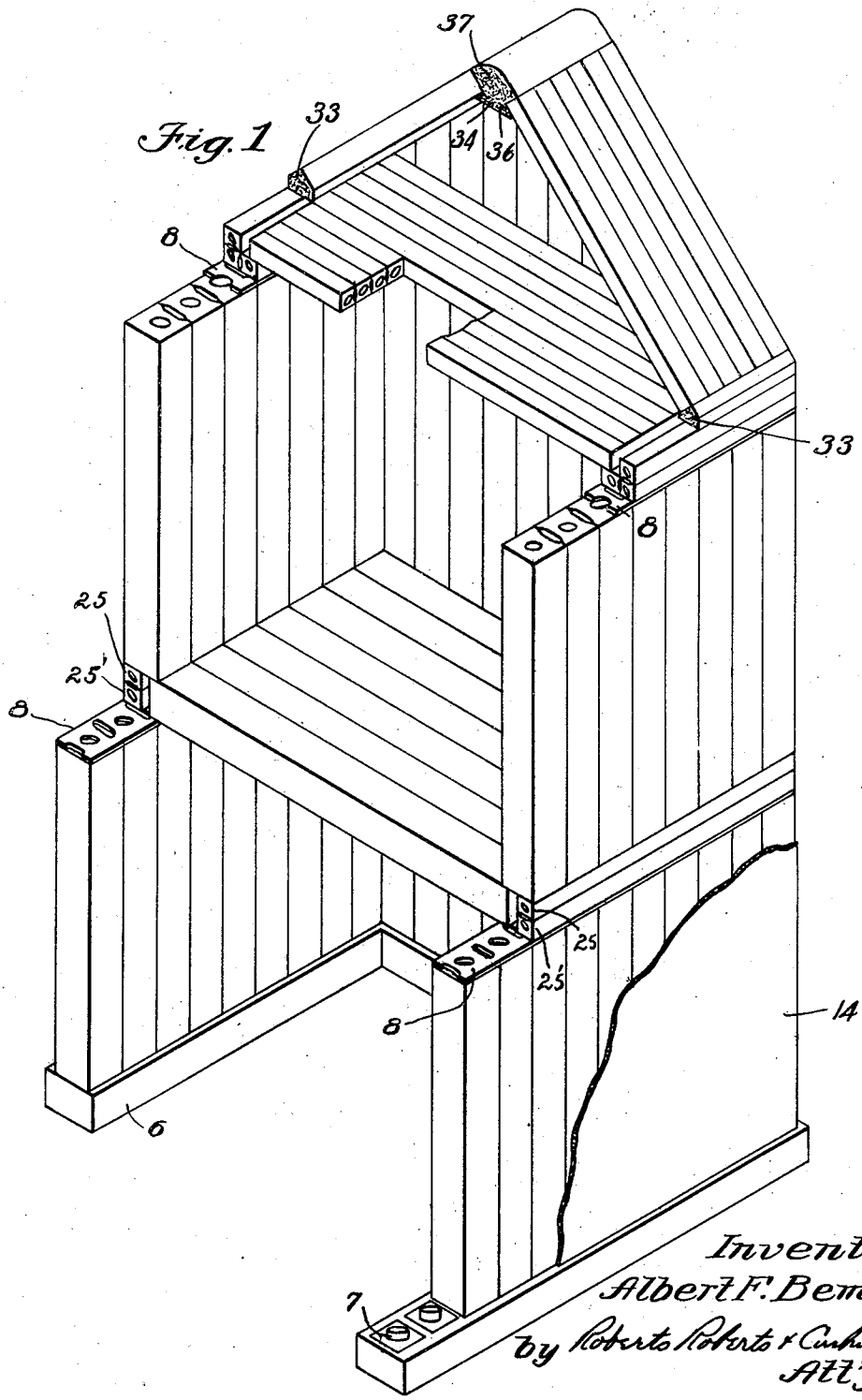
Feb. 22, 1927. 1,618,696

A. F. BEMIS

BUILDING METHOD AND PRODUCT

Filed May 27, 1925 3 Sheets-Sheet 1

Fig. 1



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BUILDING METHOD AND PRODUCT

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Fig. 2

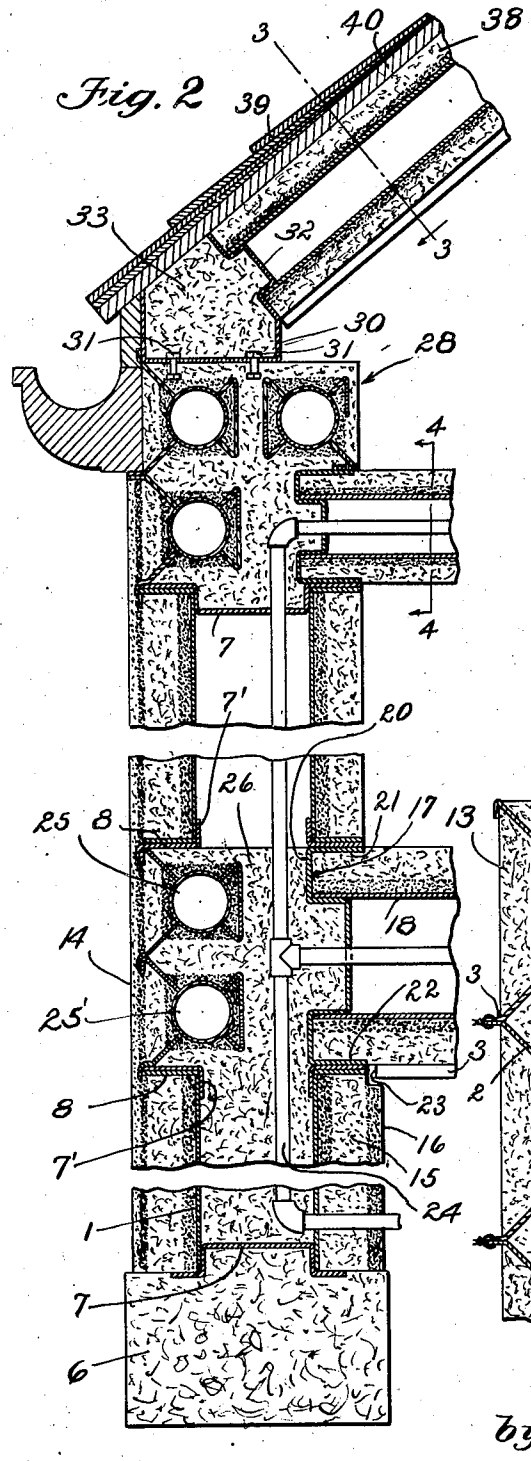
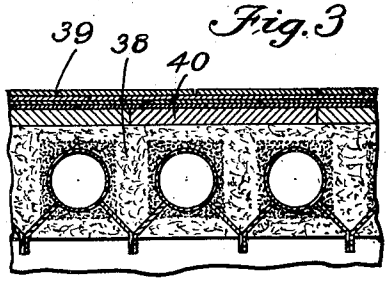


Fig. 3



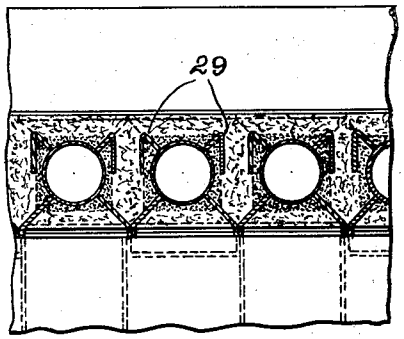


Fig. 4

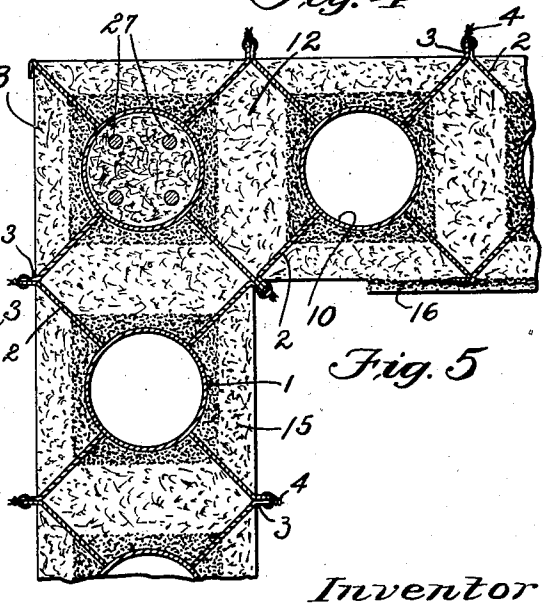


Fig. 5

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Fig. 6

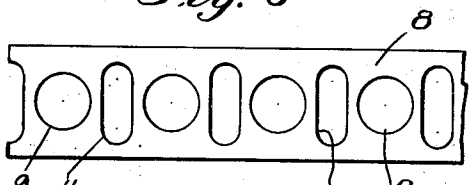


Fig. 7



Fig. 8

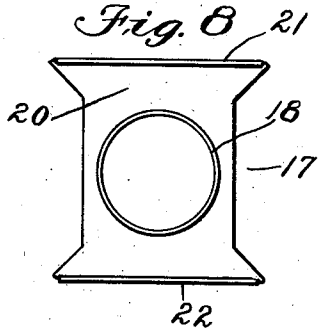


Fig. 9

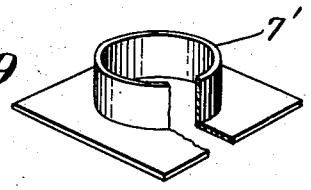


Fig. 11

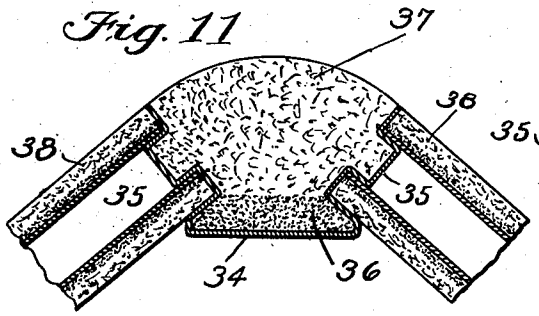


Fig. 10

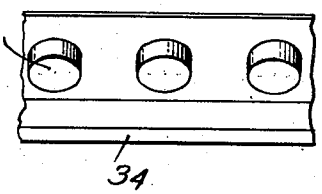


Fig. 12

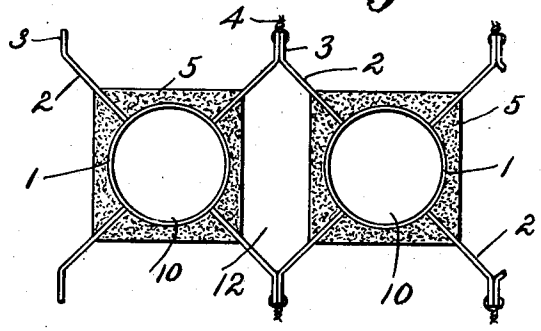
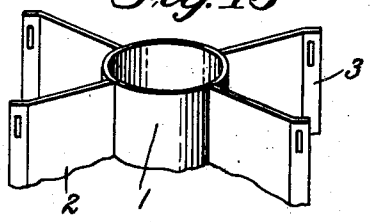


Fig. 13



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UNITED STATES PATENT OFFICE.

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BUILDING METHOD AND PRODUCT.

Application filed May 27, 1925. Serial No. 33,173.

This invention relates to building constructions, such as dwelling houses, office buildings, factories, railway cars, bridges, etc., and more particularly to initial formative pieces or units for fabricating such structures.

Objects of the invention are to provide a construction in which the component parts may be quickly and easily assembled with a minimum amount of labor and in which the component parts may be formed at a factory and distributed to various building sites, thereby reducing the time and labor required at a particular site to erect a building. Other objects are to enable the manufacture and construction of the component parts of buildings to be distributed throughout the year regardless of weather and seasonal conditions. Further objects are to provide building units which are adaptable to different requirements of strength, rigidity, etc., so that the same units may be used to construct a side wall, floor or roof adapted to sustain either a light or a heavy load, and which at the same time affords unique opportunity to incorporate reinforcing rods, conduits, wires, cables, etc., throughout the structure.

In one aspect the invention involves a columnar element constructed for parallel juxtaposed assemblage with similar elements, the element having projections at intervals around its central portion for attaching it to similar juxtaposed elements to form a wall (e. g. upright wall, floor or roof). The columnar elements are preferably tubular and may or may not be filled with cementitious or other material as will hereinafter appear. The aforesaid projections are preferably in the form of longitudinal flanges spaced around the central portion of each member, the flanges serving to secure the elements together, preferably by face-to-face connection (as by wiring, fusing, bonding, etc.) but possibly through the medium of cementitious material molded about the flanges. The flanges are also preferably constructed and arranged to position the columnar elements in spaced relationship with spaces therebetween which may be filled with concrete or other strengthening material and/or may house reinforcing rods, conduits, wires, cables, etc. The flanges also preferably serve to hold the stucco, plaster, or other finishing material applied to the face of the wall and/or to hold the base for the finishing material. The spaces between the flanges may be partly or wholly filled with molded gypsum or other strengthening or insulating material either at the factory or at the building site. In the case of hollow elements the interiors may also be utilized to house reinforcing means, conduits, wires, cables, etc., and/or may be filled with concrete or other material, preferably at the building site.

The aforesaid building units may be used as sills, struts, tiles, ridges, etc., as well as side walls, floors, and roofs. They may be assembled in parallel juxtaposition either vertically or horizontally for side walls, either cross-wise or lengthwise of a room for floors, and either perpendicular to or parallel with the ridge and eaves of a roof. Preferably the units are approximately as long as one dimension of the room they define. For example, when arranged vertically to form side walls they preferably span the spaces between the superposed sills of successive stories and when arranged horizontally to form floors they preferably span the spaces between opposite sills or foundations of the same room or bay. The cross-sectional dimensions of the units are relatively small compared with the length and the cross-sectional dimensions are of the same order; for example, the cross-sectional dimensions, while preferably equal to form a square modulus, may be four inches and eight inches respectively with a length of say nine feet.

The columnar units are assembled so that the concrete or the like which is poured into the spaces between the units, and/or into the units in case the units are hollow, extends continuously along the ends of the units so that the concrete sills or joints extending along the ends of the units are integrally joined to the concrete columns (vertical or horizontal) between and/or in the units. Where two walls (e. g. a floor and a side wall or a roof and side wall) meet at an angle the concrete sill or joint at the junction of the meeting walls is preferably integral with the poured concrete columns of both walls, the poured concrete columns of the two walls joining the concrete sill or joint in staggered relationship or preferably at the same points. Thus the concrete sills or joints serve to tie together the concrete

columns and beams as well as the aforesaid columnar units which are used as initial formative pieces. The columnar units are also preferably tied together by strips extending continuously along the ends of the units as hereinafter described.

For the purpose of illustration, a typical embodiment of the invention is shown in the accompanying drawings in which Fig. 1 is an orthograph of a building structure with parts removed;

Fig. 2 is a vertical section through the side wall and a part of the roof;

Fig. 3 is a section of the roof on line 3—3 of Fig. 2;

Fig. 4 is a section on line 4—4 of Fig. 2;

Fig. 5 is a horizontal section of a corner of the building;

Fig. 6 is a plan view of a tie plate hereinafter referred to;

Fig. 7 is an edge view of the plate;

Fig. 8 is an elevation of a connector;

Fig. 9 is a perspective view of another connector;

Fig. 10 is a perspective view of the rigid connector;

Fig. 11 is a transverse section of the ridge of the roof;

Fig. 12 is an end elevation of two columnar elements joined together; and

Fig. 13 is a perspective view of a part of one of the columnar elements shown in Fig. 12.

The particular embodiment of the invention chosen for the purpose of illustration utilizes a columnar element or unit such as illustrated in Figs. 12 and 13 in which 1 is a central cylinder of metal or fiber board or suitable material having flanges 2 extending radially therefrom at 90° intervals. At the outer ends the flanges are bent so that the ends of the flanges of juxtaposed elements meet in face-to-face engagement as shown at 3 in Fig. 12. These meeting flanges may be secured together in any suitable manner for the purpose of stiffening the columnar elements, wires 4 are shown for the purpose of illustration. Gypsum or other cementitious material or wooden bases 5 are disposed between the flanges 2 as an integral part of the columnar element. These elements are preferably constructed at the factory and sent to the building site in the form shown in Fig. 12, although they are not wired together until assembled in the building structure.

In construction a vertical wall with these columnar elements they are assembled in parallel juxtaposition in a single row as shown in Fig. 12. In erecting the first story these elements preferably rest at their lower ends directly on the foundation 6 (Fig. 1) and they may be positioned on the foundation by means of cup-shaped members 7 attached to the foundation. These cup-shaped members may be closed at the small end as shown in Fig. 2, or they may be open at the small end as shown at 7′ in Fig. 9. These positioning cups 7 are mounted on the foundation at intervals corresponding to the distances between centers of juxtaposed columnar elements and they may be attached to the foundation by being embedded therein before the concrete foundation has set. As the columnar elements are set up on the foundation they are wired or otherwise secured together as shown at 4 in Fig. 12. After a series of the columnar elements have been set up (for example, a row extending along one side of a room) they are perfectly aligned and interconnected at the top by a tie plate 8, such as shown in Figs. 6 and 7. This plate has openings 9 of the same size as the axial openings 10 in the columnar elements, the openings 9 being spaced to correspond with the spacing of the tubes 1 of the assembled columnar elements, and also with openings 11 which are disposed in alignment with the spaces 12 between the columnar elements. After the plate 8 has been laid in position along the tops of the columnar elements, cup-shaped connectors such as 7 or 7′ are telescoped through the openings 9 into the hollow columnar elements. After a row of columnar elements has been assembled in this fashion the surfacing material may be applied along the inner and outer faces of the wall, the gypsum portions 5 (Fig. 12) serving as a base for the finishing material; for example, a scratch coat of stucco may be applied along the outer face of the wall as shown at 13 (Fig. 5) and over this a finishing coat of stucco 14 may be applied (Fig. 2). The projecting ends 3 of the flanges 2 may be bent over before the finishing coat is applied as shown in Fig. 2, the flanges preferably being formed of thin flexible material such as expanded metal. The inside of the wall may be similarly finished with a rough coat 15 and a finishing coat 16.

After the side walls of one story have been erected the floor of the next succeeding story may be mounted on the walls as shown in Figs. 2 and 4, in which the floor is composed of columnar elements extending entirely across the room and resting on the opposite side walls, the floor units being identical in construction with the side wall units. A connector 17 (Figs. 2 and 8) is preferably fitted on the end of each floor unit before the unit is placed in position. This connector comprises a central tubular portion 18 adapted to telescope into the hollow columnar units, and an end plate 20 welded or otherwise secured to the tube 18, the top 21 and bottom 22 of this end wall being turned at right-angles. The end 20 has an opening registering with the opening in tube 18 and the opposite end of the tube 18 may be open

as shown in Fig. 8 or closed as shown in Fig. 2. These end connectors serve to form a flat surface adapted to rest on the top of the side wall.

The floor units are preferably mounted in the same vertical planes as the wall units, instead of in staggered relation, so that their hollow cores form a continuous opening for pipes, conduits, wires, etc., a pipe 24 being shown in Fig. 2 for illustration. The floor units preferably extend only to the central openings of the side wall units and in the remaining spaces opposite the ends of the floor units may be mounted similar units 25 and 25′ which are like the floor and side wall units except in that they are one-half size. These one-half size units 25 and 25′ constitute sills to assist in supporting the next succeeding story and also to close the outside of the space along the ends of the floor units so that concrete or the like may be poured into this space as shown at 26 in Fig. 2. In pouring the concrete 26 the spaces 12 between the columnar elements of the side wall (Fig. 12) and/or the spaces 10 in the columnar elements may be filled with concrete at the same time, the concrete entering the interior of the columnar elements through openings 9 (Fig. 6) and entering the spaces 12 through openings 11. Thus in Fig. 4 all the spaces 12 are filled, whereas only the corner columnar element is filled on the inside. Reinforcing rods may be incorporated in the spaces 10 and/or the spaces 12 and/or in the rough surface coats 13 and 15 in the side walls, floor or roof, reinforcing rods being shown at 27 (Fig. 5) for illustration. If it is not desired to fill the spaces 12 with concrete the openings 11 are omitted from plate 8 and if it is not desired to fill the hollow columnar elements the openings 9 are closed by means of cups 7 having a closed bottom. After the floor units are placed in position as aforesaid the upper and lower surfaces of the floor may be finished as desired. Typical ways will be described hereinafter in connection with the floor of the second story and the roof.

The side walls of the second story may be erected in the same manner as previously described in connection with the first story. As shown in Fig. 2 cups 7′ are mounted in any suitable manner at the second floor level and a plate 8 such as shown in Fig. 6 may be applied over the cups. The columnar elements of the side walls of the second story are then telescoped over the tubular parts of the cups 7′ and secured together as shown in Fig. 12 after which the inside and outside surface finishing may be applied.

The third floor is shown in Figs. 2 and 4 as being approximately one-half the thickness of the second floor. However the columnar units while smaller in cross-sectional dimensions are formed in a similar manner and are mounted at the top of the side walls as hereinbefore described. As shown in Fig. 2 the cups 7 fit into the upper ends of the side wall units and may have closed bottoms to prevent the concrete from flowing into the tubular units. When employing floor units of reduced dimensions a still unit of reduced dimensions may be mounted over the ends of the floor units as shown at 28 (Fig. 2). As shown in Fig. 4 the plaster forming the ceiling may be applied between the flanges of the columnar units and if desired a surface coating of plaster may be applied over the exposed edges of the flanges. In forming a floor of these columnar units the upturned flanges 29 are preferably bent down and concrete is poured over the units and into the spaces between the units to form a strong integral floor, as shown in Fig. 4.

The application of this invention to the particular roof construction illustrated in the drawings involves the use of a base member 30 formed of expanded metal and secured along the top at the side wall by means of bolts 31 embedded in the concrete. This expanded metal base has cylindrical protuberances 32 spaced therealong at intervals corresponding to the spacing of the centers of the columnar elements constituting the roof. This base member may be filled with concrete 33 or the like. The roof elements are telescoped over the protuberances 32 and their flanges are secured together in face-to-face engagement as illustrated in Fig. 3. In forming a floor or a roof, the upper flanges may be omitted entirely as illustrated in Fig. 3. At the ridge of the roof the columnar elements are held in position by an expanded metal member 34 extending lengthwise of the ridge with integral cups 35 fitting into hollow columnar elements. The lower part of the member 34 is preferably filled with gypsum or other cementitious material 36 before the parts are assembled in order to stiffen the member 34; and after the parts are assembled any suitable waterproof material 37 may be molded in the member 34 flush with the upper surface of the roof. As shown in Fig. 3 concrete or the like 38 is poured over the columnar elements of the roof and into the spaces therebetween. This coating may constitute the upper surface of the roof or shingles 39 and may be applied to planks 40 anchored to the concrete 38.

I claim:

1. A structural unit comprising a columnar element constructed for parallel juxtaposed assemblage with similar elements, the element having divergent projections at intervals around its central portion for holding juxtaposed members in assembled relation, and integral cementitious material bridging the projections.

2. A structural unit comprising an elongate tubular element constructed for parallel juxtaposed assemblage with similar elements, the element having opposed pairs of projections at intervals around its central portion for mounting juxtaposed elements in assembled relation, and integral cementitious material bridging the projections.

3. A structural unit comprising an elongate element constructed for parallel juxtaposed assemblage with similar elements and having a central body portion, a plurality of longitudinal flanges projecting at intervals from the columnar body portion, said flanges being constructed and arranged for face to face engagement with similar flanges of juxtaposed elements, whereby the tubular body portions of the elements may be held in spaced position.

4. A preformed structural unit comprising a columnar element constructed for parallel juxtaposed assemblage with similar elements, the element having a central tubular body portion, cementitious filler means applied to faces of the body portion, and longitudinal flanges projecting from the body portion and extending beyond the filler portions for securing the unit in juxtaposed assemblage with similar units.

5. A structural unit having a length approximating a room or bay dimension, and relatively small cross-sectional dimensions of the same order of magnitude, the outer surface of the unit being formed of cementitious material, and divergent radial flanges for attaching the unit to similar units arranged in parallel juxtaposed assemblage.

6. A structural unit having a length approximating a room or bay dimension and having a central tubular body portion provided with divergent outwardly projecting longitudinal flanges, said flanges having portions for face to face engagement with similar parts of adjoining units, whereby the central body portions of the units may be maintained in spaced relation to one another.

7. A structural unit having a length approximating a room or bay dimension and relatively small cross-sectional dimensions of the same order of magnitude, and longitudinal flanges projecting at intervals around the periphery thereof, said flanges being constructed and arranged for face-to-face engagement with similar flanges of juxtaposed units when the assembled units are brought together side by side.

8. A structural unit comprising a columnar base and cementitious material molded on the base, and elements extending outwardly beyond the cementitious material for attaching the unit to similar units in parallel juxtaposed assemblage.

9. A structural unit comprising a tubular base having divergent longitudinal flanges, and cementitious material molded on the periphery of the base between the flanges.

10. A structural unit comprising a tubular base having longitudinal flanges, and cementitious material molded on the periphery of the base between the flanges, certain of the flanges projecting beyond the outer surface of said material.

11. A structural unit comprising a columnar base having four longitudinal flanges spaced around its periphery at approximately equal intervals, and fillers disposed in the spaces between flanges.

12. A building construction comprising a plurality of unitary tubular elements assembled in parallel juxtaposition in a single row, each element having divergent projections at intervals around its central portion and the projections of juxtaposed elements being fastened together on each side of the row to form a substantially continuous wall, and finishing material covering said projections.

13. A building construction comprising a plurality of unitary columnar elements assembled in parallel juxtaposition, each element having longitudinal flanges at intervals around its central portion and the longitudinal flanges of juxtaposed elements being fastened together to form a substantially continuous wall, and finishing material covering said projections, the projections extending into the finishing material to bind the parts together.

14. A building construction comprising a plurality of unitary columnar elements arranged in parallel juxtaposition, and longitudinal projections extending from the elements, the projections defining recesses, and finishing material anchored in said recesses and extending from projection to projection.

15. A building construction comprising a plurality of unitary tubular elements assembled in parallel juxtaposition in a single row, each element having divergent projections at intervals around its central portion, the projections of juxtaposed elements being fastened together on each side of the row to form a substantially continuous wall.

16. A building construction comprising a plurality of columnar elements arranged in parallel juxtaposition in a single row, divergent longitudinal flanges extending from the elements for attaching the elements together with spaces therebetween and with recesses along the side of the row, and finishing material in said recesses.

17. A building construction comprising a plurality of columnar elements arranged in parallel juxtaposition in a single row, longitudinal projections extending from the elements for attaching the elements together

with spaces between the projections along the side of the row, and bonding material in said spaces.

18. A building construction comprising a plurality of columnar elements arranged in parallel juxtaposition in a single row, longitudinal projections extending from the elements for attaching the elements together with spaces therebetween, reinforcing material in said spaces, and means extending continuously along the ends of the elements for tying them together.

19. A building construction comprising a plurality of unitary columnar elements arranged in parallel juxtaposition in a single row, longitudinal projections extending in divergent directions from the elements for attaching the members together with spaces therebetween for conduits and the like, and means extending continuously along the ends of the elements for tying them together.

20. A building construction comprising a plurality of tubular elements arranged in parallel juxtaposition in a single row, longitudinal flanges projecting from the elements for attaching the elements together with spaces therebetween and with recesses along the side for finishing material, and means extending into the ends of the tubular elements for attaching them together.

21. A building construction comprising a plurality of tubular elements arranged in parallel juxtaposition, longitudinal flanges projecting from the elements for attaching the elements together with spaces therebetween, bonding material in said spaces and means extending into the ends of the tubular elements for attaching them together.

22. A building construction comprising a plurality of tubular elements arranged in parallel juxtaposition, longitudinal flanges projecting from the elements for attaching the elements together with spaces therebetween for conduits and the like and means extending into the ends of the tubular elements for attaching them together.

23. A building construction comprising a plurality of approximately rectangular elements assembled in parallel juxtaposition with their faces parallel, each element having corners projecting into abutting relation with the corresponding corners of juxtaposed elements and cementitious material in the spaces between juxtaposed elements.

24. A building construction comprising a plurality of columnar elements arranged in parallel juxtaposition, a joint element extending along one end of the members, and means telescoping with the ends of the elements for interconnecting these elements to the joint element.

25. A building construction comprising a plurality of tubular elements arranged in parallel juxtaposition, a plate extending along one end of said elements with openings aligning with the tubular elements, and connectors extending through said plate into the tubular elements.

26. A building construction comprising a plurality of approximately rectangular elements assembled in parallel juxtaposition with their faces parallel, each element having corners projecting into abutting relation with the corresponding corners of juxtaposed elements and finishing material in the spaces between juxtaposed elements.

27. A building construction comprising a plurality of columnar elements arranged in parallel juxtaposition with cementitious material substantially filling spaces therebetween, and a cementitious joint extending along the ends of said elements and integrally joining the material in said spaces.

28. A building construction comprising a plurality of tubular elements arranged in parallel juxtaposition, an integral cementitious framework having integral portions extending along the ends of said elements and through the elements respectively.

29. A building construction comprising a plurality of columnar elements having lengths approximating a room or bay, and a concrete framework having portions extending along each end of said elements and integrally connected together through spaces between said elements.

30. A building construction comprising a plurality of columnar elements having lengths approximating a room or bay, and a concrete framework having portions extending along each end of said elements and integrally connected together through said elements.

31. A building construction comprising two walls meeting at an angle, each wall including a plurality of tubular elements having lengths approximating the dimension of a room or bay, corresponding elements of the walls being disposed in the same plane so that conduits may be extended continuously through the elements of the two walls.

32. A building construction comprising two walls meeting at an angle, each wall including a plurality of columnar elements arranged in parallel juxtaposition with spaces therebetween, and a concrete framework having a portion extending continuously along the junction of the walls at said angle and having integral portions extending into said spaces in both walls.

33. A building construction comprising two walls meeting at an angle, each wall including a plurality of tubular elements having lengths approximating the dimension of a room or bay, and a concrete framework having a portion extending continuously along the junction of the walls and having integral portions extending into said tubular elements.

34. A building construction comprising a

plurality of columnar elements arranged in parallel juxtaposition with spaces therebetween, a joint element extending along one end of the columnar elements, means telescoping with the ends of the columnar elements for interconnecting these elements to the joint element, and means substantially bridging said spaces for holding concrete or the like.

35. A building construction comprising a plurality of columnar units arranged in parallel juxtaposition with spaces therebetween, a girt above the units, elongate aligning means secured to the upper ends of the units and providing openings for integral cementitious connections extending downwardly from the girt into the spaces therebetween.

36. A building construction comprising a plurality of tubular units arranged in parallel juxtaposition with spaces therein, a girt above the units, elongate aligning means secured to the upper ends of the units and providing openings for integral cementitious connections extending downwardly from the girt into the spaces therein.

37. A wall construction provided with a series of closely spaced, parallel columnar units, said units having tubular body portions and being provided with vertical spaces therein and therebetween, an aligning plate secured to the upper ends of the units, said plate being provided with openings at recurrent intervals, said openings registering with certain of the vertical spaces to permit the pouring of cementitious material within the same.

Signed by me at Boston, Massachusetts, this 21st day of May, 1925.

ALBERT F. BEMIS.