

May 10, 1949.

J. S. DONAHUE ET AL

2,469,455

COLUMN FRAME

Filed June 13, 1946

2 Sheets-Sheet 1

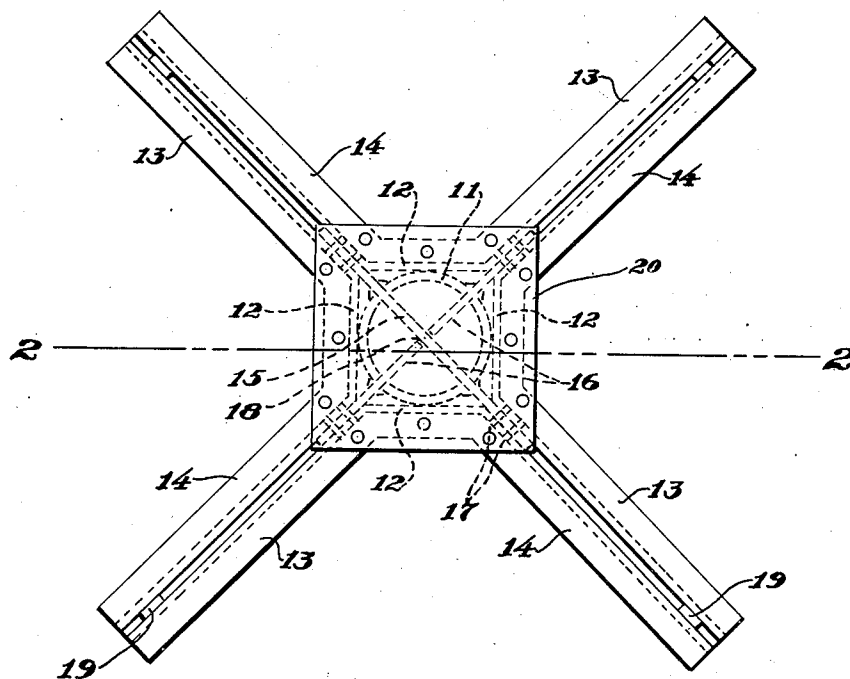


Fig. 1

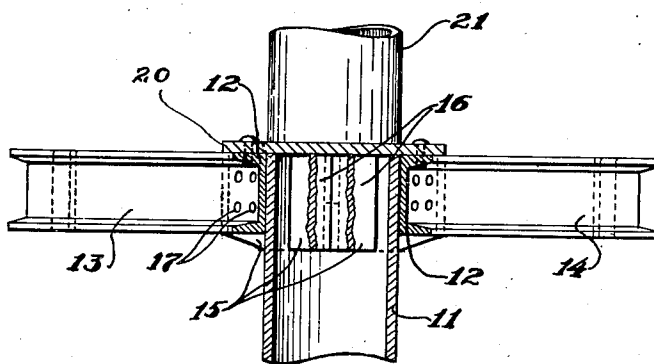


Fig. 2

INVENTORS  
JOHN STANLEY DONAHUE  
GEORGE E. STREHAN  
BY

*Thomson & Thomson*

Attorneys

May 10, 1949.

J. S. DONAHUE ET AL  
COLUMN FRAME

2,469,455

Filed June 13, 1946

2 Sheets-Sheet 2

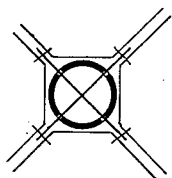


Fig. 3

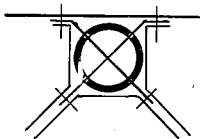


Fig. 4

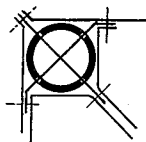


Fig. 5

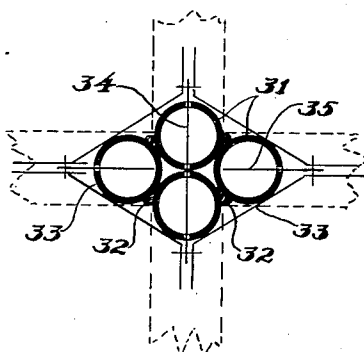


Fig. 6

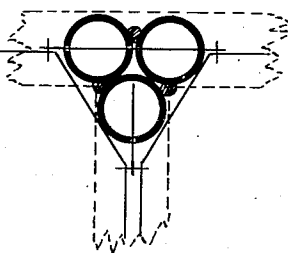


Fig. 7

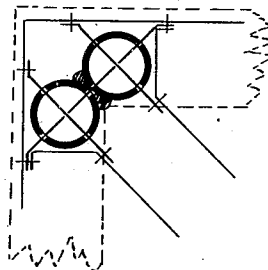


Fig. 8

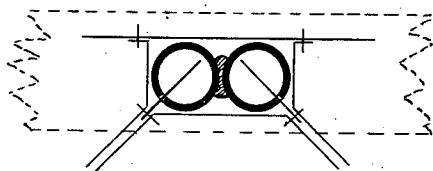


Fig. 9

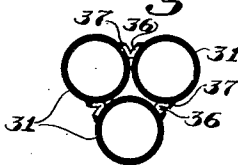


Fig. 11

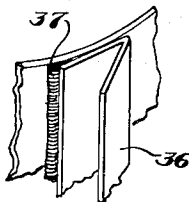


Fig. 12

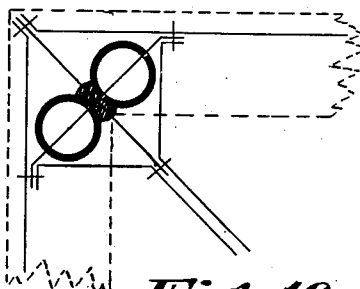


Fig. 10

INVENTORS  
JOHN STANLEY DONAHUE  
GEORGE E. STREHAN  
BY  
Thomson & Thomson  
Attorneys

## UNITED STATES PATENT OFFICE

2,469,455

## COLUMN FRAME

John Stanley Donahue, Brookline, Mass., and  
George E. Strehan, Leonia, N. J.; said Strehan  
assignor to said Donahue

Application June 13, 1946, Serial No. 676,480

3 Claims. (Cl. 189—42)

1

This invention relates to building columns and pertains more particularly to improvements in column frames for monolithic, fire-resistant structures in which a floor of concrete or other plastic material is poured in place, reinforced with steel mesh, rods, or other rigid shapes, and supported by columns which are unified with the floor, or in which a rigid column connection is required in conjunction with any other of the well known types of floor construction which are cast in place or pre-fabricated of timber, steel or reinforced concrete.

The principal purpose of the invention is to provide an integrated column head-frame in which the vertical column consists of one or more concrete-filled, cylindrical steel casings, and the horizontal frame is composed of a plurality of steel shapes of the general character disclosed in the Strehan Patent No. 2,033,595, dated March 10, 1936; each of said shapes having radiating arms secured to the opposed arms of adjacent shapes, and rigidly united to the column by web plates extending into or through a filled column and fixed between opposed pairs of radiating arms. The composite frame arms are embedded in the floor slab which thus forms a part of the integrated structural frame.

The provision of such a column frame affords adequate strength and rigidity for a floor slab of minimum and uniform depth between columns, eliminates all unsightly and space-consuming projections below the floor proper, thereby ensuring a smooth uninterrupted ceiling, with a maximum of light, ventilation and fire resistance, and reduces the time, labor and expense of building construction.

A further object of the invention is to provide a multiple column of two or more relatively small, cylindrical units, or cellular units of other shapes which may be easily assembled and concealed in relatively thin walls or partitions and at intersections thereof, thereby saving room space by obviating the necessity of employing a single, relatively large column for supporting the same load. The use of a multiple column of small size sections not only saves space which would be occupied by the architecturally undesirable wall projections caused by a single, large size column, but also provides greater stiffness and load carrying capacity as compared with a single column having the same amount of concrete and steel. These advantages of the multiple column are especially beneficial in multi-story buildings requiring columns of great height and load-bearing capacity.

The casings of the column units of the multiple column are preferably welded together, and an intervening metal clip is desirably utilized to ensure a rigid and conveniently welded connection. The shaped floor-framing members of the integrated column frame may be joined to the

2

multiple columns in the same manner as in the case of a single-unit column.

Recommended embodiments of the invention are illustrated in the accompanying drawings, but it will be understood that the structural details and arrangement of elements herein shown and described may be varied to suit particular conditions without departing from the essence of this invention as defined in the appended claims. In the drawings,

Fig. 1 is a plan view of the improved column frame in a single-unit column installation, the top of the head-frame serving as a base for another column section (not shown) to be erected thereon and having an integral base plate rigidly attached to the head-frame;

Fig. 2 is a section on line 2—2 of Fig. 1, with part of an upper column in elevation;

Figs. 3 to 5 are diagrammatic views illustrating optional arrangements of the radiating frame arms for different arrangements of wall, corner and interior columns adapted to the requirements of various wall and partition intersections;

Figs. 6 to 10 are diagrammatic views showing optional arrangements of multiple column frames for various intersections;

Fig. 11 is a detail sectional view of a three unit column having metal clips welded in the intervening spaces to unite the single-column units; and

Fig. 12 is a fragmentary perspective view of one of the metal clips welded to a casing surface.

In the single unit form shown in Figs. 1 and 2, the structural frame comprises a cylindrical column casing 11 which is normally filled with concrete or other plastic material (not shown) as is well understood; and a horizontal head-frame united to the column and consisting of a plurality of steel channel members each having a straight central web 12 engaging the column, and a pair of diverging arms 13 and 14, respectively, extending radially from the column. The webs 12 of the several frame members enclose the column, and the respective arms 13 and 14 are disposed back to back to form a cross-shaped frame designed to engage integrally with and to support the floor system and transmit the floor loads to the column unit, as indicated in Fig. 3.

The frame shapes are rigidly united to the top of the column by connecting plates 15 and 16 which extend at right angles to each other through vertical slots in the casing 11 and between the respective arms 13 and 14 of each frame member to which they are secured by bolts 17, by welding or by other fastening means. The plates 15 and 16 may be slotted, as indicated at 18, so that they nest together at their intersections at the center of the column, and it will be understood that these plates are embedded and anchored in the concrete core of the column. For additional security, the plates may also be

welded in the casing slots as illustrated, for example, in the Dean Patent No. 2,195,327, filed February 2, 1939.

As the opposed frame arms 13 and 14 are slightly spaced by the intervening connecting plates at their inner portions, their outer ends may be braced by filler plugs 19 welded between them, if desired, to maintain their parallel relationship. Continuous welds or other means of compensating for the spacing caused by the intervening web plates 15 and 16 may obviously be provided; or the web plates may be extended to the ends of the arms, if desired.

The base plate 20 of a superimposed column 21 rests on the head frame of the column 11, to support the upper column section (Fig. 2); and the plate may be bolted or riveted to the head frame as indicated in Fig. 2, or otherwise rigidly secured thereto to insure the continuity of the building frame.

The attachment of the frame members by the use of connecting plates passing through the filled column and secured between the diverging arms of the bent channel frames, rigidly integrates the column and frame in a simple, economical and efficient manner, and permits the utilization of a variety of desired arrangements at wall corners or intersections by employing four frame members having arms extending at angles appropriate for the conditions.

For example, the shape for the four-way frame of Figs. 1 to 3, suitable for an interior column, may be modified, as indicated in Fig. 4, for a three-way frame, suitable for a wall column; or as indicated in Fig. 5, for a two-way frame, suitable for a corner column.

In the optional, multiple column arrangements of Figs. 6 to 10, the individual column casings 31 are united by welding as indicated at 32; the frame members 33 have relatively long web portions which together embrace the multiple column, and outwardly diverging arms extending at the appropriate angles; and the connecting plates 34, 35 extend through or into one or more of the filled columns, and are secured between opposed frame arms, as heretofore explained.

It will be observed that the single elements of the multiple columns fit within the walls or partitions, indicated by broken lines, without any projections or protuberances below the floor slabs in which the frames are embedded, or outside of the intersecting wall or partition lines, thereby affording clear room space without sacrifice of load-supporting capacity. Indeed, the capacity of a multiple column section is substantially greater than that of a single large column having the same aggregate amount of steel and concrete, due to the increased stiffness and rigidity of the multiple arrangement, thus affording greater permissible column heights for the same load.

In Fig. 11, V-shaped steel clips 36 are inserted in the exterior crevices between the column units 35 and welded at 37 to the respective column casings. This arrangement ensures greater ease in making the weld when the columns are fitted closely together, as desired.

It will be understood that the hollow steel casings for the single or multiple column units, herein illustrated as cylindrical shells, may be of any curved or rectilinear cross-section; and that other details of the structural frame herein described may be varied within the spirit of this invention as set forth in the following claims.

We claim:

1. A structural frame of the character described, comprising a column having a hollow casing and a plastic core, the top of the casing having diametrically opposed slots, a plurality of frame members having intermediate web portions engaging and surrounding the casing, at least some of said members having integral, outwardly extending arms on opposite sides of their respective web portions, the contiguous arms of adjacent members being disposed in spaced parallel relation, a connecting plate passing through the column core and through said slots and extending between said contiguous arms, the plate being welded to the casing, and means securing the plate to said contiguous arms, thereby to provide an integrated head-frame at the top of the column.

2. A structural frame of the character described, comprising a column having a hollow casing and a plastic core, the top of the casing having two pairs of diametrically opposed slots, a plurality of frame members having intermediate web portions engaging and surrounding the casing, at least some of said members having integral, outwardly extending arms on opposite sides of their respective web portions, the contiguous arms of adjacent members being disposed in spaced parallel relation, a pair of connecting plates passing through the column core and through said slots and extending between said contiguous arms, the plates being welded to the casing, said connecting plates having complementary slots so that they interfit at their intersection at the center of the column, and said plates being welded to the casing at said casing slots, and means securing the plates to said contiguous arms, thereby to provide an integrated head-frame at the top of the column.

3. A structural frame of the character described, comprising a plurality of column sections each having a hollow steel casing and a concrete core, said casings being slotted at their upper ends, a plurality of frame members each having an intermediate web portion engaging at least one of said casings and having integral outwardly extending arms at the sides thereof, contiguous arms of adjacent members being disposed in spaced parallel relation, a connecting plate embedded in the core of at least one of the casing sections and projecting through the slotted wall thereof and between a pair of contiguous arms, each casing being welded to a casing adjacent thereto to provide a unified, multiple column, and said plates being welded to the casing wall through which they pass, and means securing the projecting portion of said plate to said contiguous arms, thereby to provide an integrated, multiple head-frame at the top of the column.

JOHN STANLEY DONAHUE.  
GEORGE E. STREHAN.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

| Number    | Name    | Date          |
|-----------|---------|---------------|
| 1,418,581 | Lally   | June 6, 1922  |
| 1,602,828 | Lally   | Oct. 12, 1926 |
| 2,033,595 | Strehan | Mar. 10, 1936 |
| 2,195,327 | Dean    | Mar. 26, 1940 |

#### FOREIGN PATENTS

| Number | Country       | Date         |
|--------|---------------|--------------|
| 5,502  | Great Britain | Mar. 7, 1906 |