C. W. WEISS.

MOTOR.

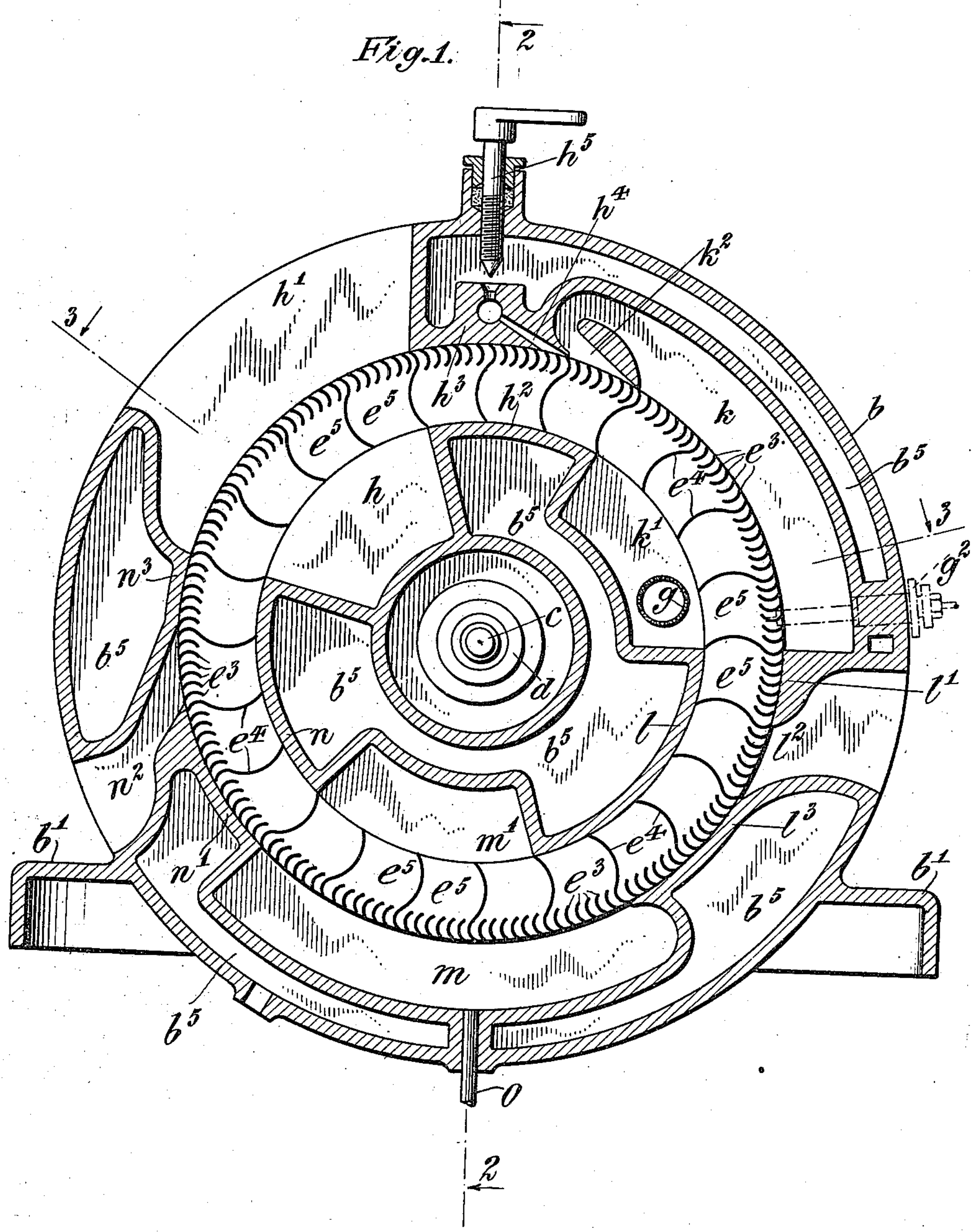
APPLICATION FILED MAR. 25, 1909.

976,236.

Patented Nov. 22, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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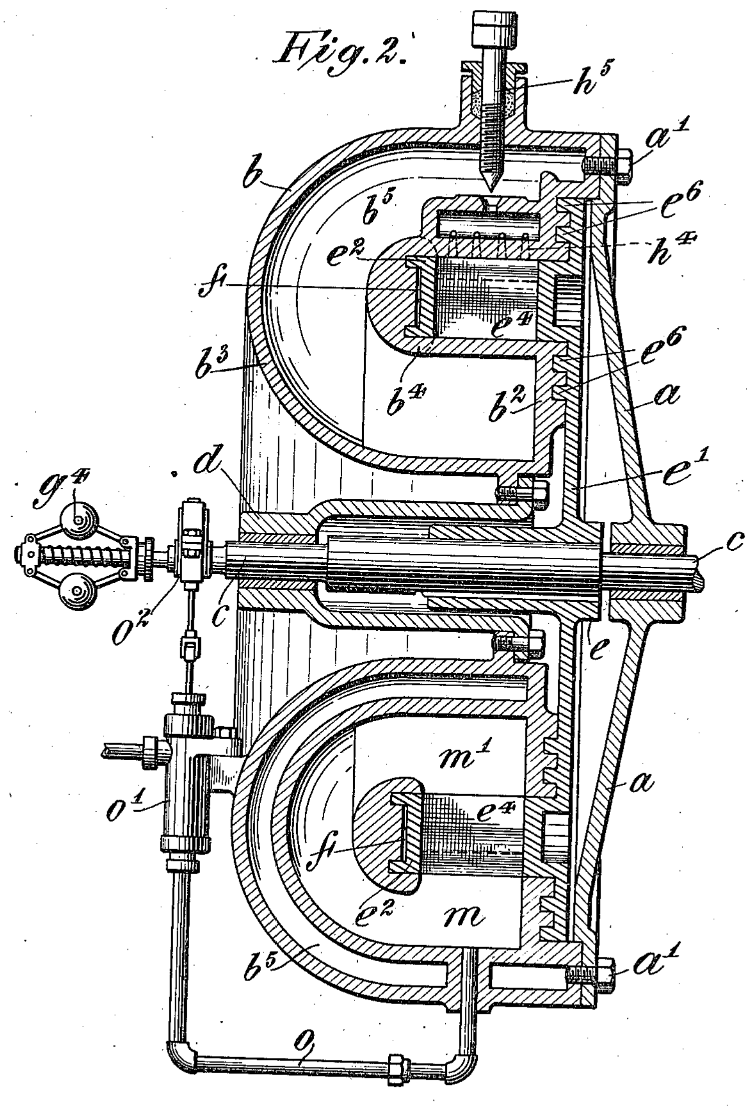
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 4.

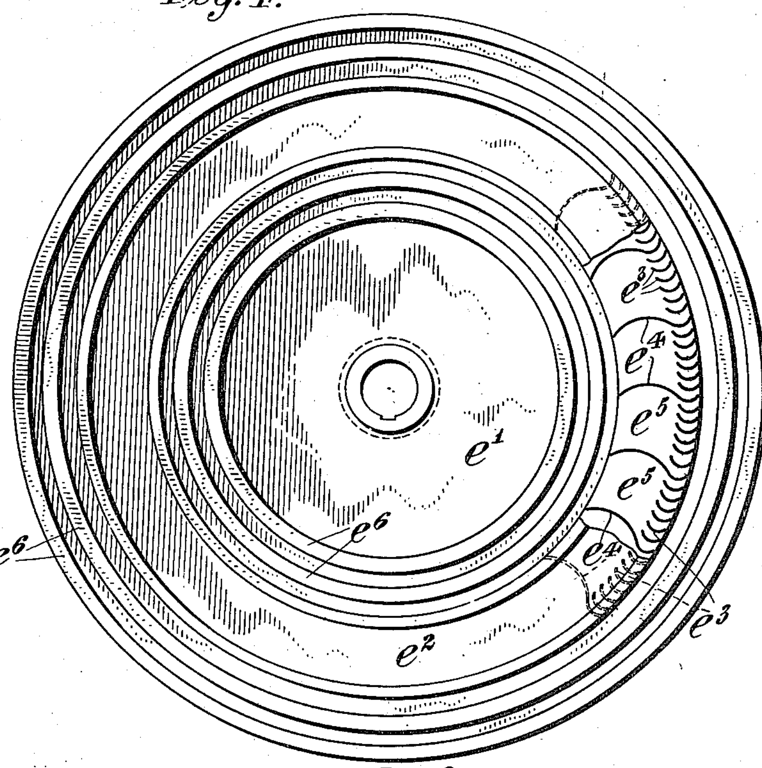
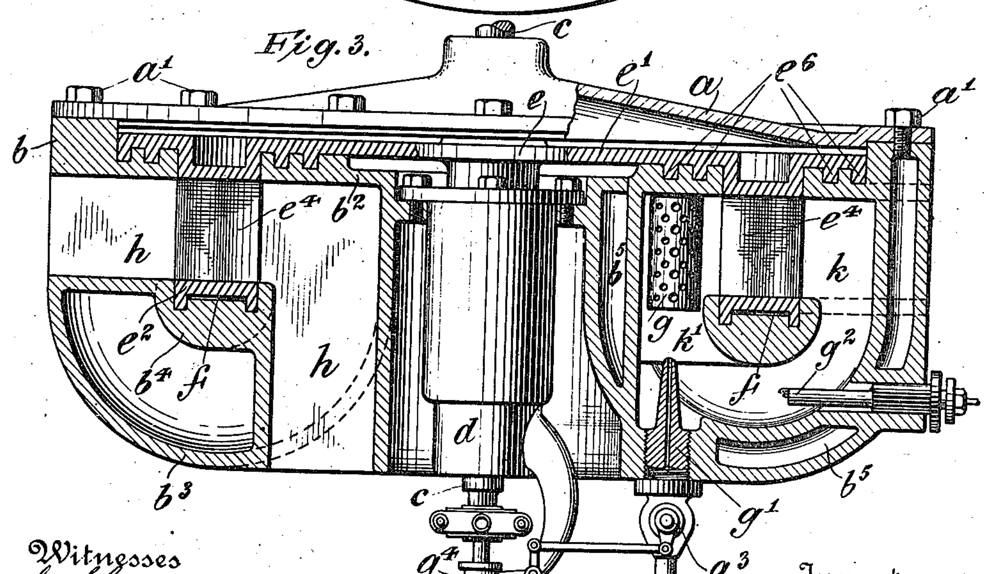


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MOTOR.

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Application filed March 25, 1909. Serial No. 485,846.

To all whom it may concern:

Be it known that I, CARL W. WEISS, a citizen of the United States, residing in the borough of Manhattan, of the city of New York, in the State of New York, have invented certain new and useful Improvements in Motors, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

The invention relates generally to rotary motors of the type known as gas turbines, in which the rotor is driven at high speed by the impact or the reaction, or by both the impact and the reaction, of products of combustion delivered at high velocity through suitable nozzles. In this invention, however, the rotor is driven by the movement of the working fluid out of and into the chambers of the rotor, between the driving blades thereof, under the influence of successive variations of pressure in the chambers of the rotor due to successive heating and cooling of the working fluid in such chambers. It will be obvious, especially as this description proceeds, that the operations herein described might be carried out in any of many different structures, and therefore it is to be understood that although there is illustrated and described herein a structure which appears now to be the best practical embodiment of the invention, nevertheless such construction is to be regarded as merely illustrative of the nature of the invention and generally typical of means by which the several actions or functions hereinafter more particularly explained are accomplished.

In the drawings in which the invention is illustrated—Figure 1 is a view in section, transverse to the axis, of a motor which embodies the invention. Fig. 2 is a section on the plane indicated by the line 2—2 of Fig. 1. Fig. 3 is a section on the irregular plane indicated by the line 3—3 of Fig. 1. Fig. 4 is a view in elevation of the rotor, with a portion thereof broken out to show the arrangement of the blades.

The embodiment of the invention shown in the drawings has its axis of rotation horizontal and comprises, as its four main elements, a back or supporting plate *a*, a main casing *b*, which is secured to the back or supporting plate *a*, as by bolts *a'*, a shaft *c* mounted to rotate in suitable bearings in the back plate *a* and in a boss or sleeve *d* which is carried by and virtually forms a part of casing *b*, and a rotor *e* which is suitably secured to the shaft *c*. The casing *b* is shown as having a flange *b'* through which the entire motor is supported upon a suitable pedestal or base. The rotor *e*, in the construction shown, consists of a circular plate or disk *e'*, an annular ring e^2, parallel with the plate *e'*, a series of driving blades e^3, secured between the plate *e'* and the ring e^2, near the outer periphery of the ring e^2, and a series of blades e^4, which divide the space between the ring e^2 and the plate into an annular series of chambers e^5, each of such chambers preferably having at its outer margin a plurality of driving blades e^3. To reduce leakage as much as possible the face of the rotor is formed with annular ribs e^6 and intervening grooves, which coöperate with corresponding ribs and grooves on the adjacent face of the main casing *b*, as clearly shown in Figs. 2 and 3.

For convenience in construction, the main casing *b* is generally annular with respect to the axis of the shaft *c*, comprising a substantially flat annular plate b^2, an outer arched wall b^3, and an internal arched wall b^4, erected upon the plate b^2 and receiving with a free working fit the projecting portion of the rotor which is composed of the ring e^2 and the blades e^3 and e^4. A water jacket b^5 is provided for a portion of the shell or casing *b*.

It will be understood, especially by reference to Fig. 1, that the walls referred to are not continuous but are so formed and disposed as to provide certain chambers, passages and ports with intervening walls which will be more particularly referred to hereinafter, such chambers, passages and ports, with the intervening walls, being mainly related to the annular chamber *f* formed in or by the shell or casing *b* and in which the blades e^3 and e^4 of the rotor travel. The arrangement of these chambers, passages and ports will be more readily understood in connection with the description of the actions or functions which take place or are accomplished, as hereinafter explained, but it will first be pointed out that in or adjacent to one of such chambers there is located a source of heat, represented by a burner tube g with a fuel injector g' and a suitable igniter g^2.

The air which, successively heated and cooled, forms the working fluid, enters the motor through the channel h and immediately fills the chambers e^5 at atmospheric pressure, free passage for the air beyond the rotor being afforded through the opening h'. As will be understood, the induction of air at a sufficiently rapid rate to meet the requirements of the motor, when the motor is in operation, is promoted by centrifugal force. Each volume of air, measured by the capacity of the chamber e^5, is immediately cut off from communication with the outer air by the passage of the containing chamber between the walls h^2 and h^3, a nozzle h^4 being conveniently located in the wall h^3 through which steam may be admitted from the upper portion of the water jacket b^5 under control of a suitable regulating valve h^5. Such volume of air originally at atmospheric pressure and normal temperature, is transferred to the chamber k in which the volume of air is expanded by heat, a source of heat g, already referred to, being located in or adjacent to this chamber, preferably in the portion k' of the chamber on the inner side of the rotor blades. In order that advantage may be taken of the expansion of the air the source of heat g is preferably located near the farther end or exit port of the chamber, the wall h^2 is extended angularly beyond the wall h^3, and a nozzle k^2 is formed in the end of the chamber k nearest to the opening h', so that the air which is expanded and has its pressure raised in the vicinity of the source of heat may exert its force through the nozzle k^2 upon the blades e^3 of the chamber which has just come into communication with the chamber k and in which the air is near the normal temperature and therefore near the normal atmospheric pressure, the volume of steam admitted through the nozzle h^4 being relatively small and therefore having relatively little effect in raising the temperature or the pressure.

From the chamber k, k' each chamber e^5 of the rotor passes in succession between walls l and l', by which the volume of heated working fluid, at its maximum pressure, is cut off from the chamber k, k'. The wall l' is shorter than the wall l and is immediately succeeded by a port l^2 which opens to the atmosphere so that the volume of working fluid in the chamber e^5, at high temperature and pressure, is expanded to atmospheric pressure through the passages between the blades e^3, acting upon the blades and adding its impulse to the rotor. The port l^2 is immediately succeeded, in the continued movement of the chamber with the rotor, by a wall l^3 which confines the now rarefied volume of working fluid in the chamber, cutting it off from communication with the atmosphere. During the passage of the chamber between the walls l and l^3 the temperature of the confined volume of working fluid remains practically at its maximum and the pressure thereof is practically atmospheric. The chamber thus containing working fluid at high temperature but normal pressure now moves into the cooling or condensing chamber m, m' in which the temperature is relatively low since the chamber is surrounded by the water jacket. The cooling of the contained volume of air causes an immediate fall in the pressure and an equalization of pressure in the chambers e^5 and the chamber m, m'. The wall l is extended angularly beyond the wall l^3 so that the movement of working fluid in each chamber e^5, as it first comes into communication with the chamber m, is outward between the blades e^3. Such working fluid therefore acts upon the blades and its force is, therefore, added to the impelling force which drives the motor.

The volume of air contained in each chamber e^5 is successively cut off from the chamber m, m' by passage between the walls n, n' and is then placed in communication with the atmosphere through the port n^2. The wall n is extended angularly beyond the port n^2 and since the volume of air contained in each chamber e^5, after leaving the chamber m, m', is at practically normal temperature and is below normal or atmospheric pressure, the equalization of pressure is established by an inward movement of air through the port n^2 into the chamber e^5 between the blades e^3. The inwardly moving air acts upon the blades e^3 and its force is, therefore, also added to the impelling force of the rotor.

Beyond the port n^2 each chamber e^5, in succession, passes between the wall n and the wall n^3 into communication with the passages or openings h, h', in which the cycle of operation already described is begun over again.

It will be seen that in the transfer and displacement of working fluid in any given chamber of the rotor at successive points in its movement about the center of revolution, the working fluid, in its successive expansion and contraction, acts upon the blades or vanes of the rotor, yielding the driving impulse. It will also be seen that the volume of working fluid contained in each successive chamber e^5 is first subjected to compression in the chamber through the action thereon of the air or gases of the chamber k through the passage or nozzle k^2 while the inner mouth of the chamber e^5 still remains closed by the wall h^2. Again when rapid rotation of the rotor has been established, the induction of air through the passage h is promoted by centrifugal force and the displacement of air from the chambers e^5 as, in succession, they reach the port l^2, is likewise promoted by centrifugal force.

The chambers, ports and walls with the source of heat and the cooler constitute means for the successive expansion and contraction of the working fluid transferred from point to point in the chambers e^5 of the rotor and means for compelling or directing the movement of the working fluid inward or outward between the blades of the rotor so that the force thereof shall act upon such blades, and it will be obvious that the form and arrangement of such means might be varied widely without departing from the spirit of the invention.

For convenience, the chamber m is shown as connected by a pipe o with a pump o', operated by an eccentric o^2 on the shaft c, for the purpose of drawing off from the chamber m the water of condensation. Likewise the fuel inlet nozzle g' is shown as provided with a controlling valve g^3 which may be operated in usual manner by a suitable governor g^4, on the shaft c for the purpose of regulating the admission of fuel.

I claim as my invention:

1. A casing having a closed chamber with ports for the passage of the rotor and a forwardly directed nozzle, a rotor having successive chambers and driving blades and arranged to travel through said closed chamber and to close said ports, and means to heat the working fluid in the chambers of the rotor as they travel through said closed chamber, whereby the working fluid expanded from the chambers of the rotor into the closed chamber is directed through said nozzle into the chambers of the rotor and against the blades thereof.

2. A casing having a closed chamber with ports for the passage of the rotor and a forwardly directed nozzle, a rotor having successive chambers and driving blades and arranged to travel through said closed chamber and to close said ports, and means to heat the working fluid in the chambers of the rotor as they travel through said closed chamber, said heating means being located adjacent to the exit port of the closed chamber and said nozzle being located adjacent to the other end of the closed chamber, whereby the working fluid expanded from the chambers of the rotor into the closed chamber is directed through said nozzle into the chambers of the rotor and against the blades thereof.

3. A casing having a closed chamber with ports for the passage of the rotor, a rotor having successive chambers and driving blades and arranged to travel through said closed chamber and to close said ports, and means to heat the working fluid in the chambers of the rotor as they pass through said closed chamber, said casing having a discharge opening beyond the exit port of the closed chamber through which opening the working fluid transferred at high temperature and pressure from the closed chamber in the chambers of the rotor may escape and in so escaping act upon the blades of the rotor.

4. A casing having a closed chamber with ports for the passage of the rotor and a forwardly directed nozzle, a rotor having successive chambers and driving blades arranged to travel through said closed chamber and to close said ports, and a burner communicating with the closed chamber to heat the working fluid in the chambers of the rotor as they travel through said closed chamber, whereby the working fluid expanded from the chambers of the rotor into the closed chamber is directed through said nozzle into the chambers of the rotor and against the blades thereof.

5. A casing having a closed chamber with ports for the passage of the rotor and a forwardly directed nozzle, a rotor having successive chambers and driving blades arranged to travel through said closed chamber and to close said ports, and a burner communicating with the closed chamber to heat the working fluid in the chambers of the rotor as they travel through said closed chamber, said burner being located adjacent to the exit port of the closed chamber and such nozzle being located adjacent to the other end thereof, whereby the working fluid expanded from the chambers of the rotor into the closed chamber is directed through said nozzle into the chambers of the rotor and against the blades thereof.

6. A casing having a closed chamber with ports for the passage of the rotor, a rotor having successive chambers and driving blades and arranged to travel through said closed chamber and to close said ports and a burner located in said closed chamber adjacent to the exit port and adapted to discharge the products of combustion into the chambers of the rotor, said casing having a discharge opening beyond the exit port of the closed chamber through which opening the working fluid, transferred at high temperature and pressure from the closed chamber in the chambers of the rotor, may escape and in so escaping act upon the blades of the rotor.

7. A casing having a closed chamber with ports for the passage of the rotor and forwardly directed nozzles for the working fluid and steam respectively, a rotor having successive chambers and driving blades and arranged to travel through said closed chamber and to close said ports, means to heat

the working fluid in the chambers of the rotor as they travel through said closed chamber, whereby the working fluid expanded from the chambers of the rotor into the closed chamber is directed through one of said nozzles into the chambers of the rotor and against the blades thereof, and means to supply steam to the other of said nozzles to be directed also into the chambers of the rotor and against the blades thereof.

8. A casing having a closed chamber with ports for the passage of the rotor and a forwardly directed steam nozzle, a rotor having successive chambers and driving blades and arranged to travel through said closed chamber and to close said ports, means to heat the working fluid in the chambers of the rotor as they pass through said closed chamber, and means to supply steam to said nozzle, said casing having a discharge opening beyond the exit port of the closed chamber through which opening the working fluid, transferred at high temperature and pressure from the closed chamber in the chambers of the rotor, may escape and in so escaping act upon the blades of the rotor.

9. A casing having a closed chamber with ports for the passage of the rotor, a rotor having successive chambers and driving blades arranged to travel through said closed chamber and to close said ports, and means to reduce the temperature of the working fluid in the chambers of the rotor as they travel through the closed chamber, whereby the working fluid expanded from the chambers of the rotor into the closed chamber acts upon the blades of the rotor.

10. A casing having a closed chamber with ports for the passage of the rotor, a rotor having successive chambers and driving blades arranged to travel through said closed chamber and to close said ports, and means to reduce the temperature of the working fluid in the chambers of the rotor as they travel through the closed chamber, the said casing having an opening beyond the exit port of the closed chamber through which the working fluid may enter the chambers of the rotor, as they pass from the closed chamber with working fluid at a lower pressure, to fill the same and in so entering the chambers of the rotor act upon the blades of the rotor.

11. A casing having a closed chamber with ports for the passage of the rotor and a forwardly directed nozzle, and having a second closed chamber independent of the first with ports for the passage of the rotor, a rotor having successive chambers and driving blades and arranged to travel through said closed chambers and to close said ports, means to heat the working fluid in the chambers of the rotor as they travel through the first closed chamber, and means to reduce the temperature of the working fluid in the chambers of the rotor as they travel through the second closed chamber.

12. A casing having a closed chamber with ports for the passage of the rotor and a second closed chamber also with ports for the passage of the rotor, and a discharge opening between, a rotor having successive chambers and driving blades and arranged to travel through said closed chambers and to close said ports, means to heat the working fluid in the chambers of the rotor as they travel through the first closed chamber, and means to reduce the temperature of the working fluid in the chambers of the rotor as they travel through the second closed chamber.

13. A casing having a closed chamber with ports for the passage of the rotor, a second closed chamber with ports for the passage of the rotor, an opening between said chambers, a discharge opening between the closed chambers and a discharge opening beyond the exit port of the second closed chamber, means to heat the working fluid in the chambers of the rotor as they travel through the first closed chamber, and means to reduce the temperature of the working fluid in the chambers of the rotor as they travel through the second closed chamber.

14. A rotary motor comprising a rotor having a succession of chambers and driving blades; means for supplying a working fluid to said chambers in succession; means for causing the working fluid within successive chambers to expand to thereby cause the working fluid to flow from said chambers past said driving blades, said chambers having open outlets so that the flow of working fluid as aforesaid may take place; and means for causing a subsequent flow of working fluid past said driving blades and into said chambers in succession.

15. A rotary motor consisting of a rotor having successive chambers and driving blades, and a casing comprising means to heat the working fluid in the chambers of the rotor, means to permit the escape of the working fluid from the chambers of the rotor between the blades thereof against a lower pressure, means to reduce the temperature of the working fluid remaining in the chambers of the rotor, and means to permit working fluid at a higher pressure to enter the chambers of the rotor between the blades thereof to fill said chambers.

16. A rotary motor comprising a casing having an inclosed internal chamber, means for burning a combustible substance within said chamber, and means for supplying a combustible substance to said chamber; a rotor adapted to move through the chamber of said casing and having a succession of chambers and driving blades; means anterior to the chamber of said casing for supplying each of the chambers of said rotor in

succession with air; means for directing products of combustion derived from the chamber of said casing into successive chambers of said rotor as they come successively into said chamber to thereby displace the air from the chambers of said rotor and supply the chamber of said casing with air to support combustion within said chamber; and means whereby products of combustion are removed from the chamber of said casing.

This specification signed and witnessed this 24th day of March, A. D. 1909.

CARL W. WEISS.

Signed in the presence of—

W. B. GREELEY,

ELLA J. KRUGER.