

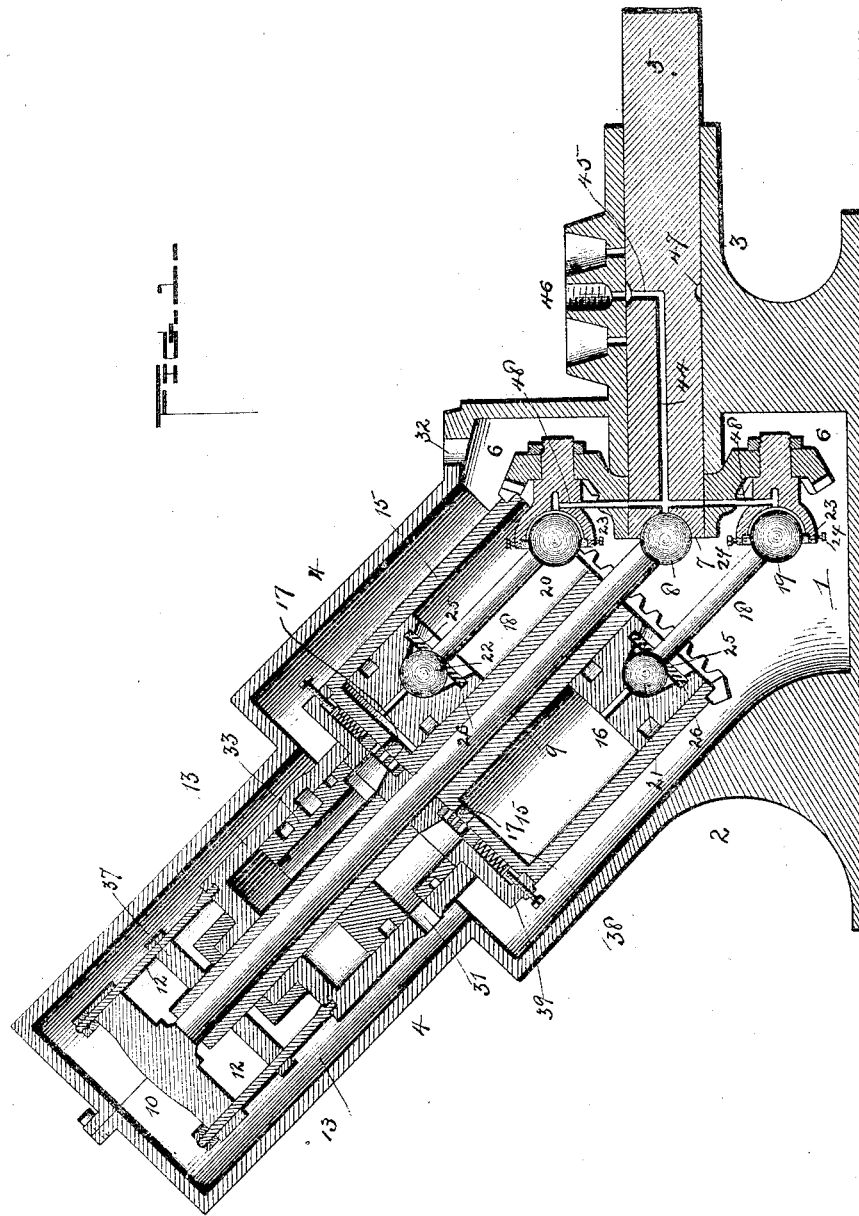
(No Model.)

2 Sheets—Sheet 1.

R. C. BERRY.  
ANGLE ENGINE.

No. 453,852.

Patented June 9, 1891.



WITNESSES:

*W. L. Bloomby*  
*James S. Jones*

INVENTOR:

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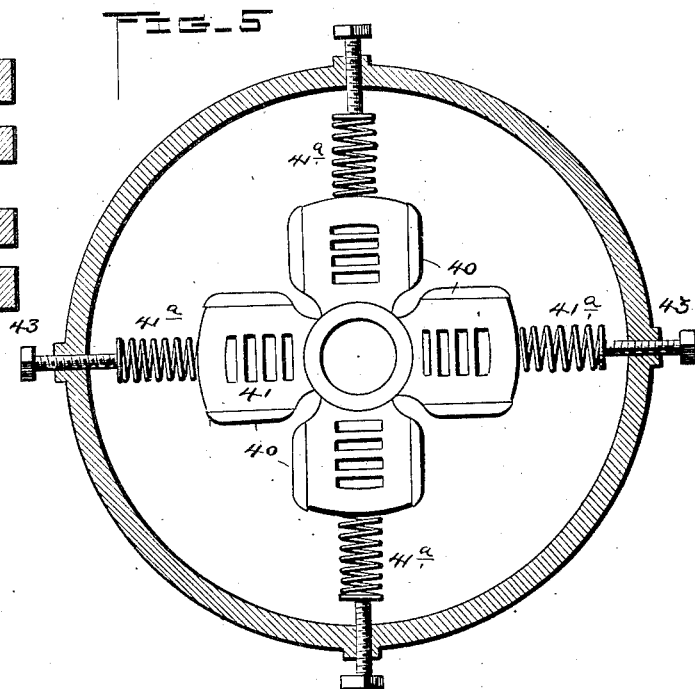
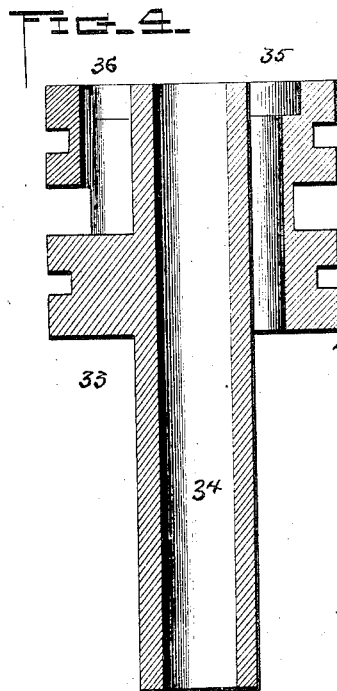
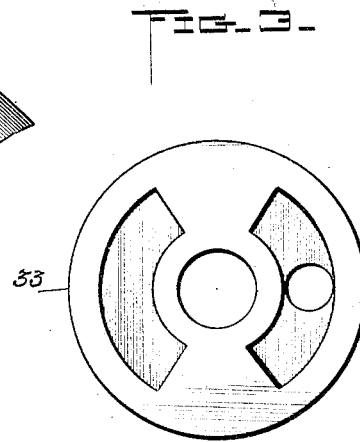
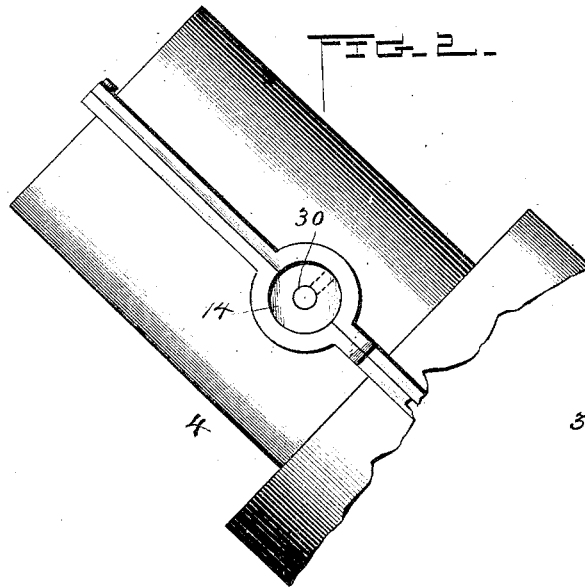
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2 Sheets—Sheet 2.

R. C. BERRY.  
ANGLE ENGINE.

No. 453,852.

Patented June 9, 1891.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

ROBERT C. BERRY, OF LAFAYETTE, INDIANA, ASSIGNOR OF THREE-FOURTHS  
TO ADAM O. BEHM, PARKER A. BYERS, AND HENRY W. COMSTOCK, ALL  
OF SAME PLACE.

## ANGLE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 453,852, dated June 9, 1891.

Application filed January 12, 1891. Serial No. 377,453. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT C. BERRY, a citizen of the United States, and resident of Lafayette, in the county of Tippecanoe and State of Indiana, have invented certain new and useful Improvements in Angle-Engines; and I do hereby 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, which form a part of this specification.

My invention relates to improvements in single-acting reciprocating steam and other engines, which are termed "angle-engines," and is designed as an improvement upon the invention for which Letters Patent were granted to me July 15, 1890, No. 432,359.

The object of the present invention is to improve the construction generally, whereby superior results and greater efficiency of operation are obtained.

The invention consists in the novel construction and combination of parts hereinafter fully described, and specifically defined in the claims.

In the accompanying drawings, Figure 1 is a central vertical sectional view of an engine constructed in accordance with my invention. Fig. 2 is an elevation of a portion of the casing or housing, showing the trunnions which support the steam-chest. Fig. 3 is a plan view of the valve. Fig. 4 is a sectional view of the same. Fig. 5 is a plan view of the upper end of the cylinder, the head thereof being removed.

In the said drawings, the reference numeral 1 designates the bed of the engine, having two uprights 2 and 3, one of which 3 supports the driving-shaft, while to the other is secured a casing or housing 4, which completely incloses the working parts of the engine. The driving-shaft 5 is provided with a disk or driving-wheel 6, firmly secured thereto, and having a central socket 7, in which works the ball end 8 of the shaft 9. This shaft extends upwardly at an angle to the plane of the driving-shaft. The upper end of this shaft has its bearings in a cross-head 10, con-

nected by means of screw-threaded bars 12 and binding-nuts with the steam-chest 13, to which said bars are secured. This steam-chest is provided with trunnions 14, which are journaled in the casing or housing and which support said steam-chest. One of these trunnions is provided with a steam-passage communicating with the steam-chest and is connected with the generator in any suitable manner. The object of the trunnions is to allow the steam-chest to conform to any wear or irregularity of lower journal without binding or cocking valve-seat.

Concentrically mounted upon shaft 9 and revolving thereon or therewith, is a series of two or more cylinders 15, each of which is provided with a single-acting reciprocating piston 16 and a steam-port 17.

18 designates the piston-rods connected with disk 6 by means of ball-and-socket joints 19 20, and which are also connected with the pistons by similar joints 21 22. The balls on the ends of the pistons are held in place in the sockets 19 20 by means of annular rings 23, secured in said sockets by means of screws 24, and the balls in sockets 21 22 are held in place by means of rings 25 of Babbitt metal inserted in grooves 26 in said sockets.

The cylinders are preferably four in number, and may be formed by taking a cylinder and boring an aperture centrally therethrough and then forming cylinders at equal distances apart and concentric with shaft 9, as in my patent before referred to. Upon the front face of the cylinder are formed or provided the bevel gear-teeth meshing with similar teeth in the disk 6, so that said cylinder and disk move in unison with each other.

The numeral 13 designates the steam-chest, provided with trunnions, as before set forth, having the inlet 30 through one of said trunnions and exhaust 31 opening into the casing or housing, which is provided with an escape-opening 32, or through the other trunnion, should it be desired.

The numeral 33 designates the valve having stem 34 and central bore or aperture for the passage of shaft 8. This valve is provided with inlet-opening 35 and exhaust-opening 36, and is held in place within the steam-

chest by means of the cross-bar 37 carried by the bars 12.

The cylinder-head is made double or in two parts 38 and 39 with a small intervening space.

5 One of their heads 39 is provided with a series of upwardly-projecting hubs 40, within which fit slide-valves 41, actuated by centrifugal motion of the engine in closing, actuated by the springs 41<sup>a</sup> in opening, and regulated by set-  
10 screws 43 acting on said springs and projecting outside the cylinder. The valves work over the ports in the cylinders, and are provided with bars extending across the steam-space, so that the track of the valves will not  
15 be so great as to open and close the ports. The driving-shaft 5 is provided with a small central bore 44, which communicates with a radial aperture 45, connecting with an oil cup or lubricator 46. The shaft is also provided  
20 with a peripheral groove 47, which communicates with the aperture or passage 45, so that oil is fed to the exterior of said shaft. The central passage or bore 44 communicates with this ball and socket of the shaft 9, and near  
25 this end is provided with radial oil-passages 48, which communicate with the ball and sockets 19 20 of the pistons.

30 The operation of the engine and its advantages will be obvious. The object of inclosing the working parts in a casing or housing

is to enable gas, naphtha, or other burning fluids to be employed.

Having thus described my invention, what I claim is—

1. In an angle-engine, the combination, with 35 the inclined shaft connected with the driving-disk by ball-and-socket joint, and the upper end stepped or having its bearings in a cross-head connected with the steam-chest, the cylinders having ports, the pistons, piston-rods, 40 and bevel gear-teeth, of a housing, the steam-chest having trunnions journaled in said housing provided with inlet-passage, an exhaust-passage in said steam-chest, and the valve having inlet and exhaust openings, 45 substantially as described.

2. In an angle-engine, the combination, with the concentric cylinders having inlet and exhaust ports, of the spring-actuated valves and tension or regulating screws located in the 50 upwardly-projecting hubs of one of the cylinder-heads, substantially as described.

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

ROBERT C. BERRY.

Witnesses:

ADAM O. BEHM,  
P. A. BYERS.