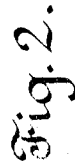
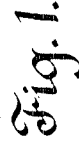


1,105,682.

6 SHEETS—SHEET 1.



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6 SHEETS-SHEET 2.

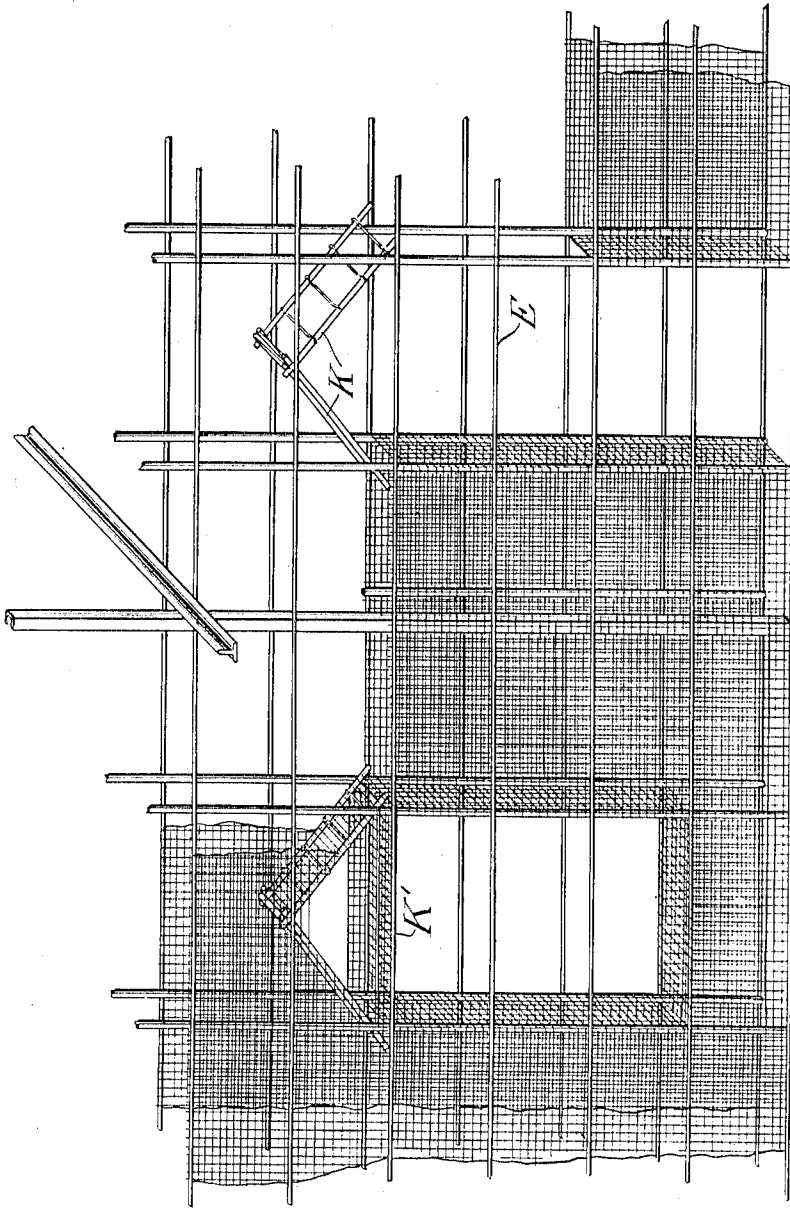


Fig. 3.

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8 SHEETS-SHEET 3.

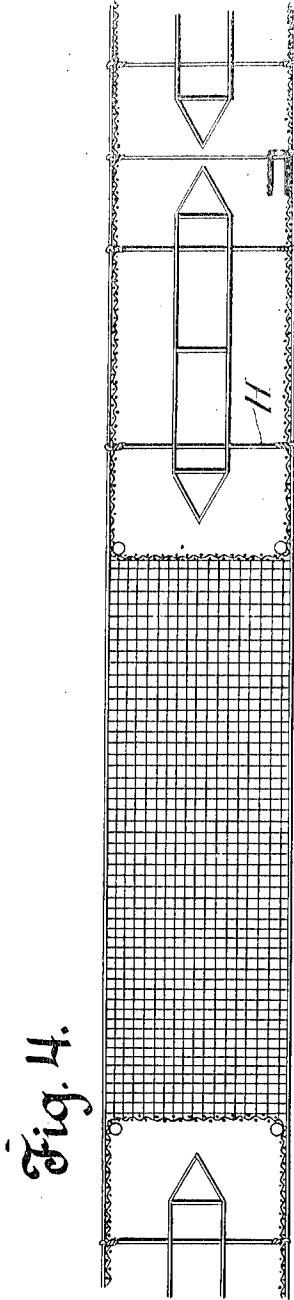


Fig. 4.

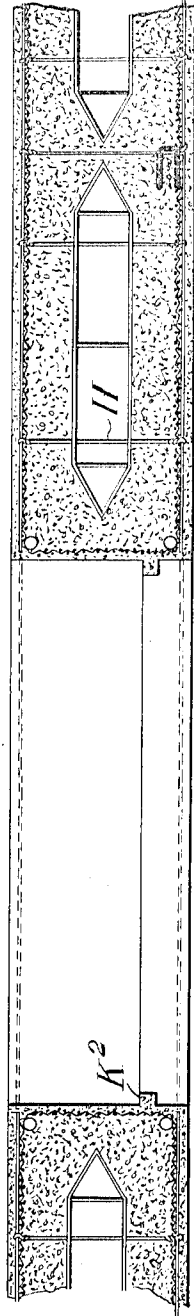


Fig. 5.

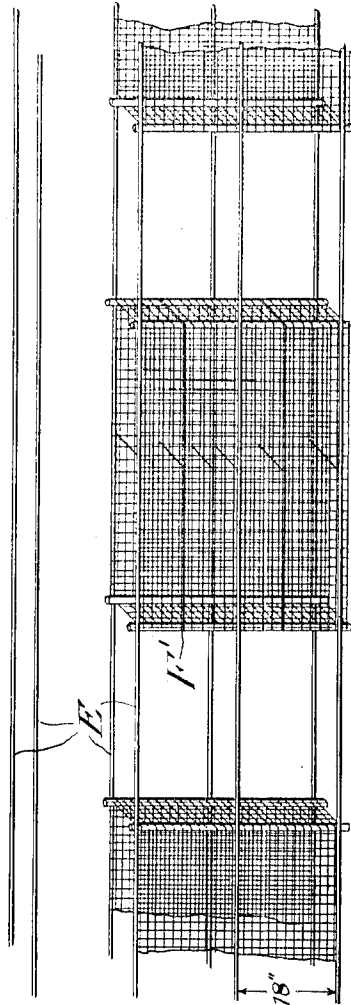


Fig. 6.

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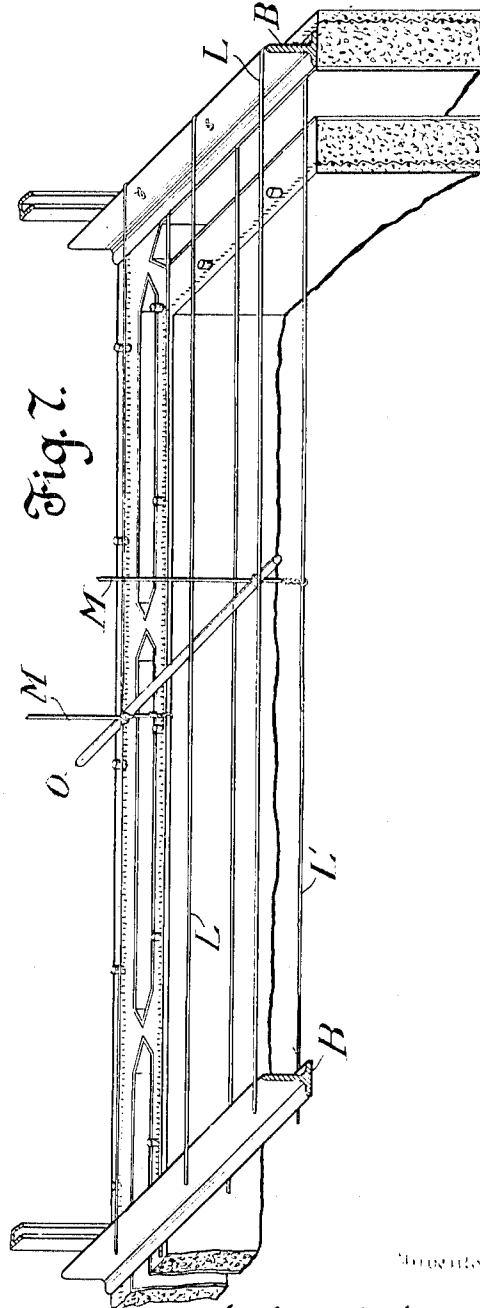
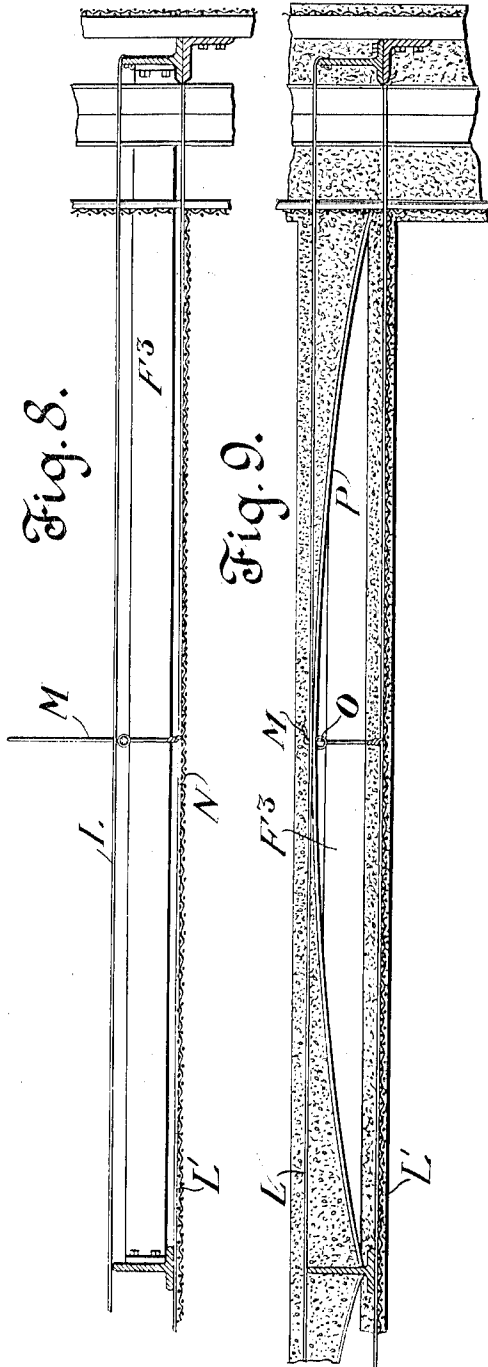
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6 SHEETS—SHEET 4.



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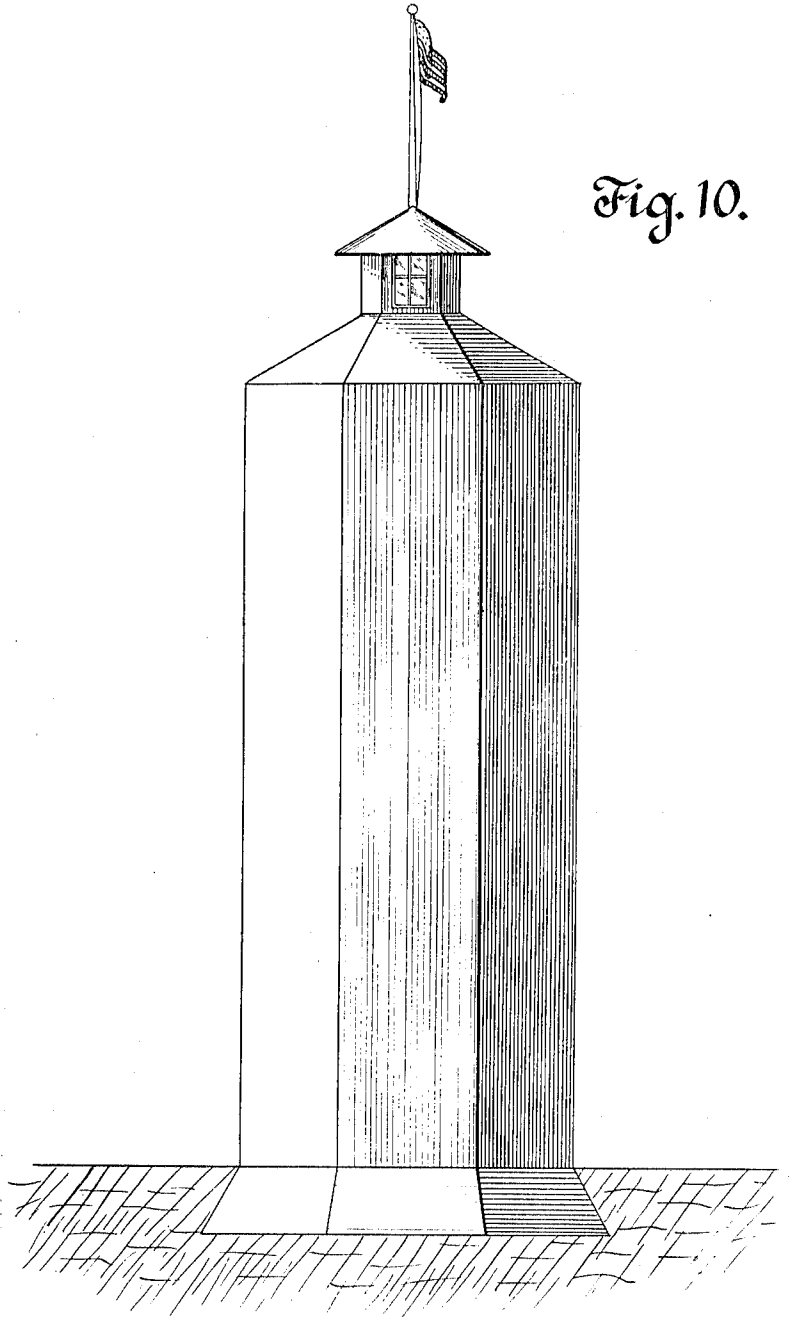
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6 SHEETS—SHEET 5.

Fig. 10.



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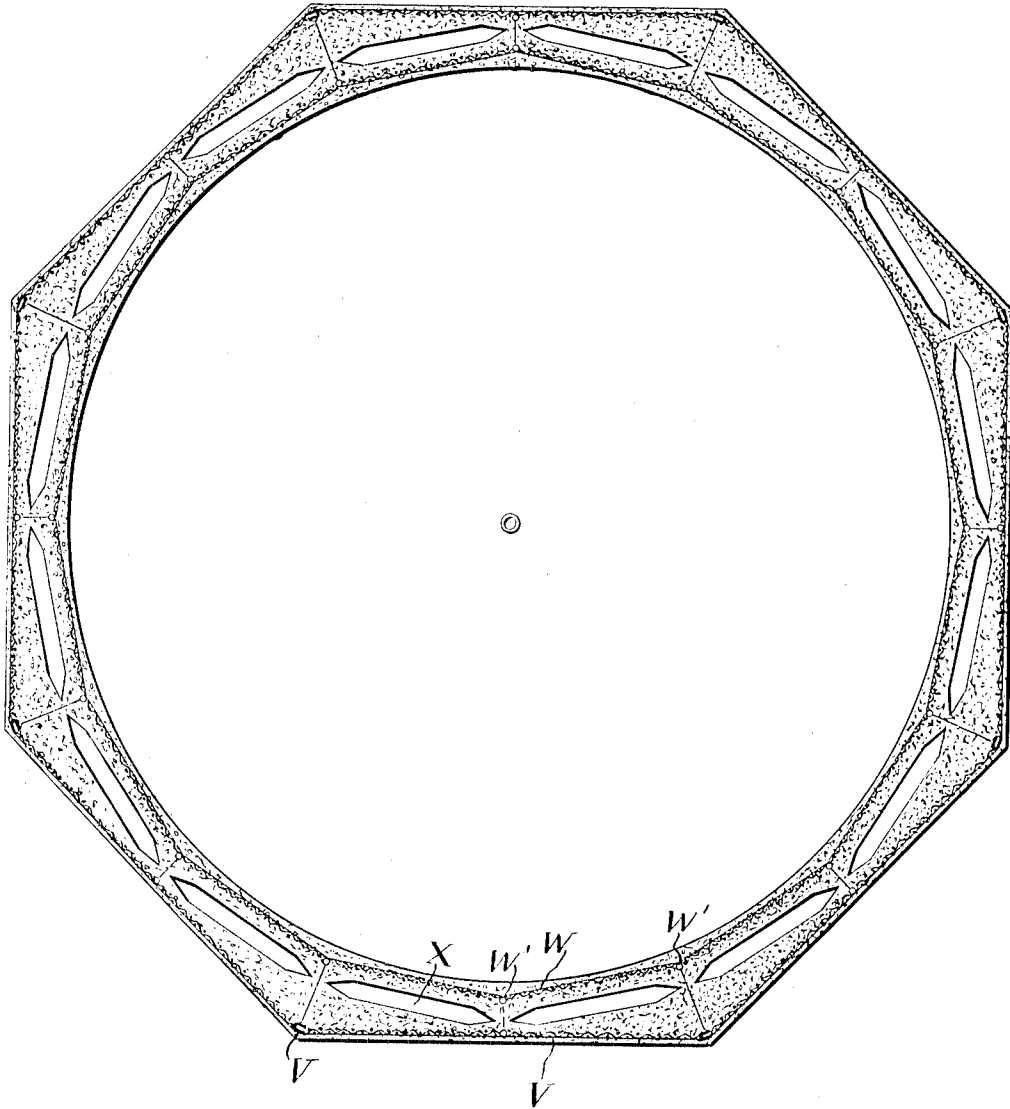
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6 SHEETS-SHEET 6.

Fig. 11.



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UNITED STATES PATENT OFFICE.

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CONCRETE BUILDING CONSTRUCTION.

1,105,682.

Specification of Letters Patent.

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Application filed May 21, 1909. Serial No. 497,488.

To all whom it may concern:

Be it known that I, NICHOLAS C. NEWERF, of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Concrete Building Construction; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

This invention relates to concrete building construction, wherein the walls, floor and roof are monolithic, the objects of the invention being to provide a structure which is effectively reinforced by metal framing, reinforcements, etc., incorporated in the completed walls, floors and roof, which framing and reinforcements are also utilized during the construction of the walls, floors, etc., as the means whereby the concrete, while in a plastic condition, is retained in its proper form and as the means whereby the hoisting and conveying appliances and scaffolds are supported during the construction of the walls, floors and roof.

In carrying the invention into practice it may be stated generally that the metallic reinforcements for the walls, etc., are composed of major verticals or columns adapted to be incorporated in the walls at salient points to serve as abutments to support T-joists and rafters. Transverse wire tension members are fastened to the abutments and combined with intermediate vertically arranged reinforcements or rods of less diameter and strength than the major reinforcements, but adapted to unite the transverse reinforcing members and to afford increased strength between the major reinforcing members. All of the said vertically arranged reinforcing members are adapted to support and carry foraminous sheets or netting reinforcements which primarily constitute the forms for giving shape to the walls, but through which the plastic composition exudes and is adapted to be finished by tooling to incase or incorporate the netting within the walls and to give a finish to the surfaces. In practical operations, in accordance with the invention, it is also designed that the walls can be made solid, hollow or cellular and that the forms for the cavities shall be composed of relatively heavy paper or paper board suitably stayed and supported within the netting

forms and adapted to be left permanently in place in the completed structure.

Referring to the accompanying drawings Figure 1 is a perspective view of a section of one corner of a building showing the forms and reinforcements in place ready for the reception of the concrete mixture. Fig. 1^A is a detail elevation of two columns and a connecting beam. Fig. 2 is a perspective view showing the upper end of one of the major reinforcements or columns with a girder or joist secured thereto and a rafter for a pitch roof supported by the girder or joist. Fig. 3 is a perspective view of the forms and reinforcements as arranged for the reception of the concrete mixture in a flat wall of a building having window and door openings therein with gable or V-shaped transom openings over the window and door openings. Fig. 4 is a detail horizontal section showing the reinforcements, netting forms and hollow forms for a section of wall, the plane of the section being through a window opening. Fig. 5 is a similar view with the concrete of the walls in place and the exterior surfaces tooled or finished. Fig. 6 is a perspective view showing somewhat more clearly the way in which the tension and reinforcing and outer form members are assembled on each side of window and door openings for a section of wall to be completed at one time. Fig. 7 is a perspective view showing a section of one corner of a building with the tension reinforcing members for a ceiling and floor prior to the application of the forms or concrete mixture thereto. Fig. 8 is a sectional view through the same showing the netting support for the concrete ceiling slab secured on the tension members. Fig. 9 is a similar view, but with the concrete in place, and a hollow arch formed and temporarily supported by a permanent imperforate arch form located within the body of the floor. Fig. 10 is an elevation, and Fig. 11 is a transverse section through a silo embodying the present invention.

In accordance with the present invention, and as illustrated in the accompanying drawings, the major reinforcements or columns referred to in the foregoing preamble, are indicated at A. They are of U-shape, one of said columns being located at each corner, as shown in Fig. 1, and also at suitable intermediate points, preferably seven to eight feet apart or wherever necessary as,

for instance, between the window and door openings as shown in Figs. 3, 4, and 5. Said columns are connected by horizontally arranged joists preferably of T-iron, as shown at B in the drawings, said joists being supported from the columns by L-shape brackets C.

In preferred construction, the number of horizontal joists or T-irons correspond to the number of columns and are placed so as to be conveniently utilized with the columns supporting the floor arches. The ends of said joists are allowed to project a sufficient distance beyond the plane of the walls, as shown clearly in Figs. 1 and 3 to form the supports for the scaffolding and the concrete conveying apparatus by which the concrete is elevated to the desired height and carried around the points where it is to be deposited in the walls and on the floors. When the construction of the walls has progressed to a point where the projecting ends may be dispensed with, the said projections are cut off and the ends of the body incorporated or covered in the wall. At the ceiling line of the top story, however, the projecting ends of the joist are not removed but serve as the supports for the eaves or cornice and lower ends of the rafters, shown at D in Fig. 2.

The lower ends of the columns A it will be understood are incorporated in the foundations where they are firmly anchored, and it is obvious that the horizontal joists are added only as the building operations progress, and consequently the columns may be made in sections, if so desired, and the sections connected end to end in any well understood manner, the principal requirement being that said columns shall be sufficiently rigid to prevent transverse deflection when subjected to strain by the transverse tension members to be presently described, and to have sufficient rigidity vertically to temporarily support the framing above the portion of the wall already completed together with the concrete conveying apparatus not shown.

Transverse wires or tension members E are drawn tightly between and secured to the outer sides of the columns A, said transverse wires or tension members being preferably located or spaced apart a sufficient distance to afford adequate support for fine mesh wire netting forms which are subsequently secured thereto, thus in the illustration of the invention the said wires or tension members are located approximately eighteen inches apart and to properly space and unite them together and afford additional intermediate reinforcements, vertically disposed and relatively heavy metallic rods F are arranged at suitable intervals in proximity to the outer faces of the walls but in position for the fine wire netting forms

G to be supported thereby, if necessary, by being bound thereto, although in the preferred arrangement additional intermediate transverse ties H are extended through the wall space from the inner to the outer tension members and serve not only to hold said tension members against the vertical reinforcing rods, but also to retain the wire netting form against outward deflection when subjected to pressure from the plastic wall material. As many of these transverse ties H may be employed as is necessary to keep the faces of the forms in their proper planes and, if desired, additional short rods or wire may be employed at any desired point, as indicated, for instance at F' in Fig. 6.

In order to support the transverse tension members at the inner faces of the walls without the necessity of employing major columns in line therewith, the tension members E for the inner face of the wall may extend through the walls at the end of the building and be attached to the rods F on the outer faces, as indicated, for instance, at E' in Fig. 1, although as an additional support and strengthening means, the vertical rod F² at the inner corner of the wall is anchored by diagonal ties f² to the column A. With this construction, when the transverse tension members and ties are tightened or drawn taut they will present an exceedingly rigid structure well adapted in connection with the vertical rods and columns to support the wire netting forms for giving shape to the outer faces of the walls and for supporting the inner forms which give shape to the cavities or hollows within the walls. Braces, such as indicated at F³ in Figs. 1, 1^A and 2 between columns will be employed for giving additional strength to said columns, and rods in outer part of wall which cooperate with them and thereby give support to the inner tension members, and rods. Rods on the outer part of the wall, not in the way of buckets carrying concrete, can be carried up one story at a time and cooperate with said brace mentioned at each story so as to form a solid, rigid support for the rods and tension wires. Braces F⁴ extend through the wall to support the rods at the inner side of the wall so that the whole will be one permanent and rigid structure, as shown in Fig. 1. Obviously, the vertical rods or reinforcing members may be made in sections and united end to end, as by sleeves or split collars I and thus it becomes unnecessary to provide rods of great length; in fact, the rods may be only of a length equal to the height of a section of wall to be completed at one time, say three feet as shown in Fig. 6.

Conveniently, the vertical rods F are located in such position that they will be at the corners of window and door openings,

as shown in Fig. 3, with which arrangement it becomes entirely practical to provide wire netting in lengths which may be drawn or wrapped around the vertical rods 5 and columns, the said netting being of proper width for a depth of cement or concrete which it is desired to add to the wall at any one time. For instance, the netting may be of eighteen inches or three feet wide 10 or high and, while this netting is being wrapped about the vertical reinforcements to make the forms at one side of the building, a previously prepared portion of the wall on the other side may be filled with 15 cement or concrete, the processes of placing the wire netting and filling the same being alternately performed at each side of the building under construction.

At the top of the windows it is preferred 20 that a gable or inverted V-shape transom opening should be formed and for this purpose diagonal reinforcing rods K, Fig. 3, are secured to the rods and taut tension members. These diagonal rods form the 25 supports for the wire mesh or netting constituting the bottom of the form on which the concrete above the window opening is placed. Below the gable transom opening a slab of concrete is preferably formed 30 within a trough-shape section of the netting form indicated at K' in Fig. 3, although this feature may be varied in accordance with the ideas of any particular builder or designer.

35 The forms for giving shape to the cavities or hollows within the walls are, as before stated, preferably made of relatively heavy paper or paper board. They may be of any desired shape transversely, but in order to 40 afford the greatest resistance to crushing strains tending to collapse the same, they are preferably angularly arched from edge to edge or have faces which are supported by each other at the edges so as to resist 45 inward pressure.

When located in the walls the internal forms are stayed and supported by the stays between the tension members or netting, although they are also designed to rest one 50 upon the other vertically in the wall, so as to form continuous hollows extending from top to bottom of the walls. By making these internal forms of heavy paper or paper board, they are cheap, easy to make, 55 light to handle and may be left in the wall without increasing materially the cost of the wall and without leaving material therein which will be a detriment to the completed structure. It will be understood that when 60 the concrete is placed within the wire netting forms and puddled rather than tamped, a certain portion of the plastic material will pass through the meshes of the netting and, in accordance with the present invention, 65 as this material passes through the meshes

of the netting it should be smoothed and spread about by hand tools or trowels so as to give form and surface to the outer face of the wall. At the points where window and door openings occur the jamb surfaces are appropriately shaped as, for instance, the retaining beads K², Fig. 5, may be formed in the window opening and a sufficient body of the plastic material is 70 accumulated on the outer side of the netting to completely embed and incorporate 75 the netting within the wall itself and to permit of a true plane surface being formed for the wall faces.

At the floor line, it is designed that tension members shall be drawn taut between 80 the joists B, as shown clearly in Figs. 7, 8, and 9. In said figures of the drawing, the floor tension members L are conveniently placed over the upper edges of the joists, 85 three feet apart, while the lower or ceiling tension members L', pass under the joists eighteen inches apart. Upon and across the lower tension members I place a sheet of fine wire mesh, indicated by the letter N, in Fig. 8, 90 the end of which rests on and in the inner wall of the outside walls. The ends of the sheet are secured to the reinforcing rods at both ends, and on the continuation of said walls and center partition upward the ends 95 of the mesh are left submerged and buried therein. However, before the placing of said wire mesh, as described, the partitions on the floor below are constructed in a similar manner as hereinbefore described with the 100 exception of the hollow or paper form, the mesh being completed on either side of said partition to the height of the ceiling tension members and fastened thereto. The partition is then filled by the buckets traveling 105 above the floor and dumping into chutes that fill said partition.

In supporting the ceiling tension members between the joists they are fastened to rods shown by letter O, in Fig. 7, or for supporting 110 them during the placing of the ceiling material they are preferably connected to the rod lettered O on floor above, said rod O resting on the braces F³ between the columns, as shown in Figs. 1, 2 and 8, and also 115 resting on center partition of the building.

To form the ceiling slab the tension members and sheet of wire netting are arranged as shown in Fig. 8, then the plastic composition is poured thereon and spread about and 120 at the same time the under face or that portion of the material which passes through the meshes of the netting is troweled and smoothed to form the surface of the ceiling. This ceiling slab so formed is allowed to 125 stand for a reasonable time, or until set to a sufficient degree after which a light arch P of relatively stiff paper board or other inexpensive material is sprung between the joists and at the center it is supported by a 130

transverse rod O carried by the vertical wires M. The concrete for the arch is next placed in position and spread over the arch form P so as to inclose and embed the upper tension wires L of the floor. This concrete is allowed to set, thereby completing the arch formation of the floor slab, and after it has set, the vertical wires M are cut off and their ends bent down, as shown in Fig. 9, so as to be covered by the final floor coating or surface which is added as a finish to the slab.

The internal forms, both of the cavities in the walls and the floor arch, are preferably waterproofed in order that they may maintain their proper shape and condition when in contact with the wet concrete mixture and the meshes of the wire netting forms should be of such size that the netting will effectually support the body of the concrete, although a certain portion of the finer part of the mixture will pass through the said meshes and be in condition for spreading and tooling. Obviously, the mixing of the concrete to the proper consistency to suit the particular mesh of the netting is a matter of some importance and should be looked after carefully during the building operation so as to obtain uniform results without liability of the surface sagging or stripping while in a plastic condition. The tension members which extend across the window and door openings are cut off when the wall is completed, so as to leave said openings free and unobstructed as shown in Fig. 5.

The structure herein described is well adapted for buildings for various purposes, such as dwelling houses, farm buildings, silos, etc., and hence, I do not wish to be limited herein to any particular type of building.

The walls are designed to be self supporting and capable of carrying a heavy load on the floors, that is to say, the concrete of the walls is simply strengthened but not supported by the metal reinforcements. In buildings having only a few stories it is well to complete the whole iron frame as a preliminary step, but in large buildings pilasters can be constructed in conjunction with and become part of said walls, and the iron frame can be erected one story at a time or an upper story frame can be set up while the walls of concrete for the lower story are being built thus facilitating construction.

In Figs. 10 and 11 I have shown a silo constructed in accordance with the present invention. A building of this character may most conveniently be constructed with external faces, the major vertical reinforcements being located in the angles as indicated at V. The relatively fine wire mesh and horizontal tension member V' form the support for the outer side of the wall dur-

ing construction while the inner side of the wall is supported by wire mesh and tension members W drawn taut between inner vertical rods W'. The number of rods W' may be made sufficient to permit the inner face of the building to be made substantially circular as shown. Each vertical rod W' on the inner side of the wall is tied through the wall to the major reinforcements and tension members on the outer side of the wall. Each section of the wall is made hollow by means of permanent paper forms X. The entrant angles on the inner side of the wall are filled by the concrete passing through the wire mesh and the angles on the outer side of the wall form buttresses to give great strength and stability to the whole structure. Inasmuch as the horizontal reinforcements run around the building a maximum strength is obtained to resist bursting pressure.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In concrete wall construction, the combination of a self-supporting metal frame embodying rigid vertical major columns spaced apart along the outer face of the wall forming supports for the frame work of the structure, transverse flexible tension members drawn taut and extending from column to column, rigid vertical reinforcing rods smaller than said columns and placed intermediate the columns and associated with the tension members in proximity to the inner and outer faces of the wall, fine wire mesh netting held by the columns, tension members and intermediate rods to give form to plastic concrete held within the same, all of said members being incorporated in the wall by being incased by the concrete passing through the meshes of the netting.

2. In concrete wall construction, the combination with the major rigid vertical metal corner columns spaced apart along the outer face of the wall, inner and outer flexible transverse tension members spaced apart substantially the thickness of the wall, the outer tension member being held by said columns in proximity to the outer face of the wall, rigid vertical reinforcing rods smaller than said columns and placed intermediate the columns substantially in line with the inner face of the wall, said inner tension members being held taut by said rods in proximity to the inner face of the wall and fine mesh netting forms held by said columns, rods and tension members and filled with concrete composition, the whole being incorporated in the body of the wall by being incased in the concrete passing through the meshes of the netting.

3. In concrete wall construction, the combination with the major rigid vertical metal corner columns spaced apart along the outer

face of the wall, inner and outer flexible transverse tension members spaced apart substantially the thickness of the wall, the outer tension member being held by said columns in proximity to the outer face of the wall, relatively small rigid vertical reinforcing rods intermediate the columns substantially in line with the inner face of the wall, ties connecting said rods and columns, additional ties extending through the wall space from the inner to the outer tension members, said inner tension members being held taut by said rods in proximity to the inner face of the wall and fine mesh netting forms held by said columns, rods and tension members and filled with concrete composition, the whole being incorporated in the body of the wall by being incased in the concrete passing through the meshes of the netting.

4. In concrete wall construction, the combination with the vertical metal corner columns spaced apart, inner and outer transverse tension members substantially in line with the inner and outer faces of the wall, said outer tension members being held taut by said columns, vertical rods in proximity to the outer face of the wall, other vertical

rods located in proximity to the inner face of the wall certain of the outer face rods being in line with the inner face of the wall, tension members held taut by said last mentioned rods, those tension members running along the inner face of the wall extending through the wall and connected to the rods located at the outer face of the wall, and fine mesh netting forms held by said columns, rods and tension members to give form to the faces of the wall and the whole being incorporated in the body of the wall by being incased in the concrete passing through the meshes of the netting.

5. In a hollow concrete wall construction, the combination with the vertically arranged columns and rods, of the permanent fine mesh netting forms, longitudinal flexible tension members supporting the forms between the columns and rods, internal forms within the wall and flexible ties connecting opposite sides of the netting forms and internal forms.

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