

No. 811,833.

PATENTED FEB. 6, 1906.

W. L. R. EMMET.
PACKING FOR ELASTIC FLUID TURBINES.

APPLICATION FILED JULY 19, 1904.

2 SHEETS—SHEET 1.

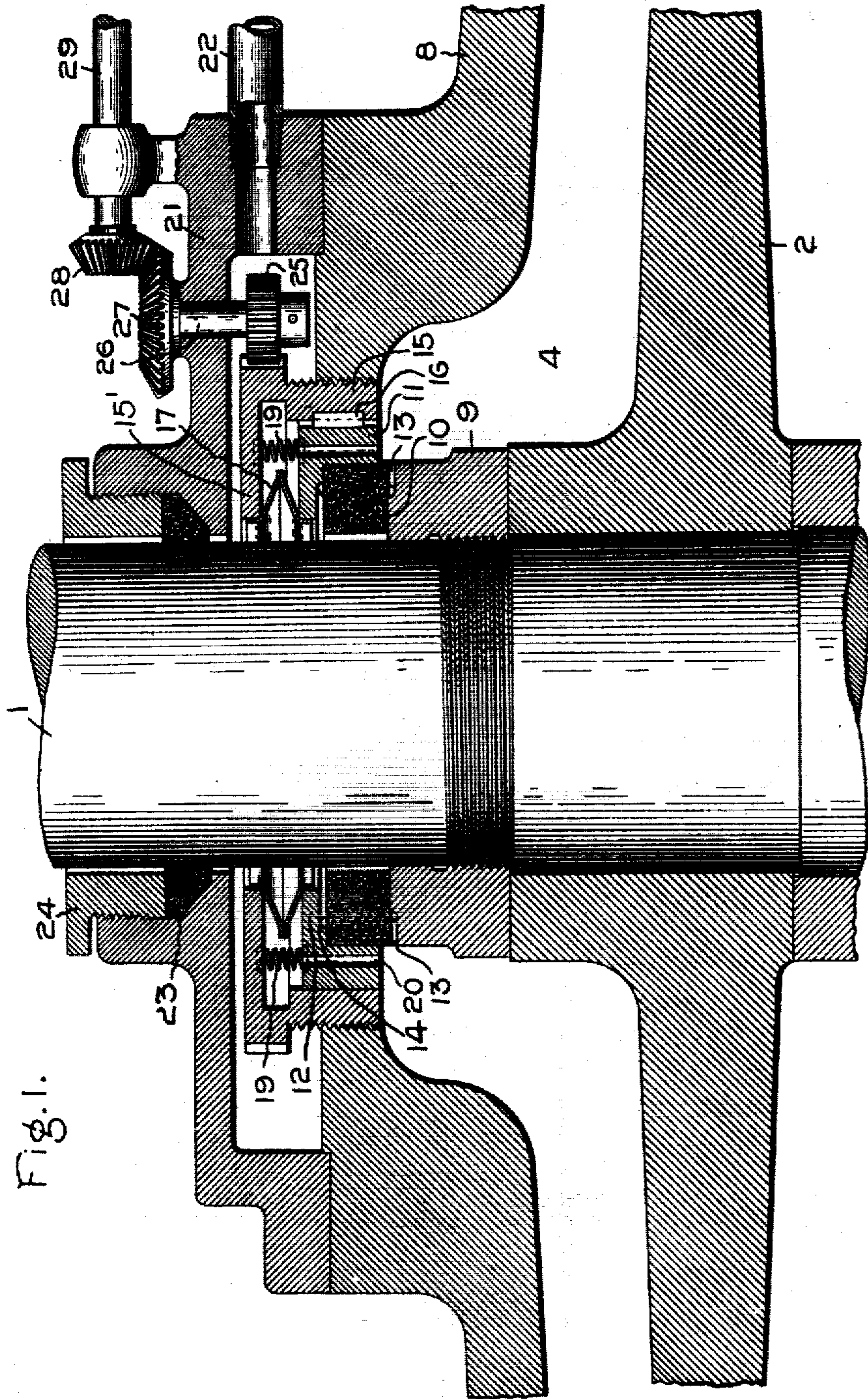


Fig. 1.

Witnesses:

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Allen Clifford

Inventor

William L. R. Emmet,

by *Albion & Davis*
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2 SHEETS-SHEET 2.

Fig. 2.

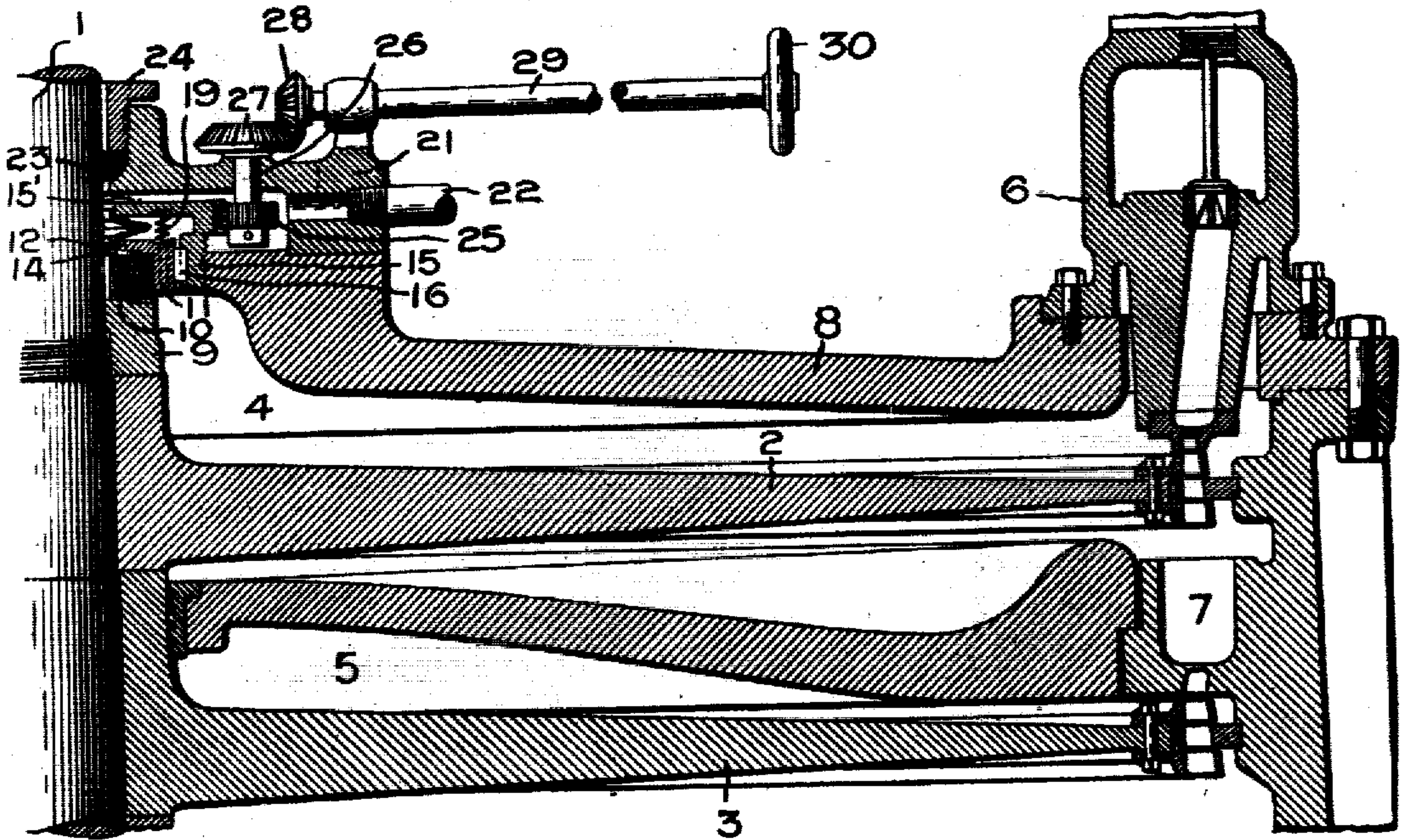


Fig. 3.

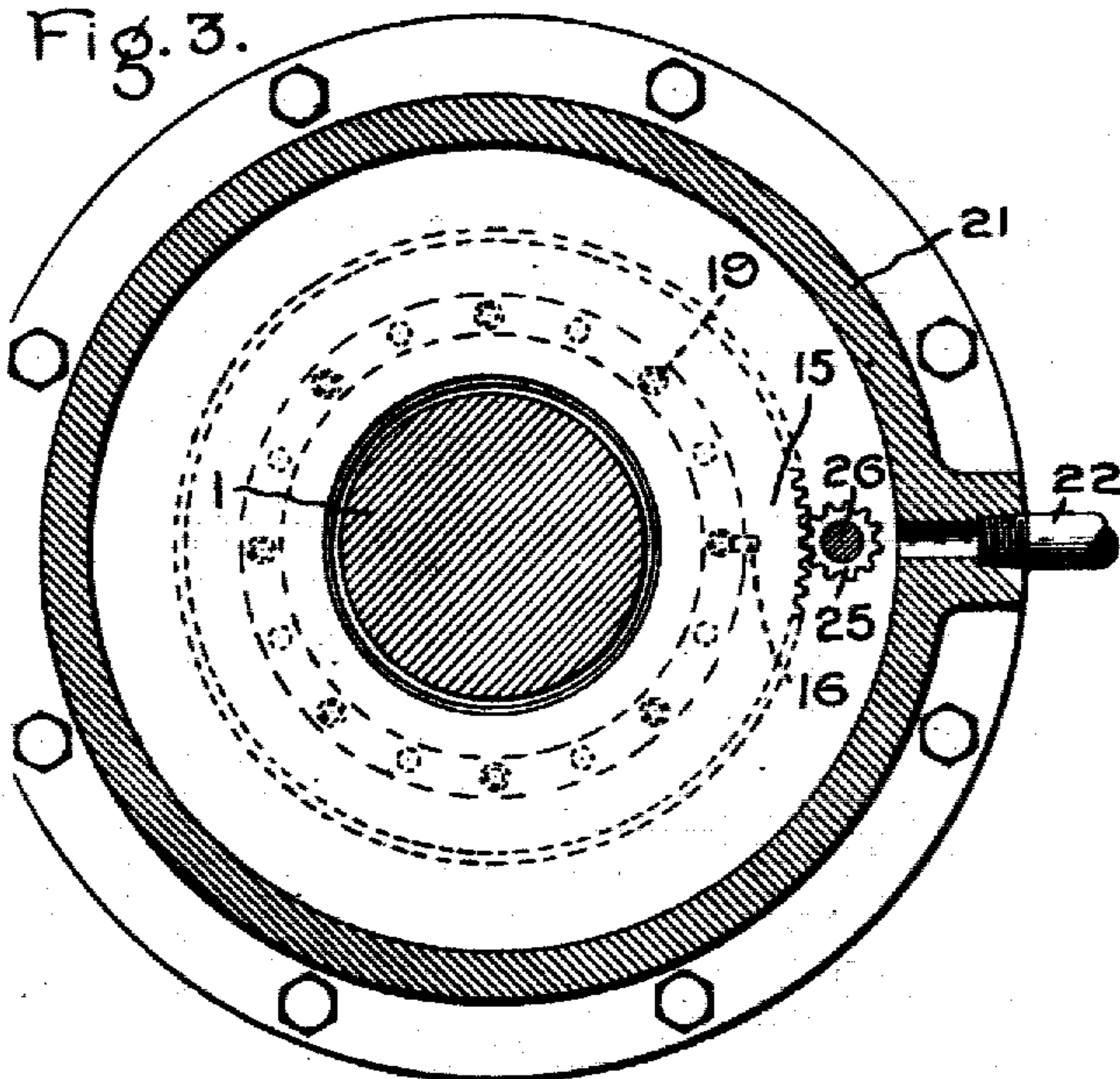
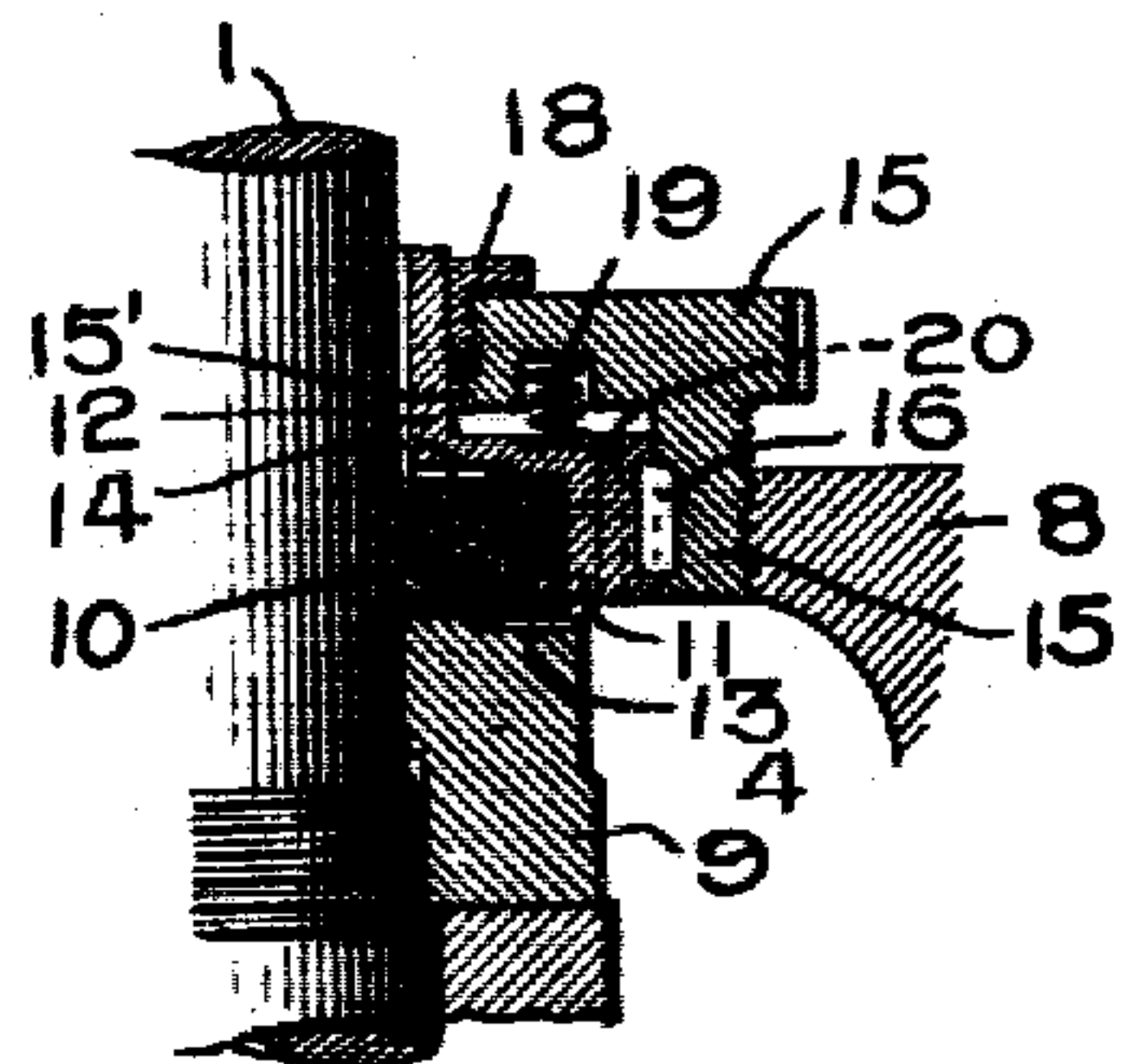


Fig. 4.



Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

WILLIAM L. R. EMMET, OF SCHENECTADY, NEW YORK, ASSIGNOR TO
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PACKING FOR ELASTIC-FLUID TURBINES.

No. 811,833.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed July 19, 1904. Serial No. 217,211.

To all whom it may concern:

Be it known that I, WILLIAM L. R. EMMET, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Packings for Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to means for making a fluid-tight joint at the point where a rotating shaft passes out of a stationary casing containing elastic fluid under pressure.

The invention is especially useful in packing the shaft of a steam-turbine, where the peripheral speed of the shaft is high and the steam-pressure is relatively heavy.

It is found that packing-rings of carbon, usually containing a certain amount of graphite to act as a lubricant, are durable and efficient if the pressure between the surfaces is not too great; and the present invention consists of means for adjusting and maintaining the proper pressure in a packing of this kind.

For convenience the invention will be illustrated and described in connection with a steam-turbine of the Curtis (vertical) type; but it will be evident that it is not necessarily confined to that kind of a machine.

In the accompanying drawings, Figure 1 is a vertical section of a portion of a steam-turbine embodying my invention. Fig. 2 shows the invention applied to a two-stage turbine. Fig. 3 is a horizontal section, and Fig. 4 is a vertical section of a modification.

The shaft 1 is shown as carrying two bucket-wheels 2 3, each operating in its own steam-chamber 4 5, the upper wheel receiving live steam from the chest 6 and the lower wheel using the exhaust steam from the upper wheel through the nozzle 7. The shaft passes up through a central opening in the dome or top 8 of the casing, and it is at this point that the packing is used which forms the subject-matter of this application.

Secured to the shaft and rotating therewith is a collar or shoulder 9 of suitable construction, on whose upper edge rests the carbon packing-ring 10, which is firmly held in an annular holder 11, having an inwardly-projecting flange 12, bearing on top of the carbon. The upper edge of the collar 9 has a plurality of narrow radial grooves 13 running in from its outer edge to a small groove concentric with the shaft, and the flange 12 has a simi-

lar set of narrow radial grooves-14, running from its inner edge to a small groove concentric with the shaft, the two small grooves lying substantially at the middle of the carbon. The holder 11 fits in a gland 15, which is screwed into the opening in the dome 8. A key or spline 16 in a vertical keyway compels the holder 11 to rotate with the gland, but permits the holder to slide vertically therein. The gland has an inwardly-projecting flange 15', and the inner edges of the flanges 12 15' are connected by a steam-tight movable joint, such as an accordion-spring 17, of sheet metal, brazed to said flanges. Instead of this construction I may use the modification shown in Fig. 4, where the flange 12 is extended up past the flange 15' and the joint is made tight by a stuffing-box 18.

In order to exert a positive mechanical pressure on the packing-ring, I prefer to arrange a set of springs 19 between the flanges 12 and 15'. Their tension is supplemented by steam-pressure admitted from the chamber 4 through ports 20 into the space above the holder 11. The ports are preferably made in the holder, as shown.

To prevent leakage steam from escaping into the engine-room, the gland may be inclosed by a cover 21, provided with an escape-pipe 22 to carry off any steam that may leak past the packing-ring. The joint between the cover and the shaft is packed by means of an ordinary stuffing-box having soft packing 23 and a screw-gland 24. Since the gland 15 is inclosed, some means must be provided for adjusting it from the outside. A simple mode of accomplishing this is shown. The edge of the gland is formed with gear-teeth meshing with a pinion 25 on a short shaft 26, extending through the cover 21 and carrying a bevel-gear 27, which meshes with a bevel-pinion 28 on an operating-shaft 29, provided with a hand-wheel 30.

The operation of the device is as follows: Since the steam has free access to the space above the holder, it will exert a downward pressure on the packing-ring, which is partly or nearly balanced by the steam entering the radial grooves 13 in the collar. The mechanical pressure exerted by the springs 19 can be closely adjusted by screwing the gland 15 in or out. This adjustability also provides for taking up wear. The grooves 14 in the flange 12 permits a free escape of any steam that

may leak between the packing-ring 10 and the holder 11, which might otherwise destroy the predetermined ratio of balancing pressures on the opposite sides of the packing-ring. Should the ring wear unevenly, the increased leakage of steam from the grooves 13 in the collar would cause a greater drop in pressure through said grooves, and thus to a certain extent reduce the upward lift on the ring, thereby causing greater resultant downward pressure thereon and tending to counteract and correct the uneven wear.

I have shown the packing located on the high-pressure end of a turbine; but it can be used on the low-pressure end as well. Where a step-bearing is provided and supported at a point within the base containing an exhaust-chamber, the packing can be located on top of the bearing-casing or at any convenient point. Where such a construction is employed, the shaft 29 should extend through the wall of the casing and the hand-wheel 30 be located outside. In using my improved construction as a vacuum-packing I may make some slight changes to suit the new condition, but the essential features will remain as before.

In accordance with the provisions of the Patent Statutes I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination with a shaft having a collar, of a packing-ring resting on said collar, an annular holder for said ring, a gland surrounding said holder, and springs between said gland and holder.

2. The combination with a shaft having a collar, of a packing-ring resting on said collar, an annular holder for said ring having a flange bearing thereon, a gland surrounding

said holder and having a flange, a steam-tight connection between said flanges, and ports leading into the space between said flanges.

3. The combination with a shaft having a collar provided with radial grooves, of a carbon packing-ring resting on said collar, an annular holder for said ring having a flange bearing thereon and ports passing through it, a gland splined on said holder and having a flange, and a steam-tight connection between said flanges.

4. The combination with a shaft having a collar provided with radial grooves, of a carbon packing-ring resting on said grooved collar, an annular holder for said ring provided with ports and having a flange bearing on said ring, a gland splined on said holder and having a flange, a steam-tight connection between said flanges, and springs between said flanges.

5. The combination with a shaft having a collar provided with narrow radial grooves running from the outside partly across the same, of a carbon packing-ring resting both on the grooved and ungrooved surface of the collar, and means for exerting a pressure on said ring.

6. The combination with a shaft having a collar, of a carbon packing-ring resting thereon, and an annular holder having a flange bearing on the ring and containing radial grooves running part way across the ring.

7. The combination with a shaft having a collar, of a packing for said shaft resting on said collar, a rotatable screw-threaded gland, springs between said gland and packing, a casing inclosing said parts, and means for rotating said gland from outside said casing.

In witness whereof I have hereunto set my hand this 18th day of July, 1904.

WILLIAM L. R. EMMET.

Witnesses:

BENJAMIN B. HULL,
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