least partly countersunk in hole 178, and 182 is the head of bolt 176 shown countersunk in board 172 and covered with plaster 184. 186, 188 and 190 show short fastener bolts that extend only through the concrete board and one web of steel channel 174, and their threaded nuts. There is no chance for moisture to follow these bolts through the wall and these fasteners are more adaptable for varying needs. 192 is still another fastener, that is cinched in place or held by clenching or bending one end as shown or otherwise. In some cases I use a wire fastener that is threaded through a hole or notch in the

concrete unit or put between two units to help attach the unit to or in a structure or to another unit or article.

Fig. 3 is largely the same as Fig. 1 except that reinforced concrete studding 194 containing element 196 is used in place of steel channel. Bolt 198 goes through a pre-made hole in the concrete studding or other unit, and bolt 200 goes through metallic cylinder or pipe 202 that is embedded in and forms a hole through the concrete stud or unit.

Fig. 2 is a cross-section view of a wall for a frame building having wooden studding 204 to the two opposite sides of which is nailed, screwed or otherwise fastened a plurality of concrete boards 206 to form an inner and outer fire proof concrete sheathing to protect the structure and contents and the wooden framework or studs against fire, weather, insects, rats, heat and cold, to increase the strength and durability of the wall and when desired be an ideal base for stucco 208 and plaster-coat 210; and with some variations as to details floors, ceilings, roofs and partitions can be made of these concrete boards entirely or in part largely in the same manner. In some cases I bevel the face, or the edges or ends of the concrete boards while plastic, say as at 212, to make it more certain that water will run outwardly or to better enable stucco or other cementing agent to get in between the board edges or ends to cement them together, and for architectural appearance. In some cases I slot the end or edge of a board as at 214 for fasteners 216 so it will be easier to adjust the board in the wall. Fasteners 218, 220 and 222 can be used when the boards or units are made of concrete that is not nailable and no fastener holes have been made therein. 224 and 226 are ordinary wire nails, spikes or other driven fasteners or screws inserted in pre-made fastener holes in the concrete boards and then driven or screwed into the wooden studding, joist, rafter or other wooden unit. 228 is a bolt or other metal fastener that connects or ties the two concrete board sheathing walls together, preferably without going through and weakening the studding. 230 is a joint without mortar. 232 is metal reinforcing which sometimes it is wise to imbed in the concrete board or a thick concrete plank such as preferably comprise the lowest or bottom course of the concrete board sheathing.

Fig. 4 is a face view of part of a wall made of vertical wooden studding 233 to which is attached a sheathing composed of a plurality of my improved concrete boards 234, 236, 238 and 240 united together with the aid of concrete or other cementitious mortar 242. Board 234 has a notch or depression (244 and 246) in each of its two

edges and in its end, so fasteners can be used to help attach the board to the structure without having holes through the board and to enable the ends and edges of the boards to be in contact with each other, or to enable use of a thin mortar-joint. Fasteners 248 and 250 are in such notches and each has a "head" that preferably extends beyond the notch to clasp or cinch and better secure the board in place, or it may be at least partly countersunk in the notch. 252 and 254 are fasteners with "heads," to be driven, screwed or otherwise inserted between the edges or ends of two adjoining concrete boards or other units or articles that do not have fastener holes, notches or other fastener means in them, so as to secure such boards, units or articles to or in a wall or structure or to another unit or article, the "heads" preferably extending over and securely clasping or cinching the ends or edges of such boards, units or articles. In these cases the space between the two adjoining boards will be wider and mortar joint 242 thicker. 256 is a vertical slot and 258 a horizontal slot in board 240, allowing some adjustability for the fasteners that go in such slots.

Fig. 5 shows my preferred method of making a large concrete board or other lumber unit of two or more smaller boards as 414 and 416 or other concrete lumber units by joining them together monolithically by cement 418, preferably without the aid of metal fasteners. Reinforcing rods 420 are imbedded in the smaller units when they are formed.

Fig. 6 shows one form of wall comprising two faces each composed of a plurality of boards 422 cemented together and secured to opposite sides of the framework 424. The wall is strengthened and stiffened by steel rods 426 set vertically against the face of the sheathing. The rods are held in place either by staples 428 passing into the framework through holes in the boards, or by wires 430 the ends of which are wrapped about opposite rods 426.

Fig. 7 shows a form of wall consisting of concrete boards 432 interwoven with wires 434 passing around and between the boards. This sheathing may be fastened to the framework by any suitable means and may be coated with plaster or stucco if desired.

The structure in Fig. 8 is similar to that in Fig. 17 except that the boards 422 of the two sheathing faces are woven or bound together by wires 436.

Fig. 9 shows a form of wall having wooden studs 454 and concrete boards 456. The wall is reinforced and bound together by the aid of wires 458 passing across the faces of the boards and twisted around spikes 460 driven into the studding between the boards, the wires being at intervals crossed over

to the other face of the wall and there twisted about a spike.

Fig. 10 shows a portion of a wall formed of a riveted structural steel framework, to which are fastened concrete boards. The frame comprises principally steel channels 462, to which may be fastened the horizontal concrete boards as 464, or diagonal boards 466, or vertical boards 468. Preferably a portion at least of the weight of the sheathing is carried on angle steel cross members such as 470, 472 fast to the studding. The boards are fastened to these angles as well as to channel braces 474. The whole structure rests in and is attached to a horizontally laid channel 476, which in turn is anchored to the concrete footing. The cement boards may be cemented together as by cement 478.

It is to be understood that the invention is not limited to the forms herein specifically illustrated and described but can be embodied in other constructions without departure from its spirit and purpose.

What I claim as my invention is particularly set forth in the appended claims.

I claim:

1. The combination of wall supports, concrete lumber units, and metallic fasteners

insertable into said supports adjacent said units and in contact therewith for securing said units to said support to form a wall.

2. In a wall or structure, the combination of supporting frame elements, a sheathing of concrete boards tied together by a cementitious coating covering the sheathing boards and bonded thereto, and metallic fastening means passing through the sheathing and in contact with the concrete thereof for fastening the sheathing to said supporting frame elements.

3. In a wall, in combination, a metallic frame comprising upright and horizontal members, a sheathing comprising a plurality of concrete boards cemented together, said sheathing being supported by said horizontal frame members, and means for fastening said sheathing to said frame.

4. The invention set forth in claim 3 in which said vertical elements are steel channels and said horizontal members are steel angles bolted to said channels.

In testimony whereof I hereunto affix my signature.

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