

(No Model.)

3 Sheets—Sheet 1.

J. G. SANDERSON.
GAS TURBINE.

No. 585,230.

Patented June 29, 1897.

Fig. 2.

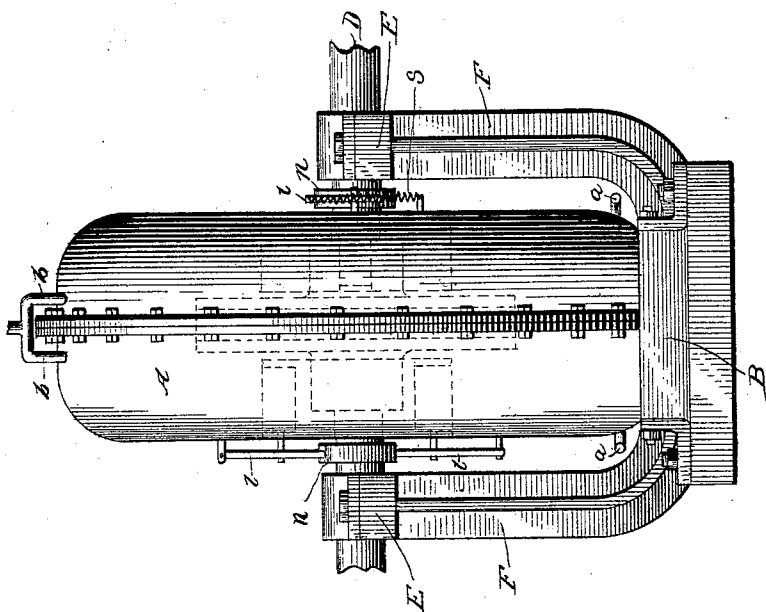
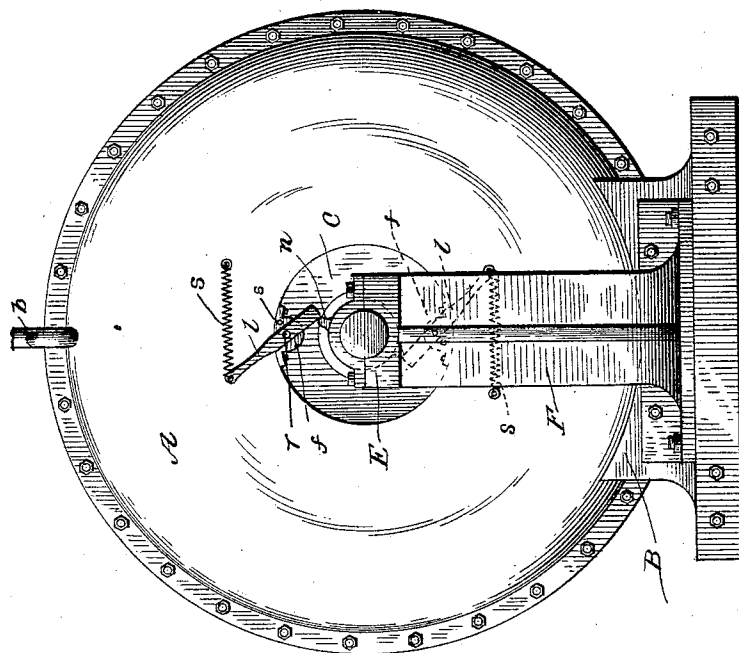


Fig. 1.



Witnesses:

Herbert Bradley.
Ed. Corne.

Inventor

J. Gardner Sanderson.

By Knight Bros.
Attorneys

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Fig. 4.

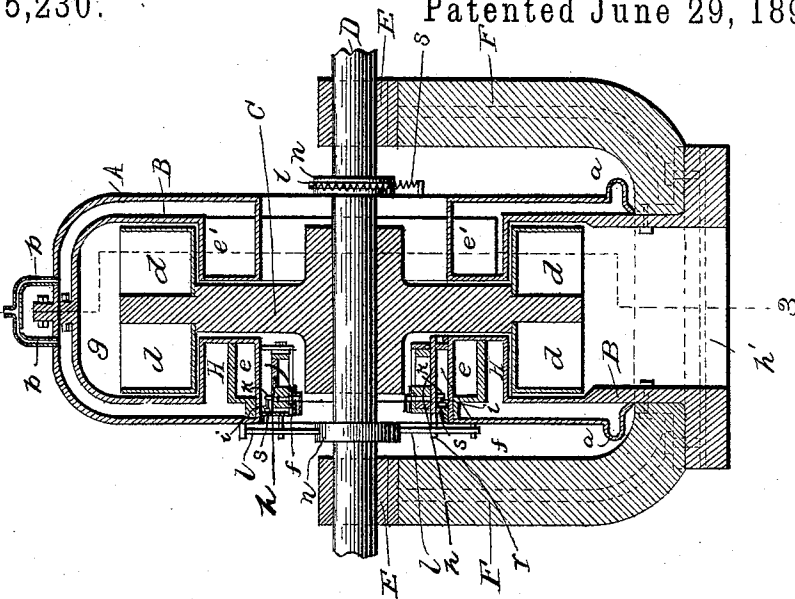
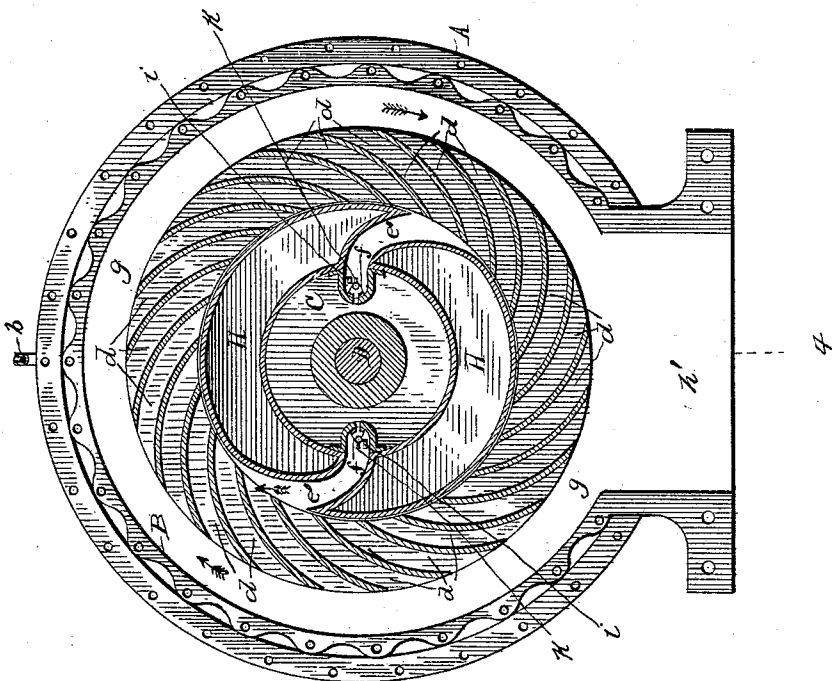


Fig. 3.



Witnesses:

Herbert Bradley

Geo. E. Crane

Inventor

J. Gardner Sanderson

By Knight Bros

Attorneys

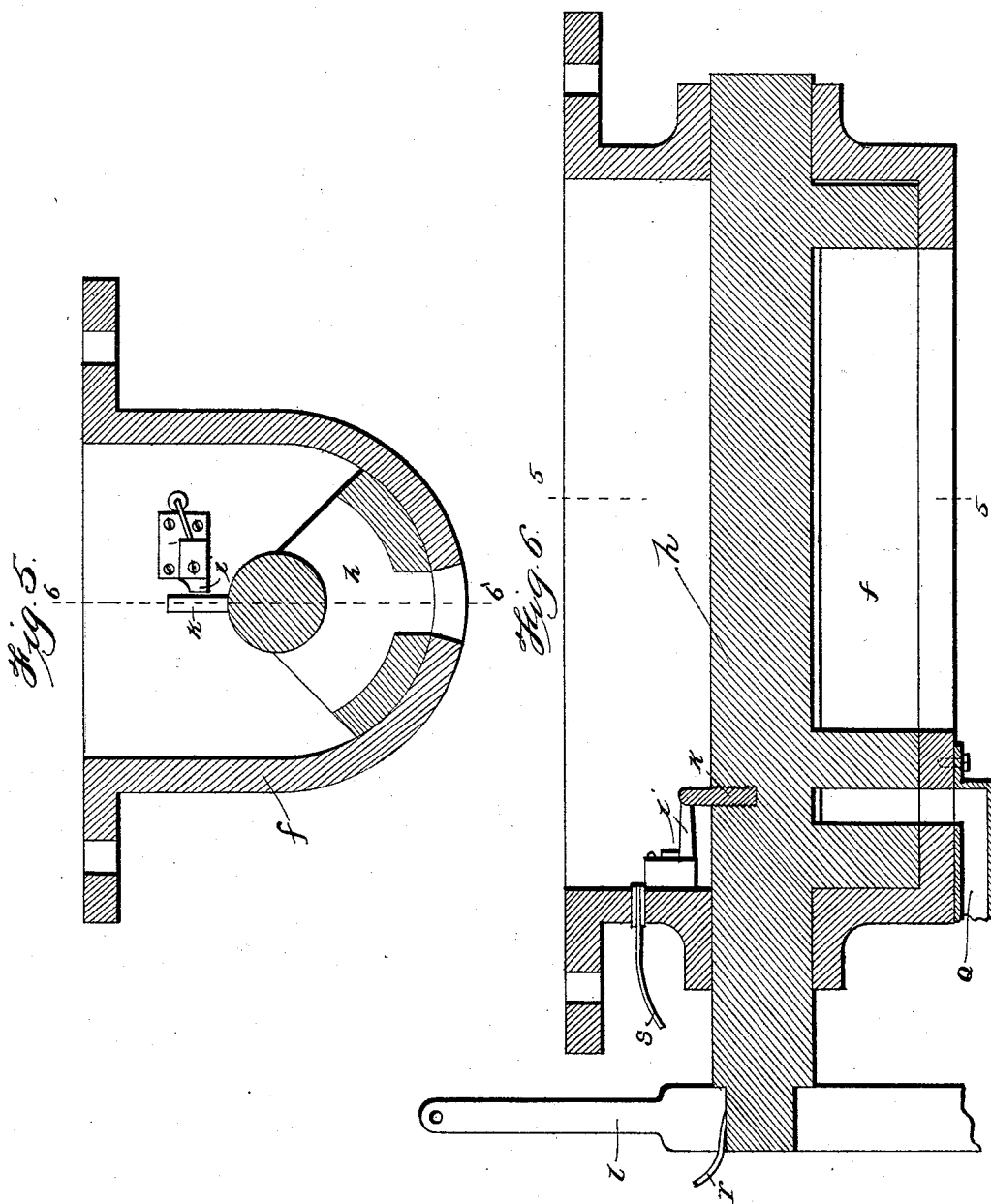
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3 Sheets—Sheet 3.

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Witnesses:
Herbert Bradley
Geo. C. Crane.

Inventor:
J. Gardner Sanderson.
By Knight Bros
Attorneys

UNITED STATES PATENT OFFICE.

JAMES GARDNER SANDERSON, OF SCRANTON, PENNSYLVANIA.

GAS-TURBINE.

SPECIFICATION forming part of Letters Patent No. 585,230, dated June 29, 1897.

Application filed March 6, 1896. Serial No. 582,079. (No model.)

To all whom it may concern:

Be it known that I, JAMES GARDNER SANDERSON, a citizen of the United States, and a resident of Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Gas-Turbines, of which the following is a specification.

My invention relates to an improvement in gas-turbines; and it consists in certain novel alterations in and additions to a simple form of turbine-wheel adapting it to the use of an intermittent force derived from the explosion of certain gases mixed with air and utilizing that force, as well as the expansive force of the heat resulting from the combustion of the gas. I thus obtain a simple and economical engine for power purposes. The form and manner of constructing the turbine, as well as the method of utilizing the forces of explosion, will be understood by reference to the following description and accompanying drawings, in which—

Figure 1 is a side elevation of my improved turbine. Fig. 2 is an end elevation thereof. Fig. 3 is a detail vertical section taken on the irregular line 3 3, Fig. 4. Fig. 4 is a detail vertical section taken on the line 4 4, Fig. 3. Fig. 5 is a vertical section of one of the explosion-chambers, taken on line 5 5, Fig. 6, and drawn to an enlarged scale; and Fig. 6 is a vertical section taken on the line 6 6, Fig. 5.

In the said drawings, A represents the outer casing or cover, and B the inner stationary portion provided with a suitable base. These two chambers, as will be seen, are each formed in halves, each half having a flange edge through which bolts pass for securing the halves together, and, as will be seen, there is a space between the outer cover and inner stationary portion, and it will also be seen from Fig. 3 that the flanged edges of the inner portion B are cut out. This arrangement is to allow water to circulate through the space and cut-out portion in order to keep these parts cool, the water being admitted through the ports *b b* and escaping through the outlets *a a*. The above arrangement of chambers is used on account of its convenience in construction, the inner portion being first secured together and then the outer casing over that; but I do not limit myself to

this particular form, as the outer casing could be formed integral with the stationary portion, so that there would be only two halves. 55

C represents a solid wheel of sufficient weight to act as a balance for the intermittent forces, rigidly secured to the shaft D, and to the periphery of the said wheel are attached in any convenient manner or cast with it, so as to form a part thereof, curved conduits *d*, which are rectangular in cross-section, as seen in Fig. 4, and open at each end. 60

e e and *e' e'* are curved guiding-passages serving also as combustion-chambers, and they are attached to and form a part of the stationary portion B, and they are in communication with the explosion-chambers *f*, which are attached to the stationary part B in any convenient manner. The other ends of these passages are in communication with the conduits *d*. The explosion-chambers *f* are provided with the oscillating valves *h*, (shown in Figs. 5 and 6,) controlling the admission of air and gas to the explosion-chambers, and they are provided with a contact-point *k*, connected with an electric supply which, when the valve is moving to closed position, momentarily engages with a second contact-point *i*, making a spark or producing heat in the explosion-chamber. The contact *i* is suitably insulated and secured in the explosion-chamber, and it is connected by a wire *s* with the electrical supply. The current for the contact *k* is supplied by the wire *r*, which is connected with the lever *l*, carried by the valve. 75

g represents the exhaust-passage for the products of combustion surrounding the wheel and is in communication with the discharge *h'*, formed in the base of the turbine. 80

l l represent levers or arms attached to the stems of the valves *h*, and to one end of the levers are attached springs *s*, which tend to normally keep the valves closed while the other end is not in contact with the cams *n*. Each valve is provided with a lever and all have the same arrangement. That is to say, the levers on the side opposite to that shown in Fig. 1 will be arranged in exactly the same manner, except in a horizontal direction. This is necessitated owing to the arrangement of the valves and chambers *e e*, &c. The cams *n* are located on the shaft D, which is 95 100

journalled in the bearings E E, carried by the supports F F, which in turn are securely attached to the base of the stationary portion of the turbine. As the shaft turns the cams come into engagement with the levers and open the valves.

There are four guiding-passages *eee'e'*, all constructed alike and arranged in alternate quarters on each side of the solid wheel. It will be observed that those shown in Fig. 3 extend in a horizontal direction, while those on the opposite side extend in a vertical direction. This arrangement will be readily understood upon reference to Figs. 3 and 4. By this arrangement of the chambers and the arrangement of the valve-operating mechanism for admitting the air and gas and also causing the explosion an explosion occurs at each quarter-turn of the wheel, alternating from side to side. For larger wheels the number may be increased and the chambers may be arranged in opposite pairs on each side of the wheel. It will also be noted that the ends of the passages adjacent the conduits are so situated that the expanded air is directed perpendicularly against the conduits, so that the full effect is obtained.

To start the wheel, one of the valves is opened by swinging one of the levers by hand, and the gas and air ports will then be in the position shown in Figs. 5 and 6—that is, the valve-openings register with the openings in the wall of the explosion-chamber. The larger opening admits the air from the exterior of the explosion-chamber and the smaller opening is connected with a gas-supply pipe Q. When a sufficient amount of gas has entered to make with the air an explosive compound, the lever is released, the spring rotating it and the valve to its normal position. As the valve returns to normal position the contact *k*, carried by the valve, comes into engagement with the contact *i*, thus producing an electric spark and exploding the gaseous mixture. The explosion may be produced by any of the methods of ignition commonly employed in gas or vapor engines; but I consider the method herein described as best adapted for this construction. There being no outlet for the force of explosion except through one of the guiding-passages *eee'e'*, as the case may be, the force is directed against one side of the conduits *d* and forces the wheel to revolve in the direction indicated by the arrows, Fig.

3. A secondary force is also generated by the expansion of air in one of the passages resulting from the heat of combustion, which must escape through the conduits, which adds greatly to the centrifugal power of the wheel.

The space *g*, surrounding the wheel, and large outlet *h'*, through the base of the turbine, admit a free discharge of the gases from combustion, thereby avoiding back pressure on the wheel. Having started the wheel, it becomes automatic, the cams *n* on the shaft D opening alternately the valves of the exploding-chambers on either side of the tur-

bine and holding them open a sufficient length of time to admit the requisite amount of air and gas for the explosive compound.

It will be observed that a small space is allowed between the stationary and revolving parts of the turbine, as it is not necessary that these parts should be in wearing contact, and the journal-bearings E E should be so adjustable that the wheel may be shifted to revolve freely within the stationary portion. It will also be observed that the inner annular portions H H, which are formed in the stationary portion B, are in open connection with the water-space surrounding the turbine and materially assist in condensing the expanded air.

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

1. A gas-turbine comprising a casing, a wheel having curved conduits and mounted within the casing, an explosion-chamber having air and gas openings and secured to the casing, a curved guiding-passage secured to the casing and extending from the explosion-chamber to the conduits, an oscillating combined air and gas valve mounted in the explosion-chamber, means for operating the valve, and means for exploding the air-and-gas mixture, in the explosion-chamber; substantially as described.

2. A gas-turbine comprising a casing, a wheel having curved conduits on both sides thereof and mounted within the casing, explosion-chambers having air and gas openings and secured to the casing and arranged alternately on opposite sides of the wheel, curved guiding-passages secured to the casing and extending from the explosion-chambers to the conduits, oscillating combined air and gas valves mounted in the explosion-chambers, means for operating the valves alternately and means for exploding the air-and-gas mixture in the explosion-chambers; substantially as described.

3. In a gas-turbine, the combination of a suitable casing, a turbine-wheel mounted in said casing, a series of explosion-chambers secured to said casing, suitable valves arranged in said chambers and adapted to be moved to admit gas and air into the said chamber, and suitable means for exploding the mixture consisting of a contact-point, having connection with an electrical supply and carried by the valve and a second contact also having connection with the electrical supply carried by the casing and which is momentarily engaged by the first contact when the valve is moved to closed position so as to create an electric spark for exploding the mixture, substantially as shown and described.

4. In a gas-turbine, the combination of a suitable casing, a turbine-wheel mounted in said casing, a series of curved conduits secured on both sides of the wheel, a series of guiding-passages on each side of the wheel, an explosion-chamber in communication with

each guiding-passage, valves located in said chambers for admitting air and gas to the chambers and suitable means for successively and alternately opening the valves and exploding the mixture, substantially as shown and described.

5. A gas-turbine comprising a casing, a wheel having an operating-cam and curved conduits and mounted within the casing, an explosion-chamber having air and gas openings and secured to the casing, a curved guiding-passage secured to the casing and extending from the explosion-chamber to the conduits, an oscillating combined air and gas valve, having a lever engaged by the cam, and mounted in the explosion-chamber, a spring for returning the lever to normal position and means for exploding the air-and-gas

mixture in the explosion-chamber; substantially as described.

6. In a turbine-wheel adapted for the utilization of the intermittent explosive force of a gaseous mixture and the force of air expanded by heat, the combination of a central solid wheel, curved conduits on each side of the outer periphery of said wheel, stationary guiding-passages located within the circle of these conduits for directing the forces of explosion and expansion, and explosion-chambers attached to said guiding-passages, substantially as shown and described.

JAMES GARDNER SANDERSON.

Witnesses:

F. L. HITCHCOCK,

J. ALTIRUS ROBERTSON.