

Sept. 18, 1934.

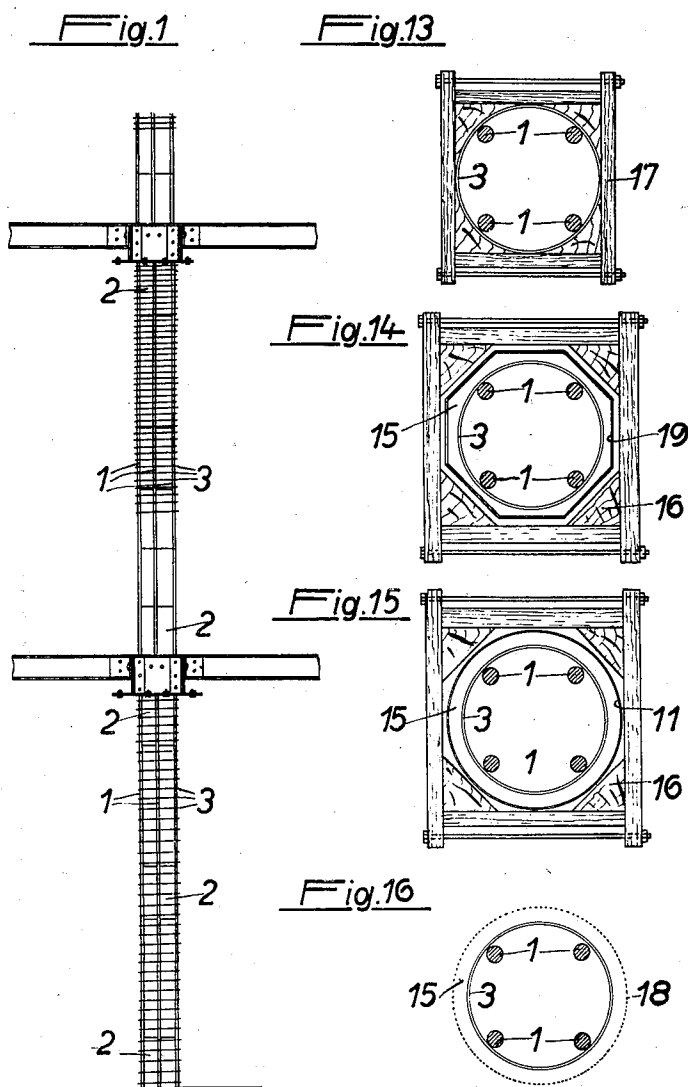
B. BAUER

1,973,741

STEEL STRUCTURE

Filed May 1, 1930

5 Sheets-Sheet 1



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Fig. 4

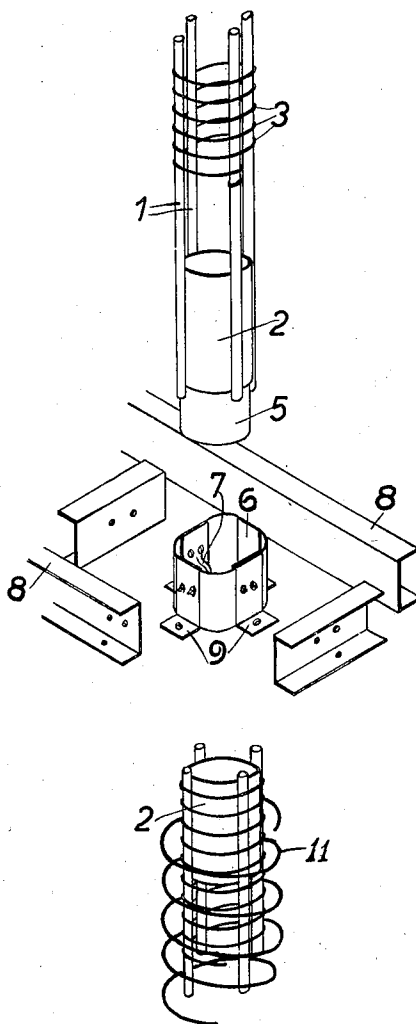
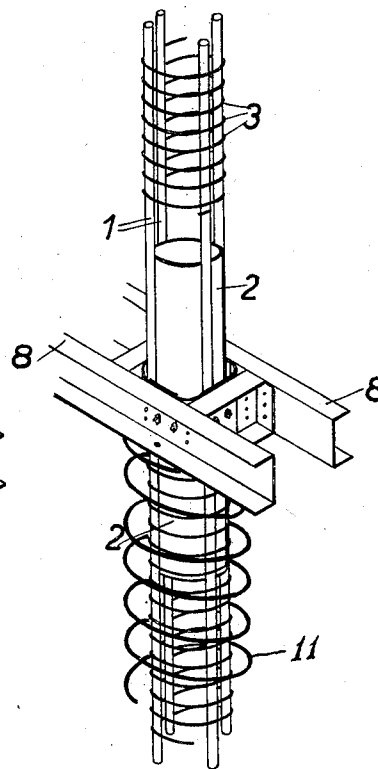


Fig. 5



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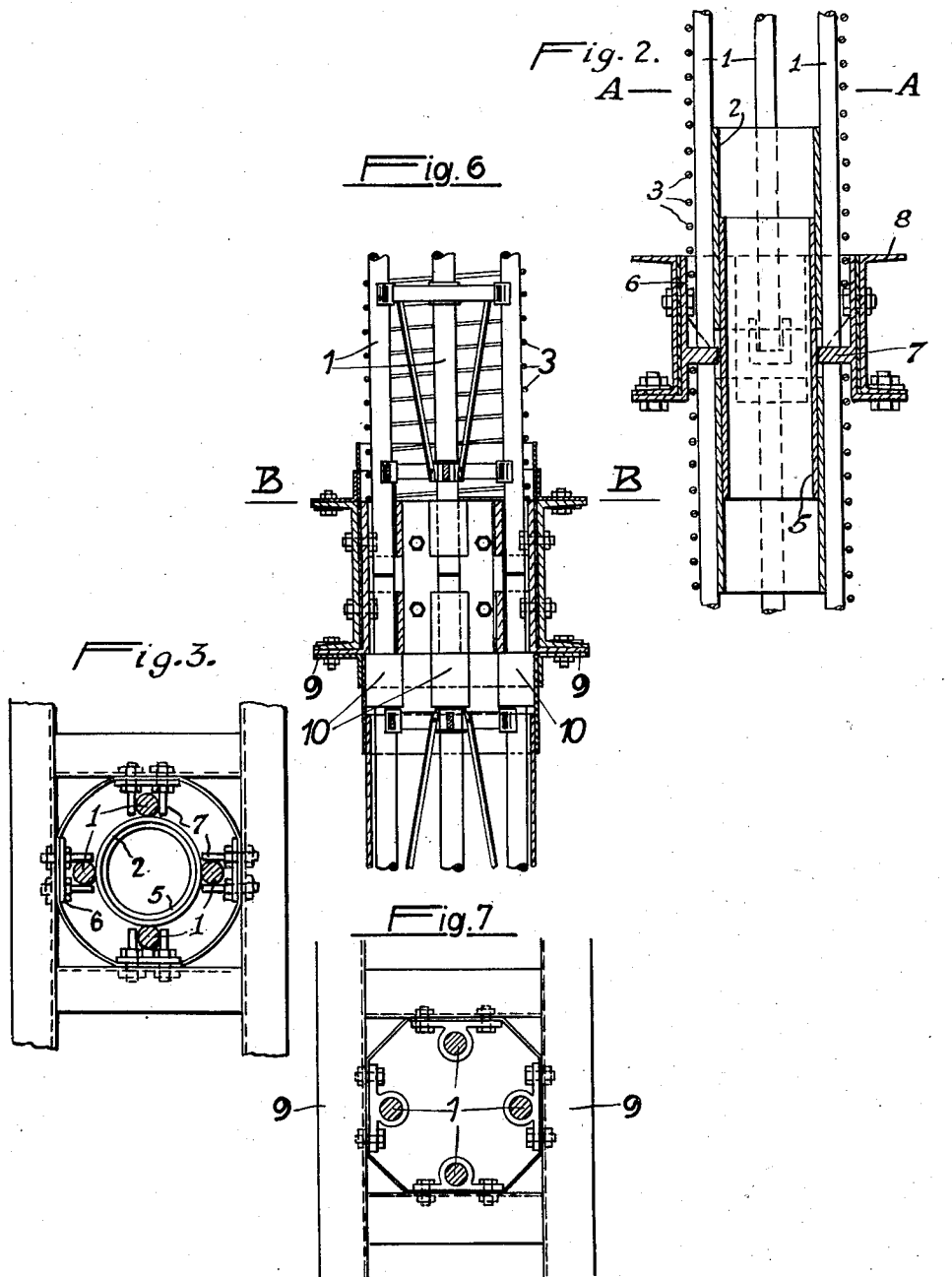
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Fig. 8

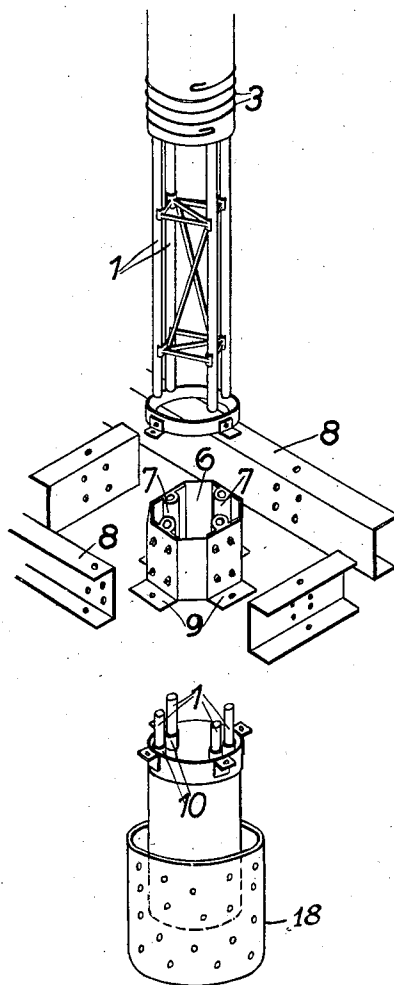
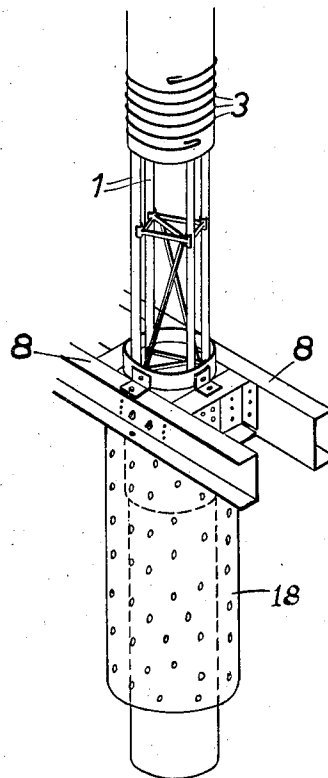


Fig. 9



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Fig. 10

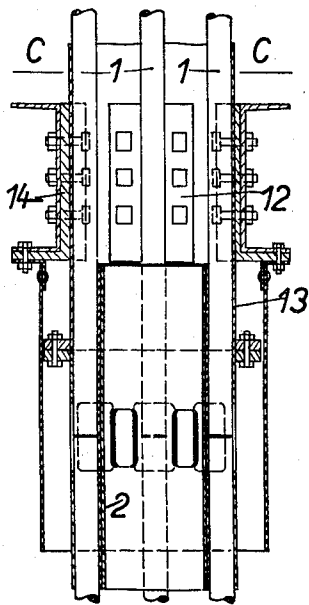


Fig. 12

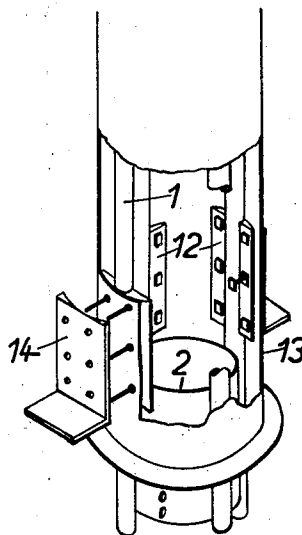
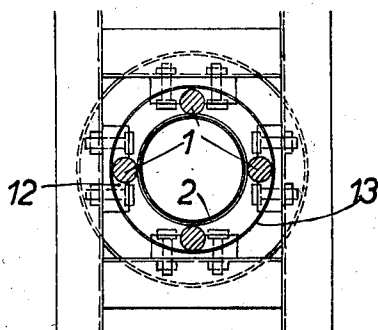


Fig. 11



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UNITED STATES PATENT OFFICE

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STEEL STRUCTURE

Bruno Bauer, Vienna, Austria

Application May 1, 1930, Serial No. 448,848
In Austria March 25, 1930

9 Claims. (Cl. 72—76)

The known method of erecting steel structures possesses certain advantages in the case of super-structures. On the other hand, it must be admitted that reinforced concrete or steel concrete structures possess also a number of advantages. Heretofore, it has not been possible to combine the advantages of the one structure with those of the other.

According to the present invention both types of construction are combined by erecting the columns only of steel concrete, while the horizontal beams are constructed of only steel.

The expression steel concrete column is intended to cover a column of the kind in which the concrete is used not only as a casing but also as a support and which, if desired, may be further reinforced to any amount beyond the 3% of the carrying cross sectional area contemplated in the present instance. According to the present invention, the reinforcement in a steel concrete column of this type, consists of steel rods of special strength (limit of compression at least 50% of the breaking strength) which are rigidly connected with one another. The binding or strapping has to be such, that the concreting of the columns is carried out either during the progressive erection of the steel structure or after the whole construction has been erected. In the latter case, the columns are concreted from floor to floor at the same time as the steel skeleton is walled up.

In the first case, the binding or strapping is immovable along the whole length of the column reinforcing skeleton, and is formed of steel rods; while in the second case the binding or strapping is wholly or partly movable and compressible on the steel rod skeleton. As a result the binding or strapping of the upper column does not obstruct the concreting of the column reinforcing skeletons of the lower column. Upon completion of the concrete work, the binding is stretched over the whole length of the skeletons and put in final position. In order to render the binding or strapping movable it is of advantage to make the diameter of the same larger than the corresponding diameter of a circle enclosing all the steel rods, so that the binding firmly rests upon the steel rod skeleton in its permanent position. Sliding movement may be provided for in various ways, for instance so that the binding or strapping is slidable and compressible at the bottom portion only.

A few types of construction of the present invention are illustrated by way of example in the accompanying drawings, in which:—

Figure 1 is a diagrammatic longitudinal section of the reinforcing skeleton for two superposed columns, the top portion of a third column being broken away. The binding or strapping is pulled up in the case of the second column.

Figure 2 is a longitudinal cross section of a column head according to the construction shown in Figure 1.

Figure 3 is a cross sectional view, the section being taken on lines A—A of Figure 2.

Figure 4 is a perspective view of the column head according to the construction shown in Figures 1, 2 and 3, the individual parts being in position before the assembly.

Figure 5 is a perspective view of the parts after assembly.

Figure 6 is a longitudinal sectional view, and

Figure 7 a transverse sectional view of a construction of the column head with a framework used as a distancing member, the section being taken on lines B—B of Figure 6.

Figures 8 and 9 are perspective views of the construction shown in Figures 6 and 7, the individual parts being shown in Figure 8 before assembly and in Figure 9 after assembly.

Figures 10, 11 and 12 show a modified construction of the column head, Figure 10 being a sectional elevation, Figure 11 a transverse cross sectional view, the section being taken on lines C—C of Figure 10, and Figure 12 is a perspective view of the column head with the tube, used as a distancing member.

Figures 13 to 16 show constructions of casings, particularly those forming the lining of concrete casings.

Referring to the drawings, the reinforcing skeleton of the steel concrete column consists of steel rods 1 of any convenient cross section, which are rigidly connected with each other, and of a binding or strapping means in the form of a coil 3 of rolled iron. In the construction shown in Figures 1 to 16, distancing tubes 2 are used which are affixed to the longitudinal reinforcing rods 1 by any welding process. 5 designates the rigid connecting tube. A sleeve 6 is provided with inwardly extending members 7 to which the girders 8 are secured.

As shown in Figure 1 in connection with the bottom column, the binding or strapping 3 is firmly secured to the column of the steel rod skeleton. In this case, the concreting has to be carried out during the erection of each floor.

As shown in the second column of Figure 1, the binding or strapping 3 is slidable and compressible in such a manner that after erecting

the skeleton of the entire building, the concreting may be carried out one floor after another. It lies within the scope of the present invention to include a slidable and compressible portion only at the bottom of the binding.

In the compressed condition the diameter of the binding is, preferably and considerably larger than a corresponding circle embracing the steel rods in order that the binding firmly rests on the steel rods when in expanded condition. The tubular shape of the distancing members 2 renders it possible to keep the interior cross section clear for the concreting operation and to partially telescope the distancing members of two superposed reinforcing skeletons.

The combination of bound or strapped reinforced concrete columns of great supporting capacity using common steel beams for the ceiling structure, requires the use of a binding sleeve 6, which heretofore has never been used in connection with reinforced concrete constructions. The use of a binding sleeve prevents an interruption of the binding at the abutting place of the reinforcing skeletons and thus secures a continuous binding effect.

As shown in the drawings, the binding sleeves 6 are also constructed to serve for carrying the ceiling beams 8. For this purpose, the binding sleeves 6 are provided with brackets 9 through which the load of the ceiling is transmitted to the steel rods. Sleeves 10, arranged on the binding sleeve 6, are preferably provided for this purpose. The binding sleeves assure concreting of the column skeletons from the one floor to the next higher floor.

In the construction shown in Figures 10, 11 and 12, counter plates 12 are secured to the longitudinal reinforcing rods 1 by welding. The tubular distancing members 2 are secured to the rods 1 by means of welding. A tubular binding 13 embraces the rods 1 and is preferably connected thereto by spot welding. The plates 14, transmitting the load of the ceiling, are screwed to the tubes 13 which then serve as binding plates.

Concrete columns of special strength call for particular provisions in the construction of the lining of the concrete casing in order to prevent disconnection between the parts.

This can be effected in two ways, either the shell is made of concrete in the one operation simultaneously with the concreting of the bound reinforcing skeleton, or the shell is subsequently applied merely as a lining to give a fireproof arrangement. As shown in Figures 14 and 15, the inner diameter of the casing is usually much larger than that of the bound column skeleton. In order to prevent the shell from being thrown off, which in the case of columns of the present construction would take place upon occurrence of stresses within the range of the allowed carrying power, the casing is provided with an inner wire netting 19 (Figure 14) or with a second binding 11 (Figures 4, 5, 11, 14 and 15) of thin wire or the like, which is not used for carrying purposes but merely secures the shell. Further, a perforated sheet metal casing 18 (Figures 8, 9 and 16) may be used, the casing remaining in the finished building after the concreting is dressed at its outside.

The casing shown in Figure 13 rests directly on the supporting binding of the reinforcing skeleton, provided the column and the shell are made in two operations. The fireproof lining is ap-

plied in a second operation in any convenient manner.

For the purpose of providing a fireproof lining the second binding 11 is used (Figure 15), which is fully closed and which secures the lining concrete shell, or a wire netting 19 (Figure 14) of like construction. The binding wires 3 and 11 are concentrically disposed and the intermediate space between the two binding members determines the thickness of the fireproof shell. In the casing shown in Figure 15, the core of the concrete column is produced simultaneously with the outer lining shell 15 whereby the reinforcing skeleton is concreted with the double binding by using a case 16.

The outer concrete shell however, may be made in a separate operation. As shown in Figure 13, the casing 17 of known construction directly rests on the supporting binding 3 and is used for concreting the column. After the setting of the concrete, the casing 17 is removed and another casing of larger diameter is used for the subsequent concreting of the outer lining shell. However, as shown in Figure 16, a perforated tube 18 may also be used as a casing, said tube remaining in the concrete column and being of a larger radius than the supporting binding.

I claim:

1. A skeleton frame for reinforced concrete of the character described, comprising horizontal girders, and supporting columns therefor, comprising upright spaced metal rods connected to said girders, spirally wound binding members embracing said rods, and a sleeve embracing the rods at their joining ends, brackets carried by the sleeve and connected to said girders to support the latter.

2. A skeleton frame for reinforced concrete of the character described, comprising horizontal girders, and supporting columns therefor, comprising upright spaced metal rods connected to said girders, spirally wound binding members embracing said rods, tubular distancing members interposed between said rods and at the ends thereof the tubular members telescoping one within the other.

3. A skeleton frame for reinforced concrete of the character described, comprising horizontal girders, and supporting columns therefor, comprising upright spaced metal rods connected to said girders, spirally wound binding members embracing said rods each of said spiral members being extensible longitudinally and attached at its upper end only to said rods, each spiral member further being capable of being extended downwardly over the rods.

4. A skeleton frame for reinforced concrete of the character described, comprising horizontal girders, and supporting columns therefor, comprising upright spaced metal rods connected to said girders, spirally wound binding members embracing said rods, each of said spiral members being extensible longitudinally and attached at its upper end only to said rods, each spiral member further being normally of a larger diameter than the column rods embraced thereby and capable of being extended downwardly over the rods, and in which the diameter of the spiral is reduced in its extended condition to closely embrace the rods.

5. A skeleton frame for reinforced concrete of the character described comprising upright spaced metal rods, a spirally wound binding embracing said rods, horizontal girders supported by said rods and a second binding member embrac-

ing the rods and being of a larger diameter than that of the first binding member, the space between the first and the second binding member being filled with concrete.

5 6. A skeleton as claimed in claim 5 in which said second binding member is a spiral.

7. A skeleton as claimed in claim 5 in which said second binding member is a wire net.

10 8. A skeleton frame for reinforced concrete of the character described, comprising horizontal girders, and supporting columns therefor, comprising upright spaced metal rods connected to said girders, spirally wound binding members em-

bracing said rods, and tubular distancing members interposed between said rods.

9. A skeleton frame for reinforced concrete of the character described, comprising horizontal girders, and supporting columns therefor, comprising upright spaced metal rods connected to said girders, spirally wound binding members embracing said rods, each of said binding members being adjustably disposed longitudinally of said rods and tubular spacing members interposed between said rods. 80 85

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