

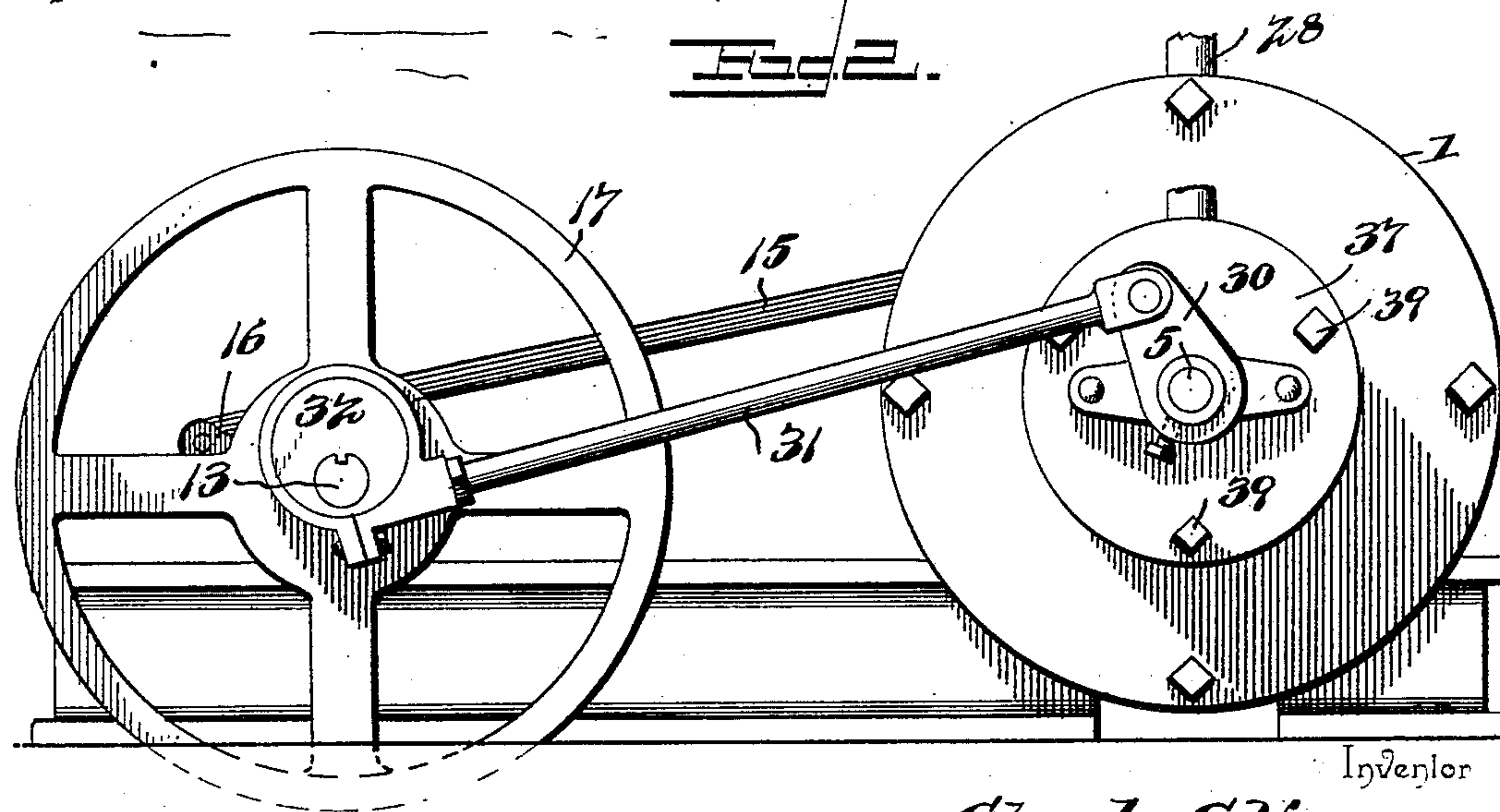
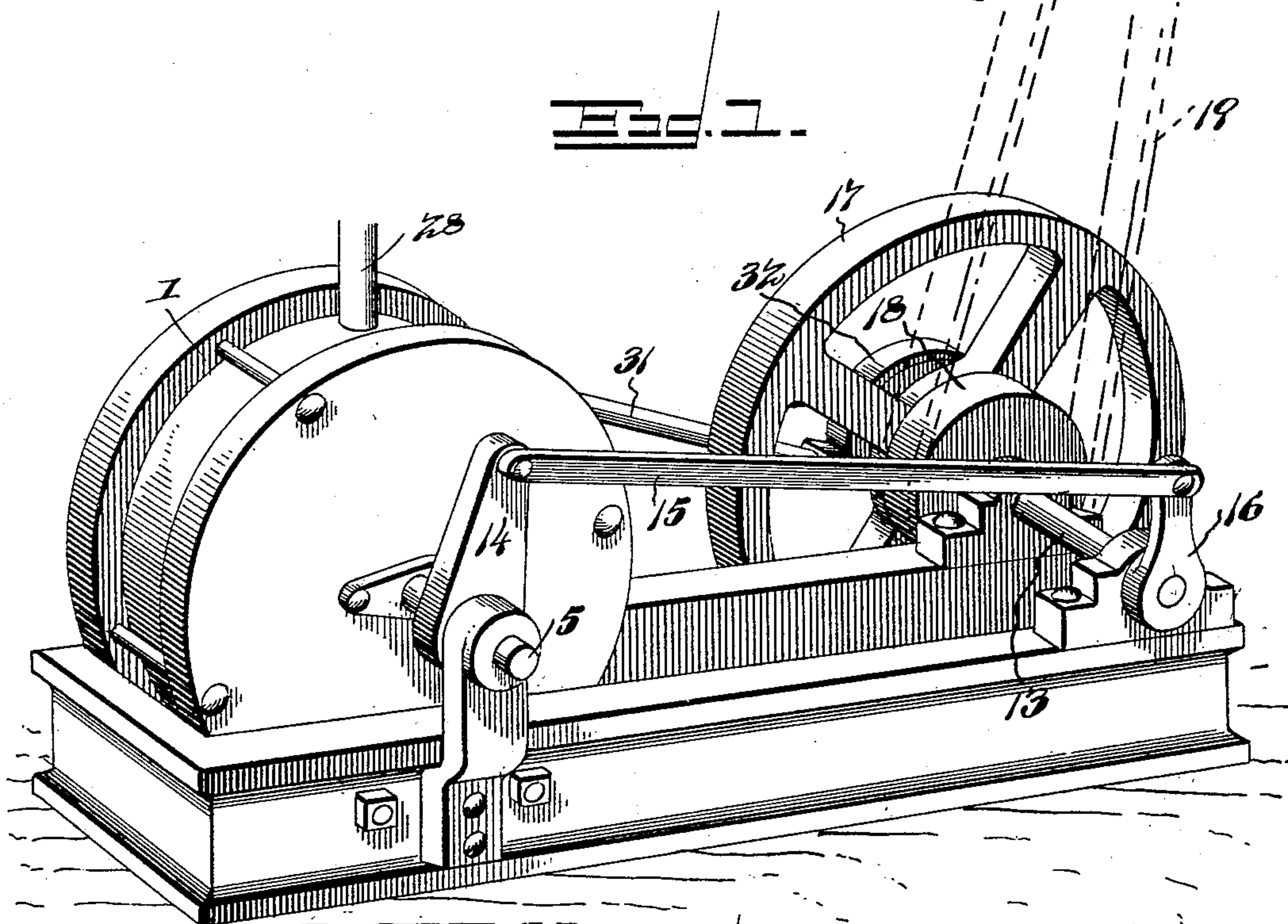
(No Model.)

2 Sheets—Sheet 1.

C. G. VANCE.
ROTARY ENGINE.

No. 602,530.

Patented Apr. 19, 1898.



Inventor

Charles G. Vance

Witnesses

E. H. Stewart.
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Chas. H. H. H.

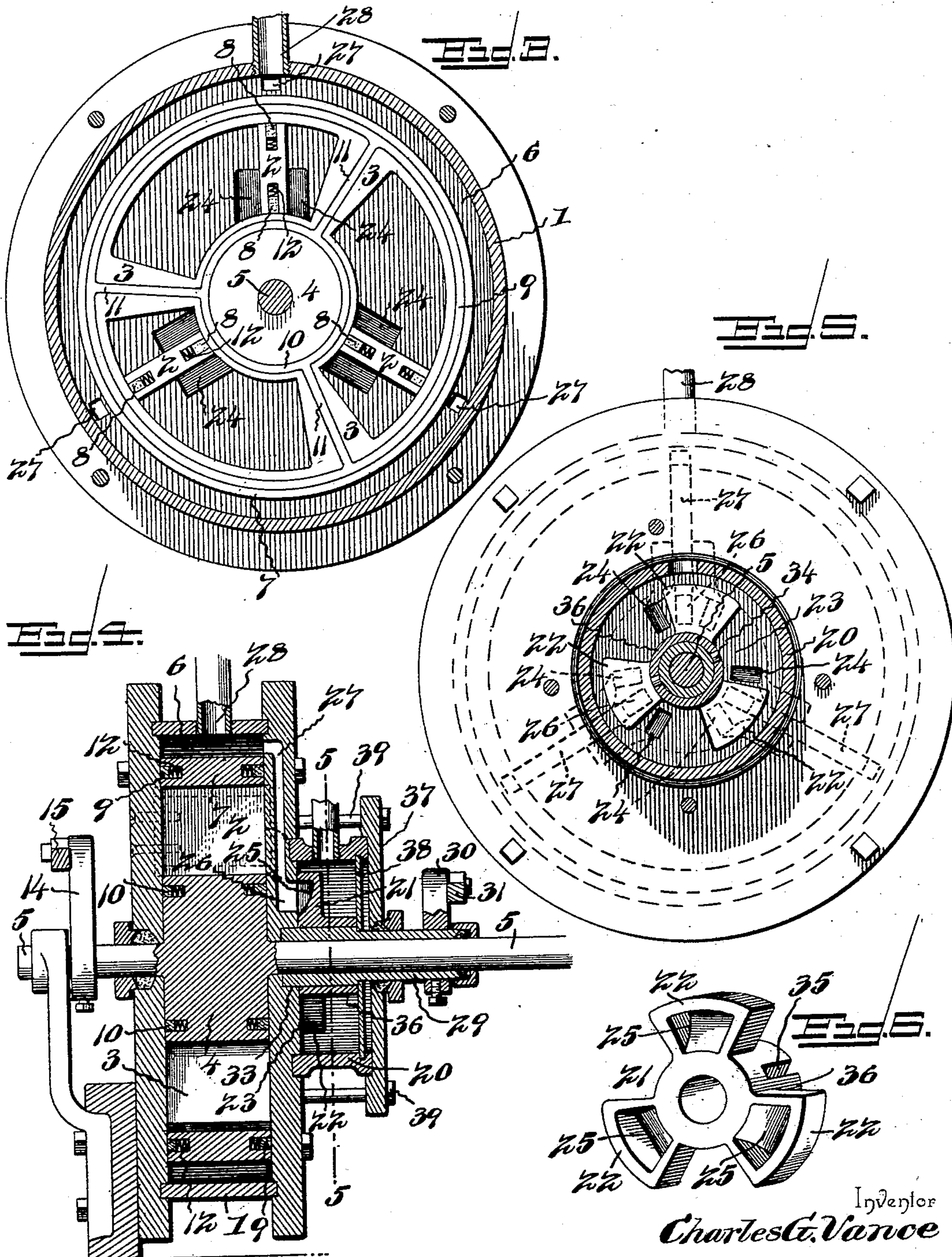
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Edw. Stewart
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By *W. D. Hays* Attorneys,

C. G. Vance

UNITED STATES PATENT OFFICE.

CHARLES G. VANCE, OF SPENCER, WEST VIRGINIA, ASSIGNOR OF TWO-THIRDS TO J. B. VANCE AND L. S. GOFF, OF SAME PLACE.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 602,530, dated April 19, 1898.

Application filed June 25, 1897. Serial No. 642,296. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. VANCE, a citizen of the United States, residing at Spencer, in the county of Roane and State of West Virginia, have invented a new and useful Rotary Engine, of which the following is a specification.

My invention relates to engines of the oscillatory-piston type, and has for its object to provide an improved compact and efficient construction of plural-piston engine wherein the moving abutments or piston-heads oscillate in segmental concentric paths to avoid the use of guides and similar devices employed in connection with pistons having a linear reciprocatory movement, and, furthermore, to provide a simple and efficient construction of valve mechanism for controlling the admission and exhaust of the motive agent, where- by the reversal of the engine may be accomplished with facility.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a perspective view of an engine constructed in accordance with my invention. Fig. 2 is a side view showing the opposite side of the engine. Fig. 3 is a sectional view of the cylinder, taken in a plane at right angles to the axis of the piston. Fig. 4 is a sectional view taken parallel with and in the plane of the piston-axis. Fig. 5 is a transverse sectional view of the valve-chest on the line 5 5 of Fig. 4. Fig. 6 is a detail view, reversed, of the valve.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

In the preferred embodiment of my invention I employ a cylinder 1, provided with a plurality of transverse partitions forming fixed abutments 2, with which coöperates a pivotal or rocking piston having a plurality of moving abutments or piston-heads 3, corresponding in number with the fixed abutments, each moving abutment or piston-head being arranged to oscillate in the space between two contiguous fixed abutments. These moving abutments or piston-heads are pref-

erably carried by a common central core 4, having a shaft or spindle 5, and in order to provide within the cylinder, in addition to the piston-chambers between the fixed abutments, an annular surrounding space or exhaust-chamber 6 I connect the outer extremities of the piston-heads by an annular rim 7, which is exteriorly spaced from the annular wall of the cylinder. Thus both the inner and outer concentric walls of the piston-chambers are carried by and form parts of the piston, and in order to form steam-tight joints between these inner and outer walls of the piston-chambers I provide the fixed abutments with inner and outer yielding-actuated packing-strips 8. Furthermore, packing-strips are arranged upon the opposite side faces of the piston on the edges of the rim 7, as shown at 9, on the corresponding faces of the core, as shown at 10, and on the corresponding faces of the piston heads or wings, as shown at 11; but these strips 9, 10, and 11 are preferably connected at their contiguous points to form a spider or continuous packing-strip provided with suitable actuating-springs 12, these packing-strips or spiders being employed for contact with the heads of the cylinder.

Inasmuch as the spindle or driving-shaft 5 receives an oscillatory motion by the application of motive agent, as hereinafter fully explained, it is necessary for ordinary purposes to convert said motion into rotary motion of a driven shaft 13, and hence I provide the driving-shaft with an arm 14, connected by a pitman 15 with a crank-arm 16 on the driven shaft; but it is obvious that any equivalent means of gearing may be employed. In the construction illustrated this driven shaft is provided with a balance-wheel 17 and suitable means for conveying power to machinery to be driven, such as a belt-wheel 18, adapted to be traversed by a belt 19. (Indicated in dotted lines in Fig. 1.)

Inasmuch as the piston-chambers are arranged concentrically, each being of segmental construction, I have constructed a valve mechanism including a valve or steam chamber 20, which is concentric with the driving-shaft, and hence is arranged coaxially with relation to the piston, and within this

chest is arranged an oscillatory valve 21, also mounted concentrically with the driving-shaft and having a plurality of radially-disposed wings 22 for controlling ports arranged in the valve-seat 23 in an annular series. The feed-ports 24 communicate directly with the piston-chambers upon opposite sides, respectively, of the plane of each fixed abutment, as will be seen by reference to Fig. 3; but the construction is such as to allow communication with the interior of the valve-chamber of only one feed-port of each group, (see Fig. 5,) the remaining feed-port of each group being by means of a cavity 25 in the under side of the contiguous valve-wing in communication with an intermediate exhaust-port 26, one of which is preferably arranged in the plane of each fixed abutment and communicates with an exhaust-channel 27, formed in the contiguous cylinder-head and communicating with the annular exhaust-chamber 6, which is provided with an outlet-port 28. Thus when the piston is moving in a direction indicated by the arrow in Fig. 3 motive agent is being fed through the port 24 at the left of the central upper fixed abutment and through the corresponding feed-ports of the remaining groups of the series and is being exhausted through the corresponding feed-ports at the opposite sides of the fixed abutments, passes into the exhaust-ports 26 through the exhaust-channels 27, and thence into the annular exhaust-chamber 6, from which it escapes through the port 28. Obviously the valve must be oscillated at the end of each stroke of the piston to reverse the direction of feed and exhaust, and in order to accomplish this I provide the valve-stem 29 with an arm 30, to which is connected an eccentric-rod 31, actuated by an eccentric 32 on the driven shaft 13.

In the construction illustrated the driving-shaft is extended in both directions beyond the opposite heads of the cylinder to provide for making a second attachment for communicating power to machinery to be driven; but it is obvious that this extension of the driving-shaft through the valve-chamber is not indispensable, provided it is desired to communicate motion of the driving-shaft only to the driven shaft 13 or its equivalent; but in order to provide for the dismounting of the valve for the purpose of regrinding its face or making other repairs or adjustments I employ a valve-stem 29, which is of tubular construction to surround the driving-shaft and is removably seated in a socket 33 in the contiguous cylinder-head and is provided with lateral pins 34 to engage registering slots 35 in opposite sides of the hub 36 of the valve. By removing the outer plate 37 of the valve-chamber and the annular shell, which constitutes the body portion of said chamber and which carries a transverse bridge 38 to bear upon the outer end of the hub of the valve, the valve, with its stem, may be dismounted. The outer plate or head of the valve-chamber

is secured in place by means of suitable fastening devices, such as bolts 39.

From the above description it will be seen that I have provided an oscillatory engine wherein any desired motive agent may be employed, the same being of compact construction, while including a plurality of chambers which in operation are the equivalent of a plurality of cylinders, while the frictional contact of the moving parts is reduced to the minimum, and the exhaust motive agent by introduction to the annular chamber surrounding the piston-rim performs the function of a lubricant. Furthermore, it will be seen that many of the advantages of a rotary engine—for instance, that of a balanced piston—are obtained by the use of a construction such as I have described, and for taking up wear it is possible to employ the simple packing-strips 8, which are arranged in the inner and outer edges of the fixed abutments, thus simplifying the construction and avoiding the necessity of repeatedly replacing worn parts or repairing the same to prevent lost motion and the leakage of motive agent.

It will be understood, furthermore, that I am enabled by this construction to obtain the advantages of a compound engine by employing the exhaust motive agent in connection with cylinders of greater capacity.

It is obvious that various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. An engine having a cylinder provided with an outlet, a piston provided with radial heads or wings, and an annular rim connecting the heads or wings and spaced from the wall of the cylinder to form an exhaust-chamber, fixed abutments spanning the cylinder between the piston-heads and within said annular rim, to form piston-chambers, and valve mechanism, having duplicate feed-ports in communication with each piston-chamber, and exhaust-ports, one for each piston-chamber, in communication with the cylinder outside of the annular rim of the piston, said feed and exhaust ports terminating in a valve-seat, substantially as specified.

2. An engine having a cylinder, a rocking piston having a core, a connected concentric rim spaced from the annular wall of the cylinder to form an annular exhaust-chamber, and interposed piston heads or wings carried by the core and rim, a plurality of fixed abutments spanning the cylinder transversely between the surfaces of the core and rim in the spaces between the piston heads or wings, and valve mechanism having feed and exhaust ports in communication, respectively, with the intervals between said abutments and with said exhaust-chamber, substantially as specified.

3. An engine having a cylinder, a rocking

piston having a core, a concentric rim exteriorly spaced from the annular wall of the cylinder to form an intervening exhaust-chamber, and a plurality of wings interposed
 5 between and carried by the core and rim, a plurality of fixed abutments spanning the cylinder transversely in the spaces between the piston heads or wings to form piston-chambers bounded at their sides by the cylinder-
 10 heads, and valve mechanism having feed and exhaust ports, in one of the cylinder-heads, in communication with said piston-chambers and the exhaust-chamber, substantially as specified.

15 4. An engine having a cylinder provided with a plurality of fixed abutments, separating segmental concentric piston-chambers, a rocking piston having a plurality of heads or wings to oscillate respectively in said segmental piston-chambers, and also having a hub
 20 and a rim forming the inner and outer walls of the piston-chambers, the rim being spaced from the annular wall of the cylinder to form an exhaust-chamber, a valve-chamber concentric with the spindle of the piston, and
 25 having a valve-seat provided with an annular series of feed and exhaust ports, arranged in groups corresponding in number with the piston-chambers, each group comprising feed-
 30 ports, in communication with the piston-chambers upon opposite sides of the fixed abutments, and an interposed exhaust-port, communicating with the annular exhaust-chamber, a winged valve seated in the valve-
 35 chamber, concentric with the piston for controlling said ports, and operating connections between the piston and valve for communicating oscillatory movement to the latter, substantially as specified.

40 5. An engine having a cylinder, a rocking piston provided with an annular rim and a plurality of heads or wings, the cylinder be-

ing provided with a plurality of fixed abutments, for dividing its interior into a plurality of segmental piston-chambers in which
 45 said heads or wings operate, and the rim of the piston being spaced from the annular wall of the cylinder to form an intervening annular exhaust-chamber provided with an outlet-port, a valve-chamber arranged concentric
 50 with the piston-spindle and having a valve-seat provided with an annular series of ports arranged in groups, each group consisting of feed-ports in communication with the piston-chambers upon opposite sides, respectively,
 55 of a fixed abutment, and an intermediate exhaust-port in communication with the exhaust-channel in the cylinder-head, said exhaust-channel being in turn in communication with the annular exhaust-chamber of the
 60 cylinder, a valve for controlling said ports, and operating connections between the piston and the valve, for communicating motion to the latter, substantially as specified.

6. In an engine, the combination with a cylinder, of an oscillatory piston recessed to form
 65 a plurality of segmental chambers and interposed piston heads or wings, said chambers being bounded at their outer sides by a rim forming part of and carried by the piston,
 70 and being intercepted by transverse partitions connected and carried by the cylinder-heads and forming fixed abutments, and valve mechanism for controlling the admission and exhaust of motive agent, substantially
 75 as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

CHARLES G. VANCE.

Witnesses:

E. H. BAILEY,
 G. P. STONE.