

932,766.

Patented Aug. 31, 1909.

Fig. 1.

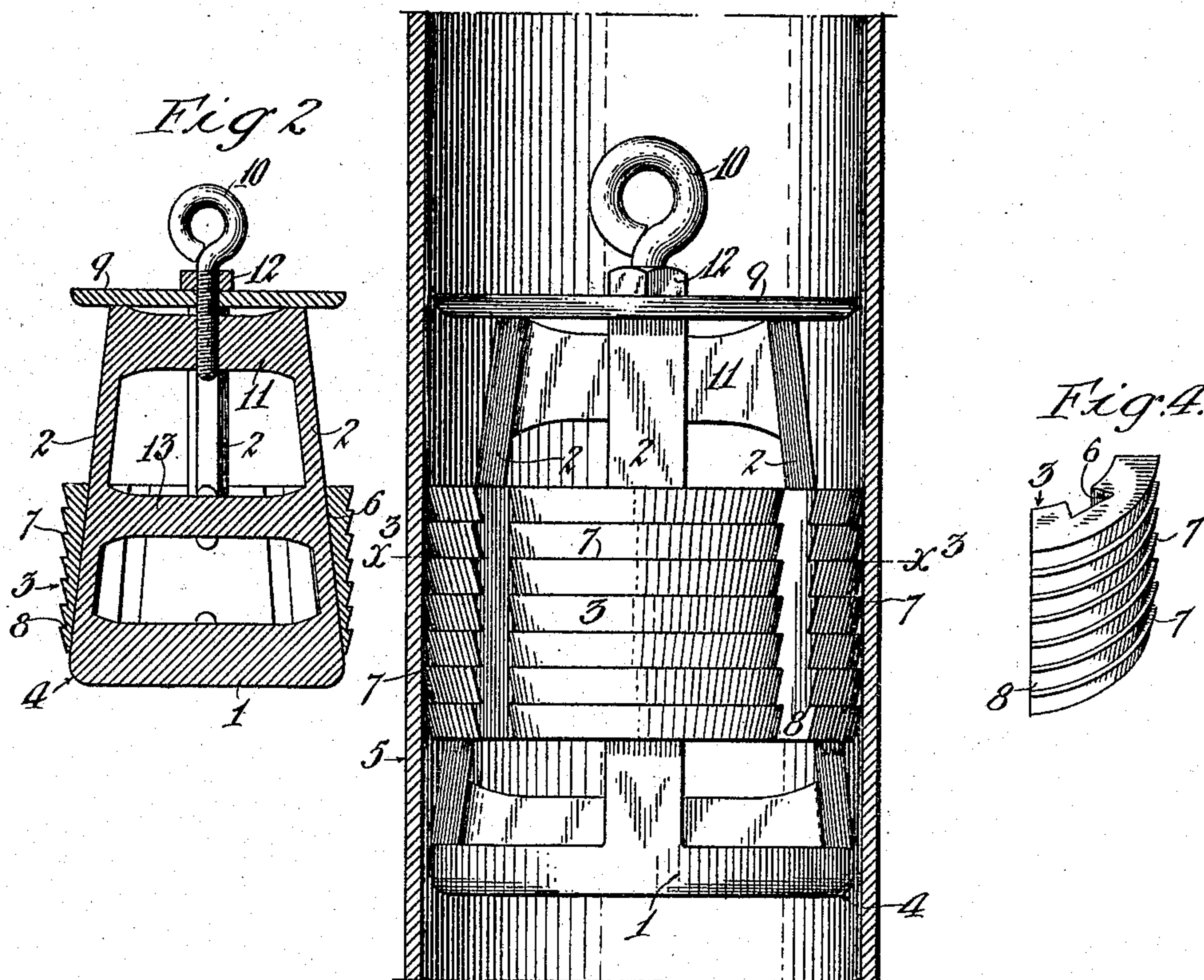


Fig. 3.

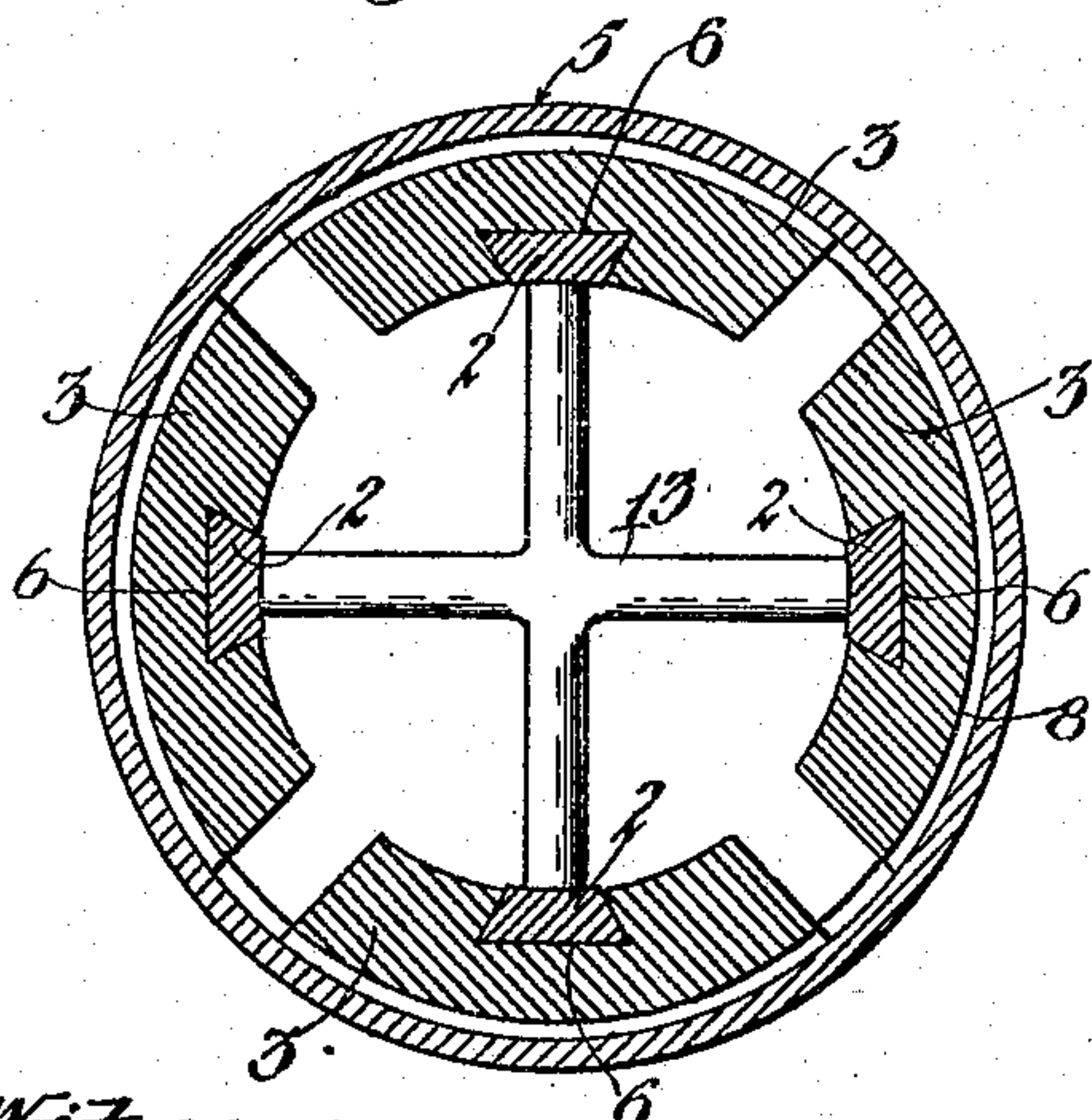
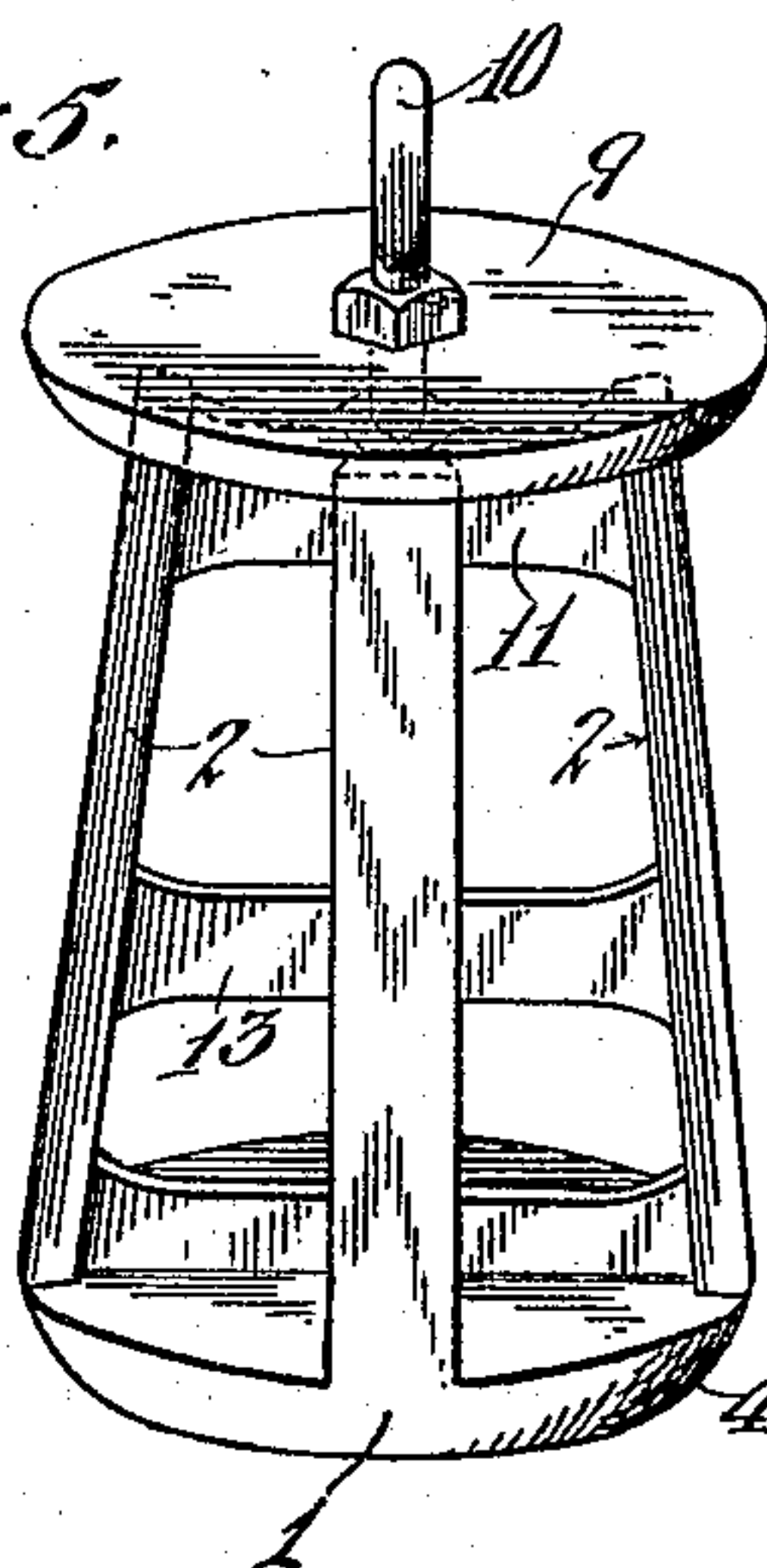


Fig. 5.



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UNITED STATES PATENT OFFICE.

DANIEL DANIELS, OF LOS ANGELES, CALIFORNIA.

HEAVING-PLUG FOR WELLS.

932,766.

Specification of Letters Patent.

Patented Aug. 31, 1909.

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To all whom it may concern:

Be it known that I, DANIEL DANIELS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Heaving-Plug for Wells, of which the following is a specification.

My invention relates to a heaving plug and has special reference to such a heaving plug as is used in preventing sand and other substances heaving or arising in well casings in oil and other wells.

One object of my invention is to provide a heaving plug which is readily adjustable so as to adapt it for use in different sized casings or to casings at any depth in the well.

Another object is to provide a heaving plug having sufficient strength and durability for accomplishing its desired function, yet being sufficiently fragile to permit of its being broken with ease and being removed from the casing with despatch.

Another object is to provide a plug in which the principal parts are quickly and cheaply formed, as by casting, and can be readily assembled and then held in a compact condition by the use of the suspending member.

The accompanying drawings illustrate the invention and form a part of this specification.

Figure 1 is a longitudinal, sectional view of a portion of a casing with my improved heaving plug shown in side elevation in position therein. Fig. 2 is a vertical, central, sectional view through the plug. Fig. 3 is a transverse, sectional view on the line x^3-x^3 of Fig. 1. Fig. 4 is a perspective view of one of the gripping slips. Fig. 5 is a similar view of the framework of the plug upon which said slips are mounted.

Referring more particularly to the drawings which are for illustrative purposes only and, therefore, are not drawn to any particular scale, 1 indicates the bottom or base of the framework of the heaving plug, upon or to which are secured slip guides 2, having slips 3 reciprocally mounted thereon. Base 1 and guides 2 constitute an open work frame, said frame comprising bars extending upwardly from the base and separated in such manner that they may be readily broken by impact as hereinafter described.

The base 1 is preferably circular and of a

less diameter than the diameter of the smallest pipe within which the plug is to be used, and preferably has its lower edge rounded or slightly curved, as shown at 4, for entering a casing, such as is shown at 5. The guides or standards 2 are preferably angular in cross section, as by making them dovetailed, as shown more particularly in Fig. 3, and each slip is preferably provided upon its inner face with a corresponding dovetailed groove or recess 6, which extends from top to bottom of the slip, whereby the slip is adapted to be reciprocally mounted upon or connected with the guides. Each slip is in the form of a segment and is of such a width that the full complement of slips when in position upon the framework of the plug will substantially form a circle with sufficient space or distance between the adjacent edges of the slips to permit of the necessary movement of the slips toward and from each other to adapt them for use in casings of different diameters. In the drawings four slips are shown, in which case each segment is a trifle less than the quadrant of a circle with four spaces between their adjacent edges, but it is evident that a greater or less number of slips could be used by varying their length and also by properly constructing the framework for their reception.

The exterior of each slip is cylindrical and provided with circumferentially arranged teeth or projections 7 which are adapted to engage with and bite into the inner wall of the casing and thereby prevent the upward movement of the plug. These teeth are preferably formed by recessing the exterior of the slip circumferentially its entire width, as shown at 8, although it is evident that they could be formed in any other desired manner.

In order to secure the adjustability of the plug whereby it is adapted for use in casings of different diameters, the slip guides or standards are inclined toward each other at the top, which will cause the slips to be retracted or drawn in toward the center when they are moved to or toward the top of said guides. By having the teeth 7 extend from the bottom to the top of each slip the greatest amount of gripping surface is secured, and to cause the points of the teeth of the different slips to occupy a vertical plane or to be parallel with each other and with the inner surface of the casing, irrespective of

the vertical position which they occupy upon the guides, the slip, or at least that portion of it between the bottom of the recess 8 and the teeth 7, is made slightly triangular in cross section to correspond with the inclination or inward taper of the guides, as clearly shown in Fig. 2, and the guides are made sufficiently longer than the length of the slips to permit of the required vertical movement of the slips to secure the desired circumferential variation or adjustment.

The slips may be non-removably held upon the guides by means of a disk like top or cover 9 which is preferably of substantially the same diameter as the base 4, so as to cause the plug to move axially within the casing, and it is adapted to rest upon the upper ends of the guides and can be locked in engagement therewith in any desired manner, preferably by the suspending means which is connected with the framework in any desired manner.

In the drawings the suspending means is shown as an eye bolt 10 which is passed through a perforation in the disk 9 and screwed into a spider 11 that is connected with the upper ends of the guides 2 and thereby holds them rigidly in position, yet permitting of the guides being made so small or fragile that they can be easily broken by a blow from above from any suitable means when it is desired to remove the plug. A shoulder is formed upon the eye bolt, as by means of a nut 12, for engaging with the top of the disk 9 and forcing the disk down upon the tops of the standards. An additional spider 13 may be connected with the guides 2 intermediate their length for giving additional strength to the guides.

In using a heaving plug as above described in oil wells and other places in which there is a quantity of sand or other sediment, the plug can be dropped or forced down the desired distance and released, when the pressure upon the bottom of the plug will cause it to move upward and thereby force the slips out into engagement with the casing, which engagement will stop the further upward movement of the base, and, owing to the inability of the sand or other sediment to pass between the edge of the base and the wall of the casing, the further flow or passage of the oil upward will be sufficiently stopped or checked. But where the plug is to be used in Artesian wells it is preferably desirable, and in some cases absolutely necessary, to insert the usual wooden plug into the casing directly in front of the bottom of the adjustable plug above described, in which instance the moisture will soon expand the wooden plug and cause it to engage with the interior of the casing with sufficient pressure to prevent the passage of the water, while the engagement of the slips with the casing will prevent the further movement of the

bottom of the adjustable plug upward in case the pressure of the water should force the wooden plug upward.

When it is desired to remove the adjustable plug, any suitable object of sufficient weight is dropped or let down into the casing so as to strike the supporting mechanism, as the top of the eye bolt, and force it downward and thereby break the top and also the cross head to which it is secured, the cross head being preferably located at a slight distance below the top so as to leave the top unsupported at that point and thereby be the more readily crushed or broken when the shoulder or nut on the eye bolt is forced down against it. This will also break the standards or guides or leave them unsupported, so that they will be collapsed inward and will thereby release the slips from engagement with the interior of the casing, after which the pieces can be removed in any desired manner. The base and the guides thereon and the connecting parts constitute a frame of frangible material, and the construction being open, the said parts separately and collectively are more readily frangible by the dropped weight than would be the case with a frame or support consisting of a closed shell.

Having described my invention, I claim:

1. In a heaving plug, a frame of frangible material and comprising a base and bars extending upwardly therefrom said bars being separated to adapt them to be crushed so as to fall inward, and slips mounted on said bars.

2. In a heaving plug, a frame formed of frangible material and comprising a base, upwardly and inwardly inclined bars extending from said base, said bars being separated and forming guides, and slips reciprocally mounted on said guides.

3. In a heaving plug, a base, inwardly inclined frangible guides thereon, forming in connection with said base an open frame, said guides being angular in cross section, and angularly slotted slips reciprocally mounted on said guides.

4. In a heaving plug, a base, inwardly inclined frangible guides thereon, forming in connection with said base an open frame, said guides being dovetailed in cross section, and a segmental slip reciprocally mounted on each guide, the inner face of said slip being provided with a slot arranged longitudinally thereof and dovetailed in cross section, and means for normally preventing said slips from becoming disengaged from said guides.

5. In a heaving plug, a disk like base, angular guides projecting from the edge thereof inwardly and upwardly, a slip reciprocally mounted upon each guide, a top, and means for holding said top against the upper ends of said guides.

6. In a heaving plug, a disk-like base provided with inwardly and upwardly extending guides, slips reciprocally mounted on said guides, a top, and supporting means extending through and engaging said top and having a connection with the said guides for holding the top in engagement with the upper ends of the guides.

7. In a heaving plug, a base provided with inwardly and upwardly extending frangible guides, slips reciprocally mounted on said guides, fragile means connecting the upper ends of said guides, a top on the upper ends of said guides, and suspending means extending through and engaging said top and engaging the said means connecting the guides for holding the top in position upon said guides.

8. In a heaving plug, a frangible frame provided with inclined guides, slips reciprocally mounted on said guides, a top in engagement with the upper ends of said guides, and supporting means extending through and engaging said top and in engagement with said frame.

9. In a heaving plug, a base provided with inwardly and upwardly inclined guides, slips reciprocally mounted on said guides, cruciform strengthening pieces connected with said guides, a top on the upper ends of the guides, and suspending means extending through and engaging said top and in engagement with the upper cruciform piece.

10. In a heaving plug, a base provided with inwardly and upwardly extending guides, slips reciprocally mounted on said guides, a cruciform strengthening piece connected with the upper ends of said guides and provided with a screw threaded perforation, a perforated top on said guides, and a screw threaded eye bolt extending through the perforation in the top and in engagement with said cruciform piece.

11. In a heaving plug, a frangible frame provided with inclined guides and a cruciform piece adjacent to the upper ends thereof, a perforated top on the upper ends of said guides and at a distance above said cruciform piece, and a shouldered eye bolt extending through said top and in engagement with said cruciform piece.

12. In a heaving plug, a disk like base provided with inwardly and upwardly inclined guides, slips reciprocally mounted on said guides, means connecting the upper ends of the guides, a perforated disk like top on the upper ends of said guides of substantially the same diameter as the base, and suspending means extending through the perforation of said top and screwing into the said means connecting the upper ends of the guides for holding said top in position.

13. In a heaving plug, a base provided with upwardly and inwardly inclined frangible guides, forming in connection with said base an open frame, said guides being angular in cross section, slips reciprocally mounted on said guides, the inner face of each slip being provided with a recess adapted to fit upon said guides, said slip between the bottom of said recess and its periphery being substantially wedge shaped and the exterior being provided with shoulders, a top member and means for supporting said plug and connecting said top member to the said guides, said top member holding the slips against removal from the guides.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 28 day of August, 1908.

DANIEL DANIELS.

In presence of—

LOUIS W. GRATZ,

FRANK L. A. GRAHAM.