

Patented June 11, 1901.

(No Model.)

(Application filed Jan. 22, 1901.)

2 Sheets—Sheet 1.



INVENTORS

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No. 675,959.

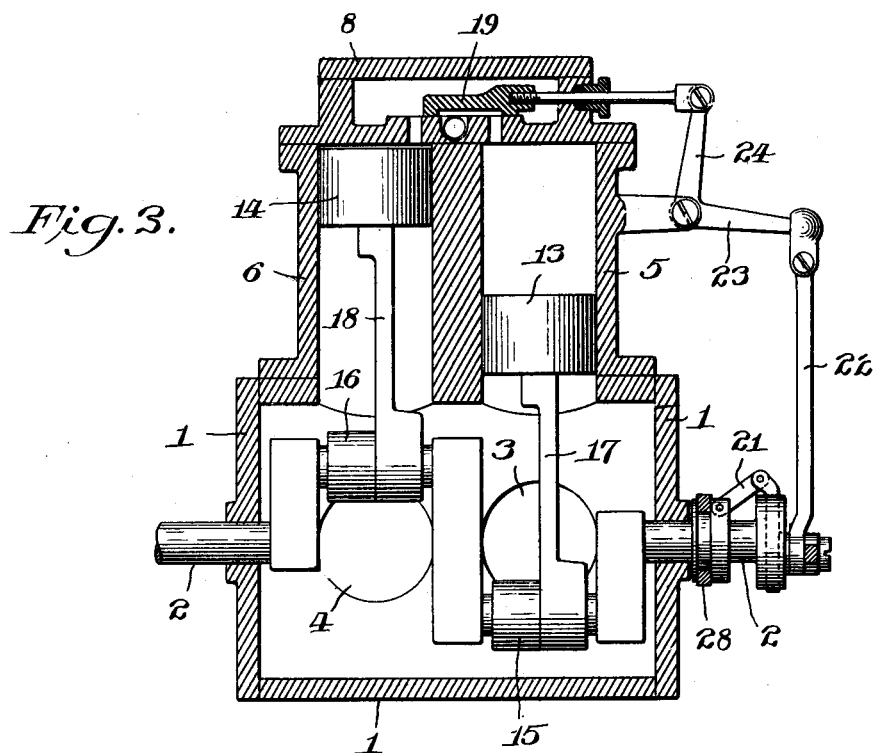
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DIRECT ACTING STEAM ENGINE.

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WITNESSES:

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UNITED STATES PATENT OFFICE.

WILL J. LOOMIS AND ARTHUR A. KARCHER, OF PHILADELPHIA,
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DIRECT-ACTING STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 675,959, dated June 11, 1901.

Application filed January 22, 1901. Serial No. 44,260. (No model.)

To all whom it may concern:

Be it known that we, WILL J. LOOMIS, residing at No. 1001 Arch street, and ARTHUR A. KARCHER, residing at No. 1016 Wallace street, in the city and county of Philadelphia, in the State of Pennsylvania, citizens of the United States, have invented a new and useful Improvement in Direct-Acting Steam-Engines, of which the following is a specification.

Our invention relates to direct-acting steam-engines; and our object is to provide an engine of this class suitable for use as a motor for vehicles of the automobile type. An engine adapted to such use should combine uniformity of driving effort, an absence of dead-points, ease in starting, stopping, and reversing, simplicity in construction and operation, and compactness in form. We attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a view of the entire engine looking down upon the same from above. Fig. 2 is a vertical section of the engine on the line X X, Fig. 1. Fig. 3 is a longitudinal section through the crank-pit and through one pair of the steam-cylinders on the line Z Z, Fig. 2.

In Fig. 1 the crank-pit casing 1 incloses the working parts of the engine, with the exception of the valve connections. The shaft 2 is a double-crank shaft rotating in the crank-pit casing 1, being mounted in suitable bearings in the ends thereof, as indicated in Fig. 3.

Upon the crank-pit casing 1, Fig. 1, are mounted the single-acting steam-cylinders 3, 4, 5, and 6, arranged in pairs, the cylinders 3 and 4 being side by side and parallel each to each, and the cylinders 5 and 6 being in like manner side by side and parallel each to each. The axes of the pair 3 4 are at an angle of ninety degrees with the axes of the pair 5 6, the axes of each pair intersecting at the center of the shaft 2, as more clearly appears in Fig. 2.

The pipe 9 supplies the steam-chests 7 and 8, Fig. 1, the steam-chest 7 communicating with the steam-cylinders 3 and 4 and the steam-chest 8 communicating with the steam-cylinders 5 and 6. All four cylinders exhaust through the pipe 10.

The steam-cylinders 3, 4, 5, and 6 are fur-

nished, as shown in Fig. 2, with the piston-heads 11, 12, 13, and 14 and piston-rods 15, 16, 17, and 18, the latter being pivoted to their respective piston-heads and coupled directly to the cranks of the shaft 2. The piston-rods of opposite cylinders are coupled to the same crank, as indicated in Fig. 3. Thus, referring to Fig. 1, the piston-rods of cylinders 3 and 5 are coupled to one crank of the shaft and the piston-rods of cylinders 4 and 6 are coupled to the other crank of the shaft.

In Fig. 2, 19 and 20 are slide-valves of any suitable pattern working in the steam-chests 7 and 8 and controlling the admission of steam to each pair of cylinders. A sectional view of slide-valve 19 is shown in Fig. 3.

Upon one end of the shaft 2 is mounted the sliding eccentric 21, Figs. 1 and 3, of ordinary pattern, with which each of the slide-valves 19 and 20 are connected by the arms or levers 22, 23, and 24 and 25, 26, and 27. The sliding eccentric 21 is controlled by the collar 28, Fig. 3, which is designed to be actuated by a lever in the ordinary manner to start, stop, or reverse the engine.

The relative position of the four piston-heads with their rods at a fixed point in the rotation of the shaft 2 is indicated in Fig. 2. The rotation of the shaft being from left to right, the piston-head 12 of the cylinder 4 is in mid-stroke downward. The piston-head 14 of cylinder 6 on the opposite side is about to take steam on the downstroke. The piston-head 13 of cylinder 5 is at the end of its downstroke and is about to rise, and the piston-head 11 of cylinder 3 is in the middle of its rise. The position of piston-head 11 has not been indicated in Fig. 2 because it is directly behind piston-head 12. It may be observed that while Fig. 2 is mainly a section through the crank-pit casing and cylinders 4 and 6 the position of all four piston-heads and piston-rods and their connection with the cranks of the shaft is also indicated, as hereinabove described. The cylinders 3, 4, 5, and 6 being single-acting, the power applied by the piston-rods is wholly a push, each rod driving the shaft through approximately a third of its revolution. Thus at any point of revolution of shaft 2 there is one piston-rod

in full stroke, that stroke being taken up and carried on by another piston-rod before the efficiency of the first is exhausted, and so on in rotation.

5 It will be observed that the number and arrangement of the steam-cylinders and the manner in which the piston-rods are coupled to the cranks of the shaft obviate the possibility of a dead-point, since one cylinder is
10 always taking steam. The employment of a pair of cylinders on each side, the piston-rods of opposite cylinders being coupled to the same crank of the shaft, as shown in Fig. 3, renders practicable the use of single-acting
15 cylinders and valve connections of great simplicity. The crank-pit is entirely inclosed, rendering it dust-proof and enabling us to employ splash lubrication for the inclosed working parts. The engine is easily handled,
20 and the parts of which it is composed are exceedingly few in number.

We have shown our pairs of steam-cylinders set at an angle of ninety degrees with each other, since we consider that angle to
25 be the one at which the highest working efficiency can be obtained; but we do not wish to be understood as confining ourselves in the arrangement of said steam-cylinders to this precise angle, as our engine might be almost equally efficient if the angle between
30 the axes of the cylinders was somewhat less or somewhat greater than ninety degrees.

What we claim as our invention, and desire to secure by Letters Patent, is—

35 1. In combination, a double-crank shaft, a crank-pit casing inclosing said shaft, two pairs of single-acting cylinders mounted upon said crank-pit casing, the axes of one pair forming an angle of ninety degrees with the
40 axes of the other pair, a piston-head and piston-rod in each cylinder connected directly

to the cranks of said shaft, the piston-rods of opposite cylinders being connected to the same crank, a sliding eccentric mounted upon
said shaft, a steam-chest mounted upon and 45 communicating with each pair of cylinders, a slide-valve in each steam-chest, connecting means such as the parts 22, 23, 24, 25, 26 and 27 whereby said valves may be actuated by
said sliding eccentric, and means such as the 50 collar 28 controlling said sliding eccentric, substantially as described.

2. In combination in a single-acting steam-engine, the double-crank shaft 2, the crank-pit casing 1 inclosing said double - crank 55 shaft, the single-acting steam-cylinders 3, 4, 5, and 6 mounted upon said crank-pit casing; said cylinders being arranged in pairs, the cylinders 3, 4 being parallel to each other, the cylinders 5, 6 being parallel to each other 60 and the axes of the pair 3, 4 forming an angle of ninety degrees with the axes of the pair 5, 6, the piston-heads 11, 12, 13 and 14, the piston-rods 16 and 18 connected directly to one crank of the shaft 2 and the piston- 65 rods 17 and 15 connected directly to the other crank of the shaft 2, the steam-chests 7 and 8, the slide-valves 19 and 20, the sliding eccentric 21, the valve connections 22, 23, 24, 25, 26 and 27 connecting said sliding eccentric 70 with said slide-valves, means for supplying power to said cylinders and means for carrying off the exhaust from said cylinders, substantially as described.

In testimony whereof we have signed our 75 names to this specification in the presence of two subscribing witnesses.

WILL J. LOOMIS.

ARTHUR A. KARCHER.

Witnesses:

CHARLES H. SPECKMAN,

H. BOVEE SCHERMERHORN.