No. 608,203. Patented Aug. 2, 1898.

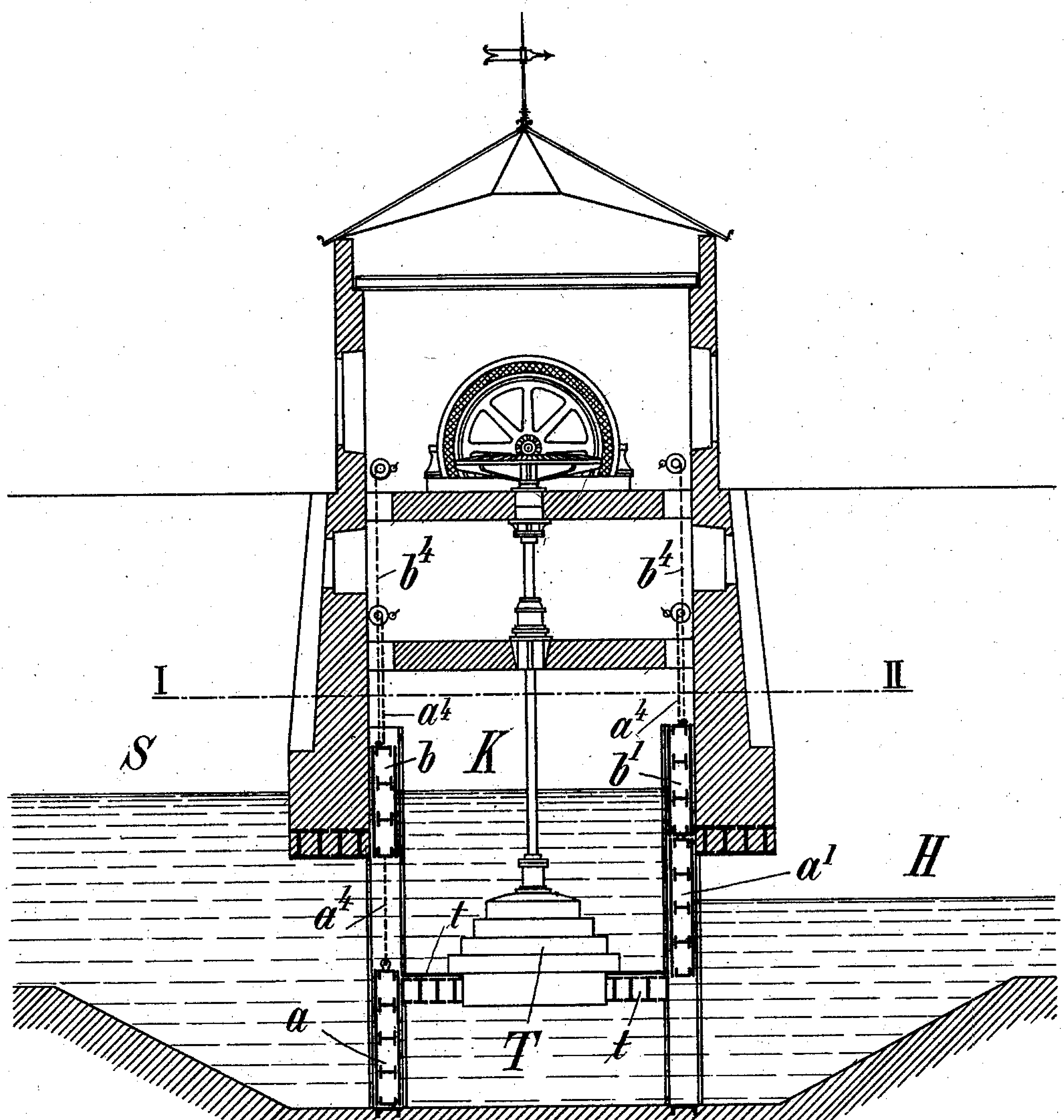
J. F. R. KNOBLOCH.

TIDAL MOTOR.

(Application filed Dec. 24, 1897.)

(No Model.) 3 Sheets—Sheet I.

Fig. 1.



Inventor.
Johann Ferdinand Robert Knobloch.
by [signature] Atty.

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Fig. 2.

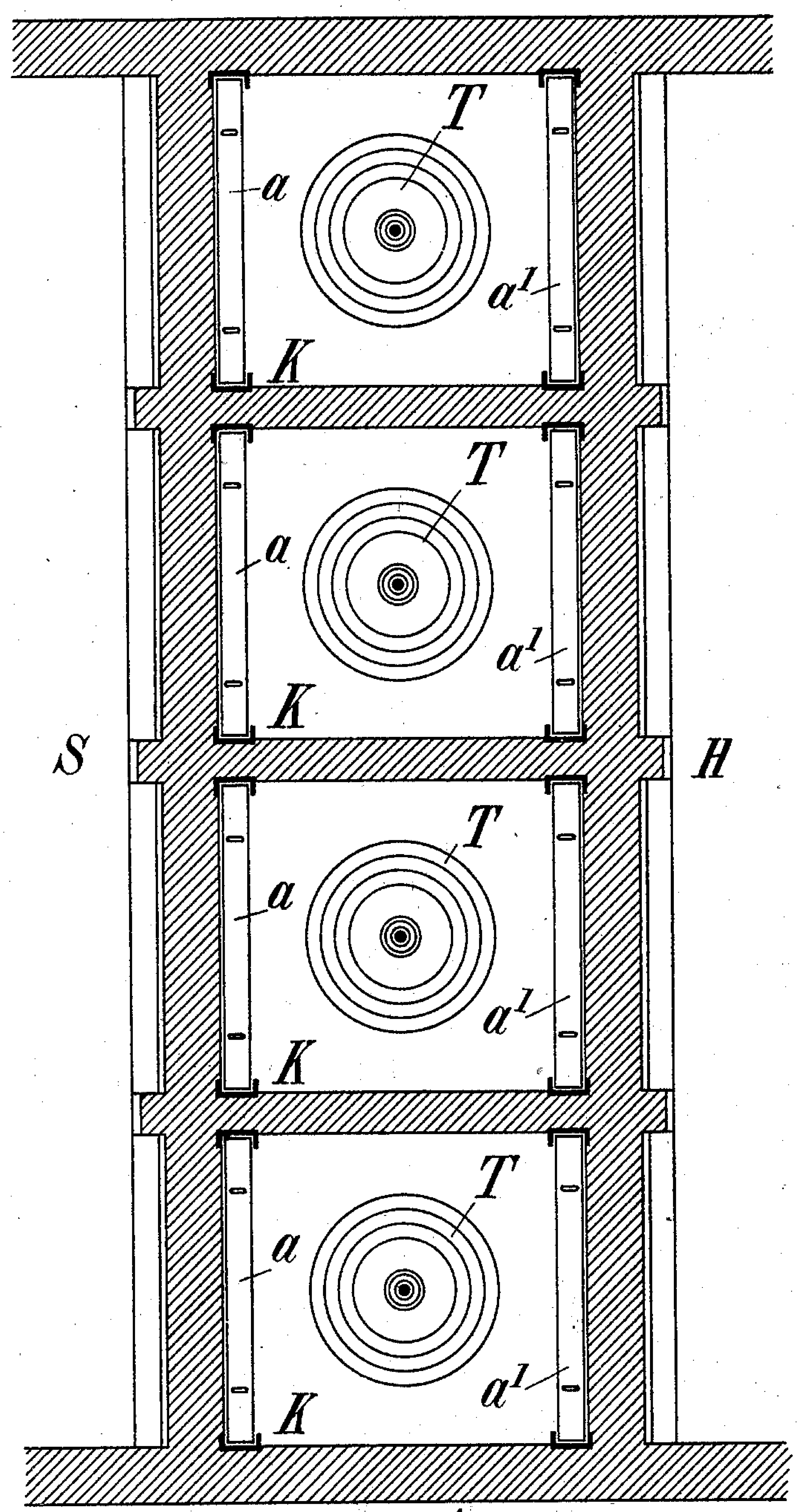

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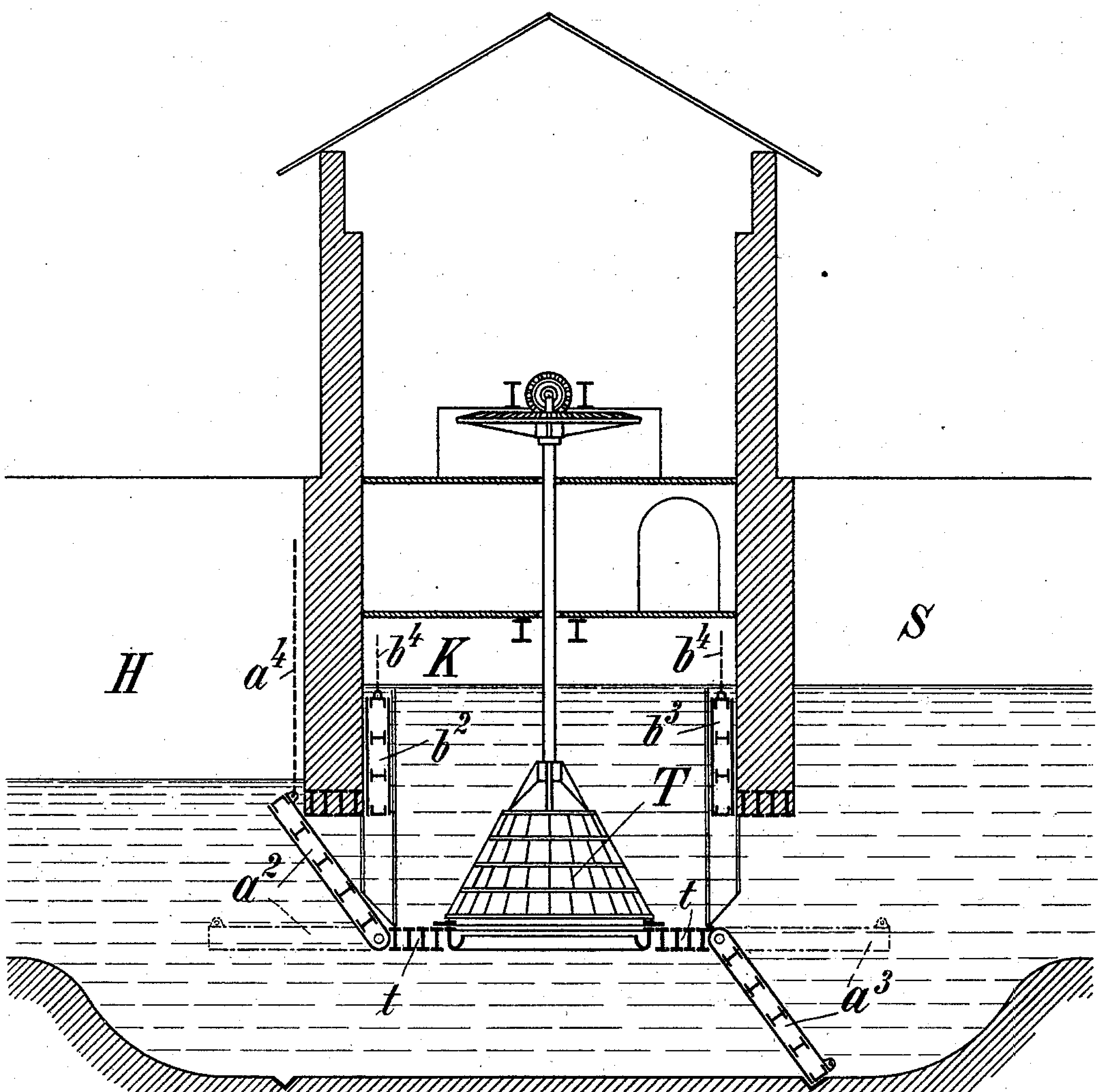
Fig. 3.



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by [signature] Atty.

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UNITED STATES PATENT OFFICE.

JOHANN FERDINAND ROBERT KNOBLOCH, OF HAMBURG, GERMANY.

TIDAL MOTOR.

SPECIFICATION forming part of Letters Patent No. 608,203, dated August 2, 1898.

Application filed December 24, 1897. Serial No. 663,391. (No model.)

To all whom it may concern:

Be it known that I, JOHANN FERDINAND ROBERT KNOBLOCH, a subject of the German Emperor, and a resident of Hamburg, in the German Empire, have invented certain new and useful Improvements in Tidal Motors, of which the following is a specification.

This invention has relation to that class of motors deriving their motive power from water the level of which changes periodically from a maximum to a minimum height, as is the case in tidal water; and it has for its object certain improvements whereby these variations in the level of the water are more effectually utilized and the installation of the motor materially simplified.

In the accompanying drawings, Figure 1 is a vertical transverse section of a tidal-motor station embodying my improvements; Fig. 2, a longitudinal horizontal section thereof, taken on line I II of Fig. 1, the auxiliary gates being omitted; and Fig. 3 is a view similar to Fig. 1, illustrating a modification in the arrangement of the main gates.

In order that tidal power may be rendered available both during the flow and ebb of the tide, I provide on the land side of the motor-station a reservoir H, whose bottom level may have such a relation to the sea-level where the station is established as to contain little or no water at the beginning of the flow or at low water. I preferably use a reaction-turbine T, so located relatively to the low-water level as to be at all times immersed in water, and provide below the turbine-floor a water-chamber. Both the turbine-chamber K and the chamber below it are provided with two waterways, respectively facing the sea S and the land-side reservoir H, said waterways being controlled by two main gates, a and a', respectively. The turbine-spindle extends up into the turbine-chamber K and is connected by bevel-gearing to a power-transmitting shaft or to the shaft of a dynamo, for instance.

The main gates a and a' are hung from chains a^4, which are carried over suitable pulleys, whereby said gates can be lifted and lowered by any desired means, said gates being guided in housings in which the waterways are formed and to which housings the water has free access to buoy the gates to a certain extent, so as to reduce the power required to lift the same.

Assuming the tide to be flowing, it is obvious that if the gate a is lowered to close the waterway facing the sea S below the turbine-floor t and closing the waterway facing the land-side reservoir H above said turbine-floor by means of the gate a' the water from the sea will flow into turbine-chamber K through turbine T, revolving the same, to the chamber below it, and thence by the waterway facing the reservoir H below the turbine-floor to said reservoir. This will continue until flood-tide, when the sea and the water in reservoir H will be on a level. When the ebb begins, the relative positions of the gates a and a' are reversed, the gate a closing the waterway facing the sea above the turbine-floor and the gate a' closing the waterway facing the reservoir below the turbine-floor t, the water from the reservoir flowing into the turbine-chamber K through the waterway facing said reservoir above the floor t, through the turbine into the chamber below the same, and thence to the sea by the waterway facing it below the turbine-floor. It will be observed that although the water during flood-tide flows into the turbine-chamber above its floor to the reservoir H by way of the chamber below said floor and in a reverse direction from the said reservoir to the sea during the ebbing tide, yet the action of the water upon the turbine T will be such as to revolve it in one and the same direction. Hence mechanism for changing the direction of motion of the power-transmitting appliances is not required.

Just before the period of flood and ebb tide the available power grows gradually less, and in order to afford free passage of the sea or reservoir water through the turbine-chamber K until the sea is on a level with the water in the reservoir H the gates a and a' are raised into their housings above the waterways in the turbine-chamber K. In this manner the equalization of the water-level on opposite sides of the turbine-chamber can be effected in the most expeditious manner possible after each period of flood and ebb, which is of importance.

It is obvious that with the described arrangement of gates it is possible to regulate within certain limits the difference in the level of the water on opposite sides of the turbine-chamber K—as, for instance, by allowing more or less water to flow directly from one side to the other of the chamber through the passage below the turbine—thereby correspondingly reducing the volume of water flowing into the turbine-chamber. I prefer, however, to use separate level-regulating gates b and b', having motion in the housings of the main gates a and a' above the same, whereby the volume of water flowing into the turbine-chamber K from one or the other side during flow and ebb can be regulated. It is evident that if the gate b, Fig. 1, is lowered to more or less close the waterway on the sea side of the turbine-chamber K the flow of water therethrough will be correspondingly lessened. Consequently the rise of the water in the land-side reservoir will be slower relatively to the rise of the sea-water. This is of great importance in case the tide rises very rapidly or in case it is desired to regulate the speed of rotation of the turbine, so that by means of these auxiliary gates the difference in the level of the water at the inlet and outlet sides of the turbine-chamber can be regulated within certain limits.

Any desired number of turbine-chambers K can be arranged in the same building, as shown in Fig. 2, while the arrangement of the main gates may be varied.

In Fig. 3 I have shown main gates a^2 a^3 hinged to the floor of the turbine-chamber and adapted to be lowered or raised by chains, the auxiliary gates b b', Fig. 1, or b^2 b^3, Fig. 3, being likewise operated by means of chains by any desired lifting and lowering mechanism.

It is evident also that instead of causing the water to flow into the turbine-chamber through the turbine to a chamber below the same results are attained by causing the water to flow up from said lower chamber through the turbine, and thence out of the turbine-chamber by properly positioning the main gates—as, for instance, by reversing the position of the gates a a', Fig. 1, or a^2 a^3, Fig. 3.

The use of auxiliary gates b b' or b^2 b^3 has a further advantage in that at the turning of the tide from ebb to flow the water from the sea can be entirely shut off from the turbine-chamber until the tide has risen to a proper or to the desired height by lowering the gate b, Fig. 1, or the gate b^3, Fig. 3, as will be readily understood.

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

1. In a tidal motor, a turbine-chamber interposed between the sea and a reservoir on land, a turbine revoluble in fixed bearings in said chamber, a chamber below the turbine and communicating therewith, said turbine-chamber and the chamber below it being provided with waterways facing the sea, and reservoir, respectively, and a gate for each two of said waterways adapted to close or more or less close one and open or more or less open the other of said two waterways, for the purpose set forth.

2. In a tidal motor, a turbine-chamber interposed between the sea and a reservoir on land, a turbine revoluble in fixed bearings in said chamber, a chamber below the turbine and communicating therewith, said turbine-chamber and the chamber below it being provided with waterways facing the sea and reservoir, respectively, and a gate for each two of said waterways adapted to close or more or less close one, and open or more or less open the other of said two waterways, in combination with regulating devices for regulating the difference in the level of the water on opposite sides of the turbine-chamber, for the purpose set forth.

3. In a tidal motor, a turbine-chamber interposed between the sea and a reservoir on land, a turbine revoluble in fixed bearings in said chamber, a chamber below the turbine and communicating therewith, said turbine-chamber and the chamber below it being provided with waterways facing the sea and reservoir, respectively, and a gate for each two of said waterways adapted to close or more or less close one, and open or more or less open the other of said two waterways, in combination with auxiliary gates adapted to close or more or less close the waterways in the turbine-chamber, for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 10th day of December, 1897.

JOHANN FERDINAND ROBERT KNOBLOCH.

Witnesses:
MAX LEMCKE,
R. OSTERMEYER.