Examiner.

No. 822,253. PATENTED JUNE 5, 1906.

J. G. DORNBIRER.

METHOD OF OPERATING TURBINES.

APPLICATION FILED NOV. 10, 1904.

MOLTEN TIN AND STEAM

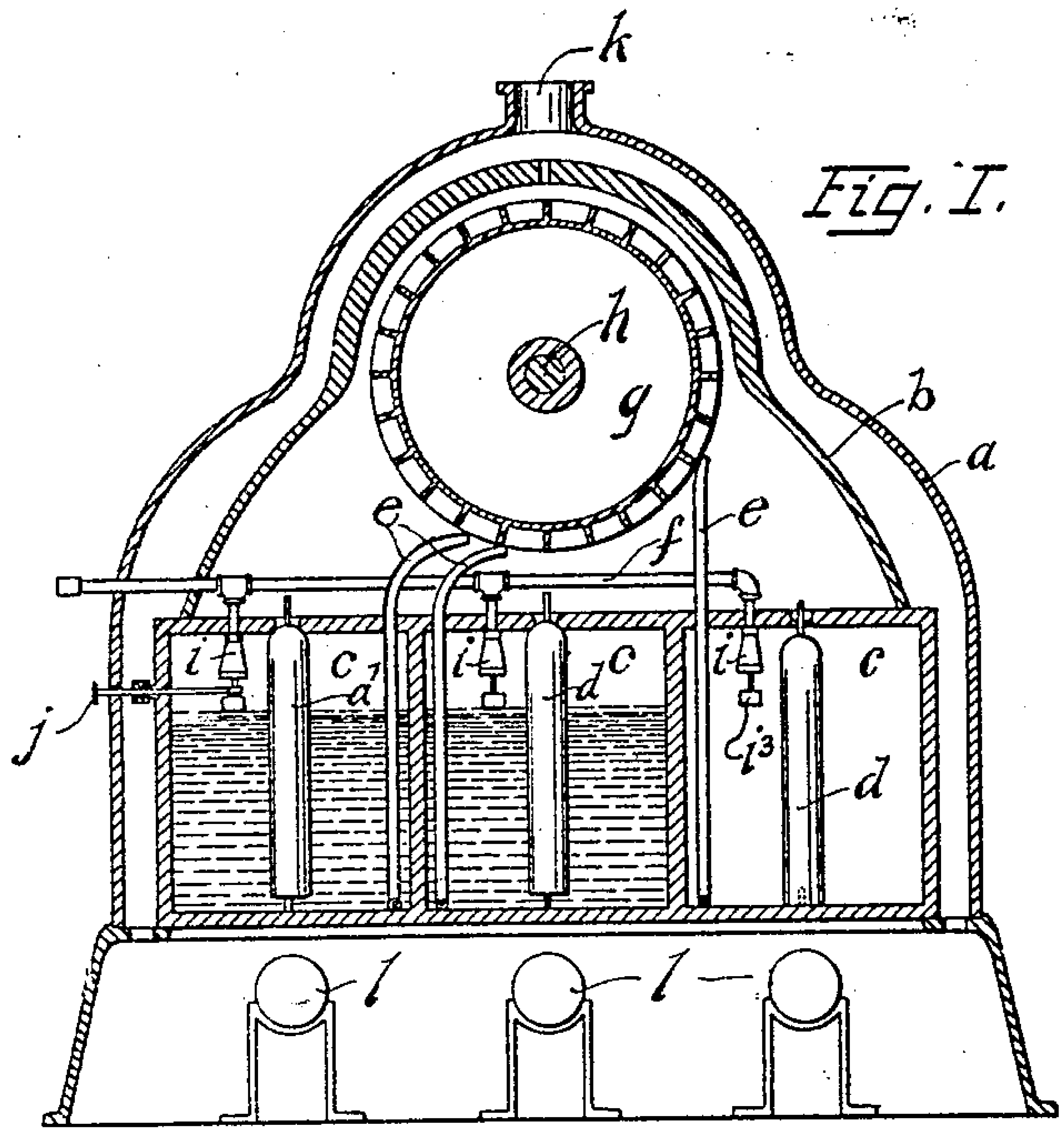

Fig. I.

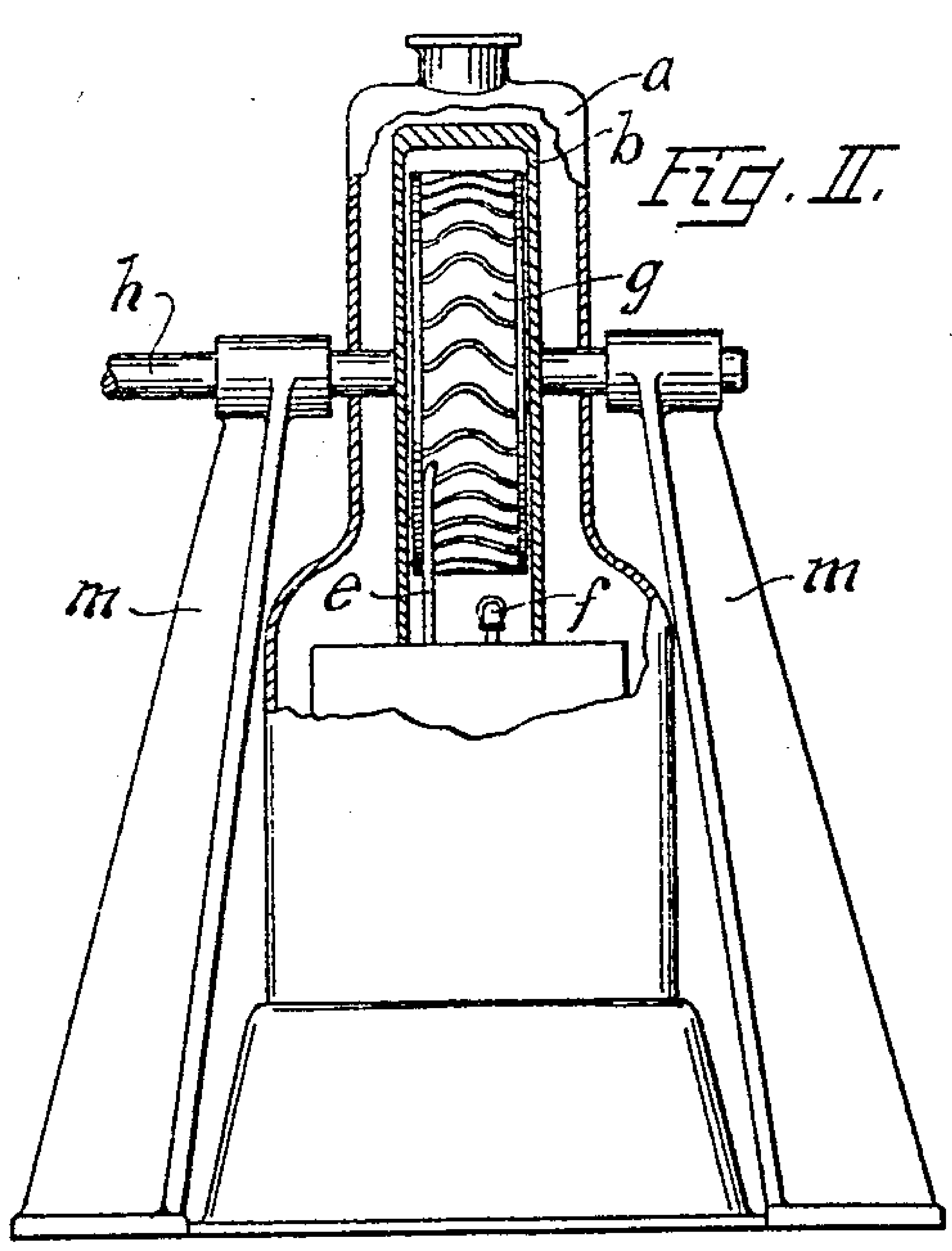

Fig. II.

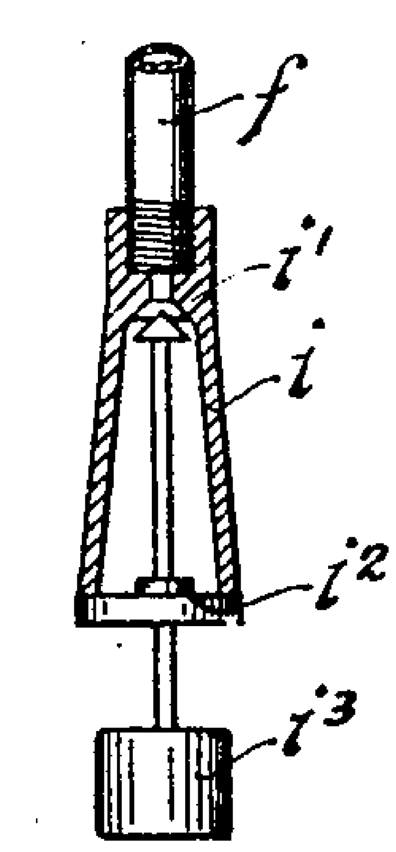

Fig. III.

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UNITED STATES PATENT OFFICE.

JAMES G. DORNBIRER, OF CLEVELAND, OHIO.

METHOD OF OPERATING TURBINES.

No. 822,253. Specification of Letters Patent. Patented June 5, 1906.

Application filed November 10, 1904. Serial No. 232,150.

To all whom it may concern:

Be it known that I, JAMES G. DORNBIRER, a citizen of the United States of America, and a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Methods of Operating Turbines, of which the following is a specification.

My invention relates to an improved method of operating turbines or similar power-generating appliances, and has for its object the operation of such appliances in a simple and economical manner, and particularly in such manner that the speed of the turbine shall be materially reduced without loss of power. It has long been a problem in prime motors of this character to secure their operation economically and at relatively low speeds, it being a well-known fact that efficient turbines hitherto have been driven only at quite high rates of speed. The demand for a prime motor of this character and of relatively small size has long been recognized, but has not thus far been satisfied, as far as I am aware.

My improvements are designed to solve such problem and provide a motor meeting the demands above, my invention contemplating as well improved motor mechanism or apparatus, which I reserve for protection in a separate patent application.

I may explain the improved method of operation in connection with the structure of my invention depicted in the annexed drawings, of which—

Figure I is a vertical section through a motor device adapted to be operated in accordance with my improvements. Fig. II is an end elevation, partially broken away and in section; and Fig. III is an enlarged detail showing a liquid-supplying-valve mechanism.

Throughout each of the figures the similar parts have been designated by the same letter of reference.

Initially I will describe the features of construction set forth, making clear in connection therewith the manner in which it is operated.

A casing *a* surrounds the entire device, in the base of which are provided inner burners *l* for supplying heat thereto. An inner shell *b* surmounts the three heating-chambers *c*, whereby the impelling medium is retained. From each of said chambers normally closed by floats or valve-like closure parts *d* extend the pipes *e*, reaching from the bottom of said chambers to the periphery of the turbine-wheel *g*, rotatably mounted upon shaft *h*. Extending to each of the heating-chambers is a liquid-supply pipe *f*, terminating in a head forming a supply-valve *i*. This valve is better shown in Fig. III and comprises a central chambered part adapted to contain a measured supply of liquid interiorly closed alternatively at its upper end by the conical valve *i′* or at its lower extremity by the disk-like valve part i^2. A hollow metal float i^3 is provided upon the valve-stem and is adapted to actuate the fluid-supply valve in a manner presently to be described.

A chimney or vent *k* at the upper portion of the casing *a* connects with the interior thereof and the burner-chamber and also affords an exit for a smaller vent in the shell *b*, disposed directly beneath.

The shaft *h* is journaled in lateral standards carrying the shaft-bearings at some distance from the casing in order to prevent too high a degree of heat from being communicated to said bearings.

With the construction depicted and above outlined in mind the operation of a turbine in accordance with my improved method may now very readily be made clear. Each of the heating-chambers is supplied with an impelling body, rendered fluid at comparatively low temperatures. The fluid-supply pipe *f* is connected with a suitable source, such as a water-supply. Upon several accounts I prefer to use for the impelling medium in chambers *c* block-tin, since this metal has a relatively low melting-point, retains its heat, and is not easily oxidized. Sufficient supply of the metal is furnished partially to fill two of the heating-chambers from two-thirds to three-fourths full. Upon heating the tin until the same has become fluid, effected at about 260° centigrade, (although the temperature can with advantage be raised considerably above this point,) the motor device is in condition for operation and the fluid-supply may be turned on pipe *f*. One of the heating-chambers, as that at the right, will not contain sufficient fluid tin to operate the float-valve *d*; but the others will be closed at the valve-openings by their respective valves. By means of a manually-operated valve-stem *j* the valve *i′* is momentarily opened and valve i^2 accordingly closed, whereby the chamber of the supply-valve *i* is filled with water. Releasing valve-stem *j* will cause the valve *i′* to close and valve i^2 to open, thereby releasing the small charge of water in the supply-chamber and causing it to spread over the surface of the molten tin in the left-hand heating-chamber *c*. Almost immediately this water will be vaporized, generating a high pressure in said chamber, which increases for a few moments, thus causing the molten tin to flow out through pipe *e* against the blades or vanes of the turbine *g* and causing it to revolve. The discharge from the turbine is retained within shell *b* and readily flows through the valve-opening into the empty right-hand chamber *c*. This continues until the molten tin and steam-pressure generated in the left-hand chamber *c* have expended themselves upon the turbine. Meanwhile the middle chamber *c* may be brought into operation, manually at first, if necessary, as before described. As soon as the pressure in the left-hand chamber is released valve *d* will open and the molten tin will once more flow into this chamber; but, on the other hand, the right-hand chamber having become filled valve *d* will be actuated, the float i^3 will serve to flood the highly-heated tin with a charge or supply of water, and said chamber in its turn will contribute its share to the power furnished to turbine *g*. The operation of the valves and floats may be explained a little more in detail. When the turbine is to start, the three valve-chambers *i* are filled with water or other suitable liquid. Initially the valve stem or lock *j* is in such position that the valve i^2 is retained upon its seat, thus preventing the fluid from escaping into the chamber containing the molten metal. Assuming such metal has been heated to the proper temperature, the manually-operated valve stem or lock is actuated, whereupon the metal acts upon the float i^3, closing i' and opening valve i^2 to permit the liquid to escape into the chamber *c*. This will generate the pressure, serving to force the molten metal into the turbine, from whence it flows into the open or emptied chamber, while the steam eventually escapes through the restricted vent and the chimney *k*. An operator or engineer with a little experience can tell from the operation when the molten metal is forced out of the chamber and will manually release any other valve stems or locks employed. The floats *d* are of such weight that nearly all the molten metal must fall into their respective chambers before such floats are actuated to close the valve-openings. Floats i^3 respectively operate at this time or even an instant before; but this latter does not interfere with the operation apparently, since there is a sudden explosion when the water strikes the molten metal, which will slam the float *d* into its seat with considerable force, thus closing the opening. Such explosion presumably is caused by the smaller particles of water almost instantaneously vaporizing or by the body of water being carried a little below the surface of the molten metal by the impact of its fall. The molten metal does not commence to flow under constant pressure at the instant of the first explosion; but this occurs some seconds later, since it is initially prevented from doing so on account of the height of the column of molten metal normally in the pipes *e*. I have also observed that with the metal at atmospheric pressure enough steam from the discharging-chamber will enter the filling-chamber so that when the float *d* closes its opening the steam will superheat and generate sufficient pressure upon the surface of the metal to cause the float i^3 to operate, closing valve i' and opening valve i^2. Thus where three chambers are employed there will be a regular cycle of operation automatically continued when once established, wherein one chamber is under pressure and supplying the impelling medium to the turbine, another is being heated and comes into play before the first is exhausted, and the third is receiving its supply of molten metal preparatory to actively supplying its charge to the turbine.

It will be at once appreciated that a very limited supply of fluid must be furnished to each heating-chamber at the proper time, since the pressure generated therein finds escape in the apparatus shown only through the relatively slow discharge of the molten metal from the turbine-pipes *e*. In a small experimental motor device wherein each heating-chamber has approximately one hundred and twenty-five cubic inches capacity a charge of water to the amount of about one-eighth of a cubic inch is supplied by valve *i* upon each actuation thereof.

While I have in describing my invention set forth specific apparatus and referred to the preferred use of tin and of water for driving the same, I desire to make it clearly understood that my invention is not necessarily limited to the use of any of these.

Apparatus varying therefrom obviously may be utilized in practicing my invention, especially in the number of heating-chambers employed, and many suitable mediums could be used therein for driving the turbine, since the requirements demand merely an impelling body rendered fluid at relatively low temperatures, preferably of high specific gravity, and a fluid readily vaporized at such temperatures.

Having now explained the method of operation practiced by me in driving a turbine at relatively low speeds through the action of a fluid of high specific gravity and under the influence of high pressure, I declare to be new and desire to secure my said invention as expressed in the following claims:

1. The method substantially as herein explained, for driving a turbine, which consists in highly heating an impelling medium while

confined in a closed chamber, supplying thereto a readily-vaporized medium, and directing the impelling medium against the turbine, under the influence of the high pressure thus generated, substantially as set forth.

2. The method substantially as herein described, for operating a turbine, which consists in heating a suitable body of material having high specific gravity, within a closed chamber, thereafter supplying to said medium a charge of readily-vaporized liquid, and directing the said medium under the pressure thus generated against the vanes or surfaces of the turbine, substantially as set forth.

3. The herein-described method of operating a turbine, which consists in heating bodies of material rendered fluid at relatively low temperatures, and having high specific gravity, supplying thereto in turn a readily-vaporized medium and directing in turn the fluid medium against the turbine, under the influence of the pressure generated, substantially as set forth.

4. A new method for operating a motor device, consisting in highly heating a body of suitable metal, such as tin, supplying thereto in a closed chamber a readily-vaporized expansive medium, such as water, and directing the molten metal in the motor device, so as to produce power through the high pressure generated by the vaporization, substantially as set forth.

5. A new method for operating turbine-wheels, which consists in highly heating separate bodies of suitable metal, such as tin, supplying thereto a readily-vaporized expansive medium, such as water, and directing automatically in succession, the several bodies of molten metal against the vanes of the turbine, whereby continuous rotation thereof is effected, substantially as set forth.

Signed at Cleveland, this 29th day of October, 1904, in the presence of two subscribing witnesses.

JAMES G. DORNBIRER.

Witnesses:
CHARLES S. BEARDSLEY,
ALBERT LYNN LAWRENCE.