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REVERSING APPARATUS FOR STEAM ENGINES.

(No Model.) (Application filed June 7, 1900.)

Fig. 1.

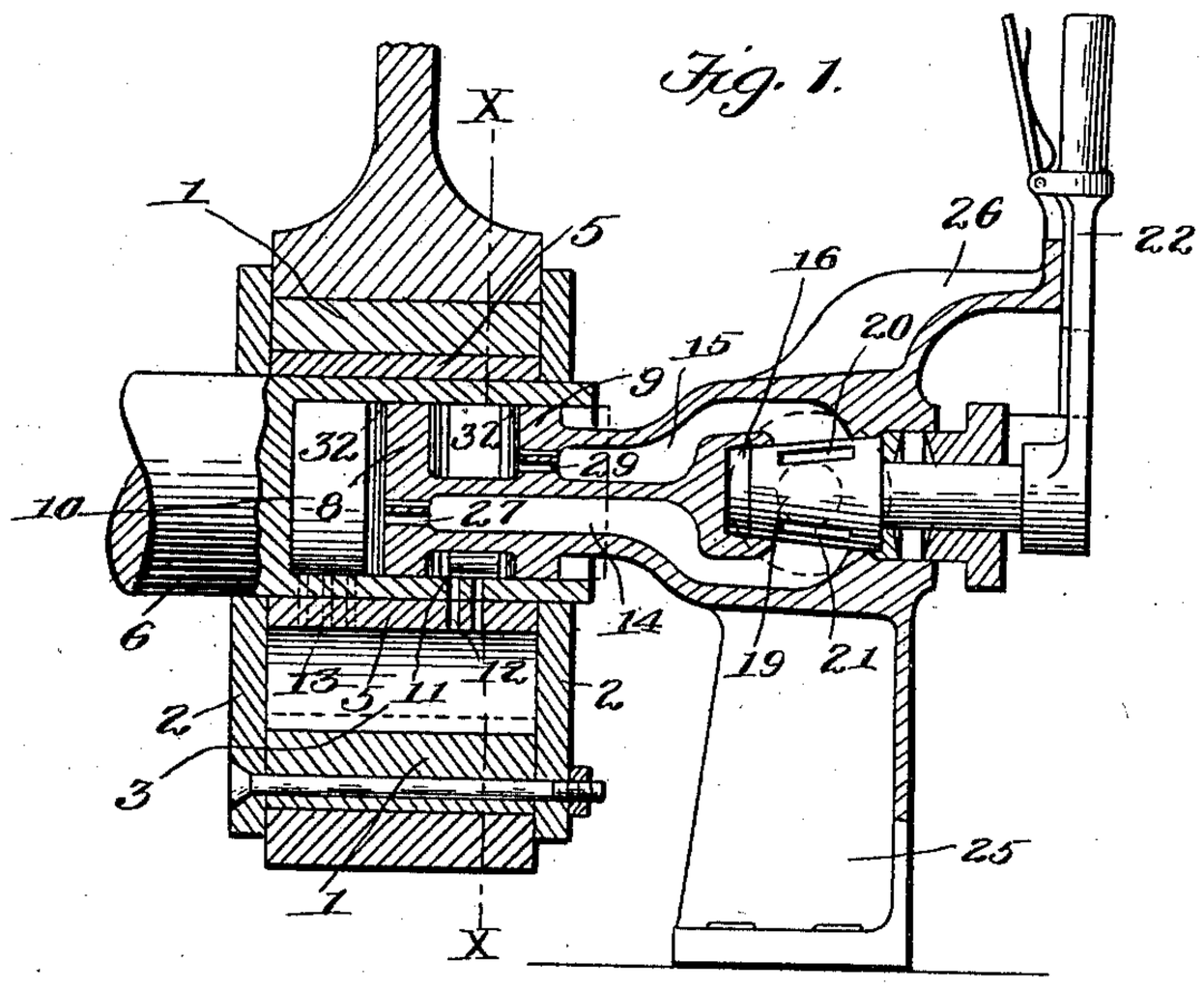

Fig. 4.

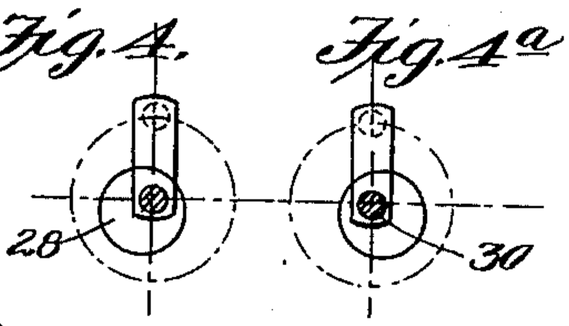

Fig. 4a

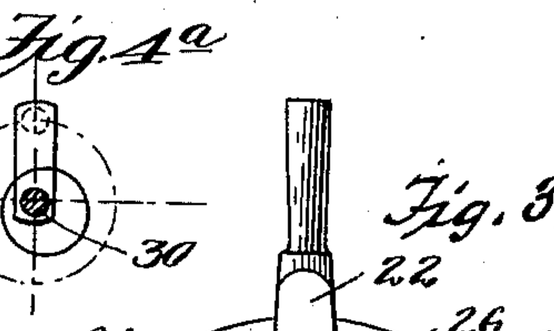

Fig. 2.

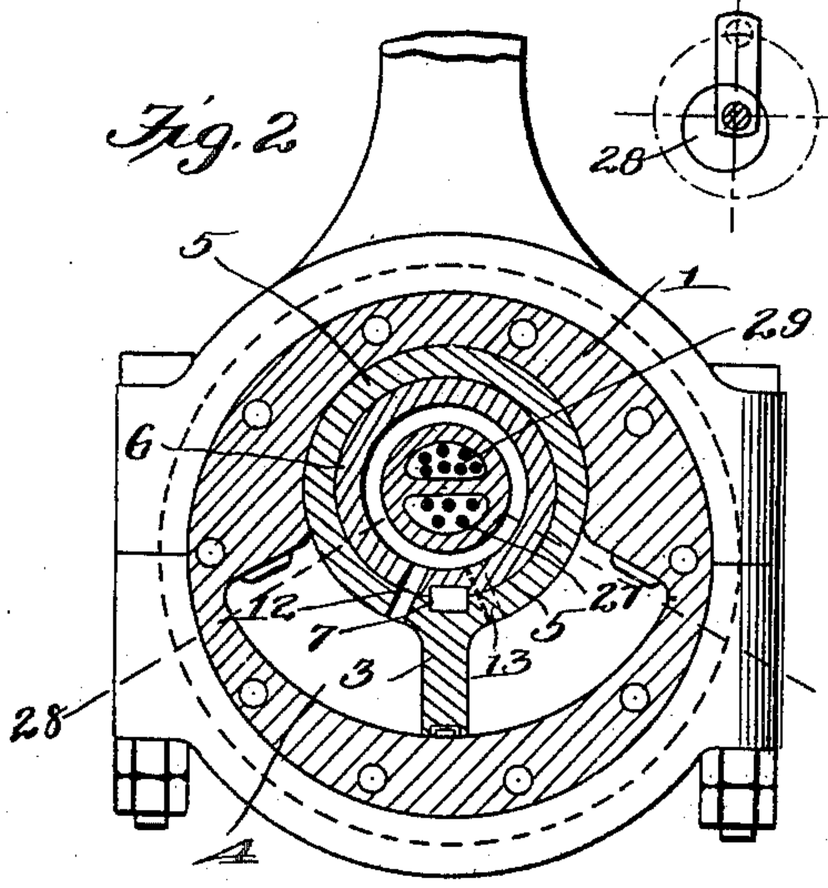

Fig. 3.

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UNITED STATES PATENT OFFICE.

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REVERSING APPARATUS FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 668,938, dated February 26, 1901.

Application filed June 7, 1900. Serial No. 19,441. (No model.)

To all whom it may concern:

Be it known that we, MAXIMILIEN CHARLES HENRI LOUIS VAN DER NOORDAA, residing at No. 3 Nieuwe Haven, and DERK HOEN, residing at No. 67 Stationsweg, Rotterdam, Netherlands, citizens of Holland, have invented a certain new and useful Improved Reversing Apparatus for Steam-Engines, (for which we have applied for a patent in Great Britain, dated April 30, 1900, No. 7,985,) of which the following is a specification.

This invention relates to a reversing apparatus for steam-engines, whereby the direction of motion of a steam-engine can be reversed in the simplest possible manner at any position of the crank.

As is well known, more or less complicated mechanisms are now used for the above purpose, whereby either the one or the other of two eccentrics of the main slide or of the expansion-slide is brought into action. These mechanisms can, however, only be worked in the engine-room itself.

The reversing mechanism which forms the subject of the present invention is best applied to steam-engines in which the regulation is not effected by varying the degrees of cut-off and expansion, but by other known means, such as by throttling the steam-supply in engines working with constant cut-off. The reversal of motion of engines of this kind is best effected by the reversal of the eccentrics, and the present invention has for its object to provide an arrangement by means of which such reversal can be effected in a very simple and effective manner, even while the engine is in motion, without requiring to previously cut off the steam-supply.

The direction of rotation of an engine-shaft, as is known, is determined by the position of the eccentric thereon, the eccentric being always in advance of the crank. If the angle of the eccentric's lead is determined, the engine will run in the forward direction in the one position of the eccentric, or when the one of two eccentrics is coupled up, and in the backward direction in the other position, or when the other eccentric is coupled. If a single eccentric were used which had to be brought either in the one or the other position, then by simply changing such position the direction of motion of the engine would be reversed. According to the present invention only a single eccentric is employed, which is mounted loose upon the engine-shaft, so as to be rotatable thereon between certain limits, and such rotation relatively to the crank in one direction or the other is effected by hydraulic or other suitable fluid-pressure. For this purpose the eccentric-disk, on which is mounted the usual eccentric rod and strap, is made of some width and contains a chamber of segmental form, into which projects a plate or piston fixed radially to the crank-shaft or on a sleeve fixed on the latter. The plate or piston is fitted fluid-tight in the segmental chamber, and the latter is in communication on each side of the plate with channels leading on the one hand to a supply of fluid-pressure and the other hand to a discharge. These channels are controlled by a valvular device in such manner that on moving the latter into one position fluid-pressure is admitted into the chamber on one side of the plate or piston, while the space on the other side thereof is made to communicate with the atmosphere. By this means the fluid-pressure acting between the one side of the plate and the corresponding end of the chamber will force the eccentric-disk around in the corresponding direction on the engine-shaft, thereby also forcing the exhaust fluid out from the other side of the plate until the latter comes in contact with the other end surface of the chamber, thus stopping the further shifting of the eccentric-disk, which will thus have been brought into position for causing the engine to run in the desired direction. When it is desired to reverse the motion of the engine, the valve device is reversed, so as to admit the fluid-pressure on the other side of the plate or piston and cause the above-described action to take place in the contrary direction.

It will be evident that various arrangements of mechanism may be devised for carrying out the above-described operation of causing the fluid-pressure to operate either on the one or the other side of the plate or piston. By way of example we will describe the construction of apparatus which we prefer to employ for this purpose, for which pur-

pose we will refer to the accompanying drawings, in which—

Figure 1 shows a longitudinal section through the complete apparatus; Fig. 2, a section through the eccentric-disk and parts connected therewith on line X X, Fig. 1; Fig. 3, an end elevation; and Figs. 4 and 4a, the two end positions of the eccentric relatively to the engine-crank respectively for the forward and the backward motion of the engine.

The eccentric-disk for the engine-slide consists of a broad part 1, which is secured by means of screw-bolts between two side cheeks 2, between which the eccentric-rod straps are fitted in the usual manner. In the disk 1 is formed a segment-shaped chamber 4, into which projects the blade or piston 3, fitted with suitable packing, so as to work to and fro fluid-tight in the chamber 4. This blade 3 projects radially from a sleeve 5, fixed on the engine-shaft 6 by means of a key 7. The eccentric-disk 1 is fitted to turn to and fro on the sleeve 5 until the blade 3 comes in contact with either the one or the other end of the chamber 4, thereby bringing the eccentric into the requisite angular positions relatively to the crank for running, respectively, forward and backward. At Fig. 2 the eccentric is shown in the middle between these two end positions. The eccentric is fitted onto the one end of the engine-shaft 6, which is bored out hollow, as shown at Fig. 1, and this hollow is divided into two chambers 10 and 11 by means of two disks 8 and 9, fitting fluid-tight therein by means of leather packing-rings 32. These chambers are in communication with the chamber 4 of the eccentric by means of channels 12 and 13, formed through the walls of the shaft 6 and sleeve 5 on each side of the blade 3. The channels 12 connect the right-hand chamber 11, Fig. 1, with the part of chamber 4 to the left hand of the blade 3, Fig. 2, and the channels 13 connect the left-hand chamber 10 with the part of chamber 4 to the right hand of blade 3. It is to be observed that the section through the eccentric shown at Fig. 1 is taken on the left-hand side of the blade 3 in Fig. 2. The water or other fluid-pressure is led through the channel 14 into chamber 10 and through channel 15 into chamber 11, for which purpose small borings 27 and 28 are formed through the disks 8 and 9. These disks 8 and 9 and the channels 14 and 15 are formed in one with the extension of the casing or barrel of a four-way cock 16, the channels 15 and 14 forming the upper and lower continuations of the ways of the casing. It will be seen that the casing of the cock is fixed and that the engine-shaft revolves upon the extension and disks of the same. As shown in Fig. 3, the supply-pipe 17 for the pressure fluid and the discharge-pipe 18 are fixed, respectively, to the left and to the right hand side of the casing 16. In the plug 19 of the cock are formed two ways 20 and 21. It will be seen that with the above-described construction if the plug of the cock be turned by means of the hand-lever 22 into one or other of two positions the channels 14 and 15 will be made to communicate in two different ways with the pipes 17 and 18. If, namely, the hand-lever 22 (which in Fig. 3 is shown in its middle position for the sake of clearness) be turned into the position at 23, the channel 14 is made to communicate with the fluid-pressure supply 17, while the channel 15 is put in communication with the discharge 18. If, on the other hand, the lever 22 be turned into the position at 24, the fluid-pressure supply 17 will communicate with the channel 15 and the discharge 18 with channel 14.

As shown at Figs. 1 and 3, the cock-casing is provided with a stand 25 and has at top a quadrant-guide for securing the hand-lever in position into which it is moved.

The action of the above-described apparatus is as follows: Assuming the hand-lever to have been moved into the position at 23, then the channel 14 will communicate with the pressure-fluid supply 17 and channel 15 with the discharge 18, Fig. 3. The pressure fluid, which is supplied from a pump or other convenient means, flows through channel 14 and holes 27 into chamber 10 of the hollow shaft, and from this chamber it will pass through the channel 13 into the chamber 4 of the eccentric-disk to the right-hand side of the blade 3. The entering pressure fluid will now cause the eccentric-disk to turn on the sleeve of the engine-shaft into the position marked 28, and the engine will then run in the direction of the arrow marked at Fig. 4. For reversing the direction of motion the lever of the cock is moved from the position 23 into the position 24—namely, through an angle of ninety degrees. In this position of the cock the channel 15 will communicate with the fluid-pressure supply 17 and the channel 14 with the discharge 18. The pressure fluid will now flow through the channel 15 and holes 29 into chamber 11 of the hollow shaft and thence through channels 12 into chamber 4 to the left-hand side of the blade 3. The space on the right-hand side of 3 will at the same time be put in communication with the discharge 18 by the channel 14. The pressure on this side of the blade being thus removed, the fluid-pressure on the other side will now cause the eccentric-disk to turn on the sleeve and shaft until it assumes the position at 30. The fluid on the right-hand side of blade 3 will during such motion flow off through the channels 13, chamber 10, holes 27, channel 14, and discharge-pipe 18. The position of the eccentric being thus reversed, the reversal of the engine's motion will consequently follow. Such reversal can be effected without requiring the steam-supply to be cut off beforehand and the engine to be brought to a standstill. Care must, however, be taken that too strong compressions do not occur under these circumstances in the steam-cylinder.

A further considerable advantage of the above-described reversing apparatus consists in that it can be operated at a distance from the engine as well as near the same, as described. For this purpose the four-way cock can be fixed in any desired position, the part of the casing containing the channels 14 and 15 being extended in form of a pipe leading to the parts contained in the hollow engine-shaft.

The above-described reversing apparatus can be applied to any existing engine in which the reversing eccentric is situated at the end of the engine-shaft, while a new engine would be correspondingly constructed to receive it. It may also be applied to engines having both a main and an expansion slide. The lead of the eccentric of the expansion-slide must in that case amount to ninety degrees, so that this eccentric retains the same relative position to that of the main slide whether this be turned into the position for the forward motion or that for the backward motion.

The pressure fluid required for actuating the eccentric can be supplied by a special pump, or in the case of water it may be taken from the feed-pump or injector of the boiler. The width of the eccentric-disk will have to be made in proportion to the available fluid-pressure and to the force required for shifting the eccentric from one position to the other.

Having thus described the nature of this invention and the best means we know for carrying the same into practical effect, we claim—

1. In an apparatus for reversing the motion of steam-engines, the combination with the engine-shaft having a hollow end and carrying an eccentric provided with a segment-shaped chamber, of a sleeve mounted upon said shaft, a blade formed integral therewith and operating within said chamber, said sleeve provided with a series of channels registering with a series of channels in said shaft, a pair of suitably-connected disks mounted in the hollow end of said shaft dividing the same into two chambers, said disks each provided with a series of channels opening into said chambers of the shaft, and an extension formed integral with said disks and connected to a source of pressure-supply for supplying and exhausting pressure from the said chambers of the shaft, substantially as described.

2. In an apparatus for reversing the motion of steam-engines, a pair of disks adapted to be mounted in the hollow end of an engine-shaft dividing the same into two chambers, said disks provided with a series of channels, an extension formed integral with said disks and formed with a pair of channels 14, 15, and a four-way cock in communication with said channels 14, 15, and adapted to permit of an alternate supply and exhaust of pressure to and from said chamber, substantially as described.

3. In an apparatus for reversing the motion of steam-engines, a pair of disks adapted to be mounted in the hollow end of an engine-shaft dividing the same into two chambers, fluid-tight packing for the said disks, each of said disks provided with a series of channels, an extension formed integral with said disks and provided with a pair of channels 14, 15, communicating respectively with said chambers of the shaft by means of the channels of the disks, a four-way cock in communication with said channels 14, 15, and adapted to permit of an alternate supply and exhaust of pressure to and from the said chambers of the shaft, and means for operating said cock, substantially as described.

4. In apparatus for reversing the motion of steam-engines, an eccentric working the engine-slide mounted loose upon the engine-shaft, a segment-shaped chamber in said eccentric, a blade projecting from the engine-shaft into said chamber and fitted to work fluid-tight therein, a cylindrical hollow in the end of the engine-shaft on which the eccentric is mounted, two disks fitted to work fluid-tight in said hollow so as to divide it into two chambers which communicate respectively by channels with the chamber of the eccentric on opposite sides of the blade therein, a stem leading from the casing of a four-way cock to which said two disks are fixed, two channels in said stem communicating at one end respectively with one of the chambers of the engine-shaft, and at the other end with the channels in the casing of the four-way cock, a channel connecting the one side of the cock-casing with a supply of pressure fluid, a second channel connecting the other side of the cock-casing with a discharge, a rotatable plug in the cock-casing having passages adapted to put said pressure-fluid supply in communication either with the one chamber or the other of the engine-shaft and at the same time to put the second said chamber in communication with the discharge and a hand-lever or equivalent device for turning said plug into either the one or the other position according as the engine is required to run forward or backward, substantially as described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

MAXIMILIEN CHARLES HENRI
LOUIS VAN DER NOORDAA.
DERK HOEN.

Witnesses:
AIRE H. VOORWINDEN,
ALBERT C. LISTOE.