(No Model.) 2 Sheets—Sheet 1.

H. B. SEELY.

CONSTRUCTION OF FLOORS.

No. 467,141. Patented Jan. 12, 1892.

Fig. 1.

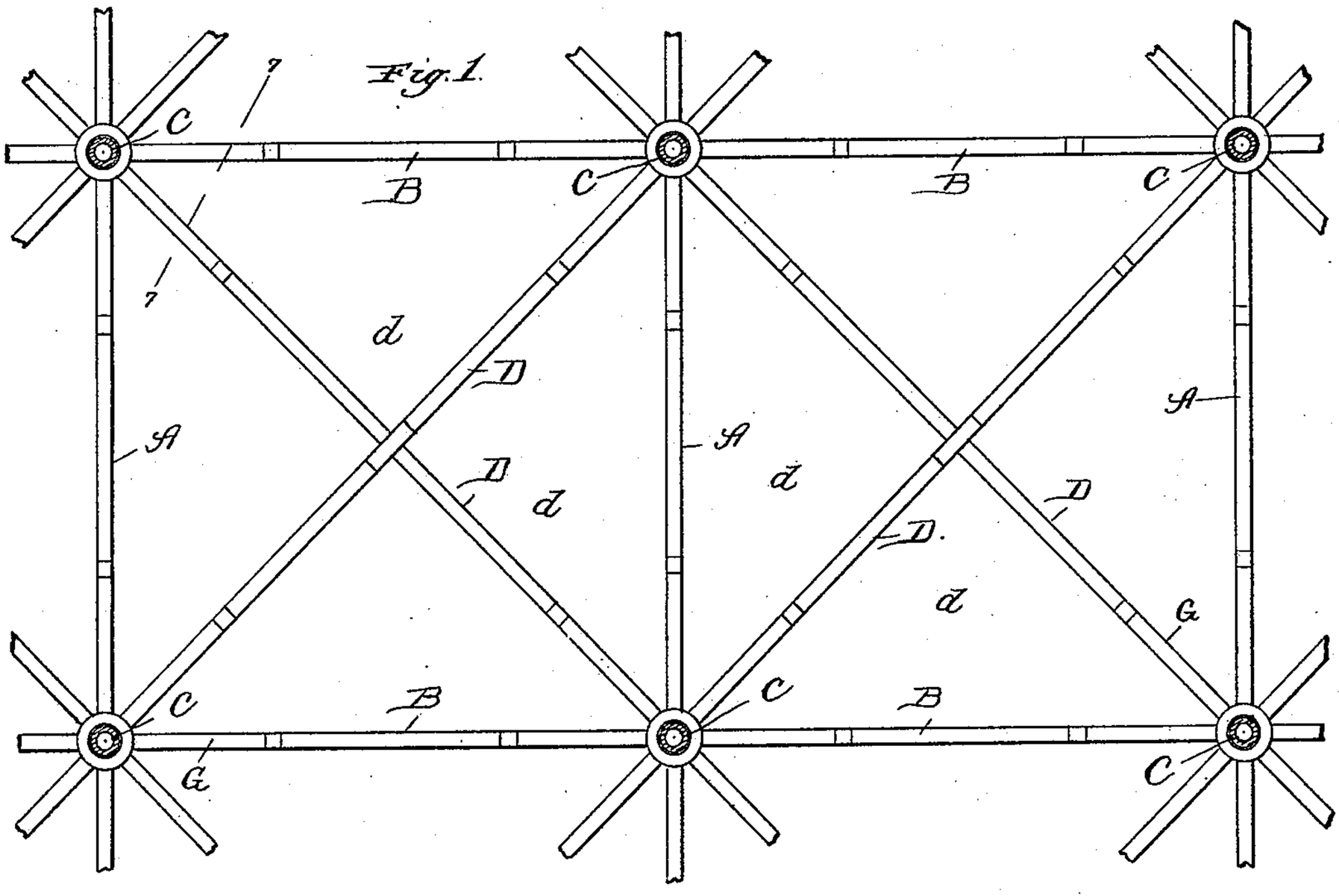


Fig. 2.

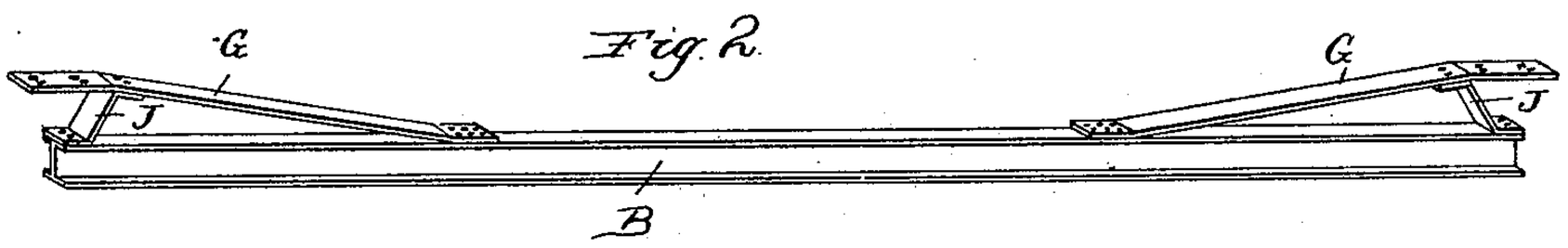


Fig. 3.

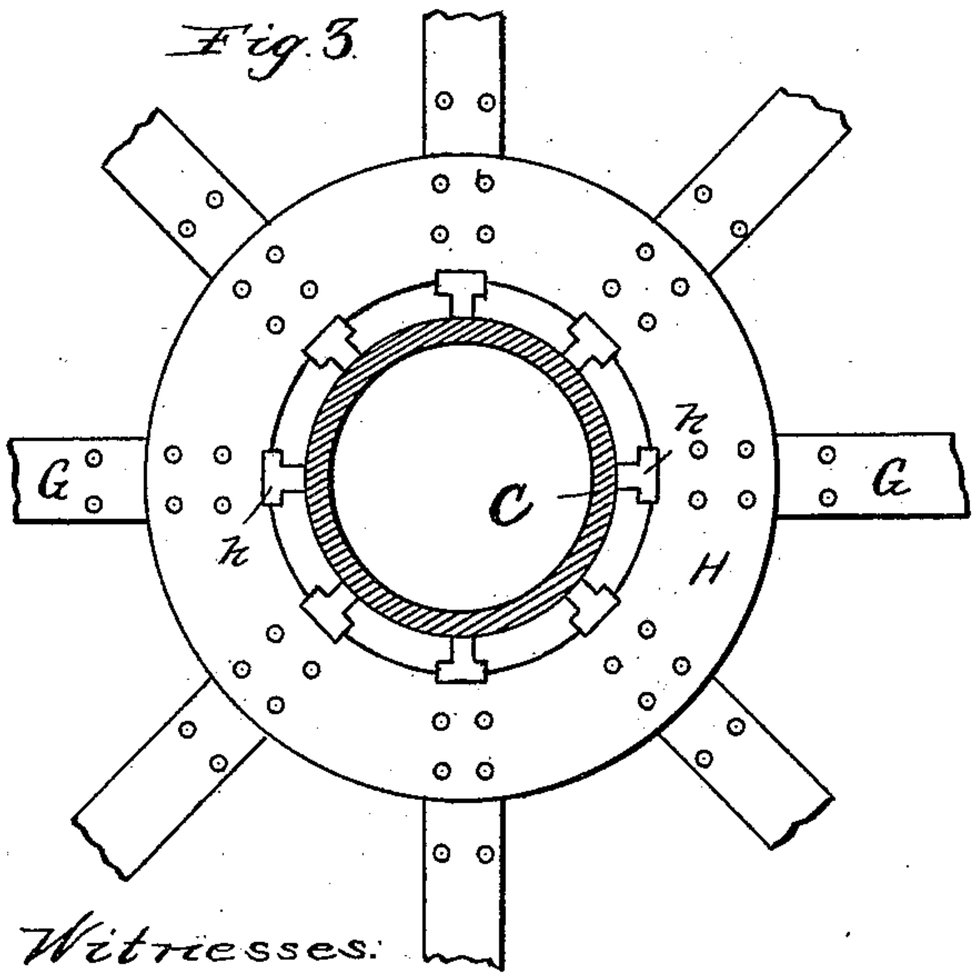
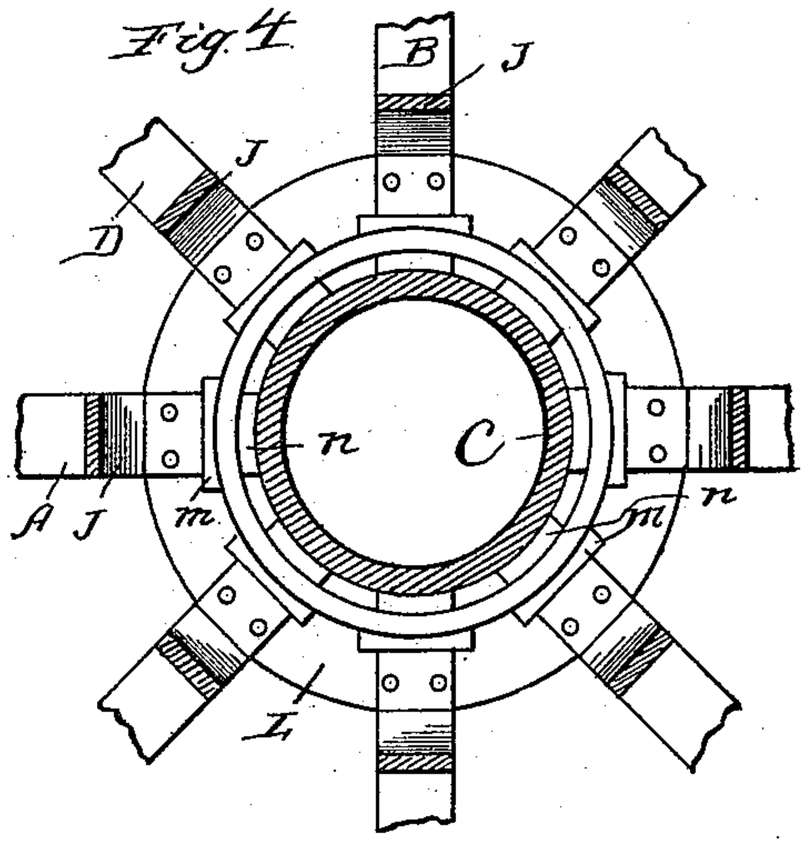


Fig. 4.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

H. B. SEELY.

CONSTRUCTION OF FLOORS.

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Fig. 5.

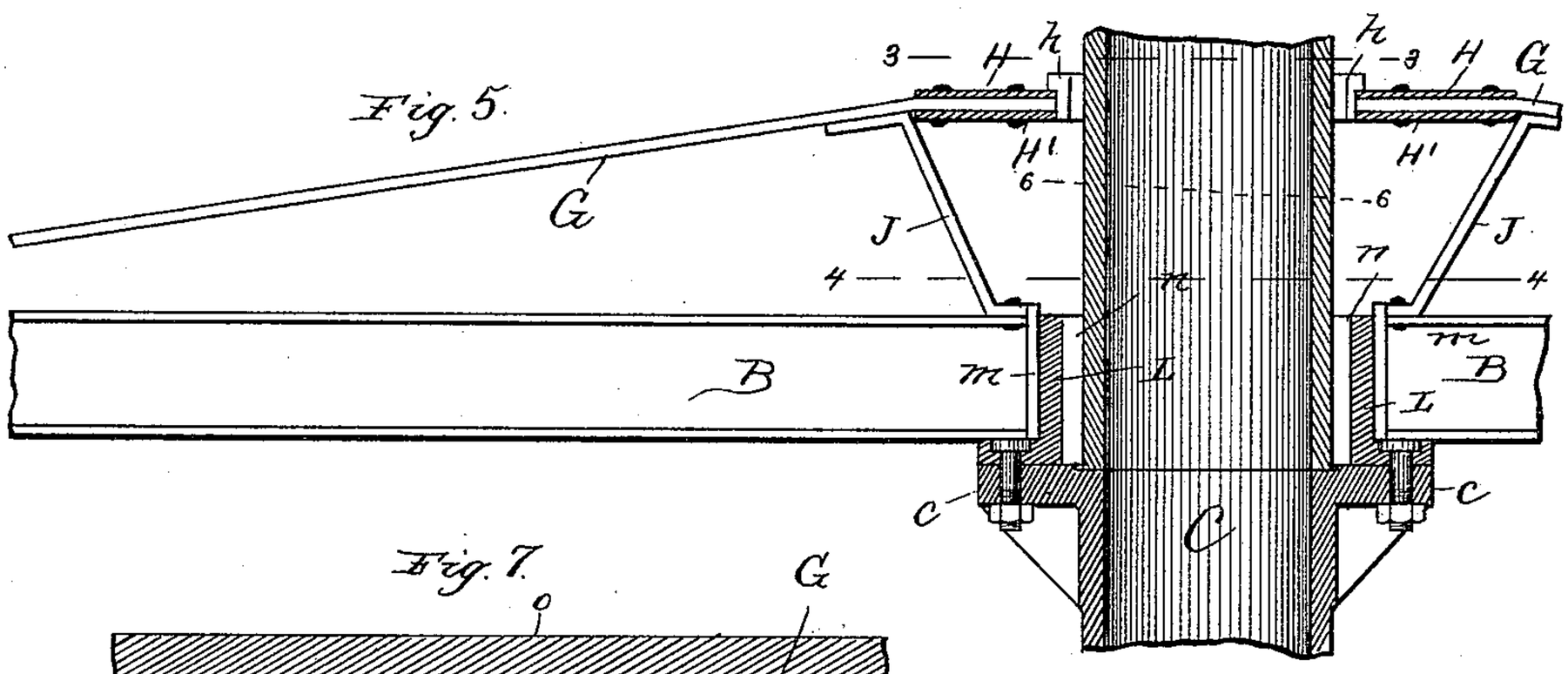


Fig. 7.

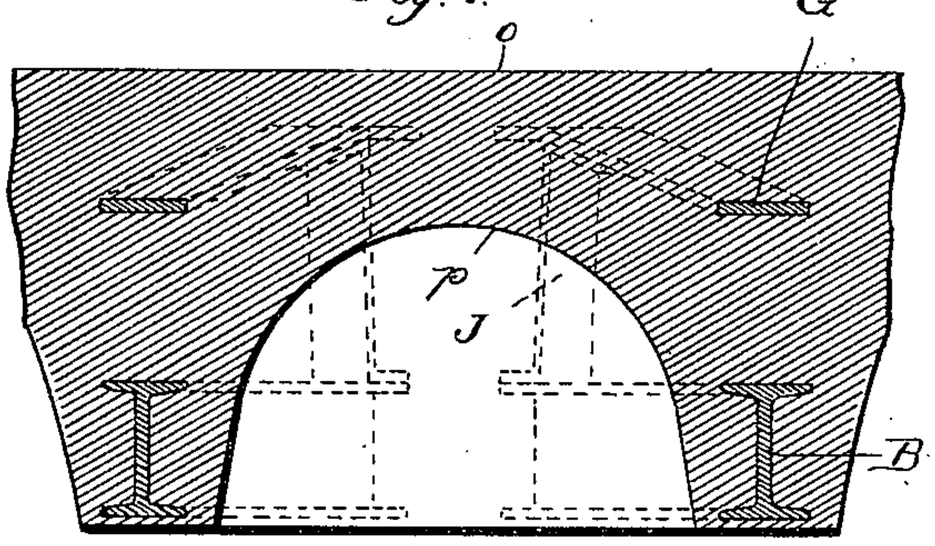


Fig. 6.

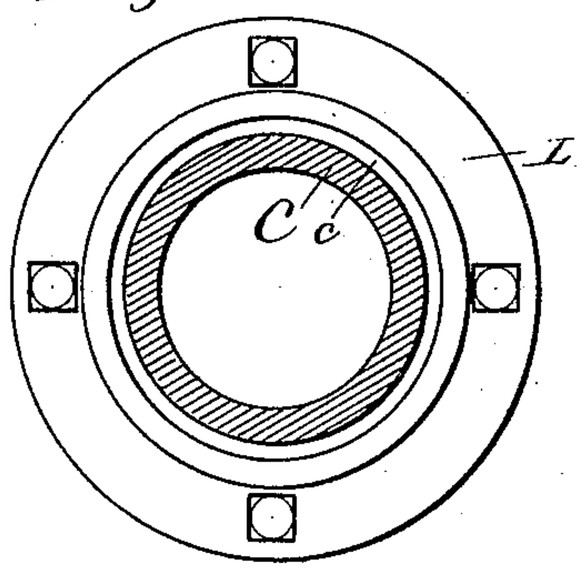


Fig. 8.

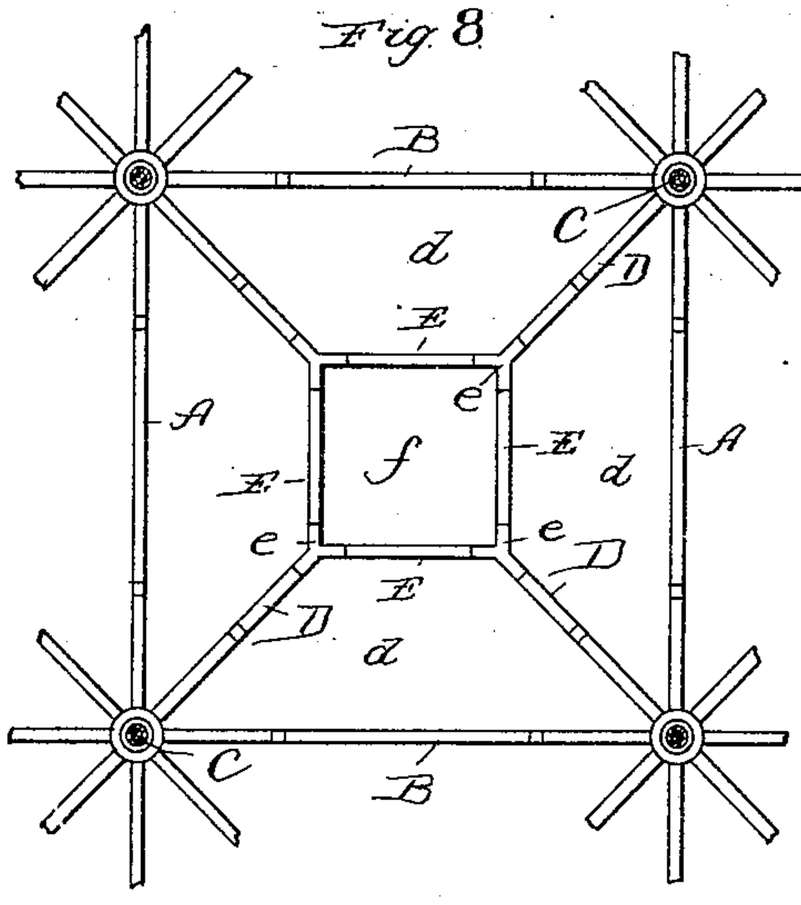
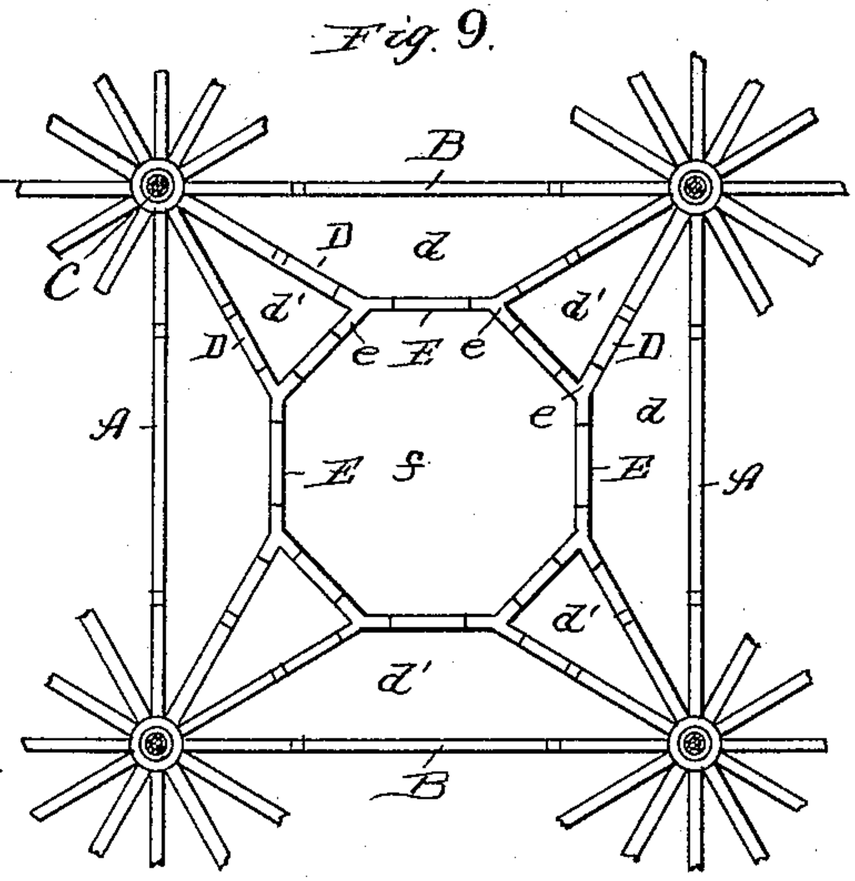


Fig. 9.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HERMAN B. SEELY, OF CHICAGO, ILLINOIS, ASSIGNOR TO PHILIP W. HERZOG, TRUSTEE, OF SAME PLACE.

CONSTRUCTION OF FLOORS.

SPECIFICATION forming part of Letters Patent No. 467,141, dated January 12, 1892.

Application filed June 5, 1891. Serial No. 395,200. (No model.)

To all whom it may concern:

Be it known that I, HERMAN B. SEELY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Construction of Floors, of which the following is a specification.

This invention relates to the construction of the floor-frames of buildings. It is especially adapted for use in fire-proof buildings, inasmuch as the chief results accomplished by it are a large reduction in the amount of material employed in the frames and a reduction in the length of the spans for the filling material; but it may be used in other buildings with advantage.

I accomplish much of the saving referred to by dividing the floor spaces or squares into triangles by means of diagonal beams crossing the squares at substantially right angles to each other. These diagonal beams, as well as the direct or parallel beams, I prefer to support independently of each other upon the columns or other supports, as thereby each beam is required to support only its own burden, none of them serving as girders to carry any other beam. The spaces between the beams thus disposed are of such area as to require a much shorter span than has been customary where all the beams are independent and are arranged to form squares or parallelograms. I further obtain necessary strength in the floor with a minimum amount of material in the frame by the employment of ties or braces leading from the columns or walls upon which the various beams are supported and secured to the beams at a remove from the support and at points between the ends of the beams. In case ties are used I attach them to the support, so that they may withstand a horizontal strain, as well as a strain in a vertical direction. These features of construction may be varied considerably, and I have shown in the drawings a few modifications which contain the essence of my invention and may often be used. The drawings also show the simpler form of the invention and the construction which I prefer under ordinary circumstances.

While I have shown some modifications, it will be understood that there are many others besides those illustrated which can be employed without departing from the claim and which will occur readily to any architect and builder.

The accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, show at Figure 1 a plan of a portion of a floor-frame constructed according to my invention. Fig. 2 is a detail view of my preferred construction of beam. Figs. 3 and 4 are horizontal sections of one of the supporting-columns, showing the floor-beams radiating therefrom and taken upon the lines 3 3 and 4 4, respectively, of Fig. 5. Fig. 5 is a vertical section of the column and the beam-supports. Fig. 6 is a horizontal section of the column on line 6 6 of Fig. 5. Fig. 7 is a partial section of the completed floor upon the line 7 7 of Fig. 1, showing the filling in place; and Figs. 8 and 9 are plans of floor-space frames embodying modifications of what I call my "triangular-frame system."

In the drawings, A A and B B may represent the direct beams, and which are disposed at right angles to each other, so as to inclose a square or substantially square space. They are supported by the walls or columns of the building in the ordinary way. I have shown them resting upon columns C. The space inclosed between these direct beams I divide into triangular or substantially triangular shape sub-spaces *d* by means of the diagonal beams D, which may be supported in any suitable way; but I prefer to support them independently from the same supports which are provided for the direct beams, so that in the case of the interior columns the various beams will radiate therefrom, much after the fashion of the spokes in a wheel. The spaces *d* require but short spans in the filling material, and they are filled in any of the ordinary ways well-known to builders, such as with tile, cement, &c.

Instead of dividing the floor into the accurately-formed triangular spaces shown in Fig. 1, I may employ the constructions shown at Figs. 8 and 9, the spaces in these constructions being approximately triangular. Thus in Fig. 8 I omit the central portions of the beams D and connect the inner ends of the

sections thereof by means of the connecting-bars E, united to the diagonal beams in any suitable way—as, for instance, by the Y-shaped strap-irons *e*. In this frame a central space *f* is formed from the inner apices of the outer triangular spaces *d*. In Fig. 9 I employ two sets of diagonal beams D and connect them at their inner ends by similar connecting beams or bars E, which may be united to the diagonal beams by similar strap-fastenings *e*. In this construction the central space is octagonal, and additional triangular spaces *d'* are formed. Other modifications of the triangular system may be devised, and in them all the light beams may be used with the attendant benefits.

As already explained, I prefer that all the beams, both direct and diagonal, should be supported independently of each other from the walls or columns of the building, and it will be observed from the drawings that this feature is clearly shown. Where the columns C form the support they may be provided with an outstanding flange *c* for this purpose. In the most desirable construction, however, I prefer to provide the beams with ties G, which can be secured to the column or support in such manner as to sustain the center of the beam and permit the employment of lighter beams than could be used where they are supported only at the ends. These ties may be secured to the column in any appropriate way, and while I have illustrated but one way, it will be understood that I do not wish to be limited to that construction, except where it forms the specific matter claimed, the illustrated construction being one of many types which can be used. In the construction which I have chosen as a sample for this attachment I secure the ties by rivets or bolts to a ring H, surrounding the column and keyed in position by the keys *h* if the latter feature is requisite. It will now be seen that if the outer ends of the ties G be riveted or otherwise secured to the beams the weight put upon the beams will be sustained in great measure by the ties, instead of the unaided beams, and if light beams are used these ties will prevent any bending or crushing thereof at their centers. A companion ring H' may be used, if desired, and the attaching bolts or rivets in that case may be passed through both of the rings and the end of the ties. These rings, or that one of them which may be used, unite all the beams at each column or support, so as to reduce the resultant bending strain to a minimum. A brace J is also preferably employed in the case of each beam and its tie, as illustrated at Fig. 5. It is intended to prevent any breaking down or vertical movement of the tie at the end adjoining the support. It may rest upon the inner end of the beam, as shown, if that is preferred, and be riveted there.

To provide a universal connection for the ends of the beams and to avoid the calculation of angles to bring the abutting surfaces square with the beams, I prefer to rest their ends upon a flanged ring L, which is supported upon and bolted to the shoulder *c* of the column, as shown, and to insert between the ends of the beams and this ring abutment-blocks *m*, as shown at Figs. 4 and 5. The ring L is made large enough to allow the upper column to be readily placed in position, and other keys or blocks *n* may also be inserted between it and the column, as illustrated.

All the beams, both direct and diagonal, are desirably, though not necessarily, provided with tying or bracing devices, substantially as described, as by the use of the triangular frame and the ties the strength of the floor is maintained with a frame employing, as I estimate, only about forty per cent. of the material commonly used in floors constructed in the ordinary way. I may of course employ either metal or wood beams or composite beams in the triangular system and with the supporting-ties. I have illustrated at Fig. 7 the completed floor employing the beams and ties shown at Fig. 5, the letter *o* designating the ordinary cement filling, arched as shown at *p*.

The various keys or abutting-blocks *m* employed at the inner ends of the beams are concaved upon one side and flat upon the other, thus adapting them to conform to both the beams and the ring. In this manner I am enabled to use square-ended beams and to avoid all necessity for any special fitting of the beams to the surface of the column or ring. So, too, by the use of keys within the ring L, I am enabled to use the same size of ring with various sizes of columns, the keys employed being suited to fill the space in which they are placed and to conform to both surfaces.

One benefit attending my invention is found in the fact that the beams of adjacent squares are rendered practically continuous by reason of their being all joined to the same column-rings. There are thus provided cross connections, which unite the upper portions of contiguous beams. By this feature every beam is made to contribute some resistance to the strains coming upon every other beam. The beams are also made thereby to relieve the columns of some of the bending strain, which would otherwise require to be borne by the latter unaided.

I claim—

1. The metallic floor-frame composed of direct beams forming a square or space, and diagonal beams dividing said square or space into triangular or substantially triangular sub-spaces, substantially as specified.

2. The metallic floor-frame composed of direct beams forming a square or space, and other beams extending diagonally across the square or space, substantially as specified.

3. The metallic floor-frame composed of direct beams and diagonal beams, in combination with column or wall supports, upon which all said beams rest, substantially as specified.

4. In a floor-frame, the combination of the direct beams and the diagonal beams with supports, upon which all of said beams are supported independently of each other, substantially as specified.

5. The triangular floor-frame, all the members whereof are continuous beams and are all individually supported directly from the columns or walls, substantially as specified.

6. The triangular floor-frame composed of beams, the ends whereof are fixed to the supports and are independent of each other, substantially as specified.

7. The triangular floor-frame, the beams whereof are provided with braces or ties, in combination with suitable supports, substantially as specified.

8. The triangular floor-frame, the beams whereof are provided with braces or ties, in combination with supports upon which the beams are sustained, said braces or ties being also secured to said beam-supports, substantially as specified.

9. The triangular floor-frame, the beams whereof are provided with braces or ties, in combination with a ring or rings to which the braces or ties are secured, and supporting-columns surrounded by the ring, substantially as set forth.

10. The combination, with the beams of a floor-frame, of ties or braces connecting the central portion of the beams to supporting-rings, located at the columns, and to which rings said ties or braces are secured, and said rings and columns, substantially as specified.

11. In a floor-frame, the combination, with the beams of adjacent squares, of ties secured to the beams, as described, supports for the beams, and connections uniting the ties of adjacent squares with one another, substantially as set forth.

12. In a floor-frame, the combination, with the beams of adjacent squares, of the column rings and ties uniting the beams together, substantially as specified.

13. In a floor-frame, the combination, with the beams of adjacent squares, of a ring at the column and above the beams and to which said beams are united and whereby the frame is rendered practically continuous, substantially as set forth.

14. A floor-frame comprising the beams, combined with cross connections unitng the upper portions of the beams, whereby all the beams are connected together at the point of support and thereby rendered continuous, substantially as set forth.

15. The combination, with the beams and their supports, of separate abutting pieces or blocks each conforming to the end of its beam and the surface of the support, whereby special fitting of the beams to the supports is avoided, substantially as set forth.

16. The combination of the column with the surrounding ring L, of larger diameter than the column, and filling-pieces *n*, inserted between the ring and column, whereby rings of the same size are adapted to be used with variously-sized columns, substantially as set forth.

17. The combination, with the beams, of the ties and braces J, substantially as set forth.

18. The combination, with the floor-beams, of the ties, the rings to which the ties are secured, the columns, and the braces J, substantially as specified.

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