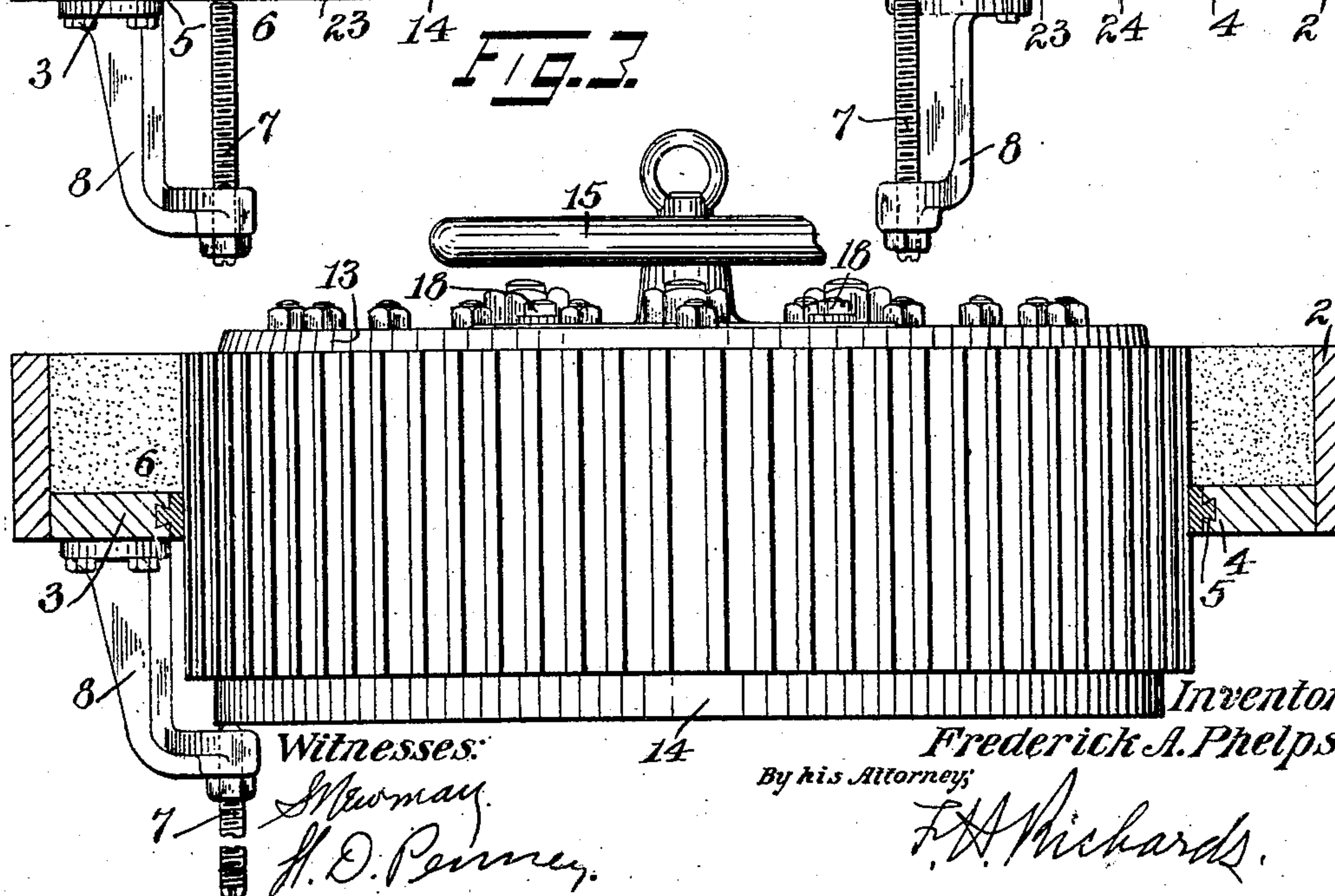
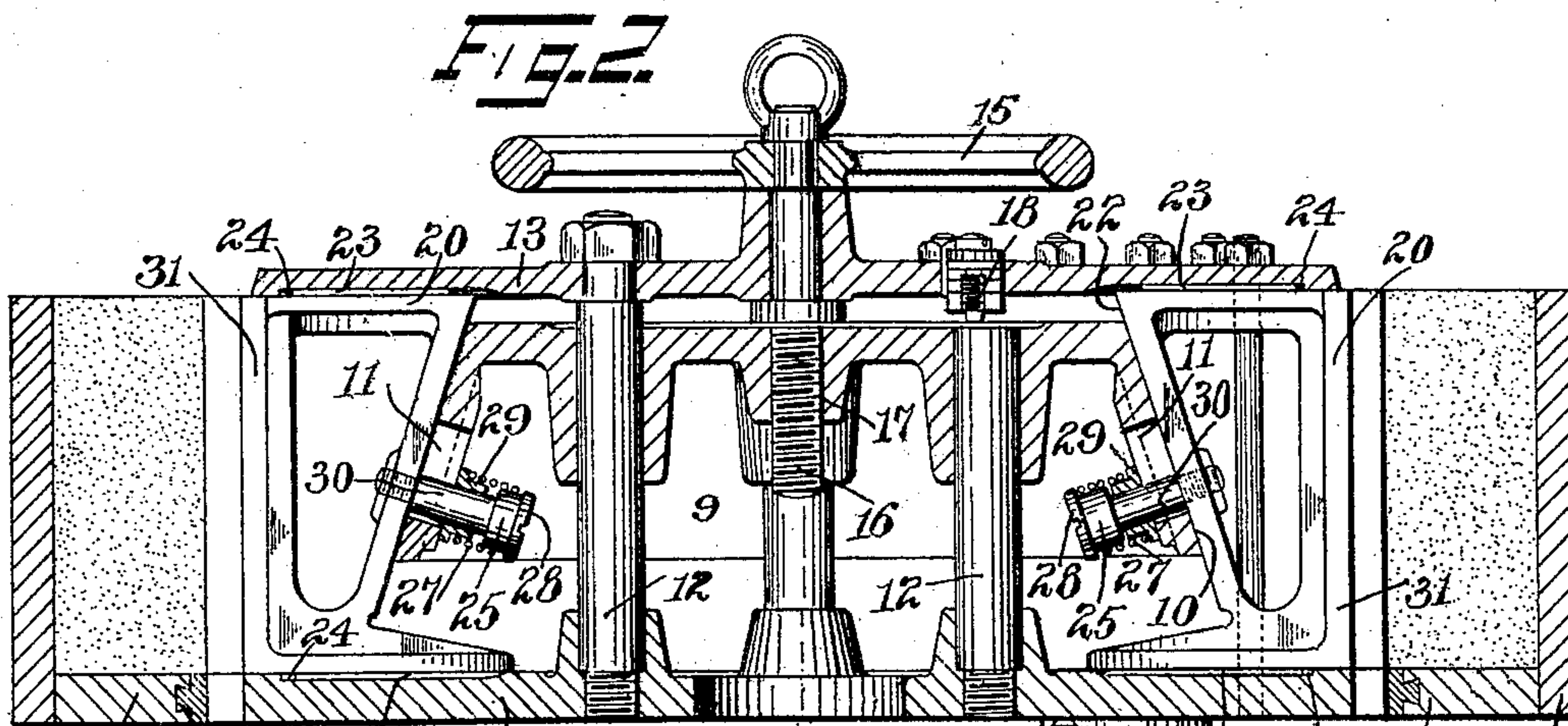
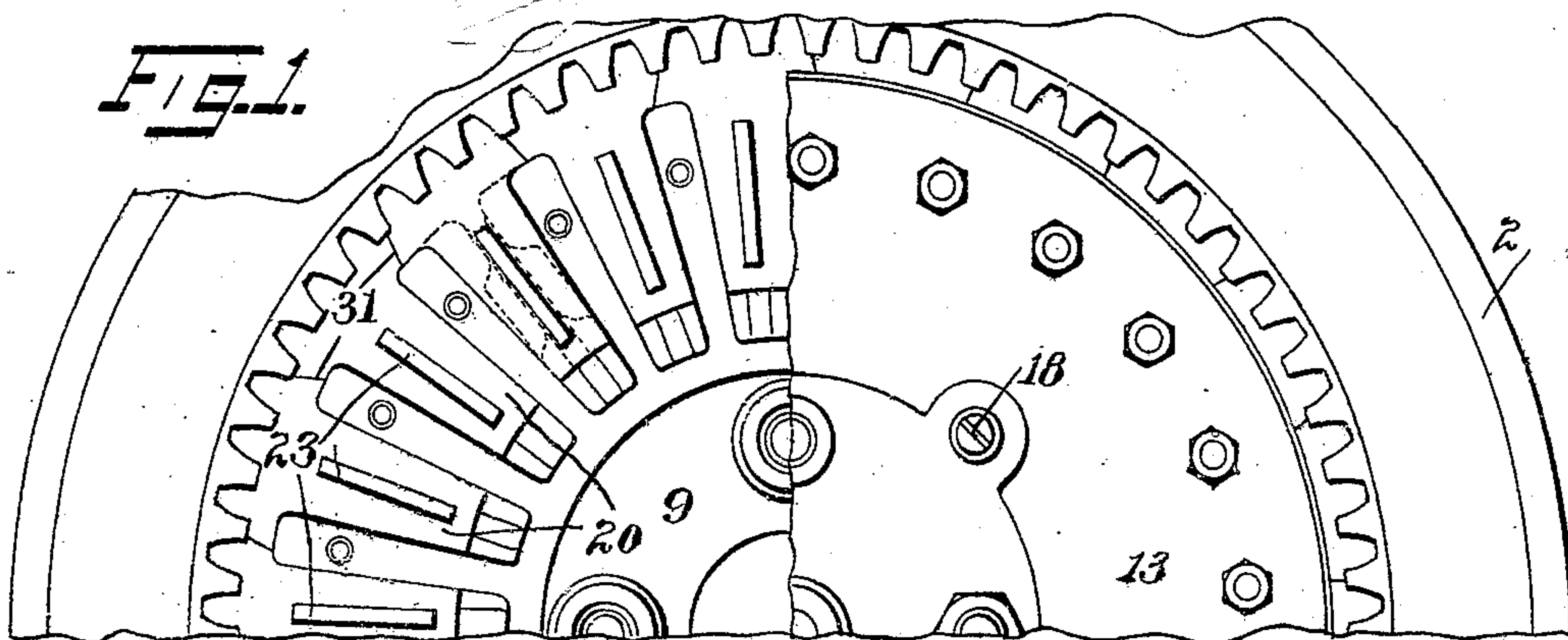


F. A. PH LPS.
MOLD FORMING MACHINE.
APPLICANT FILED JAN. 3, 1908.

915,215.

Patented Mar. 16, 1909.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

FIG. 4.

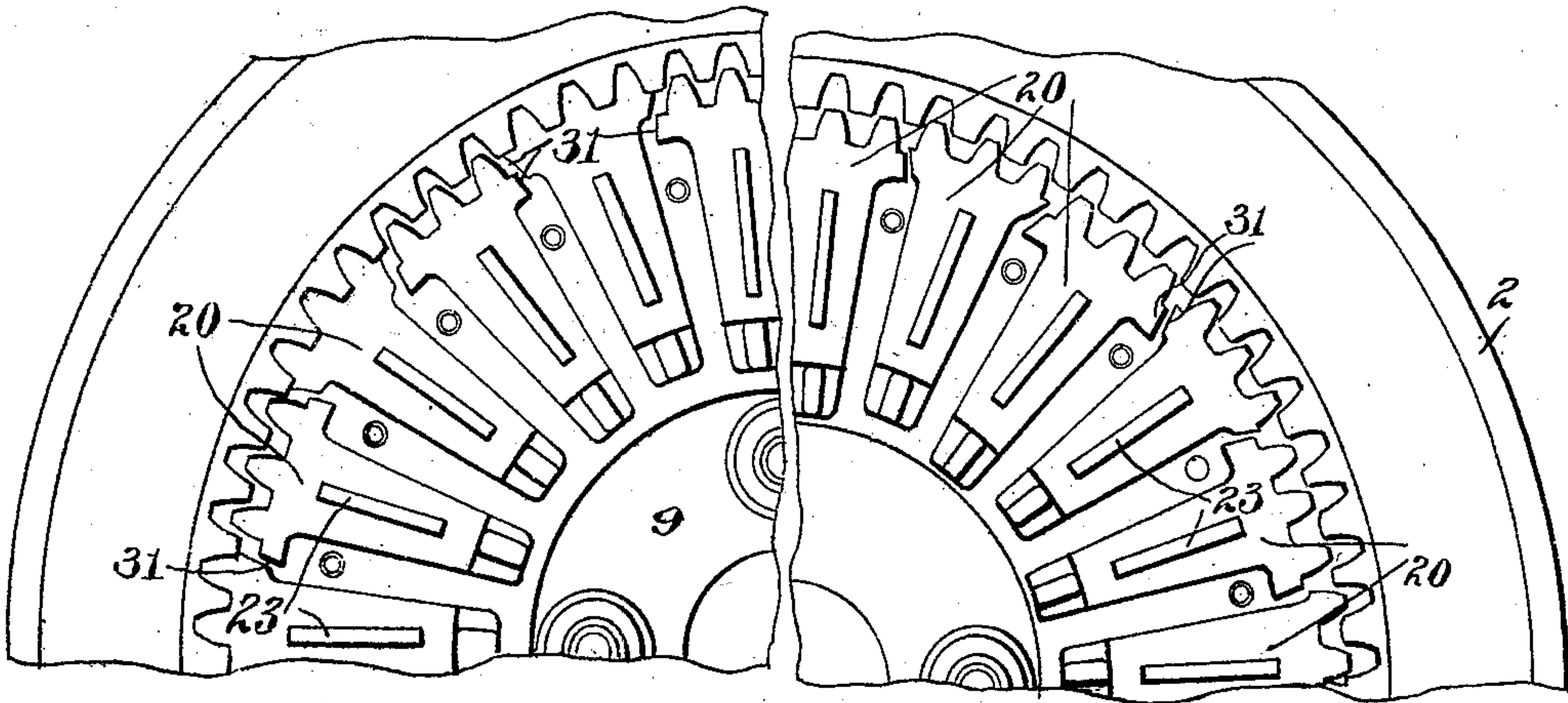


FIG. 5.

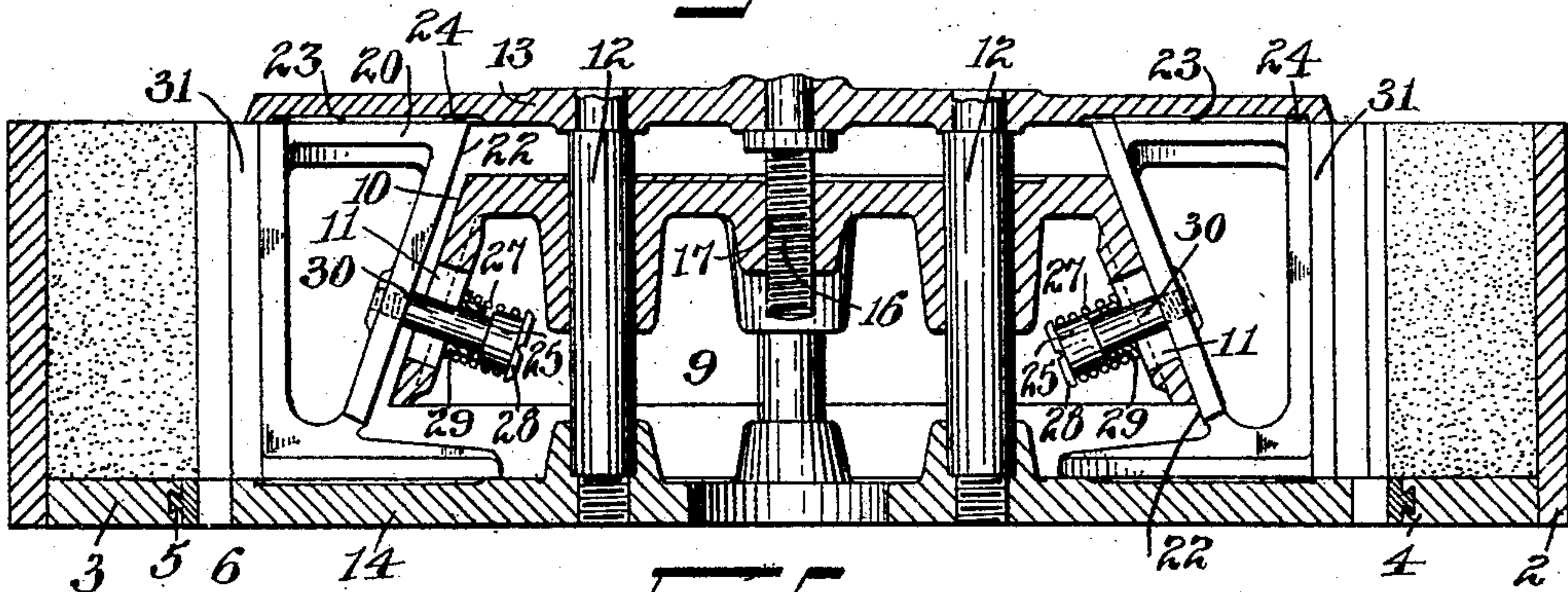
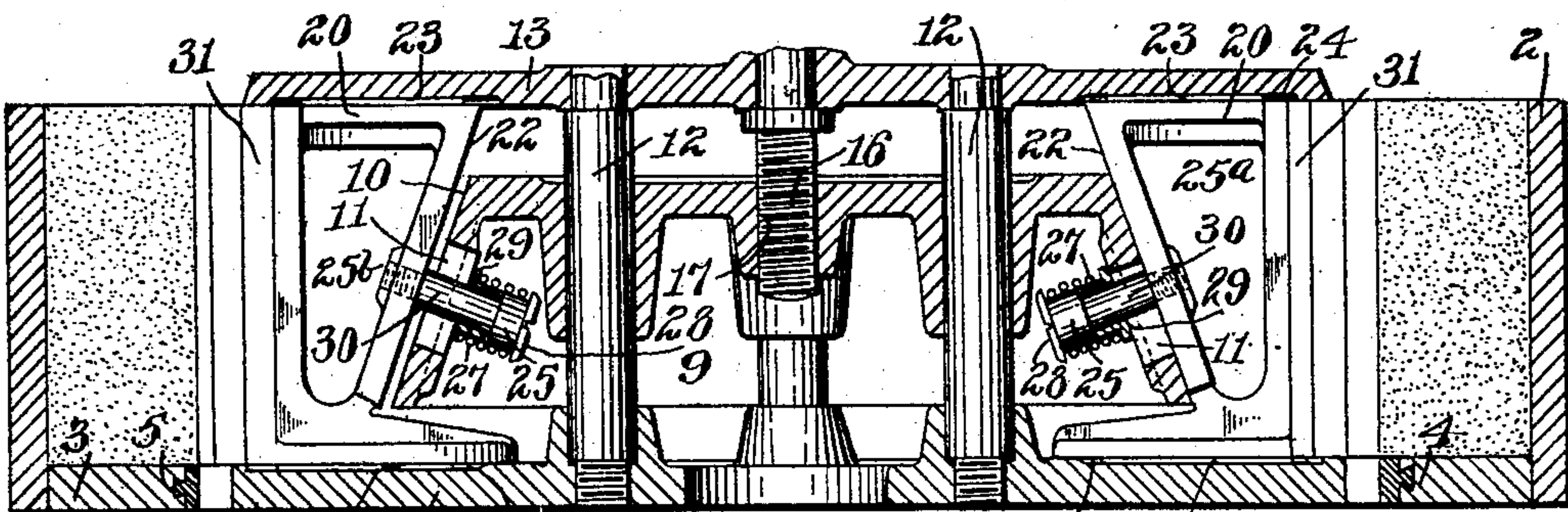


FIG. 6.



Witnesses: 23 14 24

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3 SHEETS—SHEET 3.

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FIG. 7.

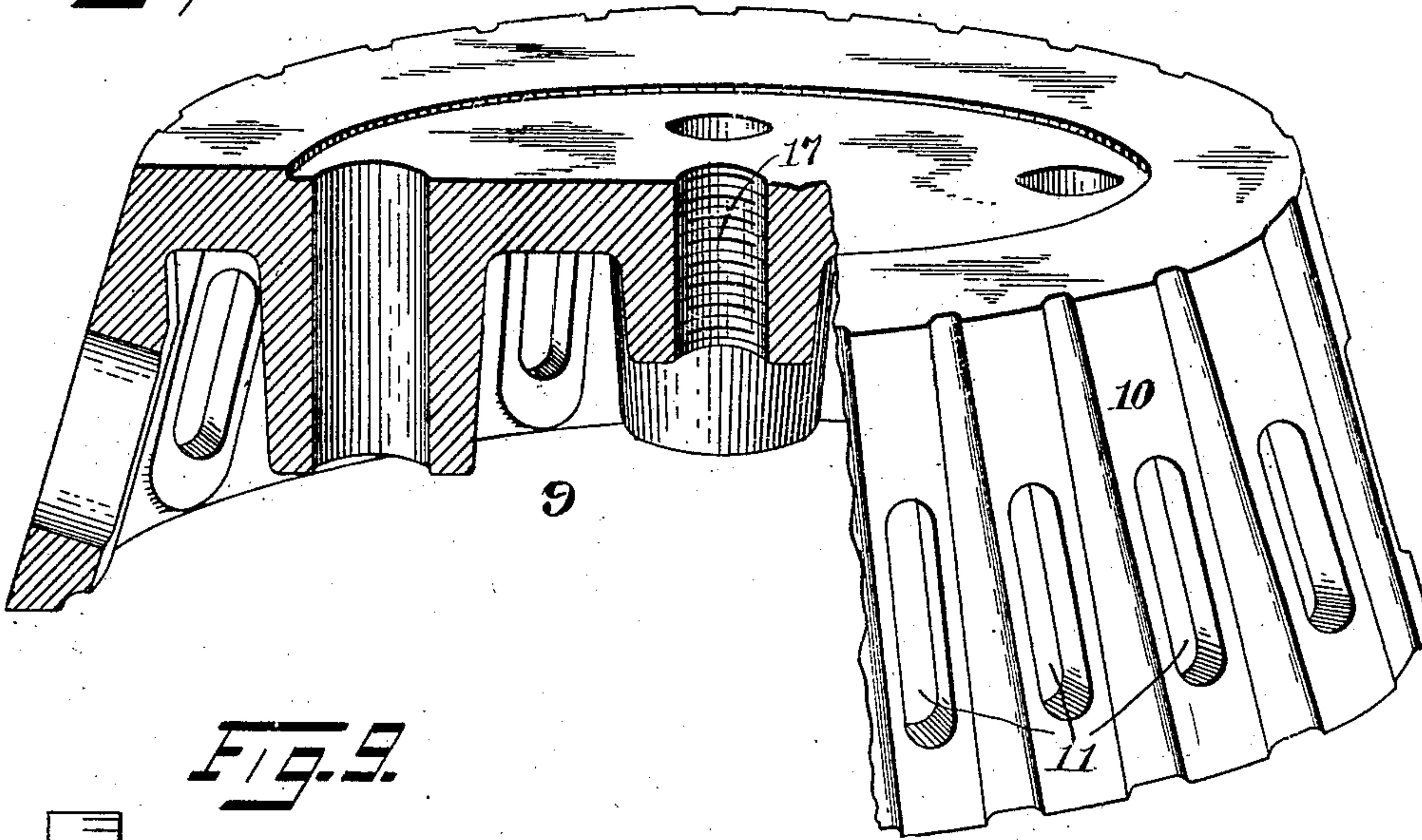


FIG. 9.

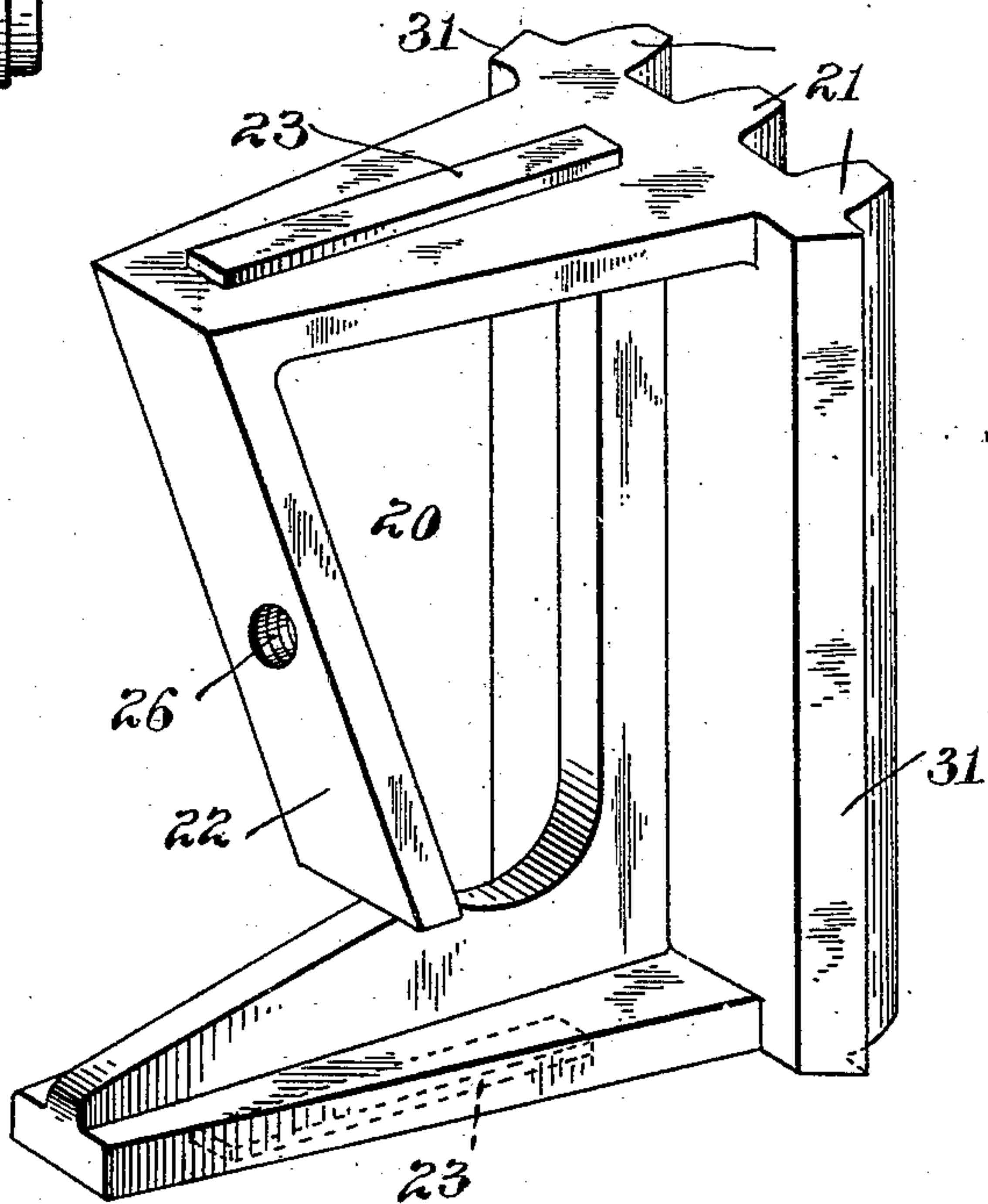
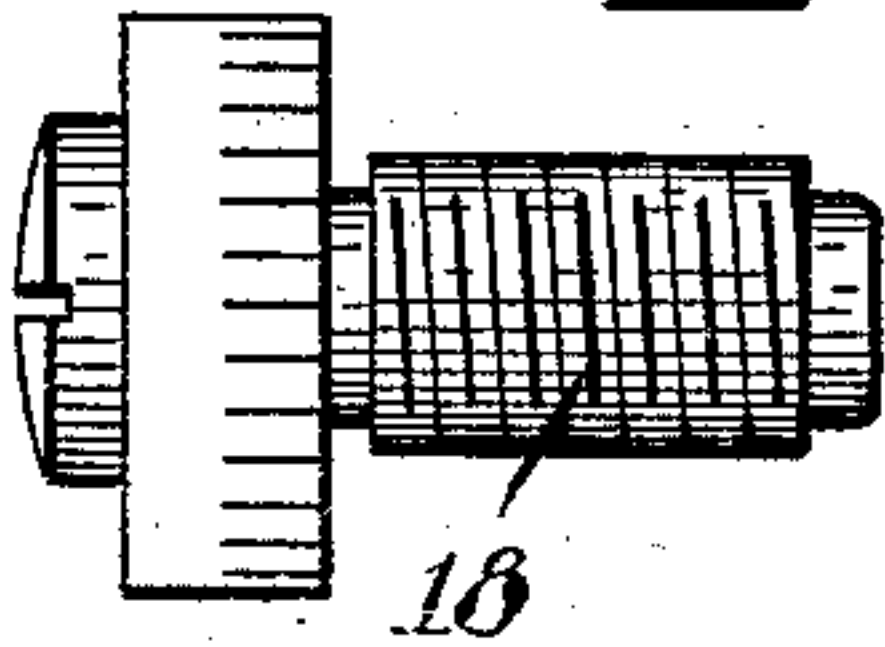


FIG. 8.

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UNITED STATES PATENT OFFICE.

FREDERICK A. PHELPS, OF NEWARK, NEW JERSEY, ASSIGNOR TO TAYLOR IRON & STEEL COMPANY, OF HIGH BRIDGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MOLD-FORMING MACHINE.

No. 915,215.

Specification of Letters Patent.

Patented March 16, 1909.

Application filed January 3, 1908. Serial No. 409,201.

To all whom it may concern:

Be it known that I, FREDERICK A. PHELPS, a citizen of the United States, residing in Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Mold-Forming Machines, of which the following is a specification.

The present improvement relates to machines for forming molds, and particularly molds for gears, the object of the invention being to provide an improved machine of this class by means of which all of the teeth of the mold may be formed simultaneously and when formed the pattern withdrawn without liability to roll up the sand and break down the molded teeth.

A further object of the invention is the provision of an improved pattern made up of a series of toothed segments, and means for withdrawing all of the segments radially, thereby to avoid the necessity, as heretofore, of drawing the pattern out of the sand mold facewise of the molded teeth.

A further object of the invention is the provision of an improved mold-forming machine in which the patterns are withdrawn radially from the teeth, instead of facewise thereof, and in which means are also provided for determining the amount of face which the molded teeth are to have.

In the drawings accompanying and forming part of this specification, Figure 1 is a top view, partly broken away, of substantially one-half of this improved gear-mold forming machine; Fig. 2 is a sectional view of the mechanism shown in Fig. 1, illustrating the pattern in position to form a mold with the teeth the full length of the pattern; Fig. 3 is a somewhat similar view to Fig. 2, but showing the pattern in elevation adjusted relatively to the mold box so that the face of the mold teeth will be but approximately one-half of the face of the pattern; Fig. 4 is a view somewhat similar to Fig. 1, with the top plate of the pattern, however, removed, the left hand side illustrating every alternate gear segment partly withdrawn and the right hand side illustrating all of the gear segments withdrawn, one set, however, to a greater extent than the other; Fig. 5 is a cross-sectional view illustrating the position of the pattern segments as shown at the left-hand side of Fig. 4; Fig. 6 is a similar cross-sectional view to Fig. 5, but illustrating the position

of the pattern segments as shown at the right-hand side of Fig. 4; Fig. 7 is a partly sectional view of the segment-supporting drum; Fig. 8 is a perspective view of one of the segments detached; and Fig. 9 is a detail view of one of the adjusting devices for regulating the position of the segment-carrying drum.

Similar characters of reference indicate corresponding parts throughout the different figures of the drawings.

In the formation of sand molds for the making of gears, it is desirable to mold all of the teeth simultaneously, but so far as I am aware no practicable mode of doing this has heretofore been devised except when the pattern or mold is withdrawn one from the other facewise, or depthwise of the molded teeth, and as these gear teeth frequently have six to eight-inch face, when the pattern is drawn out of the sand it frequently rolls up the sand surface and breaks down the molded teeth so that the mold is useless.

By means of the present improvement, in which the pattern is withdrawn from the mold by a radial draft, instead of a face draft, that is to say, the segments forming the pattern are drawn radially away from the teeth of the sand mold prior to removing the pattern depthwise of the mold, I am able not only to mold all of the teeth at the same time, but am able to withdraw the pattern from the mold without any injury thereto.

This improved mold-forming machine comprises, when assembled for the forming of gear molds, in the preferred embodiment thereof shown in the drawings, an annular mold box 2 having a bottom forming the follow-board 3, which is in the form of a ring, the edge of which conforms to the shape of the pattern, which, in the present instance, is shown as consisting of gear teeth. This is obtained by providing the inner edge 4 of the follow-board with a dovetail groove 5, and then, when the pattern is in position, pouring in some suitable metal, as for instance zinc, whereby, when such metal has set, the edge 6 of the follow-board entirely around the pattern will fit such sand pattern and conform thereto.

Located within the opening of the mold box and supported by adjusting means 7 carried by brackets 8 secured to the underside of the follow-board is this improved pattern, which, in the present instance, comprises a drum 9 having an incline periph-

ery 10 provided with a series of slots 11 therein, preferably corresponding in number with the number of segments of which the pattern is formed. This drum is supported for
 5 vertical movement on rods 12 carried by top and bottom plates 13 and 14 forming the top and bottom walls of the pattern, movement upwardly and downwardly of said drum being obtained by means of a hand-wheel 15
 10 journaled in the top plate 13 and having a screw 16 fitting a centrally formed threaded opening 17 in the drum, whereby on the turning of this hand-wheel the drum will be moved upwardly or downwardly on its guide
 15 rods, the proper positioning of the pattern segments being obtained by means of a micrometer adjusting device 18 carried by the top plate and engaging the top of the drum; permitting a slight increase or de-
 20 crease of diameter of pattern.

The pattern proper is made up of a series of metal segments or sections 20, each having the desired number of pattern faces. In the present instance, as the pattern is a 66-
 25 tooth gear pattern, three teeth are taken as a multiple, so that each segment is provided with three teeth or matrices 21. Each such segment is provided with an inclined face 22 at the rear thereof, formed at the same angle
 30 as the periphery of the drum and in position to engage the drum. The segments are suitably guided for radial movement, this being obtained in the present instance by providing the top and bottom of the pattern segments
 35 with keys 23 fitting key-ways 24 in the opposed faces of the top and bottom plates 13 and 14 of the machine. Of course, it is to be understood that this construction could be reversed, the plates having the keys while
 40 the top and bottom plates be provided with the key-ways.

For securing the segments to the drum, suitable means is provided, consisting of fastening screws 25 threaded into openings 26
 45 in the inclined rear faces of the segments and movable in the slots 11 of the drum, spiral springs 27 being located between enlarged heads 28 of such fastening devices and collars or washers 29 mounted on the shanks 30 of
 50 such fastening devices and engaging the inner face of the inclined portion of the drum. The springs act to hold the pattern segments in firm engagement with the inclined faces of the drum. The side faces 31 of the pattern
 55 segments are beveled so that such segments will slip into close engagement with each other and present an unbroken pattern face, and it therefore follows that it is impracticable, after the sand mold has been formed,
 60 to withdraw all of the segments simultaneously. It is therefore necessary that certain of the segments be withdrawn radially from the mold prior to the withdrawal of others thereof, and in the present embodiment of
 65 the machine each alternate segment is partly

withdrawn before its companion segments are withdrawn, and to enable this to be done, the fastening screws are provided with different sized heads. For instance, the fastening device of each segment which is to be
 70 withdrawn prior to its companion segment has a somewhat longer and wider head, as 25^a, as shown at the right in Fig. 6, than the fastening devices 25^b. In consequence, on the rotation of the hand-wheel, when the
 75 drum is moved downward, see Fig. 6, the washers of the screws 25^a will engage the heads of such fastening devices, owing to the small distance which they have to travel prior to the engagement of the washers with
 80 the heads 25^b, so that the first set of pattern segments will be partly withdrawn, as shown for instance at the left-hand side of Fig. 4, before the companion segments are started. When, however, the drum has been further
 85 shifted the washers of the screws 25^b will engage the heads of such screws, whereupon such companion segments will also be withdrawn, see Fig. 4 at the right thereof, this movement of the drum also further with-
 90 drawing those segments which were already partly withdrawn. The reversal of the hand-wheel, of course, will move the drum upwardly and shift the segments into proper position to form a new mold.
 95

When it is desired that the mold teeth shall have a face of less depth than the full depth of the pattern teeth, this is accomplished by adjusting the pattern with relation to the mold box, or vice versa, this being
 100 accomplished by providing the brackets 8 with adjusting screws 7 engaging the bottom plate of the pattern, so that on adjusting the screws, as shown for instance in Figs. 2 and 3, either the whole or a half, or any desired por-
 105 tion, of the pattern may be left in position to form the desired face of the teeth.

I claim as my invention:

1. In a mold-forming machine, the combination of a series of radially movable pattern sections sufficient in number to form the complete pattern when assembled, each having a gear-tooth-formed face and means for moving all of said pattern sections radially away from the mold.
 110
 115

2. In a mold-forming machine, the combination of a series of radially movable pattern sections all of substantially the same size and sufficient in number to form the complete pattern, and means for moving all
 120 of said sections radially away from the mold, each alternate one ahead of its companion section.

3. In a mold-forming machine, the combination of a series of radially movable
 125 toothed pattern segments all of substantially the same size and sufficient in number to form the complete pattern, and means for moving all of said segments radially away from the mold, some ahead of others.
 130

4. In a mold-forming machine, the combination of supporting means, a drum mounted thereon for reciprocation and having an inclined periphery, means for moving said drum on its supporting means, and pattern segments all of substantially the same size and each having an inclined face engaging the inclined periphery of said drum, whereby on the movement of said drum the pattern segments will be moved radially.

5. In a mold-forming machine, the combination of supporting means, a drum mounted thereon for reciprocation and having an inclined periphery, means for reciprocating said drum, a series of segments having inclined rear faces engaging the inclined periphery of said drum and gear-tooth-formed faces, means for securing the segments to the drum, and guiding means for the segments whereby on the movement of said drum the segments will be moved radially.

6. In a mold-forming machine, the combination of supporting means, a drum mounted thereon for reciprocation and having an inclined periphery, a series of pattern segments carried by said supporting means and having inclined rear faces engaging the inclined face of said drum, said drum having slots, one for each segment, and means working in said slots for fastening the segments to the drum whereby on the reciprocation of the drum the segments will be moved radially, each of said means comprising a headed device, a washer in engagement with the drum, and a spring between said washer and the head of said device whereby each segment is maintained in close engagement with said drum.

7. In a mold-forming machine, the combination of supporting means, a drum mounted thereon for reciprocation and having an inclined periphery, a series of pattern segments carried by said supporting means and having inclined rear faces engaging the inclined face of said drum, said drum having slots, one for each segment, and means working in said slots for fastening the segments to the drum whereby on the reciprocation of the drum the segments will be moved radially, each of said means comprising a headed device, a washer in engagement with the drum, and a spring between said washer and the head of said device whereby each segment is maintained in close engagement with said drum, the heads of some of said devices being longer than the heads of companion devices whereby some of the segments will be moved radially prior to the movement of companion segments.

8. In a mold-forming machine, the combination of a supporting means, a drum mounted thereon for reciprocation and having an inclined periphery, a series of pattern segments carried by said supporting means

and having inclined rear faces engaging the inclined face of said drum, said drum having slots, one for each segment, and means working in said slots for fastening the segments to the drum whereby on the reciprocation of the drum the segments will be moved radially, each of said means comprising a headed device, a washer in engagement with the drum, and a spring between said washer and the head of said device whereby each segment is maintained in close engagement with said drum, the head of each alternate fastening device being longer than the head of its companion device, whereby each alternate segment will be moved radially prior to its companion segment.

9. In a mold-forming machine, the combination of a mold-box having a bottom provided with an opening, a pattern made up of a series of radially movable segments, each having a gear-tooth-formed face, means for moving said segments radially, and means for adjusting one of said parts with relation to the other.

10. In a mold-forming machine, the combination of a mold-box having a bottom provided with an opening, a pattern made up of a series of radially movable segments, means for moving said segments radially, and means for adjusting one of said parts with relation to the other, said means comprising brackets secured to one of said parts and carrying adjusting screws in engagement with the other part.

11. In a mold-forming machine, the combination of a mold-box having a bottom provided with an opening, a pattern made up of a series of radially movable segments, means for moving said segments radially, and means for adjusting one of said parts with relation to the other, said means comprising brackets secured to one of said parts and carrying adjusting screws in engagement with the underside of the other of said parts.

12. In a mold-forming machine, the combination with a mold-box having a bottom, of a pattern comprising a series of tooth-formed segments, the edge of said mold-box bottom conforming to the shape of said toothed segments, and means for adjusting one of said parts relatively to the other.

13. In a mold-forming machine, the combination with a mold-box having a bottom, of a pattern comprising a series of tooth-formed segments, the edge of said mold-box bottom conforming to the shape of said toothed segments, and means for adjusting one of said parts relatively to the other, said means comprising brackets carried on the underside of the mold-box bottom and having adjusting screws in engagement with the underside of the pattern.

14. In a mold-forming machine, the combination with a mold-box having a bottom provided with an opening, of a pattern

located therein and comprising a series of toothed segments, means for moving said segments radially with relation to the box, and means for adjusting one of said parts 5 vertically with relation to the other thereby to regulate the face of the molded teeth.

15. In a mold-forming machine, the combination with a mold-box the bottom of which is provided with an opening, of a pattern located therein and comprising a series 10 of toothed segments, means for supporting said segments, and means for moving said segments radially relatively to said box.

16. In a mold-forming machine, the combination with a mold-box the bottom of which is provided with an opening, of a pattern located therein and comprising a series of toothed segments, means for supporting said segments, and means for moving 20 said segments radially relatively to said box, some prior to others.

17. In a mold-forming machine, the combination with a mold-box the bottom of which is provided with an opening, of a pattern located therein and comprising a series 25 of toothed segments, means for supporting said segments, and means for moving said segments radially relatively to said box and in alternation.

18. In a mold-forming machine, the combination of mold-box, a pattern comprising top and bottom plates, a series of segments guided therebetween for movement radially toward and from said mold-box and each 35 having a gear-tooth-formed face, a drum supported between said plates and having an inclined periphery, and means for reciprocating said drum thereby to move the toothed segments radially relatively to said 40 mold-box.

19. In a mold-forming machine, the combination of a mold-box, a pattern comprising top and bottom plates, a series of toothed segments guided therebetween for 45 movement radially toward and from said mold-box, a drum supported between said plates and having an inclined periphery, means for reciprocating said drum thereby to move the toothed segments radially rela-

tively to said mold-box, and means for 50 regulating the position of said drum.

20. In a mold-forming machine, the combination of a mold-box, a series of radially movable toothed pattern sections, said box having a bottom having its inner edge conforming to and fitting the faces of said 55 toothed sections, means for moving said pattern sections radially, and means for adjusting one of said parts vertically with relation to the other thereby to determine 60 the width of the face of the mold.

21. In a mold-forming machine, the combination of a mold-box, a series of radially movable toothed pattern segments, said box having an annular bottom having its inner 65 edge conforming to and fitting the faces of said segments, means for moving said pattern segments radially, and means for adjusting said segments vertically with relation to said mold-box thereby to determine the 70 width of face of the mold.

22. In a mold-forming machine, the combination of a series of movable toothed segments sufficient in number to form the complete pattern when assembled, and means 75 for shifting said segments to increase or decrease the diameter of the pattern.

23. In a mold-forming machine, the combination of a series of movable toothed segments sufficient in number to form the complete pattern when assembled, and each 80 having a gear-tooth-formed face, and wedge-shaped means for shifting said segments, some prior to others, to increase or decrease the diameter of the pattern. 85

24. In a mold-forming machine, the combination of a series of movable toothed segments sufficient in number to form the complete pattern and all of substantially the same size, wedge-shaped means for shifting 90 said segments, some prior to others, to increase or decrease the diameter of the pattern, and rotating means for operating said wedge-shaped means.

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