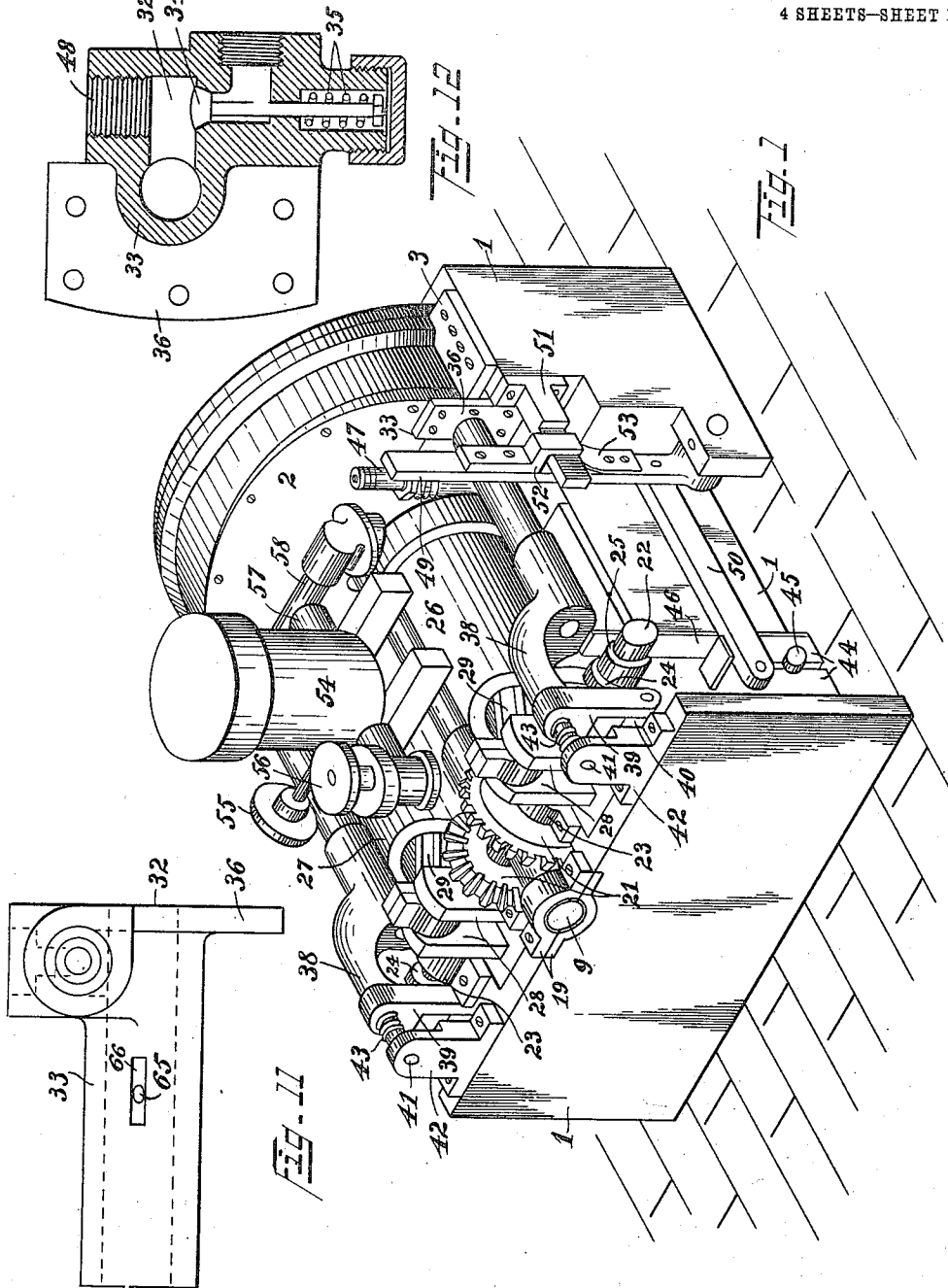


W. C. COOPER.
INTERNAL COMBUSTION TURBINE ENGINE.
APPLICATION FILED APR. 13, 1911.

1,064,962.

Patented June 17, 1913.

4 SHEETS—SHEET 1.



Witnesses:
H. Griewold.
E. P. Schlosser.

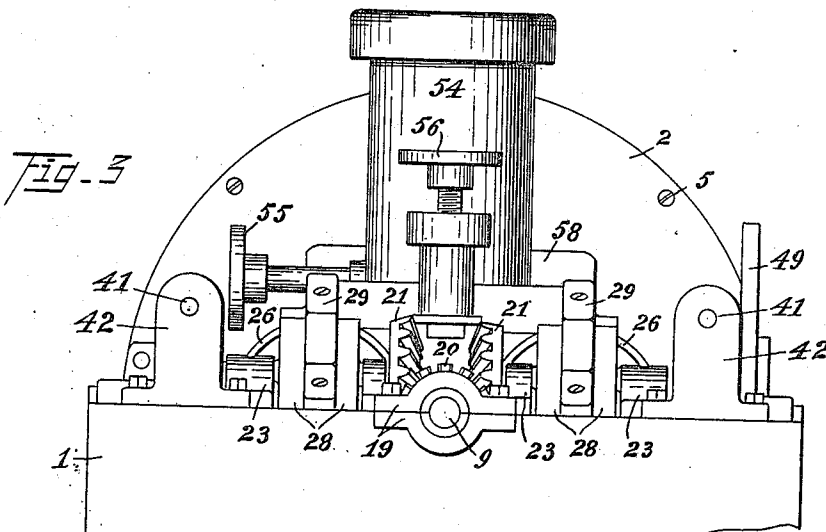
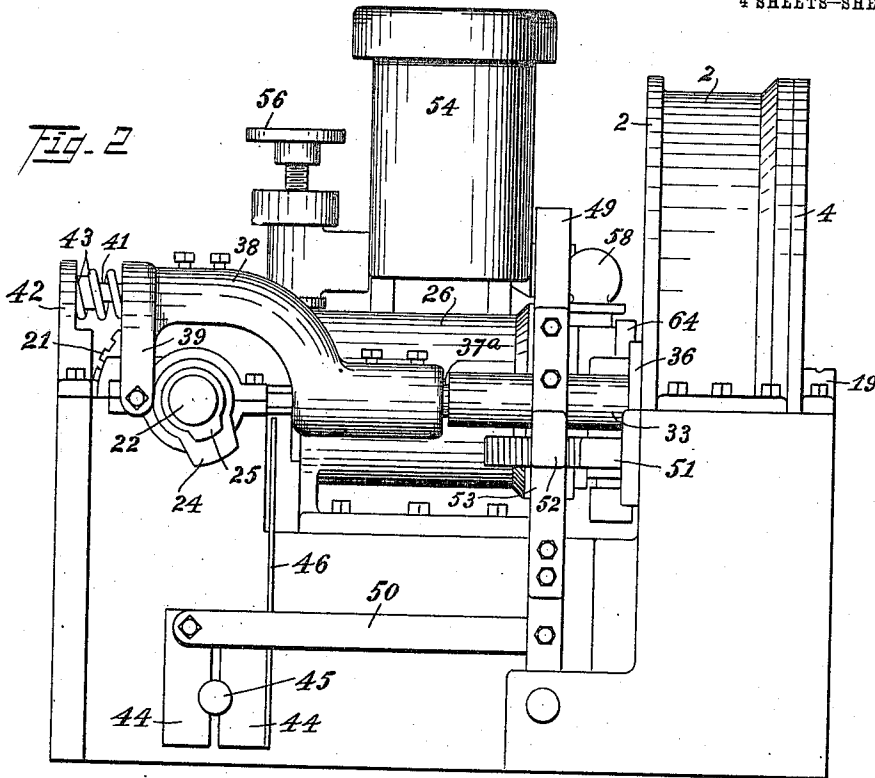
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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

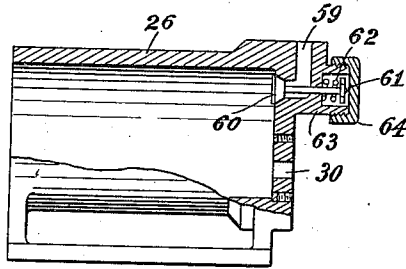


Fig. 5

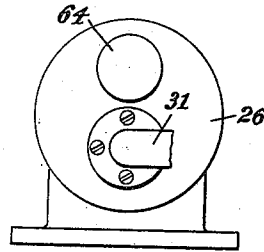


Fig. 6

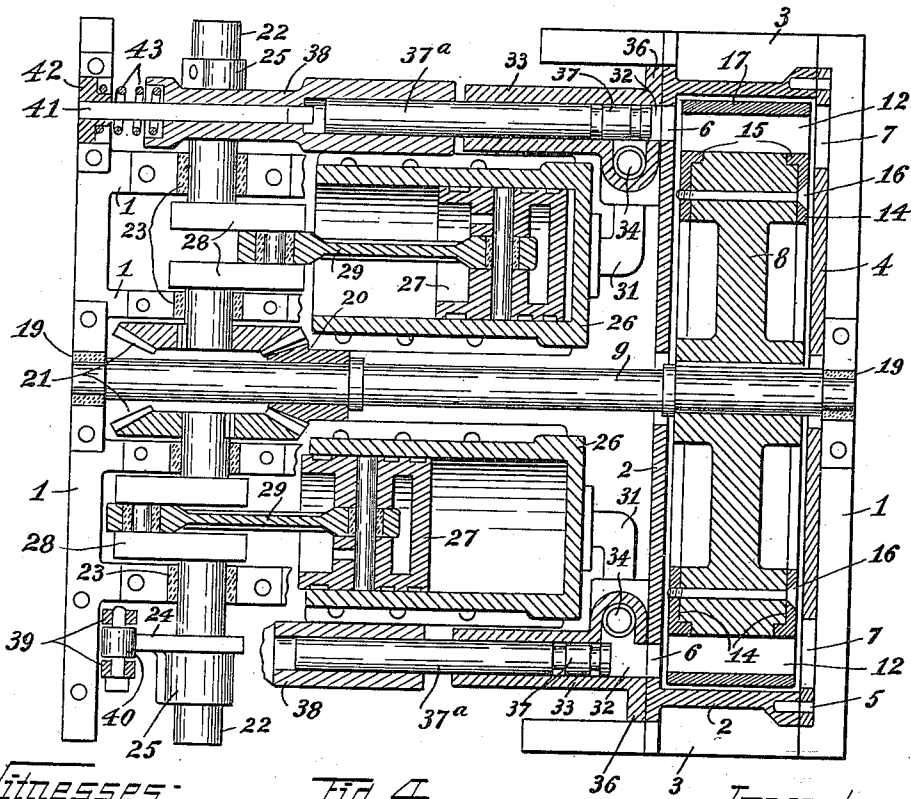


Fig. 4

Witnesses:

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4 SHEETS-SHEET 4.

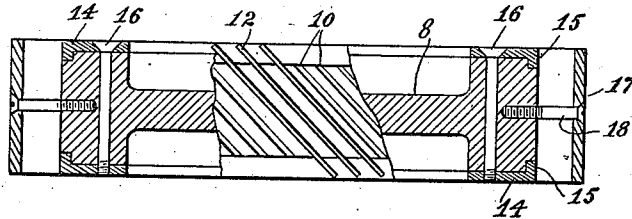


Fig. 9

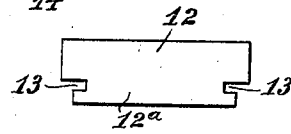


Fig. 10

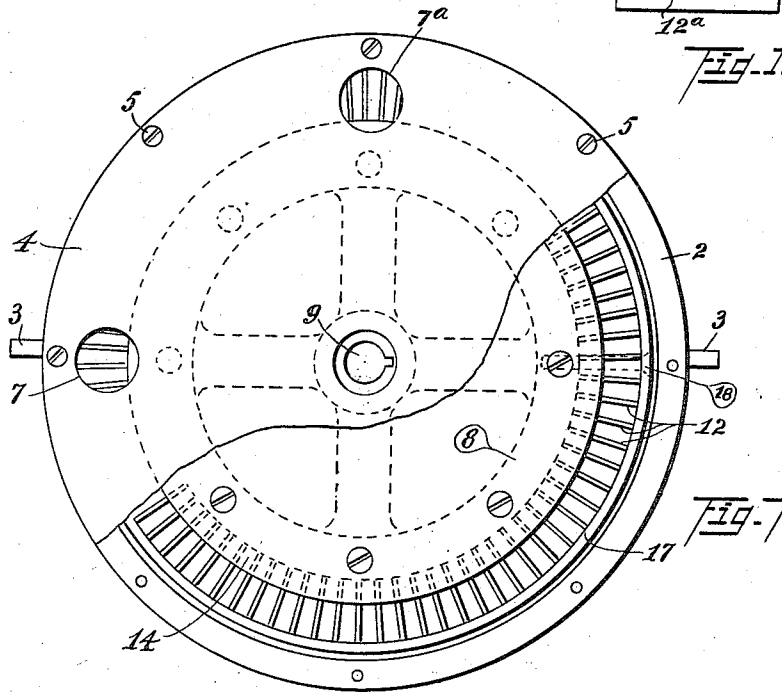


Fig. 7

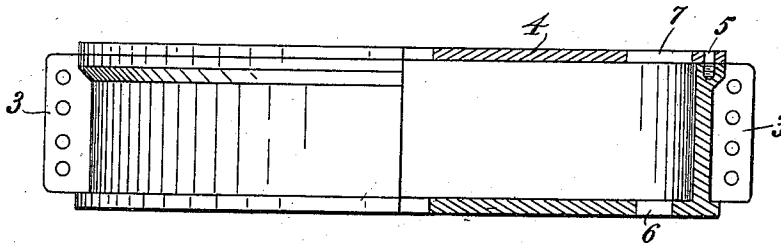


Fig. 8

Witnesses:

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UNITED STATES PATENT OFFICE.

WILLIAM CARL COOPER, OF PERRY, MICHIGAN.

INTERNAL-COMBUSTION TURBINE-ENGINE.

1,064,962.

Specification of Letters Patent.

Patented June 17, 1913.

Application filed April 13, 1911. Serial No. 620,733.

To all whom it may concern:

Be it known that I, WILLIAM CARL COOPER, a citizen of the United States, residing at Perry, in the county of Shiawassee and State of Michigan, have invented certain new and useful Improvements in Internal-Combustion Turbine-Engines, of which the following is a specification.

My invention relates to improvements in internal combustion turbine engines, the primary object being to provide a generally improved explosive engine of this class or type having the vanes or blades of the rotary element or turbine arranged to receive the direct impact and explosive force of the motive agent thus providing means for directly imparting motion to the driving shaft, and having its parts arranged and co-operating for the purpose of securing a steady, speedy, and powerful motion with a minimum amount of friction and greater economy of fuel than is possible in the ordinary engines of this type with which I am acquainted.

In carrying out these objects the invention has in view the provision of simple and practical means for delivering the motive agent or products of combustion to the vanes or blades of the rotor in such a manner as to utilize the full explosive force of such products thus securing a maximum effect from the compression and expansion thereof and resulting in greatly increased speed and power.

For practical reasons it is desirable to have the explosion or combustion chambers as near as possible to the points of impact on the blades of the rotor and owing to the great heat evolved by the combustion of the gases, means are provided for the rapid cooling of the parts after each impact thereon, the products of combustion being directed successively upon different blades of the rotor during the revolution of the latter so as to prevent overheating or injury to the parts.

A still further object of the invention is to so arrange and dispose the co-operating parts relative to each other as to result in uniformity of speed and power.

With the above mentioned and other ends in view, the invention consists in the novel construction, arrangement, and combination of parts, hereinafter described, illustrated in one of its embodiments in the accom-

panying drawings, and particularly pointed out in the appended claims.

Referring to the drawings, forming a part of this specification, Figure 1, is an isometric view of the improved internal combustion turbine engine. Fig. 2, a side elevation of the same. Fig. 3, a front elevation of the same. Fig. 4, a horizontal sectional view of the same, a portion of one of the cam actuated valve brackets being broken away for the purpose of clearer illustration of the adjacent cam on the cam shaft. Fig. 5, a vertical longitudinal sectional view, part in side elevation, of one of the compression cylinders. Fig. 6, a rear elevation of the same. Fig. 7, an enlarged rear elevation of the turbine or rotor casing, a portion of its walls being broken away for the purpose of clearer illustration of the rotor or turbine, proper. Fig. 8, a view partially in top plan and partially in section of the rotor casing, the rotor or turbine wheel being removed. Fig. 9, a view partially in section and partially in plan of the improved rotor or turbine wheel. Fig. 10, a plan view of one of the turbine vanes or blades detached. Fig. 11, a top plan view of one of the combustion cylinders detached. Fig. 12, a cross sectional view taken through the valve or combustion chamber portion of the same.

Similar numerals of reference designate like parts throughout all the figures of the drawings.

The improved engine comprises a supporting base or frame 1, adapted to carry and support the various parts. The rotor or turbine casing 2, is mounted upon the frame by means of supporting brackets 3, and is provided at its rear with a removable disk plate 4, secured by means of a plurality of screw bolts 5. The front disk plate of the rotor casing 2, is provided with expansion or firing ports 6, and the rear disk plate 4, is provided with exhaust ports 7, at the rear of the firing or expansion ports 6, and an intermediate exhaust port 7^a, at the top. The rotor or turbine wheel 8, is mounted upon a rotor shaft 9, and is provided about its rim with a plurality of diagonally disposed slots 10, adapted to receive and contain a plurality of turbine vanes or blades 12.

Each vane or blade comprises a main body portion adapted to extend beyond the pe-

riphery of the rotor 8, and to receive the impact of the products of combustion from the expansion or firing ports 6, as hereinafter explained, and a reduced stem or base portion 12^a, adapted to be seated in the corresponding vane slot 10. Each stem or base portion 12^a, is provided with oppositely disposed notches or recesses 13, and as a means for retaining the vanes or blades in the slots 10, retaining rings 14, are provided, said retaining rings being provided about their periphery with inwardly extending flanges 15, seated within the notches 13, and being secured to the rim portion of the rotor by means of a plurality of screw bolts 16. The outer ends of the vanes or blades 12, abut against and are surrounded by a band or ring 17, secured to the rim portion of the rotor by means of a plurality of retaining bolts 18, extending through the rim portion of the rotor 8.

The rotor shaft 9 is mounted in suitable bearings 19, of the frame 1, and is provided with a bevel gear or pinion 20, meshing with a pair of oppositely disposed bevel gears 21, carried upon the ends of a pair of crank shafts 22, said crank shafts being mounted in bearings 23, of the frame 1. The crank shafts 22, are provided at their outer ends with valve actuating cams 24, and reduced contact cams 25, adapted to cooperate with the timer mechanism as hereinafter described. A plurality of compression cylinders 26, are mounted upon the frame 1, said compression cylinders being provided with pistons 27, connected to cranks 28, on the crank shafts 22, by means of connecting arms 29. The cranks 28, of the crank shafts 22, are so arranged that the cranks will be 180° apart at either end of the respective strokes or paths of reciprocation of the piston trunks 27, as illustrated most clearly in Fig. 4, of the drawings, so that one piston trunk is compressing gas while the other is taking in gas.

Each compression cylinder is provided at its rear end with an outlet port 30, communicating with a conduit pipe 31, each of said conduit pipes leading to a combustion chamber 32, formed within a combustion cylinder or body 33, said compression cylinders 26, being adapted to be alternately thrown into and out of communication with the combustion chambers 32, during the reciprocation of the piston trunks 27, by means of valves 34, normally seated by means of springs 35, and operating in a well-known and understood manner. Each combustion cylinder or body is secured to the front disk plate 2, of the rotor casing by means of a bracket portion 36, and the combustion chamber or firing portion communicates with the expansion or firing port 6, during the combustion of the explosive charge.

As a means for alternately opening and

closing the expansion or firing ports 6, plunger slide valves 37, are provided, said plunger slide valves being provided with stem portions 37^a, carrying valve brackets 38. The valve brackets 38, are provided with depending brackets 39, provided with antifriction rollers 40, adapted to travel upon and to cooperate with the cams 24, on the crank shaft 22.

As a means for guiding the brackets 38, in their respective movements as actuated by the cams 24, guide pins 41, are provided, said guide pins being adapted to be reciprocated through guide brackets 42, and being surrounded by springs 43, interposed between the guide brackets 42, and the valve brackets 38, whereby the latter together with the antifriction rollers 40, are adapted to follow the movements of the actuating cams 24.

The timer mechanism comprises, in the present instance, a pair of blocks 44, mounted at each end of a rock shaft 45, said rock shaft being mounted in suitable bearings in the frame of the engine, said blocks 44, carrying contact plates or springs 46, adapted to cooperate with the contact cams 25, on the crank shafts 22. These contact plates are in circuit with a suitable system of ignition plugs 47, communicating with the combustion chamber or firing ports 32, said ignition plugs being adapted to be threaded in threaded openings 48, (see Figs. 11, and 12) in the combustion cylinders or bodies 33.

The timer mechanism is adapted to be regulated by means of a timer lever 49, connecting with one of the blocks 44, by means of a connecting bar 50, said timer lever being adjustably mounted by means of a bracket 51, frictionally engaged by means of a bracket 52, on the lever 49, and a spring member 53. A tank 54 is adapted to contain the supply of liquid hydrocarbon adapted to be vaporized through a suitable carbureter and controlled through the medium of suitable valves 55 and 56, a supply pipe 57, communicating with a branch pipe 58, leading to the top of the compression cylinders 26, through charge inlet ports 59, (see Fig. 5) said inlet ports being controlled by valves 60, adapted to cooperate with the piston trunks 27, in the compression cylinders, said valves being adapted to be regulated by means of adjusting nuts 61, mounted upon the stem portions of the valve 60, and abutting against springs 62, said springs being mounted in housings 63, provided with caps 64. The slide valves 37, are adapted to have a limited reciprocatory movement in the combustion cylinders 33, by being provided with stop pins or members 65 (see Fig. 11,) operating in guide slots 66, in the guide portions of the combustion cylinders 33.

From the foregoing description, taken in connection with the accompanying drawings, the operation and advantages of my invention will be readily understood.

5 Having thus described an embodiment of my invention, what I claim and desire to secure by Letter Patent is—

1. A turbine engine, comprising a frame, a rotor casing mounted thereon and provided with oppositely arranged expansion and exhaust ports, a rotor mounted in said casing and provided with blades diagonally disposed between said ports, a rotor shaft, crank shafts geared to said rotor shaft so as to revolve in opposite directions, combustion chambers communicating with said expansion ports, compression cylinders provided with pistons connected to said crank shafts, valved conduit pipes leading from said compression cylinders to said combustion chambers, plunger valves in said combustion chambers, means for operating said valves in coöperative relation to said pistons, ignition mechanism communicating with said combustion chambers, and timer mechanism operatively connected with said crank shafts.

2. A turbine engine, comprising a rotor casing provided with oppositely arranged expansion and exhaust ports at its front and rear, respectively, a rotor mounted therein and having blades extending between said ports, a rotor shaft provided with a pinion gear, crank shafts provided with bevel gears meshing with said pinion gear,

oppositely arranged combustion chambers communicating with said expansion ports, compression cylinders provided with pistons connected to said crank shafts, valved conduit pipes leading from said compression cylinders to said combustion chambers, plunger valves in said combustion chambers adapted to open and close said expansion ports, and means for operating said valves from said crank shafts in coöperative relation to said pistons.

3. A turbine engine, comprising a rotor casing including front and rear disk plates provided with oppositely arranged expansion and exhaust ports, respectively, a rotor mounted therein and having blades extending at an angle between said ports, a pair of crank shafts geared to said rotor, combustion chambers communicating with said expansion ports, a pair of compression cylinders provided with pistons connected to said crank shafts and communicating with said compression chambers by means of valved conduit pipes, and plunger valves in said combustion chambers operatively connected to said crank shafts and adapted to open and close said expansion ports in coöperative relation to said pistons.

In testimony whereof I have affixed my signature in presence of two witnesses.

WILLIAM CARL COOPER.

Witnesses:

SADIE BARRETT,
JULIA BOARDMAN.