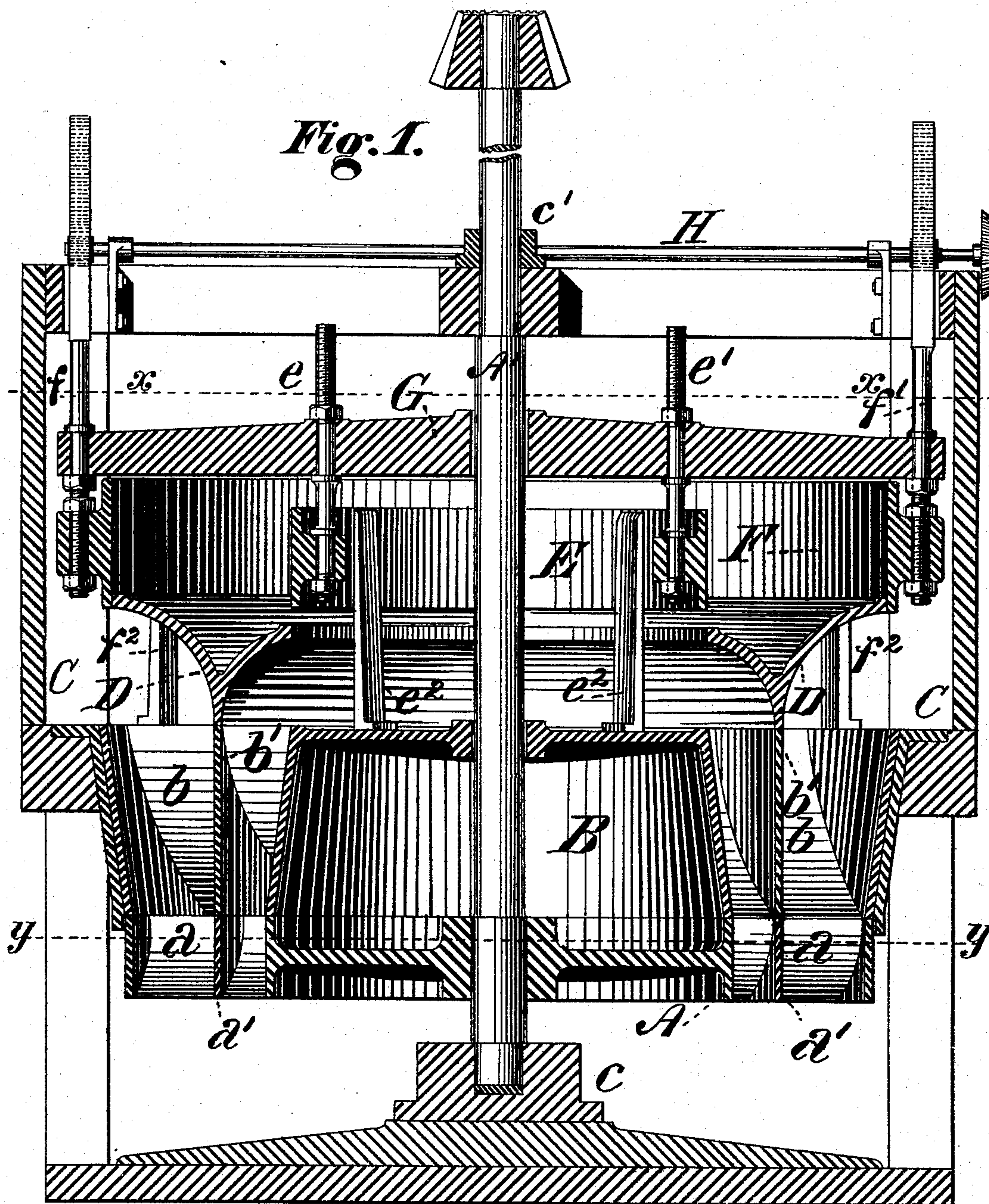


E. GEYELIN.
Turbine Water-Wheels.

No. 156,632.

Patented Nov. 10, 1874.



Witnesses.

D. L. Collier

J. P. Vaillant

Inventor:

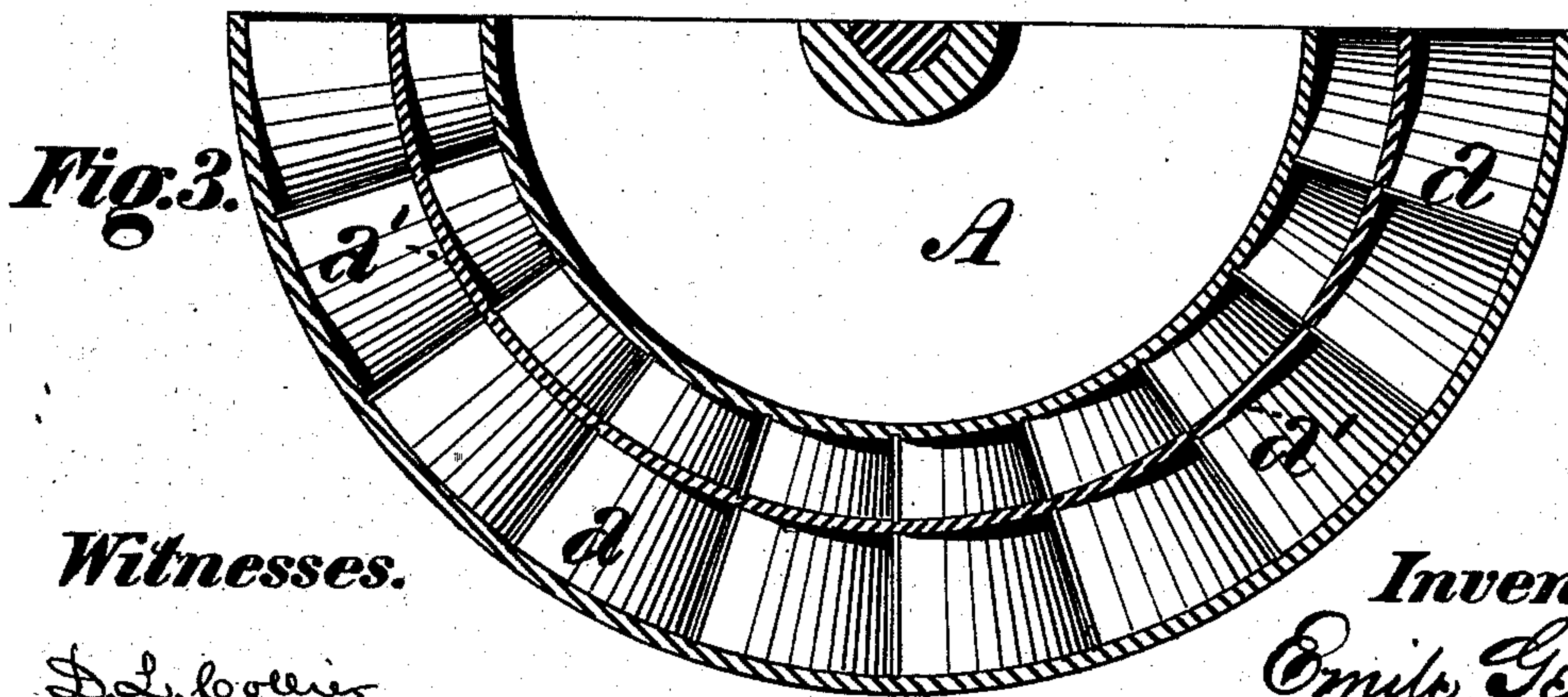
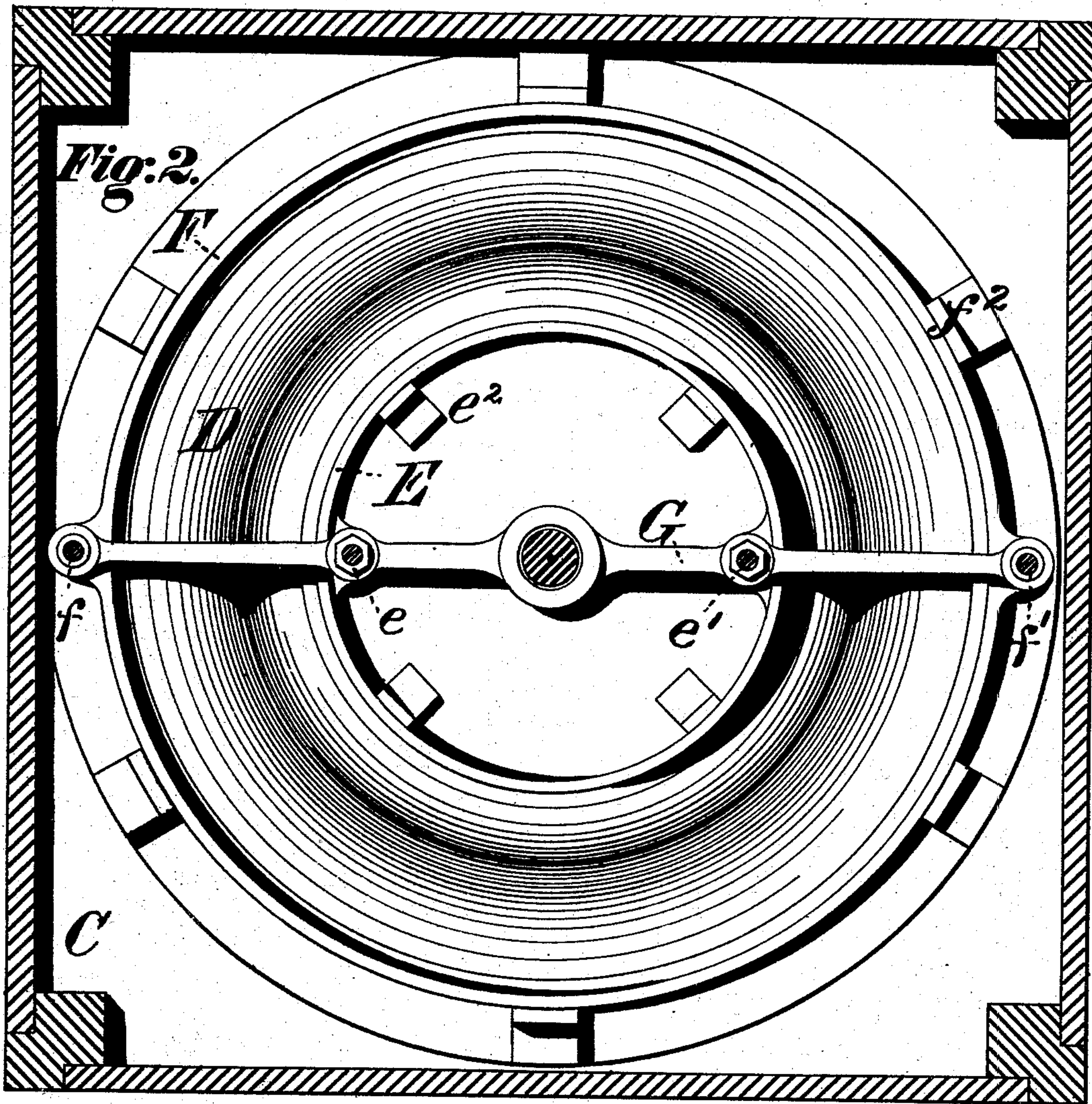
Emile Geyelin

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UNITED STATES PATENT OFFICE.

EMILE GEYELIN, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. **156,632**, dated November 10, 1874; application filed July 29, 1874.

To all whom it may concern:

Be it known that I, EMILE GEYELIN, of the city and county of Philadelphia, in the State of Pennsylvania, have made certain new and useful Improvements in Turbine Water-Wheels, of which the following is a specification:

My improvement relates to that class of turbine water-wheels (known as Jonval turbines) which receive the water from above through a stationary or guide wheel, provided with a series of curved vanes or guides set in reverse direction to the buckets of the turbine proper or movable wheel, which rotates immediately beneath the stationary wheel, the water escaping after having operated upon it at its bottom.

In the practical operation of these as well as of all other varieties of turbines, it has long been a desideratum to provide suitable means for utilizing varying quantities of water—that is to say, either the full amount which the turbine is designed to work under, or a fractional portion thereof, inasmuch as by reason of floods and droughts a constant and regular supply of water can seldom, if ever, be depended upon. Sundry devices have been proposed for this purpose, consisting chiefly of gates of various descriptions, moving either separately or together, to contract the channel or channels through which the water passes in to the wheel; but they have not proved practically successful, from the fact that they do not correspondingly contract the discharge-area, and, the proper and normal ratio of the area of discharge to that of supply being therefore disturbed, the wheel cannot operate with the same economy when the supply of water is reduced.

In the construction of Jonval turbines, disks have been secured to the guide-wheels, and corresponding disks to the movable wheels, thus reducing both the ingress and egress area; but such disks were unprovided with facilities for opening and closing them, or for advantageously directing the water upon the movable wheel, nor were there any means afforded for properly regulating the speed of the water.

The first practical step toward the success-

ful attainment of the desired object in this class of turbines, so far as I am aware, is found in the suggestion of the construction of a double turbine—that is to say, one in which both the stationary and movable wheels were each divided by a diaphragm or partition into two wheels, each preserving in itself the normal ratio of ingress to egress area, and each being susceptible of having its supply of water regulated independently of the other.

My improvements, which relate to a double turbine of this description, are designed to provide simple and efficient means for varying and shutting off the supply of water, so as to admit of the regulation of such supply to either one of the sections into which the wheel is divided by the diaphragm independently of the other section, thus enabling the water to be entirely shut off from the one and admitted to the other when it becomes necessary to work under a reduced head and fall, or to be admitted to both when the supply is ample, the reduction of the ingress-area being accompanied by a proportional reduction of the egress.

The improvements claimed are hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical central section of a Jonval turbine embodying my improvements; Fig. 2, a horizontal section of the same at the line *xx* of Fig. 1; and Fig. 3, a similar section of half the movable wheel at the line *yy* of Fig. 1.

To carry out the object of my invention I provide a movable wheel, A, secured upon and rotating with a vertical shaft, A'. The lower end of the shaft A' bears upon a step, *c*, and the shaft rotates in a bearing, *c'*, secured to a casing or pen-stock, C. A stationary or guide wheel, B, is placed immediately above the movable wheel A, and concentric therewith. The movable wheel A is provided with a series of curved buckets, *a*, and the stationary wheel B with a series of guides or vanes, *b*, curved in reverse direction to the buckets of the movable wheel, there being about one-half as many guides as there are buckets.

The shape and number of the guides and buckets need not be specifically set forth herein, as the manner of constructing them is

well known to those skilled in the art of building turbine wheels, and, moreover, constitutes no part of my present invention.

The stationary or guide wheel is so constructed that its guides *b* shall be of greater width at their upper than at their lower ends, so that the area for the ingress of the water shall be greater than the egress-area. A vertical diaphragm, *a'*, separates the movable wheel A into two concentric sections, which, for convenience of description, I will term the inner and outer sections, respectively, and another vertical diaphragm, *b'*, immediately above the diaphragm *a'*, similarly divides the stationary wheel B. A gate ring or abutment, D, which may be described as an annulus, the section of which is that of a V with curved sides, rests upon the top of the diaphragm *b'*, and should be suitably secured thereto. The abutment flares both inwardly and outwardly toward its top, as shown in Fig. 1, and forms faces or seats for the cylindrical or sleeve gates E and F, which respectively govern the admission of water to the inner and outer sections of the wheels B and A. The gates E and F are attached, respectively, by the bolts *e e'* and *f f'*, to a vertically-moving cross-head or yoke, G, and are guided in their movements by standards *e'' f''*. Racks are formed upon the outer bolts *f f'*, into which pinions upon a horizontal shaft, H, gear, and, by the proper rotation of the shaft H, the yoke and gates are elevated or depressed, as required, to admit the water to or exclude it from the wheel, the water being entirely shut off when the gates are lowered far enough to rest upon the top of the stationary wheel B.

When by reason of a scarcity of water, or from other causes, it is desired to shut off the water from either the inner or outer sections of the wheels, the nuts are removed from the bolts of the gate governing such section, (both gates at the time being closed,) and the gate

remains closed until they are replaced, when it can be raised, as usual.

The arrangement shown for raising and lowering the gates may obviously be modified in its details without departing from the spirit of my invention—as, for example, the gates E and F could be attached to separate yokes, and operated either independently or together; but the plan shown and described possesses the merit of simplicity, and satisfactorily accomplishes its functions.

It will be obvious that in the use of my improvements the contraction of the ingress-channels of the water to the wheel, produced by shutting off the water from one or the other of its sections, is accompanied by a proportional contraction of the discharge-area, and consequently that that ratio between the two areas which is indispensable to the proper and normal operation of a well-constructed wheel is not interfered with. Moreover, the devices which I employ for the purpose are readily susceptible of application to Jonval turbines of the ordinary approved construction, and, by adapting such wheels to use under varying heads of water, will greatly enhance their usefulness.

I am aware that double turbine wheels provided with separate gates have been heretofore known, and do not, therefore, broadly claim such device.

I claim as my invention, and desire to secure by Letters Patent—

In a Jonval turbine water-wheel, the V-section double-faced gate-ring D, in combination with cylinder-gates E and F and a stationary and a movable wheel, each divided into two separate sections by a vertical diaphragm, substantially as set forth.

EMILE GEYELIN.

Witnesses:

D. L. COLLIER,
J. SNOWDEN BELL.