

No. 790,007.

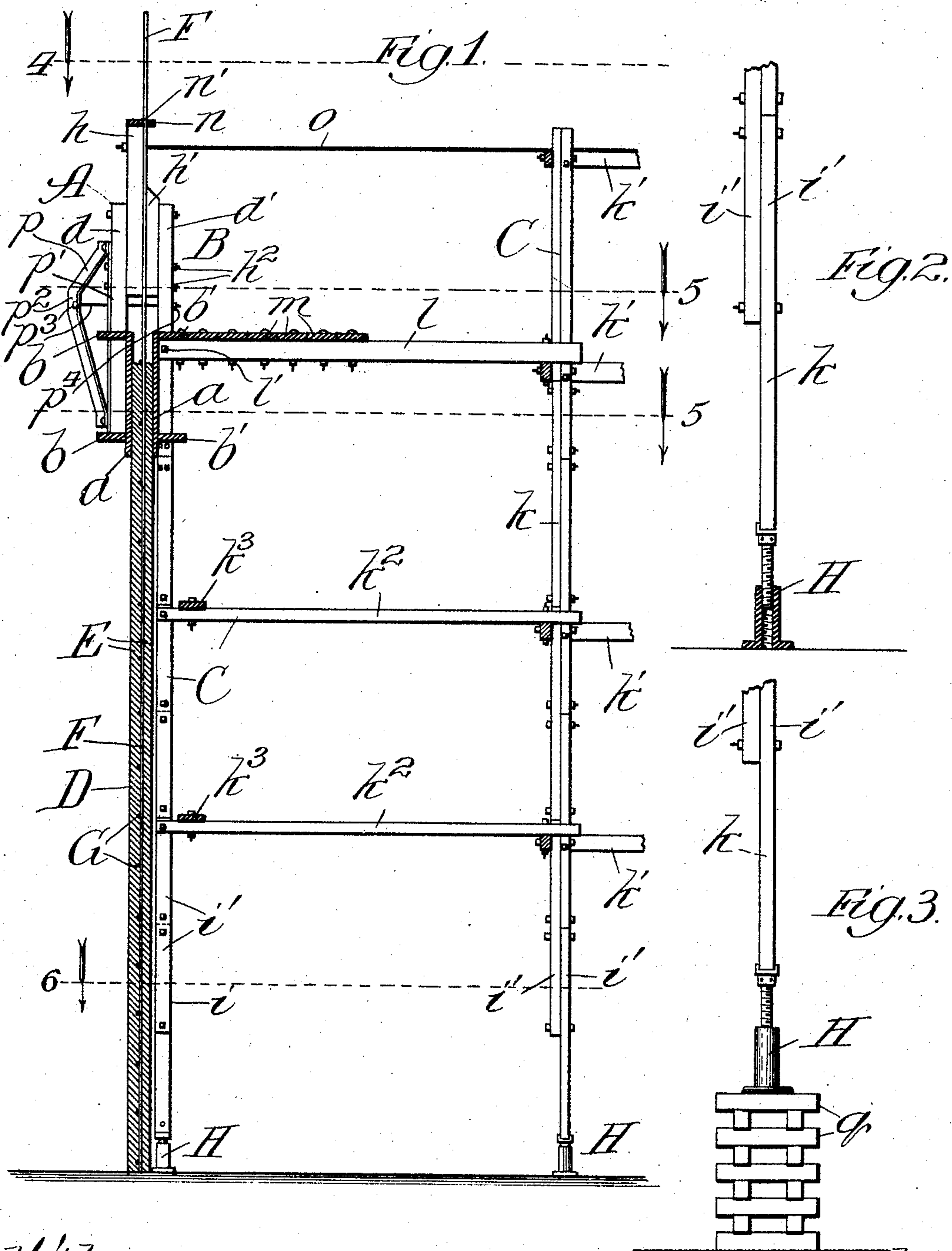
PATENTED MAY 16, 1905.

J. SPELMAN.

MEANS FOR USE IN ERECTING METAL-CONCRETE STRUCTURES.

APPLICATION FILED AUG. 8, 1904.

6 SHEETS—SHEET 1.



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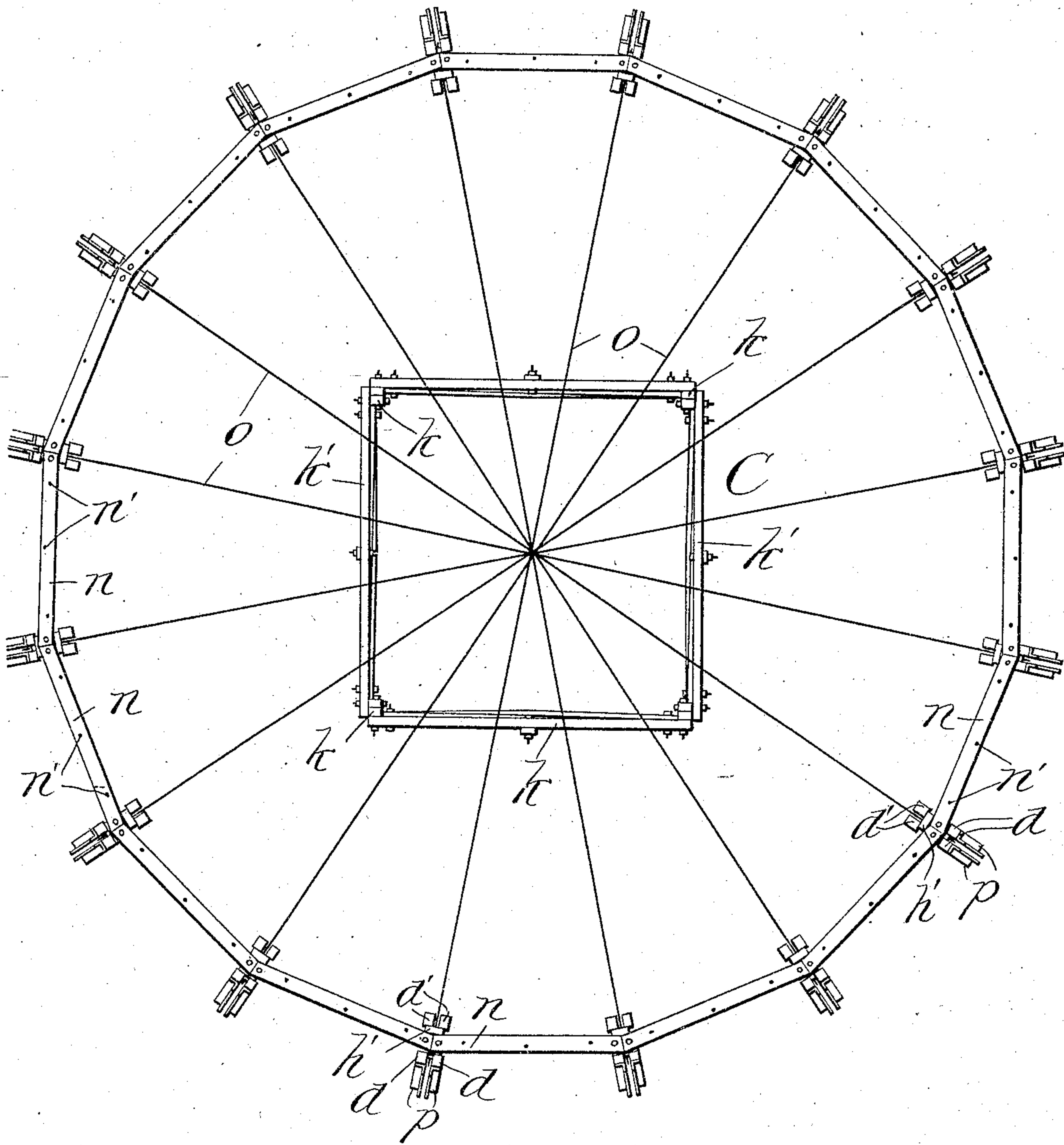
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6 SHEETS—SHEET 2.

Fig. 7.



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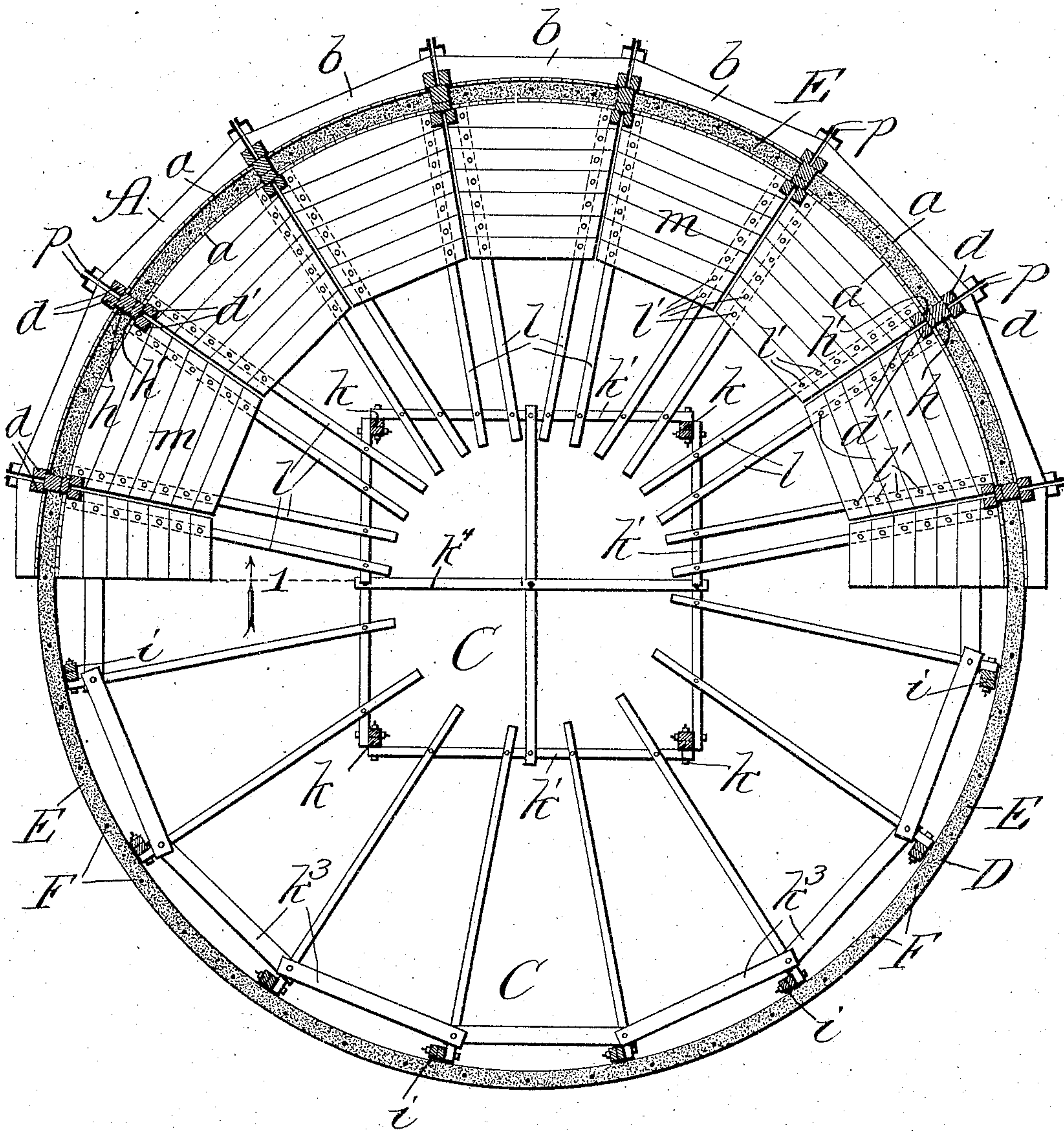
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6 SHEETS--SHEET 3.

Fig. 5.



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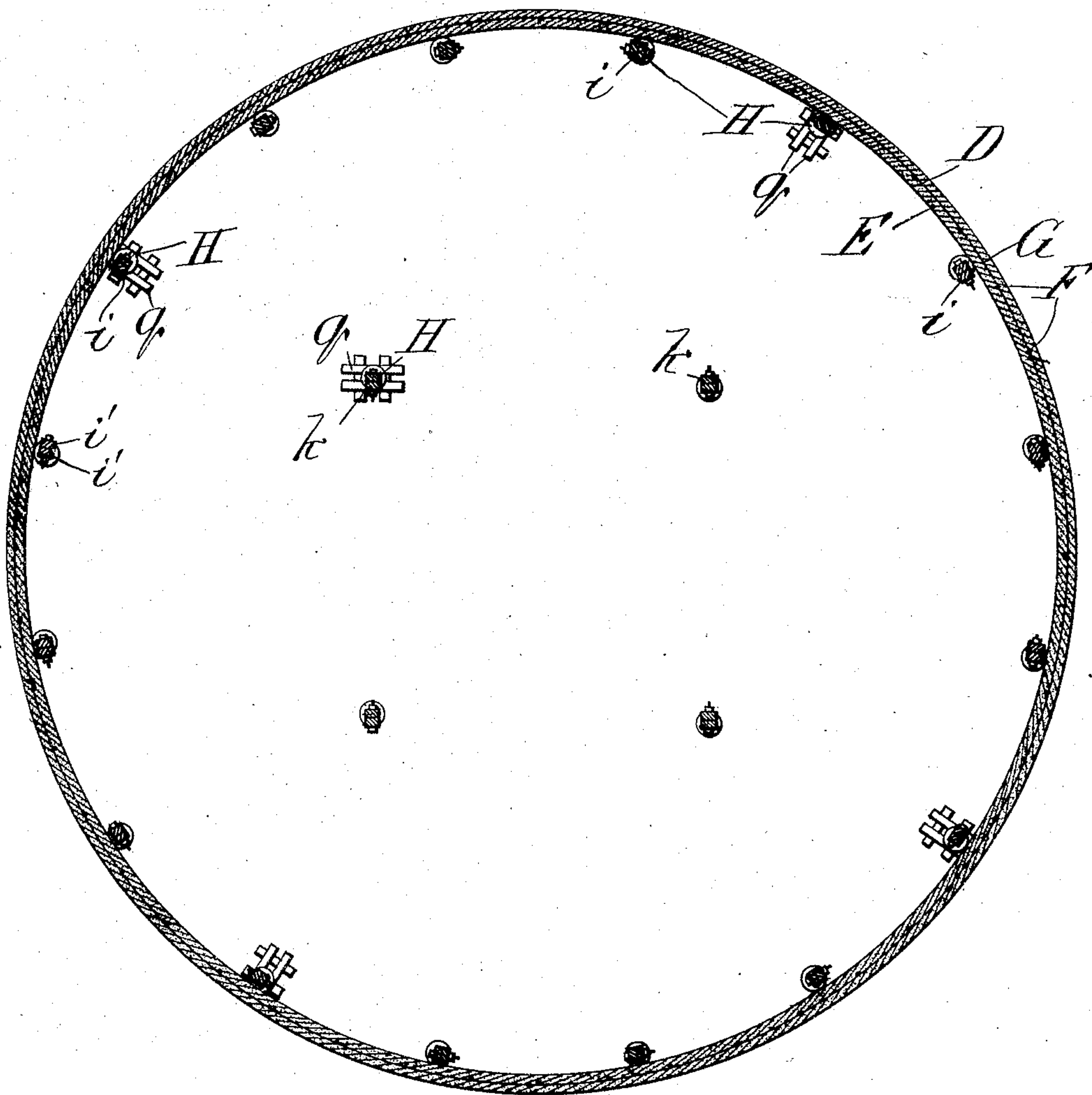
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6 SHEETS—SHEET 4.

Fig. 6.



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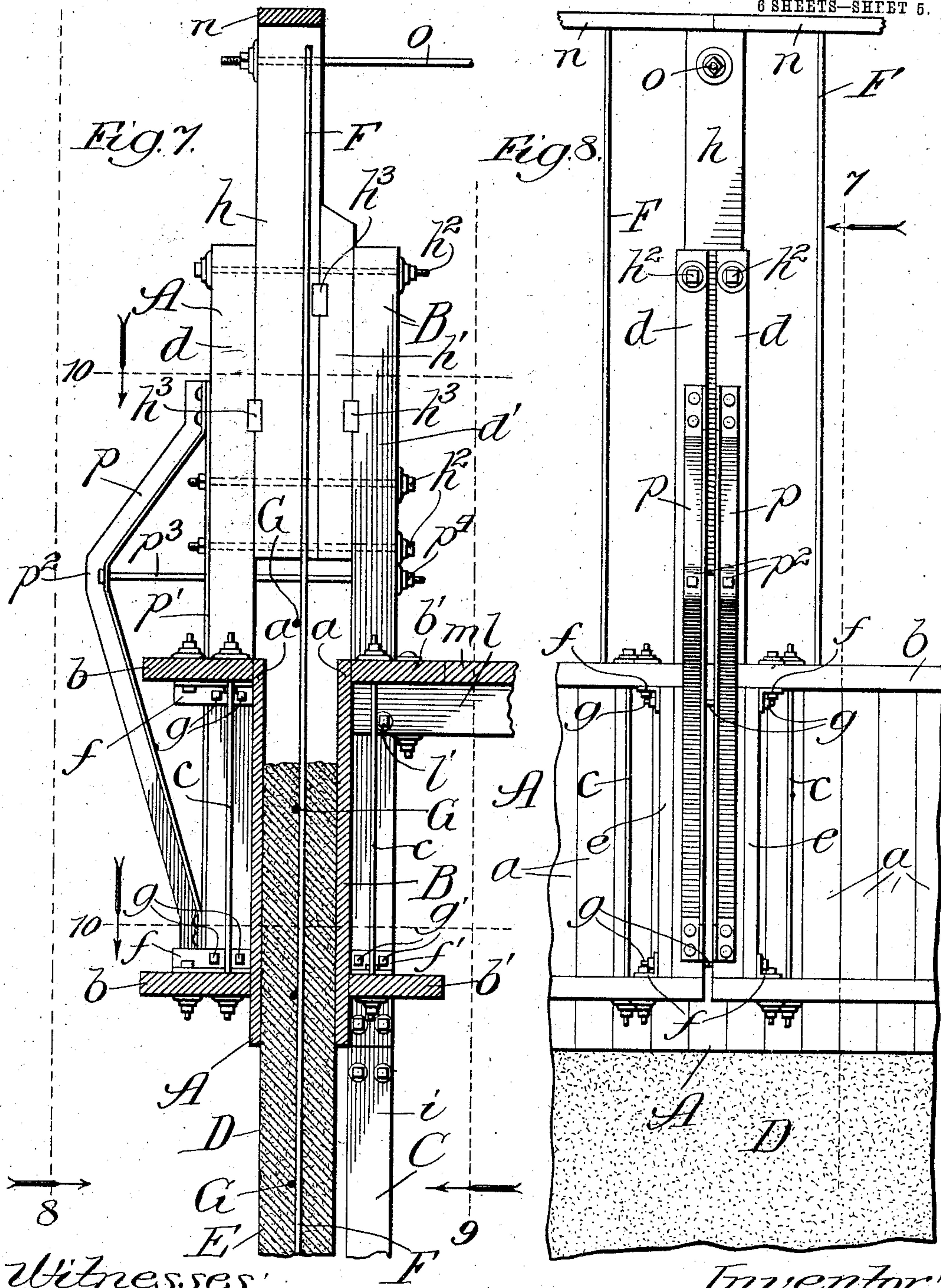
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APPLICATION FILED AUG. 8, 1904.

6 SHEETS—SHEET 5.



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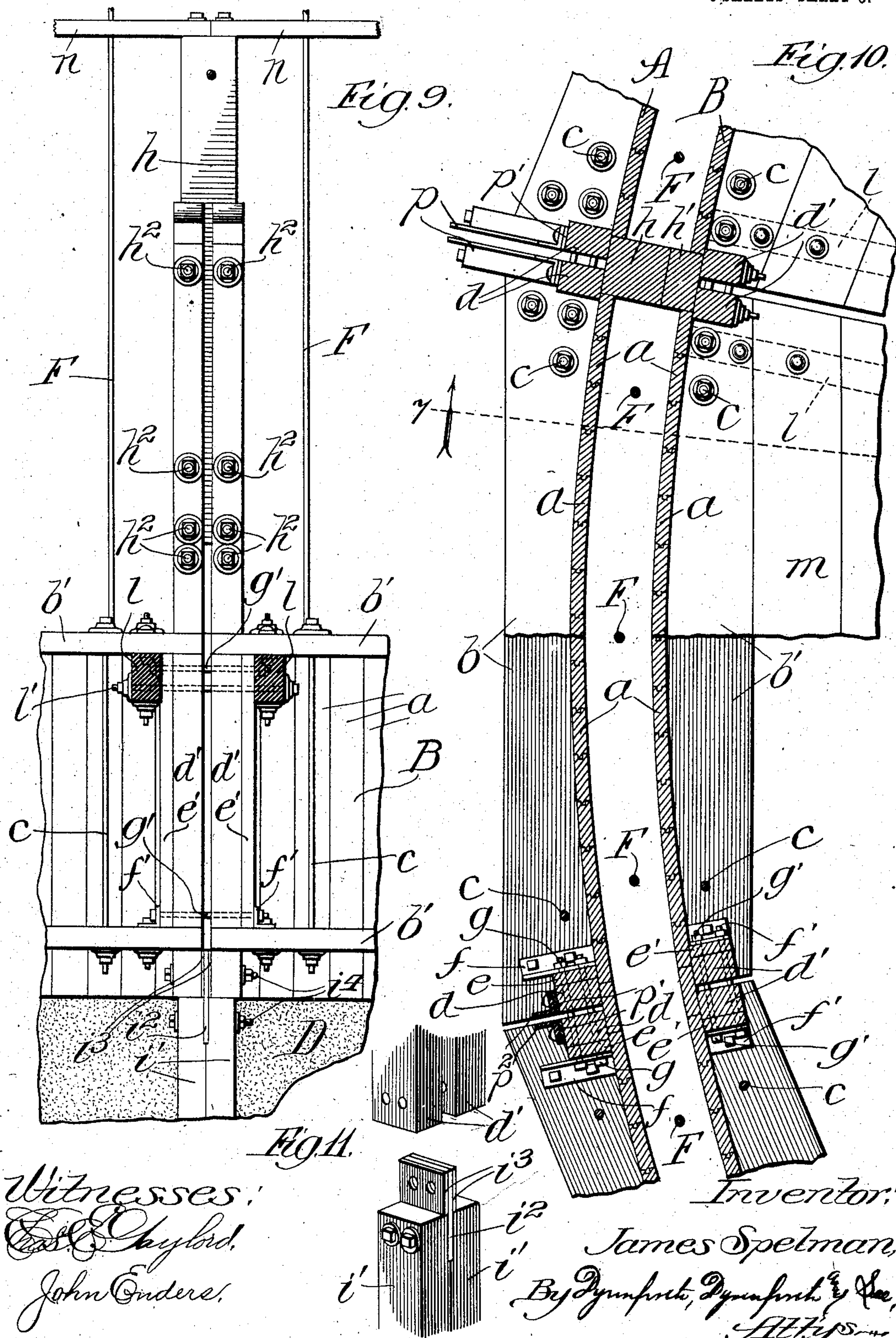
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APPLICATION FILED AUG. 8, 1904.

6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

JAMES SPELMAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO JOHN S. METCALF COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

MEANS FOR USE IN ERECTING METAL-CONCRETE STRUCTURES.

SPECIFICATION forming part of Letters Patent No. 790,007, dated May 16, 1905.

Application filed August 8, 1904. Serial No. 219,930.

To all whom it may concern:

Be it known that I, JAMES SPELMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Means for Use in Erecting Metal-Concrete Structures, of which the following is a specification.

My invention relates to an improvement in means for erecting the class of buildings the walls of which are composed of concrete molded in sections about vertical and horizontal bars to embed them for their reinforcing effect. The common practice observed in erecting structures of the kind referred to is to lay the foundation and form upon it the walls in sections, employing for the purpose suitable outside and inside mold-sections, between which the concrete is molded about the preparatorily-placed metal reinforcing-bars, and when a section thus placed has been allowed to set for a sufficiently long period the mold is removed and the same or another mold is adjusted on the previously-finished section to receive another filling of concrete, requiring to be hardened by setting before the mold is removed to be readjusted for filling in another section. Thus forming the wall of the structure section after section incurs waste of time in waiting for each previous section to set and in the removal or readjustment, or both, of the mold, with the result of delay in the erection and attendant expense for labor.

The primary object of my improvement is to avoid this waste of time, with the advantages of expediting the work and greatly reducing the expense of erection, in enabling the work to be performed continuously by providing means for raising the mold as the work proceeds, either continuously or intermittently, without removing and readjusting it, and therefore without requirement for its repeated disintegration and reintegration, and novel means for the purpose are illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section taken at the line 1 on Fig. 5 and viewed in the direction of the arrow of the wall of a grain-bin structure undergoing construction in accordance

with my improvement. Fig. 2 is a broken enlarged view, partly in section, showing a leg of the scaffolding employed supported at its base on a jack-screw; and Fig. 3 shows the same with the jack-screw propped from underneath by blocks. Fig. 4 is a plan view regarded in the direction of the arrow from the line 4 on Fig. 1. Fig. 5 is a section taken partly at the upper line 5 and partly at the lower line 5 on Fig. 1 and viewed in the direction of the arrows. Fig. 6 is a section taken at the line 6 on Fig. 1 and viewed in the direction of the arrow. Fig. 7 is a section of the wall undergoing erection, being like the representation in Fig. 1, but on a larger scale, the section being taken at the line 7 on Fig. 10 and viewed in the direction of the arrow. Fig. 8 is a broken view in elevation regarded in the direction of the arrow from the line 8 on Fig. 7, showing the outer side of the structure. Fig. 9 is a similar view regarded in the direction of the arrow from the line 9 on Fig. 7, showing the inner side of the structure. Fig. 10 is a broken section of the structure, taken partly at the upper and partly at the lower line 10 on Fig. 7 and viewed in the direction of the arrows; and Fig. 11 is a broken perspective view showing a detail.

A is the outer mold-section, and B the inner mold-section, both of circular form for a cylindrical structure, though, as will be understood, their shape may be varied to accord with structures of cross-sectional shape other than cylindrical.

C is the scaffolding employed inside the structure undergoing erection, which comprises a suitable foundation (not shown) and a wall D or walls rising therefrom, composed of concrete E, with vertical metal bars F placed at suitable intervals and crossed by horizontal circuitous bars G, placed at suitable intervals. Where the mold-sections are formed mainly of wood, which is the preferred material, their molding portions are composed of match boards *a* to present smooth opposing molding-surfaces, these boards of each mold-section being nailed to upper and lower ribs

5 b on the outer mold section and similar ribs
 b' on the inner mold-section, conforming to
 the surfaces which are nailed to them and
 straight at their free edges, as shown, these
 upper and lower ribs on each mold-section
 being connected together by bolt-rods c .
 The two mold-sections are securely united to-
 gether at intervals, of which sixteen are
 shown, by framework, each frame comprising
 10 two parallel vertical timbers d d' on the outer
 mold-section, passing through the upper and
 lower ribs b between strips e e , extending be-
 tween the ribs, adjacent to which they are re-
 15 strips being firmly secured together by bolts
 g passing transversely through them and the
 angle - irons, two parallel vertical timbers
 d' d' on the inner mold-section passing coin-
 20 cident with the timbers d d through the up-
 per and lower ribs b' between strips e' e' , ex-
 tending between the ribs, adjacent to which
 they are reinforced by angle-irons f' , these
 inner timbers and strips being firmly secured
 25 together by bolts g' passing transversely
 through them and the angle - irons and a
 spacing-timber h , with a supplemental spac-
 ing-timber h' , (if needed,) extending upward
 from between the timbers d and d' , to which
 30 they are securely fastened by bolts h^2 . The tim-
 bers h (and h' if used) determine the width of
 space between the mold-sections for the thick-
 ness of the wall D of the structure, and to
 take the strain off the bolts h^2 the timbers
 d , d' , h , and h' are further joined by keys h^3 , in-
 35 serted between them, as represented in Fig. 3.

The scaffolding C comprises an outer cir-
 cumferential series of legs i , corresponding
 in number with the number of frames con-
 necting the mold-sections, each said leg con-
 40 sisting of two sets of timbers i' , each, say,
 about seven feet in length, bolted flatwise to-
 gether, with those in one set overlapping
 those of the other in break-joint arrangement,
 an inner central series of four similar legs k
 45 forming the corners of a rectangle connected
 at intervals together by side bars k' , forming
 the square, which is joined to the outer sec-
 tion of the scaffolding by radial strips k^2 , ex-
 tending at vertical intervals between the legs
 50 i and k , these radial strips being connected
 together from one to the other near their outer
 ends by strips k^3 , Fig. 5. The central rec-
 tangular section of the scaffolding C is fur-
 ther reinforced at its upper end and at other
 55 lower points by cross-beams k^4 , Fig. 5. To
 the outer sides of the upper ends of each pair
 of timbers d' of each mold-frame are fastened,
 by bolts l' , floor-beams l , extending over and
 bolted near their inner ends to the top frame
 60 k' of the central section of the scaffolding, and
 on these beams l is bolted the flooring m to
 form the working floor on the structure.

From one to the other of the timbers h at
 their upper ends and bolted thereto are ex-
 65 tended the strips n , which thus lie over the

center of the space between the mold-sections,
 and they are provided with perforations n' ,
 through which to admit the vertical metal
 bars F of the walls for assuring their vertical
 trueness. The scaffolding structure is fur-
 70 ther reinforced at its upper end by extending
 between diametrically opposite timbers h the
 tie-rods o , as represented in Fig. 4.

The members of each pair of the timbers d
 are faced on their outer surfaces throughout
 75 the greater portion of their length and width
 with metal plates p' , held in place by the bolts
 h^2 which fasten together the sets of timbers
 d d' and h h' . To each face-plate p' is riv-
 80 eted at its opposite ends a channel-iron bar p ,
 bent to an angle, as shown, to form a clamp-
 ing-brace, with the knee portion p^2 nearer the
 upper than the lower end, the brace being ad-
 justably fastened at its knee by a bolt p^3 pass-
 85 ing through the latter, the respective plate p' ,
 and the timbers d , h , h' , and d' , beyond which
 last-named timber the bolt carries on its pro-
 truding end a nut p^4 . By properly turning
 these nuts on different braces they may be ad-
 90 justed by drawing them inward toward their
 lower ends to true the outside mold-section to
 its required vertical position toward its lower
 end wherever it may need such truing in the
 event of springing in the process of erection
 of the structure as hereinafter described. 95

In erecting a metal-concrete structure with
 the use of the mold carried by the inside,
 outer, and central scaffolding C the mold is
 raised as the molding work progresses by
 raising the scaffolding with power applied un-
 100 derneath it, preferably through the medium
 of jack-screws H, of usual or suitable construc-
 tion, this operation being performed as fol-
 lows: To start the erection of a wall D upon
 a preparatorily-formed foundation, the mold,
 105 with the initially-constructed portion of the
 scaffolding C, being that portion of the scaf-
 folding illustrated which is within the con-
 fines of the mold, with the framework extend-
 ing above the latter, is placed in position upon
 110 the foundation. Jack-screws H are placed to
 rest at their bases upon the foundation, one
 underneath each beam l near the junction
 thereof with the inner mold-section. If the
 height of the mold is greater than the length
 115 of the jack employed, as it usually is, blocks
 may be placed underneath each jack to cause
 it to bear at its upper end against its respec-
 tive beam l . With the vertical metal bars
 placed at proper intervals between the mold-
 120 sections and supported in position by passing
 through the guide-holes in the strips n con-
 crete E is filled into the mold to begin the
 wall D, and at proper intervals the circuitous
 metal bars G are placed (say three feet apart)
 125 to intersect the vertical bars and are embed-
 ded in the concrete filling. As the wall grows
 in height within the mold laborers turn the
 jack-screws to raise the mold and scaffolding
 connected with it. When by continuously 130

filling concrete into the mold-space and meantime raising the mold by turning the jack-screws the height to which the mold is raised enables strips i' in predetermined length—say of seven feet, more or less—to form sections of the scaffolding-legs i and k to be bolted thereto to extend at their lower ends short of the foundation-surface sufficiently to admit the jack-screws underneath them, the first of these extension-sections of the scaffolding-legs are thus applied. The application of these first leg-extension strips i' is made to the timbers or beams d' of the inner mold-section B in the manner indicated in Fig. 11 by bolting between two strips i' of unequal length a metal plate i'' to protrude beyond the coincident upper ends of the strips, with the protruding portion embraced between washers i''' , forming a tongue which enters between the lower ends of the timbers d' through coincident bolt-holes, in which and the tongue bolts i'' are passed to fasten the leg-section formed of the respective strips i' in place. The jack-screws are set (removing for the resetting purpose only a few at a time, so as to leave the others in place for stably supporting the mold and scaffolding structure) underneath the legs of the scaffolding as required, and as the work of concrete-filling into the mold about the metal reinforcing-bars progresses the jack-screws are turned to further raise the mold. When a jack-screw becomes extended to its full capacity under a scaffolding-leg, (say to the height of eighteen inches,) it is raised from time to time, as by placing blocks g underneath it, as indicated in Fig. 3, or it may be caused otherwise to continue to perform its raising function until its base becomes elevated above the surface of the foundation sufficiently to admit the jack-screw underneath another length of leg-section i' , when a strip for such a leg-section is added to the respective scaffolding-leg in break-joint relation to the strip precedingly so added. The work of thus raising the scaffolding, and with it the mold, by turning the jack-screws may be performed in the erection of a large-sized structure by, say, two laborers during the day, while the filling with concrete is in progress, and by one laborer during the night, while the filling-work is suspended, these laborers attending to the matters of blocking or otherwise adjusting the jack-screws, adding sections to the scaffolding-legs, and resetting the jack-screws as these operations require performance. The mold-raising operation continues until the desired height of the metal-concrete structure is attained, when it is dismantled of the mold and scaffolding. The mold-raising operation may be performed intermittently or continuously while the mold is being filled with concrete, and though jack-screws placed underneath the scaffolding and worked by hand-labor have proved perfectly

satisfactory means for the purpose it is feasible to employ other power for turning the jack-screws and means other than jack-screws operated by power other than hand-labor continuously or intermittently for raising the mold, so that I do not limit my improvement to any particular means for raising the mold by power applied underneath or elsewhere to the scaffolding. Moreover, the construction of the mold, that of the framework and of the scaffolding, and of other parts may be varied in matters of detail without departing from the spirit of my invention. It will readily be seen that by thus raising the mold as the erection of the structure progresses interruption for dismantling and readjusting molds with incidental delays due to waiting for the concrete to set are avoided and the progress of erection rendered continuous, with the advantage of very great saving in time and expense. Another advantage due to the progressive raising of the mold is that of the effect of the mold in slipping upon the inner and outer concrete surfaces of the structure of smoothing those surfaces, whereby when the structure is completed it presents a uniformly-smooth surface throughout.

What I regard as new, and desire to secure by Letters Patent, is—

1. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold for receiving the filling of concrete, scaffolding inside the structure, carrying said mold, and mechanism under the scaffolding for raising it and with it said mold along the surfaces of its filling of concrete, substantially as set forth.

2. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold for receiving the filling of concrete, scaffolding inside the structure, carrying said mold, said scaffolding consisting of an outer section and an inner central section connected therewith, and means under the scaffolding for raising said scaffolding and with it said mold along the surfaces of the filling of concrete, substantially as set forth.

3. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold, formed of connected outer and inner sections, for receiving the filling of concrete, provided at intervals about it with upwardly-extending frames spacing apart the outer and inner mold-sections, scaffolding inside the structure, carrying said mold, and mechanism under the scaffolding for raising the scaffolding and with it said mold along the surfaces of its filling of concrete, substantially as set forth.

4. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold, formed of connected outer and inner sections, for receiving the filling of concrete, provided at intervals

about it with upwardly - extending frames spacing apart the outer and inner mold-sections and with adjustable clamping-braces on the outer mold-section, scaffolding inside the
 5 structure, carrying said mold, and mechanism for raising the scaffolding and with it said mold along the surfaces of its filling of concrete, substantially as set forth.

10 5. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold, formed of outer and inner sections, for receiving the filling of concrete, provided at intervals about it with
 15 upwardly-extending frames each composed of upright timbers on the outer mold-section, similar timbers on the inner mold-section and a spacing-timber rising from between said upright timbers, scaffolding inside the structure carrying said mold, and mechanism under the scaffolding for raising the scaffolding
 20 and with it said mold along the surfaces of its filling of concrete, substantially as set forth.

25 6. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold, formed of outer and inner sections, for receiving the filling of concrete, provided at intervals about it with upwardly-extending frames each composed of upright timbers on the outer mold-section,
 30 similar timbers on the inner mold-section and a spacing-timber rising from between said upright timbers, perforated guide-strips for the vertical metal bars employed in the structure, said strips connecting said spacing-timbers at
 35 their upper ends from one to the other about the series thereof, scaffolding inside the structure, carrying said mold, and mechanism for raising the scaffolding and with it said mold along the surfaces of its filling of concrete,
 40 substantially as set forth.

7. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold for receiving the filling of concrete provided at intervals about
 45 it with upwardly-extending frames spacing apart the outer and inner mold-sections composing the mold, clamping-braces upon the outer mold-section at said frames, said braces being formed of metal bars bent to form intermediate knee portions and fastened at their
 50 upper and lower ends to the frame-timbers with bolts passing through said knee portions and transversely through the frame-timbers and carrying nuts on their protruding ends for adjusting said bars, scaffolding inside the structure, carrying said mold, and mechanism under the scaffolding for raising it and with
 55 it said mold along the surfaces of its filling of concrete, substantially as set forth.

60 8. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold for receiving the filling of concrete, scaffolding inside the structure, carrying said mold, and jack-screws
 65 under the scaffolding for raising it and with

it said mold along the surfaces of its filling of concrete, substantially as set forth.

9. Means for use in erecting the wall of a structure of the character described comprising, in combination, a mold for receiving the
 70 filling of concrete, scaffolding inside the structure, carrying said mold, said scaffolding consisting of an outer section and an inner central section connected therewith, and jack-screws under and engaging the scaffolding for
 75 raising it and with it said mold along the surfaces of its filling of concrete, substantially as set forth.

10. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold, formed of outer and inner sections, for receiving the filling of
 80 concrete, provided at intervals about it with upwardly-extending frames spacing apart and connecting said mold-sections, scaffolding inside the structure, carrying said mold, said scaffolding consisting of an outer section and an inner central section connected therewith,
 85 tie-rods connecting diametrically opposite said frames above the mold, and jack-screws engaging the scaffolding for raising it and with
 90 it said mold along the surfaces of its filling of concrete, substantially as set forth.

11. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold, formed of outer and inner sections, for receiving the filling of
 95 concrete, with upwardly - extending frames spacing apart and connecting said mold-sections, scaffolding inside the structure, consisting of an outer section connected with said frames and an inner central section connected with said outer section, and jack-screws on
 100 which the legs of the scaffolding stand, for raising said scaffolding and with it said mold along the surfaces of its filling of concrete, substantially as set forth.

12. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold, formed of outer and inner sections, for receiving the filling of
 105 concrete, with upwardly - extending frames spacing apart and connecting said mold-sections, scaffolding inside the structure connected with said frames and having legs formed of strips secured flatwise together in break-joint relation, and jack-screws on which said
 110 legs stand, for raising the scaffolding and with it said mold along the surfaces of its filling of concrete, substantially as set forth.

13. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold, formed of outer and inner sections, for receiving the filling of
 115 concrete, with upwardly - extending frames spacing apart and connecting said mold-sections, scaffolding inside the structure, consisting of an outer section connected with said mold and an inner central section connected with said outer section, floor-beams extending
 120

between said frames and the upper part of said central scaffolding-section with flooring secured upon said beams, and jack-screws, upon which the legs of the scaffolding stand, for raising said scaffolding and with it said mold along the surfaces of its filling of concrete, substantially as set forth.

14. Means for use in erecting the wall of a structure of the character described, comprising, in combination, a mold, formed of outer and inner sections, for receiving the filling of concrete, upwardly-extending frames provided at intervals about the mold, each frame being composed of upright timbers on the outer mold-section, similar timbers on the inner mold-section, and a spacing-timber rising from between said upright timbers, perforated strips connecting said spacing-timbers from

one to the other at their upper ends, tie-rods connecting diametrically opposite spacing-timbers across the mold, scaffolding inside the structure consisting of an outer section connected with said frames and an inner central section connected with said outer section, floor-beams extending between said frames and the upper part of said central scaffolding-section with flooring secured upon said beams, and jack-screws, upon which the legs of the scaffolding stand, for raising said scaffolding and with it said mold along the surfaces of its filling of concrete, substantially as set forth.

JAMES SPELMAN.

In presence of—

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WALTER N. WINBERG.