

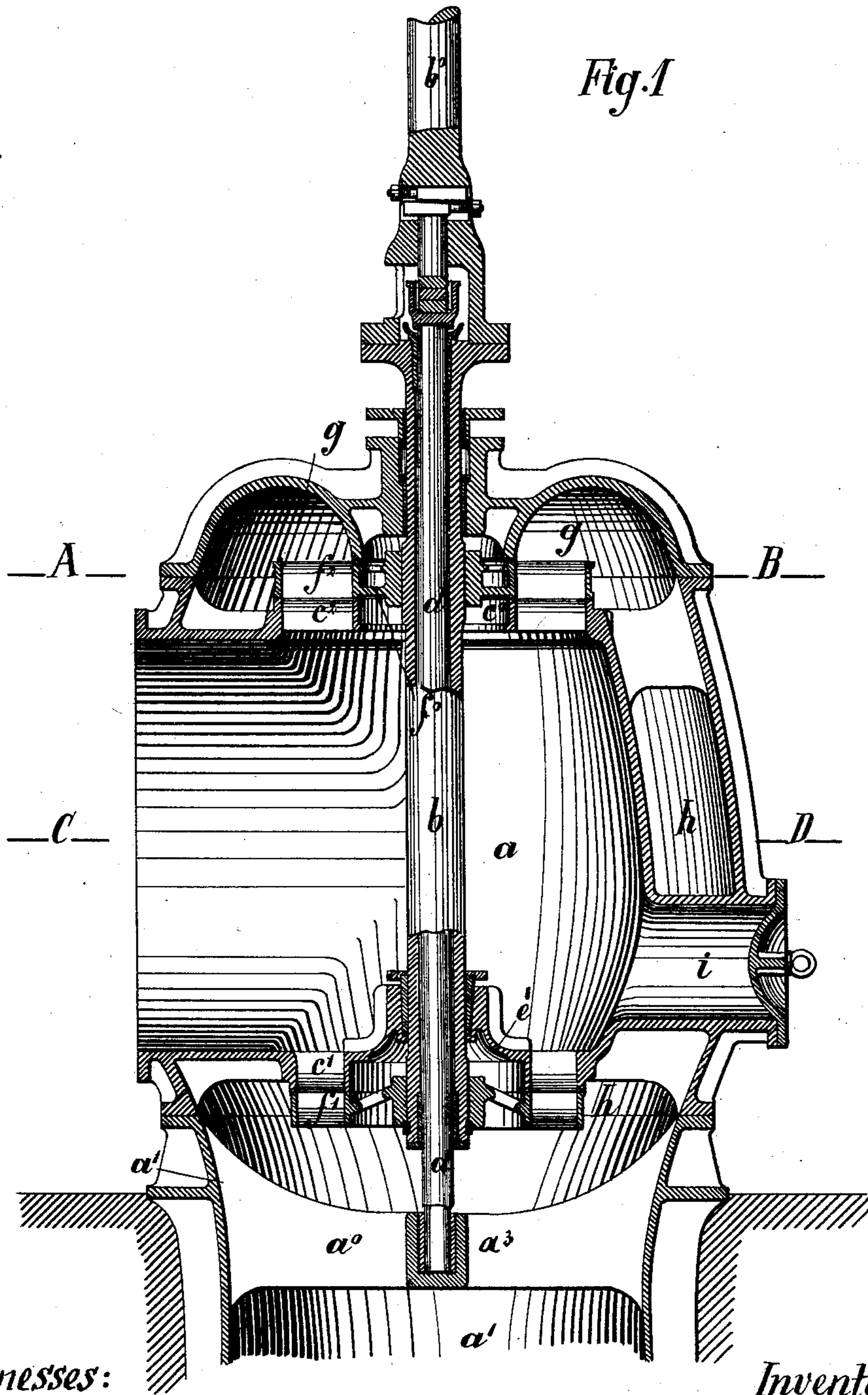
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4 Sheets—Sheet 1.

H. ZOELLY.  
TURBINE WATER WHEEL.

No. 452,590.

Patented May 19, 1891.



Witnesses:  
Henry Huber  
O. P. Huber

Inventor:  
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by Samuel R. Rogers  
Attorneys.

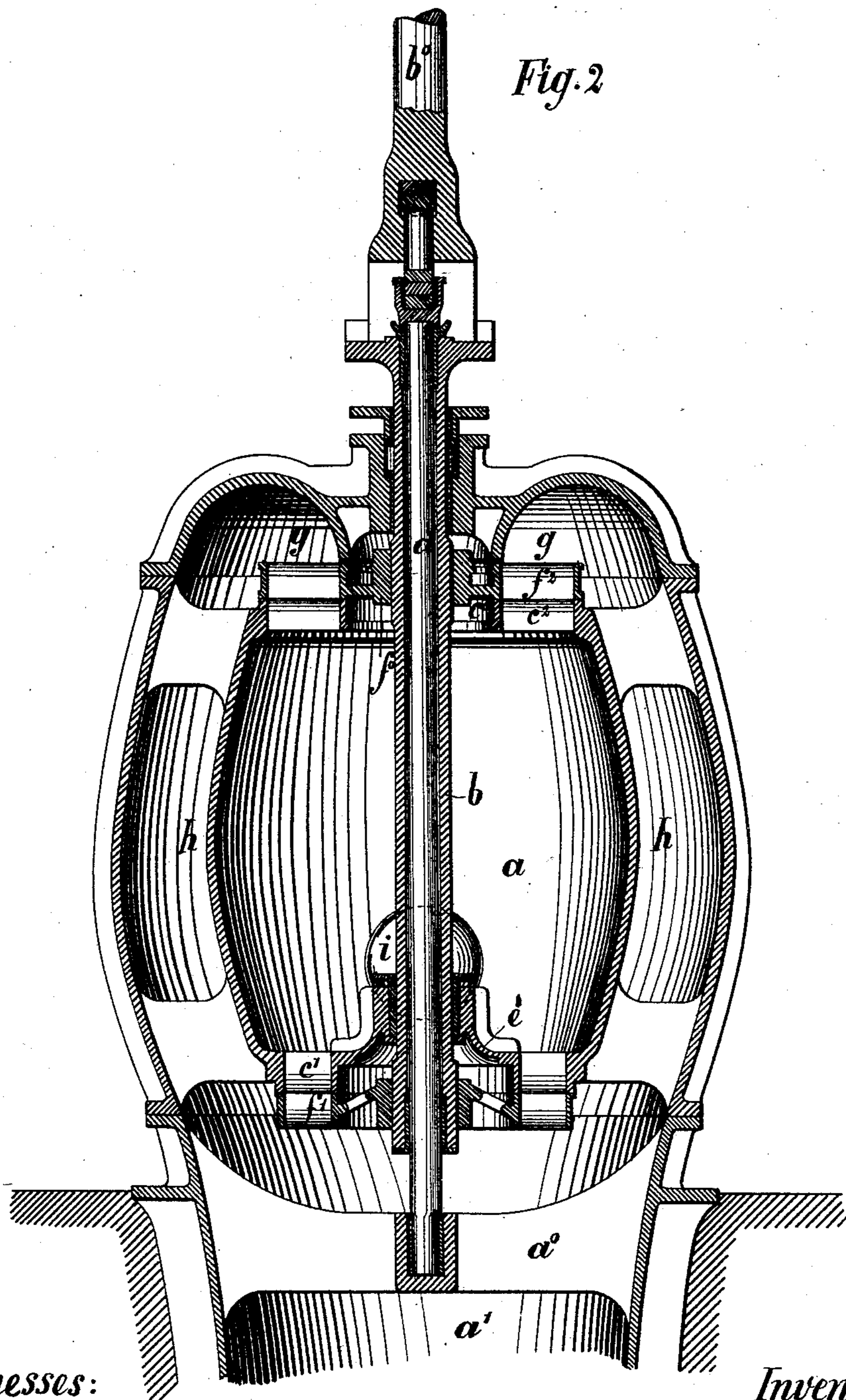
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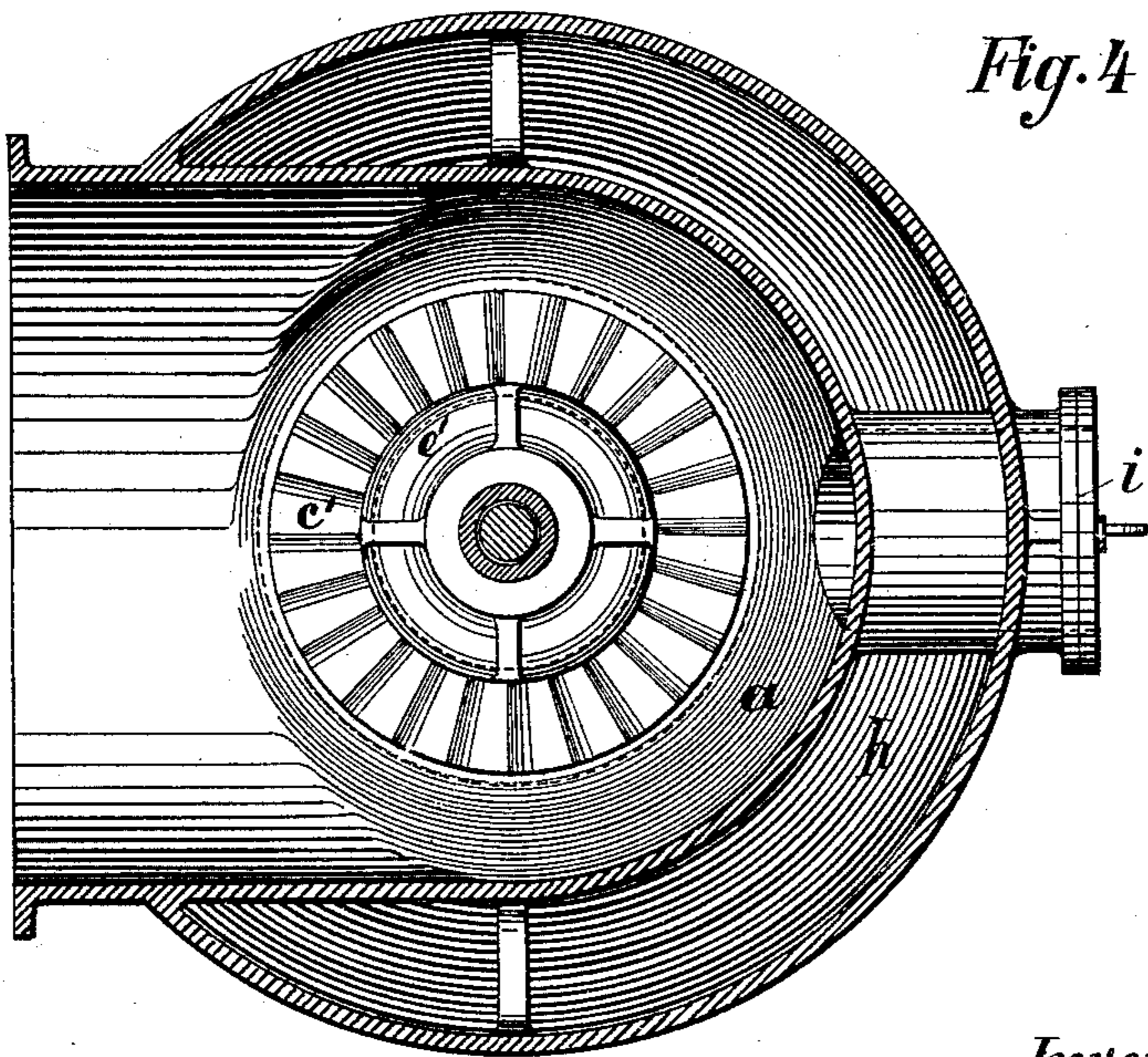
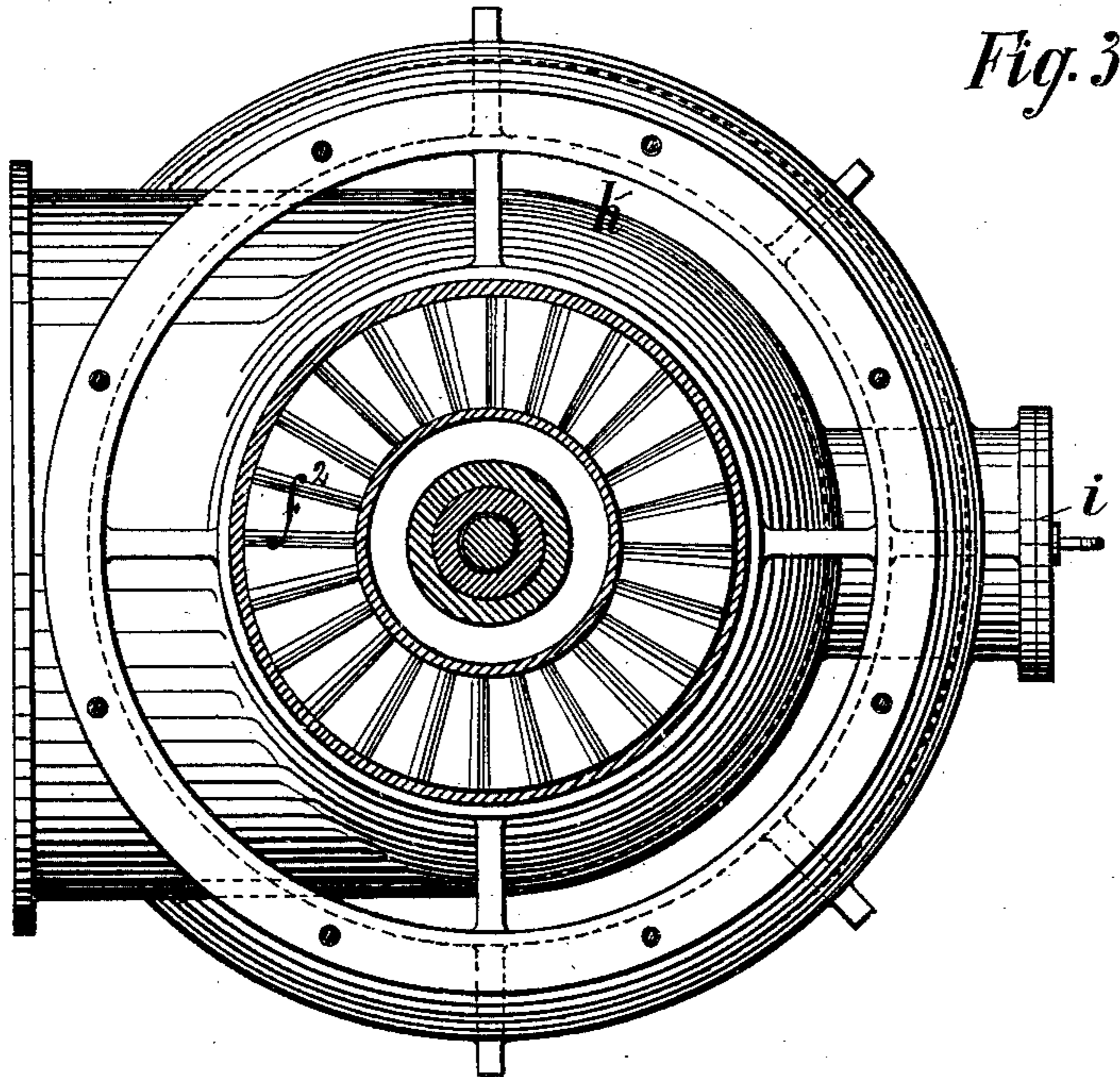
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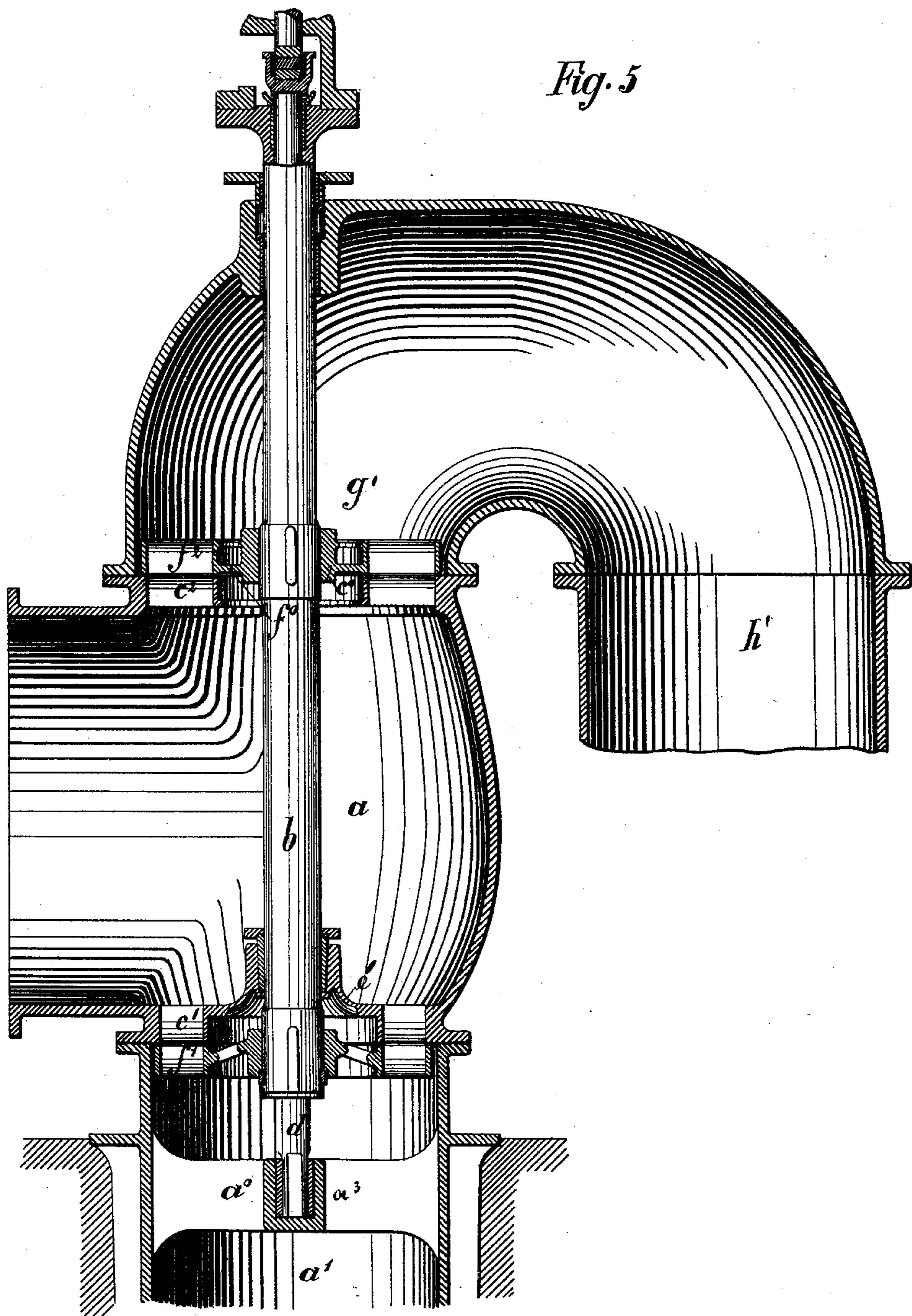
(No Model.)

4 Sheets—Sheet 4.

H. ZOELLY.  
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No. 452,590.

Patented May 19, 1891.



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# UNITED STATES PATENT OFFICE.

HEINRICH ZOELLY, OF ZURICH, SWITZERLAND.

## TURBINE WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 452,590, dated May 19, 1891.

Application filed January 15, 1891. Serial No. 377,821. (No model.)

*To all whom it may concern:*

Be it known that I, HEINRICH ZOELLY, a citizen of the Republic of Switzerland, residing at Zurich, in Switzerland, have invented certain new and useful Improvements in Tur-

bines, of which the following is a specification. The object of my invention is to provide certain new and useful improvements in vertical shaft turbine water-wheels for the purpose of counteracting the vertical pressure of the shaft on the step or for removing said vertical pressure entirely or partially.

The invention consists in the combination, with a casing, of the vertical shaft, upper and lower turbine water-wheels on said shaft, the upper turbine wheel having a disk extending from the hub to the rim for receiving the upward pressure of the water to counteract the downward pressure of the shaft on the step, and a guide-wheel for the lower turbine wheel, having all parts closed from the hub to the rim.

The invention also consists in the construction and combination of parts, as will be fully described hereinafter, and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical transverse sectional view of my improved turbine water-wheel in a plane parallel with the axis of the inlet-opening. Fig. 2 is a similar view at right angles to the plane of the axis of the inlet-opening. Fig. 3 is a horizontal sectional view on the line A B of Fig. 1. Fig. 4 is a similar view on the line C D, Fig. 1; and Fig. 5 is a vertical transverse sectional view showing a modification.

Similar letters of reference indicate corresponding parts.

The shed or casing *a* of the turbine water-wheel is provided with the fixed guide-wheels *c'* *c''*, concentric with the vertical shaft *b*, which shaft is tubular and is supported by the interior shaft *d*, resting on the step *a''* in the cross-bar *a'* of the bottom outlet-tube *a'*, supporting the casing *a*. The driven shaft *b'* is connected with the upper end of the shaft *b* in any well-known manner. The lower guide-wheel *a'* is provided with a closed hood *e'*, forming a guide for the shaft *b*, which hood *e'* covers those parts of the wheel *c'* between the hub and the openings

at the rim, so that the downward water-pressure at both sides of the opening at the rim of the guide-wheel *c'* is taken up by said hood *e'* and the walls of the casing *a*. The upper guide-wheel *c''* has openings *c''* between the rim-openings and the hub, so as to permit the upward pressure of the water to act not only against the walls in the pockets in the upper turbine-wheel *f''*, but also against the disk *f''* of said upper wheel *f''*, which disk *f''* connects the rim-pockets with the hub. The upward pressure of the water on said disk *f''* counteracts the downward pressure of the shaft on the step and takes up the same partially or entirely. The lower turbine-wheel is constructed in the usual manner and receives no downward pressure, except that acting on the pockets or openings of the rim. On the top of the casing an annular hood *G* is provided for receiving the water passing up through the upper wheels *f''* and *c''*, which water passes from said hood through the jacket *h* around the casings *a* in the outlet-tube *a'*. If desired, said hood *g* and jacket *h* may be dispensed with and a U-shaped tube *g'* arranged on the top of the casing *A*, as shown in Fig. 5, which U-shaped tube *g'* is connected with a second outlet-pipe *h'* for the water passing through the upper wheels. It is also advisable to make the upper wheels larger in area than the lower ones, so as to utilize the upward pressure on said wheels in conjunction with the pressure on the disk *f''* for taking up the downward pressure on the step.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a vertical turbine wheel, the combination, with upper and lower turbine wheels, of a hood covering the lower wheel from the hub to the rim-openings, the upper wheel having a disk extending from its hub to its rim-openings, substantially as set forth.

2. In a vertical turbine wheel, the combination, with a casing, of a vertical shaft, a bottom fixed guide-wheel having a hood covering the same from the hub to the rim-openings, and an upper wheel having a disk extending from its hub to its rim, substantially as set forth.

3. In a turbine water-wheel, the combina-

tion, with a casing, of a vertical shaft, upper  
and lower turbine wheels having rim-open-  
ings, the area of the openings of the upper  
wheel being larger than the area of the open-  
5 ings of the lower wheel, substantially as set  
forth.

In testimony whereof I hereunto sign my

name, in the presence of two subscribing wit-  
nesses, this 29th day of December, 1890.

HEINRICH ZOELLY.

Witnesses:

EMIL BLUM,  
H. LABHART.