

E. C. SHERMAN.  
 TRUNNION SUPPORT FOR DUMPING LADLES.  
 APPLICATION FILED APR. 16, 1909.

952,368.

Patented Mar. 15, 1910.  
 3 SHEETS—SHEET 1.

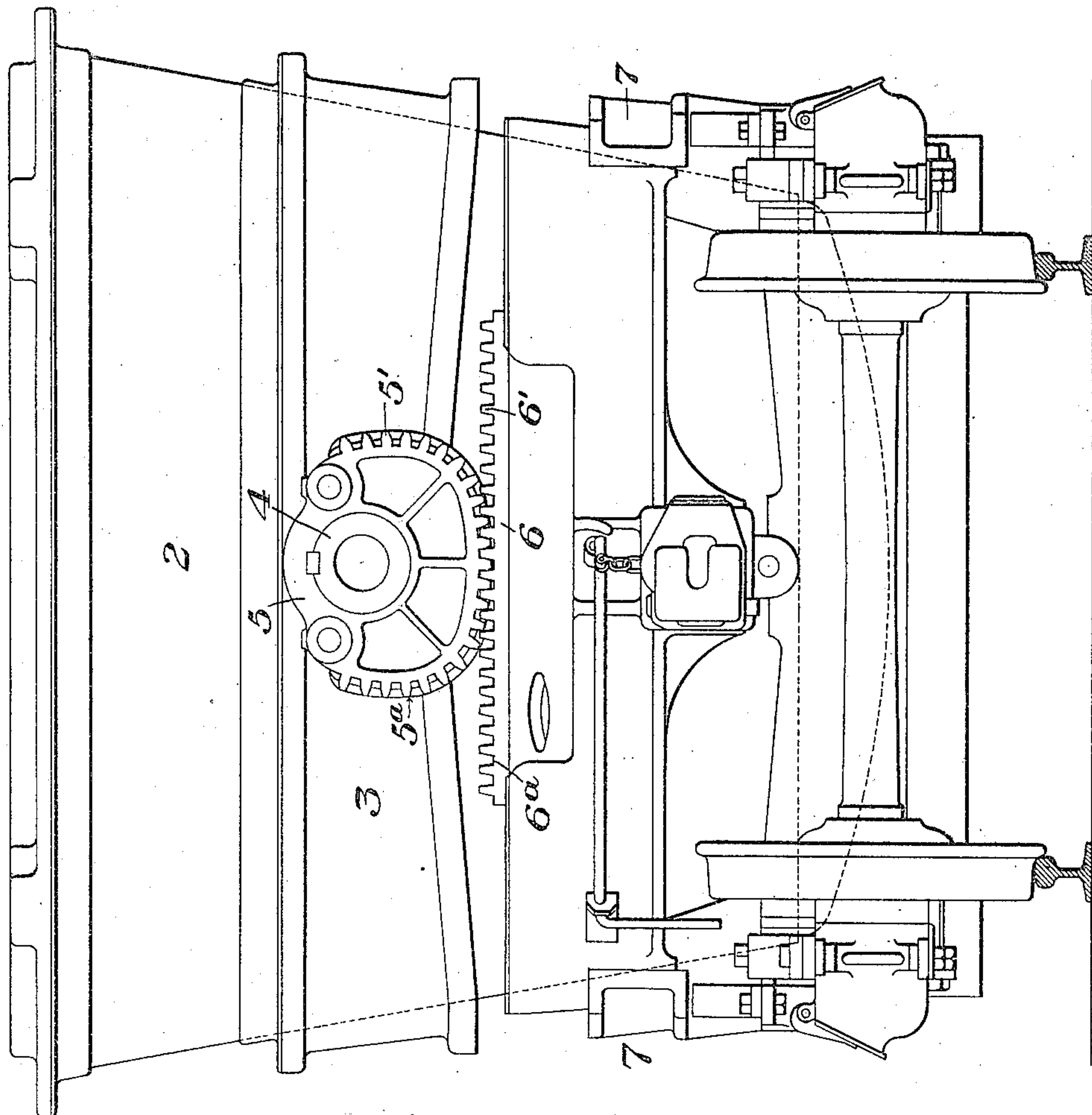


Fig. 1.

WITNESSES

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*G. L. Winters*

INVENTOR

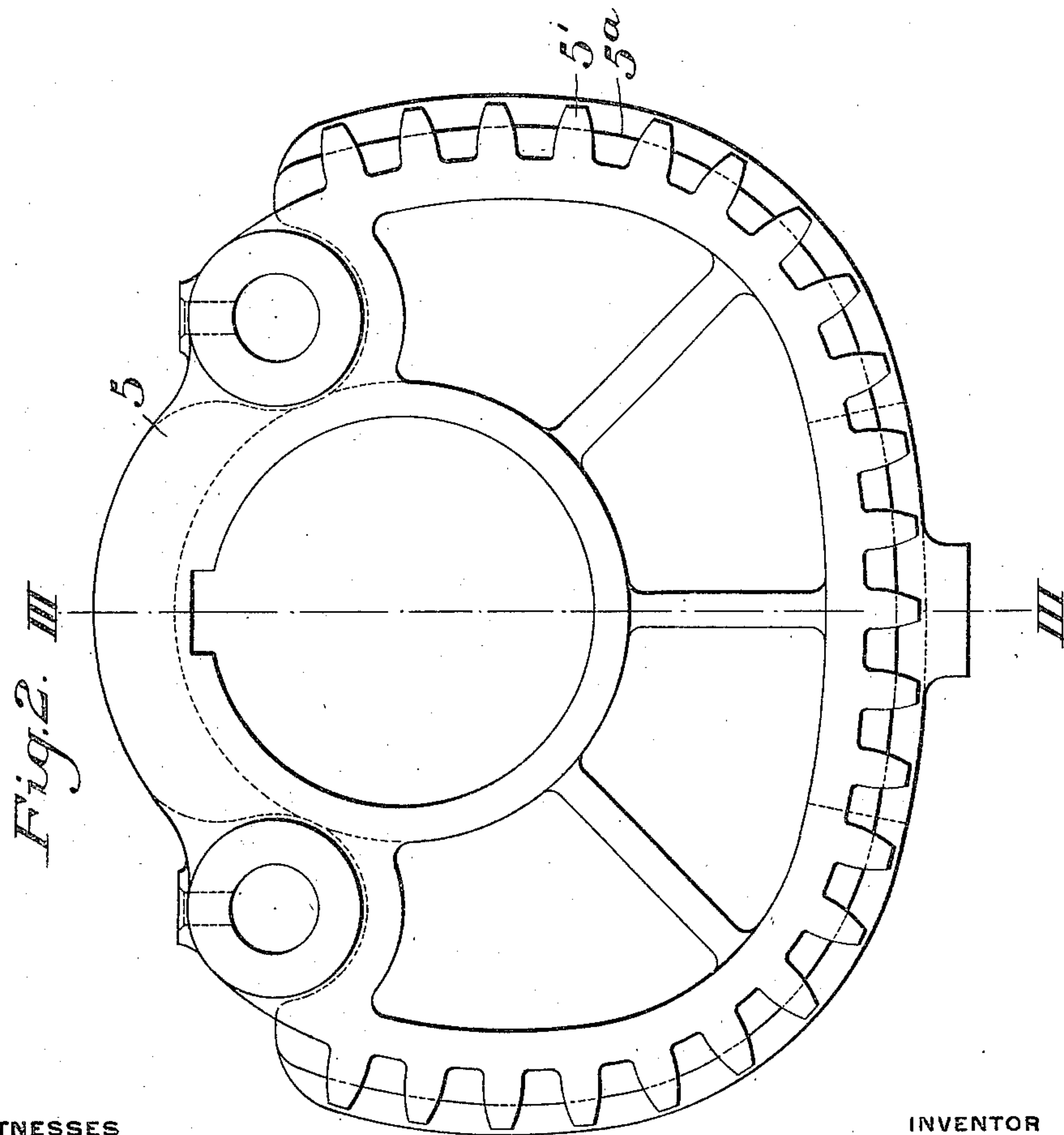
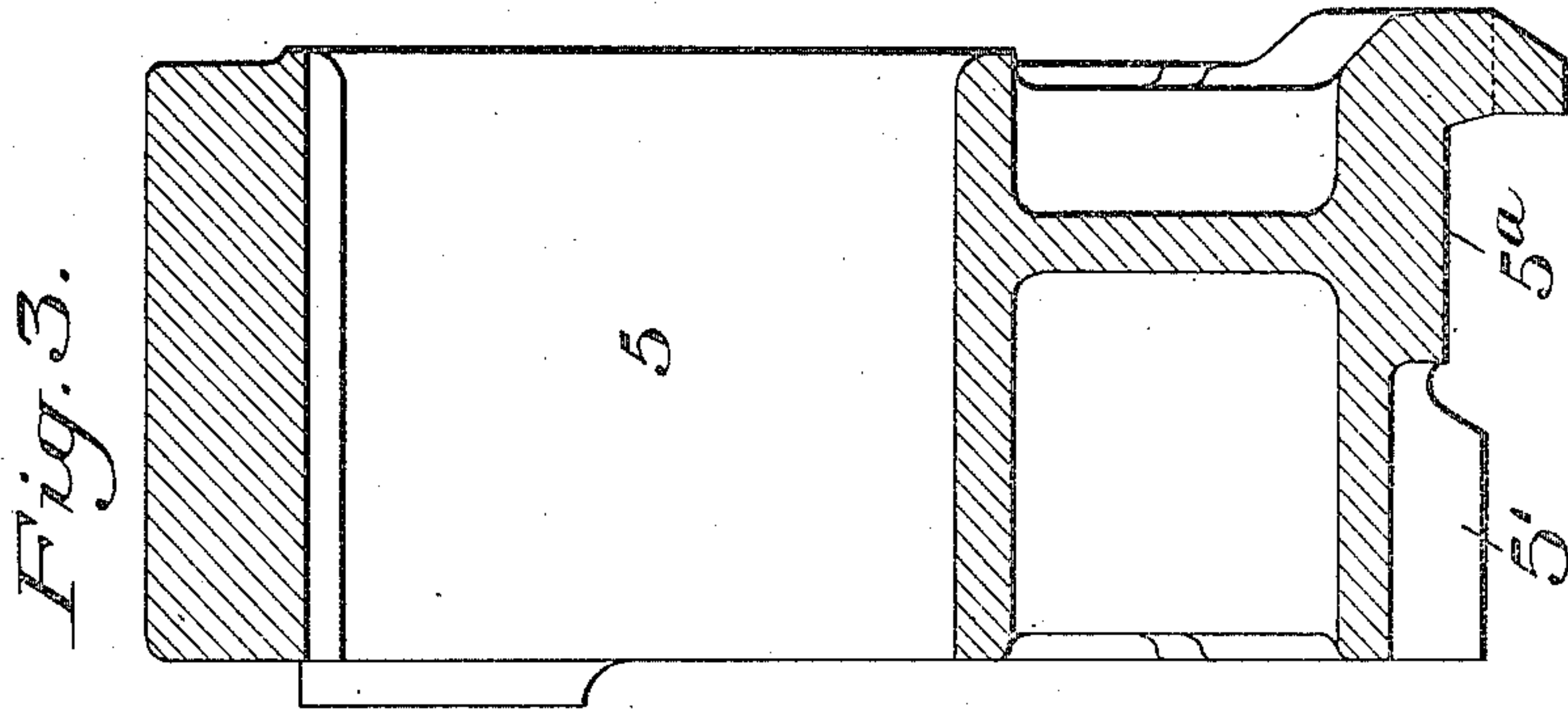
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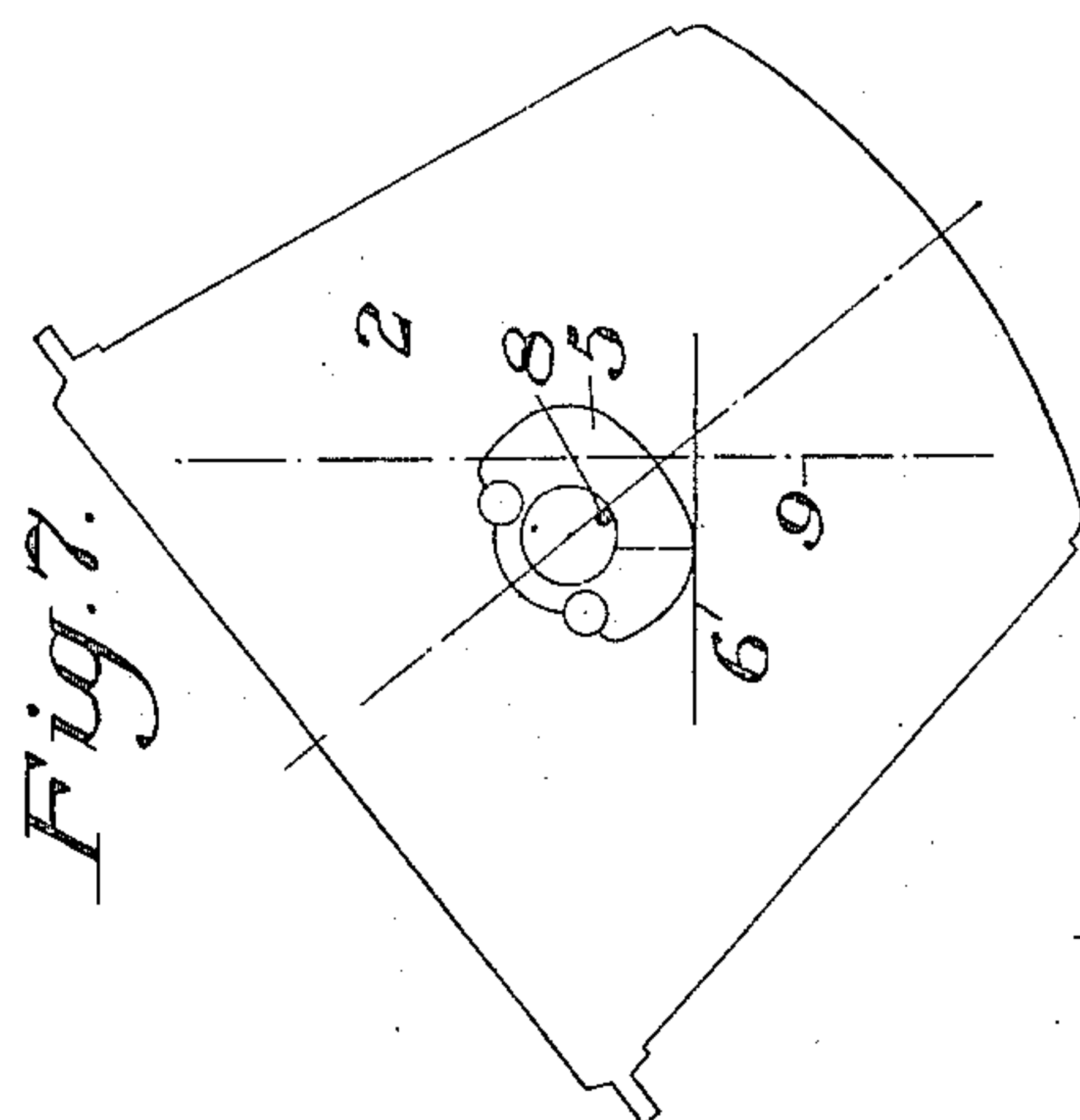
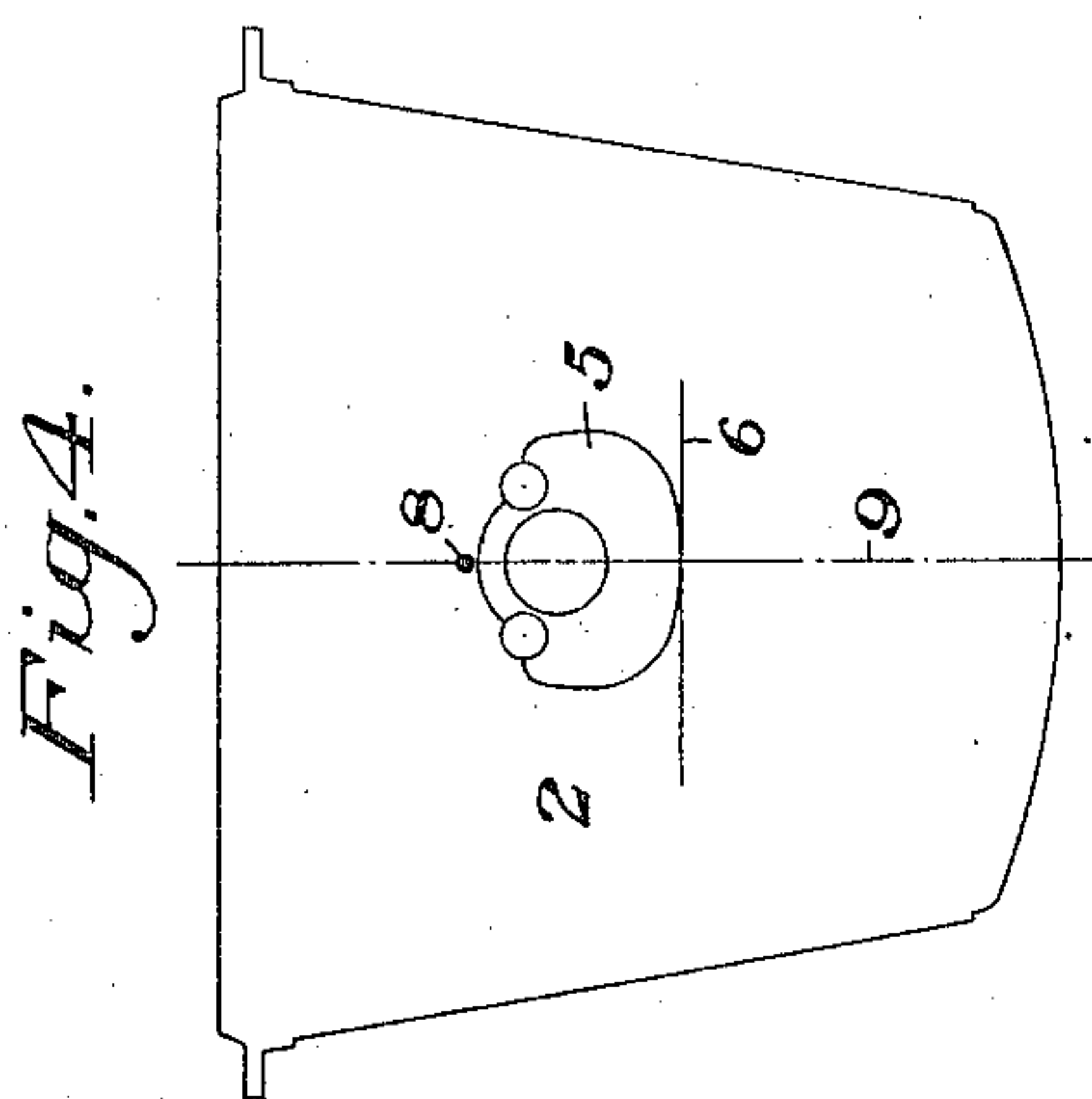
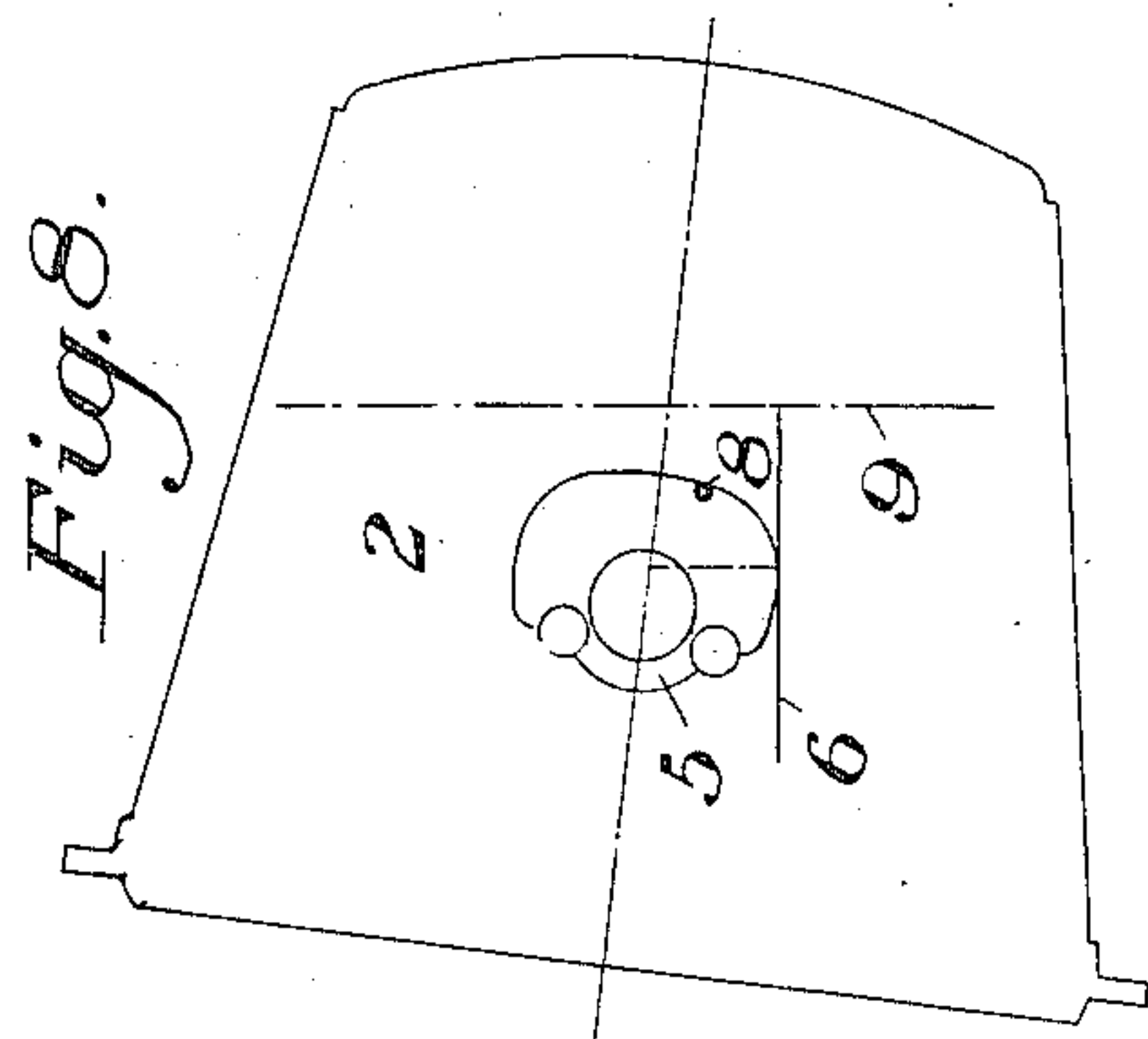
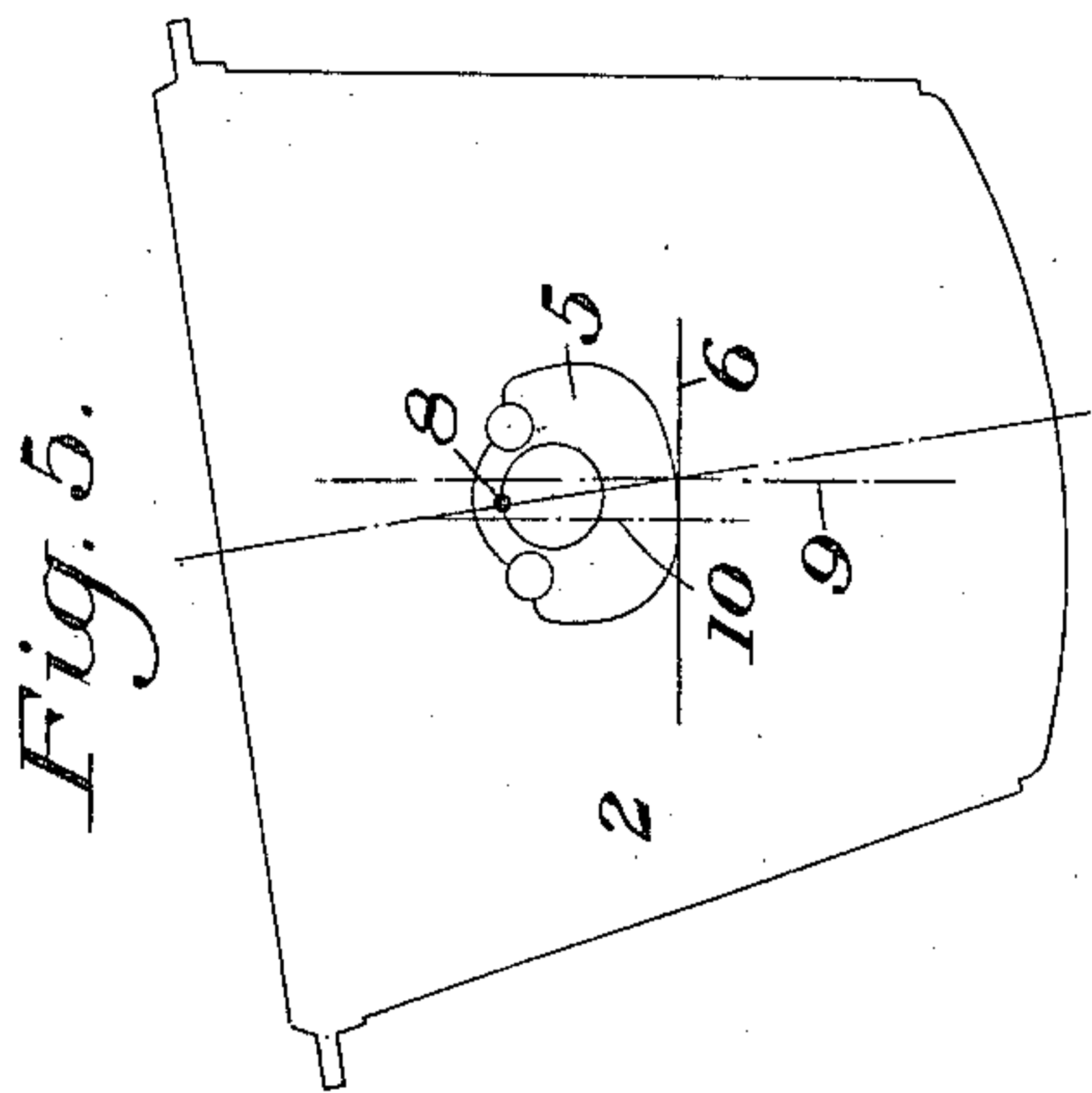
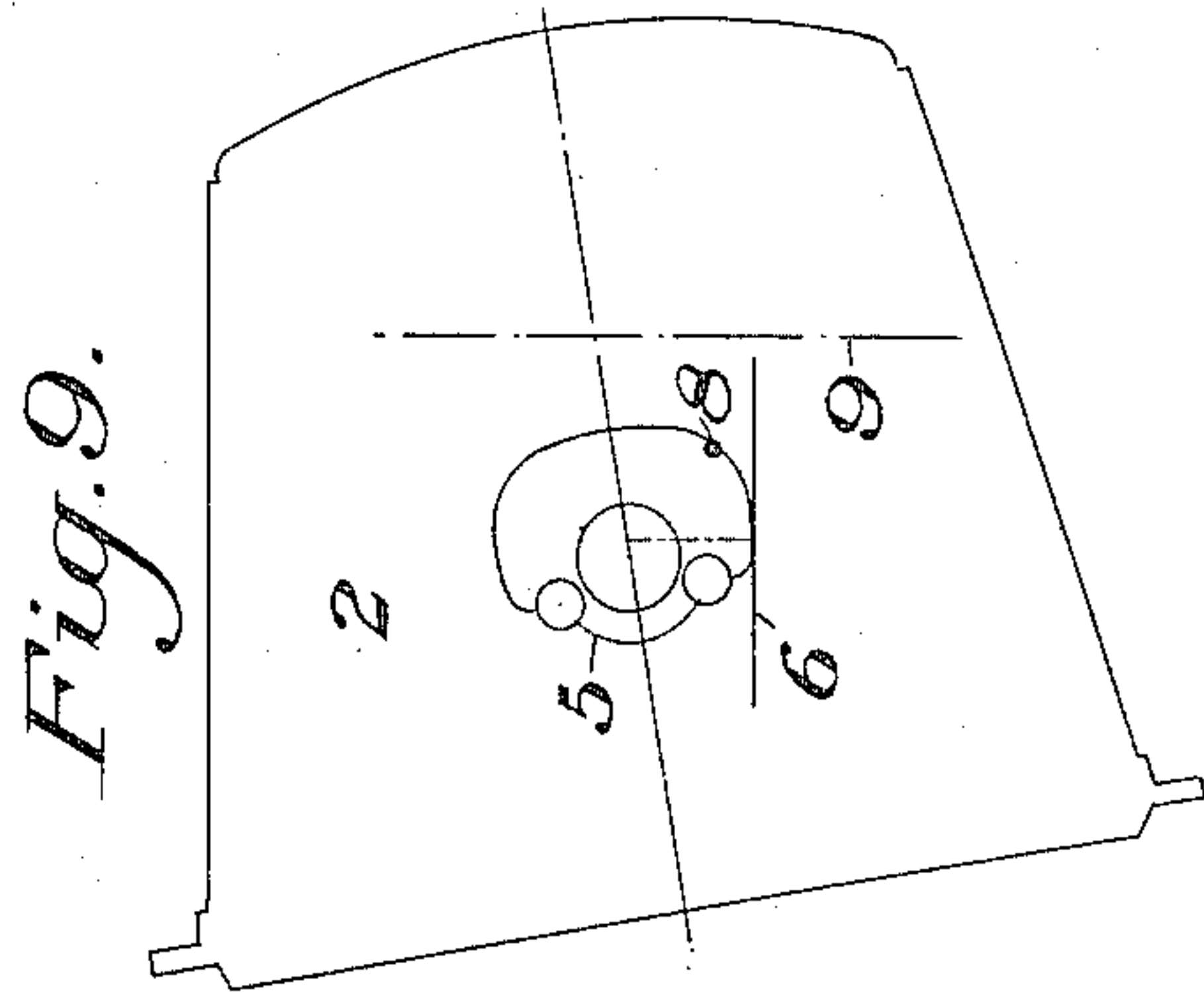
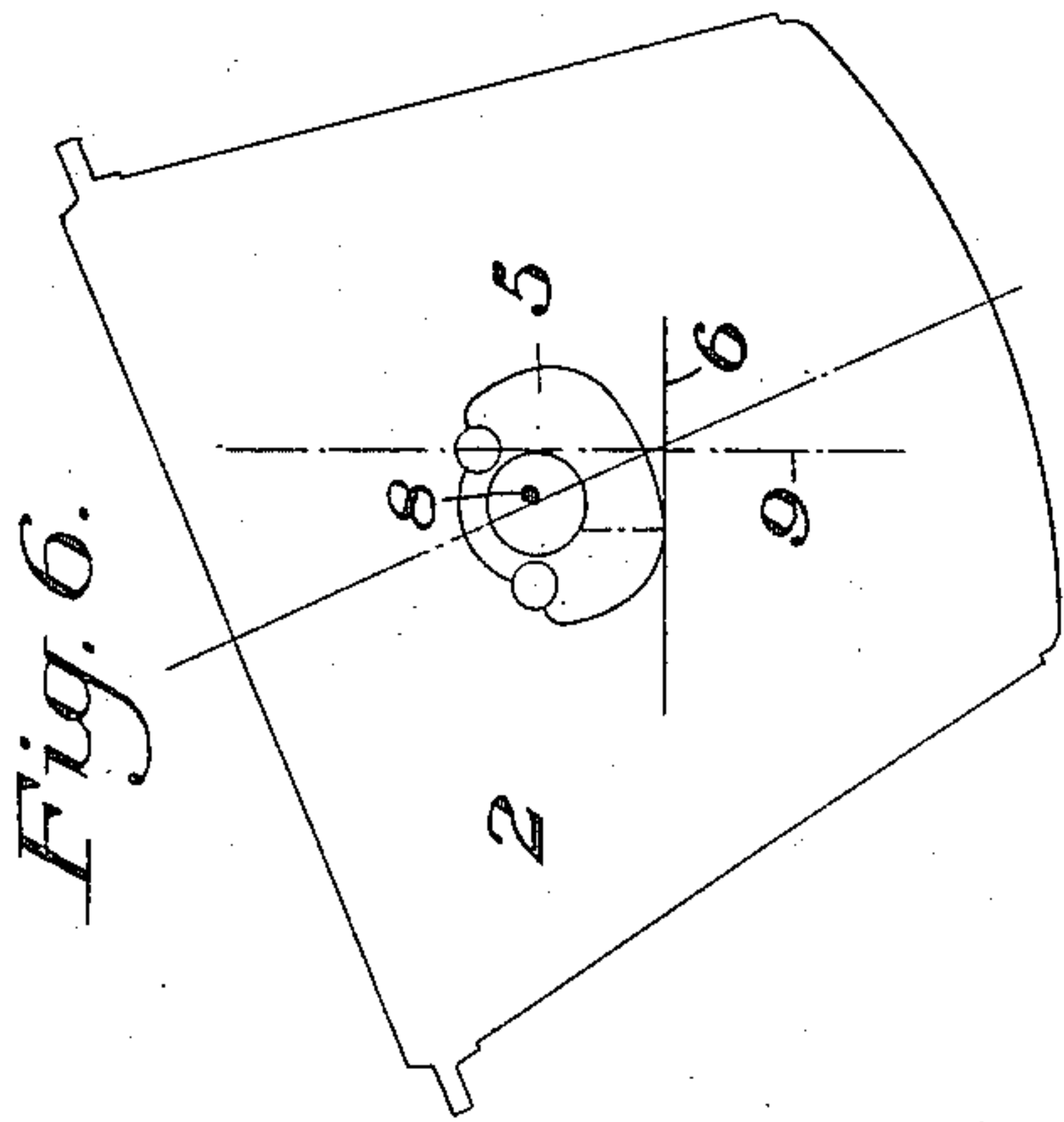
by Bohewell, Byrnes & Parnelle,  
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# UNITED STATES PATENT OFFICE.

ERWIN C. SHERMAN, OF YOUNGSTOWN, OHIO, ASSIGNOR TO THE WILLIAM B. POLLOCK COMPANY, OF YOUNGSTOWN, OHIO, A CORPORATION OF OHIO.

## TRUNNION-SUPPORT FOR DUMPING-LADLES.

952,368.

Specification of Letters Patent.

Patented Mar. 15, 1910.

Application filed April 16, 1909. Serial No. 490,339.

To all whom it may concern:

Be it known that I, ERWIN C. SHERMAN, of Youngstown, Mahoning county, Ohio, have invented a new and useful Improvement in Trunnion-Supports for Dumping-Ladles, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an end elevation of a ladle car having a toothed trunnion gear forming part of the ladle support constructed and arranged in accordance with my invention; Fig. 2 is a detail side elevation on a larger scale of the trunnion gear shown in Fig. 1; Fig. 3 is a sectional elevation of the gear on the line III—III of Fig. 2; Figs. 4 to 9 are diagrammatic views showing the ladle in different positions assumed by it in dumping.

My invention relates to the construction of ladles used in handling molten materials such as iron or blast furnace cinder, of the rolling or rocking type, which advance on their supports while being emptied and the invention more particularly relates to improved means by which the dumping operation is automatically controlled.

The object of my invention is to provide improved means whereby the ladle or tilting body while either wholly or partly loaded is always in such position as will tend to cause it to assume its vertically upright position.

Heretofore in such cars, when the ladle or dumping body is being tipped in dumping, the trunnion gears which are generally cylindrical, roll forwardly upon trunnion supports provided for that purpose on the car body. During the dumping operation, while the molten materials are flowing from the cars, the weight of the materials, together with that of the ladle tends to dump the ladle and should it not be held back by the dumping apparatus, would rapidly accelerate the speed of the dumping action and thereby cause frequent accidents. When fluid pressure motors are used for dumping such ladles, on applying the fluid pressure to start the dumping operation, the ladle is dumped but a slight distance when the materials begin to flow from the cars. When this occurs, the center of gravity of the ladle and its contents will be outside of a line extending from the center of the ladle trun-

nion through the point where the curved surface of the trunnion gear is tangent with the surface of the trunnion gear support. In such case the weight of the ladle and its load causes the ladle to tip suddenly, and to quite an extent, until such time as the fluid pressure in the exhaust end of the dumping cylinder is compressed sufficiently to overcome this tendency, after which the movement of the ladle is comparatively steady. By means of my improved apparatus, these difficulties are overcome and a steady dumping operation is insured at all points throughout the tipping or dumping operation of the ladles.

In the drawings, 2 represents the ladle of a cinder ladle car mounted in a trunnion ring 3. The trunnion ring is provided with trunnions 4 upon which are secured the toothed trunnion gears 5, constructed and arranged in accordance with my invention. The teeth 5' on the gears 5 mesh with similar teeth 6' on the horizontal rack 6 forming part of the car body 7, and the surface 5<sup>a</sup> of the gears 5 contacting with the rack surface 6<sup>a</sup> is made irregular in contour, its contour approximating the curvature of a semi-ellipse. This curved surface preferably is arranged in such manner that at all times throughout the dumping operation of the loaded ladle, the center of gravity of the ladle and amount of material in the ladle is between the vertical axis of the trunnion and a line extending from the point on the curved surface of the trunnion gear 6, then tangent with the horizontally extending rack surface upon which the ladle is being moved through the center from which such curved surface is struck. In practice, however, it may be found desirable in some cases to advance the center of gravity to a point vertically above the point of contact of the gear with the support or even slightly in advance of this point of contact.

As shown in Fig. 4, the center of gravity 8 is on the vertical center line 9 of the car. When the ladle 2 is tipped into the position shown in Fig. 5, the center of gravity 8 is between the vertical center line of the car and a line 10 extending from the center through which the curved portion of the support 5 is struck which is then tangent with the horizontal trunnion support 6. As shown in Fig. 6, the center of gravity 8 of



the ladle and its load in the ladle is again located between the vertical center line 9 of the car and the radial center line extending through the point on the curved surface of the gear 5 which is then tangent with the support 6. As shown in Figs. 7, 8 and 9, the ladle is tipped to successively greater amounts, the lowest position of the ladle being shown in Fig. 9. The ladle will be entirely emptied in this position. In each case the center of gravity 8 is located between the vertical center line 9 of the car and a radial line extending from the point on the gear 5 then tangent with the support 6 through the center from which this portion of the curved surface is struck.

The trunnion gear and the gear support are arranged in such manner that the results above described are obtained while dumping the ladle in either of opposite directions.

The advantages of my invention will be apparent to those skilled in the art. By making the peculiarly shaped contacting surfaces between the trunnion gears and supports a steady pouring action is secured in operating the ladle and the center of gravity of the ladle, which changes with different amounts of molten material in the ladle during the pouring operation, is always located at a point which will tend to bring the ladle back into its vertically upright position. This feature is of particular value, as in case of an accident to the mechanism for tilting the ladle, in dumping, the ladle would right itself instead of tipping in the opposite direction so as to quickly spill the molten contents of the ladle.

The device is simple and is easily kept in repair and may be applied to existing ladles and ladle cars at a small cost.

Modifications in the construction and arrangement of the gear and its supporting rack may be made without departing from my invention. Instead of providing the peculiarly curved surface on the gear, the gear may be made cylindrical and the rack made with an irregular contour instead of the straight line shown and other changes may be made without departing from my invention.

The invention is applicable to ladles other than those used in connection with a wheeled truck to form a ladle car.

I claim:—

1. A dumping ladle having ladle supports on which the ladle moves outwardly in dumping, said supports having means causing a tendency in the dumping ladle to move into its vertically upright position throughout its dumping operation; substantially as described.

2. A dumping ladle having ladle supports on which the ladle moves outwardly in dumping in either of opposite directions, means arranged to tend to cause the ladle

to move into its vertically upright position throughout its dumping operation; substantially as described.

3. A dumping ladle having ladle supports on which the ladle rolls outwardly in emptying in either of opposite directions, said supports having means tending to cause the ladle and contents to assume vertically upright position in all positions assumed during the dumping operation; substantially as described.

4. A dumping ladle having ladle supports on which the ladle rolls outwardly in emptying, said supports having means tending to cause the ladle when loaded to assume its vertically upright position in all positions assumed in emptying the ladle; substantially as described.

5. A dumping ladle, having supports on which the ladle rolls outwardly in emptying in either of opposite directions, at least one element of each support having a contacting surface of irregular contour which acts to maintain the center of gravity of the ladle and its contents in a position to tend to cause it to assume an upright position throughout its dumping movement; substantially as described.

6. A dumping ladle having supports on which the ladle rolls outwardly in dumping, at least one element of the supports having an irregular curved contour which acts to maintain the center of gravity of the ladle and its contents in a position to tend to cause it to assume an upright position throughout its dumping movement; substantially as described.

7. A dumping ladle car having a trunnion ring in which the ladle is mounted, trunnion gears on said ring, and toothed racks on which said gears roll outwardly in dumping the ladle, the contour of the contacting surfaces of the gears and racks being arranged to maintain the center of gravity of the ladle with the portion of its load then in the ladle between vertical lines passing through the points of contact of the gear and rack and through the center of the car at all points throughout the ladle emptying operation; substantially as described.

8. A dumping ladle car having a trunnion ring in which the ladle is mounted, trunnion gears on said ring and toothed racks on which said gears roll outwardly in dumping the ladle, in each of opposite directions, the contour of the contacting surfaces on the gears and racks forming means to maintain the vertical center line of the trunnion gear in advance of the center of gravity of the ladle and the remaining portion of its load at all points throughout the ladle emptying operation; substantially as described.

9. A dumping ladle car having a trunnion ring in which the ladle is mounted, trunnion gears on said ring, and toothed racks on



which said ring is moved outwardly in dumping the ladle, the contour of the contacting surfaces of the gears and racks being arranged to keep the center of gravity of the dumping ladle and the portion of its load then in the ladle in a location tending to bring the ladle into its vertically upright position; substantially as described.

10. A dumping ladle car having a trunnion ring in which the ladle is mounted, trunnion gears on said ring, and toothed racks on which the ring is moved outwardly in dumping the ladle in each of opposite directions, the contour of the contacting surfaces of the gears and racks being arranged to keep the center of gravity of the dumping ladle and the portion of its load then in the ladle in a location tending to bring the ladle into its vertically upright position; substantially as described.

11. A dumping ladle having ladle sup-

ports on which the ladle rolls outwardly in emptying, the contour of the contacting surfaces of at least one of the supporting elements having an irregular curved surface for contact with the other element, the curve of said surface being constructed and arranged relatively to successive positions assumed by the center of gravity of the moving mass relative to the vertical center line of the ladle when in upright position on the car and being also arranged to cause a tendency in the dumping ladle to move into its vertically upright position throughout the dumping movement; substantially as described.

In testimony whereof, I have hereunto set my hand.

ERWIN C. SHERMAN.

Witnesses:

C. W. McCLURE

W. G. WILSON.