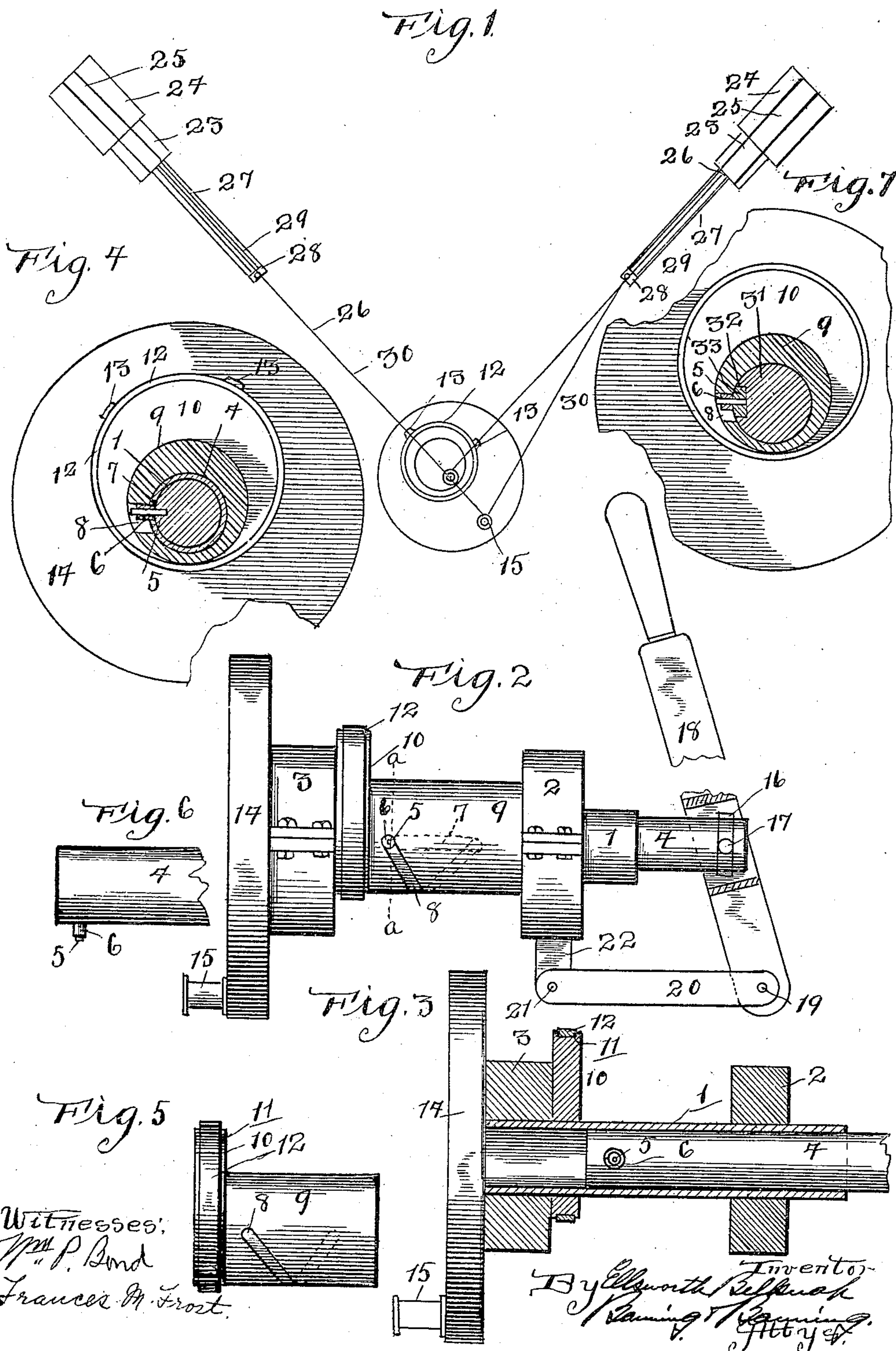


No. 841,481.

PATENTED JAN. 15, 1907.

E. BELKNAP.
REVERSING ECCENTRIC.
APPLICATION FILED DEC. 26, 1905.



UNITED STATES PATENT OFFICE.

ELLSWORTH BELKNAP, OF POLO, ILLINOIS.

REVERSING-ECCENTRIC.

No. 841,481.

Specification of Letters Patent.

Patented Jan. 15, 1907.

Application filed December 26, 1905. Serial No. 293,282.

To all whom it may concern:

Be it known that I, ELLSWORTH BELKNAP, a citizen of the United States, residing at Polo, in the county of Ogle and State of Illinois, have invented certain new and useful Improvements in Reversing-Eccentrics, of which the following is a specification.

The object of the present invention is to construct a simple, efficient, and reliable reversing-eccentric by means of which a compound engine or other engine or motor can have its valve quickly changed, so as to reverse the engine as may be required and which can be readily and quickly given its position in either direction to shift the valve as may be needed and the control of which in shifting positions will be positive and reliable and the movement of which can be had without manipulating any extraneous valve or appliance.

The invention consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is a diagrammatic view of a compound engine, illustrating one form of using the reversing-eccentric of the invention; Fig. 2, a side elevation of the several parts of the invention properly assembled for use; Fig. 3, a detail, partly in section, showing the arrangement of eccentric as embodied in Fig. 2; Fig. 4, a cross-section on line *a a* of Fig. 2; Fig. 5, a side elevation of the eccentric detached, and Fig. 6 a detail showing the engaging pin with its antifriction-roller for moving with the thrust-rod; and Fig. 7, a detail in section, showing a sliding key instead of a sliding rod for moving the reversing-eccentric.

The invention is shown in connection with a hollow shaft 1, mounted in suitable journal boxes or bearings 2 and 3, which can be supported in any suitable manner. The hollow shaft 1 has located therein a thrust rod or pin 4, endwise movable and carrying adjacent to its inner end a projecting pin 5, on which is an antifriction roller or sleeve 6 with the pin and antifriction roller or sleeve projecting through a longitudinal slot 7 in the hollow shaft.

The pin 5, with its antifriction roller or sleeve 6, enters a curved slot 8, extending half-way around in a spiral course of travel, of a hub or head 9, having an eccentric formation in cross-section and mounted on the exterior of the hollow shaft 1 with one end abutting against or in contact with the face of the

journal box or bearing 2 in the arrangement shown. The opposite end of the eccentric hub or head 9 has formed therewith or secured thereto an eccentric or cam disk 10, the periphery of which has a groove 11 for the reception of a strap or hoop 12, furnishing the connection for the valve-rods, for which purpose, in the construction shown, the outer face of the strap or band 12 has thereon bosses or nipples 13 for the attachment of the valve-rods, as usual.

The end of the shaft 4 projects beyond its journal box or bearing 3 and has fixed thereto a disk 14, with a crank-pin 15 for the attachment thereto of the connecting-rods from the pistons of the engine or motor. The end of the slidable rod or pin 4 projects beyond the end of the hollow-shaft 1 and, as shown, adjacent to its extreme end has a circumferential groove to receive a ring 16, having on opposite sides pins 17, which take into a lever 18, adapted to be hand-operated. The end of the lever opposite the handle is attached by a pin or pivot 19 to a link 20, which in turn is attached at its end by a pin or pivot 21 to a pendant or lug 22, extending down from the journal-box 2 or other support, so that by moving the handle forward or back the slidable rod or pin 4 will be advanced or receded, carrying with it the pin 5, with the antifriction roller or sleeve 6, which, by its travel in the spiral grooves 8, will turn the eccentric hub or sleeve 9 on the shaft, reversing the position of eccentricity according to the position of the pin and roller or sleeve within the spiral slot. The reversing of the position of the eccentric hub or sleeve 9 correspondingly reverses the position of the eccentric disk or cam 10, so that in one position the eccentricity of the disk or cam will move the controlling-valve in the direction to admit pressure to the engine for forward driving, and the reversal to the opposite position will carry the eccentricity of the disk or cam to a point for changing the location of the controlling-valve, so as to give a back or reverse drive to the engine.

The reversing-eccentric in Fig. 1 is shown in connection with two compound engines arranged at an angle of ninety degrees one to the other. Each of these compound engines consists of a high-pressure cylinder 23 and a lower-pressure cylinder 24, and each cylinder has a valve-chest 25 for steam or other fluid pressure. Each cylinder has a piston and each valve-chest has a control-

ling-valve as usual for inducting steam or other fluid pressure into and out from the cylinders. A valve-rod 26 is connected with the valve at one end and to a stud or boss 13 of the band or strap 12 at the other end. Each engine or motor has a guideway 27; on which travels a cross-head 28, connected by a piston-rod 29 with the pistons of the cylinders, and the cross-head is connected by a pitman or rod 30 with the wrist-pin 15 on the disk or wheel 14 of the hollow shaft. It will be understood that the engine-cylinders, steam-chest, valve-rods, piston-rods, cross-head, and connecting-rods are shown conventionally, as these parts can be of any usual and well-known form of construction and arrangement.

The operation briefly is as follows: The operator through the hand-lever 18 moves the slidable rod or pin 4 to its advanced position, as shown in Fig. 2 of the drawings, and with the parts in this position the eccentric hub or head and the eccentric disk or cam are turned, as shown in Fig. 1, so as to direct steam or fluid pressure into the engine to produce a forward drive for the shaft. The operator, by drawing the lever 18 back, recedes the pin or rod 4 and carries the pin 5 and roller or sleeve 6 from its advanced position in the spiral slot 8 to its receded position in said slot, and this movement of the pin and roller in the slot carries the eccentric hub or head, and with it the eccentric cam or disk, to a reverse position from that shown in Fig. 1, moving the controlling-valves of the engines to their reverse positions for the steam or fluid pressure to enter and back-drive or reverse the movement of the engine, giving a reverse rotation to the shaft.

It will thus be seen that the operator by moving the lever forward or backward to the limit of movement in either direction can set the controlling-valves of the engines so as to drive forward or backward, as may be desired, and with the forward movement of the lever the pin and roller of the slidable rod is carried to its advance position in the spiral slot, setting the eccentric in position for a forward drive, and with the backward movement of the lever to its limit the pin or roller is carried to the opposite end of the spiral slot, turning the eccentric into a position for a reverse drive of the engine. It will be understood that with the pin set central of the reversing-slot the valve will be set central, so as to shut off the induction and eduction of steam or other fluid-pressure, thereby stopping the engines. It will be seen that by means of this reversing-eccentric the engine can be operated so as to drive forward or backward, as may be required, and this without the manipulation of any intermediate valves or valve-gearing, as the position of the eccentric entirely controls the position of the controlling-valve for admitting and educting

pressure to the cylinders of the engine, and to drive the engines in either direction it is only necessary to shift the relative position of the eccentric according as to whether the engines are to drive forward or backward. It will be understood that the same reversing-eccentric controls both of the compound engines, dispensing with the use of more than one controlling means for the valves.

The device is very simple in construction and employs but a few parts, thereby reducing the wear and tear to a minimum, and at the same time a positive positioning of the reversing-eccentric must follow the movement of the lever either forward or backward to the limit of movement or to a point where the pin and roller will be at one or the other end of the spiral reversing-slot of the eccentric. The placing of the movements of the valve solely under the reversing-eccentric enables a high pressure to be used in the cylinders and a high speed for the engine or motor to be obtained, and this without impairing the efficiency of the reversing-eccentric and without increase in wear, as the only wear is on the eccentric in moving it to its advanced and receded positions.

A solid shaft having a groove for the reception of a sliding key can be used instead of a hollow shaft. A construction of solid shaft is shown in Fig. 7, in which the shaft 31 has a groove 32 in one side, in which is located a sliding key or bar 33, having thereon the shifting-pin 5 and its roller 6. The operation of the sliding key or bar is had by means of a lever, and in use the sliding key or bar moves the eccentric through the engagement of the pin and roller with the spiral reversing-groove 8, the same as described for the endwise movement of the pin or rod 4 for the hollow-shaft construction. Under the term "hollow shaft" is included a shaft having a bore longitudinally thereof and a shaft having a longitudinal slot or guideway in its periphery for receiving a slidable rod or a slidable key.

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

1. In a reversing-eccentric, the combination of a hollow driving-shaft, a slidable rod endwise movable in the hollow shaft, an eccentric-hub on the shaft, a cam-disk on the hub, a connection between the eccentric-hub and the endwise-slidable rod, and means for moving the rod, substantially as described.

2. In a reversing-eccentric, the combination of a hollow driving-shaft, a slidable rod endwise movable on the shaft, an eccentric-hub on the shaft and having in its body a spirally-curved slot, a cam-disk on the hub, a pin carried by the slidable rod and engaging the slot of the eccentric-hub, and means for moving the rod, substantially as described.

3. In a reversing-eccentric, the combination of a hollow driving-shaft, a slidable rod

endwise movable on the shaft, an eccentric-hub on the shaft and having in its body a spirally-curved slot, a cam-disk on the hub, a pin carried by the slidable rod and engaging the slot of the eccentric-hub, and a lever connected with the slidable rod for moving the rod endwise in both directions, substantially as described.

4. In a reversing-eccentric, the combination of a hollow driving-shaft, a slidable rod endwise movable in the hollow shaft, an eccentric-hub on the shaft, a cam-disk on the hub, a connection between the eccentric-hub and the endwise-slidable rod, means for moving the rod, a disk fixedly attached to the driving-shaft, a crank-pin on the disk, a cylinder having a piston actuated by fluid-pressure, a valve controlling the induction and eduction of pressure, and a connection between the valve and the cam-disk for reversing the engine by changing the position of the eccentric-hub and cam-disk, substantially as described.

5. In a reversing-eccentric, the combination of a hollow driving-shaft, a slidable rod endwise movable in the hollow shaft, an eccentric-hub on the shaft, a cam-disk on the hub, a connection between the eccentric and the endwise-slidable rod, means for moving the rod, compound cylinders set at an angle, valves controlling the induction and eduction

of pressure into and from the cylinders, a disk fixedly attached to the driving-shaft, a crank-pin on the disk, and a connection between the cam-disk and the valves of the cylinders, substantially as described.

6. A reversing-eccentric, consisting of a hollow shaft adapted for connection with the piston of a fluid-pressure cylinder, a slidable rod endwise movable in the hollow shaft, an eccentric-hub on the shaft and having in its body a curved slot, a cam-disk on the hub, a pin carried by the slidable rod and entering the curved slot of the eccentric-hub, and means for moving the slidable rod endwise in both directions, substantially as described.

7. A reversing-eccentric, consisting of a hollow shaft adapted for connection with the piston of a fluid-pressure cylinder, a slidable rod endwise movable in the hollow shaft, an eccentric-hub on the shaft and having in its body a curved slot, a pin carried by the slidable rod and entering the curved slot of the eccentric-hub, and a lever connected with the slidable rod for moving the rod endwise in both directions and shifting the position of the eccentric, substantially as described.

ELLSWORTH BELKNAP.

Witnesses:

OSCAR W. BOND,
WALKER BANNING.