(No Model.) 2 Sheets—Sheet 1.

A. NELSON.

ROTARY CUT-OFF VALVE.

No. 332,101. Patented Dec. 8, 1885.

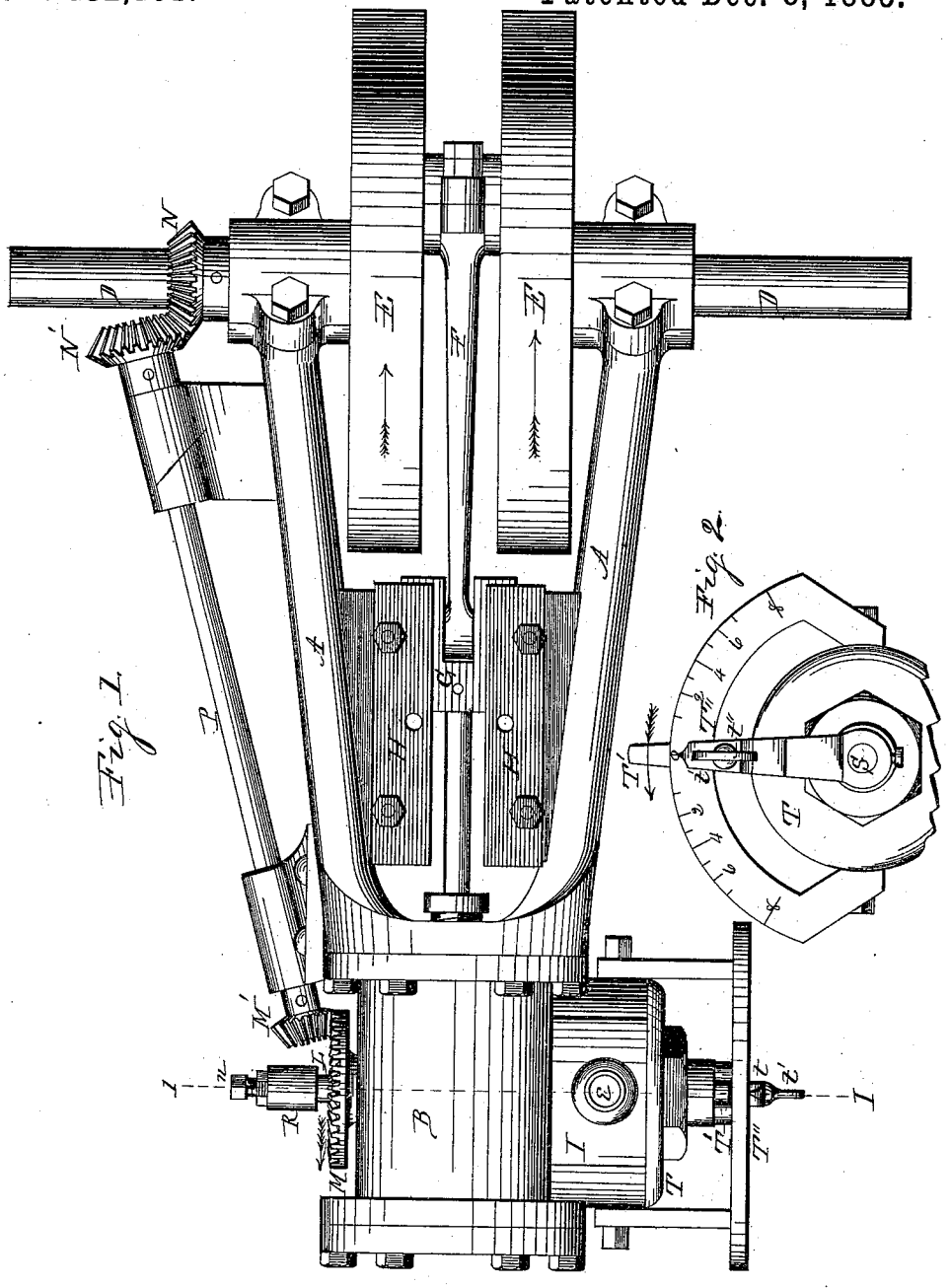

Fig. 1.

Fig. 2.

WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 9.

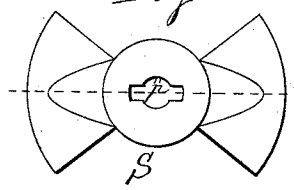


Fig. 3.

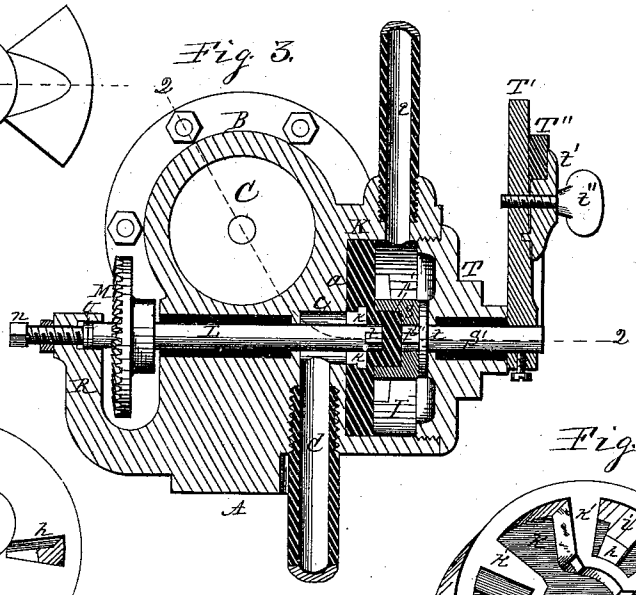


Fig. 7.

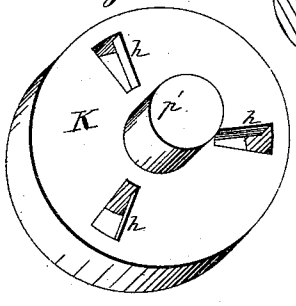


Fig. 8.

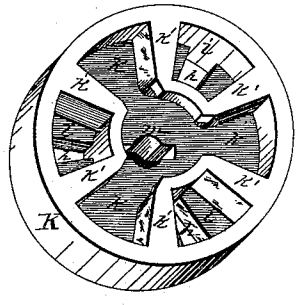


Fig. 11.

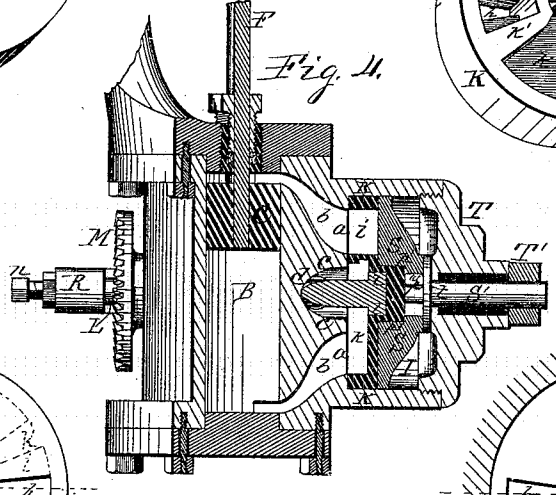


Fig. 6.

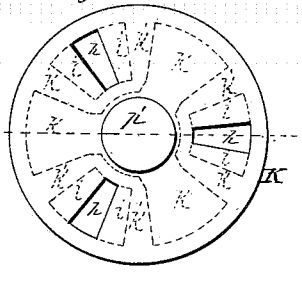


Fig. 5.

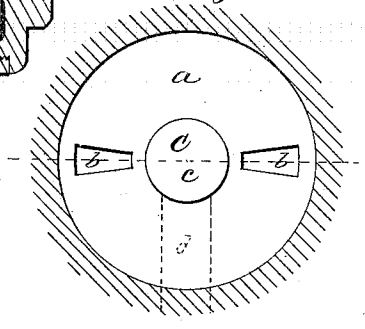
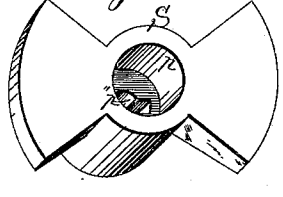


Fig. 10.



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UNITED STATES PATENT OFFICE.

ALFRED NELSON, OF ROCKFORD, ILLINOIS.

ROTARY CUT-OFF VALVE.

SPECIFICATION forming part of Letters Patent No. 332,101, dated December 8, 1885.

Application filed December 9, 1884. Serial No. 149,872. (No model.)

To all whom it may concern:

Be it known that I, ALFRED NELSON, a citizen of the United States, residing in the city of Rockford, in the county of Winnebago and State of Illinois, have invented new and useful Improvements in Rotary Cut-Off Valves, of which the following is a specification.

This invention relates to steam-engines employing a rotary valve to regulate the flow of steam to the cylinder, but more especially to the valve in its several parts to produce a more efficient and durable machine. To this end I have designed and constructed the machine represented in the accompanying drawings, in which—

Figure 1 is a plan view of an engine embodying my invention. Fig. 2 is a side elevation of the cut-off and reversing lever. Fig. 3 is a transverse vertical section on dotted line 1. Fig. 4 is a lengthwise section on dotted line 2. Fig. 5 is a plan of the valve-seat. Fig. 6 is an outer face view of the valve. Fig. 7 is an isometrical representation of the outer or port face of the valve. Fig. 8 is an isometrical representation of the inner or under face of the valve. Fig. 9 is an outer face view of the cut-off, and Fig. 10 is an isometrical representation of the cut-off.

The several parts of the engine represented in the figures consisting of the frame A, cylinder B, piston C, crank-shaft D, balance-wheels E, connecting-rod F, cross-head G, and ways H are substantially such as may be found in engines now in use.

At I is represented a steam-chest formed on the side of the cylinder, having its projecting end at *a* produced in rotary-valve-seat form, fitted on opposite sides with steam-ports *b*, which open into opposite ends of the steam-cylinder. The center of the valve-seat I is provided with an exhaust-port, *c*, which communicates with the exhaust-pipe *d*, and an induction-pipe, *e*, communicates with the steam-chest.

At K is represented a rotary steam-valve produced in disk form fitted with three steam-ports, *h*, on equal third divisions of the disk, and open centrally into the steam-chambers *i*, formed in the under face of the valve. This valve K is fitted on its under face with exhaust-chambers *k*, which communicate with the center exhaust of the valve-seat. The walls *k'* in the valve separating the steam-chambers *i* from the exhaust-chambers *k* are slightly larger than the ports in the valve-seat, and when these walls are placed centrally over the ports in the valve-seat operate to close the ports and prevent the passage of steam through the ports.

At L is represented a valve-shaft supported preferably in a Babbitt-metal bearing to revolve in the axial center of the rotary valve. The valve end of the valve-shaft is provided on opposite sides with feathers *l*, projecting from the body of the shaft, adapted to enter the central slotted opening, *m*, in the valve in such a manner that the valve will be made to rotate with the shaft. The outer portion of the valve-shaft is provided with a bevel-toothed gear-wheel, M.

At N is represented a bevel-toothed gear-wheel fixed on the projecting end of the crank-shaft D. A shaft, P, having its end portions provided with bevel-toothed gear-wheels M' and N', is supported to revolve in suitable bearings projecting from the main frame and in such position relatively with the bevel-toothed gear-wheels M and N that the teeth of the respective pairs of gear-wheels shall engage each other in working contact. The relative size of the toothed gear-wheels in the train connecting the crank-shaft with the valve-shaft is such as to require three complete revolutions of the crank-shaft to impart one complete revolution to the valve, and that each throw of the crank will place one of the induction-ports and one of the exhaust-chambers of the valve in position relatively with the ports of the valve-seat to permit a free exhaust and induction of the steam, to impart movement to the piston and to the parts connected therewith. By this construction and arrangement of the parts I reduce the velocity of the valve relatively with the velocity of the crank-shaft, and consequently require a less expenditure of power to operate the valve and increase its durability.

At R is represented a bracket-arm rising from the frame to the axle center of the valve, and is produced in tubular form to receive the projecting end of the valve-shaft.

At *n* is represented an adjusting-screw having a screw-thread connection with the bracket-arm in line with the axial center of the valve-shaft.

At *o* are represented hardened washers,

placed between the adjusting-screw and the end of the valve-shaft, to prevent undue wear of the parts. By means of this adjusting-screw connection with the valve-shaft I am enabled to regulate the pressure of the valve upon its seat, to reduce its frictional contact therewith to the lowest practical point.

At S is represented a cut-off produced in opposite sector form, in which the sectors are preferably about one-fifth of a complete circle, but may be greater or less. This cut-off is provided on its inner face with an axial opening, *p*, to receive the stud *p'*, rising from the axial center of the outer face of the valve to oscillate thereon and permit the valve-stud to rotate therein. The outer face of the cut-off is provided with an axial opening, *p''*, slotted to receive the feathered end *p'''* of a cut-off shaft, S', by means of which the cut-off may be adjusted and held in its adjusted position. The outer end of the steam-chest is provided with a removable head, T, having a screw-thread connection with the steam-chest, and this removable head is bored in its axial center to receive the shaft S' of the cut-off. The cut-off shaft S' is produced with a collar, *t*, to engage the inner face of the removable head, and its shaft portion is supported to oscillate preferably in a Babbitt-metal bearing in the removable head.

At T' is represented a cut-off lever, fixed to the projecting end of the cut-off shaft in such position thereon relatively with the cut-off that when the lever is in a vertical position relatively with the axis of the cylinder the position of the cut-off relatively with the valve and valve-seat will be such as to exclude the steam from the cylinder.

At T'' is represented a segment rising from the steam-chest in a plane to receive the cut-off lever on its rear face.

At *t'* is represented a clamping-jaw of index-finger form fitted to engage the cut-off lever, having its index-finger portion overlapping the segment which serves to determine its position on the segment. A clamping-screw, *t''*, is passed through the clamping-jaw, and is screw-threaded into the lever, and serves to fix the lever to the segment in its adjusted position. The segment T'' from its vertical center or zero point, 0, is graduated on opposite sides in eight unequal like divisions, each division of which indicates one-eighth of the reciprocating movement of the piston, and when the index-finger is adjusted to the zero-point the cut-off will be in position to exclude the steam from the cylinder, and its adjustment to the division No. 8 on either side will admit steam into the cylinder throughout the entire movement of the piston.

If it is required that the engine move in the direction indicated by the arrows, a movement of the cut-off lever in the direction indicated by the arrow thereon will adjust the cut-off relatively with the induction-ports of the valve and valve-seat, to control the admission of steam into the cylinder to cut off the flow of steam at any point between the non-admission of steam up to full stroke.

When it is required that the engine move in the opposite direction to that indicated by the arrows, the relative position of the valve on its seat must be so changed as to reverse the position of the steam and exhaust chambers of the valve relatively with the ports of the valve-seat, which adjustment will require the valve in its gear-connection to be changed one-sixth of a complete revolution, either forward or backward, and when so changed the movement of the cut-off lever in the direction opposite to that indicated by the arrow thereon will adjust the cut-off relatively with the induction-ports of the valve and seat, to control the admission of steam to the cylinder to cut off the flow of steam at any point between the non-admission of steam up to full stroke.

Instead of the adjustment of the cut-off lever by means of the clamping mechanism, the lever may be suitably connected with a governor to be controlled by the running movement of the engine, to control the admission of steam proportionate to the work required of the engine. In this instance I have provided my improved valve with three ports, but instead of which any practical odd number of ports may be employed; or, by a suitable change in the position of the ports in the valve-seat any practical even number of ports may be employed in the valve.

I claim as my invention—

1. The improved rotary valve herein described, made as a single disk, having on one side a series of non-communicating live-steam chambers, each having ports of less width than the said chambers, and the exhaust-chambers communicating with a central exhaust in the valve-seat, substantially as shown and described.

2. The combination, with a valve-seat provided with ports communicating with the cylinder and with a central exhaust, of the improved rotary valve herein described, made as a single disk, having on one side a series of non-communicating steam-chambers, each having ports of less width than the said chambers, and the exhaust-chambers communicating with a central exhaust in the valve-seat, substantially as described.

3. In a steam engine, the combination of the improved rotary valve herein described, made as a single disk, having on one side a series of non-communicating steam-chambers, each having ports of less width than the said chamber, the exhaust-chambers, as described, and an oscillatory cut-off, operating as set forth.

4. In a steam-engine, the combination, with a cut-off and lever therefor, of a segment, an index-finger, and means for clamping all together, substantially as described.

ALFRED NELSON.

Witnesses:
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A. O. BEHEL.