

O. RUHL.

CONCRETE AND METAL SKELETON FOR BUILDING PURPOSES.

(Application filed July 22, 1901.)

(No Model.)

2 Sheets—Sheet 1.

FIG. 1.

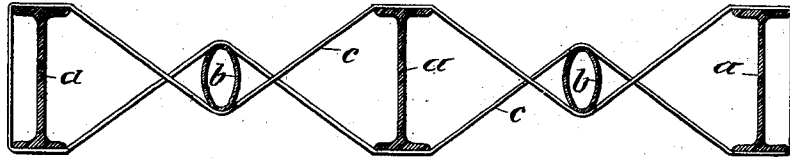


FIG. 2.

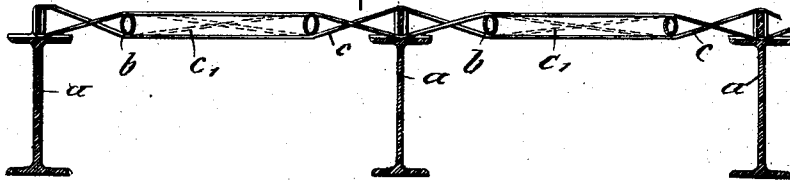


FIG. 3.

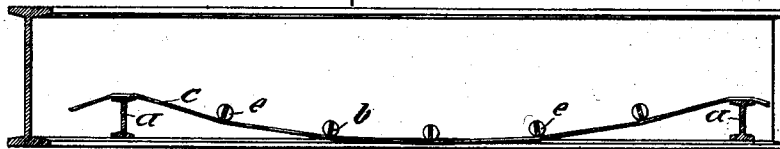


FIG. 4.

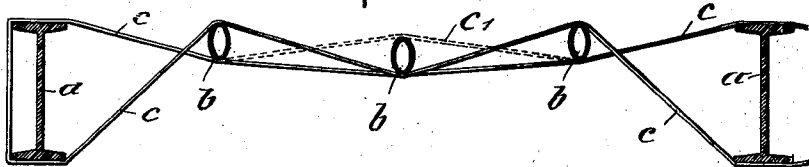
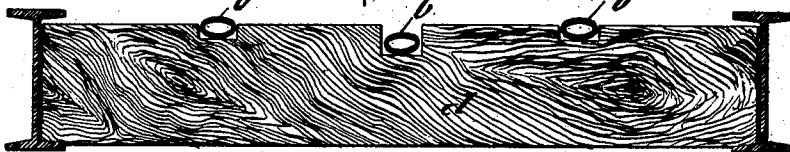


FIG. 4a.



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*Ludwig Fum.*

Inventor:  
*Otto Ruhl*  
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FIG. 5.

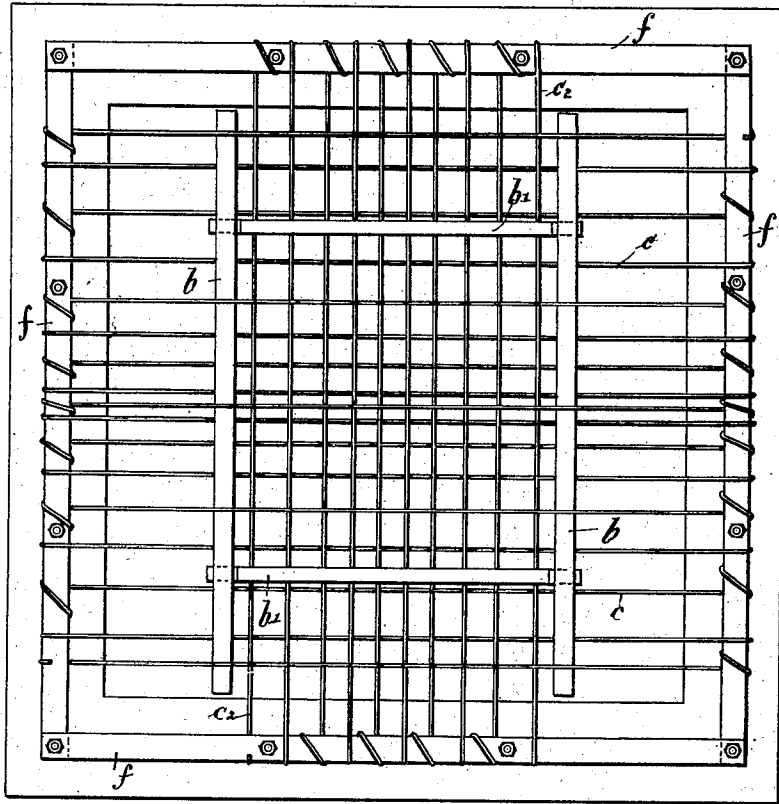
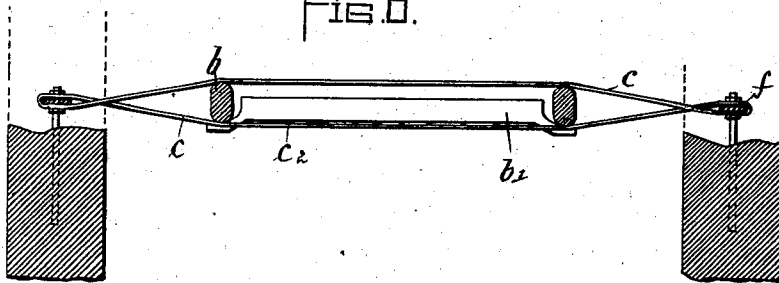


FIG. 6.



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# UNITED STATES PATENT OFFICE.

OTTO RUHL, OF BREMEN, GERMANY.

## CONCRETE-AND-METAL SKELETON FOR BUILDING PURPOSES.

SPECIFICATION forming part of Letters Patent No. 700,443, dated May 20, 1902.

Application filed July 22, 1901. Serial No. 69,236. (No model.)

*To all whom it may concern:*

Be it known that I, OTTO RUHL, a subject of the German Emperor, and a resident of Bremen, Germany, have invented certain new and useful Improvements in Concrete-and-Metal Skeletons for Building Purposes, of which the following is a specification.

The object of the present invention is to enable fine metal wire to be used for supporting constructions made of concrete, mortar, &c., in accordance with the suppositions of the static calculations.

The present invention has for its object to procure stability in the wires in a very simple and consequently profitable manner by tension without the complete building being affected in its power of resistance against its own weight and the load they will have to bear. While giving the tension each wire receives the definite shape required from a static point of view.

In the accompanying drawings, Figure 1 shows the construction in a simple form between fixed girders *a*. Fig. 2 shows the construction in another form on the upper side of the fixed girders *a*. Fig. 3 shows the fixed supporting-girders *a* arranged upon the flanges of other girders of the building. Fig. 4 shows another form of construction of the device. Fig. 4<sup>a</sup> shows a mold for supporting the distribution-supports *b* during the mounting. Fig. 5 shows another form of construction in horizontal projection and vertical section without fixed girders *a*. Fig. 6 shows a form of construction in which the secondary distribution-supports *b'* are employed.

Between fixed main supports *a* and if necessary on the molds *d*, Fig. 4<sup>a</sup>, are flat-placed distribution-supports *b*, having a proportionate cross-section and capable of being turned upon their longitudinal axis. Then metal-work *c* or *c'* is plaited together and the molds are withdrawn according as the wires are placed. The stability in the wire skeleton then is made by turning the distribution-supports *b* edge upward. In order to prevent lateral displacement of the distribution-supports *b*, the wire is passed at suitable intervals in the direction, (see *c'*.)

In order that the wires may not have their power of resistance diminished for the com-

plete building by the turning upward of the distribution-supports *b*—that is to say, for example, in the use of iron wire in order that the tension on mounting will not exceed five hundred kilos per square centimeter, the following method is adopted: If the finished building will be submitted to direct as well as to indirect burdens, and consequently if the construction, Figs. 1 or 2, receives for static reasons the same number of wires above the distribution-supports *b* as beneath, or if, as in Fig. 3, the passage of the wires is only effected on one side, the height of the axis of the distribution-supports remaining invariable by the provision of distribution-supports *b* in perforations *e*, the distribution-supports *b* are proportionate in their cross-measurements in such a way that the turning or elevation of the said supports in the direction of their smallest to their largest cross-section only causes a stretching of the wires corresponding to a strain on the material constituting the said wire equal at most to the allowed strain less by the strain to which the wire in the building of metal and concrete will be exposed. If the weight is almost wholly on one side—as, for example, a ceiling—the wires will be distributed above and below the distribution-supports *b*, but with a larger number of wires on the under face thereof to compensate for the static pressure, which will of course be greater at that point. If the construction is to be executed, for example, with iron wires, one wire in every eight or ten wires is drawn above the distribution-supports *b*, while the others pass underneath. In consequence of this arrangement the transmission of a hurtful tension in the lower wires by the turning edge upward of the distribution-supports *b* is quite impossible, because the upper wires would be broken. In the construction shown in Fig. 4 it would suffice to pass one wire in every twelve or fourteen wires above the supports, because the wires drawn upwardly simply guide or hold the distribution-supports in position, the supporting-wires or those beneath the support sustaining the weight.

Fig. 5 of the accompanying drawings shows an amplification of the use of the distribution-supports *b*. A space contained by four walls or more is covered by a smooth sheet of con-

crete and metal, using all the delineation-lines available as supports and dispensing with all framing of joists made of double T-irons, &c. To the surrounding walls is fixed an iron frame 5 *f*; otherwise holdfasts, nails, &c., may be fastened in the wall. The distribution-supports *b* are laid flat in the ceiling, as hereinbefore described, and secondary distribution-supports *b'* are placed between them in such a way 10 that the distribution-supports *b'* pass underneath the distribution-supports *b*. Then the metal wires *c* and *c'* are so placed that they cross each other, as shown in the drawings, and finally the distribution-supports *b* are 15 turned edge upward. In this way the distribution-supports *b* press down the secondary distribution-supports *b'*, which pass under them, and thus directly stretch the secondary wires *c'*. For the rest the strain of 20 mounting is adjusted just as for the present and other constructions.

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

25 1. The combination with a series of lengths of wires, of distribution-supports extending transverse to said wires, the said wires engaging two faces of said distribution-supports, the said distribution-supports adapted to be 30 turned upon their longitudinal axis whereby the tension of the said wires may be adjusted, substantially as described.

2. In combination with a series of wires, of distribution-supports having two faces thereof engaged by said wires whereby the said 35 supports may be turned on their longitudinal axis and the tension of the wires adjusted, substantially as described.

3. In combination with primary wires engaging two faces of the primary distributing- 40 supports, of secondary distributing-supports engaged by the primary distributing-supports, secondary wires engaged by said secondary support whereby the tension of both 45 is effected by the turning of the primary support upon its longitudinal axis, substantially as described.

4. In combination with a primary series of lengths of wires, of a secondary series of lengths of wires extending transverse to the 50 said primary series, secondary distribution-supports engaging said secondary series, primary distribution-supports engaging said secondary supports and being engaged by said 55 primary series of wires, whereby said primary supports may be turned on their longitudinal axis and adjustment of both series of wires effected, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

OTTO RUHL.

Witnesses:

F. A. BRYCE,  
FR. HOPERMANN.