

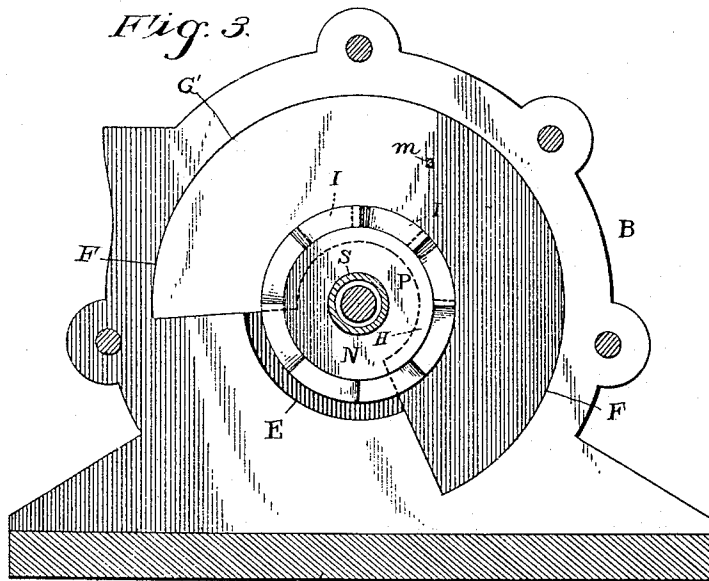
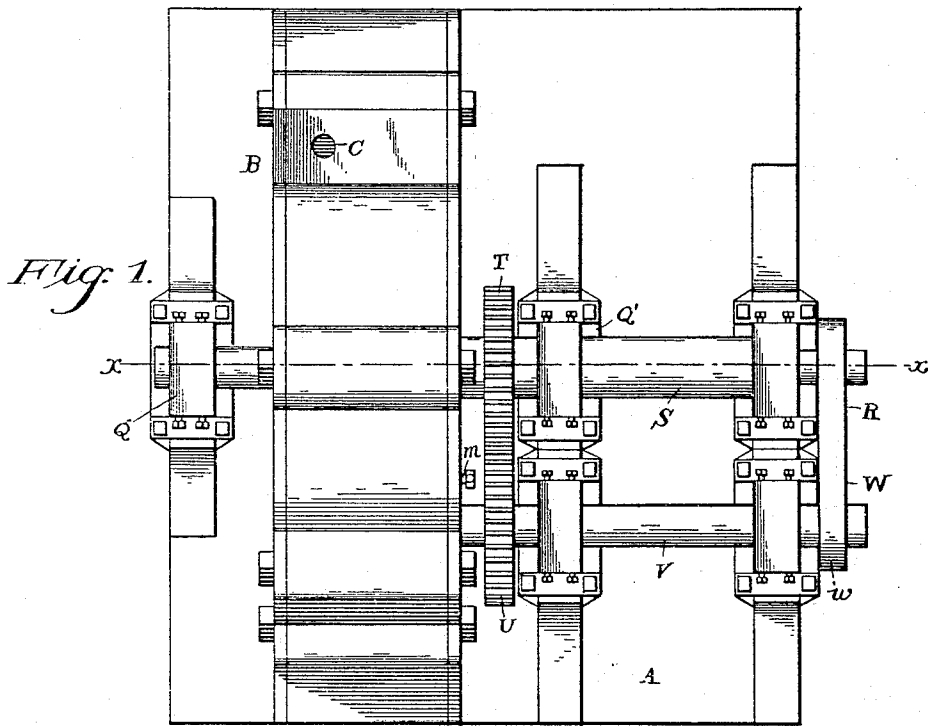
(No Model.)

2 Sheets—Sheet 1.

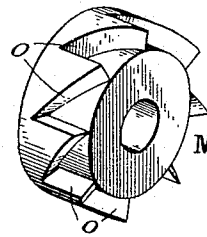
W. M. BYRD.  
ROTARY STEAM ENGINE.

No. 523,958.

Patented July 31, 1894.



*Fig. 6.*



Inventor

Witnesses

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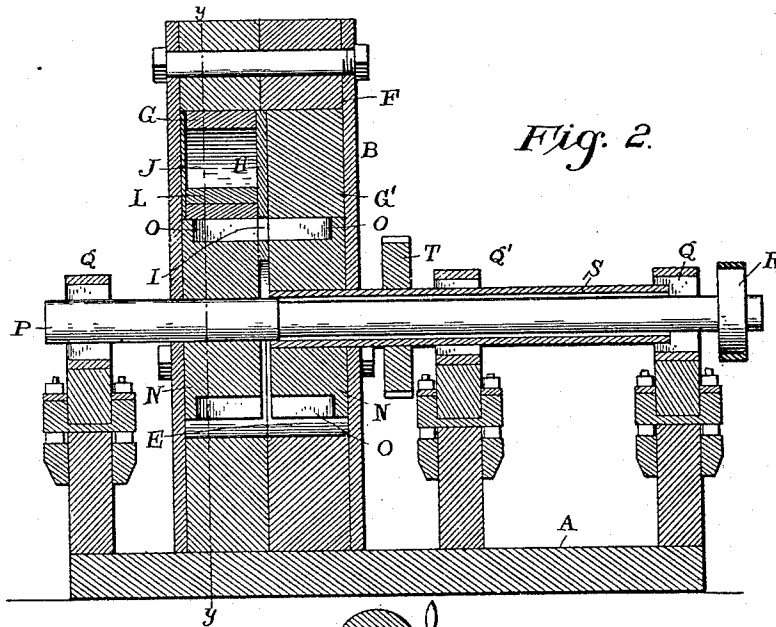


Fig. 2.

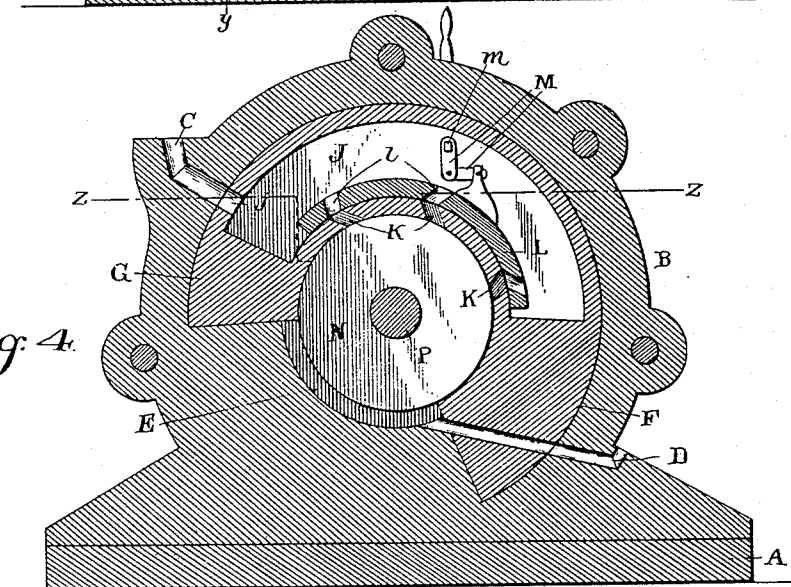


Fig. 4.

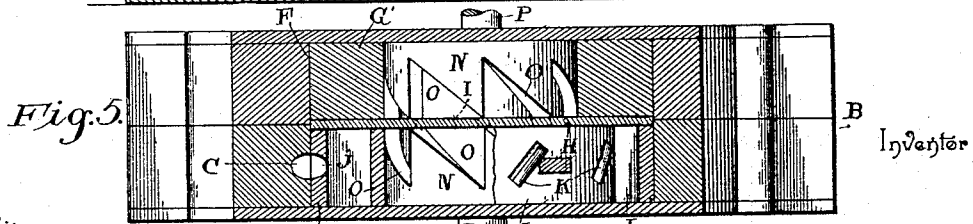


Fig. 5.

Witnesses

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# UNITED STATES PATENT OFFICE.

WALTER MOSELY BYRD, OF MOUNT GILEAD, ASSIGNOR OF ONE-HALF TO WILLIAM D. CLARK AND ARCHIBALD D. CLARK, OF FLY, NORTH CAROLINA.

## ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 523,958, dated July 31, 1894.

Application filed October 10, 1893. Serial No. 487,748. (No model.)

### *To all whom it may concern:*

Be it known that I, WALTER MOSELY BYRD, a citizen of the United States, residing at Mount Gilead, in the county of Montgomery and State of North Carolina, have invented a new and useful Rotary Steam-Engine, of which the following is a specification.

This invention relates to rotary steam engines; and it has for its object to provide an improved engine of this type in which the steam employed shall be used expansively to secure a thorough utilization thereof for imparting motion to the main drive shaft.

To this end the present invention contemplates an improved double piston or drum rotary steam engine, which provides for the transmission of expanded or deflected steam from one drum to the other, whereby back pressure is effectively prevented while at the same time securing a utilization of this force.

With these and other objects in view which will readily appear, as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

Referring to the accompanying drawings:—Figure 1 is a top plan view of a rotary steam engine constructed in accordance with this invention. Fig. 2 is a central transverse sectional view on the line  $x-x$  of Fig. 1. Fig. 3 is a central vertical longitudinal sectional view at one side of the intermediate partition plate. Fig. 4 is a longitudinal sectional view on the line  $y-y$  of Fig. 2. Fig. 5 is a horizontal sectional view on the line  $z-z$  of Fig. 4, showing clearly the shape of the steam buckets in the pistons or drums when in a registering position. Fig. 6 is a detail in perspective of one of the revolving pistons or drums.

Referring to the accompanying drawings, A represents a suitable base on which is mounted the sectional steam cylinder B. The sectional steam cylinder B, is constructed in any suitable size and in any shape, but is interiorly bored to inclose therein a circular steam chamber of the ordinary form which is adapted to accommodate rotating pistons or drums, and said steam cylinder is provided

at one side with an inlet port C, leading thereto, and at an opposite and lower point with a single exhaust port D, which communicates with the lower steam exhaust space E, formed at the bottom portion of the inclosed steam chamber.

The inner wall of the steam cylinder beyond both ends of the bottom steam exhaust space E, is provided with an off-standing segmental recess F, which removably receives the segmental packing abutments G and G', arranged side by side within the steam cylinder. Both of the segmental packing abutments G and G', extend around the greater portion of the interior wall of the steam cylinder, and have their ends project inwardly within the inclosed steam chamber beyond the inner wall of the cylinder in order to close in and form the exhaust space E, which is always left open to the exhaust port D.

The packing abutments G and G', which are arranged side by side within the steam cylinder are separated from each other by an intermediate segmental partition plate H. The segmental partition plate H, is of a shape corresponding to the shape of the packing abutments so as to also fit snugly within the off-standing segmental recess F, but said partition plate is of a greater width than the abutments and projects nearer to the center of the cylinder, in order to separate the same into opposite compartments which are located directly under each of the packing abutments, and said partition plate is provided at a point immediately below the inner circle or walls of the partition abutments with the intermediate steam ports I, curved in shape and concentric to the center of the steam cylinder, such intermediate steam ports providing for the escape of steam from under one abutment to the space under the opposite abutment, as will be more particularly described. The said segmental partition plate H, is formed of suitable anti-friction metal, and therefore not only serves to provide a double steam chamber inclosed within the cylinder, but also serves as packing for the inner faces of the pistons or drums to be presently referred to.

The packing abutment G', located at one side of the intermediate partition plate H, is

formed out of a solid piece of material, while the abutment G, is provided with an inclosed steam box or reservoir J, into which steam is admitted through the steam inlet opening *j*, which pierces the abutment near one end thereof and aligns with the inlet port C, of the cylinder. The hollow construction of the packing abutment G, provides means whereby the steam from the boiler may be impacted in the steam box or reservoir J, thereof, until it equals the boiler pressure and is therefore capable of exerting its greatest power, and the steam thus impacted in the inclosed box or reservoir of the abutment J, is admitted into the steam cylinder at one side of the partition plate through the steam openings or ports K, cut at an angle in the inner wall of the abutment G, and opening into the steam box or reservoir J.

The steam which is discharged from the steam box or reservoir J, into one side of the cylinder is regulated or entirely cut off at will by means of the segmental cut-off valve L. The segmental cut-off valve L, is mounted within the inclosed steam box or reservoir J, so as to slide on the curved bottom thereof and is provided with a series of steam ports *l*, which are adapted to be brought into and thrown out of alignment with the openings or ports K, of the packing abutment G, and said valve L, has suitably attached to the top thereof, at a convenient point, the jointed lever arms M, one of which is moved by the valve stem *m*, journaled transversely of the abutments and the cylinder, and operated by means of a suitable lever arranged outside of the cylinder.

Mounted to revolve in the opposite steam chambers located at opposite sides of the partition plate H, and under the abutments G and G', are the oppositely rotating steam pistons or drums N. The oppositely rotating steam pistons or drums N, are held in proper position within the steam cylinder by the opposite side plates of the cylinder, so as to work in contact with the intermediate partition and packing plate H, which serves to insure a steam tight joint for the inner moving sides or faces of both pistons or drums. The said oppositely rotating steam pistons or drums are provided in their periphery with the triangularly shaped steam buckets O, which are of a uniform depth throughout, and which are open at the inner sides of the pistons or drums. The triangular steam buckets which indent the periphery of the pistons or drums N, are disposed in one piston reversely to the disposition of the bucket of the other piston or drum, so that when such steam buckets assume a registering position, they form a complete rhomboidal steam bucket or pocket, which is only intersected or bisected by the intermediate anti-friction plate H, and when the buckets are thus positioned, the steam from the buckets in the drum under the packing abutment G, expands or rebounds through the circularly arranged steam ports I, and into

the buckets of the drum under the solid abutment G', so as to impart a reverse rotation to that piston or drum. It may be also observed that the width of the intermediate steam ports I, correspond to the depth of the steam buckets O, and are in alignment with the bottom of such buckets so as to provide for a free transmission of the expanded or deflected steam from one steam drum to the other, whereby steam, otherwise unused and causing back-pressure, is utilized to rotate a steam piston or drum.

It is thought that the operation involved in the reverse rotation of the two steam pistons or drums will be clear, it being apparent that the steam is first admitted from the hollow packing abutment into the buckets of the drum immediately thereunder, while the other drum or piston is rotated in a reverse direction by the expanded or deflected steam escaping from the buckets of the first drum through the ports I. Both of the steam drums or pistons N, which are thus given reverse rotations, rotate in contact with the inner walls of the packing abutments G and G', and inclose the steam in the buckets thereof until such buckets reach the exhaust space E, from which the steam escapes out of the exhaust port D, and by reason of the uniform depth of the buckets of such drums, backward pressure on the periphery of the drums is effectually prevented. At this point attention is directed to the fact that the angular disposition of the openings or ports K, in the inner wall of the packing abutment G, provides for directing the current of steam horizontally across the rhomboid formed by the buckets on the two drums, and thereby placing such steam current in line with the bucket in which it works, and thus providing an arrangement whereby a greater area of steam pressure on the shoulders of the buckets is secured.

One of the steam pistons or drums is securely mounted on the main drive shaft P, which projects through opposite sides of the cylinder and is mounted in the oppositely arranged bearings Q, which are preferably constructed similar to the bearings described in my allowed application, bearing Serial No. 466,512. A belt-wheel R, is mounted on the shaft P, outside of one of the bearings Q, and journaled in this same bearing and an intermediate bearing Q', is a sleeve shaft S, which embraces the shaft P, and has mounted on the inner end thereof within the steam cylinder the other one of the steam pistons or drums. A cog wheel T, is mounted on the sleeve shaft outside of the cylinder and meshes with an adjacent cog wheel U. The cog wheel U, is mounted on one end of the counter shaft V, journaled in one of the bearings Q, and the bearing Q', and carrying at the outer end thereof a belt-wheel W, which wheel drives a belt *w*, passing over the wheel R, and thereby providing means for transmitting the backward motion of the steam piston or drum on

the sleeve shaft to the forward motion of the main drive shaft, which is primarily driven by the steam piston or drum under the hollow packing abutment G.

5 Changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

10 Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a rotary steam engine, the cylinder having separated steam chambers and intermediate ports connecting the same, and oppositely rotating steam drums or pistons mounted within the cylinder and having registering steam buckets communicating with said intermediate ports, substantially as set forth.

2. In a rotary steam engine, the combination of a steam cylinder having a steam box or reservoir provided in the bottom thereof with angularly disposed steam openings or ports, and separated oppositely rotating steam pistons or drums provided with triangular registering and communicating steam buckets of a uniform depth and receiving steam from said angularly disposed steam openings or ports, substantially as set forth.

3. In a rotary steam engine, the cylinder having a circular steam box or reservoir provided with angularly disposed steam openings or ports, and oppositely rotating steam pistons or drums provided with peripheral communicating steam buckets, said buckets being cut in from the adjacent sides of the pistons so as to form bisections of a perfect rhomboid formed by the registering of such buckets, substantially as set forth.

4. In a rotary steam engine, the cylinder having oppositely located inlet and exhaust ports, segmental packing abutments seated within the cylinder between the ports thereof, one of said packing abutments having a steam box or reservoir and steam openings leading

into the cylinder, a combined packing and partition plate arranged between the packing abutments and having intermediate steam ports opening into the spaces below such abutments, and oppositely rotating steam pistons or drums mounted on both sides of said plate and having registering steam buckets communicating with said intermediate ports, substantially as set forth.

5. In a rotary steam engine, the combination of the cylinder having an inner segmental recess, a hollow and a solid segmental packing abutment removably seated side by side in the recess of the cylinder, the former of said abutments having an inclosed steam box, a steam inlet opening, and ports communicating with the interior of the cylinder, a combined partition and packing plate of a greater width than the packing abutments and located between the same, said plate having a circular series of intermediate steam ports, and oppositely rotating steam drums or pistons mounted at opposite sides of said plate and having peripheral steam buckets communicating with the intermediate ports, substantially as set forth.

6. In a rotary steam engine, the combination with the steam cylinder and the bucket pistons or drums mounted therein; of the segmental packing abutment mounted within the cylinder and partially around said piston or drum, said abutment having an inclosed steam reservoir and steam openings or ports leading therefrom, a segmental cut-off valve mounted inside of the abutment to slide on the curved bottom thereof and provided with a series of steam ports, and means for shifting said segmental cut-off valve, substantially as set forth.

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

WALTER MOSELY BYRD.

Witnesses:

J. M. DEATON,

J. P. LEACH.