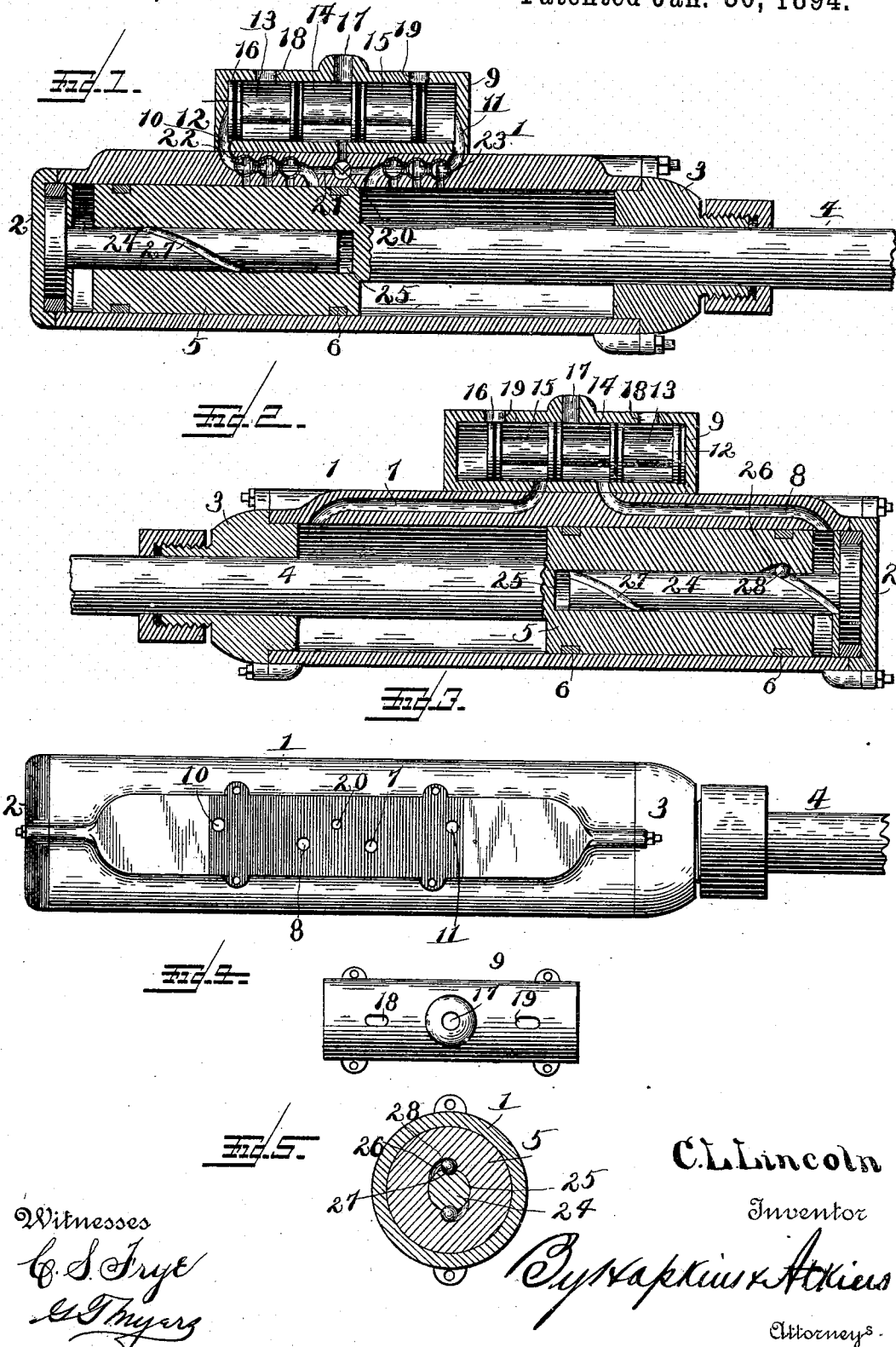


(No Model.)

C. L. LINCOLN.
ENGINE.

No. 513,947.

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Witnesses
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ENGINE.

SPECIFICATION forming part of Letters Patent No. 513,947, dated January 30, 1894.

Application filed July 28, 1892, Serial No. 441,488. (No model.)

To all whom it may concern:

Be it known that I, CHARLES L. LINCOLN, of Stamford, county of Fairfield, and State of Connecticut, have invented certain new and useful Improvements in Engines, of which the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to provide improved means for utilizing the steam in a cylinder after it has performed, or during the performance of its function of driving the piston, for the purpose of shifting the valve controlling the supply of steam to the cylinder and the exhaust therefrom, and to provide means for shortening the stroke of the piston by shifting the controlling valve before the piston travels a full stroke.

In the accompanying drawings, Figure 1 is a vertical section of my device, taken a little to one side of the center; and Fig. 2 a similar view, taken a little to the other side of the center. Fig. 3 is a top plan view of the cylinder with the valve case removed. Fig. 4 is a top plan view of the valve case. Fig. 5 is a vertical section of the piston-head.

Referring to the numerals on the drawings, 1 indicates a cylinder, suitably constructed of any desirable material. It is provided with heads 2 and 3 as usual, the head 3 being bored for the reciprocation within it of the piston-rod 4, which is fastened, as usual, to the piston-head 5.

6 indicates a packing of any ordinary kind. One side of the cylinder is made of thicker metal to accommodate the steam ports. There are two sets of steam ports. The cylinder ports 7 and 8 establish communication respectively with the interior of the opposite ends of the cylinder and the interior of the valve case 9 near its middle. The valve ports 10 and 11 extend from the interior of the cylinder, near its middle, to the interior of the valve case at its ends. The main purpose of the two sets of ports, respectively, generally speaking, is to drive the piston-head, and to drive the valve-piston 12, which is longitudinally movable within fixed limits within the valve case. The valve-piston is preferably separated into three chambers 13, 14, and 15 by four piston rings 16.

17 indicates the main supply opening in the

valve case; and 18 and 19, respectively, indicate the exhaust openings.

20 indicates a three-way cock seated in a suitable opening, preferably the valve case and the cylinder, and communicating by channels 21 with the ports 10 and 11 and the interior of the valve case, respectively.

22 indicates short ports controlled by cocks 23 located in the ports 10 and 11. In the drawings three short ports are shown on each side. The office of the cock is to keep the short ports normally closed, or to open one of them at a time and cause it to act for and in the place of the port with which it communicates, for the purpose hereinafter explained.

Within the cylinder, and preferably secured to its head 2, is a guide-rod 24 concentric with the cylinder, and adapted to enter a central bore 25 of the piston-head.

26 indicates oblique wedge shaped apertures in the walls of the piston-head surrounding the bore 25, and opening therein.

27 indicates spiral grooves in the sides of the guide-rods.

28 indicates a globular bearing of suitable material, as for example hardened steel, and seated in the recesses of the walls of the piston-head, and the grooves in the sides of the guide-rod, respectively, thereby imparting rotary motion in one direction to the piston-head as it reciprocates within its cylinder.

The operation of my device is as follows: Referring to Fig. 2 of the drawings, suppose steam to be admitted through the main port 17. It will pass through the chamber 14 into the port 8 behind the cylinder-head and force it toward the head 3 of the cylinder. Referring now to Fig. 1 of the drawings it will be seen that the steam behind the piston-head has no means of egress until the piston has made its stroke and the steam is ready to pass off as exhaust steam. At that time, however, the piston-head having opened the port 8 the steam will pass thence into the interior of the valve case behind the valve piston and throw it to the opposite end of the case. The steam passes thence through the exhaust port 10 or 14, as the case may be, and—as will appear by reference to Fig. 2—the port 7 is converted from a supply port to an exhaust port through which the residuum of exhaust steam, if any,

may pass outward through the chamber 14 and the exhaust port 17 in the valve case. At the same time the port 8 is converted into a supply port and conveys the live steam in front of the piston-head and drives it in the direction of the head 2, thereby opening the port 11 and throwing the valve-piston into the position first above described ready for a repetition of the operation, as explained.

Let it be observed that the reciprocation of the valve-piston controls the supply of steam to the cylinder; and that by shortening the interval between the reciprocations of the controlling valve, the stroke of the piston may be diminished, and by lengthening it it may be correspondingly increased. I therefore prefer to make my ports 10 and 11 of maximum length, and to provide short ports 22 and cocks 23, by which the time of operation of the controlling valve may be controlled, and the stroke of the piston diminished at will. If, when in starting the machine, the piston-valve should occupy a position to close both of the ports 7 and 8, the engine would be at a dead point. For this purpose I have provided the two-way cock, by which steam may be directed into either of the ports 10 or 11, as preferred, so as to shift the controlling-valve for operation, as explained in the beginning. I thus provide suitable means for operating the machine under any contingency. The means of imparting rotary motion to the piston-head has been suggested. It remains only to indicate that the rotary motion is compelled to be in one direction by the oblique sides of the recesses in the walls of the piston-head. A tendency to rotate in the opposite direction would be effectually resisted by the wedging action of the globular bearings between the sides of the guide-rod and the oblique walls of the recess.

While I have described my invention as applicable to steam engines, I desire it to be distinctly understood that I do not limit myself to the use of steam, for any kind of gas may be substituted therefor, without departing from the scope of my invention, such for example as air, or the like. Neither do I desire to limit myself to the exact details of construction as herein illustrated and described, as they may be materially modified within the scope of my invention.

What I claim is—

1. The combination with a cylinder and piston, a valve case and controlling valve, of cylinder ports and valve ports communicating with the cylinder and valve case, said valve ports being adapted ordinarily to convey steam from the cylinder to actuate the valve, and means for communicating either of the

valve ports with the middle of the valve case to receive the steam directly therefrom to shift the valve when the same is made necessary by the obstruction of a port by the main piston, substantially as and for the purpose specified.

2. The combination with a cylinder and piston, valve case, and controlling valve, of cylinder ports, valve ports, short ports communicating with the valve ports, and cocks at the intersection of the valve ports, and short ports, substantially as and for the purpose specified.

3. The combination with a cylinder and piston, valve case and controlling valve, of cylinder ports, valve ports, short ports and cocks, a port communicating the valve ports with the valve case, and a cock controlling said port substantially as and for the purpose specified.

4. The combination with a cylinder and piston, a valve case and controlling valve, of cylinder ports and valve ports and exhaust openings in the valve case arranged to permit the exhaust from the cylinder and from behind the controlling valve simultaneously through each opening alternately, substantially as and for the purpose specified.

5. The combination with a cylinder and piston, a valve case and valve provided with chambers, cylinder ports leading respectively from the ends of the cylinder to the middle part of the valve case, and valve ports leading from the valve case to the middle part of the cylinder, channels leading respectively from the interior of the valve case and the valve ports, and a three-way cock for communicating the middle of the valve case with the said channel, substantially as and for the purpose specified.

6. The combination with a cylinder and piston, valve case and controlling valve, of cylinder ports communicating the ends of the cylinder with the middle part of the valve case, valve ports communicating the middle part of the cylinder with the ends of the valve case, short ports communicating with the valve ports, cocks controlling said short ports, a port communicating the valve ports with the middle of the valve case, a cock controlling said port and a main port and exhaust openings in said valve case all co-operating, substantially as and for the purpose specified.

In testimony of all which I have hereunto subscribed my name.

CHARLES L. LINCOLN.

Witnesses:

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JOHN E. KEELER.