No. 717,181. Patented Dec. 30, 1902.

J. H. FELTHOUSEN.

WATER WHEEL.

(Application filed Mar. 28, 1902.)

(No Model.) 4 Sheets—Sheet 1.

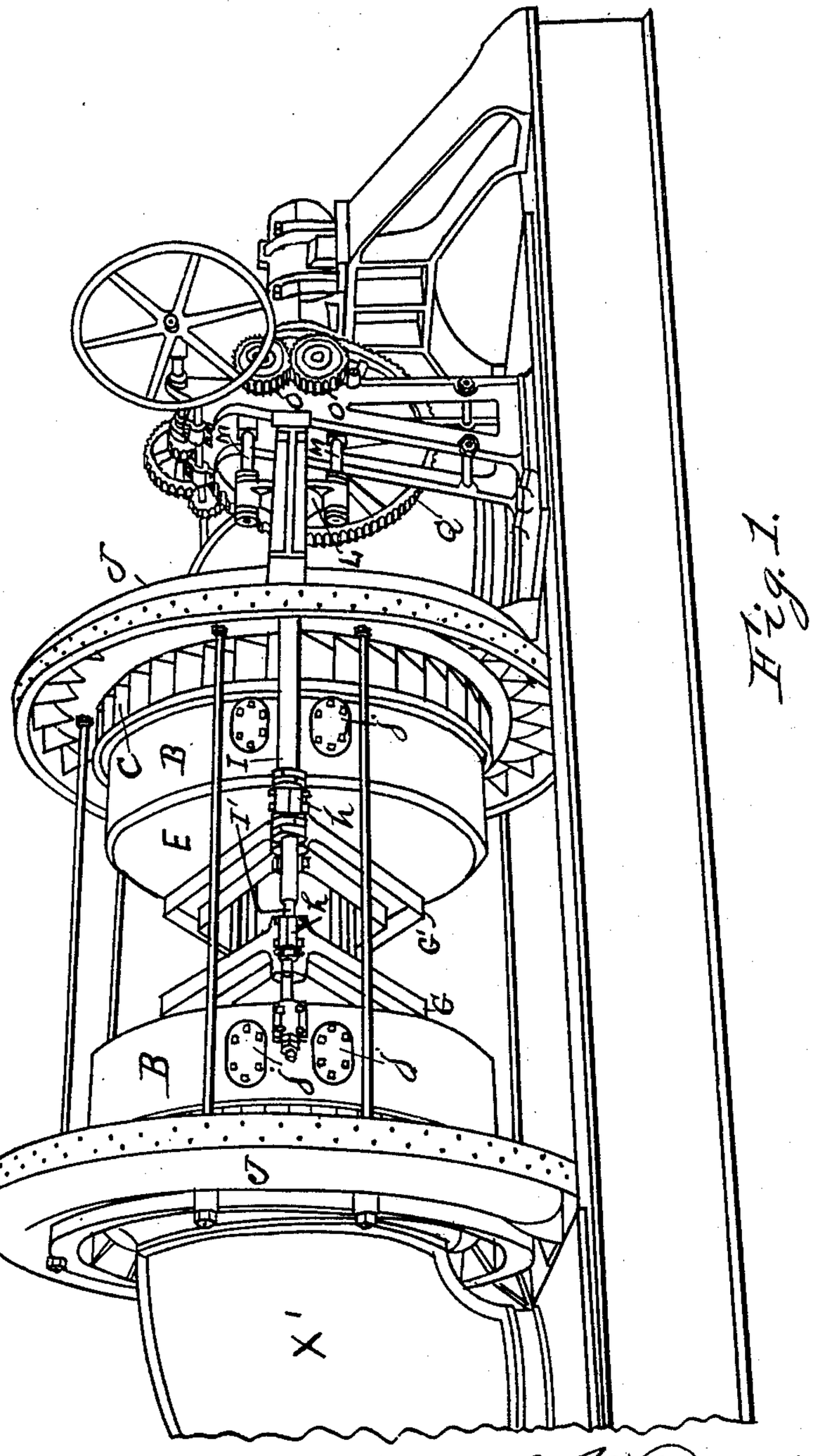

FIG. 1.

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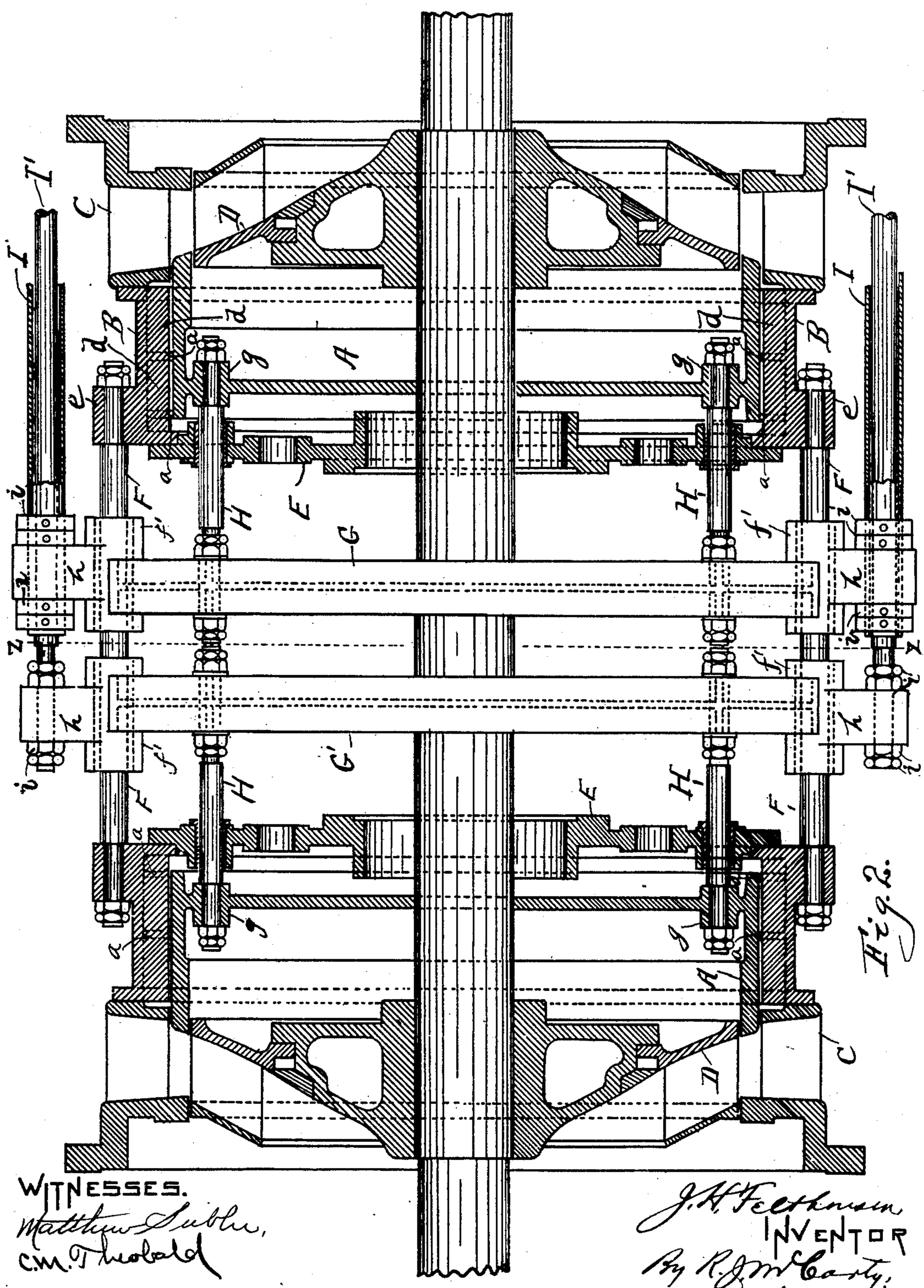

Fig. 2.

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Fig. 3.

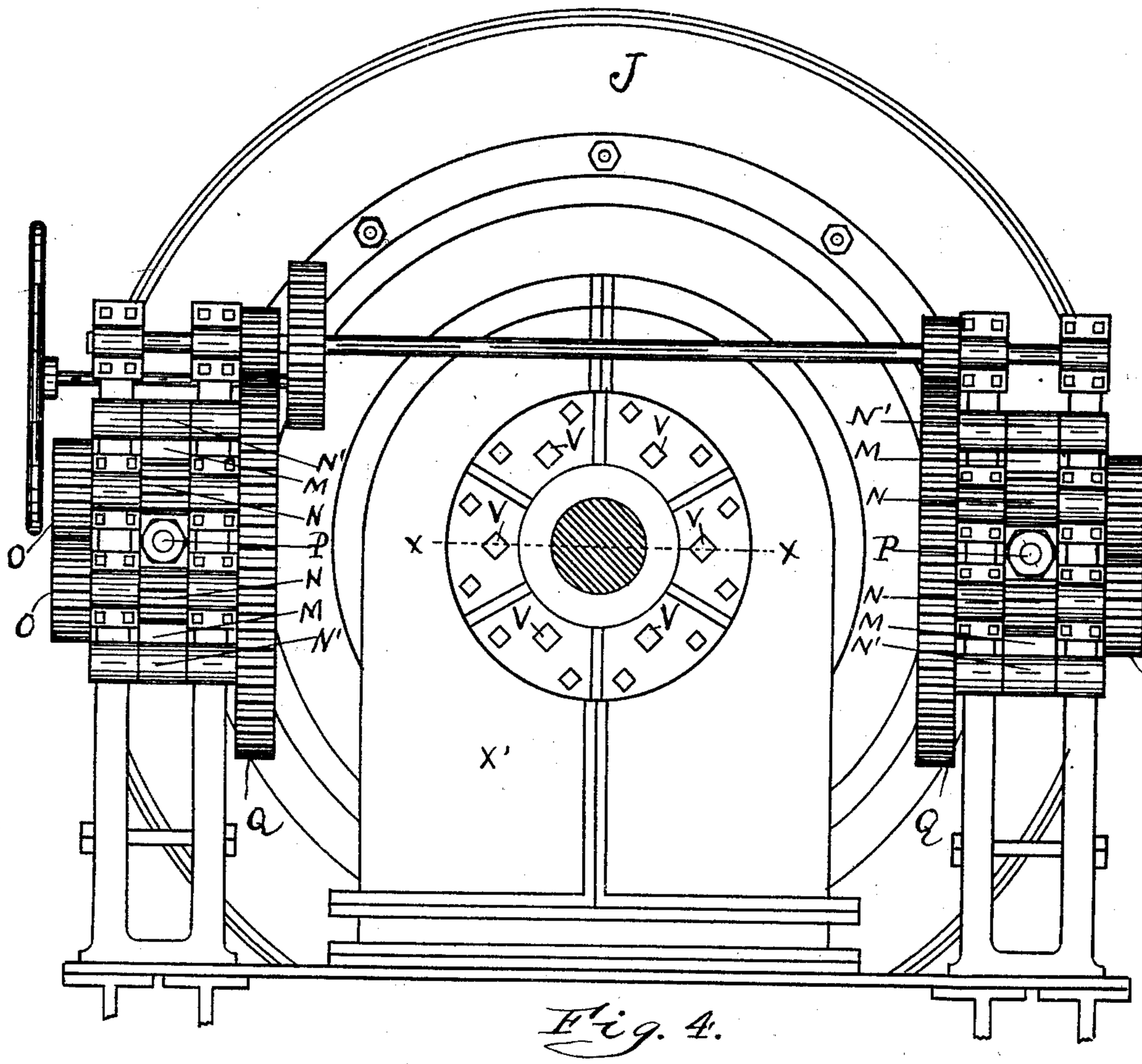
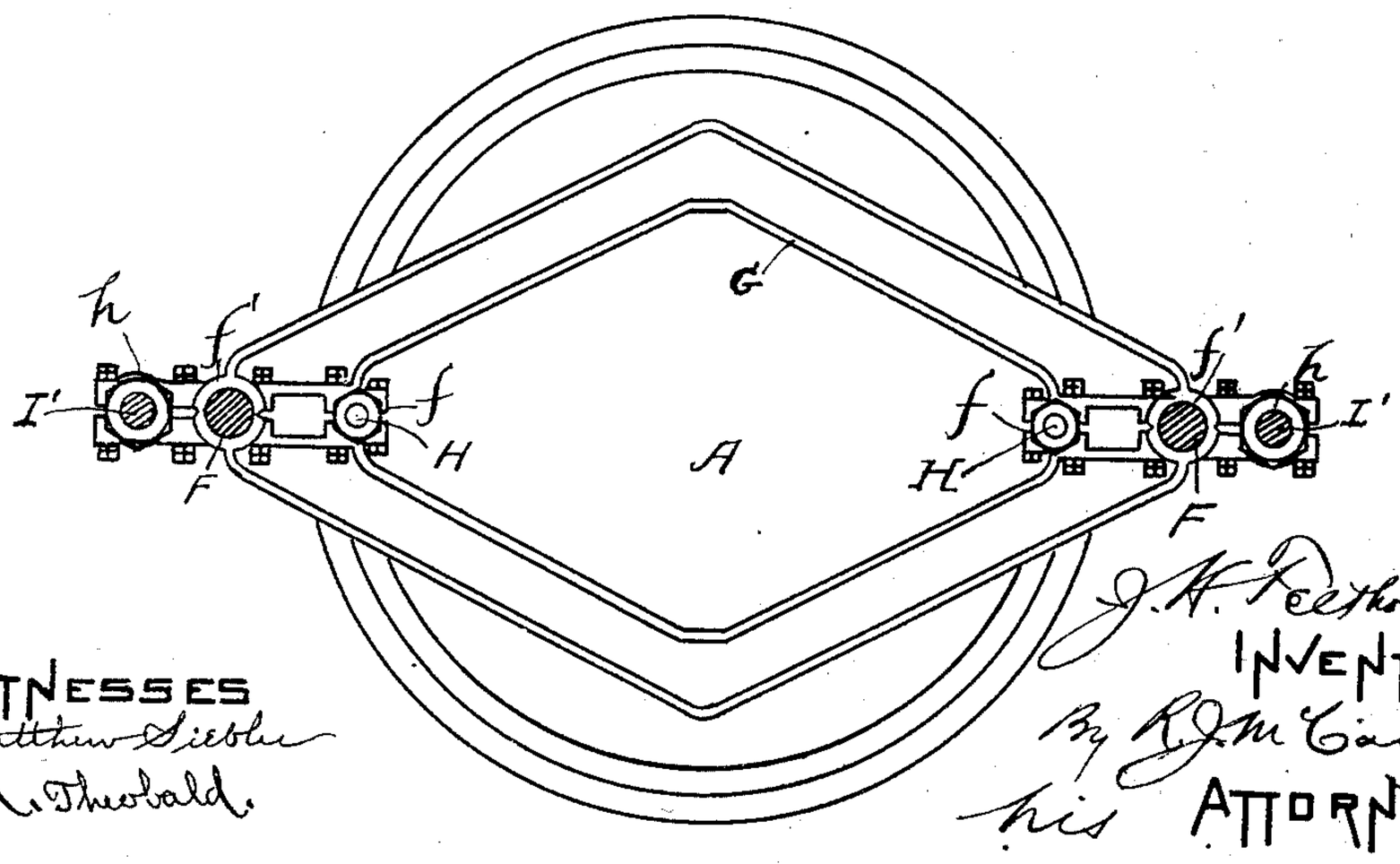


Fig. 4.



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(Application filed Mar. 28, 1902.)

(No Model.) 4 Sheets—Sheet 4.

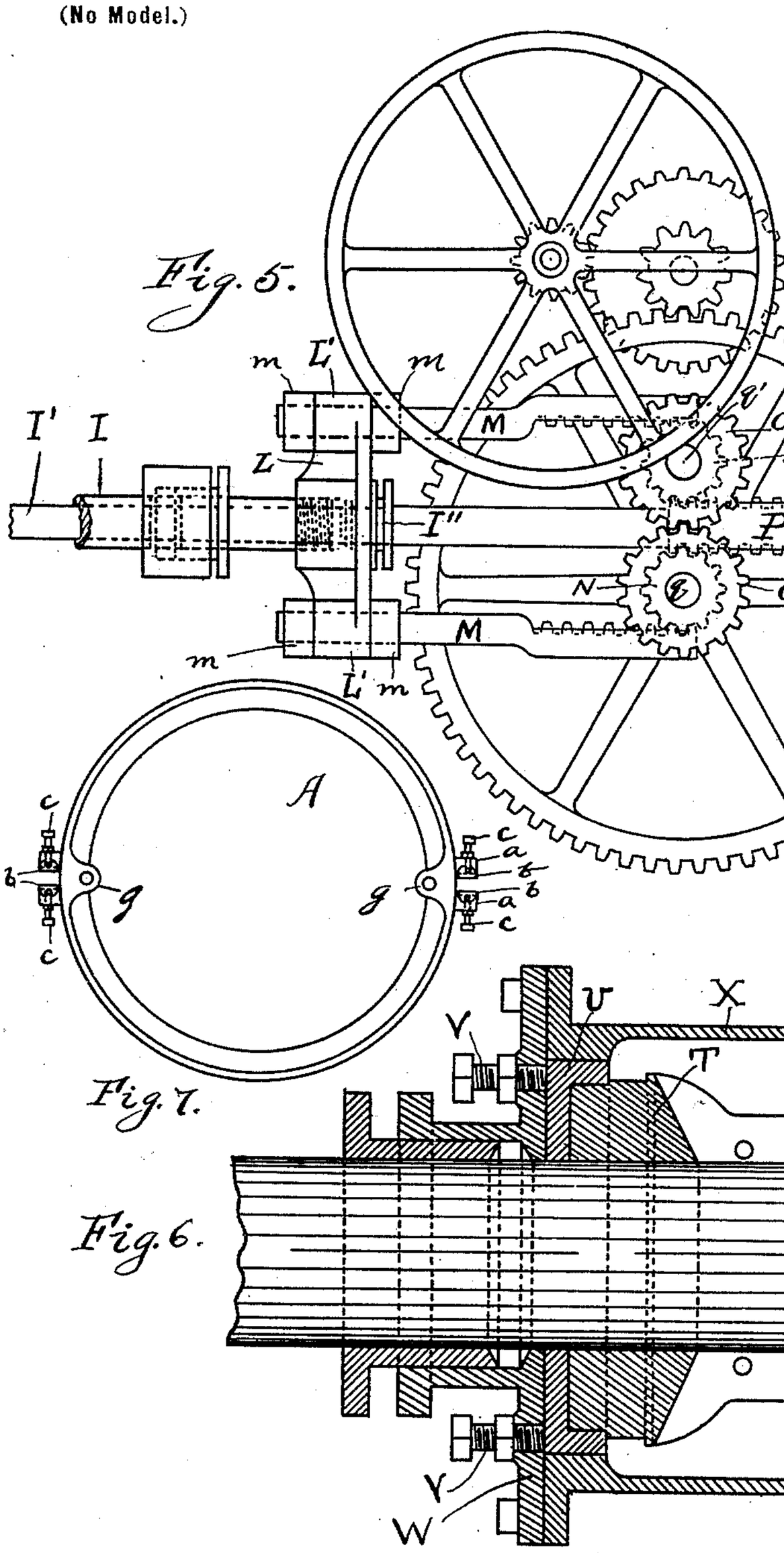

Fig. 5.

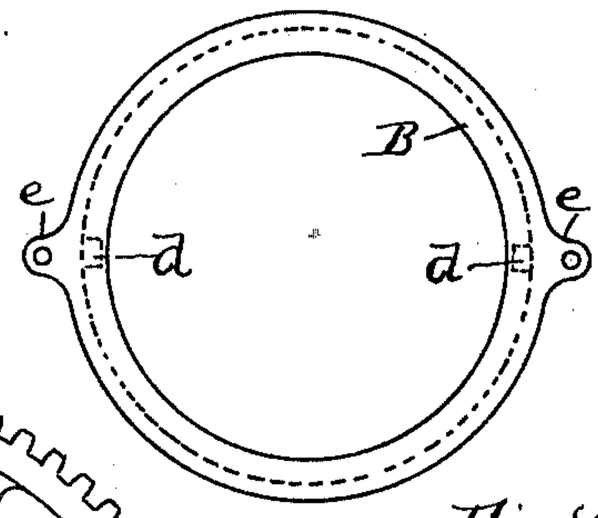

Fig. 8

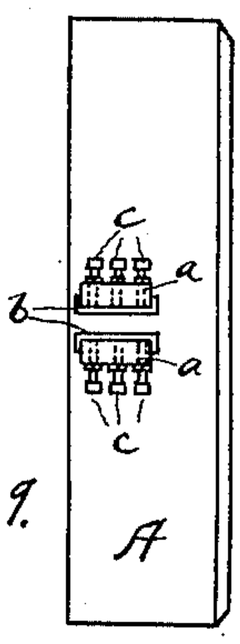

Fig. 9.

Fig. 7.

Fig. 6.

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UNITED STATES PATENT OFFICE.

JOHN H. FELTHOUSEN, OF DAYTON, OHIO.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 717,181, dated December 30, 1902.

Application filed March 28, 1902. Serial No. 100,489. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. FELTHOUSEN, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Water-Wheels; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in turbine water-wheels, and has specific reference to improvements in gate-operating mechanism.

The object of the invention is to provide gate-operating mechanism by means of which the gates of one or more pairs of water-wheels are operated on a plane running horizontally through the center of all the gates and the turbine-shaft. By thus operating the gates by applying the force necessary to their movement in a plane coinciding with the center of the gates and the axis of the turbine-shaft all movement of said gates of a twisting or torsional nature is obviated, so that the gates are moved in unison throughout their area.

In a detail description of the invention reference is made to the accompanying drawings, of which—

Figure 1 is a perspective view of a pair of water-wheels having my improvements thereon. Fig. 2 is an enlarged horizontal sectional view through the wheels, chute-cases, and gates, showing the mechanism by which the gates are operated. Fig. 3 is an end elevation showing the gearing through which the gates are actuated. Fig. 4 is an end elevation of a gate and yoke on the line *z z* of Fig. 2. Fig. 5 is a side elevation of the gearing through which the gate mechanism is actuated. Fig. 6 is a sectional view on the line *x x* of Fig. 3, showing one of the end-thrust bearings of the wheel-shaft. Figs. 7, 8, 9 are details of the cylinder-gate and outer cylinder.

In a detail description of my invention similar reference characters indicate corresponding parts.

A designates a cylinder-gate which has four guide-lugs *a* arranged on opposite sides. The inner surfaces of these lugs *a* are fitted with brass gibs *b*, which are adjustable by means of set-screws *c*. B designates an outer cylinder inclosing said cylinder-gate. This cylinder has two guide-lugs *d*, which project inwardly between the lugs *a* on the gate-cylinder. By the adjustment of the brass gibs *b* the cylinder-gate A is maintained in a central position at all times. (See Figs. 7 and 9.) The lugs *d d* project inwardly from the outer cylinder B and serve as guides for the gate in its movement and support the weight of the gate and at the same time render easy the operation of moving said gate, thereby taking the strain of said gate off of the gate-stems H. In Fig. 1, *j* designates covers which inclose hand-holes in the outer cylinder B, through which access may be had to the adjusting-screws *c* in order to adjust the gibs *b*. The outer cylinder B is bolted to the top of the chute-case C, the latter case surrounding the turbine-wheel D.

E designates a dome, to which the outer cylinder B is also bolted. The said cylinder B has two oppositely-positioned lugs *e*, with openings therein through which the outer guide-rods F pass. These rods F act as guides for the movement of the yokes G G′, the said yokes being subjected to a back-and-forth movement with the gates in operating said gates. The rods F also act as brace-rods for the flume-heads J by connecting with the outer cylinders B. The said outer cylinders are connected to the chute-cases, and the chute-cases are connected to the flume-heads. It will therefore be seen that the rods F tie both ends of the water-wheel system.

G and G′ designate two diamond-shaped yokes, each of which consists of upper and lower halves which are united at their outer ends. To each end of said yokes at *f f* there are connected gate-stems H H, which pass loosely through the domes E E and connect with the gates A by means of bosses *g g*. *f′ f′* designate bosses on opposite ends of said yokes, through which guide-rods F F loosely pass. These guide-rods constitute the main bearings upon which the yokes are moved back and forth in operating the gates, the gate-stems H H being entirely relieved of the weight of said yokes and gates. To the two

outer bosses *h h* on said yokes the actuating gate-rods I′ are connected as follows: The outer actuating-rods I I are tubular and are attached to the bosses *h* by being passed through them and secured thereto by lock-nuts *i*. The inner actuating-rods I′ I′ pass through the tubular rods I I and are secured to the bosses *h* of yoke G′ by lock-nuts *i*. The tubular actuating-rods I I pass through stuffing-boxes in the flume-heads J and are screwed into outer yokes L, but do not pass through said yokes. The extent to which these rods I I pass into said yokes is shown in Fig. 5. In the outer face of each of said yokes L there is formed a stuffing-box I″, through which the inner gate-actuating rod I′ passes. The two ends L′ of said yoke L receive the inner ends of racks M M, which are secured to said ends by lock-nuts *m m*. The yoke L is moved by these racks, and with said yoke the outer rod I is likewise moved. Racks M M gear with pinions N, which are on the shaft with larger pinions O. On the outer end of the inner actuating-rod I′ there is a double-faced rack P, which also meshes with the two pinions N. It will therefore be seen that the rods I I′ are moved simultaneously in opposite directions in opening and closing the gates. Wheels O and pinions N are driven from a large spur-wheel Q, which is splined to the end of lower shaft *q*. The two wheels O gear together, and the upper shaft *q′* is driven from the lower shaft *q*. Wheel Q is driven by an ordinary means of conveying motion thereto.

Referring to Fig. 3, the upper and lower racks M M are held in gear with pinions N N by means of two rollers N′ N′.

Referring to Fig. 2, it will be readily understood that the gates will have a uniform movement throughout. The yokes G G′, moving along the guide-rods F F, will impart such uniform movement to the gates through the gate-stems H H, which are made secure to said yokes and to the gates. It will therefore be impossible to impart any uneven lateral movement to the gates.

Referring to Fig. 6, X designates the neck of the quarter-turn X′, through which the wheel-shaft passes. W is a cover-plate containing an ordinary packing-box. The said plate is bolted to the neck X. Upon this plate are arranged bosses through which adjusting-screws V pass. U designates a concave or cup casting into which fits a safety-step T, made of hard wood or other suitable material. S designates a split clamp-collar secured to the shaft and bearing against the safety-step T. The safety-step is adjustable endwise in the neck X and against the clamp S by means of the adjusting-screws V, acting upon the concave U.

Having described my invention, I claim—

1. In a water-wheel, the combination with outer cylinders, cylinder-gates within said outer cylinders, guide-lugs on the interior of said outer cylinders along which said gates are movable, gate-stems secured to opposite points of said gates, yokes to which said gate-stems are attached, guides interposed between the outer cylinders at opposite points and upon which the yokes are supported and moved, tubular actuating-rods attached to opposite ends of one of said yokes, and actuating-rods attached to the opposite ends of the other of said yokes and passing through said tubular rods, and means for imparting opposite movements to said actuating-rods whereby the yokes and the cylinder-gates are moved in opposite directions to open or close the gates, substantially as specified.

2. In a water-wheel, the combination with chute-cases, outer cylinders bolted to said chute-cases, domes bolted to said outer cylinders, and cylinder-gates within said outer cylinders, of gate-stems attached to opposite points of said gates and passing through said domes, yokes to the opposite ends of which the said gate-stems are attached, guides upon which said yokes are movable and are supported, said guides being interposed between the outer cylinders, tubular actuating-rods attached to one of said yokes, and actuating-rods attached to the other of said yokes, the last-named actuating-rods being in line with the tubular rods, and means for imparting opposite movements to said rods to open or close the gates through the movements of said yokes.

3. In a water-wheel, the combination of outer cylinders, cylinder-gates within said outer cylinders, gate-stems attached to said cylinder-gates and yokes, the point of attachments of said stems with the gates and yokes being in a common plane, guide-rods interposed between the outer cylinders in a plane with the gate-stems, said guide-rods providing supports for opposite ends of the yokes and upon which said yokes are movable, actuating-rods attached to said yokes in a plane with the gate-stems, and guide-rods, and means for imparting opposite movements to said actuating-rods to open or close the gates through the movement of the yokes, substantially as specified.

4. In a water-wheel, the combination with outer cylinders having guide-lugs on their opposite interior sides, cylinder-gates having exterior lugs between which the guide-lugs on the interior of outer cylinders project, means for adjusting the engagement between said lugs to insure a proper position of the gates, actuating-yokes, stems connecting the gates with said yokes, guides interposed between the outer cylinders upon which said yokes are supported and are movable, and means for moving said yokes in opposite directions to open or close the gates, substantially as specified.

5. In a turbine, the combination of a turbine-shaft, a cylinder-gate, stems attached to opposite points of said gate, a yoke surrounding the turbine-shaft and to which said stems

are attached, guides upon which said yoke is supported at opposite ends and is movable, actuating-rods attached to opposite ends of said yoke; the gate-stems, yoke-guides and actuating-rods all being arranged in a plane passing through the axis of the turbine-shaft, and means for imparting movement to said actuating-rods to move the yoke upon its supporting-guides to open and close the cylinder-gate.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN H. FELTHOUSEN,

Witnesses:

R. J. McCARTY,

C. M. THEOBALD.