No. 840,688. PATENTED JAN. 8, 1907.

A. H. CARPENTER.

ROTARY ENGINE.

APPLICATION FILED SEPT. 19, 1905.

Fig. 1.

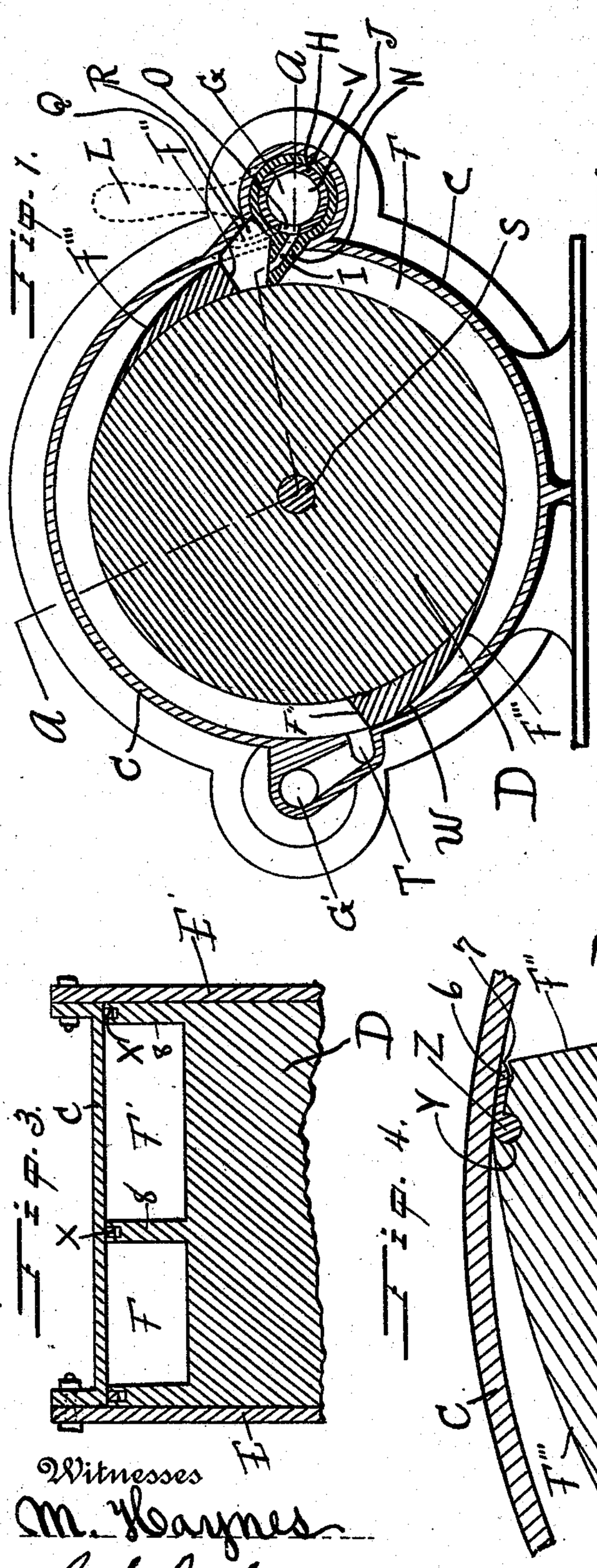

Fig. 2.

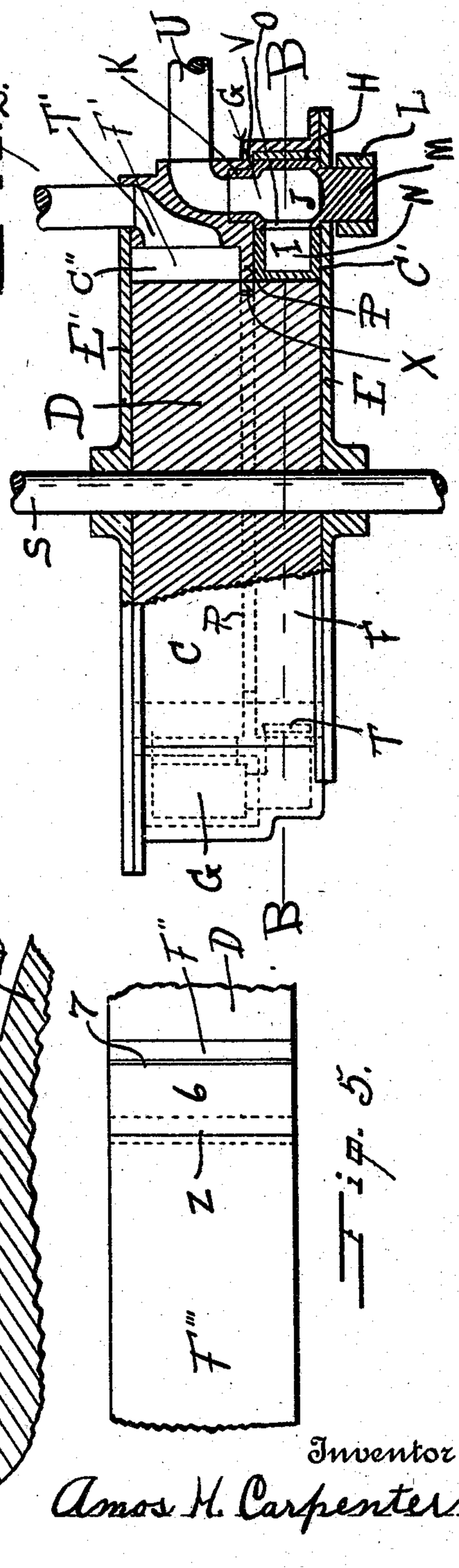

Fig. 3.

Fig. 4.

Fig. 5.

Witnesses

M. Haynes

J. L. Dreher

Inventor

Amos H. Carpenter

UNITED STATES PATENT OFFICE.

AMOS H. CARPENTER, OF STOCKTON, CALIFORNIA.

ROTARY ENGINE.

No. 840,688. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed September 19, 1905. Serial No. 279,153.

To all whom it may concern:

Be it known that I, AMOS H. CARPENTER, a citizen of the United States, residing at Stockton, in the county of San Joaquin, State of California, have invented a new and useful Improvement in Rotary Engines; and I declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and the letters of reference marked thereon, which form a part of this specification.

My invention relates to certain improvements in rotary engines; and the object of my improvement is to provide a machine that will utilize steam economically and to the best advantage and receive the steam directly against projections in the periphery of the rotating wheel at any desired distance from the axle, and thereby develop more power than can be obtained from engines now in use with a like amount of steam. This I accomplish by the use of the peculiar construction and novel combination and adaptation of parts hereinafter described, and particularly pointed out in the claims hereunto annexed, reference being had to the accompanying drawings for a better comprehension thereof, in which—

Figure 1 is a side elevation in vertical section through line B B of Fig. 2, showing the valves and parts. Fig. 2 is a plan view, partly in section, on line A A of Fig. 1, showing the live-steam port and the exhaust-steam port. Fig. 3 is a detail view of a section of the solid wheel, with only one compartment in the cylinder. Fig. 4 is a detail view of a section of the shell and piston, showing the packing in position. Fig. 5 is a face view of the same.

My improvement consists, essentially, of the hollow cylinder C, which may be made of any suitable length and diameter and which may have one compartment only, as shown in Fig. 3, or it may be divided by suitable partitions P into two or more compartments, as shown in Fig. 2. Each end of the cylinder is tightly closed by a suitable cover or end piece E and E′, which is fastened to its respective end of the cylinder by any suitable means. The shaft S may be enlarged or provided with a drum D and is made to pass lengthwise through the center of said cylinder C and through the aforesaid covers or end pieces and is journaled in the latter, which said journals are properly packed to make the same steam-tight. In each compartment C′ and C″ of said cylinder is placed a rotating wheel W, which is rigidly attached to said shaft S and which is of sufficient size to completely fill its respective chamber and turn loosely therein, except that one or more recesses or steam-chambers F and F′ are made in its periphery of suitable length, depth, and width, one end of which said recess F″ is made to extend abruptly into said rotating wheel at any desired angle, and the the other end of said recess F‴, commencing at any suitable point, gradually lessens in depth, and finally terminates in the periphery of the wheel, which recess constitutes the steam-chamber, and the abrupt end thereof F″ serves as the end of the piston against which the steam is driven to produce the rotation of the inside wheel. A suitable steam-feed chamber G is rigidly attached to said cylinder C for each compartment thereof at a suitable point on its periphery, the inside of which is cylindrical in form and serves as the incasement of the feed-valve V, which said valve is adapted to closely fit and work in said feed-chamber G and is cylindrical in form, except that on its periphery is rigidly attached a triangular or other suitably-shaped projection or nozzle N, which when turned downward is stopped by the walls of the feed-chamber and rests closely against the sides of its chamber and is of sufficient length and width to reach the bottom and sides of said recesses in the periphery of its respective wheel, and thereby forms a steam-tight partition therein.

Extending lengthwise through the center of the feed-valve V is a cylindrical hole H, which serves as a journal for its axis and from which passes a slot-like aperture I through its triangular projection or nozzle N to the front face thereof, whereby the same is connected with the said steam-chambers F and F′ in the wheel when the valve is open and the nozzle N has penetrated the same.

The axle of the feed-valve consists of a hollow cylindrical pipe J, each end of which is journaled loosely but steam-tight in the respective end pieces of the feed-chamber G, so that the same may be turned by the lever L, that is fastened rigidly to its end M, that projects through one of the ends of said feed-chamber G, and the other end of said axle-pipe K is journaled loosely in the other end

piece of the feed-chamber and connects with the pipe U, through which steam is admitted from the boiler to the feed-valve V. A long narrow slot O passes lengthwise through the periphery of said axle-pipe J, which allows the steam to pass from the same and come in contact with the inside contiguous surface of the feed-valve V, and said slot is so disposed therein that by turning the axle-pipe by means of the lever L the slots of the valve and axle-pipe can be adjusted with reference to each other, so as to increase or diminish the supply of steam that is admitted into the steam-chamber of the wheel. A triangular or other suitably-shaped recess R is made in the frame of the feed-chamber contiguous to its cylindrical apartment and the periphery of its respective wheel for the purpose of receiving said triangular or other suitably-shaped nozzle of the feed-valve when the same is closed. When it is desired to use the same steam more than once, a similar feed-chamber G′ with feed-valve, axle-pipe, and recess, is made and rigidly attached to the periphery of said cylinder at any suitable place for each compartment thereof, or when the wheel is solid, having only one compartment and more than one set of steam-chambers, as shown in Fig. 3, for each set or series of steam-chambers therein, and the working of each subsequent feed-valve in such chamber is similar to the first, except that the exhaust-pipe of the first chamber serves as the feed-pipe of the second, and if more than two feed-chambers are used the exhaust-pipe of the second serves as the feed-pipe of the third, the same being connected by suitable connecting-pipes, whereby the steam may be used as many times as desired by making additional compartments in the cylinder or more chambers or sets of chambers in the solid wheel, as shown in Fig. 3, the subsequent compartments or sets of chambers and rotating wheels being larger than the preceding one in order to allow the steam to expand in passing from one to the other.

When the feed-valve is open and the nozzle projects into the steam-chamber of the rotating wheel, the steam presses against the piston-head F″, formed in the periphery of the wheel, and forces the same to turn on its axis, and when the nozzle of the feed-valve is raised from said steam-chamber by the cam portion and thrown into its recess R in the frame of the cylinder the slot I of the valve V passes the slot O in the axle-pipe J and the steam is shut off; but the slot I remains full of compressed steam, and when the cam portion on the periphery of the wheel passes the nozzle N and the steam-chamber becomes contiguous to said nozzle the compressed steam in the slot I expands against the upper wall of the recess R and throws the nozzle back into the said contiguous chamber, thereby making the valve seft-acting. The dotted lines Q show the position of the slot I when the valve V is closed and resting in the recess R. The exhaust-holes T and T′ for each set of steam-chambers pass from the periphery of the cylinder into the inside thereof at any suitable point, and the exhaust-hole of the first set of steam-chambers is connected by any suitable pipe with the feed-valve of the next set of steam-chambers, and the exhaust of the last set is made into the open air by the pipe T′.

Steam packing rings or strips X, such as are commonly used, are placed on the periphery of the axle or its drum at each end thereof, and where the partitions P between the compartments of the cylinder come in contact with the same, so that such bearings or joints may be steam-tight, and when the rotating wheel is solid such steam-rings X are placed on the periphery of the wheel at each end and between each set of steam-chambers therein and work closely against the periphery of the cylindrical hole of the cylinder.

For packing other joints or bearings that are necessary to be made steam-tight a cylindrical hole Y is made at any suitable place that opens upon the surface to be packed, and into this hole is fitted a cylindrical post Z, to which is laterally attached a thin flat metal card-piece 6, with beveled outer end 7, which is hinged therein, and the pressure of the steam under the beveled edge forces the card-piece against the opposite surface, thereby making the joint steam-tight, or any other suitable steam-packing device may be used.

The partitions P, in which the shaft S is journaled and which are rigidly attached to the hollow cylinder, and thereby form steam-tight compartments therein, may be dispensed with by making the rotating wheel, regardless of the number of sets of steam-chambers in its periphery, solid with a projecting rim 8 encircling the wheel between the sets of steam-chambers and extending outward to the periphery of the cylindrical hole in the cylinder, as shown in Fig. 3, and the same results are thereby obtained.

When steam is made to pass into the steam axle-pipe, it can pass into the feed-valve only when the slots of the valve and pipe are in conjunction, and when the nozzle of the valve is raised from the steam-chamber of the wheel and thrown into the recess R in the frame of the cylinder the slots are so arranged that they cease to be in conjunction and the steam is shut off. When the nozzle is thrown downward by the expansive force of the steam in the slot, as above shown, the steam passes to the steam-chamber of the rotating wheel and presses against the head thereof and causes the same to revolve, and when the cam portion of said wheel reaches the nozzle of the feed-valve it gradually

raises it into the recess R out of the pathway of the wheel, so that it may fall into the next chamber, and the same process is repeated.

When the slot in the valve passes upward, the slot in the steam axle-pipe becomes closed and the steam is shut off, and the fore part of the steam-chamber then reaches the exhaust-pipe, and the steam thereupon passes into the second set of steam-chambers through its feed-valve, and the steam acts again in the engine. As soon as the aforesaid slots in valve and axle pipe cease to be in conjunction the steam ceases to enter the chamber, and the steam then works expansively.

By means of the lever L the axle-pipe J may be turned in either direction, and the admission of steam into the chamber is regulated thereby.

If it is desired to fill the entire chamber with steam, the lever is turned so that the slot in the pipe extends upward, so that it cannot be covered by the encircling pipe of the feed-valve until it reaches its position in the recess R, and by turning it in the opposite direction the slot may be partially covered when the valve is wide open, and the amount of steam that passes into the chamber is thereby diminished, and if the lever is turned still further in the same direction the steam may be entirely shut off, and the engine will cease to work.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A hollow cylinder with closed ends, provided with a shaft that passes lengthwise through its center and is journaled in the end pieces thereof, a rotating wheel within said cylinder that turns therein and is rigidly attached to said shaft, and that has one or more recesses or chambers in its periphery, of suitable depth, length and width, one end of which said recess or recesses extends abruptly into the periphery of the wheel, at any suitable angle, and the other end, commencing at any suitable point, gradually lessens in depth until it terminates in the periphery of the wheel, a suitable feed-chamber for each set of recesses in the wheel for the incasement of the feed-valve, a suitable feed-valve with projecting nozzle that is adapted to drop from the frame of the inclosing feed-chamber into the chambers in the periphery of the inside wheel, and suitably hinged on a laterally-slotted feed-pipe for the entrance of the steam so as to open or close the slot in the valve at any desired point in the revolution of the inside wheel by the motion of the nozzle caused by its contact with the cam portion on the periphery of said wheel so as to utilize the expansive power of the steam, and a suitable exhaust-port for the escape of the steam, substantially as set forth.

2. A hollow cylinder with closed ends, provided with one or more compartments and suitable partitions to form the same, and a shaft that passes lengthwise through its center and is journaled in the end pieces thereof and said partitions, a rotating wheel in each compartment that turns loosely therein and is rigidly attached to said shaft and that has one or more recesses or steam-chambers in its periphery, of suitable depth, length and width, one end of which said recess or chambers extend abruptly into the periphery of its respective rotating wheel, at any suitable angle or curve, and the other end, commencing at any suitable point, gradually lessens in depth until it terminates in the periphery of the wheel, a suitable feed-chamber for each compartment and inclosed wheel for the inclosure of the feed-valve, a suitable cylindrical feed-valve, with projecting nozzle, hinged on a hollow feed-pipe and adapted to swing thereon and drop from the frame of the inclosing feed-chamber into the chambers in the periphery of the inside wheel, and provided with a lateral slot extending lengthwise from its interior to the outer surface through the front face of the nozzle, and having a hollow feed-pipe as an axle which is provided with a lateral slot extending lengthwise through its shell that is so arranged as to be opened or closed at any desired point in the revolution of the inside wheel by properly adjusting the cam-piece on its periphery to operate said nozzle and thereby use the expansive force of the steam, and a suitable exhaust-hole for the escape of the steam, substantially as set forth.

3. A hollow cylinder with closed ends, provided with an enlarged shaft or drum that passes lengthwise through its center and is journaled in the end pieces thereof, a rotating wheel within said cylinder that turns therein and is rigidly attached to said shaft or drum, and that has one or more recesses or steam-chambers or sets of chambers in its periphery, of suitable depth, length and width, one end of which said recess or chambers extends abruptly into the periphery of the wheel at any suitable angle, and the other end, commencing at any suitable point, gradually lessens in depth until it terminates in the periphery of the wheel, a feed-chamber for each set of steam-chambers in the wheel rigidly attached to said cylinder at a suitable place on its periphery for the inclosure of the feed-valve the inside of which is cylindrical in form and adapted to receive and closely embrace a hollow cylindrical feed-valve that turns loosely therein and upon a hollow pipe passing through its center and which has a lateral slot running lengthwise through its shell at any suitable place as an axis, the ends of which are journaled in the ends of said feed-chamber, and that has a triangular or other suitably-shaped projection or nozzle rigidly attached to its periphery, of suitable length, breadth and thickness to penetrate said

steam-chambers in the wheel and form a steam-tight partition therein, through which a long narrow slot passes from the center of said valve to its front face, a lever attached to the end of the axle-pipe which projects through one of the end pieces of said feed-chamber, a suitable recess in the frame of said feed-chamber to receive said nozzle of said valve when closed, a suitable exhaust hole and pipe for each set of steam-chambers in the wheel for the escape of the steam, and suitable packing for the steam-joints, substantially as set forth.

4. A hollow cylinder with closed ends, provided with one or more compartments, and an enlarged shaft or drum that passes lengthwise through its center and is journaled in the end pieces thereof, a rotating wheel in each compartment of the cylinder that turns loosely therein and is rigidly attached to said shaft or drum, and that has one or more recesses or steam-chambers in its periphery, of suitable depth, length and width, one end of which said recess or chambers extends abruptly into the periphery of its respective wheel at any suitable curve or angle, and the other end, commencing at any suitable point, gradually lessens in depth until it terminates in the periphery of the wheel, a feed-chamber rigidly attached to said cylinder for each compartment thereof, at any suitable place on its periphery for the inclosure of the feed-valve, the inside of which is cylindrical in form and adapted to receive and closely embrace a hollow cylindrical feed-valve that works loosely therein and upon a hollow pipe passing through its center and which has a lateral slot running lengthwise through its shell at any suitable place as an axis, the ends of which are journaled in the ends of said feed-chamber, and that has a triangular or other suitably-shaped projection or nozzle rigidly attached to its periphery, of suitable length, breadth, and thickness to penetrate the said steam-chambers in the wheel and form a steam-tight partition therein, through which a long narrow slot passes from the center of said valve to its front face, a lever attached to the end of the axle-pipe which extends through one end of the feed-chamber, a suitable recess in the frame of said feed-chamber to receive said nozzle of the valve when closed, suitable partitions between the compartments of the cylinder, a suitable exhaust-hole for each compartment, a suitable channel connecting the exhaust of one compartment with the feed-pipe of its adjacent compartment, and suitable packing for the steam-joints, substantially as set forth.

5. A hollow cylinder with closed ends, provided with one or more compartments, and an enlarged shaft or drum that passes lengthwise through its center and is journaled in the end pieces thereof, a rotating wheel in each compartment of the cylinder that turns loosely therein and is rigidly attached to said shaft or drum, and that has one or more recesses or steam-chambers in its periphery, of suitable depth, length and width, one end of which said recess or chambers extends abruptly into the periphery of its respective wheel at any suitable curve or angle, and the other end, commencing at any suitable point, gradually lessens in depth until it terminates in the periphery of the wheel, a feed-chamber rigidly attached to said cylinder for each compartment thereof, at any suitable place on its periphery for the inclosure of the feed-valve, the inside of which is cylindrical in form and adapted to receive and closely embrace a hollow cylindrical feed-valve that works loosely therein and upon a hollow pipe passing through its center and which has a lateral slot running lengthwise through its shell at any suitable place as an axle, the ends of which are journaled in the ends of said feed-chamber, and that has a triangular or other suitably-shaped projection or nozzle rigidly attached to its periphery, of suitable length, breadth and thickness to penetrate the said steam-chambers in the wheel and form a steam-tight partition therein, through which a long narrow slot passes from the center of said valve to its front face, a lever attached to the end of the axle-pipe which extends through one end of the feed-chamber, a suitable recess in the frame of said feed-chamber to receive said nozzle of the valve when closed, suitable partitions between the compartments of the cylinder, a suitable exhaust-hole for each compartment, a suitable channel connecting the exhaust of one compartment with the feed-pipe of its adjacent compartment, the steam-packing device composed of the thin flat card-piece hinged by means of a post-like attachment fastened on one end and that works loosely in a cylindrical hole which opens laterally upon the surface to be packed, and having its outer end beveled to admit the steam into such beveled recess, substantially as set forth.

6. The combination, in rotary engines, of the hollow cylinder C, the drum D, the shaft S journaled in the end pieces E, the wheel W attached to said shaft or drum, with its recesses F and F′ in its periphery, the feed-chamber G for the inclosure of the feed-valve, the feed-valve V with its nozzle N to penetrate the steam-chambers of the wheel for the passage of the steam to the wheel, the axle-pipe J with its slot O, the recess R for the reception of the nozzle of the valve, the exhaust-pipe T′ for the escape of the steam, the lever L, the aperture I, the pipe U, the steam-rings X, substantially as shown and described and for the purposes set forth.

7. The combination, in rotary engines, of the cylinder C, with the end pieces E, provided with one or more compartments C′ and C″, the partitions P, the drum D, the shaft S

journaled in the end pieces E, the wheel W in each compartment of the cylinder with one or more steam-chambers F and F′ in its periphery, the feed-chamber G for each compartment of the cylinder, the feed-valve V with its hole H, nozzle N, aperture I, the axle-pipe J with its slot O, and projecting end M, the entrance-pipe U, the recess R, the exhaust-pipe T and T′ for each compartment of the cylinder for the escape of the steam and connecting the exhaust of one with the entrance-pipe of its adjacent compartment, the feed-chamber G′, the lever L, the rim 8, the flat card-piece 6 with edges 7, cylindrical post Z and journal Y, substantially as shown and described and for the purposes set forth.

8. In a rotary engine, the combination of a cylinder with closed ends, having one compartment, and an enlarged shaft or drum that passes lengthwise through its center and is journaled in the end pieces thereof, a rotating wheel that turns loosely therein and is rigidly attached to said shaft or drum and that has two or more sets of chambers in its periphery, of suitable depth, length and width, each recess in said several sets of chambers extends abruptly into the periphery of said wheel, at any suitable curve or angle, and the other end, commencing at any suitable point, gradually lessens in depth until it terminates in the periphery of the wheel, a feed-chamber rigidly attached to said cylinder for each set of recesses in said wheel, at any suitable place on its periphery for the inclosure of a feed-valve, the inside of which is cylindrical in form and adapted to receive and closely embrace a hollow cylindrical feed-valve that works loosely therein and upon a hollow feed-pipe passing through its center, which has a lateral slot running lengthwise through its shell at any suitable place as an axis, the ends of which are journaled in the end pieces of said feed-chamber, and that has a triangular or other suitably-shaped projection or nozzle rigidly attached to its periphery, of suitable length, breadth and thickness, and adapted to drop from the frame of the feed-chamber and to penetrate the said steam-recesses in the wheel and form a steam-tight partition therein, through which a long narrow slot passes from the center of said valve to its front face, a lever attached to the end of the axle-pipe which extends through one end of the feed-chamber, a suitable recess in the frame of the feed-chamber to receive said nozzle of the valve when closed, suitable partitions between the several sets of recesses or chambers in the periphery of said wheel, a suitable exhaust-port for each set of chambers, a suitable channel or pipe connecting the exhaust of one set of chambers to the feed-pipe of its adjacent set of chambers and suitable packing for the steam-joints, substantially as described and for the purposes set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AMOS H. CARPENTER.

Witnesses:

KARL C. BRUECK,

HARRY F. WULFF.