No. 680,524. Patented Aug. 13, 1901.

M. GARLAND & D. LUMGAIR.

STEAM ENGINE.

(Application filed Aug. 10, 1900.)

(No Model.) 2 Sheets—Sheet 1.

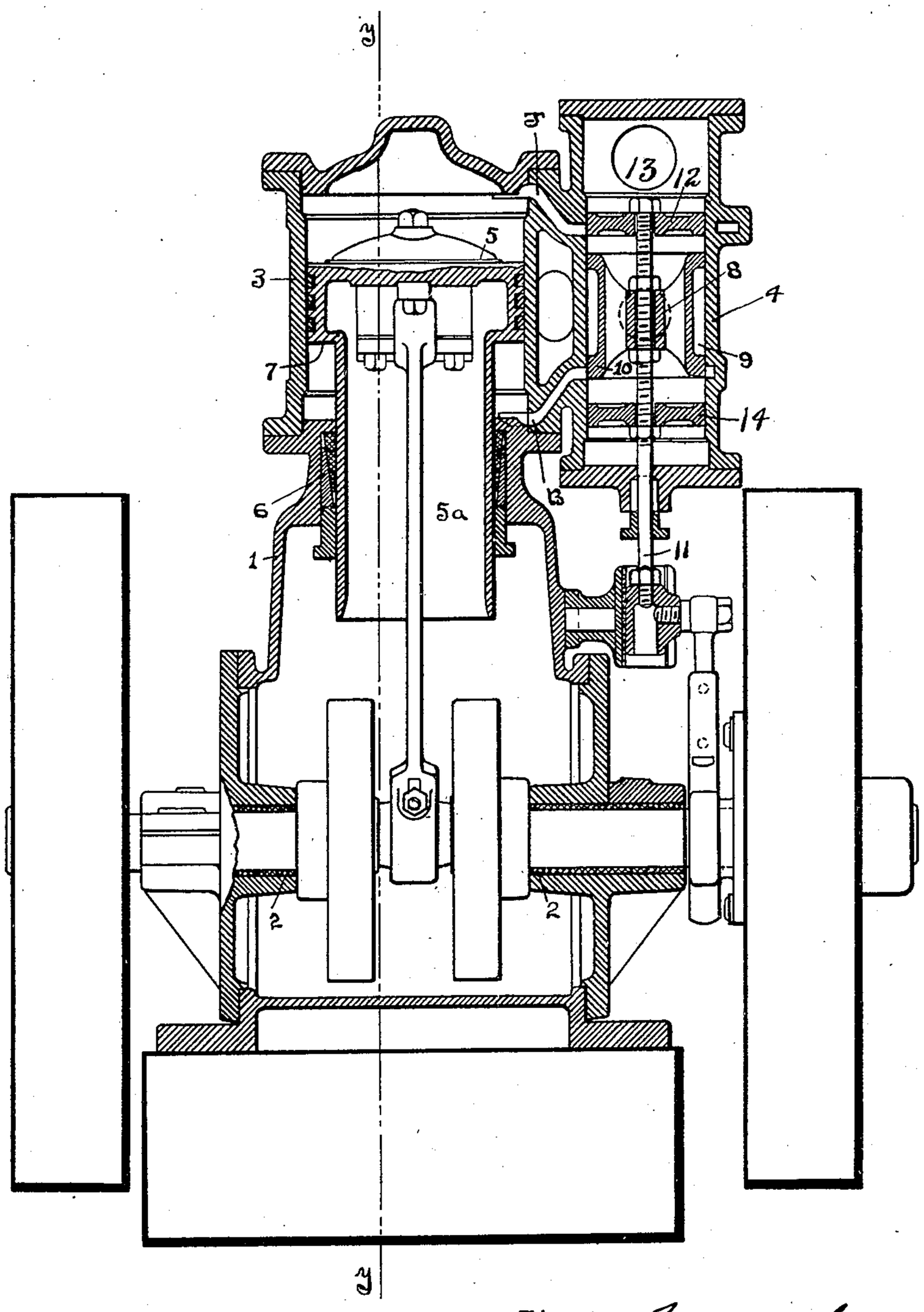

Fig. 1.

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David Lumgair
INVENTORS.

WITNESSES:
Wm. Stephens
W. A. Peter

BY
Geo. B. Willcox ATTORNEY.

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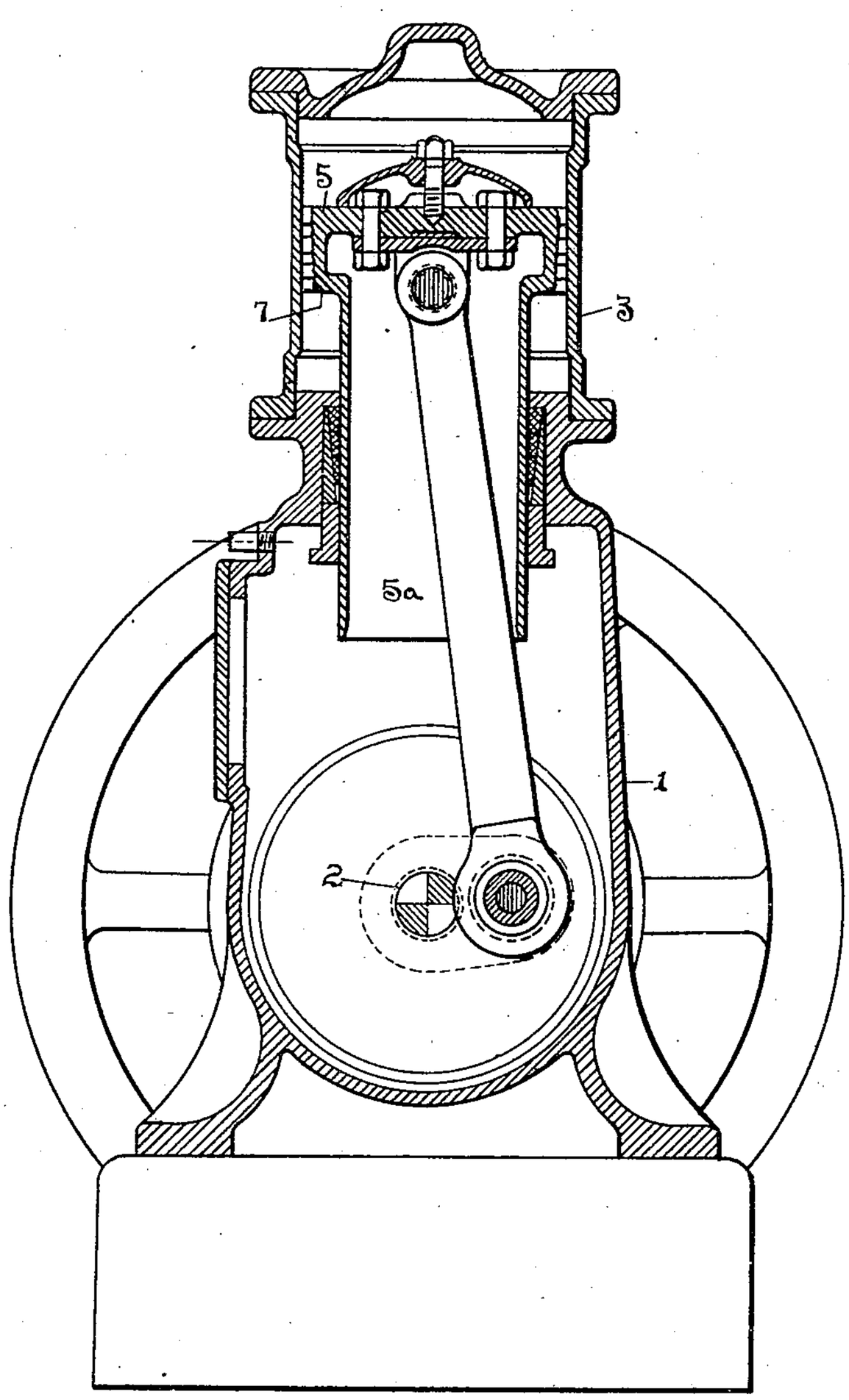

Fig. 2.

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UNITED STATES PATENT OFFICE.

MICHAEL GARLAND AND DAVID LUMGAIR, OF BAY CITY, MICHIGAN, ASSIGNORS TO THE M. GARLAND COMPANY, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 680,524, dated August 13, 1901.

Application filed August 10, 1900. Serial No. 26,456. (No model.)

To all whom it may concern:

Be it known that we, MICHAEL GARLAND and DAVID LUMGAIR, citizens of the United States, residing at Bay City, in the county of Bay and State of Michigan, have invented certain new and useful Improvements in Steam-Engines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to steam-engines; and the improvements consist in certain combinations and arrangements of parts whereby the objects of our invention are accomplished. These objects are to produce a steam-engine of the vertical inverted type that is simple in construction, easily accessible for renewal or repair of its parts, and combines the inexpensive construction of an inverted single-acting trunk-engine with the practical operating advantages of a double-acting piston-engine.

A further object is to provide in such an engine a balanced piston-valve arranged to take steam inside and capable of not only admitting live steam to the cylinder-ports and carrying away the exhaust, as in ordinary engines, but arranged also to carry the exhaust from one end of the cylinder around into the other end, where it performs work expansively, and then to allow this steam to exhaust from the engine.

Our invention is illustrated in the accompanying drawings, throughout the views of which similar characters of reference designate corresponding parts and devices.

Figure 1 is a part vertical section of the engine, the section being taken parallel with the shaft. Fig. 2 is a transverse section on the line *y y* of Fig. 1.

As is clearly shown in the drawings, the engine consists in a hollow base-casting 1, entirely inclosed, forming an oil-receptacle, in which the crank revolves. The shaft is supported in suitable bearings 2, carried by the base-casting 1.

The cylinder 3 and valve-chest 4 are supported by the upper end of the base-casting 1. Within the cylinder is the piston 5, having a depending trunk 5^a of smaller diameter than the piston-body. The trunk extends downward and slides longitudinally through a suitable steam-tight packing 6 below the cylinder. The annular ring 7 of exposed surface on the under side of the piston is obviously of less area than the exposed upper surface of the piston 5. In practice we admit high-pressure steam through the bottom port B to the under side of the piston during the upstroke and afterward pass this steam out through the bottom port B and into the upper end of the cylinder through the top port T. Thus the steam that has operated under high pressure against the smaller piston area to force the piston up is now available at lower pressure to operate against the larger piston area and force the piston down.

The trunk form of piston eliminates the cross-head and guide, that would otherwise be necessary, and further simplifies the construction, producing a shorter and more compact engine. By this peculiar piston arrangement and steam distribution we not only attain the above-noted advantages of trunk-engine construction, but also secure the advantages of a double-acting engine capable of working the steam expansively. It will be noted that this construction utilizes the energy of the steam not by a single expansion, as in simple double-acting engines, but by two expansions, as in compound engines, the first expansion taking place below the piston and the second expansion above the piston, where the steam operates against an increased area.

We will now consider the means by which the steam in passing through the engine is admitted first to the bottom port B during the upstroke, exhausted through the port B during the downstroke, then transferred into the top port T to operate the piston during the next downstroke, and finally exhausting from the port T during the succeeding upstroke and leaving the engine. This means of distributing the steam consists in the valve construction shown in Fig. 1. Steam enters the valve-chest through the steam-pipe opening 8 and fills the annular steam-space 9 between the wall of the valve-chest and the shell of

the main piston-valve 10, which is secured by set-nuts or other suitable means to the eccentric-actuated valve-stem 11. As the valve descends live steam from the steam-space 9 enters the bottom port B and forces the piston upward. After the completion of the upstroke the valve 10, moved upward by the eccentric, uncovers the bottom port B, and the steam below the piston exhausts into the valve-chest, whence it passes up through the middle of the annular valve 10 and top port T into the cylinder above the piston, where it acts upon the piston, forcing it downward. When the downstroke is completed and the next upstroke is commenced, the steam above the piston is exhausted through the top port T.

In order to separate the two bodies of exhaust-steam—namely, the exhaust from the bottom port B and that from the top port T—an auxiliary solid piston-valve 12 is secured to the valve-stem above the main valve 10. This valve 12 is of suitable thickness and is placed at a proper distance above the valve 10 to uncover the top port T and put it in communication with the exhaust from port B when the valve is at the top of its travel and to uncover the port T and put it in communication with the outboard-exhaust 13 when the valve is at the bottom of its travel. To balance the pressure on the valve 12 and to permit it to move freely, a piston 14 is mounted on the valve-stem 11 below the main valve 10. It is evident that the steam distribution—*i. e.*, the admission, expansion, exhaust, compression, and lead—is as easily controlled by properly fixing the lap, travel, and angular advance as these same functions are controlled in any plain slide-valve engine.

By the above-described means we have produced a single-acting compound engine having but one cylinder and capable of working the steam expansively. The engine is simple in construction, has few moving parts, and is very compact.

What we claim is—

In a single-acting compound engine comprising a single cylinder, a piston having an enlarged upper end fitting the cylinder and a downwardly-extending hollow trunk of less diameter than the cylinder; the combination of an inclosed crank-space communicating with the lower end of the trunk, a connecting-rod secured in the trunk at its upper end, and means for admitting and discharging steam from the cylinder, comprising a hollow cylindrical valve mounted on the valve-stem for opening and closing the port of the high-pressure end of the cylinder; a flat disk valve adjustably secured to the valve-stem above the cylindrical valve for opening and closing the port of the low-pressure end of the cylinder, substantially as described.

In testimony whereof we affix our signatures in presence of witnesses.

MICHAEL GARLAND.
DAVID LUMGAIR.

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