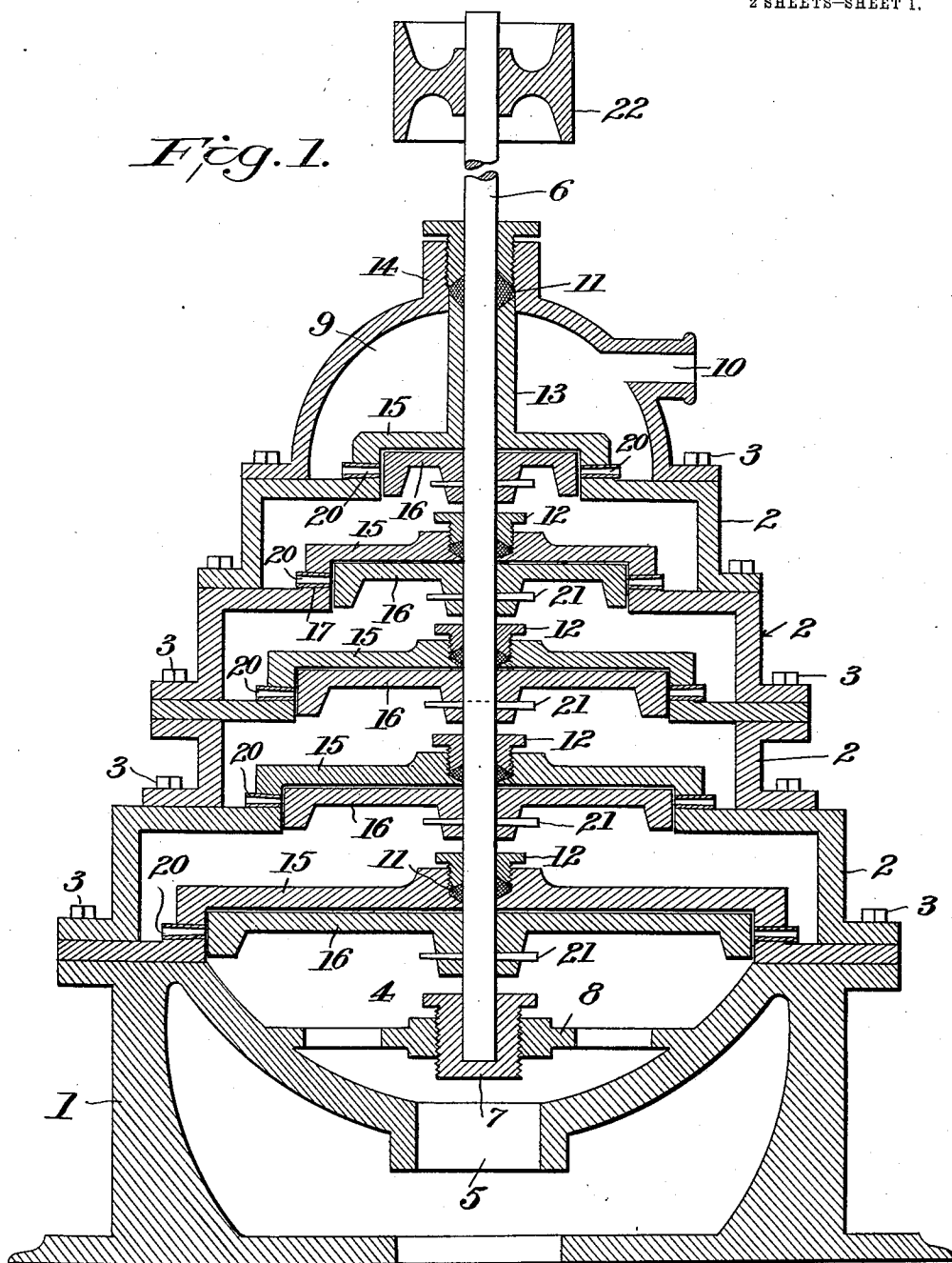


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COMPOUND ROTARY ENGINE.
APPLICATION FILED MAY 8, 1911.

1,008,137.

Patented Nov. 7, 1911.
2 SHEETS—SHEET 1.



WITNESSES

Ed Walker
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George C. Hale, INVENTOR

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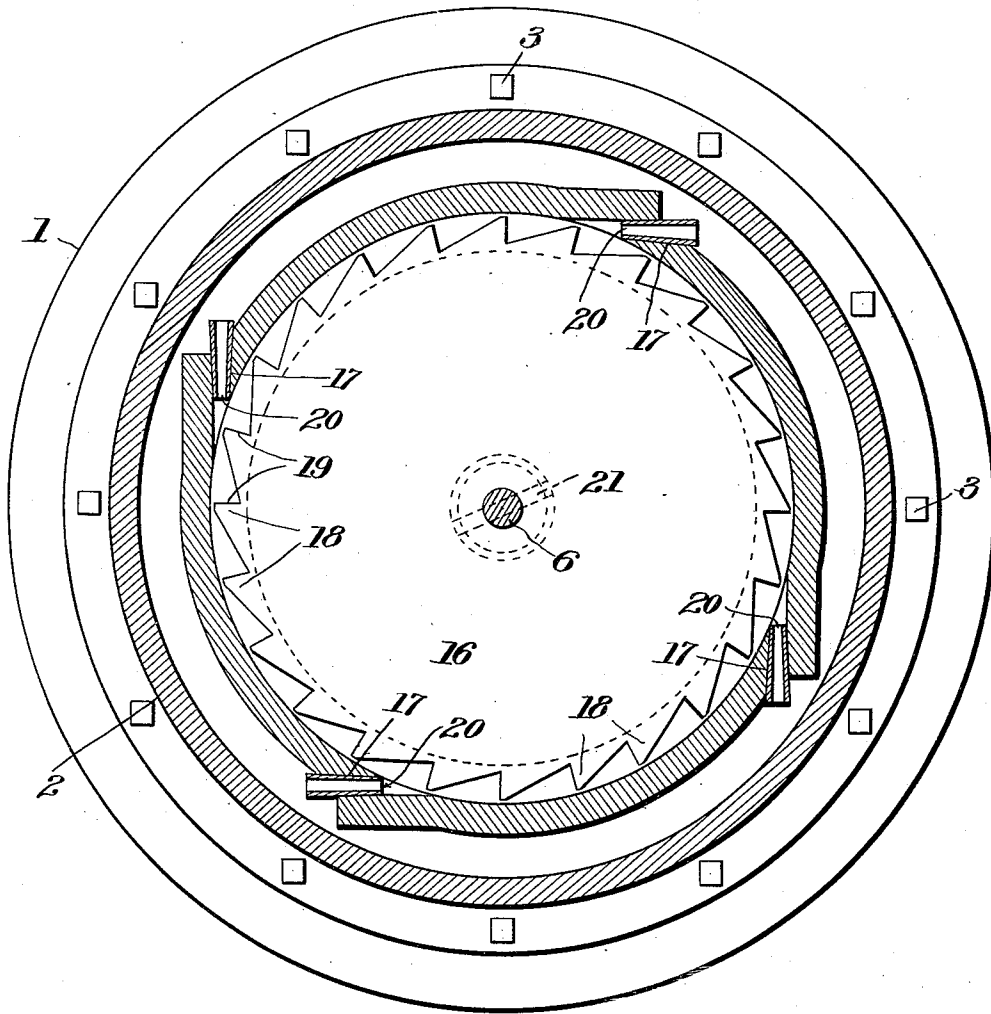
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Fig. 2.



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UNITED STATES PATENT OFFICE.

GEORGE CONSIDER HALE, OF KANSAS CITY, MISSOURI.

COMPOUND ROTARY ENGINE.

1,008,137.

Specification of Letters Patent.

Patented Nov. 7, 1911.

Application filed May 8, 1911. Serial No. 625,795.

To all whom it may concern:

Be it known that I, GEORGE C. HALE, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Compound Rotary Engines; 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 a compound rotary engine.

It has been my aim to construct a simple, efficient and economical rotary or turbine engine of the compound type,—that is to say, of the type in which the steam is used successively and expansively in a series of cylinders, the capacities of which increase from the one nearest the main intake port of the engine to the one adjacent to the exhaust thereof.

Other objects of my invention are to decrease friction and the consequent wear upon the parts and to also greatly reduce the cost of constructing the engine, as well as the expense of operating it.

A further object is to simplify the construction of the pistons.

Another object is to dispense with all valves and other small parts which are apt to get out of order, thereby impairing the efficiency of the engine.

Further objects will become apparent from the following description.

In carrying out my invention, I arrange the shaft of the engine in vertical position extending through a series of housings erected one upon another in the form of a pyramid, said housings decreasing in diameter as they approach the top of the pyramid. Within the respective housings and rigidly secured to the shaft are a series of rotary pistons or runners which have ratchet-shaped teeth or abutments on their peripheries. A dome-shaped steam chest is superposed upon the uppermost housing and is adapted to receive the steam at the initial boiler pressure. Each housing has ports opening upon the rigid abutments on the periphery of the piston which it incloses. After acting upon each piston, the steam passes down and acts upon the next lower one until it finally reaches a chamber formed below the bottom housing and which is provided with an exhaust port. Suitable

packing is placed around the shaft or piston rod where it passes through each housing and through the steam chest in order to prevent the escape of the steam from the latter or from one housing to another except via the ports which open upon the peripheries of the pistons.

The invention also consists in the features of construction and combinations of parts hereinafter described, illustrated in the accompanying drawings, and specified in the appended claims.

In the accompanying drawings: Figure 1 is a central vertical section of an engine constructed in accordance with my invention, and Fig. 2 is a horizontal section on the line *x-x* of Fig. 1 showing the formation of the periphery of the pistons.

Referring more particularly to the drawings, 1 designates the foundation or bottom casting of the engine which supports the several housings 2 detachably secured upon one another by bolts 3 or other suitable fastening means. The chamber 4, leading to the exhaust port 5, is preferably formed on the foundation 1, as illustrated, and said exhaust port is preferably arranged in vertical alinement with the shaft or piston rod 6. Said shaft is supported in an inverted thimble 7 adjustably mounted upon a stationary bridge 8. The thimble preferably has screw-threaded connection with the bridge, whereby the former may be readily turned for adjusting the shaft, as may be desired.

The steam chest 9, mounted upon the uppermost one of the housings, is provided with an inlet port 10. Packing 11 is placed around the shaft where it passes through each of the housings, said packing being retained in place by plugs 12. The top housing has a tubular extension 13 reaching up into the neck 14 of the chest, and the plug which retains the packing at that point is screwed into said neck, instead of into the housing, as is the case with the other plugs.

Each of the housings is provided with a central circular raised portion partition 15, forming a recess below it, in which is fitted one of the pistons or runners 16. In the sides of said raised portions, there are a suitable number of ports 17 opening at their inner ends upon the ratchet-shaped abutments 18 on the periphery of said piston. Each of said ports extends substantially tangentially to the piston so as to direct the full impact of the steam against the radial faces 19 of

the abutments. Tubular nozzles 20 are inserted in the ports 17 and extend some distance beyond them for the purpose of concentrating the jets of steam passing through the ports, whereby said steam is rendered more efficient for turning the pistons. As illustrated, the pistons are rigidly secured to the shaft by pins 21.

The path of the steam from the time it enters the chest 9, through its port 10, until it escapes through the exhaust port 5, is indicated by arrows. The full pressure of steam is directed against the uppermost one of the rotary pistons via the ports 17 in the topmost housing. In passing through each succeeding one of the lower housings, the steam is allowed to expand to a greater degree at each step, its final energy being expended upon the lowest piston or runner. A pulley 22 may be mounted upon the upper projecting end of the shaft for transmitting the power generated by the engine.

I claim:

1. In a compound rotary engine, the combination, with a shaft, a series of housings of gradually increasing capacities from one end to the other, said housings being connected together and arranged concentrically of the shaft, partitions extending to the shaft and separating the housings, said partitions having circular recesses formed therein, packing between said partitions and the shaft, a series of pistons fast on said shaft,

one of said pistons being arranged in each of said recesses, and abutments formed on the periphery of the pistons and presented to the annular walls of said recesses, which are provided with ports opening upon said abutments for the purpose specified.

2. In a compound rotary engine, the combination, with a vertical shaft, a series of housings of gradually increasing capacities from one end to the other, said housings being connected together and arranged concentrically to the shaft, a series of pistons fast on said shaft, one of said pistons being arranged in each of said housings, abutments on the peripheries of said pistons, a steam chest arranged externally of the smallest housing and having a neck arranged concentrically of the shaft, each of said housings having ports opening upon the peripheries of the respective pistons, packing around the shafts at the points where it passes through said housings, a sleeve on the smallest housing extending into the neck of the steam chest, and plugs securing said packing, one of said plugs being secured in the neck of the steam chest and the other plugs in the larger housings.

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

GEORGE CONSIDER HALE.

Witnesses:

O. C. WIESNER,
M. H. BOTTOM.