D. LE R. DRESSER.

GENERATION OF HEAT AND MOTIVE POWER.

APPLICATION FILED JULY 31, 1912.

1,049,213.

Patented Dec. 31, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

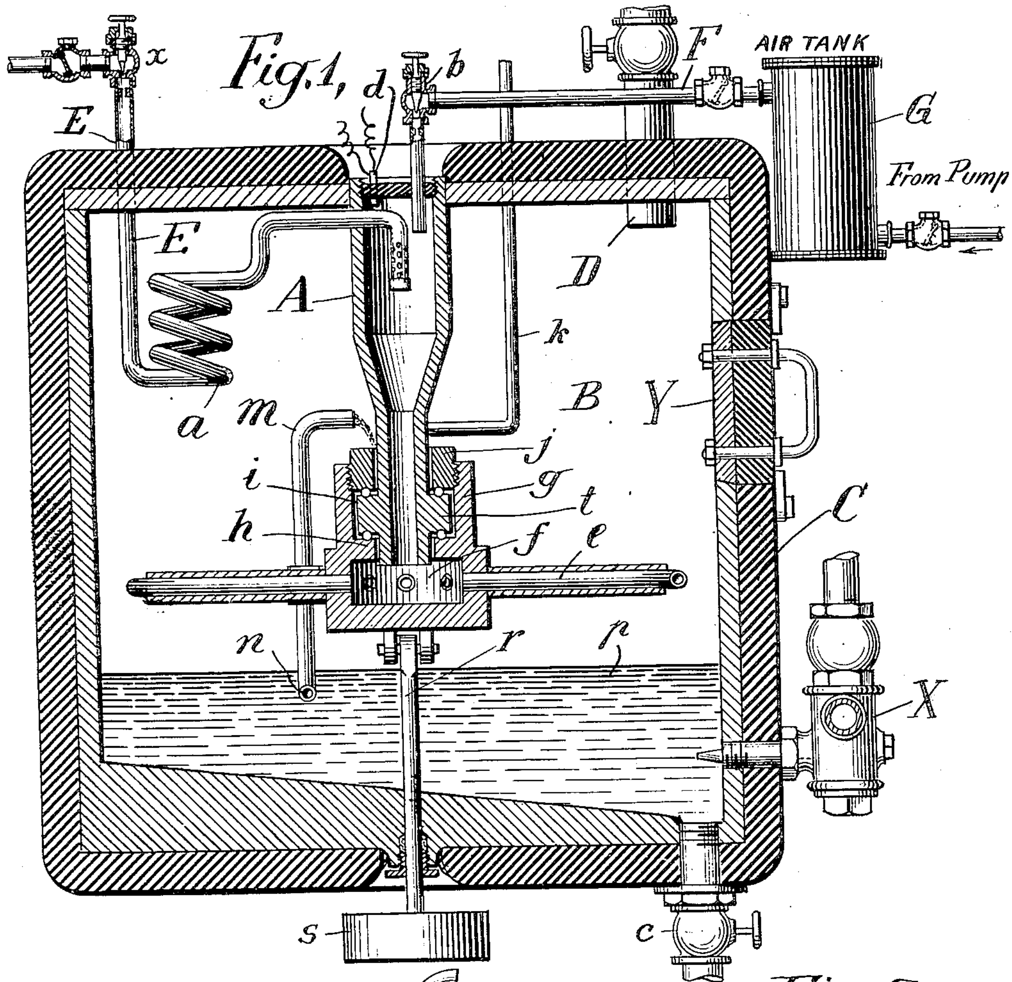


Fig. 2.

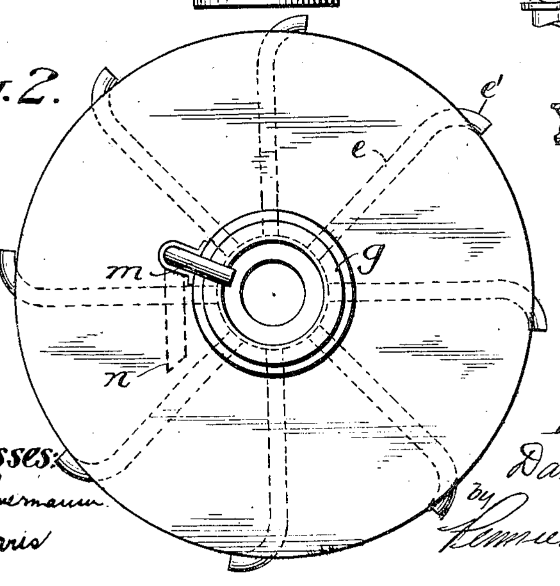
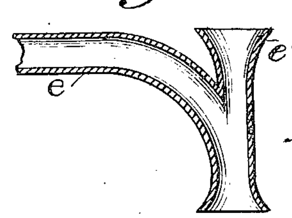


Fig. 3.



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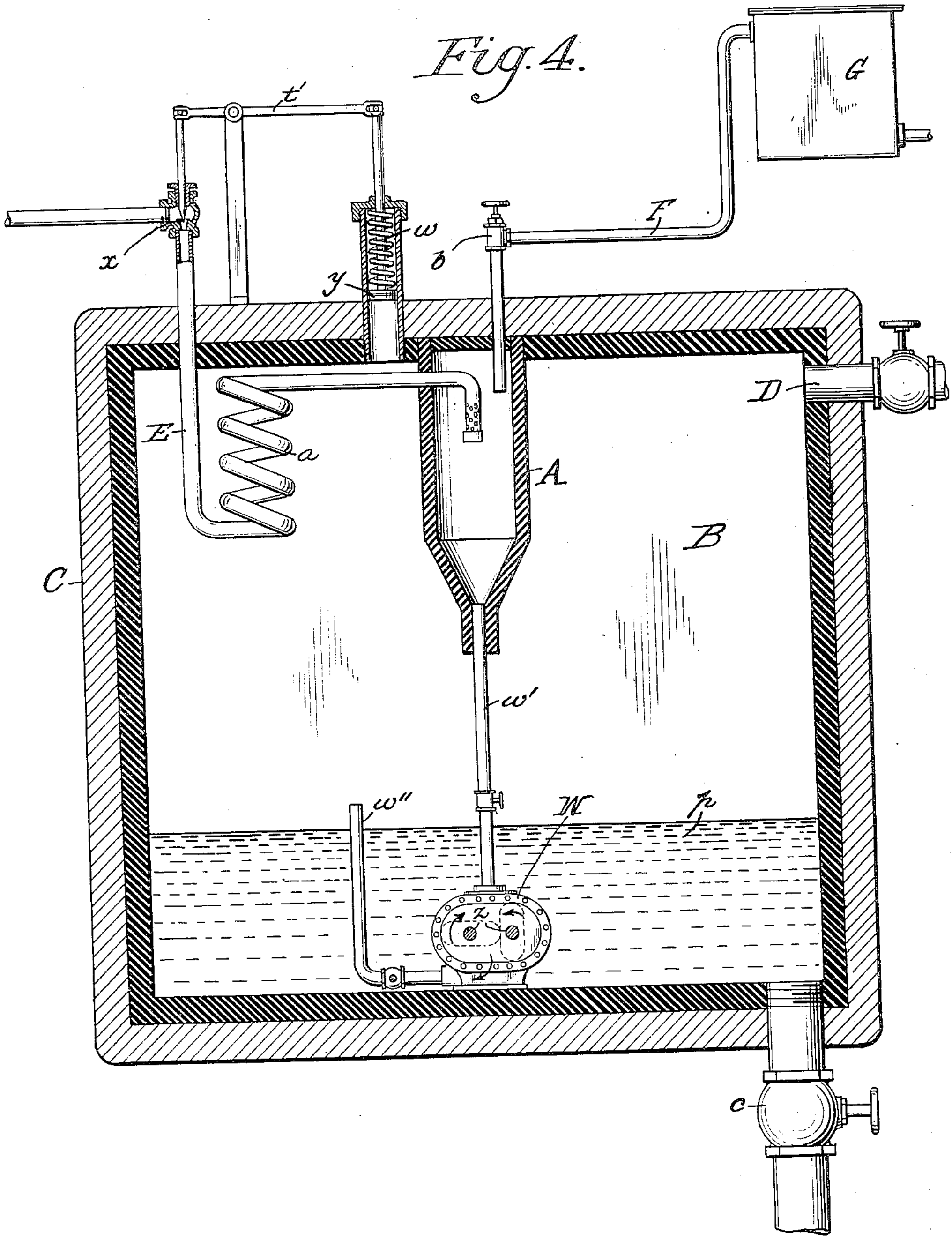
2 SHEETS—SHEET 2.

Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

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GENERATION OF HEAT AND MOTIVE POWER.

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To all whom it may concern:

Be it known that I, DANIEL LE ROY DRESSER, a citizen of the United States, residing at and whose post-office address is Newport, county of Newport, and State of Rhode Island, have invented certain new and useful Improvements in Generation of Heat and Motive Power; and I do hereby 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.

My invention relates to certain new and useful improvements in the generation of heat and of motive power, from the combustion of fuel, and has for its object to avoid, in large measure, the serious heat losses incident to the customary methods of the consumption of fuel and in combustion motors more particularly, and to place at the disposal of the user a combined generator and pressure storage chamber, wherein the heat radiated from the combustion chamber is taken up and transmitted to the generated gases in the storage chamber; the operation being conducted under such conditions of practice that the generator chamber shall progressively deliver into the storage chamber its products of combustion, so as to make way for the continuous admission into the combustion chamber of a combustible mixture of air and fuel substantially uncontaminated by the presence of combustion gases.

In the practice of my invention, I locate the combustion chamber within or encompassed by the storage chamber, so that, in addition to the sensible heat of the products of combustion which enter the storage chamber through the passages connecting it with the combustion chamber, the heat radiated from the walls of the combustion chamber will be likewise transmitted to the stored gases. The air and fuel constituting the combustible or explosive mixture are supplied in appropriate quantity to the interior of the combustion chamber and may be suitably ignited therein, in any appropriate way, as, for instance, by an igniting flame, or by a spark-plug, or by the heat of the interior walls of the combustion chamber, as is well understood in the art. In order to preheat the fuel when it is a gas or vapor, or in order to both preheat and vaporize or gasify it when it is a liquid, I may conveniently provide the fuel supply pipe with a coil, located in the storage chamber and subjected to the heat of the stored gases. The air and fuel are adapted to be supplied to the combustion chamber under such suitable injecting pressure as may be necessary for their feed.

In order to assure the prompt removal of the exploded gases or the products of combustion from the combustion chamber, I provide means for creating a suction at the end of the chamber nearest the exhaust. This may be effected in various ways, the fundamental principle involved being to exhaust the explosion or combustion chamber into the storage chamber. By so doing, as the products of combustion or the exploded gases are drawn from the explosion or combustion chamber, the new explosive or combustible mixture follows, but is unmixed with the products of combustion.

In order to increase the volume of the storage gases, I preferably provide in the storage chamber a quantity of water or other vaporizable liquid which may be maintained at a suitable level therein. The heat of the products of combustion vaporizes a portion of the water, and the water vapors, converted into steam, or even in part decomposed and forming new combinations with the products of combustion serve not only to increase the volume of the stored gases, but also to moderate the excessive temperatures that might otherwise be developed within the apparatus.

Any suitable exhaust device may be employed for the purpose of exhausting the products of combustion from the explosion or combustion chamber, as, for instance, a vacuum pump located below the level of the water in the storage chamber and operated from the outside by a suitable device through a stuffing box, and having its feed pipe lead to the exhaust end of the explosion or combustion chamber and having its delivery pipe leading from the pump to the storage chamber and preferably above the water. I prefer however the exhaust device hereinafter shown, which consists of a rotatory adjunct, having a series of radial arms, bent at their free ends, after the manner of a reaction wheel or Barker's mill, this adjunct being supported upon suitable bearings at the lower part of the explosion or combustion chamber, so as to permit of ready rotation. This rotatory adjunct of the combustion chamber is provided with a shaft whereby it may be given a rapid movement of rotation from any suitable source of power, as, for instance, by means of a belt pulley or the like.

By reason of the speed of rotation of the radial arms, sufficient centrifugal force is generated to cause the products of combustion within the arms to be thrown outward into the storage chamber, whereupon the new explosive or combustible charge on entering rushes down to fill the place thus vacated. In this way, the movement is maintained, and, as the arms rotate, with their exit orifices either pointing backward from the direction of rotation or supplied with devices, hereinafter more specifically described, which act as siphons, the gases from the storage chamber cannot reënter the arms nor can they exert a back pressure upon the products of combustion sufficient to prevent their exit into the storage chamber. On the contrary, the movement of the products of combustion is always outward from the explosion or combustion chamber into the storage chamber. The complete and practically instantaneous exit of the exploding gases, under these circumstances, together with the complete combustion and high temperatures obtained in the combustion chamber, is found, in practice, to entirely avoid the deposition of carbon upon the inner walls of the combustion chamber, or upon the terminals of the spark plug. So also, while the temperature of the inner walls of the combustion chamber is always maintained at a high degree, the temperature of the outer walls is lowered by radiation into the surrounding storage chamber space, and without the sacrifice of the energy of the heat thus radiated, in view of the fact that it is taken up and absorbed by the gases which are in the storage chamber.

In the accompanying drawing, Figure 1 represents partly in section, and partly in elevation, a suitable form of apparatus embodying my invention; Fig. 2 represents a top plan view of the rotatory exhaust adjunct or exhaust chamber; Fig. 3 represents a view partly in section, of the outer end of a modified construction of the radial arms of the exhaust chamber; and Fig. 4 represents a similar view to Fig. 1, of a modification.

Similar letters of reference indicate similar parts throughout the several views.

Referring to the drawing, A indicates the generator chamber, and B the storage chamber in which the generator chamber is inclosed. The storage chamber B is provided with any suitable outer jacket C of asbestos or like material for lessening radiation into the outer air. As will be understood, it is likewise provided with the usual gages, safety valves, mud-valve *c* and the like, as required, and its contents may be withdrawn, as required, for motive or other useful purposes, through a valved discharge pipe as D. This delivery pipe should preferably be connected directly to the motor or motors or machines requiring heat to be served and should be as short as possible so that losses by radiation may be diminished in passing from the storage chamber to the place of use.

The fuel pipe E is preferably provided with a coiled section *a* located within the storage receptacle. The fuel pipe enters the combustion chamber, as indicated, and is supplied under any suitable pressure appropriate to the prevailing condition of use and the particular fuel selected. The fuel employed may, as hereinbefore indicated, be gaseous, vaporous, or liquid, and the invention lends itself particularly to the utilization of crude oils, such as Lima oil, or the like, which are available in large quantities at a low price, although it will, of course, be understood that when a liquid fuel is employed, naphtha, petrol, wood alcohol, or any of the familiar liquid fuels, or a powdered solid (such as gunpowder) may be utilized, according to the particular exigencies of use.

Air admitted through the pipe F may be conveniently supplied under pressure from any air-supply tank G having the usual check-valves, and adapted to receive compressed air from an air-compressing pump, whose function is to maintain a given pressure in the air tank appropriate to the demands of the apparatus. The pipe F may be provided with an automatically operated or hand-operated needle-valve *b* for regulating the amount of air supplied to the combustion chamber, and a similar automatically operated or hand-operated valve *x* is provided for regulating the fuel supply. The spark plug *d* is adapted to be operated from a suitable magneto generator, to initiate the ignitions in the combustion or explosion chamber A, although it will be understood that after the inner walls of the explosion chamber have attained a sufficiently high temperature, the ignitions will be effected without the aid of the spark plug, which may thereupon be put out of service.

At its lower end, the combustion chamber A is provided with the rotatory exhaust device hereinbefore referred to. This exhaust device conveniently consists of a series of radial arms *e* bent at their outer ends *e'* in a direction opposite to the direction of rotation and radiating from a chamber *f*, whose walls are prolonged upwardly to form a cylindrical sleeve *g*. The rotating exhaust chamber is likewise provided with an internal annular flange *h* having a groove for the reception of ball-bearings as shown, these ball-bearings likewise fitting into a corresponding groove of an exterior flange *i* upon the prolonged end of the combustion chamber. So also, a groove for the reception of ball-bearings is provided on top of the flange *t* and a corresponding groove on the bottom of a screw-threaded nut *j* which engages an internal thread of the cylindrical wall portion *g*. The rotatory exhaust device is therefore adapted to rotate freely upon the ball-bearings, and the nut *j* is slightly spaced away from the prolongation of the combustion chamber which it encircles, so as to avoid frictional contact therewith, and also to permit the entrance of lubricating oil which may be supplied if desired through the pipe *k*. So also, the rotatory exhaust device may carry the water take-up pipe *m* whose lower end *n* is adapted to dip below the surface of the water *p* contained in the storage reservoir and to thereby supply a quantity of water to the rotating parts, as indicated in Figs. 1 and 2, and for a further purpose hereinafter described. The rotatory chamber is provided with a shaft *r* which passes through a stuffing-box of the storage chamber and which may be rotated at the speed desired by means of a belt pulley *s* or the like, the water or other vaporizable liquid supplied to the interior of the storage chamber, may be injected thereinto in any suitable manner, as for instance, by a Giffard injector X, or the like. It will further be understood that a suitable hand-hole, or the like, as Y may be provided in order to obtain ready access to the interior of the storage chamber.

In order to lessen resistance to the rotation of the radial arms, I preferably fill in the space between them as far as possible, as indicated, so as to give them as a whole, the disk-like configuration shown.

The parts of the device being constructed and arranged as described, and the mode of operation is as follows: A suitable charge of fuel and air being supplied to the combustion chamber A and preferably mixed therein, it is then ignited by the spark plug *b* or its equivalent. The resulting explosion projects the products of combustion through the radial tubes *e*, assisted by the rotation of the exhaust chamber due to the application of power to the belt pulley *s*. As a consequence, the products of combustion are at once withdrawn from the combustion chamber A and received in the storage reservoir B, whereupon the next succeeding charge of air and fuel, entering the combustion chamber A forms a substantially pure mixture therein and is in its turn exploded. The continued rotation of the rotatory exhaust chamber removes the products of combustion of this additional charge, in like manner as before, the removal in each instance being facilitated by the fact that the carbon dioxid and the watery vapor produced as an incident of the combustion have a tendency to fall through the extension of the combustion chamber because of their weight. This tendency is amplified by the water or watery vapor supplied from the pipe *m* and which finds its way down through the ball-bearings into the space *f* where it joins the outgoing products of combustion. The rapid rotation of the exhaust chamber, therefore, continuously depletes the combustion chamber of its products of combustion and supplies them to the storage chamber without. The operation is a practically continuous one, in the sense that a rapidly recurring series of explosions takes place in the combustion chamber, accompanied by a continuous discharge of the products of combustion into the storage chamber, and a continuous admission of air and fuel into the combustion chamber in the predetermined quantities requisite for complete combustion. The rising temperature in the storage chamber produces an appropriate vaporization from the surface of the water contained therein, and the pressure in the storage chamber gradually rises to the predetermined maximum appropriate to the particular use intended. The heat of combustion, instead of being radiated into the outer air from the walls of the combustion chamber is usefully conserved for raising the temperature and pressure of the stored gases in the storage chamber, and the lower temperature of the gases in the storage chamber is made available, by the interchange of heat thus effected, to keep down, within practical limits, the temperature of the walls of the combustion chamber itself; so that not only is the calorific energy of the combustion thus conserved and utilized, but all parts of the apparatus are protected against the prejudicial effects of excessive heat.

As indicated in Fig. 3, the outer extremities of the radial arms may, if desired, be provided with tubular branches *e''* open at both ends, so that as the arms *e* are rotated, through the gaseous atmosphere of the storage chamber E, the rush of the gaseous atmosphere of the storage chamber through the branches *e''* will exert an additional suction upon the interior of the main body portions of the arms *e* and consequently upon the interior of the combustion chamber itself.

As hereinbefore indicated, it will be noted as characteristic of my invention that the combustion chamber is, by reason of the exhaust device interposed between it and the storage chamber, maintained in a condition of maximum efficiency; that is to say, it is by reason of the instantaneous depletion of the products of combustion, kept constantly in the ideal condition for the reception and explosion of undiluted charges of air and fuel, and the products of combustion themselves, constituting the motive power gases, are removed, as formed, into the entirely separate storage chamber, where they receive the further expansive effect of the heat radiated from the walls of the combustion chamber, but without having an opportunity to contaminate the unexploded charges within that chamber.

Whether the combustion taking place within the inner chamber is to be regarded as explosive, or otherwise, depends of course, upon its rate. It will be understood, therefore, that in the practice of my invention, the rate of combustion may be so chosen as to be either explosive, or non-explosive, as the case may be, so that the inner chamber may be designated generically, as an internal combustion chamber, in the sense just indicated. So also the rotatory exhaust chamber is to be regarded generically as an exhaust or vacuum pump, and, therefore, as but one means of exhausting the products of combustion from the internal combustion chamber,—other exhaust or vacuum devices for the same purpose being within the broad contemplation of my invention.

It will be understood that instead of generating power by the confining of the gases and the heat therein and using that pressure to drive motors, the products of combustion received in the outer chamber may be made available for heating purposes only. Thus, for instance, instead of providing the walls of the outer chamber with a non-conducting jacket, they might be left bare, and be made preferably thin instead of thick, so as to give off their heat readily into a room wherein the apparatus might be employed as a heating medium; or, the heat generated might be employed for any other useful purpose, as hereinbefore indicated.

In the modification shown in Fig. 4, I have illustrated one form or embodiment of means for making the fuel feed valve automatic, as hereinbefore referred to. Thus, the stem of the needle valve x is connected by a suitable lever t' with the piston y exposed to the pressure within the storage chamber; so that when the pressure rises beyond a predetermined maximum, the piston will rise against the tension of the spring w, and will cause the lever to close the needle valve x, thereby shutting off temporarily the supply of fuel to the generator. When the pressure falls again, the piston will be restored to its original position by the spring and the supply of fuel will be reestablished. So, also, in Fig. 4, I have illustrated the application of a vacuum pump W which may be of the rotary type shown, in lieu of the rotatory exhaust chamber of Fig. 1. The vacuum pump, of whatever type selected, may be located, as shown, entirely below the level of the water or other vaporizable liquid within the storage chamber. The vacuum pump may be connected to the generator chamber by a pipe w' and discharges into the space above the water level to the pipe w''. It will, of course, be understood that the shafts z of the rotary pistons of the vacuum pump will extend through the walls of the storage chamber and will be operated from without by any suitable source of power. It will further be understood that, as in Fig. 1, the apparatus of Fig. 4 will be provided with a hand-hole closed by a suitable door and with a spark plug or other suitable device for igniting the explosive or combustible charges in the generator chamber.

Having thus described my invention, what I claim is:—

1. A generator for heat or motive power, consisting of an internal-combustion chamber, means for supplying and igniting combustible charges therein, an outlying storage chamber inclosing the internal-combustion chamber, and means for continuously exhausting into the storage chamber the products of combustion from the internal-combustion chamber; substantially as described.

2. A generator for heat or motive power, consisting of an internal-combustion chamber, means for supplying and igniting combustible charges therein, an outlying storage chamber inclosing the internal-combustion chamber, and means for continuously exhausting into the storage chamber the products of combustion from the internal-combustion chamber and for preventing the return of any gases into the internal-combustion chamber from the storage chamber; substantially as described.

3. A generator for heat or motive power, consisting of an internal-combustion chamber, means for supplying and igniting combustible charges therein, an outlying storage chamber inclosing the internal-combustion chamber, and means for continuously exhausting into the storage chamber the products of combustion from the internal-combustion chamber and for keeping separate the gases in the storage chamber from the combustible mixture in the internal-combustion chamber; substantially as described.

4. A generator for heat or motive power, consisting of an internal-combustion chamber, means for supplying and igniting combustible charges therein, an outlying storage chamber inclosing the internal-combustion chamber, and means for continuously exhausting into the storage chamber the products of combustion from the internal-combustion chamber, said means consisting of a rotatory chamber having a series of radi-

ating exhaust arms, and a power-shaft for effecting the rotation of said rotatory chamber; substantially as described.

5. A generator for heat or motive power, consisting of an internal-combustion chamber, means for supplying and igniting combustible charges therein, an outlying storage chamber inclosing the internal-combustion chamber, a rotatory exhaust chamber intermediate of the internal combustion chamber and the storage chamber, and means for supplying water to the interior of the rotatory exhaust chamber; substantially as described.

6. A generator for heat or motive power, consisting of an internal-combustion chamber, means for supplying and igniting combustible charges therein, an outlying storage chamber inclosing the internal-combustion chamber, means for continuously exhausting into the storage chamber the products of combustion from the internal-combustion chamber, said means consisting of a rotary chamber provided with radiating exhaust pipes and an upwardly extending cylindrical sleeve, said sleeve inclosing the lower end of a prolongation of the internal-combustion chamber, and ball-bearings for supporting the rotatory chamber upon said prolongation; substantially as described.

7. A generator for heat or motive power, consisting of an internal combustion chamber, means for supplying and igniting combustible charges therein, an exhaust or vacuum device for continuously exhausting the products of combustion from the combustion chamber, and means for utilizing the heat generated; substantially as described.

8. In a generator for heat or motive power, the combination with the generator chamber of a rotatory chamber supported on ball-bearings thereon and having radiating discharge arms for the products of combustion; substantially as described.

9. In a generator for heat or motive power, an internal combustion chamber having a prolongation provided with an annular flange having top and bottom grooves for the reception of ball-bearings, in combination with a rotatory chamber having a cylindrical sleeve, said sleeve being provided at its upper end with an internal flange, said nut and flange having grooves for the ball-bearings, and radiating arms for the discharge of the products of combustion of the combustion chamber; substantially as described.

10. In a generator for heat or motive power, an internal-combustion chamber having a prolongation provided with an annular flange having top and bottom grooves for the reception of ball-bearings, in combination with a rotatory chamber having a cylindrical sleeve, said sleeve being provided at its upper end with a screw-threaded nut and at its lower end with an internal flange, said nut and flange having grooves for the ball-bearings, and radiating arms for the discharge of the products of combustion of the internal combustion chamber, said rotatory chamber also being provided with a water take-up pipe; substantially as described.

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

DANIEL LE ROY DRESSER.

Witnesses:
THOMAS J. O'NEILL,
M. J. RODERICK.