F. P. KAFKA.

SYSTEM OR METHOD OF CONCRETE FIREPROOFING OF STRUCTURAL STEEL.

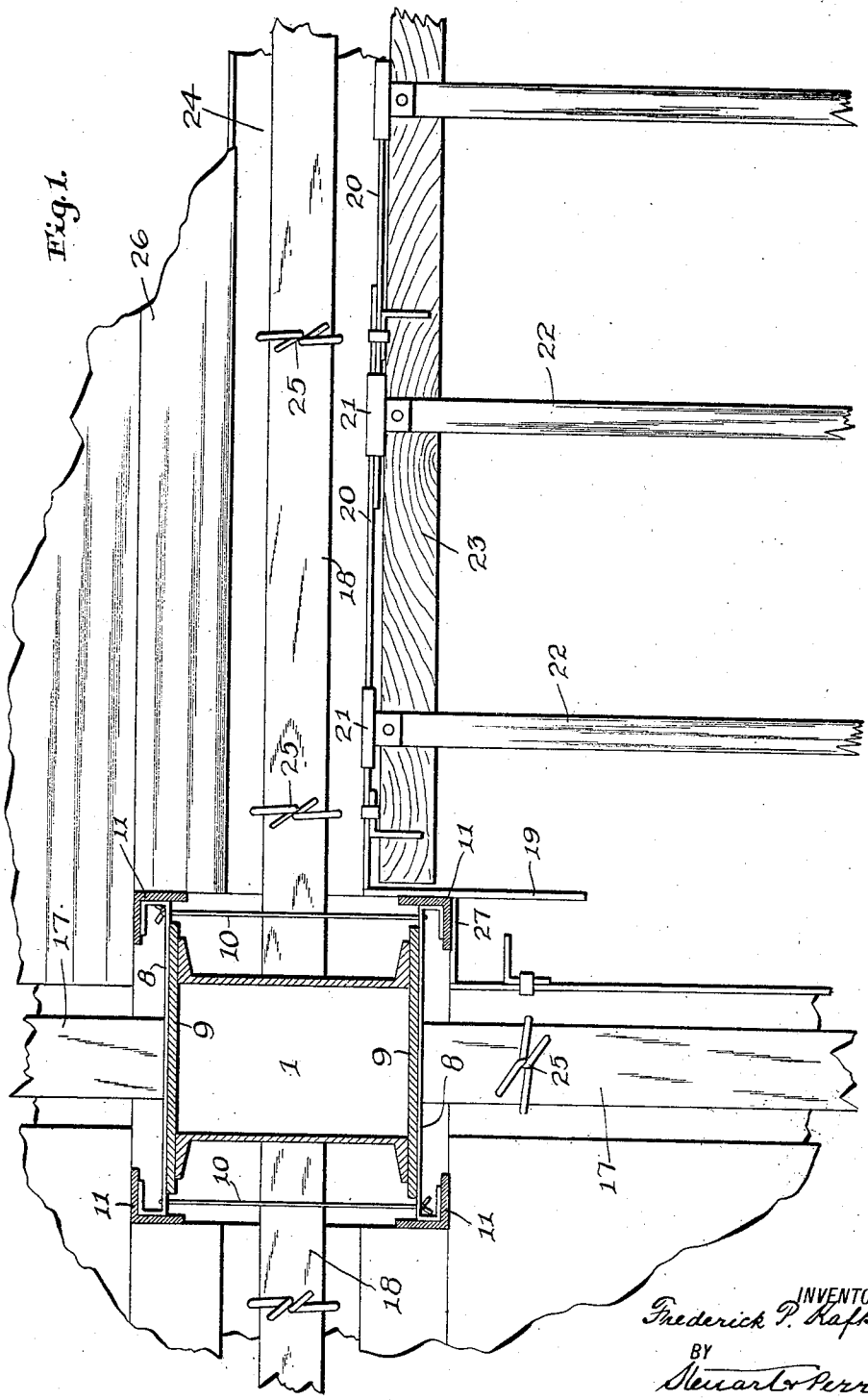
APPLICATION FILED NOV. 9, 1918.

1,306,701.

Patented June 17, 1919.

2 SHEETS—SHEET 1.

Fig. 1.



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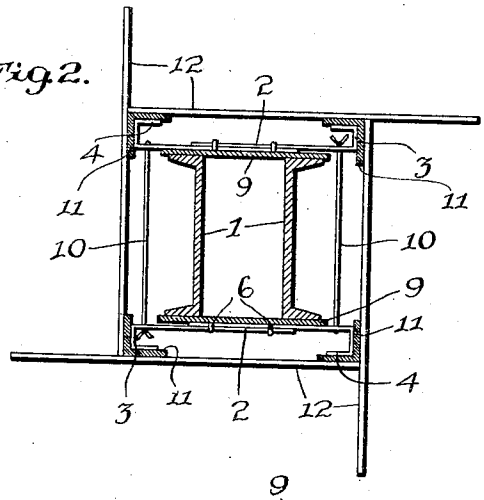
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2 SHEETS—SHEET 2.

Fig. 2.



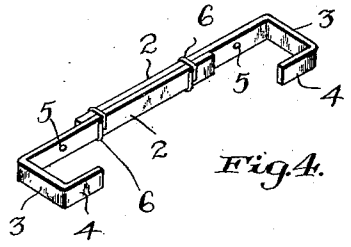
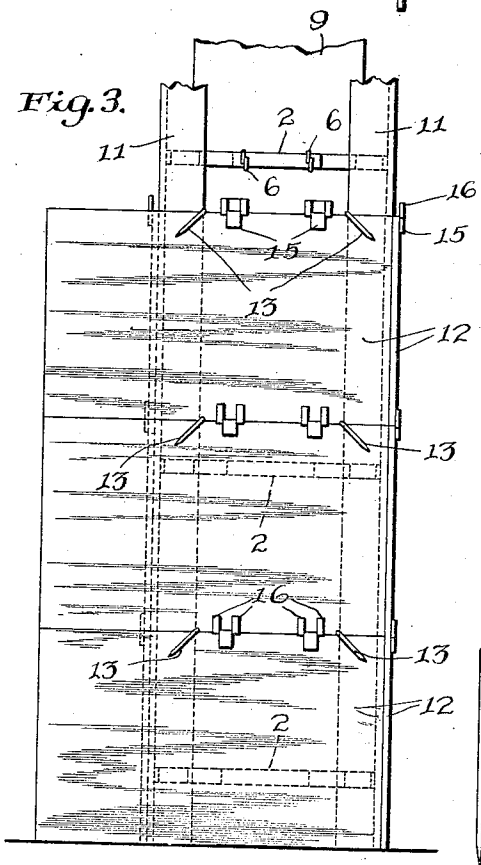


Fig. 4.

Fig. 3.



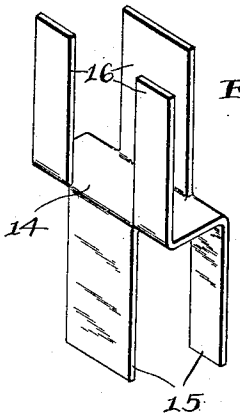
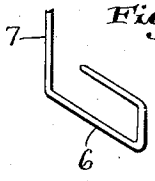


Fig. 5.

Fig. 6.



Fig. 7.



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SYSTEM OR METHOD OF CONCRETE FIREPROOFING OF STRUCTURAL STEEL.

1,306,701. Specification of Letters Patent. Patented June 17, 1919.

Original application filed May 25, 1918, Serial No. 236,445. Divided and this application filed November 9, 1918. Serial No. 261,778.

To all whom it may concern:

Be it known that I, FREDERICK P. KAFKA, a citizen of the United States of America, and resident of New Rochelle, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Systems or Methods of Concrete Fireproofing of Structural Steel, of which the following is a specification.

My invention relates to a method, or system of means, by which structural steelwork is incased in concrete, reinforced or otherwise, for the purpose of fire protection and such additional stability as may be derived from the inherent characteristics of the means employed, and, particularly, relates to the method, or system of means, by which columns, pillars, or other similar vertical structures are reinforced, strengthened, and fireproofed, including means for supporting forms or molds so as to enable the production of a homogeneous structure of great strength, durability, and many other desirable characteristics, in combination with the adjacent or coöperating girders and beams of fabricated structures, such as set forth in my pending application Serial No. 236,445, filed May 25, 1918, of which this application is a division.

It should be understood that, while the columns, pillars, or other vertical members, constructed in accordance with my invention, may be in, and form a part of, fabricated structures of all kinds and incorporated in the latter in combination with floors, ceilings, walls, and horizontal girders and beams, my present invention is to be taken in the broader sense and to comprehend stanchions, uprights, columns and pillars made independently of fabricated structures, when and as desired.

In order that my invention may be clearly understood, I have provided drawings wherein:

Figure 1 is a view showing, in section and plan, part of the layout of a fabricated structure, including horizontal girders, beams, and a pillar or column embodying my invention;

Fig. 2 is a horizontal section of column or pillar beams, together with the means employed by me to build up a concrete form about the same;

Fig. 3 is a side elevation of the structure shown in Fig. 2;

Fig. 4 is a detail, in perspective, of a member of the form employed in connection with the construction of a column, etc.;

Fig. 5 is a detail in perspective of a clip employed to unite the side walls of the form;

Fig. 6 is a perspective view of a clip adapted to hold the side walls to the corner members; and

Fig. 7 is a perspective view of a clip adapted to join the elements of the member illustrated in Fig. 4.

Referring to Figs. 1, 2 and 3 of the drawings, the numeral 1 indicates a pair of structural iron or steel beams or members arranged in juxtaposition such as to produce a column, pillar, stanchion, or other upright member which is to be reinforced, or is to become a part of a fabricated structure, in accordance with the method, or system of means, of my invention. These members may have any form desired; but, for example, are herein illustrated as U-shaped in cross-section, and are shown as spaced apart and arranged in parallelism with their longitudinal side flanges extending in opposite directions. A plurality of form-members are grouped about the column members 1, each consisting of two elements and the latter each having a long arm 2, an arm 3 bent at a right-angle thereto, and an arm 4 bent at a right-angle to the arm 3, and in parallelism with the arm 2. The long arm 2 is provided with an aperture 5. A pair of these elements are linked together by means of the clip 6, shown in Fig. 7, said clip having its arm 7 bent over upon the overlapping arms 2. By thus combining the elements of the form-members they may be made of any length desired, within the limitations of the arms 2, and applied at opposite sides of the column members 1. As shown in Fig. 1, the form-members may be made all in one piece, as indicated at 8, if desired. By making them in two pieces, as shown, adjustments can be made to answer practically any requirement of the column structure. Two such form-members, as shown in Figs. 1 to 4, are applied to the column members 1, with side column members 9 interposed between them, the same being secured together by tie-wires or bars 10 passing through the apertures 5 in the arms 2 of the form-members, the angular ends of the form members being out-turned, as shown in Figs. 1 and 2. The form members, thus ap-

plied to the column members 1, in any desired number and relation, become a foundation upon which to build the ultimate form for the concrete filling. Four corner angle-irons, or angular members 11 of suitable material, are then applied to the angular ends of the form-members, as shown in Figs. 2 and 3, said angular members being of any desired length, and of sufficient dimensions to embrace the angular ends of the form-members, the same being held in position at the four corners of the structure by encircling binding wires. The structure is now in condition to receive the first tier or layer of wall or form boards 12, which are applied as shown in Figs. 2 and 3, one on each flat side of the form structure, against the angle-irons or members 11, and spanning the space between the same, the arrangement being such that the end of each board abuts the body of an adjacent board and overlaps the edge or end of another board. I prefer to secure the form boards to the angle-irons by means of clips 13, such as illustrated in Fig. 6, the same being applied so as to cause its arms to embrace one side of an angle-iron and a part of the form board adjacent the edge thereof, which overlies said side of the angle-iron, as clearly shown in Fig. 3. Thus the form boards are temporarily secured to the angle-irons in proper position. The next tier of form boards is built up by applying a pair of clips 14, such as shown in Fig. 5, to the upper edge of the form boards, by setting said clips over said edge with the parallel legs 15 downwardly and the three parallel legs 16 upwardly. Thus, the sets of three parallel legs of the clips are in position to receive the form boards of the second tiers, the lower edges of which are entered between the parallel legs. Another pair of clips 14 is then set upon the upper edge of each of the form boards, as shown, until the entire column is surrounded by form boards held in place by the clips 13 and clips 14.

In practice, I prefer that the form boards shall be of uniform size suitable for the purpose; but, a large latitude in the size is possible and permissible, as shown in Figs. 1 and 2. Also, I prefer, in practice, to employ form boards composed of what is known as fiber-board. This board is made very thin and has a remarkable degree of strength. It may be cut to any desired size suitable for the work or within the limitations of the capacity of the frames and forms; but, of course, it will be understood that I may use sheets of metal, if desired. A desirable feature, however, is that the form boards, whether of fiber or metal, shall be cut of uniform size suitable for the purposes indicated. It is within the scope of my invention to adjust the form boards on the ground and elevate the same to a position adjacent the column forms; but, I find that it is a more convenient practice to build up the form members on the column members as described and then apply the form boards.

With the forms thus built, the cement or concrete substance is poured into the mold or form, and between the column members in all the open spaces, after which it is allowed to set or solidify.

To knock down or disassemble the form, the clips 13 are first knocked out or removed. The boards are then successively removed, which, of course, means the removal of the clips 14. When all the boards are removed, the angle-irons or corner braces 11 are separated from the concrete, which is quite readily accomplished. The form members of Fig. 4, however, are allowed to remain embedded in the solidified structure and are lost in each operation.

In Fig. 1, I have shown my invention applied to a column, pillar or stanchion surrounded by other elements of a fabricated structure built up in accordance with my invention considering the same from another aspect; that is to say, that aspect of my invention disclosed in my aforesaid application, #236,445. In this figure, I have shown the girders 17 of a fabricated structure, such as a building, at opposite sides of the column form and abutting against the side spanning members 9; also, beams 18 having their ends abutting against the walls of the column members or beams. The wall boards 19 of the forms do not extend from angle-piece to angle-piece 11, but are made to extend only to the form boards 20, which are held together by a clip 21 and to floor board supporting beams 22, the latter being supported by mortised sill beams 23. Base boards 24 underlie the beams 18 and the whole structure is supported by a plurality of looped and tied supporting wires 25, all as set forth in my aforesaid application. Floor boards 26 overlie the entire structure thus described, thus constituting a support and mold for the concrete forming the floor and reinforce for the beams. The same structure is applied to the girders 17, and, when the columns are entirely surrounded as described, the forms are ready to have the cement poured therein, in order to produce a homogeneous mass constituting the floors and columns of a fabricated structure. According to the form and size of the columns and the nature of the fabricated structure in which they are incorporated, the size and form of the wall boards 19 and 27 will be determined.

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

1. In a system for concrete fireproof construction, wherein vertical structural pillars

are incased in concrete, the following elements in combination to constitute a mold or form: a metal form bent at each end to produce angular members both in one and the same plane and on the same side of the form, the remaining section of the form being of a length equal to the width of the pillar, two or more of these forms being secured on opposite sides of the pillar with the angular members in a horizontal plane and equi-distant from the column; angle-irons secured to said forms to provide the corners of the form; boards placed against the outer faces of said angle-irons and secured thereto to form the first section of the form; bifurcated clips employed to embrace the edge of the angle-irons and boards; oppositely disposed bifurcated members, one bifurcation embracing the edge of the lower board and the other bifurcation to serve as a seat for the board forming the upper section, whereby the form is built up and ready to be filled with concrete, all of the elements being capable of being liberated when the concrete sets, except the angular form members which remain embedded in the concrete.

2. In a system for concrete fireproof construction, wherein vertical pillars are incased in concrete, the following elements in combination to constitute a mold or form: a plurality of strips of metal bent at each end to produce rectangular forms, both of said forms projected on one and the same side of the strip and in the same plane, the remaining straight section of the strip being of a length equal to the width of the column to which they are to be applied; a plurality of these strips being secured to opposite sides of the column with the angle sections disposed in a horizontal plane and equi-distant from the columns; angle-irons of right-angular cross-section secured to said angular forms to produce the vertical corners of the column form; suitable boards placed against the outer faces of said angle-irons and secured thereto, and so the form is built up tier by tier.

3. In a system for concrete fireproof construction, wherein vertical pillars are incased in concrete, the following elements in combination to constitute a mold or form: a plurality of rods or strips of metal bent at each end to produce rectangular forms, both of said forms projecting on one and the same side of the rod and in the same plane, the remaining straight section of the strips being of a length equal to the width of the column to which they are to be applied, a plurality of these strips being secured to opposite sides of the column with the angle-sections disposed in a horizontal plane and equi-distant from the columns; angle-irons of right-angular cross-section secured to said angular forms to produce the vertical corners of the column; fiber-boards of predetermined dimensions secured to the outer faces of the right-angular sections to make the first tier of the form; cleats having oppositely disposed bifurcated termini adapted to fit over the upper edge of said fiber-boards and so spaced as to form slots to receive the second tier of fiber-boards; with means to secure said boards to the angle-irons, and so the form is built up and ready to be filled with the plastic material, and when the concrete is set all of the elements above named are liberated except the rods and right-angular forms which remain embedded in the concrete.

4. In a system for incasing vertical pillars in concrete for purposes of fire protection and reinforcement a plurality of right angular forms adapted to be mounted at the corners of a rectangular pillar with means to secure said forms to the pillar, and form boards adapted to coöperate with said right angular forms to form a mold about the pillar, and means to secure said boards to said angle forms.

5. In a system for incasing vertical pillars in concrete for purposes of fire protection and reinforcement a plurality of right angular forms adapted to be mounted at the corners of a rectangular pillar with means to secure said forms to the pillar, and angle irons adapted to be supported by said angle forms to form the corners of the mold and means to secure said angle irons to said forms, and form boards adapted to coöperate with said angle irons to form a mold about the pillar and means to secure said boards to said angle irons.

Signed by me at New York city, N. Y., this 7th day of November, 1918.

FREDERICK P. KAFKA.

Witnesses:
B. A. MINNICH,
ROB. N. CARRICK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."