Aug. 19, 1952 A. HOROWITZ 2,607,450

METAL SUPPORTING SKELETON FOR A BUILDING CONSTRUCTION

Filed Dec. 31, 1947 2 SHEETS—SHEET 1

FIG. 1.

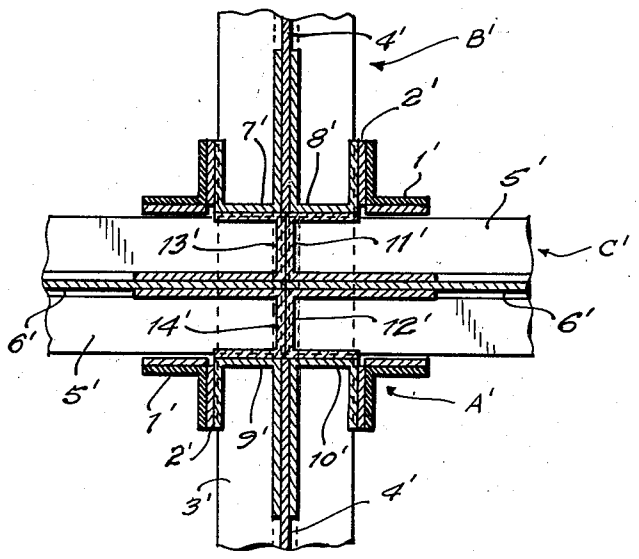
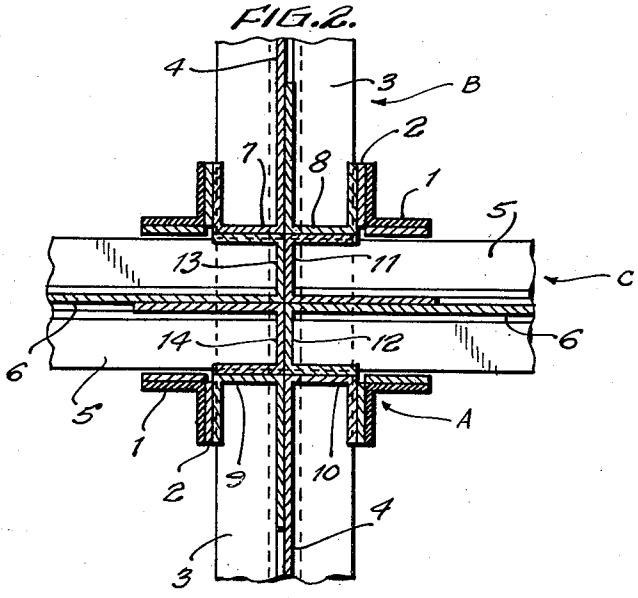


FIG. 2.



INVENTOR.
ALEXANDRE HOROWITZ
BY

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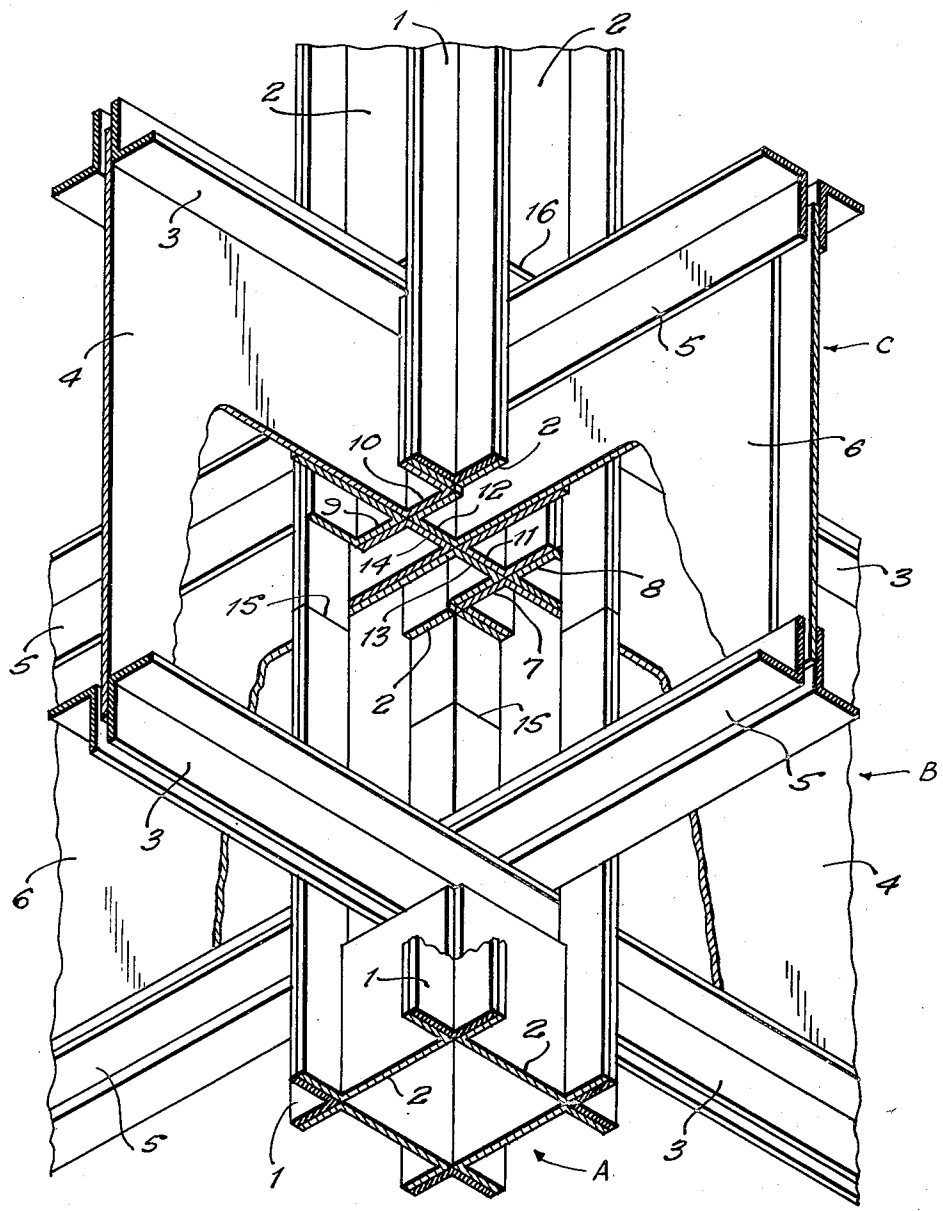
FIG. 3.



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ALEXANDRE HOROWITZ
BY

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2,607,450

METAL SUPPORTING SKELETON FOR A BUILDING CONSTRUCTION

Alexandre Horowitz, Eindhoven, Netherlands

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4 Claims. (Cl. 189—36)

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This invention relates to a supporting skeleton for a building or similar constructional work, comprising a plurality of supporting members forming a number of intersecting systems in which the members are running substantially in the same direction.

In the customary frame work systems and other supporting constructions the longitudinal dimensions of the composing structural members, such as columns, main girders and beams, have to be limited to the distances between the existing junction points, since the structural members are interrupted at every intersection of two systems, where they are joined together by more or less complicated connections. In consequence thereof many columns are put under additional bending strain by the main girders, whilst the bending stresses in the girders and beams are also increased, since these supporting members cannot extend along a number of supporting points.

An object of the present invention is to eliminate the above mentioned drawbacks and to provide a supporting skeleton of the kind referred to, in which the longitudinal dimensions of the supporting members are by no means restricted. This is mainly attained by that at least two of the said intersecting systems of supporting members are so arranged as to permit the members of one system to be intersected by the members of the other system in the intersection points.

Another object of the invention is to construct the members of the intersecting systems in such a manner that the said intersection may be easily and readily effected.

A further object of the invention is to effect the intersection of the intersecting supporting members without substantially diminishing the strength of the said members.

A still further object is to have the members of the vertical system, such as the columns, intersected by the members of two other systems, such as the main girders and the beams.

It is also an object of the invention to join together the intersecting and the intersected members at their intersection region by means of coupling members which may be easily and rapidly secured to the supporting members or may form integral parts thereof.

Further objects, features and constructional details of the invention will become evident from the following description with reference to the accompanying drawings, in which some embodiments of a supporting skeleton according to the invention have been illustrated by way of example. In the drawings the intersecting systems

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are constituted by columns, main girders and beams.

Fig. 1 is a horizontal cross-section of a metal supporting skeleton for a building construction embodying the invention in a practical form, the section being taken at a point of intersection of a girder and beam supported by a column.

Fig. 2 is a similar horizontal cross section showing a form of the invention in which some of the connecting elements are formed by conveniently bending the webs of the girder and the beam.

Fig. 3 is a perspective view of the structure shown in Fig. 2.

Referring first to Figs. 2 and 3 of the drawings, each column A is composed of four angle bars 1 having their openings turned outwardly and being joined together by means of U- or channel-shaped irons 2, as is clearly illustrated in Fig. 3. Each girder B includes a web 4 having secured thereto border profile portions, such as two sets of angle irons 3 having their openings turned away from each other. Each beam C includes a web 6 having secured thereto border profile portions, such as two sets of angle irons 5 with their openings turned toward each other.

At each point of the intersection of a girder B and a beam C, the web 4 of the girder B is interrupted. The beam C is of a lesser height than the girder B and fits with its continuous angle bars 5 between the continuous angle bars 3 of the girder B.

The construction illustrated in Fig. 1 includes the same features which are described above in connection with the structure illustrated in Figs. 2 and 3. Thus, as is shown in Fig. 1, the column A' is composed of four angle bars 1' having their openings turned outwardly and being joined together by means of U- or channel-shaped irons 2'. Each girder B' includes a web 4' having secured thereto profile portions, such as two sets of angle irons 3' having their openings turned away from each other. Each beam C' includes a web 6' having secured thereto border profile portions, such as two sets of angle irons 5' having their openings turned toward each other. As is the case with the structure of Figs. 2 and 3, described above, each girder B' is interrupted where it intersects a beam C', and the beam C' is of a lesser height than the girder B' and fits with its continuous angle bars 5' between the continuous angle bars 3' of the girder B'.

In the construction shown in Fig. 1, the interrupted web 4' of the girder B' is connected to the uninterrupted web 6' of the beam C' by means of special connecting elements of channel form.

The connecting elements 7', 8', 9' and 10' are attached to the web 4' of the girder B', whereas the connecting elements 11', 12', 13' and 14' are connected to the web 6' of the beam C'. The connections between the corresponding elements 7'—13', 8'—11', 9'—14' and 10'—12', respectively, are situated substantially in the vertical planes passing through the outer edges of the angle irons 5' of the beam C'. When the intersection point of a girder and beam is supported by a column A', as shown in Fig. 1, the connecting elements 7', 8', 9' and 10' of the girder B' are also secured to the angle bars 1' of the column A'. This column A' is intersected by the girder B' as well as by the beam C', to which end the webs of the channel bars 2' of the column A' are cut away immediately above and below the angle bars 3' and 5' of the girder B' and the beam C' in a manner similar to the cut-away portion of column A illustrated at 16 in Fig. 3.

The embodiment of the invention which is illustrated in Figs. 2 and 3 differs from the construction shown in Fig. 1 in that some of the connecting elements, such as connecting elements 12 and 13 of the beam C, are not formed as separate members, but instead are simply formed by conveniently bending the webs 4 and 6 of the girder B and the beam C, respectively. This structure may be advantageously adopted when the webs of the girder B and the beam C are constituted by overlapping web plates as disclosed in my co-pending U. S. application, Serial No. 787,677, now abandoned (note especially the end of the beam C at the right-hand side of Fig. 3). Fig. 3 illustrates how the several connecting elements are joined together, and this figure also illustrates how the column A is composed of two superposed parts in order to facilitate the mounting of the column. The angle irons 1 of the column are interrupted at the level of about half the height of the beam, as has been indicated at 15 in Fig. 3. The connection of the two superposed parts of the column A is effected by the connecting elements 7, 8, 9 and 10.

It will be evident from the foregoing description that the connecting elements according to the present invention provide a very solid and simple connection between the several members of the supporting skeleton, and especially between the girders and beams thereof, the latter virtually forming a horizontal network. The parts and elements to be joined together are so situated that they are always readily accessible. More specifically it is possible to provide the girders and beams beforehand with the said connecting elements and to move each beam with the connecting elements secured thereto in a longitudinal direction through the openings in the webs of the girders, to which the corresponding connecting elements have also been fixed, until the connecting elements of the beams are exactly positioned with regard to the corresponding elements of the girders, after which the said elements can be welded or otherwise secured together. It will be understood that the mounting of the netting of intersecting girders and beams will thus be greatly facilitated.

In other words, this invention presents several important advantages. The columns as well as the main girders and beams are as little as possible under bending strain. A complete use is made of the advantages and possibilities afforded by the construction of continuous girders and beams which may be executed, if desired, with overhanging portions. At a given room available for the whole supporting skeleton, the outer measures of columns, girders and beams can be made as large as possible, thereby increasing the moments of inertia and the moments of resistance of the supporting members. The system lines of the skeleton may be easily and exactly followed and the connections in the meeting points of the systems are greatly facilitated.

What I claim is:

1. In a metal supporting frame for a building construction, in combination, an upright supporting column; a composite girder extending in a substantially horizontal direction, intersecting said column, and being supported thereby, said girder having a web formed with an opening passing therethrough in the region where said girder intersects said column, said girder having a flanged connecting element integral with the web thereof and located also in said region of intersection; a composite beam having a web and a flange connected thereto, said flange having an outer edge, said beam being of a lesser height than said girder and extending in a substantially horizontal direction through said opening in said girder and said beam having a flanged connecting element integral with the web thereof and being located adjacent to said flanged connecting element of said girder; and means connecting said flanged connecting elements of said girder and said beam to each other, said connecting means being located in a vertical plane passing substantially through the outer edge of said flange of said beam.

2. In a metal supporting frame for a building construction, in combination, an upright supporting column; a composite girder extending in a substantially horizontal direction, intersecting said column, and being supported thereby, said girder having a web provided with border profile portions connected to the outer edges thereof, said web being formed with an opening passing therethrough in the region where said girder intersects said column, said girder having a flanged connecting element located on the web thereof and located also in said region of intersection; a composite beam having a web provided with border profile portions connected to the outer edges thereof, at least one of said beam border profile portions being in the form of a flange having an outer edge, said beam being of a lesser height than said girder and extending in a substantially horizontal direction through said opening in said girder, said beam having a flanged connecting element located on the web thereof and being located adjacent to said flanged connecting element of said girder; and means connecting said flanged connecting elements of said girder and said beam to each other, said connecting means being located in a vertical plane passing substantially through the outer edge of said flange of said beam.

3. In a metal supporting frame for a building construction, in combination, an upright supporting column having a web portion formed with an opening passing therethrough; a composite girder extending in a substantially horizontal direction through said opening in said web of said column, resting on said column, and being supported thereby, said girder having a web provided with border profile portions connected to the outer edges thereof, said web being formed with an opening passing therethrough in the region where said girder intersects said column, said girder having a flanged connecting element integral with the web thereof and located also in said

region of intersection; a composite beam having a web provided with border profile portions connected to the outer edges thereof, at least one of said beam border profile portions being in the form of a flange having an outer edge, said beam being of a lesser height than said girder and extending in a substantially horizontal direction through said opening in said girder, said beam having a flanged connecting element integral with the web thereof and being located adjacent to said flanged connecting element of said girder; and means connecting said flanged connecting elements of said girder and said beam to each other, said connecting means being located in a vertical plane passing substantially through the outer edge of said flange of said beam.

4. In a metal supporting frame for a building construction, in combination, an upright supporting column having a web portion formed with an opening passing therethrough; a composite girder extending in a substantially horizontal direction through said opening in said web of said column, resting on said column, and being supported thereby, said girder having a web provided with border profile portions connected to the outer edges thereof, said web being formed with an opening passing therethrough in the region where said girder intersects said column, said girder having a flanged connecting element located on the web thereof and located also in said region of intersection; a composite beam having a web provided with border profile portions connected

to the outer edges thereof, at least one of said beam border profile portions being in the form of a flange having an outer edge, said beam being of a lesser height than said girder and extending in a substantially horizontal direction through said opening in said girder and said beam having a flanged connecting element located on the web thereof and being located adjacent to said flanged connecting element of said girder; means connecting said flanged connecting elements of said girder and said beam to each other, said connecting means being located in a vertical plane passing substantially through the outer edge of said flange of said beam; and additional connecting means comprising bent portions mounted on the webs of said girder and beam, respectively, and further connecting said girder and beam to each other.

ALEXANDRE HOROWITZ.

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