

(No Model.)

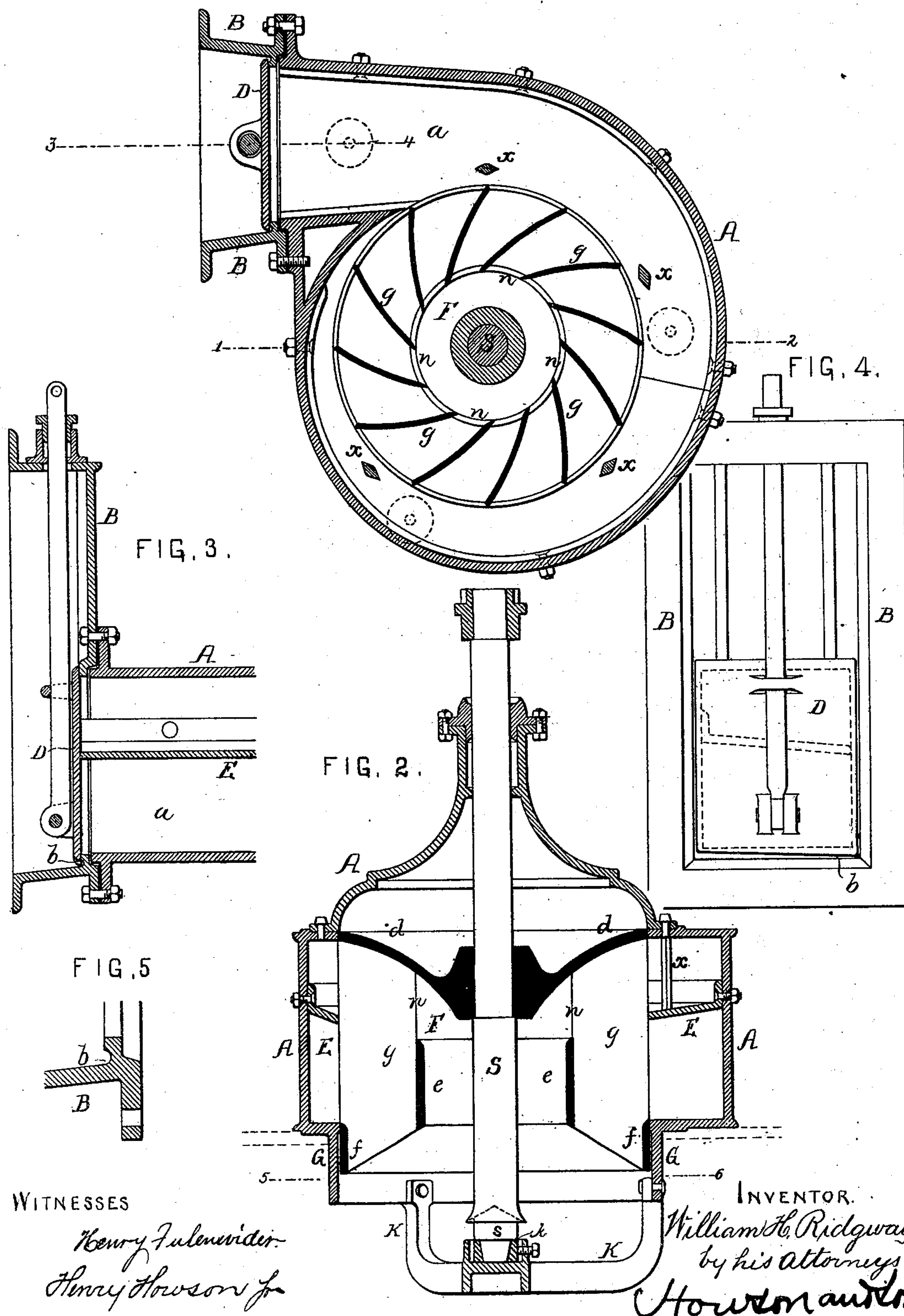
2 Sheets—Sheet 1.

W. H. RIDGWAY.
Turbine Water Wheel.

No. 230,339.

Patented July 20, 1880.

FIG. 1.



WITNESSES

Henry Tulenviden
Henry Howson Jr

INVENTOR.

William H. Ridgway
by his attorneys
Howson and Co

(No Model.)

2 Sheets—Sheet 2.

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FIG. 6.

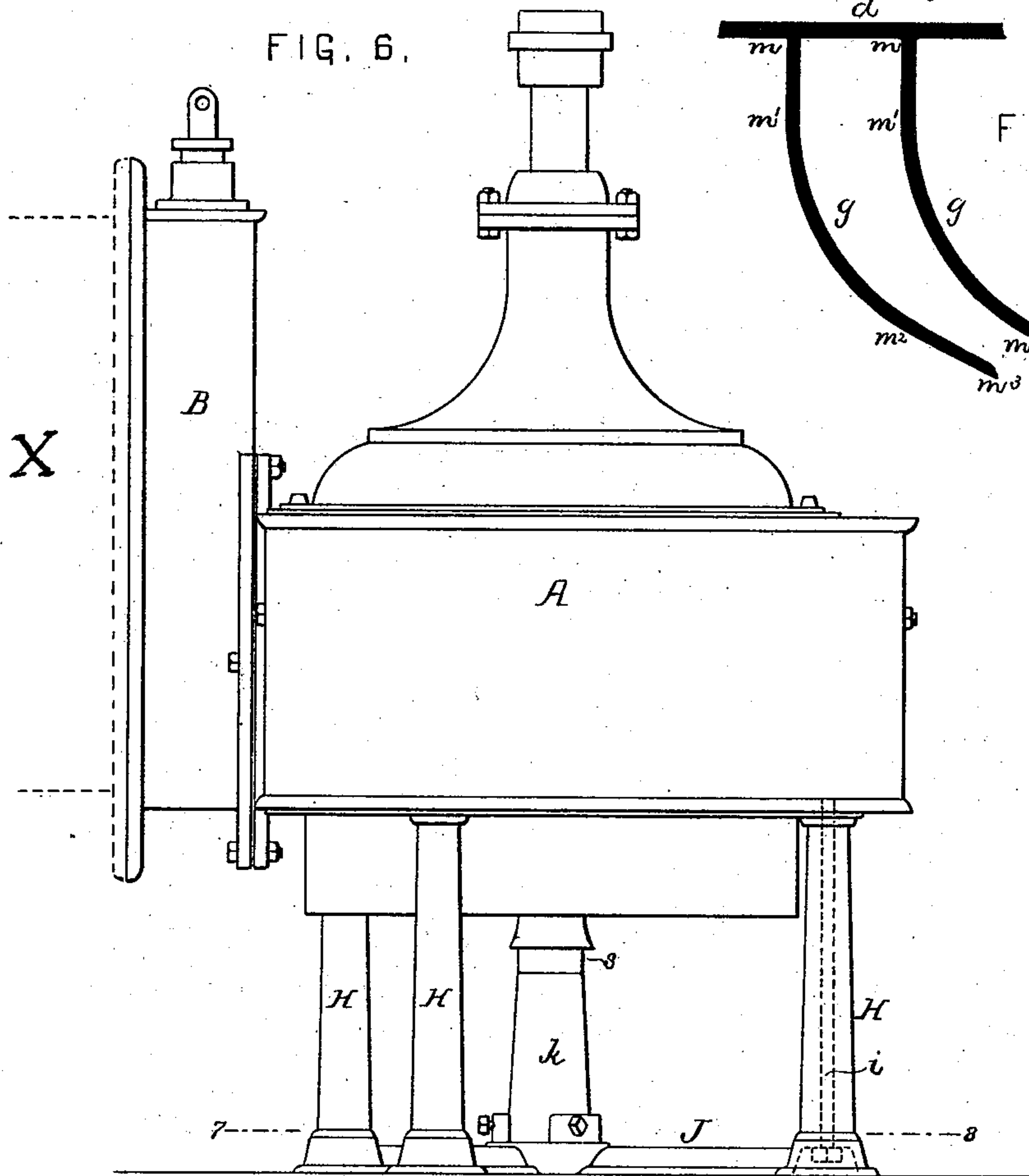


FIG. 9.

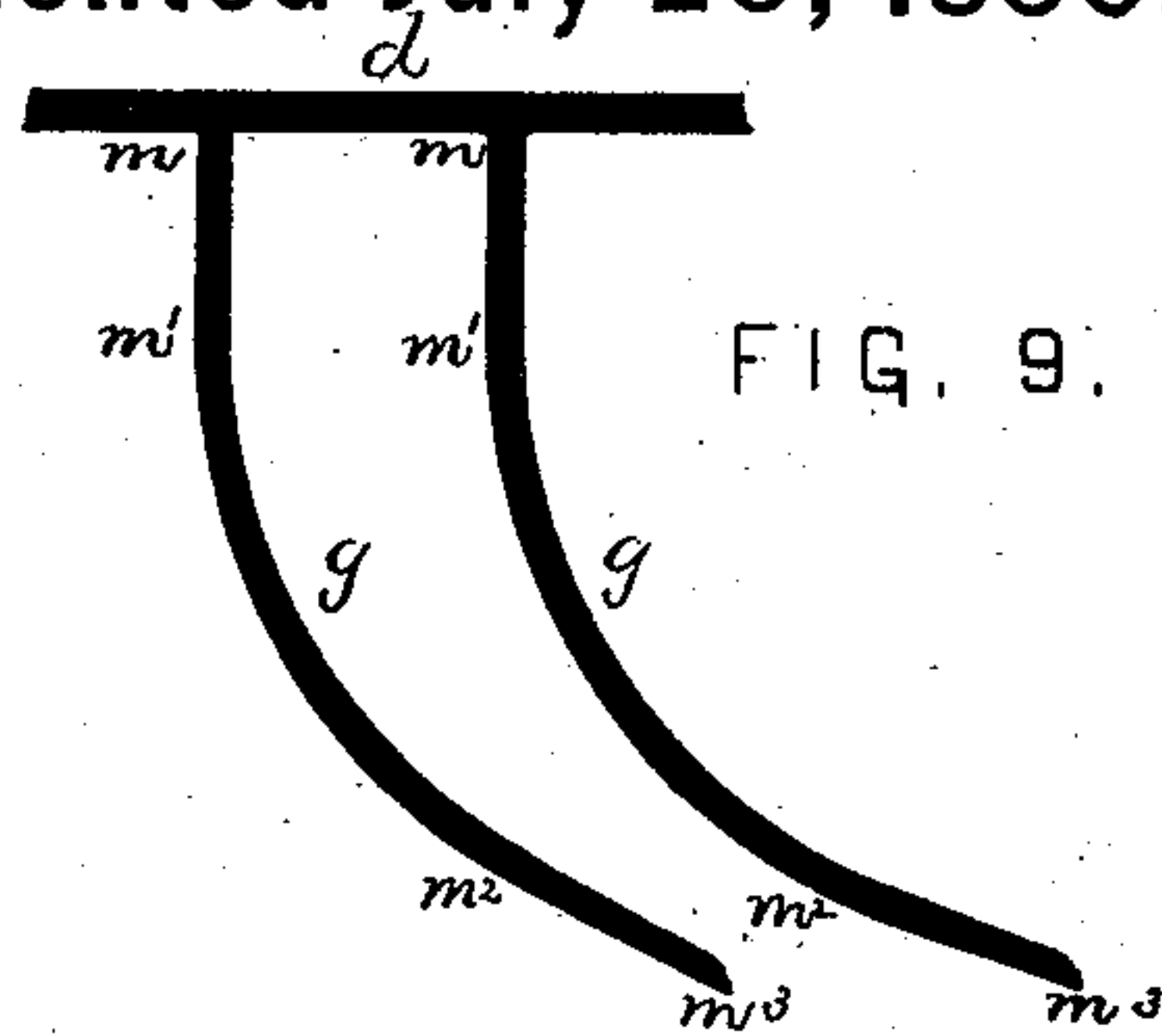


FIG. 7.

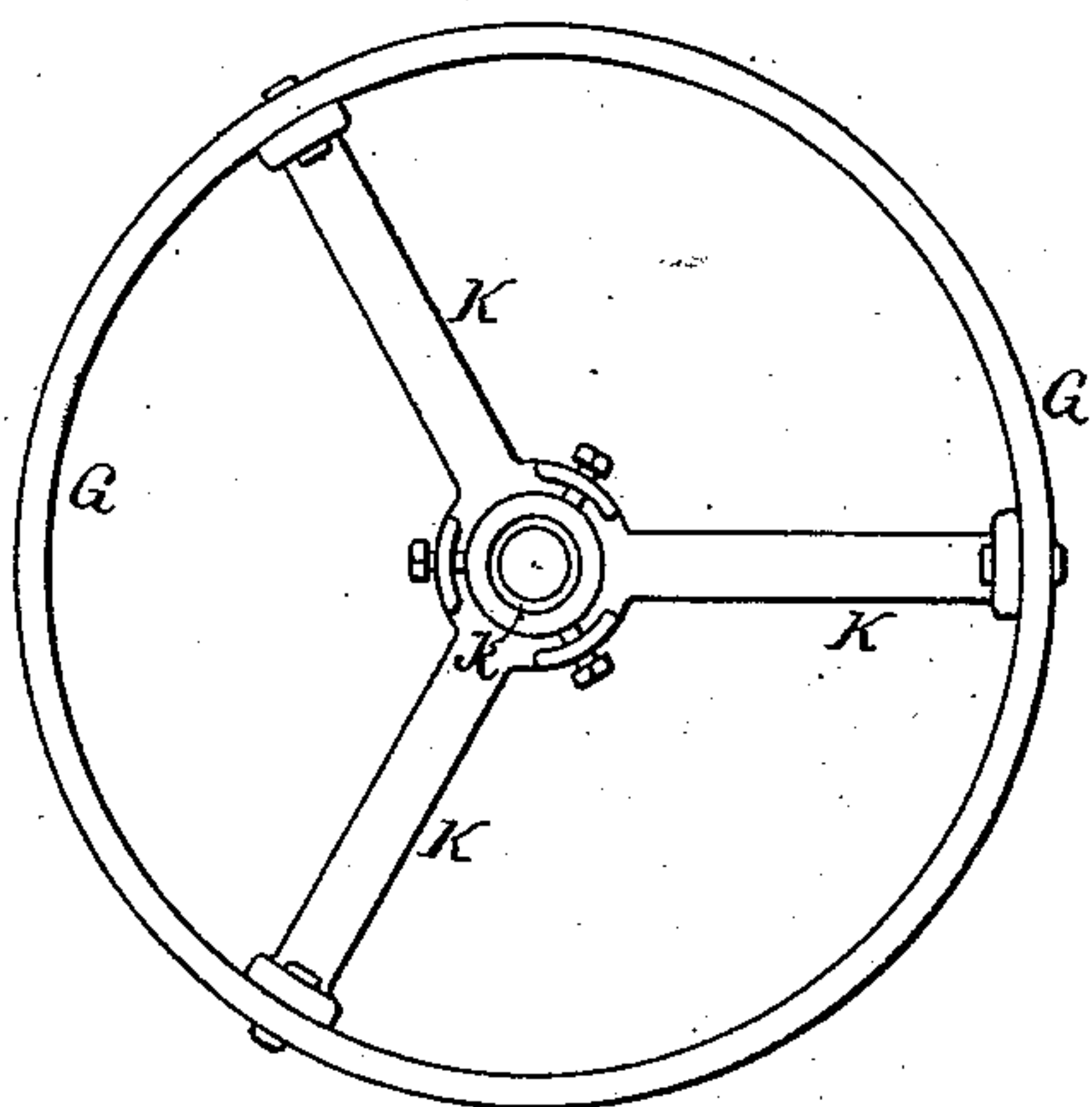
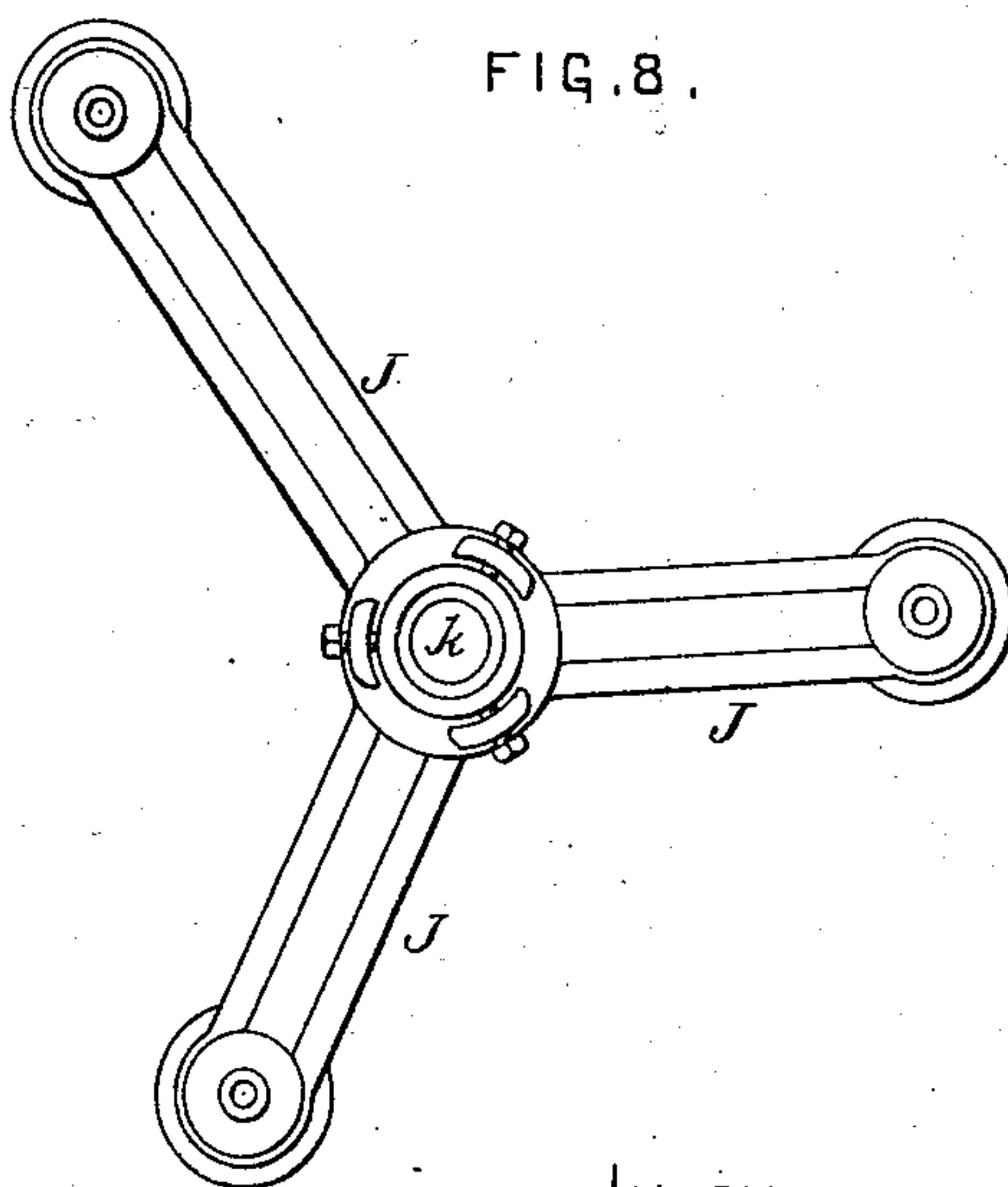


FIG. 8.



WITNESSES.

Henry Fulemunder
Henry Howson Jr.

INVENTOR.

William H. Ridgway
by his Attorneys
Howson and Son

UNITED STATES PATENT OFFICE

WILLIAM H. RIDGWAY, OF COATESVILLE, PENNSYLVANIA.

TURBINE WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 230,339, dated July 20, 1880.

Application filed April 30, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. RIDGWAY, a citizen of the United States, residing in Coatesville, Chester county, Pennsylvania, have invented certain Improvements in Turbine Wheels, of which the following is a specification.

My invention relates to an improvement in that class of turbine wheels known as "scroll-wheels," the objects of my invention being to obtain a high degree of efficiency when the wheel is running at "part gate," to prevent the choking of the wheel when running at full or almost full gate to generally improve the form of the wheel proper and the construction of the gate and gate-chamber, and to adapt the wheel for use either at the end of a flume or water-way or within a flume or reservoir. These objects I attain in the manner too fully described hereinafter to need preliminary explanation.

In the accompanying drawings, Figure 1, Sheet 1, is a sectional plan view of a turbine wheel constructed according to my invention; Fig. 2, a vertical section on the line 1 2, Fig. 1; Fig. 3, a vertical section on the line 3 4, Fig. 1; Fig. 4, a front view of Fig. 3; Fig. 5, a section of part of Fig. 3 drawn to a larger scale; Fig. 6, Sheet 2, a side view, showing a different method of supporting the wheel; Figs. 7 and 8, sectional plans, respectively on the lines 5 6, Fig. 2, and 7 8, Fig. 6; and Fig. 9, a longitudinal vertical section of one of the buckets of the wheel.

A is the casing, which is made in the usual scroll form, and has an inlet branch, *a*, to the end of which is bolted a casing, B, inclosing the gate-chamber.

D is the gate, which is operated as usual by means of a rod hung thereto and passing through a stuffing-box on the casing B. The seat for the gate is surrounded by a groove, *b*, which isolates said seat from the bottom and sides of the casing B, and thus facilitates the proper truing of the seat by the planing-machine. The lower edge of the gate D is inclined, but the bottom of the inlet-opening is horizontal, so that as the gate is opened or closed the inlet or cutting off of the water is gradual, the operation of the gate being thus materially facilitated.

Within the casing A, and at some distance from the top of the same, is a partition, E, which extends completely around the casing and through the branch *a* to the gate D, the partition being graduated in width to accord with the scroll shape of the casing and being firmly bolted to the side of the latter, as shown in Figs. 1 and 2.

The partition E is inclined downward toward its inner edge, which fits snugly to the outer edges of the buckets of the wheel F, but does not interfere with the free rotation of the said wheel. The object of the partition E is to confine and properly direct downward to the buckets of the wheel the volume of water which enters the casing A when the gate D is only partially elevated, so that its lower inclined edge corresponds with the inclined partition, or, as it is technically termed, when the wheel is running at "part gate," it being a great desideratum with wheel-makers to secure the maximum of efficiency in such case.

In order to prevent damage to the partition E owing to the upward pressure of the water, I provide braces or columns *x*, extending from said partition to the top of the casing, as shown in Fig. 2, these braces being preferably tapered in the direction of the flow of water, so as to offer but slight resistance to such flow, as shown in Fig. 1.

As the casing A is cast in one piece, it is necessary, in order to introduce or remove the partition E, to make the same in sections, which can be passed through the branch *a*. In the drawings the partition is shown as being made in but two sections; but it may consist of three or more sections, if desired.

The wheel F comprises the usual concave top *d*, the inner ring, *e*, the outer ring, *f*, and the blades *g*, the various parts being arranged so as to form buckets around the rim of the wheel in the ordinary manner, the buckets receiving the water at the rim over the ring *f* and discharging it at the bottom.

Each blade *g* is curved transversely, as shown in Fig. 1, the radius of the curve being preferably equal to two-thirds the diameter of the wheel, and the center of the curve being in the peripheral line of the wheel. The buckets have the longitudinal section shown in Fig.

9, being substantially vertical from the top m to the point m' , in the form of a true segment of a circle from m' to m^2 , and again straight and tangential to said segment from the point m^2 to the bottom m^3 of the bucket. This longitudinal form is the usual Jonval curve, which has been found, in practice, to give the most advantageous results, with the greatest economy in the consumption of water.

The longitudinal form in itself, therefore, I do not claim; but I have found that the efficiency of the wheel is increased by combining this longitudinal form with the curved transverse section.

The discharging capacity of the buckets at the exit-opening m^2 should correspond with the volume of water entering the casing at part gate—that is to say, when the lower edge of the gate coincides with the partition E ; but in order to prevent choking of the wheel in the event of the raising of the gate above the partition and the inlet of a larger volume of water, I discontinue the inner ring, e , of the wheel at some distance from the top plate, d , so that the upper portion of each bucket is open at the back, and any excess of water can freely escape through the openings n thus formed into the center of the wheel, and thence down through the draft-tube G , with the water escaping from the regular exit-openings of the buckets.

I have designed my improved wheel to be used either on the end of a flume or waterway, X , as shown by dotted lines in Fig. 6, or within a flume or reservoir, as shown by dotted lines in Fig. 2; hence, in addition to the draft-tube G , the under side of the casing A has three studs, which, when the wheel and casing are secured to the end of the flume or waterway, are adapted to the upper ends of tubular legs H , the lower ends of which are fitted to projections on the arms of a frame, J , resting on a suitable foundation, vertical bolts i passing up through the legs and serving to firmly secure the casing, legs, and frame together.

The frame J has a central annular ring or a series of lugs, through which pass the set-screws, whereby the adjustment of the bearing-box k is effected, said box k carrying the usual wooden toe s , which forms a step for the shaft S of the wheel, the upper end of the shaft passing through a stuffing-box in the top of the casing A , and being furnished with an ordinary coupling, whereby it is attached to the machinery to be driven.

When the wheel is used inside a flume or reservoir the legs H are not necessary, a three-

arm spider, K , in this case, being bolted to the draft-tube G and serving to carry the bearing-box k .

I wish it to be understood that I do not desire to claim, broadly, the combination of a scroll-casing and wheel with a partition, as movable partitions have heretofore been used in this way; but such partitions require complicated and expensive operating devices, and are liable to be broken by careless attendants, objections which I avoid by bolting the partition rigidly to the casing.

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

1. The combination of the wheel F and the scroll-casing A with an internal partition, E , rigidly secured to the side of said casing A , and serving to confine and direct to the wheel the volume of water admitted to the casing at part gate, as set forth.

2. The combination of the wheel F and the scroll-casing A with the internal partition, E , made in sections, bolted to said casing, as specified.

3. The combination of the wheel F and the scroll-casing A with the internal partition, E , inclined downward toward the inner edge, as described.

4. The combination of the casing A with a wheel, F , each of the buckets of which has in the back an opening, n , for the discharge of surplus water, whereby the choking of the wheel is prevented, as set forth.

5. The within-described wheel, comprising the top plate, d , inner ring, e , outer ring, f , and plates g , each of said plates g being curved in transverse section, and having a longitudinal section substantially vertical from m to m' , a true segment from m' to m^2 , and straight and tangential to the said segment from m^2 to m^3 , as set forth.

6. The combination of the casing A , having an internal partition, E , inclined, as specified, with the gate D , having its lower edge inclined to correspond with said partition, as described.

7. The combination of the casing A , the internal partition, E , and the braces x , as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM H. RIDGWAY.

Witnesses:

JAMES F. TOBIN,
HARRY SMITH.