

F. TRUMP.
WATER WHEEL.

No. 452,813.

Patented May 26, 1891.

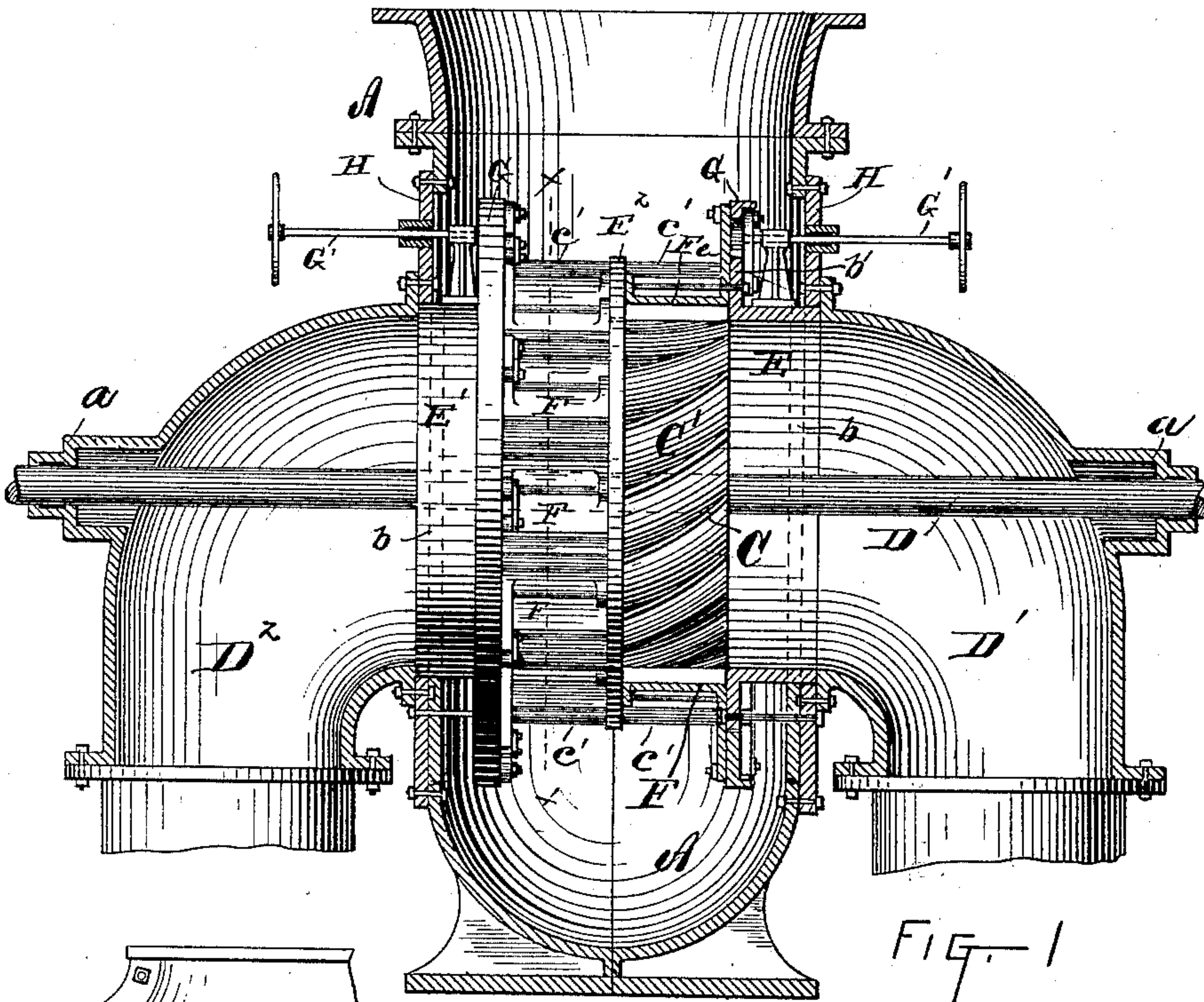


FIG. 1

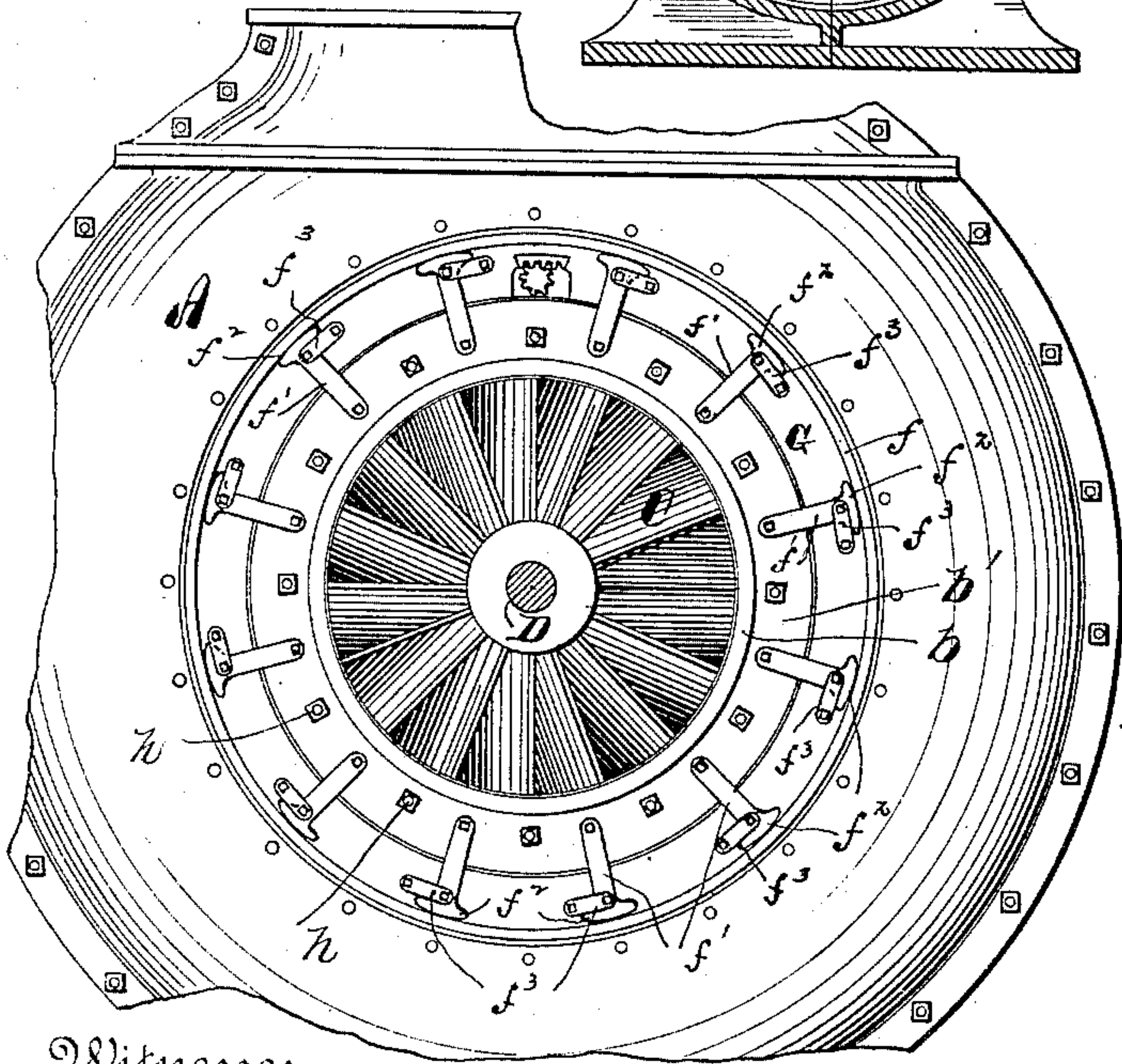


FIG. 2

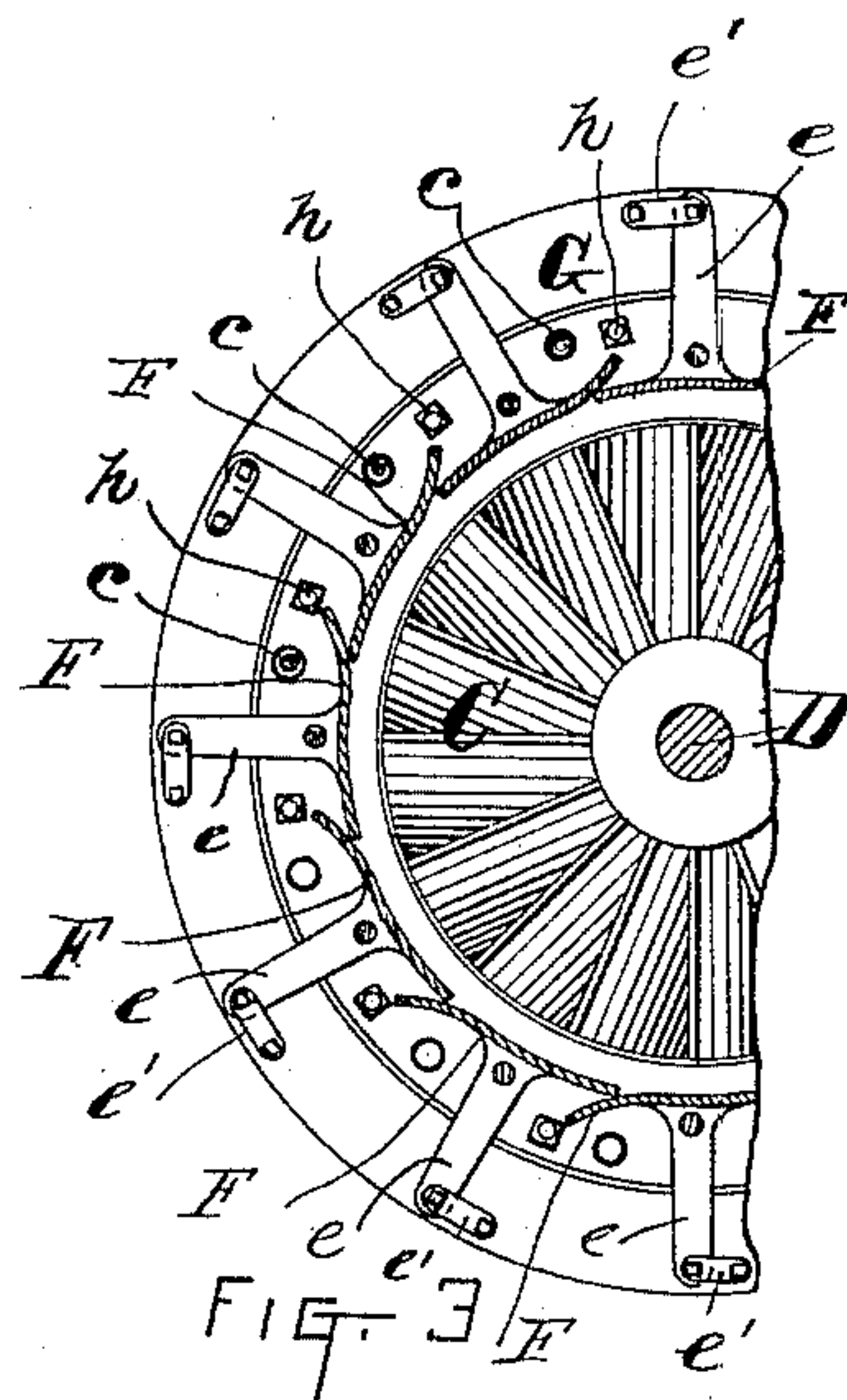


FIG. 3

Witnesses
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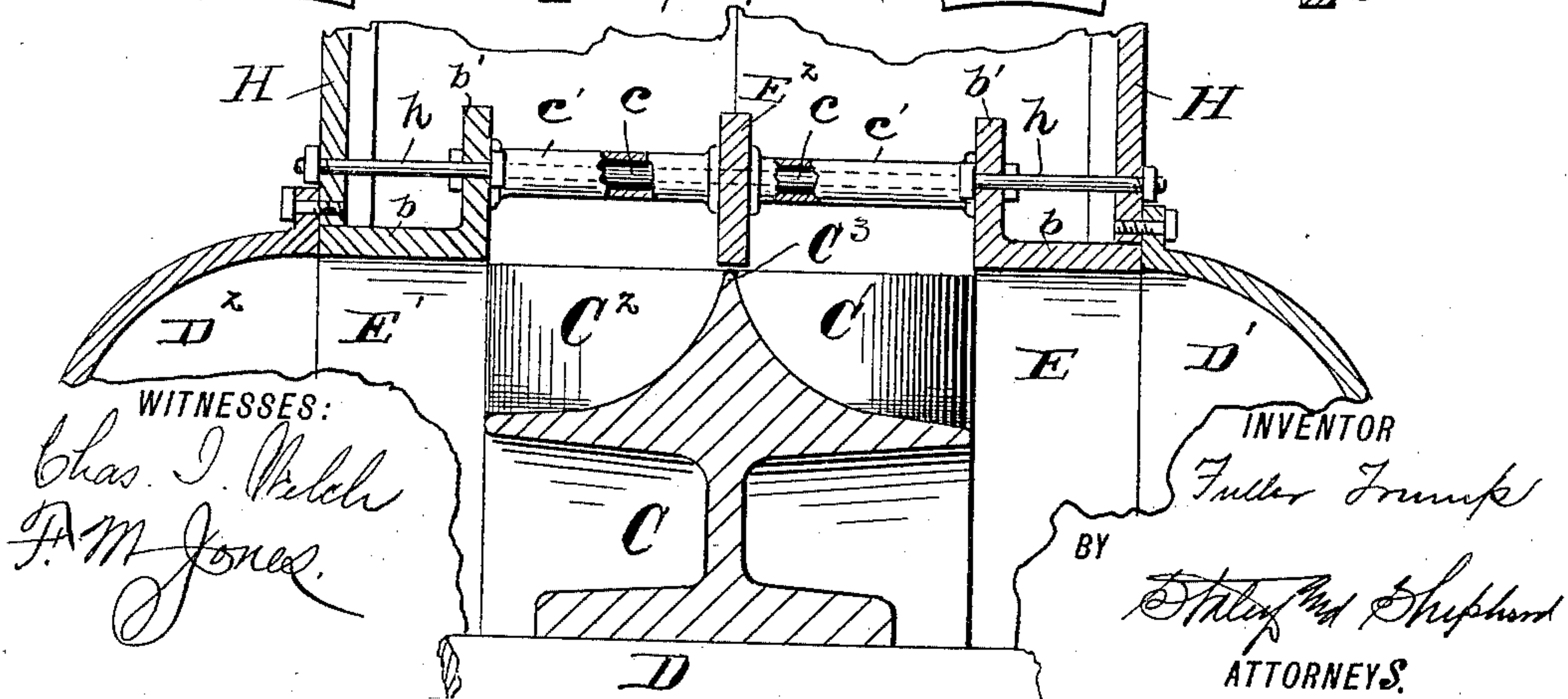
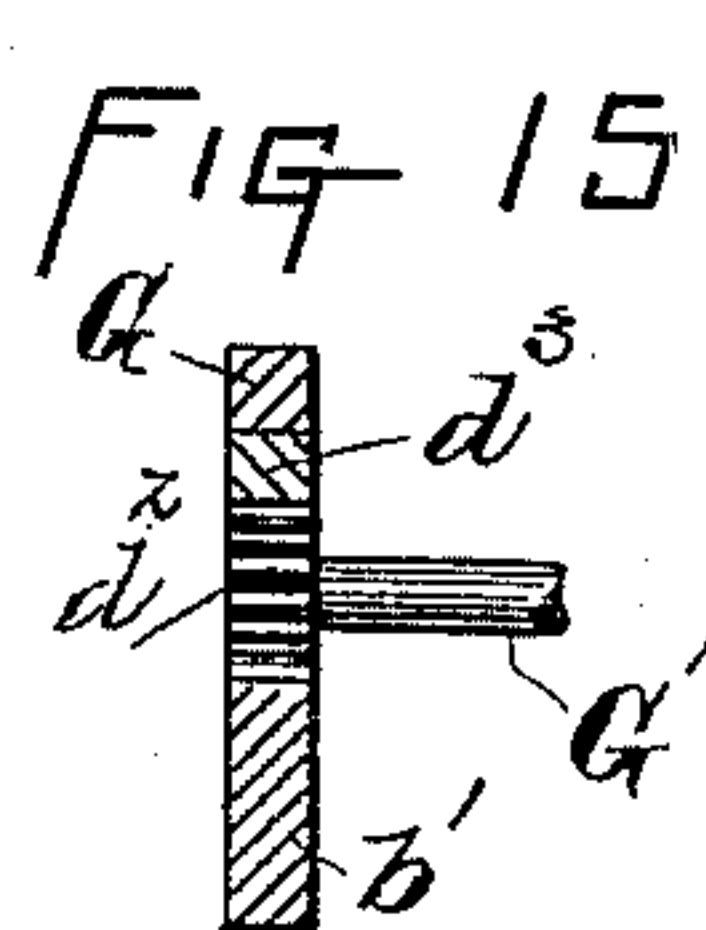
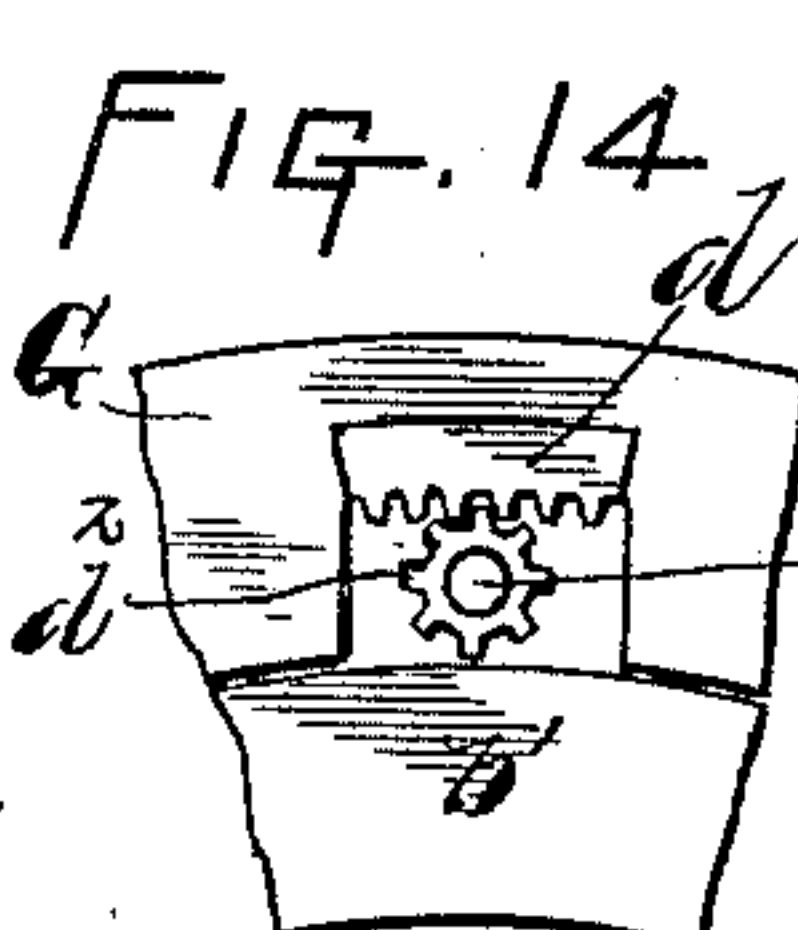
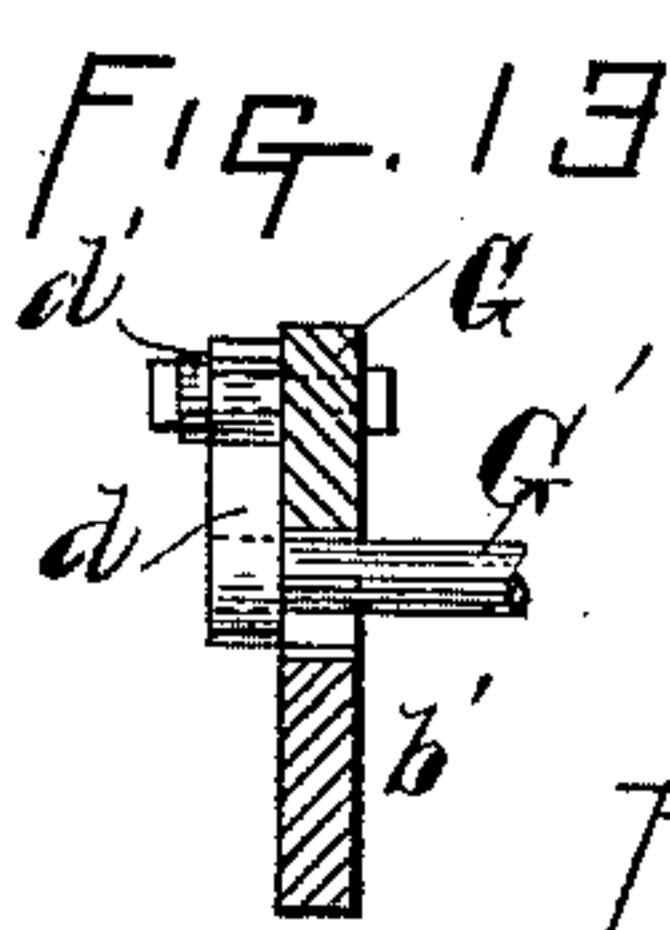
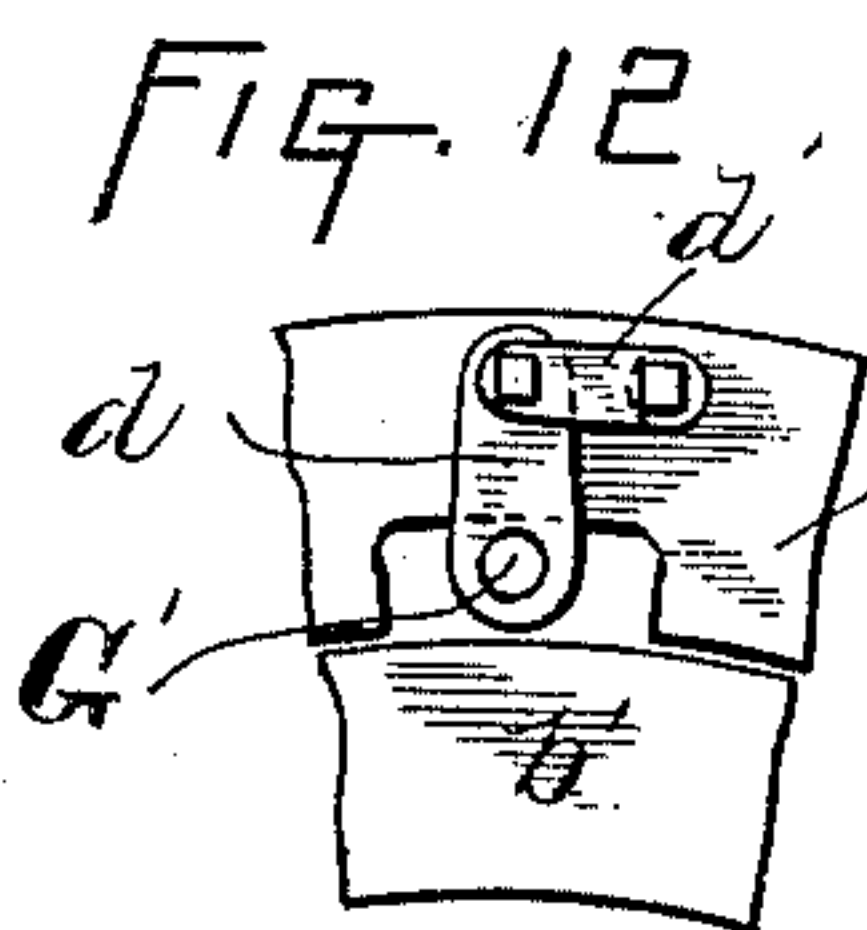
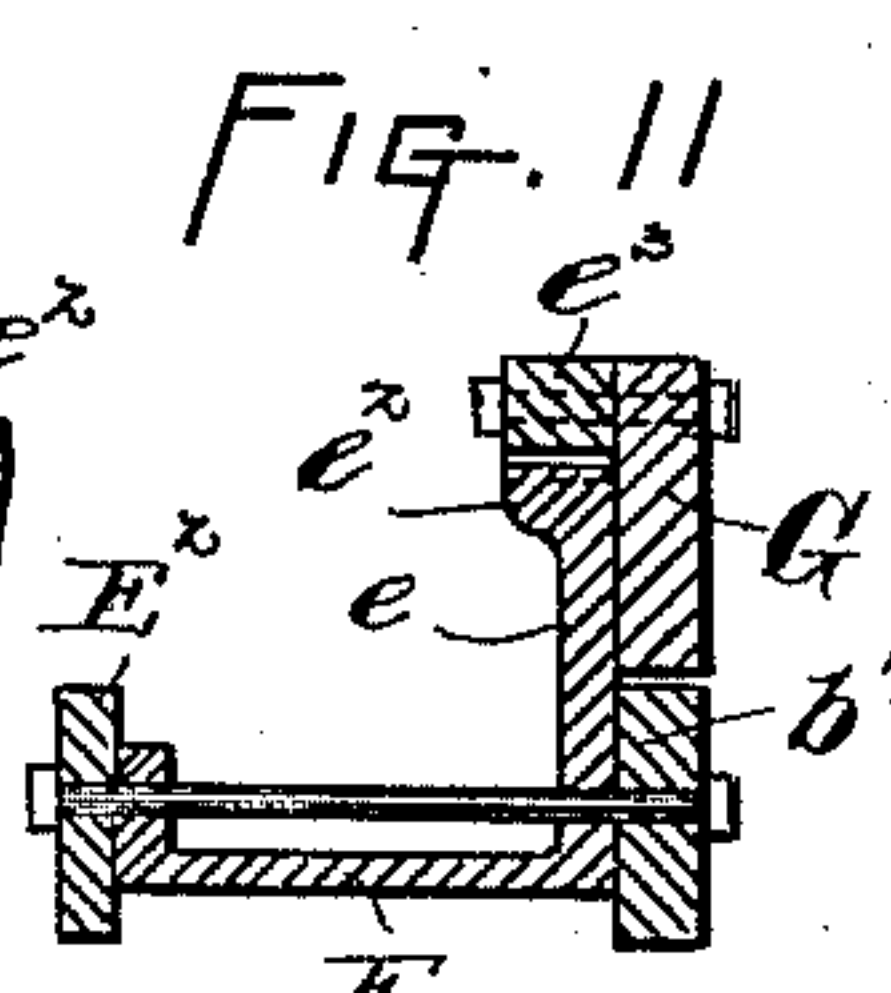
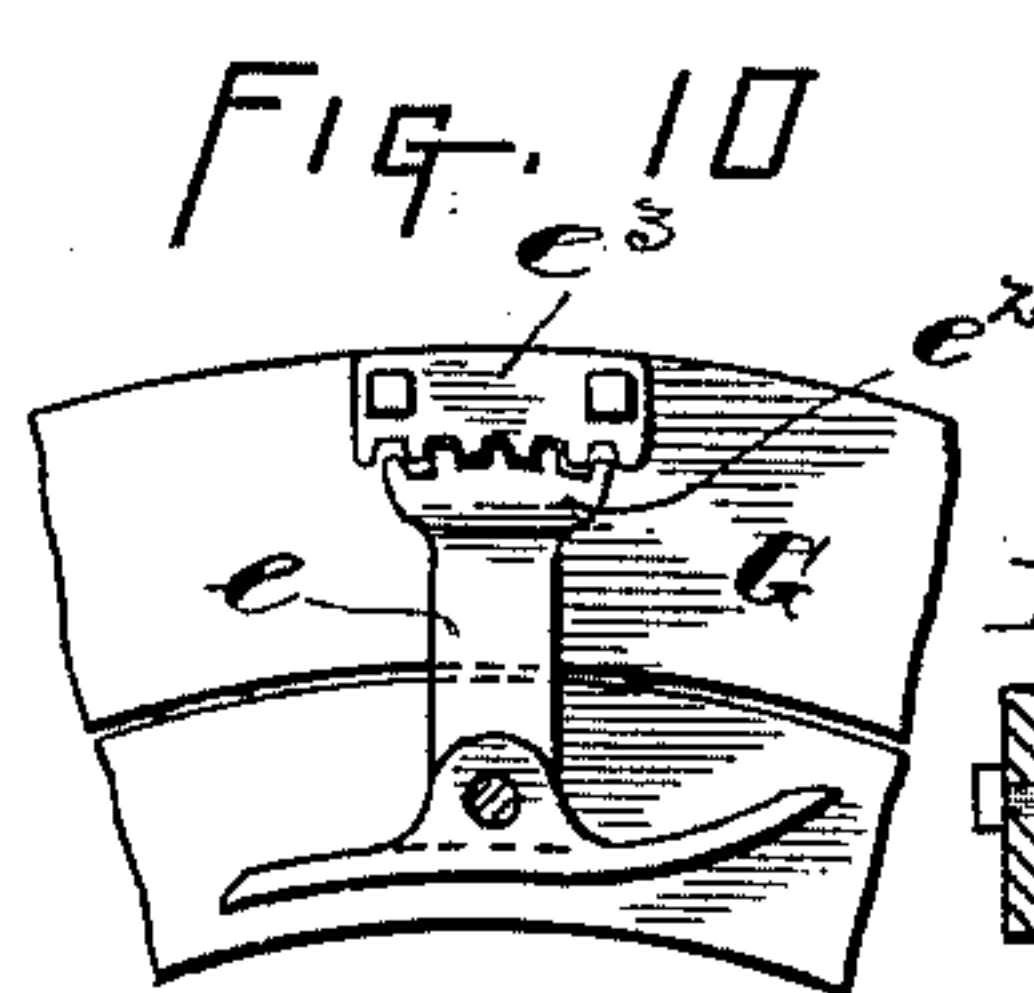
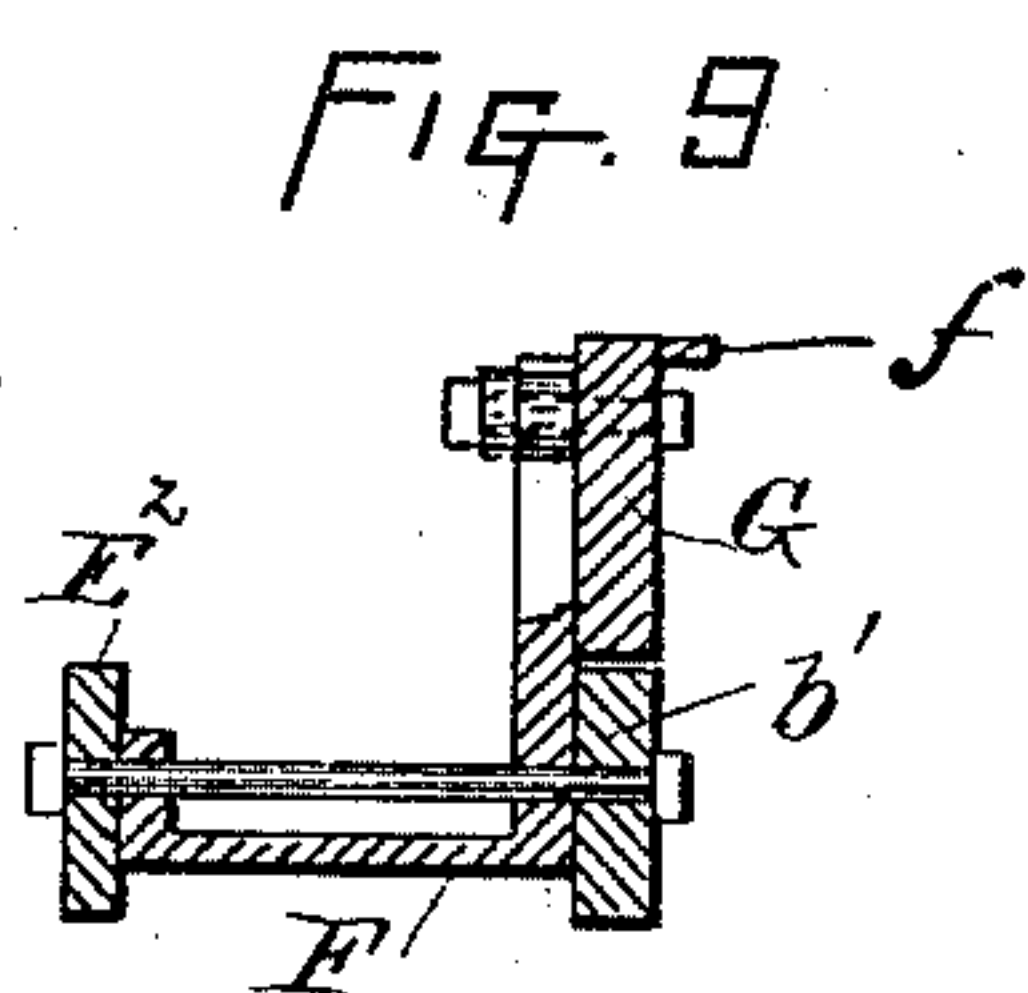
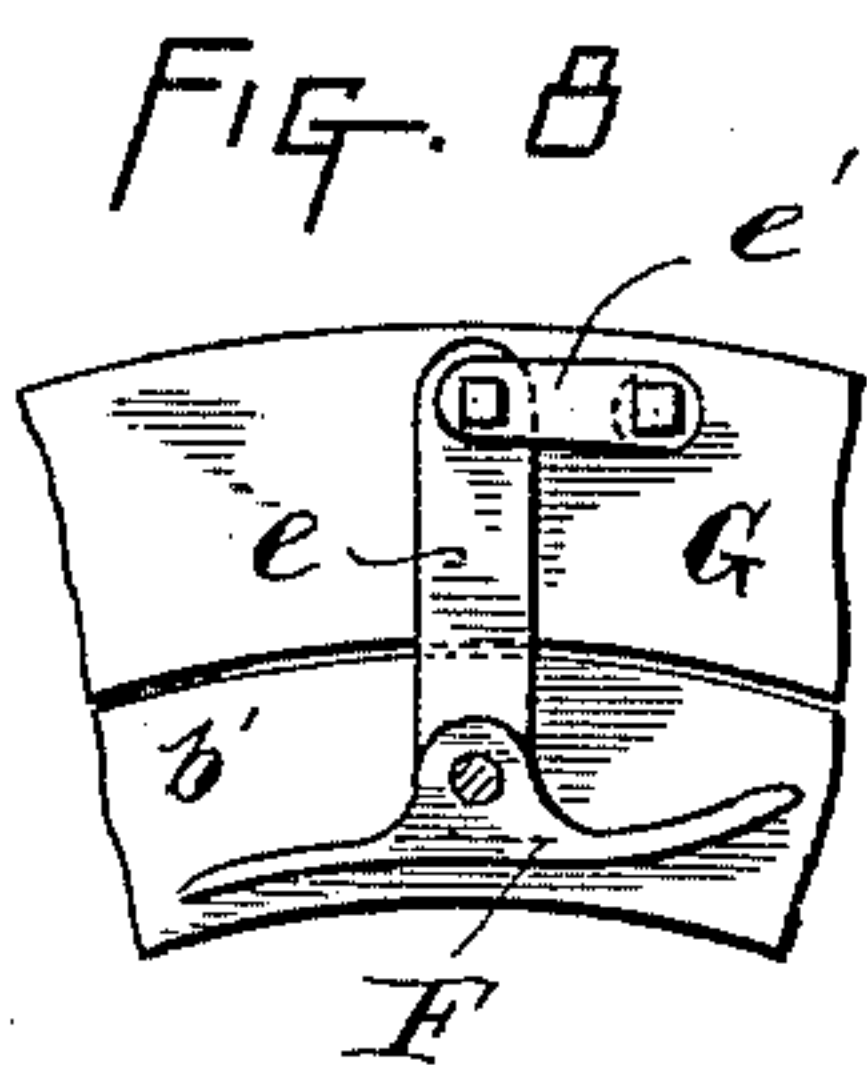
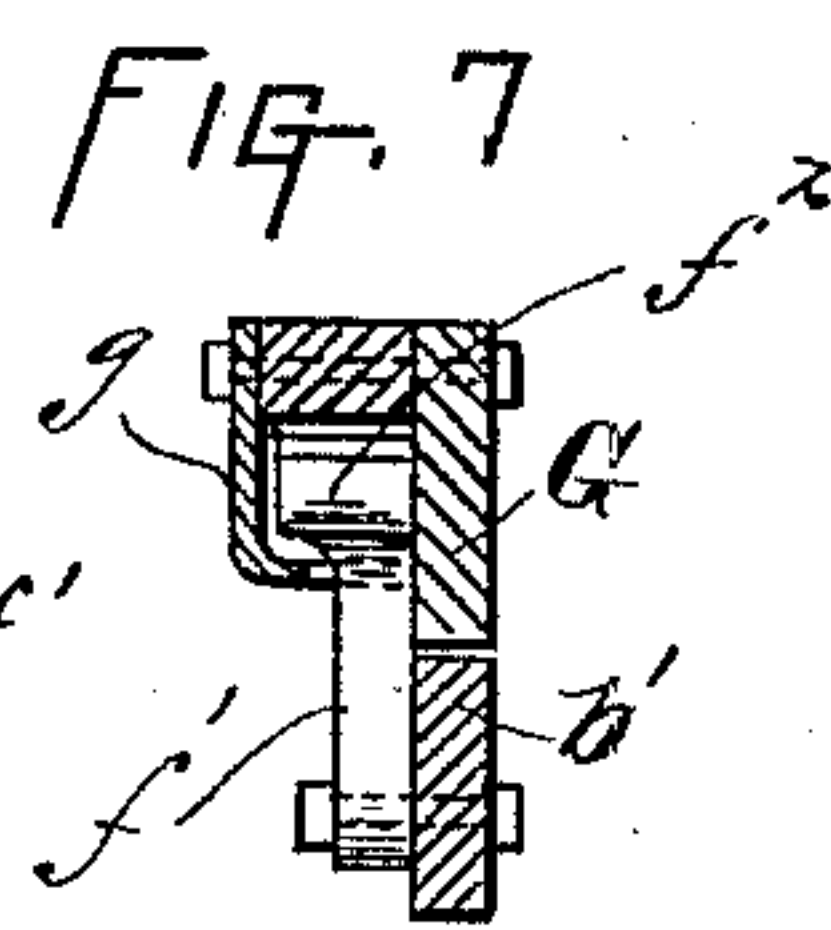
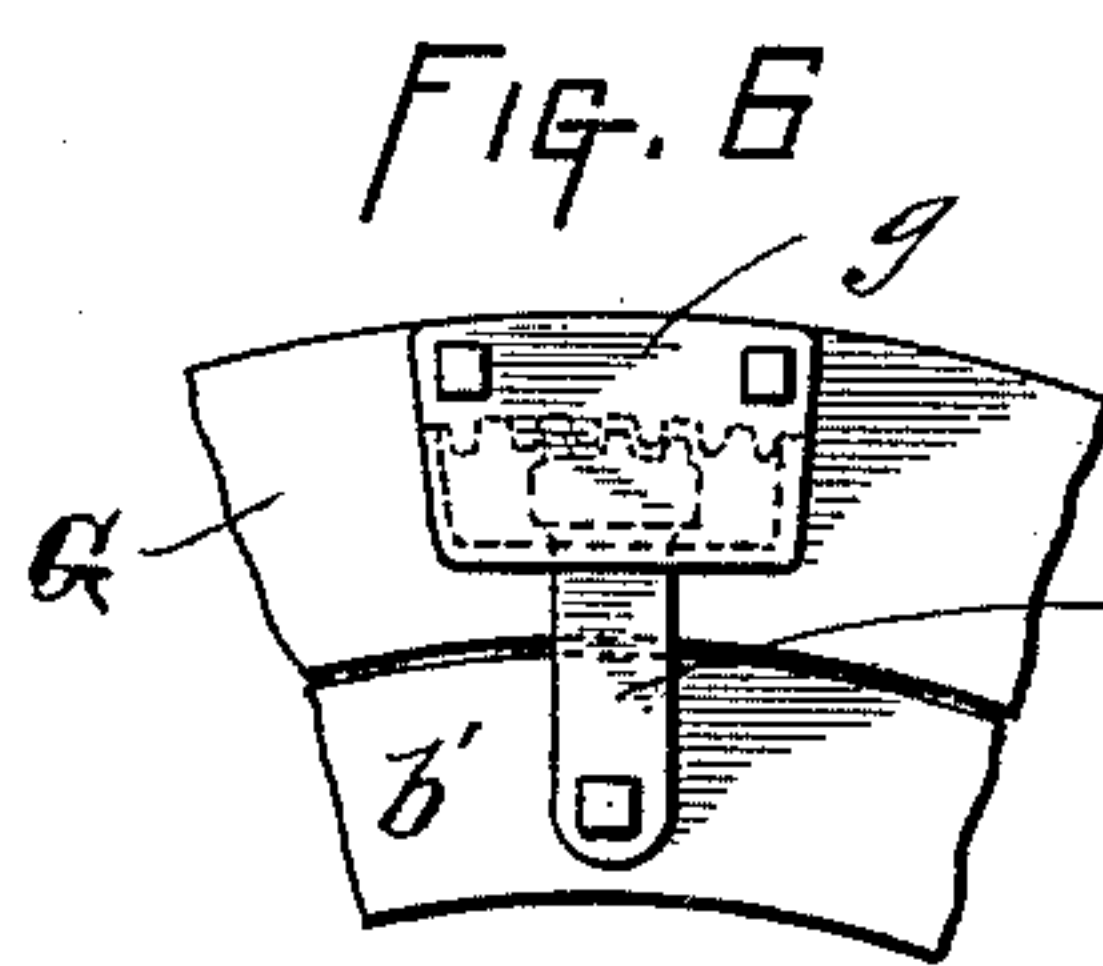
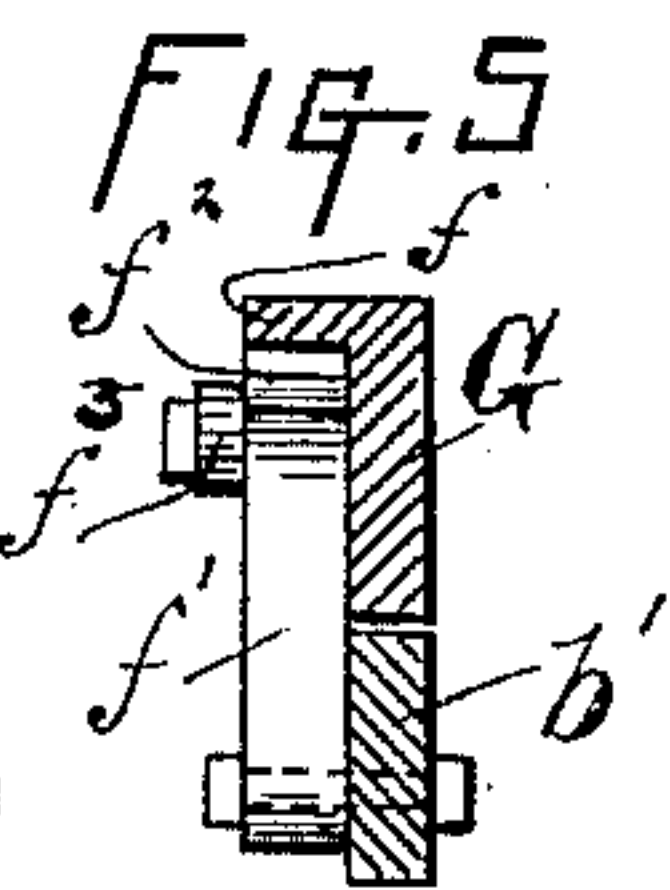
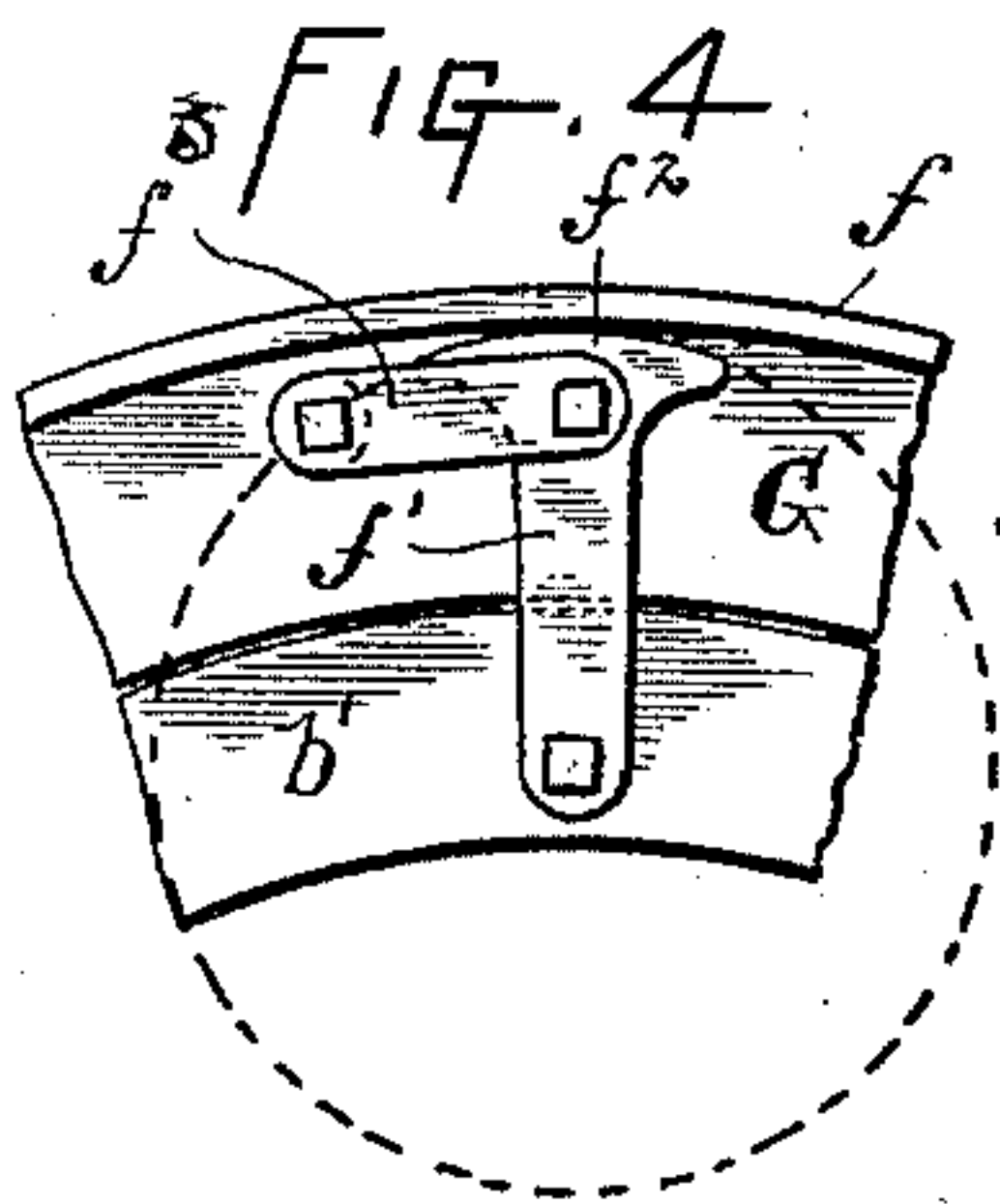
By

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F. TRUMP.
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INVENTOR

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UNITED STATES PATENT OFFICE.

FULLER TRUMP, OF SPRINGFIELD, OHIO.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 452,813, dated May 26, 1891.

Application filed January 9, 1891. Serial No. 377,215. (No model.)

To all whom it may concern:

Be it known that I, FULLER TRUMP, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Water-Wheels, of which the following is a specification.

My invention relates to that class of water-wheels known as "turbine water-wheels," and it especially relates to wheels of the vertical type which are mounted on a horizontal shaft within a suitable casing.

The object of my invention is to provide a double wheel so constructed and arranged that the motive power may be applied to one or both parts of said wheel, as desired, the construction being such that end-thrust on the supporting-shaft is obviated whether operating as a single or double wheel.

A further object of my invention is to provide novel constructions in the gate-operating mechanism. I attain these objects by the constructions shown in the accompanying drawings, in which—

Figure 1 is a vertical sectional elevation of a device embodying my invention, the outer casing or flume being shown in section, with the inner casing of the wheel partly in section and partly in full. Fig. 2 is a side elevation of the same with one of the side plates and the discharge pipe or flume removed. Fig. 3 is a partial sectional view on the line xx in Fig. 1. Figs. 4 to 15, inclusive, are detailed views of the gate-operating mechanism and modifications thereof. Fig. 16 is a partial sectional view of the inner casing and wheel, showing the arrangement of the gates with reference to said wheel.

Like parts are indicated by similar letters of reference throughout the several views.

In the said drawings, $A A$ represent the outer casing or flume, in which is located an inner casing $B B$, which inner casing contains the wheel proper C .

The wheel proper is supported on a horizontal shaft D , which extends entirely through the said wheel and casing and is supported in suitable bearings a in the side or discharge flumes $D' D^2$, the shaft D being extended as desired and provided with suitable pulleys or other power-transmitting devices.

The inner casing, which surrounds the

wheel proper, consists, essentially, of the side rings E and E' , each of which is formed substantially L-shaped in cross-section, with a horizontal annular flange b and a vertical peripheral flange b' , the vertical peripheral flanges of said casing being connected together and to a central ring or flange E^2 by tie-bolts c , which extend through said flanges and through spacing sleeves or columns c' , arranged between the respective flanges in a well-known manner. The horizontal projecting annular flanges b are extended to the side of the outer casing A , so that the inside of said flanges communicates with the discharge-flumes $D' D^2$, but has no communication with the outer casing, except through the wheel in the manner hereinafter more fully described.

The space between the respective rings E E' E^2 is closed by pivoted gates F , these gates being adapted to be moved about their pivotal centers, so that the back of one gate comes against the front of another and thus completely incloses the wheel, or, when moved in the opposite direction, to form openings between the respective gates, so as to establish a communication from the outer casing to the wheel proper in a well-known manner.

The wheel C is formed with two separate though integral parts C' and C^2 , each provided with a separate series of buckets, which may be of any desirable shape, to receive the water admitted through the gates and discharge it through the side flumes D and D' . The respective series of buckets are separated from each other by a central flange or diaphragm C^3 , which is located in the same plane with the central ring or flange E^2 of the wheel-casing.

Each set of gates lying adjacent to the respective series of buckets is provided with separate operating mechanism, so that one set of gates may be opened or closed independent of the other set of gates in the manner more particularly described hereinafter, so that the water may be admitted to either one side or the other of said wheel, or to both, as desired.

In operating wheels of this character, when there is but a single discharge-opening at one side of the wheel and an oppositely-arranged cover or casing, there is a heavy end-thrust

imparted to the supporting-shaft in the direction toward which the water is discharged, caused by the pressure of the water which accumulates between the wheel proper and that part of the casing which is opposite to the discharge-opening.

By the arrangement of the wheel herein described with a double set of buckets separated by a central flange or diaphragm, which is located on a line with the dividing-wall between the separate sets of gates, water may be admitted to one side of the wheel only and discharged from that side without the resulting end-thrust referred to, inasmuch as there is no opposing casing or cover, and any leakage of water past the central flange or diaphragm is discharged through the other wheel or through the other discharge pipe or flume.

It is obvious that when both sets of buckets are supplied with water the water is discharged in opposite directions from the respective series of buckets, and, the pressure being the same on each series, no leakage can take place; but any end-thrust which would result from the action of one wheel would be counteracted by an opposing action in the other wheel.

To provide for simultaneously and uniformly opening and closing the respective gates upon either side of the wheel, I employ an outer gate-operating ring G, preferably arranged in line with or in the same plane with the vertical flange b' of the side rings of the wheel-casing. Means are employed for imparting a rotary movement to this ring from the outside of the outer casing, which may be accomplished by a small shaft G' , provided with a suitable hand-wheel and extended through a suitable stuffing-box in the side of the casing and connected to said ring, so that a revolving movement of said shaft will produce a corresponding movement of said ring. This may be accomplished, as shown in Figs. 12 and 13, by means of a rocking arm d on the end of said shaft, connected by a pivoted link d' to the ring G, or, as shown in Figs. 14 and 15, by a pinion d^2 on the shaft engaging with a suitable rack-segment d^3 , secured in said ring. The gates are each connected to the operating-ring, so that a movement of said ring will be transmitted uniformly and simultaneously to said gates. This may be accomplished, as shown in Figs. 8 and 9, by providing an extended arm e on each of said gates and a connecting-link e' from said arm to said ring, or by providing said arm with a segment of gear e^2 , adapted to engage with a similar gear e^3 on the operating-ring.

To prevent cramping of parts and to furnish means whereby the ring G may be moved with as little friction as possible, I provide for said ring rolling supports between the said ring and the wheel-casing and connect said supports to the ring in such a manner that they are moved positively as the ring is moved, so that a positive rolling motion is secured between the parts. This I preferably

accomplish as follows: On that side of the ring G opposite to the gate-arms and their connections I provide a laterally-projecting flange f , and at intervals about the side rings of the wheel-casing I pivot supporting-arms f' , provided on their outer extremities with a segmental rim f^2 , formed on the arc of a circle whose center is at the pivotal point of said supporting-arm, this segmental rim being adapted to engage with the flange f and form a support for said ring. To provide for positively moving said supporting-arm, so as to produce a rolling motion between the contacting faces of said flange and arm, I form a positive connection from said arm to said ring, preferably as shown in Figs. 4 and 5, by a pivoted link-connection f^3 , connected at one end to said arm and at the other to said ring, or, as shown in Figs. 6 and 7, by gear-teeth arranged on the projecting flange and the end of said arm, substantially as before described, for the connection between the gate and ring.

When the gear-connection is provided, instead of having a continuous flange f , I preferably form said flange in the nature of segments bolted or otherwise secured to the side of the operating-ring, the gear-teeth in the respective parts being preferably cut so as to fit and operate smoothly together.

To prevent dirt and foreign substances from entering the teeth and interfering with the operation thereof, I employ a cap or cover g , adapted to surround the segments on the ring and arm, respectively, the said cap or cover being formed so as to fit over the respective segments and be bolted thereto and to the operating-ring by the same bolts which secure the gear-segments to said ring. It will be seen that by the device as thus described any movement of the ring is transmitted positively to the supporting-arms, the outer extremity of each of said arms being substantially the segment of a periphery of a wheel whose diameter is equal to twice the length of said arm. The rolling movement between the parts reduces the friction of the ring to the minimum, while the positive movement between the respective parts prevents any sticking or cramping and the wear resulting therefrom.

To provide for staying or holding the outer casing and the inner casing firmly together against the pressure which results when the outer casing or flume is located at the bottom of a considerable head or fall, I provide a series of stay rods or bolts h , extending from the vertical flange of the respective side rings of said casing to the side of said outer casing or flume. To prevent cramping or springing of the side rings forming a part of the inner casing, I locate these stay-bolts in proximity to the column or tie bolts c , which connect the respective rings of the casing and locate said bolts on a line with the said tie or column bolts, the line of centers of said bolts representing a circle whose center is coincident with the center of the casing-ring.

In the drawings I have shown the outer casing provided at each side with an opening large enough to permit the insertion or removal of the inner casing and the wheel there-
 5 in contained, this opening being closed by a removable plate H, the discharge pipe or flumes D' D² being connected to said plate, and in this construction the stay rods or bolts
 10 h are connected to the removable cover or plate H. It is obvious, however, that one or both of the removable plates may be dispensed with, in which case the stay-rods are connected directly to the side of the flume.

It is obvious that the devices as thus de-
 15 scribed admit of modifications other than those set forth. I do not, therefore, limit myself to the exact constructions described; but I claim as my invention—

1. The combination, with an outer casing
 20 or flume and an inner wheel-casing, said inner casing being composed of annular flanges or rings connected by tie-bolts, as described, of stay-bolts connecting said rings to the outer casing or flume in line with the tie-bolts
 25 connecting said rings, substantially as specified.

2. The combination, with an outer flume or casing and an inner wheel-casing, said inner casing being composed of annular flanges or
 30 rings connected together by column or tie bolts, and pivoted gates between said flanges, of stay-bolts connecting said flanges or rings to the outer flume or casing, said stay-bolts being arranged in proximity to said column-
 35 bolts, substantially as specified.

3. The combination, with a wheel-casing having pivoted gates therein, of a gate-operating ring connected to each of said gates, said ring being supported on movable arms
 40 pivoted to the wheel-casing independent of the gates, said pivoted arms being connected to said ring so as to move positively by a movement of said ring, substantially as specified.

4. The combination, with the outer casing
 45 having the gates pivoted therein, of a gate-operating ring supported about the outer casing by pivoted supports, said pivoted supports being connected to said ring, so as to be

moved positively thereby, and a connection from each of said gates to said ring independent of said supports, substantially as specified. 50

5. The combination, with an outer casing and the gates pivoted therein, of a gate-operating ring supported about said outer casing by pivoted movable supports adapted to form
 55 rolling bearings for said ring, said ring being connected to each of said gates, and means for producing a positive movement of said rolling supports as the ring is moved to open or close said gates, substantially as specified. 60

6. The combination, with an outer casing having the gates pivoted therein, of a gate-operating ring supported about said casing by movable pivoted supports adapted to form
 65 roller-bearings for said ring, positive connections between said ring and bearings, and means for operating said ring to produce a uniform and simultaneous movement of said gates, substantially as specified.

7. The combination, with a wheel-casing
 70 having pivoted gates, of an outer gate-operating ring supported on pivoted supporting-arms adapted to form roller-bearings for said ring, a connection from each of said gates to said ring, a lateral flange on said ring
 75 adapted to come in contact with said pivoted supports, and a connecting-link from each of said pivoted supports to said ring, substantially as specified.

8. The combination, with an outer casing
 80 or flume and an inner wheel-casing having gates pivoted therein, each connected to a common gate-operating ring, of pivoted supports adapted to form roller-bearings for said ring about said casing, positive connections be-
 85 tween said pivoted supports and said ring, and means for operating said ring from the outside of said flume or casing, substantially as specified.

In testimony whereof I have hereunto set
 90 my hand this 2d day of January, A. D. 1891.

FULLER TRUMP.

Witnesses:

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 F. M. JONES.