United States Patent

[11] 3,603,052

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[45] Patented **Sept. 7, 1971**

[54] **BUILDING CONSTRUCTION SYSTEM**
6 Claims, 16 Drawing Figs.

[52] **U.S. Cl.** **52/257,** 52/281, 52/599, 52/725, 52/727
[51] **Int. Cl.** **E04b 1/16,** E04c 2/50
[50] **Field of Search** 52/724, 725, 730–732, 257, 296, 599, 743, 404, 405, 434, 495, 281, 257, 599, 727, 725, 251

[56] **References Cited**

UNITED STATES PATENTS

1,345,880	7/1920	Priest et al.	52/495
1,563,598	12/1925	Wakeman	52/495
1,925,417	9/1933	Swank	52/599
2,420,427	5/1947	Henderson	52/296

FOREIGN PATENTS

210,311	7/1940	Switzerland	52/725
670,026	4/1952	Great Britain	52/724

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Assistant Examiner—James L. Ridgill, Jr.
Attorney—Sparrow and Sparrow

ABSTRACT: Molds are provided in the improved construction arrangement which can be put together in various ways for various shapes of columns, walls and the like construction elements, to prefabricate such elements on the construction site itself. The molds become permanent parts of the prefabricated parts and remain in the final construction assembly of the building.

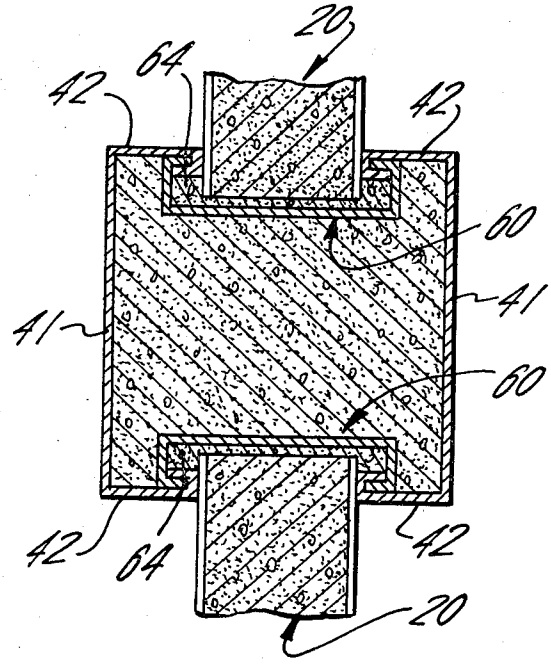


FIG. 1

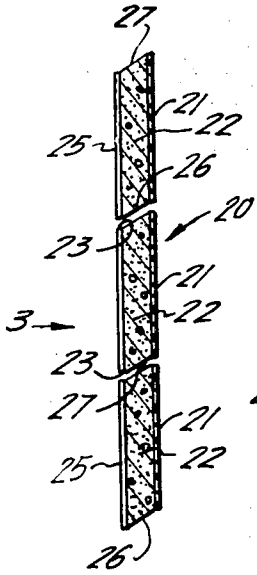


FIG. 2

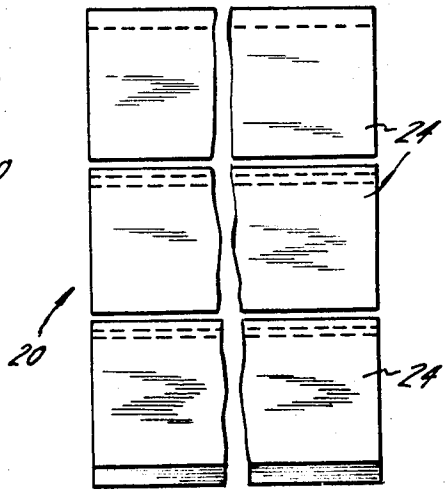


FIG. 4

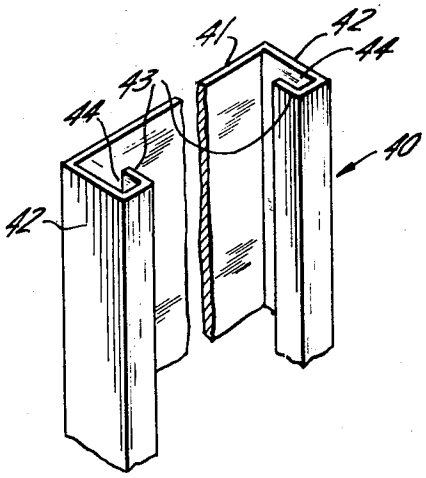


FIG. 3

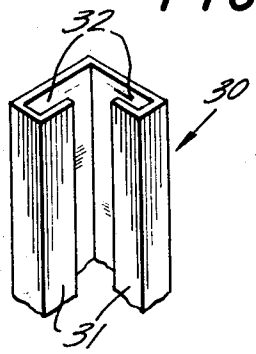
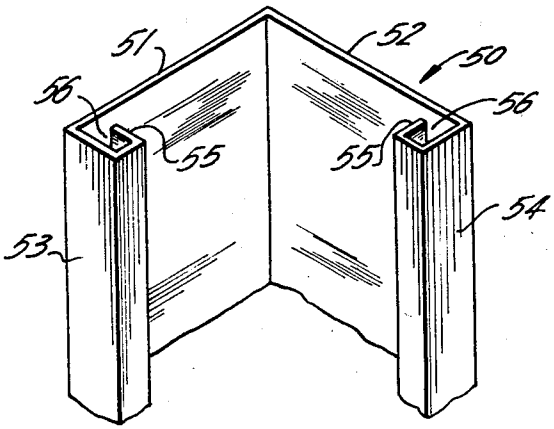


FIG. 5



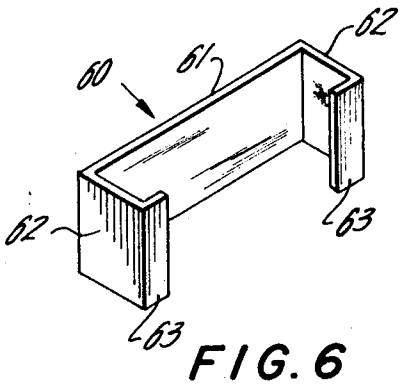


FIG. 6

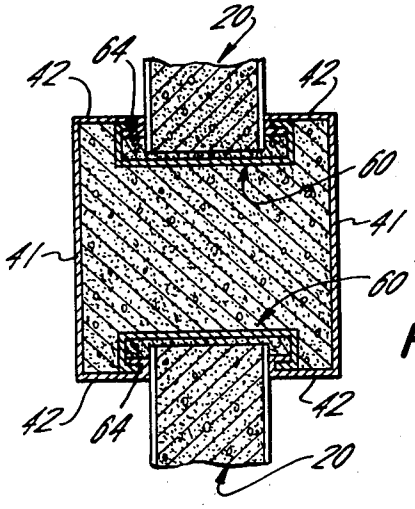


FIG. 7

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FIG. 8

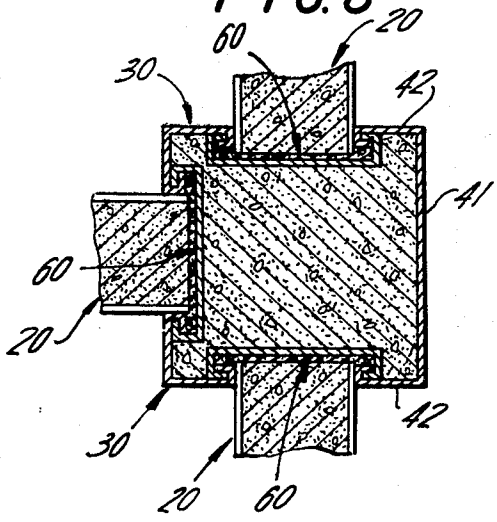


FIG. 9

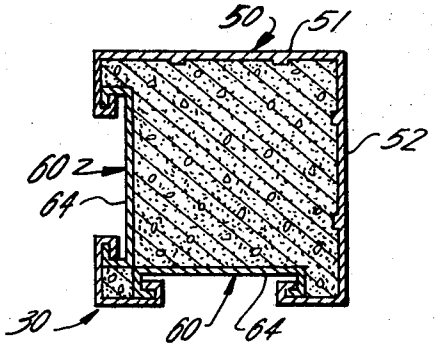


FIG. 10

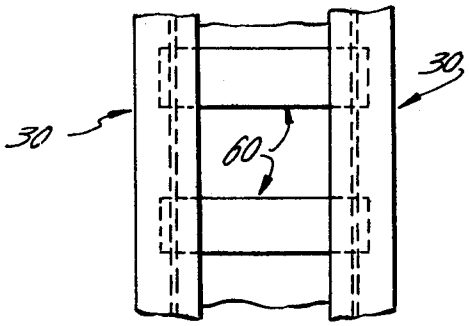


FIG. 11

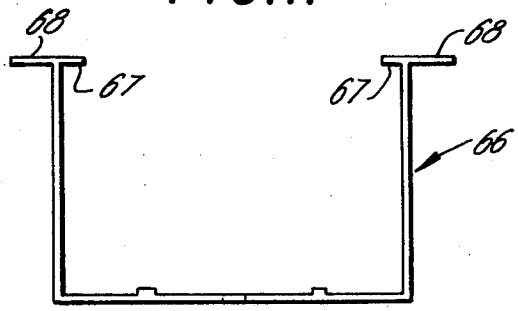
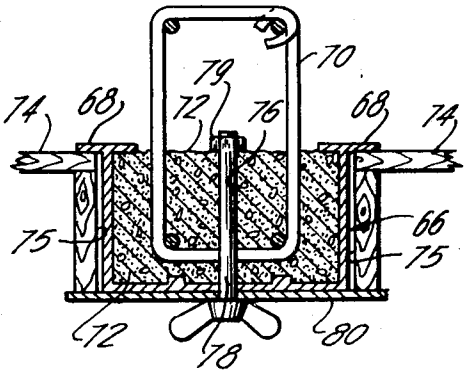


FIG. 13



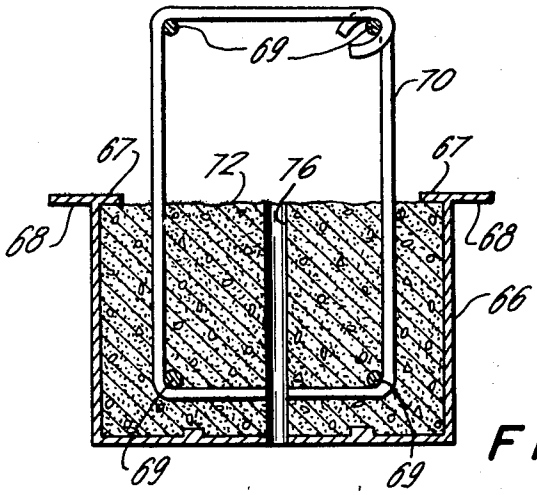


FIG. 12

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FIG. 14

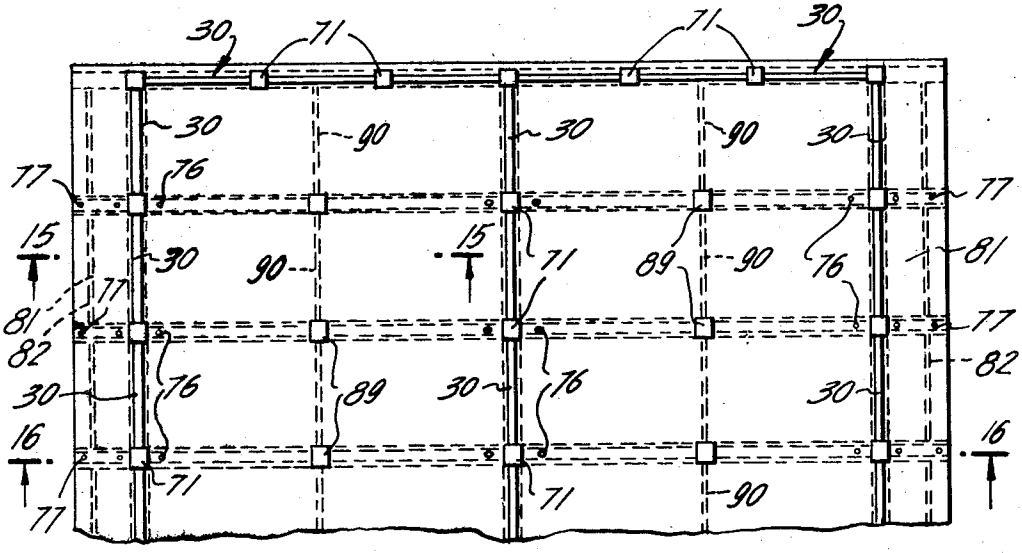
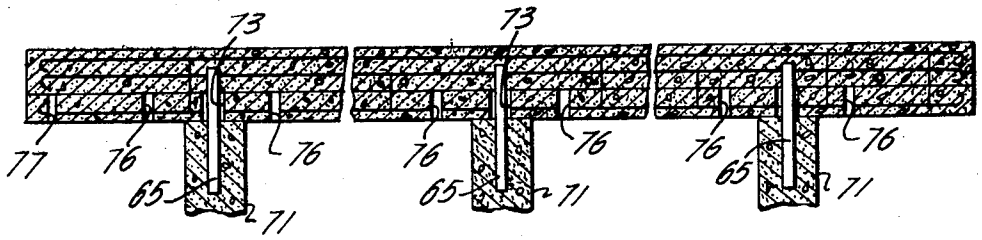


FIG. 15



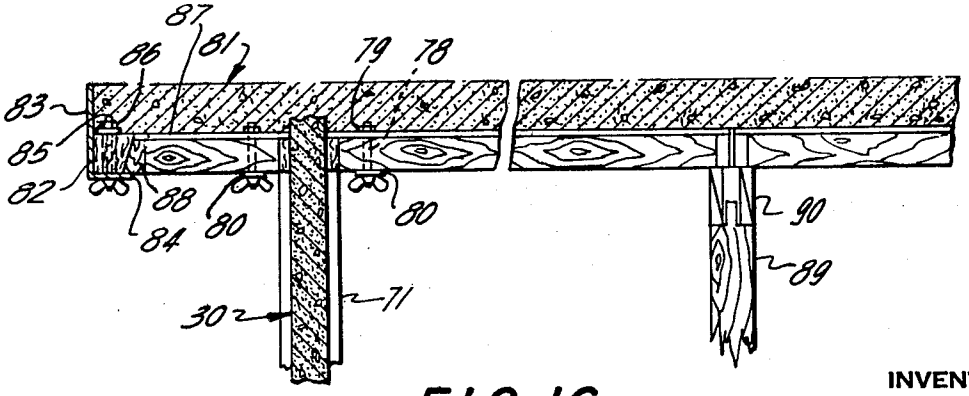


FIG. 16

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BUILDING CONSTRUCTION SYSTEM

BACKGROUND OF THE INVENTION

The invention relates to arrangements of the construction of buildings, and particularly to constructions of partially prefabricated buildings and of prefabricated parts thereof.

In the conventional arrangement of erecting buildings most of the construction elements are made on the construction site while the erecting of the building is carried on. It is known that this arrangement is costly and not too efficient because preparation of molds, time for settling of the concrete in the molds, or of mortar used in columns, beams etc., cannot be considered a really productive time, during which inevitable costs are involved such as wages and material which become scrap after the construction has been finished. Furthermore, the individual work performed at the construction site is more expensive than the use of certain prefabricated and standardized parts. It is also known in the trade that the erecting of buildings by using exclusively prefabricated parts is subject to certain disadvantages which are practically insurmountable. For example, the handling of prefabricated concrete parts, both in transportation and in placing thereof on the construction site, is in most cases difficult, requires special equipment and is usually a slow procedure, all of which amounts to high costs. Joining of such parts to an assembly for becoming a monolithic structure requires adjusting, sealing and fitting which turns out in practice to be poor at best, for example, in the case of roofs made with prefabricated parts consisting of concrete. This invention has been made to solve these problems.

SUMMARY

The invention consists in such novel features, construction arrangements, combinations of parts and improvements as may be shown and described in connection with the apparatus herein disclosed by way of example only and as illustrative of a preferred embodiment. The advantages of the invention are qualitative improvements of construction component parts, improved and more expeditious handling of such parts and timesaving prefabrication of such parts on the construction site itself, prior to final use and assembly of these parts.

Objects and further advantages of the invention will be set forth in part hereafter, and in part will be obvious herefrom or may be learned by practicing the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

It is an object of this invention to provide an improved arrangement of constructing of buildings, encompassing the use of prefabricated parts and the means for fabricating such parts on the construction site itself.

Another object of the invention is to provide prefabricated construction parts of great strength combined with relative light weight.

A further object of the invention is to provide for molds for prefabricating of building construction parts, which molds are noncorrosive and constitute integral members of such parts.

Yet another object of the invention is to provide a building construction arrangement for reducing of the costs of the construction without impairing the strength thereof.

Furthermore, it is an object of the invention to provide facilities for constructing of buildings for substantially reducing the time required for the constructing and erecting work of the buildings.

Various further and more specific purposes, features and advantages will clearly appear from the detailed description given below taken in connection with the accompanying drawing which forms part of this specification and illustrated merely by way of example one embodiment of the device of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the following description and in the claims, parts will be identified by specific names for convenience, but such names are intended to be as generic in their application to similar parts as the art will permit. Like reference characters denote like parts in the several figures of the drawing, in which

FIG. 1 is a side view of three wall panels in the superimposed position in which they form a wall section;

FIG. 2 is a front view of the wall section shown in FIG. 1;

FIGS. 3, 4 and 5 are isometric views of portions of three different mold pieces for fabricating of building columns;

FIG. 6 is an isometric view of a connecting element for the mold pieces shown in FIGS. 3, 4 and 5;

FIG. 7 is a cross section of a prefabricated building column showing two wall panels joining the same;

FIG. 8 is a cross section of a prefabricated building column with three wall panels joining the same;

FIG. 9 is a cross section of a prefabricated corner column with two wall panels joining the same;

FIG. 10 is a front view of a part of a mold for a column, showing the connecting elements (FIG. 6) of the mold parts;

FIG. 11 is an end view of a beam mold;

FIG. 12 is a cross section of a prefabricated reinforced concrete beam made with the mold shown in FIG. 11; FIG. 13 is a cross section of a prefabricated reinforced concrete beam similar to FIG. 12, incorporating forms for the concrete roof;

FIG. 14 is a plan view of the roof of a building constructed according to the invention with the forms still in operative positions;

FIG. 15 is a section of the plan view shown in FIG. 14, taken along the line 15—15;

FIG. 16 is a section of the plan view shown in FIG. 14, taken along the line 16—16.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in more detail to the drawing illustrating a preferred embodiment by which the invention may be realized, there is shown in FIGS. 1 and 2 a portion of a wall consisting of prefabricated panels 20 which are conveniently fitted together. Each one of panels 20 is formed by an outer shell 21 which is filled with a hardenable material 22. Shell 21 is preferably made of extruded aluminum or of a strong plastic, or other suitable noncorrosive material which is open on the vertical sides. The filling material 22 may consist of a lightweight concrete or the like material which becomes solid after setting. Panels 20 are preferably prefabricated in standardized sizes for being delivered to the building construction sites. The actual shape of panel 20 is that of an oblique parallelogram with larger front and rear faces 24, 25, respectively, than the oblique upper and lower faces 26, 27, respectively. When panels 20 are assembled for forming a wall, for example, an outside wall of a building, inclined faces 26, 27, are arranged in such manner that no water can penetrate through the seams 23, not even in case of a strong storm because the inclination of seam 23 is outwardly directed, and since faces 26, 27 can be easily made smooth, a rather very narrow seam between two panels 20, resting one upon another under their weight, is formed. Panels 20 are placed between columns in such manner that open faces 26, 27 thereof are inserted in suitable recesses of these columns, and in such quantities and arrangements as are required for forming walls.

As shown in FIGS. 3, 4 and 5, molds 30, 40 and 50 for parts of column molds are made, which can be composed for fabricating various kinds of columns on the building construction site. Binding plates 60 (FIG. 6) are used to connect the various mold parts. FIG. 7 shows a cross section of a column joining two straight walls, FIG. 8 shows a cross section of another column joining three walls and FIG. 9 shows a cross section of a corner. Mold pieces 30, 40, 50 and binding plates 60 are made of extruded aluminum sections or of suitable strong plastic or other suitable noncorrosive material, the same as shell 21 of panels 20. When mold pieces 30, 40, 50,

held together by binding plates **60**, are filled with concrete for becoming solid and rigid columns, they remain permanently on the solidified column constituting perfectly smooth outside faces of the latter. For proper joining of mold parts **30**, **40**, **50** with binding plates **60**, each one of the parts has a proper shape. Mold part **30** for a corner has longitudinally extending clamping edges **31** which form adequate grooves **32**. Straight wall part **40** has a flat portion **41** which is as wide as the column to be formed. Two short sides **42** are arranged at right angles of flat portion **41**. The edges of short sides **42** are bent twice inwardly for forming the clamping edges **43** and grooves **44**, similar to edges **31** and grooves **32** of corner part **30**. A further mold part **50** is shown in FIG. **5** for forming a corner column such as shown in FIG. **9**. Mold **50** has two flat sides **51** and **52** arranged at right angle to one another, each side constituting the width of the column. Obviously the width of each side **51** and **52** is the same as flat side **41** of mold **40**. Two short sides **53** and **54** are arranged at right angles of flat sides **57**, **52**, respectively, and the edges of short sides are bent twice inwardly for forming the clamping edges **55** and grooves **56**. Binding plate **60** is also made of extruded aluminum or strong plastic, but has a comparative short length for being used in multiples on columns of various lengths, as shown in FIG. **10**. Binding plate **60** has a flat back side **61** with edges **62** but at right angles thereto and clamping lugs **63** arranged at the ends of edges **62**.

FIGS. **7**, **8**, **9** and **10** illustrate the various mold combinations. When the mold parts have been combined and spaced apart from one another at the building construction site for the actual requirements and have been joined by the appropriate number of binding plates, panels **20** are inserted in the recesses **64** (FIG. **9**). The mold has now been completely closed and is ready for being filled with concrete, whereby the mold pieces remain permanently, as it has been mentioned above, for constituting the outside faces of the column.

Roof or ceiling beams are likewise prefabricated by using a mold as shown in FIG. **11** and further illustrated in FIG. **12** and **13**. Molds **66** have the appropriate length and width and consist basically of U-shaped trough with inside flanges **67** and outside flanges **68** extending longitudinally of the upper edges of the vertical walls of the channellike section. The beams are prefabricated in the desired length at the building construction site by placing the conventional longitudinal reinforcing steel rods **69** in the mold and holding them in place by binding wires **70**, and subsequently filling mold **66** with concrete so that mold **66** and concrete filling **72** eventually become one solid reinforced unit. Spaced apart from one another at intervals commensurate with the position of the columns supporting the beams are holes **76** provided in the beams for inserting of vertical bars **65** (see FIG. **15**) which locate and join columns and beams properly. A further series of holes **76** is provided in the beams for permitting the inserting of bolts **78** which are secured by nuts **79**. Bolts **78** holding anchor plates **80** serve the purpose of holding the molding boards **74** for the concrete slabs of the roof or the ceiling, whatever the case may be. Anchor plates **80** hold boards or plates **74** against outside flanges **68** of U-shaped molds **66** (FIG. **13**).

In the case of building a roof, provision is made for forming of the eaves **81**, the edges of which project downward for forming of the gutters **82**. To this extent an angle bar **83**, which has one flange **84** which is shorter than the other. Angle bar **83** is used there as a temporary mold, whereby the larger flange is placed against the ends of beams **72** whereas shorter flange **84** is placed under beams **72**. Bolts **85** inserted through holes **77** at the ends of beams and secured by nuts **86** hold angle bar **83** in place. The plates **87** of the molds for gutters **82** are arranged flush with the upper sides of beams **72** and project outwards less than the latter. The outward edge of plates **87** terminate the lower wedge-shaped piece **88** which rests on flange **84** of angle bar **83** in such manner as to form gutter **82** when the concrete for the roof (or ceiling) eventually is poured after all preparations have been made as it has been described above. Thus, the roof (or ceiling) becomes an integrated structure with columns **72** and wall panels **20**, as illustrated in FIGS. **14**, **15** and **16**.

It occurs that the distance between columns which support panels **20** between them, such as in the case of outer columns and in the case of inner columns with dividing walls, is smaller than the clearance between an outer wall and an inner partition wall. In such case it is necessary to place additional temporary supporting posts **89** and crossbeams **90** under the molding boards for the concrete roof, as it is shown in FIG. **16**. It also is illustrated on the left side of FIG. **16** how the top of the uppermost panel **20** of a wall projects into the roof slab when the concrete for the roof is poured, thus forming an integrated structure of walls and roof (or ceiling).

While the invention has been described and illustrated with respect to a certain example which gives satisfactory results, it will be understood by those skilled in the art after understanding the principle of the invention, that various other changes and modifications may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. Improved arrangement of constructing a building incorporating prefabricated first structural elements and second structural elements fabricated on the building construction site, said arrangement comprising a plurality of mold parts, said parts having joining means thereon joining same obtaining composite molds, said molds constituting integral parts of said first and said second structural elements, and prefabricated panels joined to said structural elements by said joining means for forming wall sections, each one of said panels comprising an outer shell, said shell comprising moldable material and having open ends, and of an inner filling consisting of concrete or the like hardenable material, said prefabricated first structural elements comprising beams for supporting a roof or the like, said beams comprising substantially U-shaped mold parts and inner bodies of reinforced concrete integral with said molds, said beams having a series of vertically oriented holes spaced horizontally apart in suitable increments, and said second structural elements comprising columns each one of said columns comprising a plurality of said mold parts, joined together, and of an inner filling of concrete or the like hardenable material.

2. Improved arrangement of constructing a building according to claim **1**, and said mold parts comprising extrusions containing noncorroding material.

3. Improved arrangement of constructing a building according to claim **1**, said mold parts comprising noncorroding lightweight material.

4. Improved arrangement for constructing a building according to claim **1**, each one of said panels having the shape of a substantially oblique parallelogram having the upper and lower sides smaller than the front and rear faces thereof and said panels arranged in said wall sections in such manner that said smaller upper and lower sides are inclined sloping rearwardly and upwardly.

5. Improved arrangement of constructing a building according to claim **4**, each one of said columns having a vertically extending bar on the top thereof, said bar fitting into one of said vertically oriented holes in said beams, and having at least two longitudinally extending open sides receiving said wall sections composed of said panels.

6. Improved arrangement of constructing a building according to claim **4**, said U-shaped mold parts having flanges extending laterally of the upper ends of the vertical walls of said U-shaped molds, and means on said beams clamping form parts thereon for the construction of said roof.