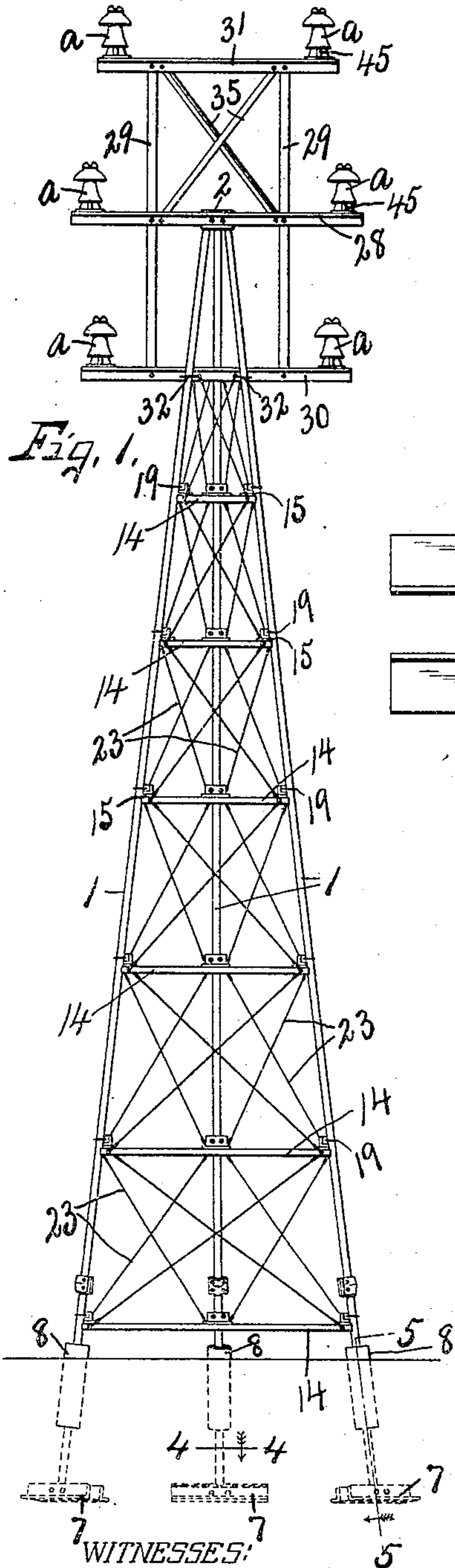


No. 791,975.

PATENTED JUNE 6, 1905.

R. L. ALLEN.
SKELETON TOWER.
APPLICATION FILED DEC. 29, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

B. E. Robinson
H. E. Chase

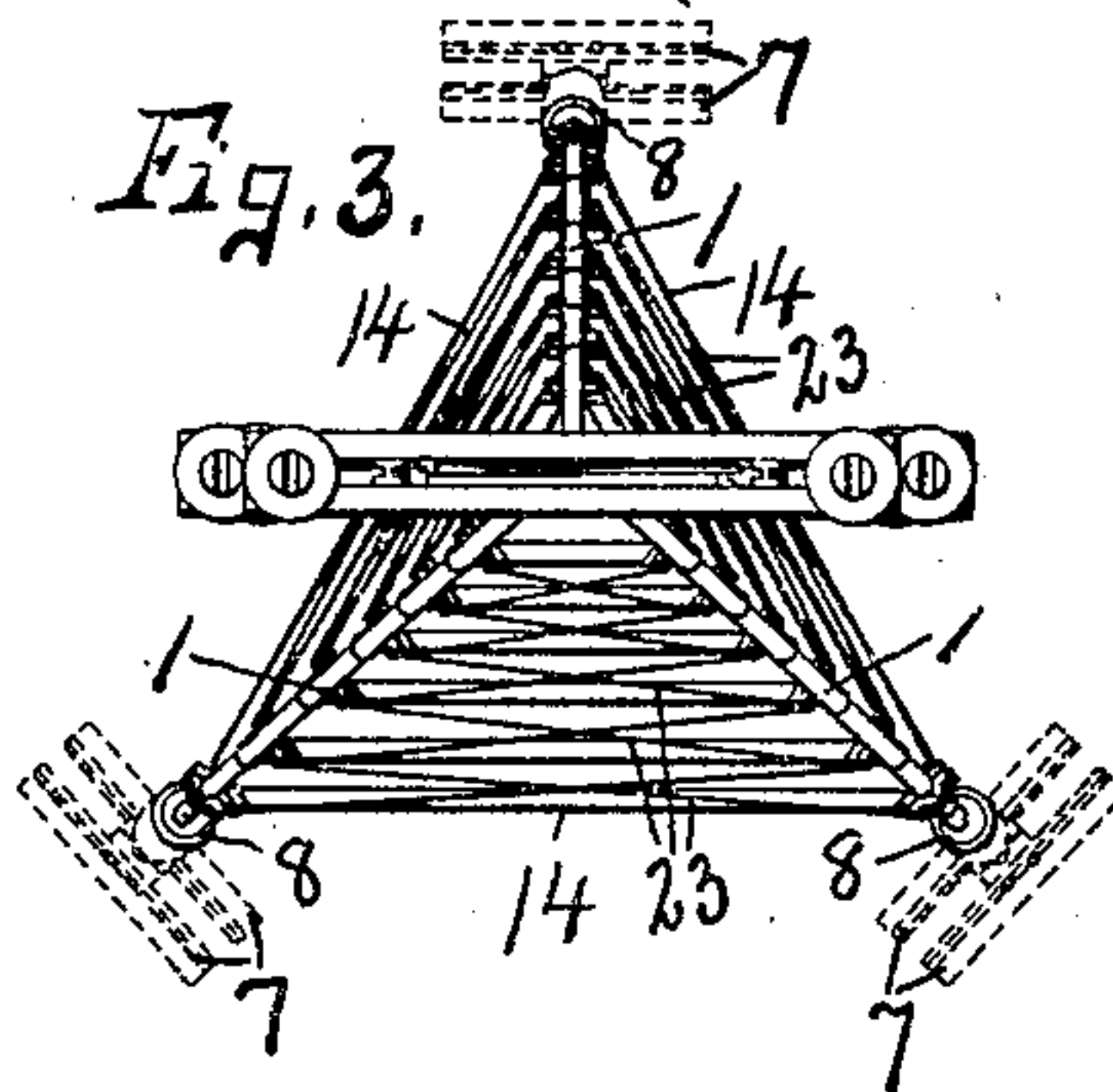


Fig. 4

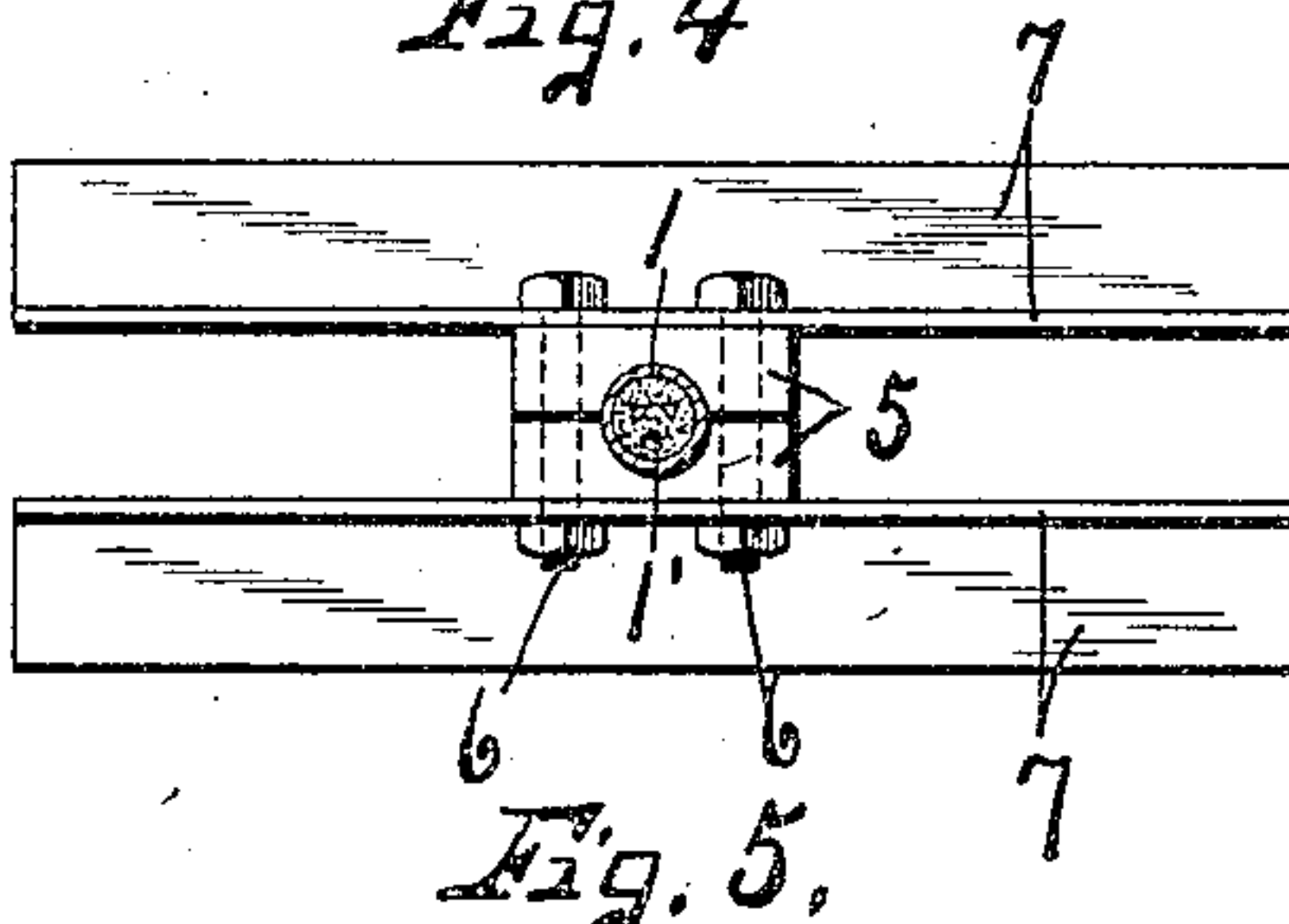
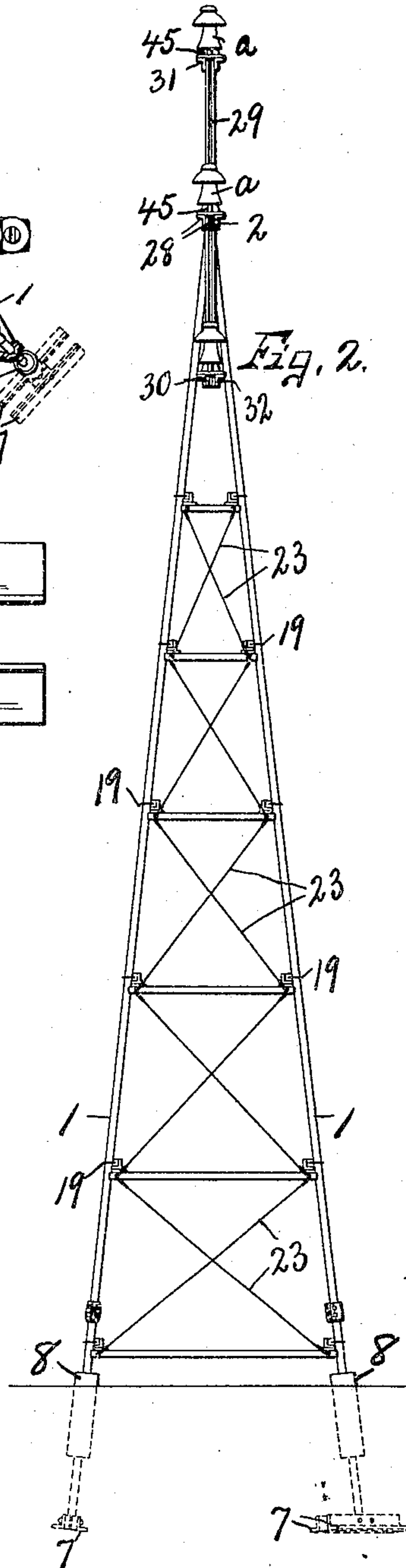
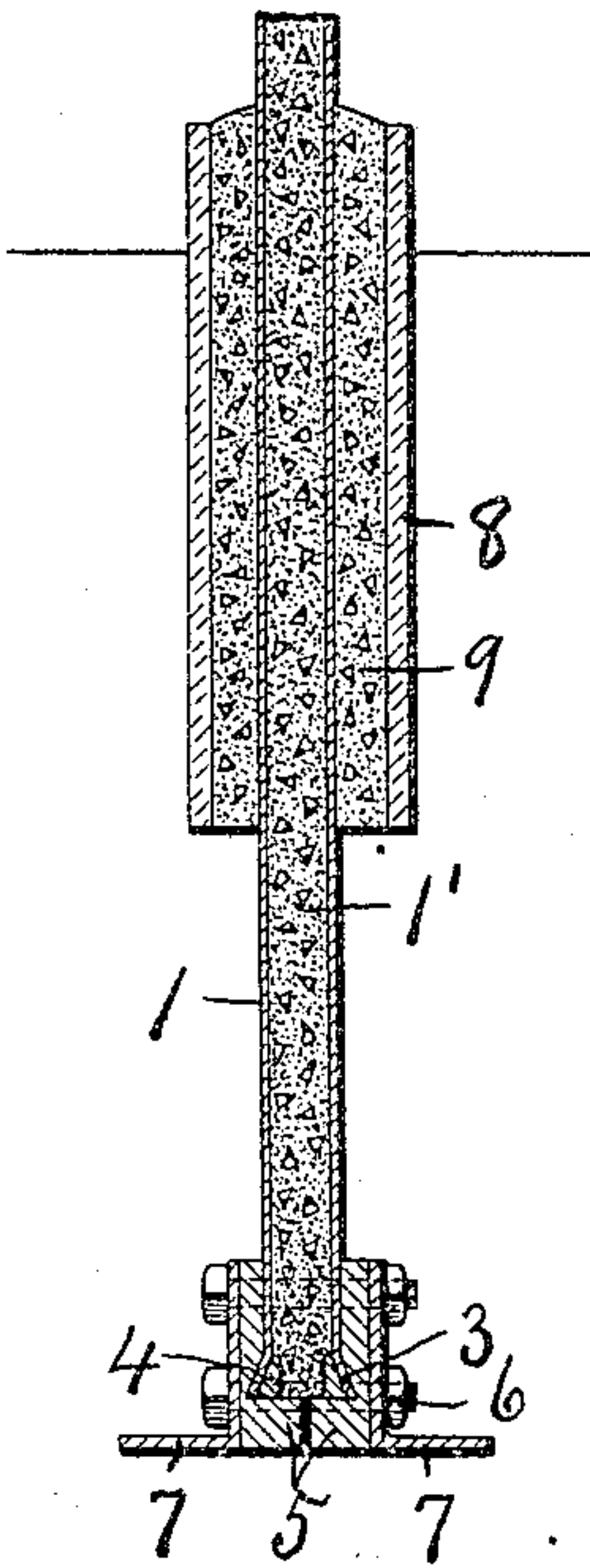


Fig. 5



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APPLICATION FILED DEC. 29, 1904.

2 SHEETS—SHEET 2.

Fig. 6

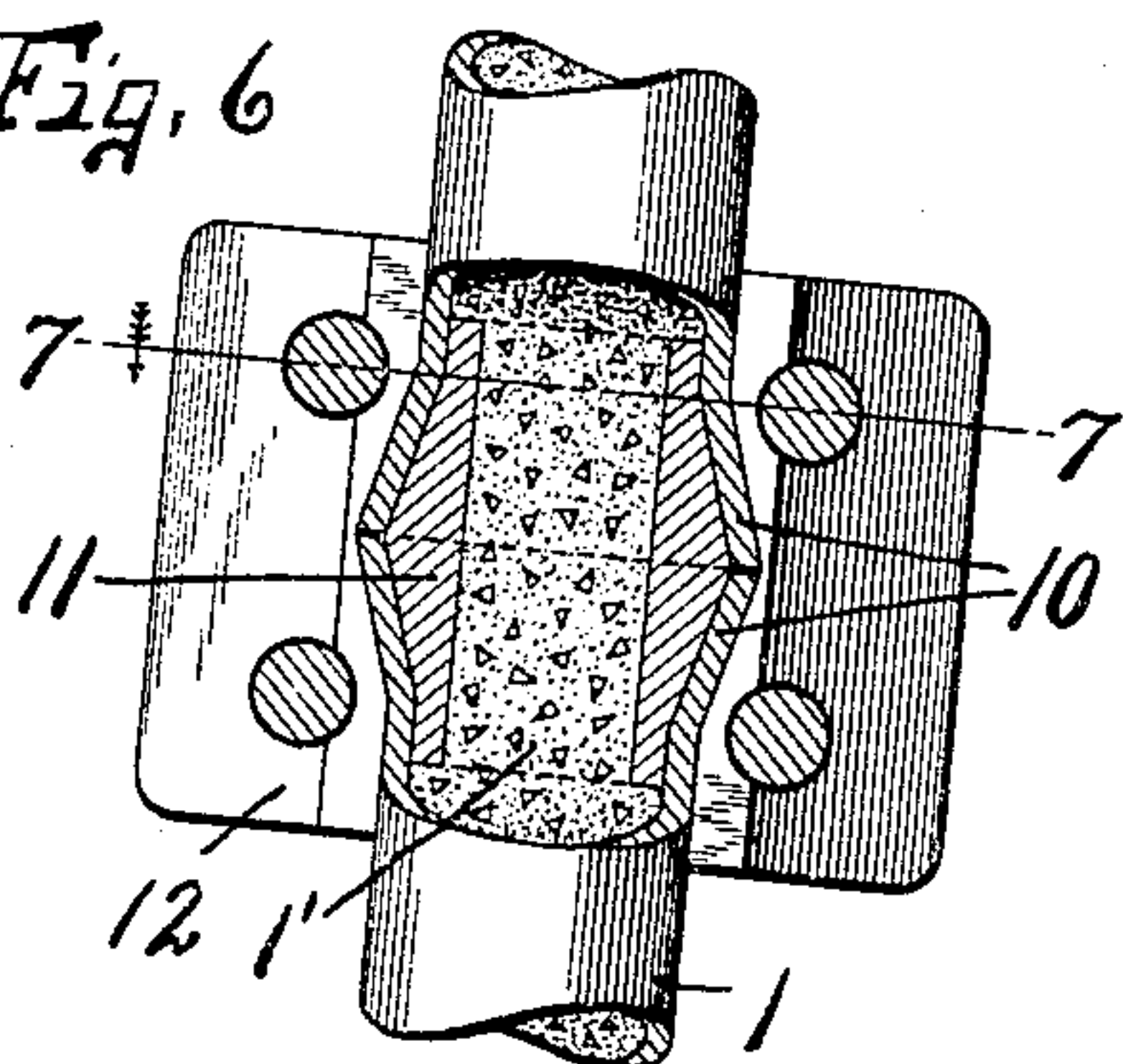


Fig. 8.

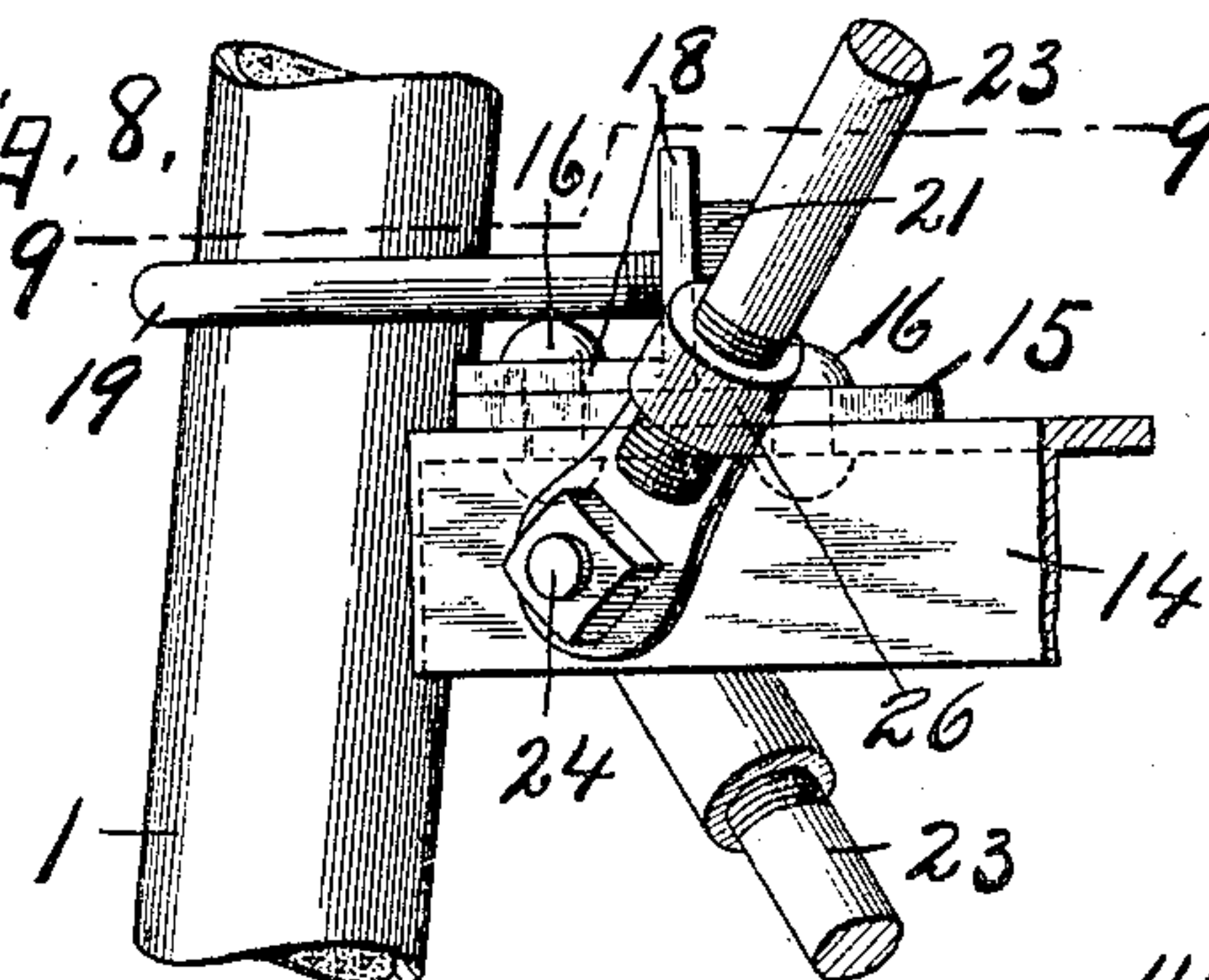


Fig. 7.

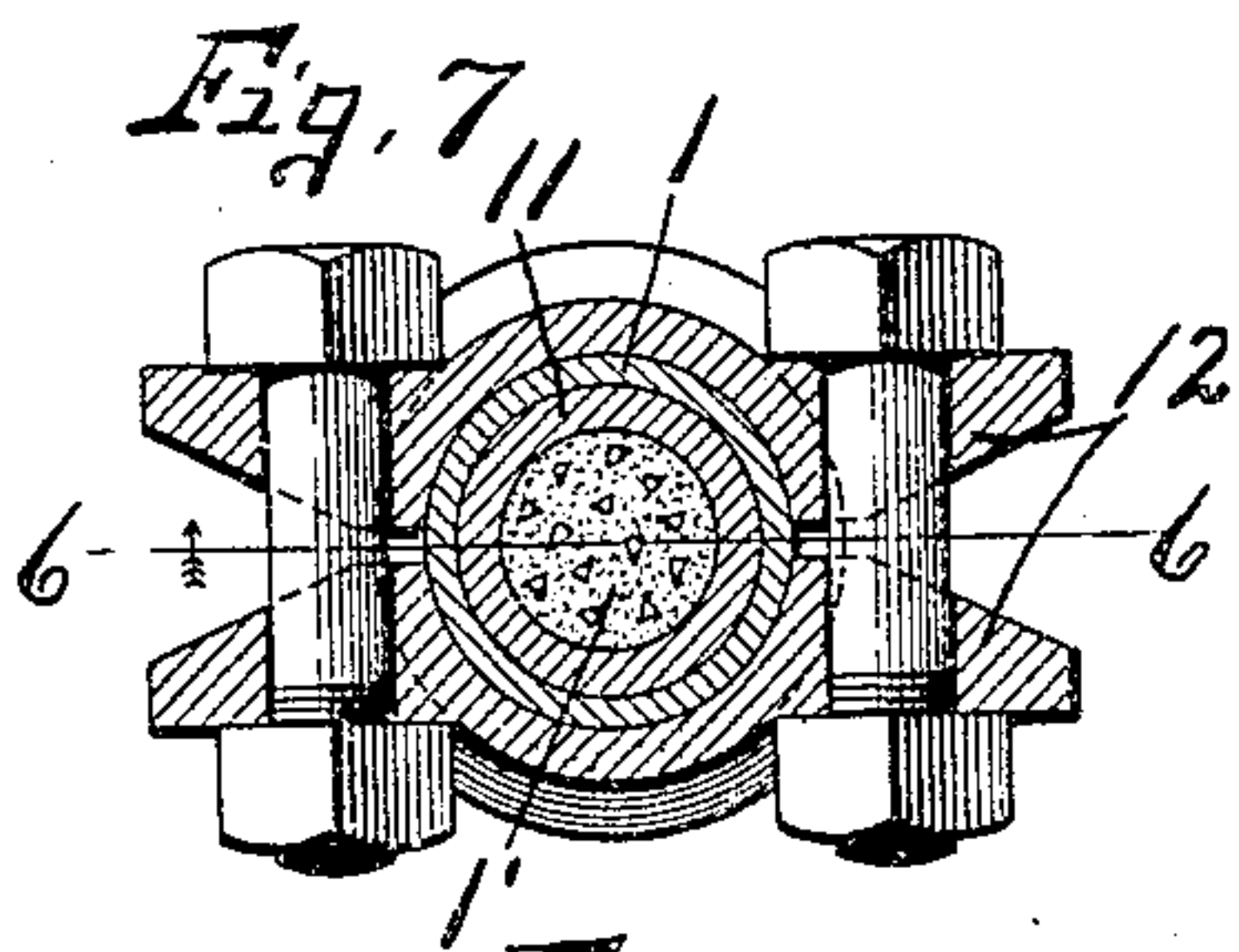


Fig. 9.

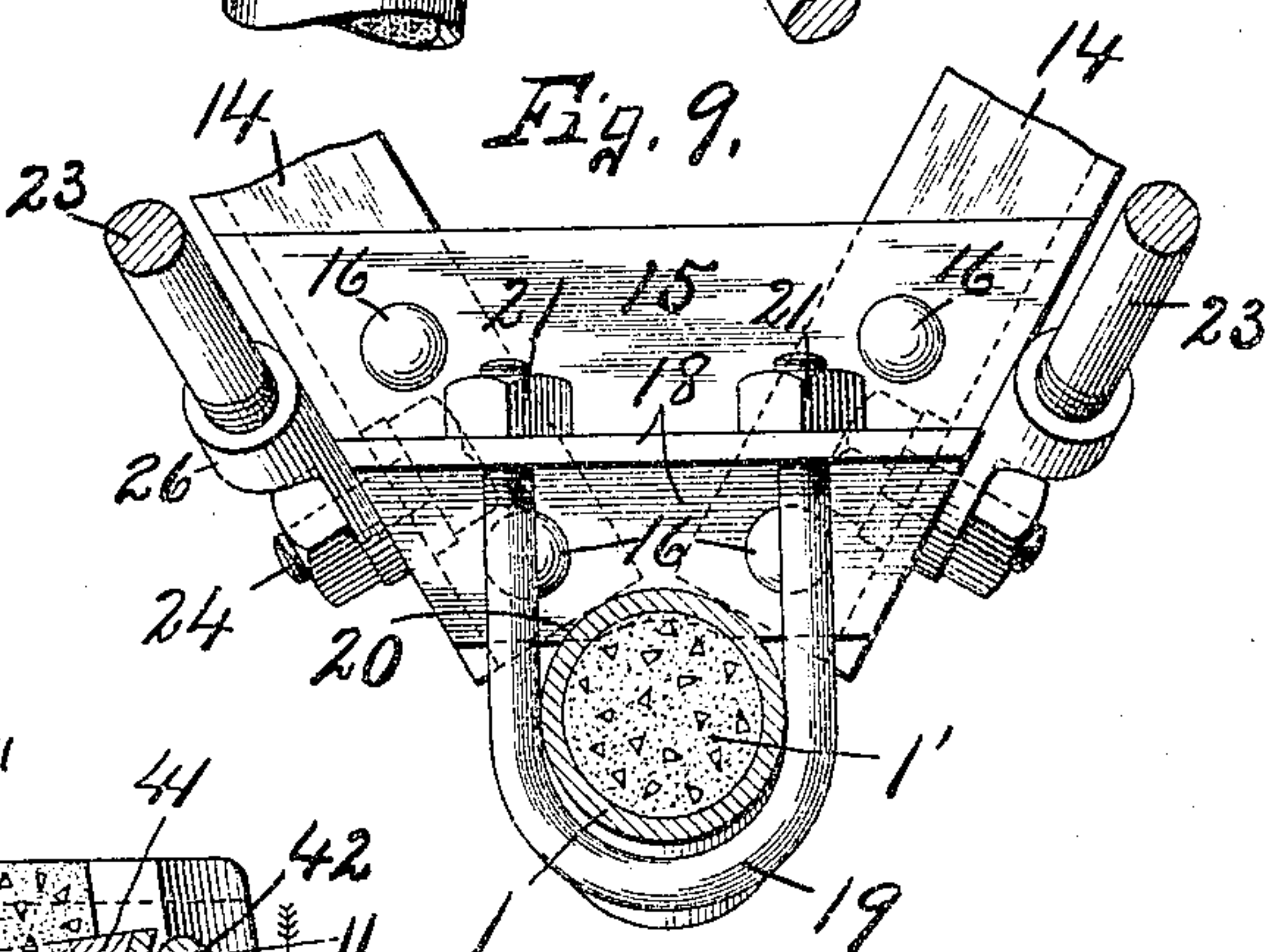


Fig. 10.

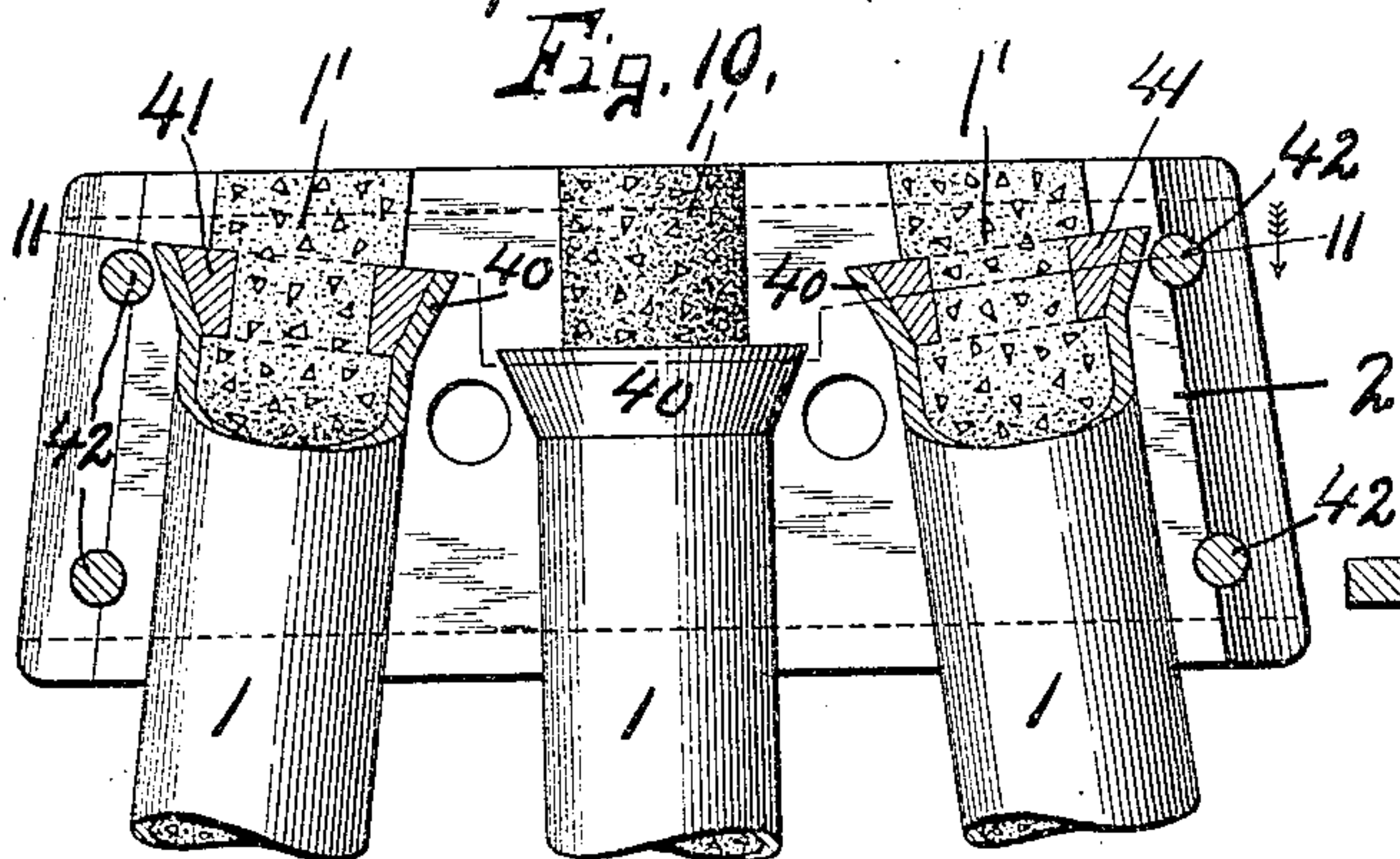


Fig. 12.

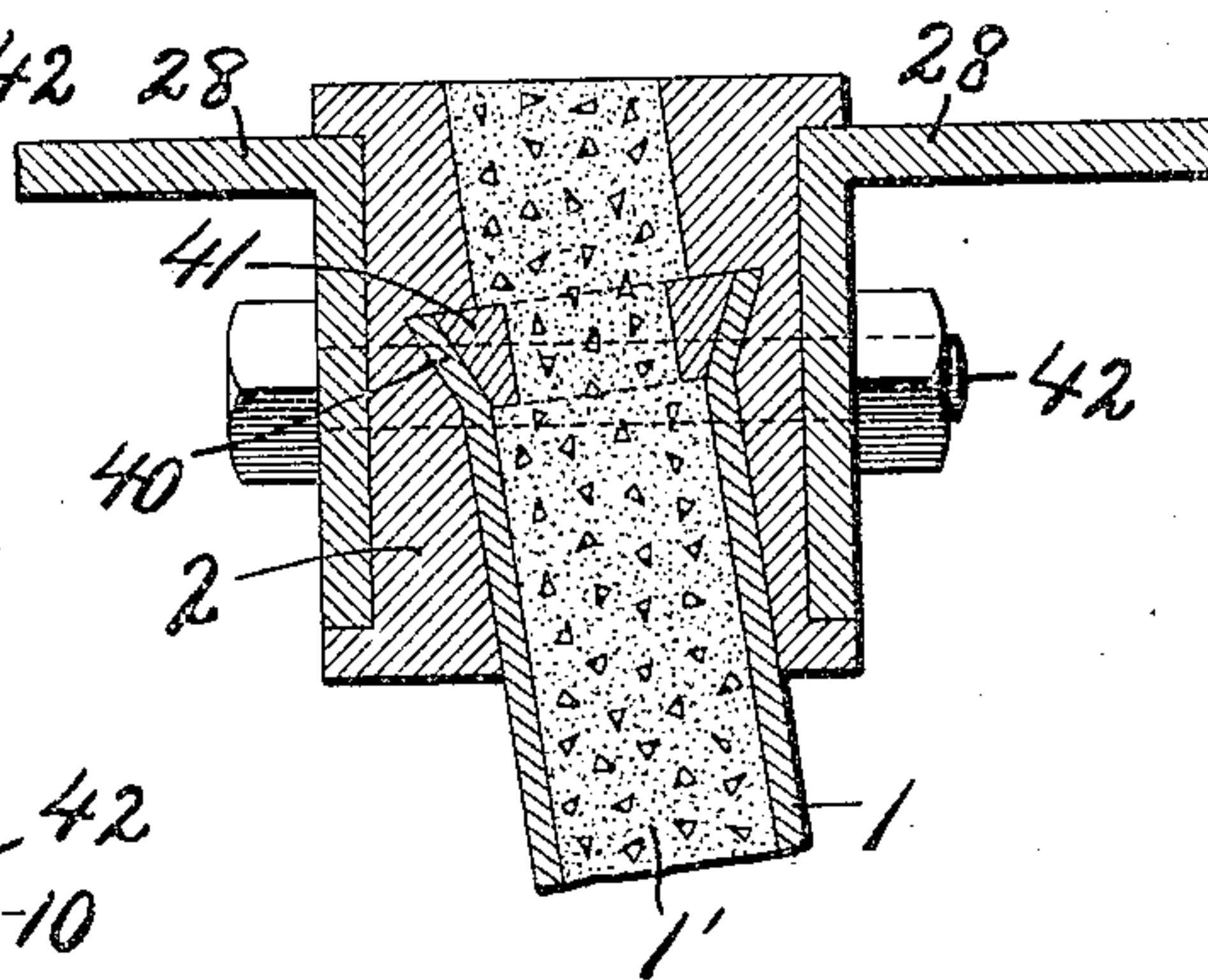
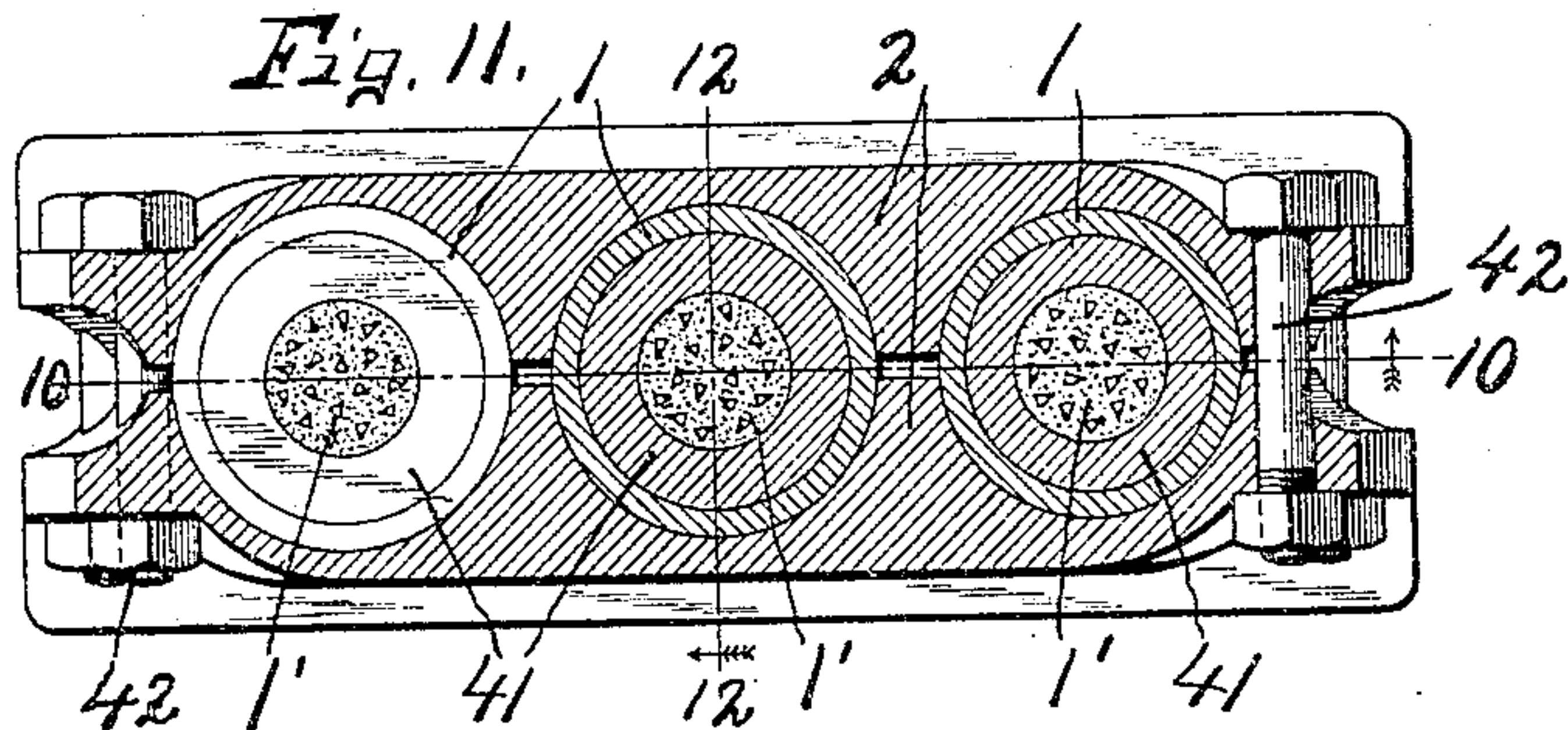


Fig. 11.



WITNESSES:

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UNITED STATES PATENT OFFICE.

ROBERT L. ALLEN, OF SYRACUSE, NEW YORK, ASSIGNOR TO ARCHBOLD-BRADY COMPANY, OF SYRACUSE, NEW YORK, A CORPORATION OF NEW YORK.

SKELETON TOWER.

SPECIFICATION forming part of Letters Patent No. 791,975, dated June 6, 1905.

Application filed December 29, 1904. Serial No. 238,845.

To all whom it may concern:

Be it known that I, ROBERT L. ALLEN, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and
5 useful Improvements in Skeleton Towers, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in skeleton towers, which, although specifically adapted for supporting electric conductors, insulators, and allied apparatus, are
10 equally applicable for other uses, not necessary to herein describe.

The primary object is to produce a comparatively light, yet strong and durable, structure, which possesses a maximum resistance to tensile, torsional, and crushing strains, and may be manufactured and quickly placed in
15 operative position ready for use at a comparatively small cost.

One of the specific objects is to make the tower in the form of a skeleton triangular pyramid having a single upright leg at each
25 angle, each leg having a separate anchorage and incased at the ground-line in a suitable tile containing a filling of concrete, so as to avoid as far as practicable oxidation and disintegration at this point where the destructive elements are most active.

Another specific object is to construct the legs of pipe-sections secured together end to end and filled with cement or concrete and to expand the ends of the pipe-sections into recessed clamps, which fit snugly upon the expanded ends and firmly unite the ends of the
35 pipe-sections to each other and to their respective fastenings to form a substantially integral structure.

A further object is to terminate the upper converging ends of the legs in substantially the same straight line or vertical plane and to expand and clamp these converged ends firmly together by a single clamping device
45 capable of supporting cross-arms and other analogous fixtures.

A still further object is to tie the three corner-legs together in the same horizontal plane and at intervals throughout the height of the

tower, so as to form suitable transverse braces, 50 to which are attached the ends of diagonal braces spanning the spaces between the transverse brace-bars on each side of the triangle, whereby the whole framework is tied together and braced transversely and vertically against 55 the specific strains previously mentioned.

Other objects and uses will appear in the following description.

In the drawings, Figures 1, 2, and 3 are respectively front, side, and top plan views of 60 a tower embodying the features of my invention. Figs. 4, 5, 6, and 7 are enlarged sectional views taken, respectively, on lines 4 4 and 5 5, Fig. 1, 6 6, Fig. 7, and 7 7, Fig. 6. Fig. 8 is an enlarged elevation of a portion of 65 one of the corner-legs and the adjacent ends of the horizontal or transverse tie-bars, showing the means for clamping the tie-bars to the legs and also showing the adjacent ends of the diagonal braces and their fastenings. Fig. 9 70 is a sectional view taken on line 9 9, Fig. 8. Fig. 10 is an enlarged elevation, partly in section, of the upper ends of the corner-legs and the means for clamping said ends together, taken on line 10 10, Fig. 11. Fig. 11 is a 75 horizontal section of the parts seen in Fig. 10, taken on line 11 11, Fig. 10. Fig. 12 is a vertical section taken on line 12 12, Fig. 10, showing the cross-arms secured to the clamp.

The invention consists, essentially, of three 80 upright tubes or hollow legs 1, spaced equidistant apart at the base, where they are securely anchored in the ground and converge upwardly in straight lines to the top, where they are disposed in substantially the same 85 vertical plane and are tied together by a suitable clamp 2. Each of the corner-legs is filled with concrete 1' to stiffen and weight the structure at the corners, where the strains are most severe, and the lower end of each leg, which 90 is embedded or anchored in the ground, is expanded at 3 upon a swaging or expanding sleeve or bushing 4, and to this expanded end is secured a clamp 5, composed of opposite half-sections, which are clamped upon the 95 lower end of the leg by suitable bolts 6 and are provided with semiconical recesses fitting snugly upon the expanded portions 3 to firmly

lock the clamp to the leg. Secured to the opposite faces of the clamp 5 by the bolts 6 are suitable anchor-plates 7, which in this instance consist of angle-irons of sufficient length and area and embedded a sufficient distance in the ground to resist lifting strains to which the tower may be subjected. Each of the legs where it enters the surface of the ground is incased in a tile 8, of vitreous or other non-corrodible material, which extends some distance above and beneath such surface, and the intervening space is filled with concrete 9 to prevent the corrosion or disintegration of this part of the leg, where the action of the elements is usually most destructive. Each lower leg is usually composed of a series of lengths of pipe secured together end to end, and the meeting abutting ends are expanded at 10 and are securely clamped upon an inclosed double-cone sleeve 11 by means of a clamp 12, composed of two half-sections, which are drawn against opposite-sides of the meeting ends of the pipe-sections and are formed with tapering recesses fitting closely against said expanded ends of the pipe-sections. These corner-legs are braced transversely at suitable intervals from bottom to top by horizontal bars 14, which are arranged between the legs of the tower with their ends in close proximity to the legs and have their adjacent ends secured together by plates 15 to form substantially horizontal triangular frames or braces. The bars 14 preferably consist of angle-irons arranged with one flat side uppermost and their depending flanges at the outside, and the plates 15 are usually flat pieces of iron secured to the top flat faces of the adjacent ends of the bars 14 by rivets 16, the ends of the plates being cut to conform to the angle of the frame.

Each corner of the triangular frame or brace formed by the bars 14 is provided with an angle-plate 18, which is secured to the top face of each underlying plate 15 by one of the rivets 16, with one of its flanges disposed vertically and apertured to receive the opposite arms of a U-shape clamp or bolt 19, which is clamped around the adjacent corner-leg to lock the transverse bracing-frame to said legs. The outer edges of the plates 15 and 18 are recessed at 20, Fig. 9, to fit against the inner face of the adjacent corner-leg, so that when the U-shaped bolts 19 are drawn up by nuts 21 the leg is securely impinged between said bolt on one side and the plates 15 and 18 on the opposite side.

The transverse brace-bars 14 on each side of the several triangular bracing-frames are tied and braced by diagonally-disposed braces or tie-rods 23, which span the distance between the successive horizontal frames and have their opposite ends secured by bolts 24 to the faces of the bars 14—that is, the lower end of each tie-rod or brace 23 is secured to one end of the bars 14 and its upper end is secured

to the opposite end of the next bar 14 above, so that these tie-rods 23 which traverse the same space intersect each other, and the same bolt 24 secures the adjacent ends of the two rods 23, which extend above and below the same end of the bar 14, as best seen in Fig. 8. The ends of the rods 23 are provided with right and left threads, respectively, and are screwed into suitable nuts 26, which in turn are secured by the bolts 24 to the brace-bars 14, so that the braces 14 and rods 23 may be properly adjusted in assembling the parts of the tower, it being apparent that the U-shape bolts 19 may be adjusted up or down along the corner-legs to accommodate the adjustment of the rods 24 and bars 14.

A suitable steel framing is secured to the top of the tower for supporting a number of insulators, as *a*, to carry the conductors of, in this instance, two circuits of three wires each. This framing is secured to the tower at two points, one above the other, to afford greater strength and rigidity against twisting of the cross-arms in case one of the wires breaks, and consists of a pair of horizontal angle-bars 28, secured to the opposite faces of the head or clamp 2, vertical I-beams 29, secured intermediate their ends between the angle-bars 28 at opposite sides of the tower, and additional pairs of horizontal angles 30 and 31, secured, respectively, to the lower and upper ends of the I-beams. The lower pair of angle-bars 30 are disposed some distance below the bars 28 and head 2, between one of the corner-legs and the legs at the opposite side of the tower, and are secured to said legs by any suitable means, as U-shape clamps 32, similar to the bolts 19, thereby forming a rigid connection of the upper framing with the tower. The upper pair of cross-arms 31 are riveted to the upper ends of the vertical beams 29, which are additionally braced by diagonal brace-bars 35 to stiffen the upper part of the framing.

The upper converging end of the corner-legs are each expanded at 40 and fitted with an interior conical bushing 41, and the clamping-head 2 is made in half-sections with suitable tapering recesses to snugly fit against the opposite faces of the adjacent expanded ends of the legs, so that when these sections are clamped in place by bolts 42 the expanded ends of said legs are firmly tied together and locked to the clamping-head.

The insulators *a* are secured to suitable pins 45, of malleable iron or steel, which are suitably secured to the cross-arms of the upper framing.

The top of the clamping-head 2 is flat and adapted to receive and support an insulator-pin, as 45, if desired; but the fixtures which the tower is adapted to support are not material parts of my invention, which is confined more particularly to the structural elements of the tower and to their coaction one with

the other. The details of the construction shown and described may, however, be modified more or less without departing from the spirit of this invention.

5 In setting up the tower the lower tubular leg-sections, which are usually made of galvanized iron, are securely anchored in the ground at the desired angle according to the predetermined height and are incased at the
10 ground-line, as described, after which the structure is continued stage by stage, the horizontal brace-frames forming convenient platform-supports for carrying on the work in the superstructure and the tie-rods or diagonal braces being placed as the work progresses toward the top. After the main tower structure is thus completed the tubular legs, which are open from the top to bottom, are filled with concrete, which excludes any moisture from the interior of the legs and also forms continuous columns from top to bottom, thereby stiffening the joints in the legs and adding greater rigidity to the whole structure.

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

1. A skeleton tower comprising three upright tubular legs converging upwardly from the base, the upper ends of one of the legs being brought between the upper ends of the other two legs, the upper ends of said legs being expanded, and a clamp composed of half-sections having recesses fitting the expanded ends, and bolts drawing said sections against opposite faces of the expanded ends.

2. A skeleton tower comprising upright tubular legs having their lower ends expanded, a clamp composed of opposite half-sections secured to opposite faces of and recessed to fit the expanded end of each leg, and anchor-plates secured to said clamp.

3. A skeleton tower comprising upright tubular legs having their lower ends expanded, a clamp composed of opposite half-sections secured to opposite faces of and recessed to fit the expanded end of each leg, and parallel anchor-plates secured to opposite faces of the clamp.

4. A skeleton tower comprising upright tubular legs each composed of two or more sections secured together end to end the meeting ends of each section being expanded to substantially the same diameter, and a clamp composed of half-sections having recesses in their adjacent faces fitting snugly to opposite faces of said expanded ends, and means to draw the sections together against said expanded ends.

5. A skeleton tower comprising three upright tubular legs spaced equidistant apart at the base and converging at the top, said legs being filled with concrete and having their lower and upper ends expanded, an anchor-clamp for each leg recessed to fit and secured to the expanded end of such leg, and an additional clamp composed of half-sections recessed to fit and clamped to the expanded upper ends of the legs to tie said upper ends together.

6. A skeleton tower comprising tubular upright legs spaced equidistant apart and having their lower ends expanded and anchored in the ground, said tubes being filled with concrete.

7. A skeleton tower comprising tubular upright legs spaced equidistant apart and having their lower ends expanded and anchored in the ground, a conical bushing fitted in the expanded lower end of the leg, and anchor-plates secured to and held from endwise movement by said expanded ends.

8. A skeleton tower comprising tubular upright legs spaced equidistant apart and having their lower ends expanded and anchored in the ground, each leg comprising two or more sections secured together end to end, the meeting ends of said sections being expanded and provided with a bushing having tapering ends fitting snugly in said meeting ends, and a sectional clamp inclosing each joint and recessed to fit upon said expanded ends.

9. A skeleton tower comprising three upright tubular legs anchored at their lower ends and converging upwardly toward the top, said legs being filled with concrete and having their upper ends expanded, and a sectional clamp recessed to fit upon and secured to the expanded ends.

10. A skeleton tower comprising three upright tubular legs anchored at their lower ends and converging upwardly toward the top, triangular frames adjustably secured at intervals to the legs and having depending flanges, a clamping-bolt in each end of each flange, and two tie-rods attached to each bolt, one rod from each bolt being attached to the bolt at the opposite end of the superimposed frame and the other rod from the same bolt being attached to the bolt at the opposite end of the underlying frame.

In witness whereof I have hereunto set my hand this 16th day of December, 1904.

ROBERT L. ALLEN.

Witnesses:

H. E. CHASE,
MILDRED M. NOTT.