No. 646,770. Patented Apr. 3, 1900.

J. E. THORNTON & J. P. LEA.

MOTOR.

(Application filed Jan. 6, 1899.)

(No Model.) 2 Sheets—Sheet 1.

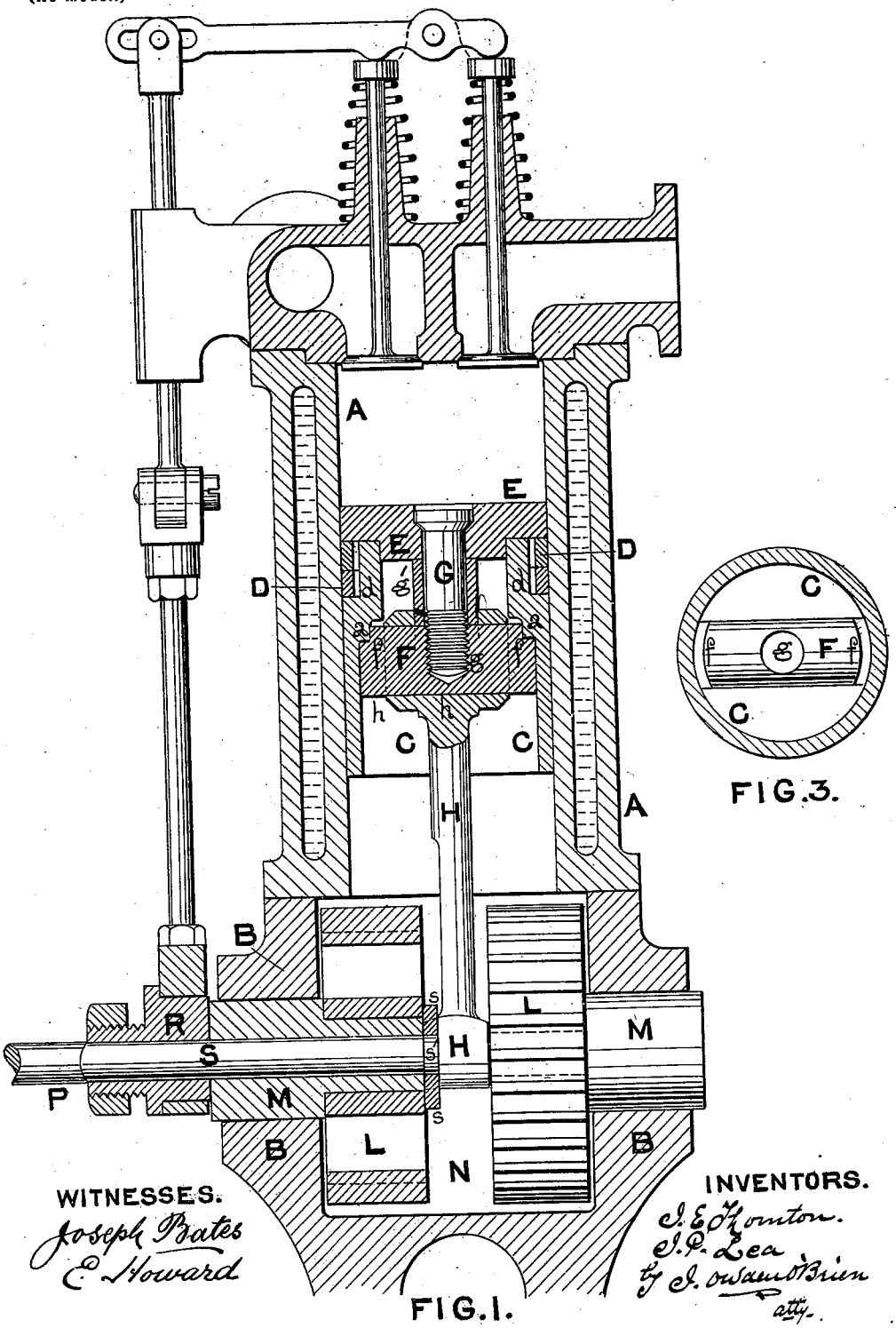

FIG. 1.

FIG. 3.

WITNESSES.

Joseph Bates

E. Howard

INVENTORS.

J. E. Thornton.

J. P. Lea

by J. Swan O'Brien

atty.

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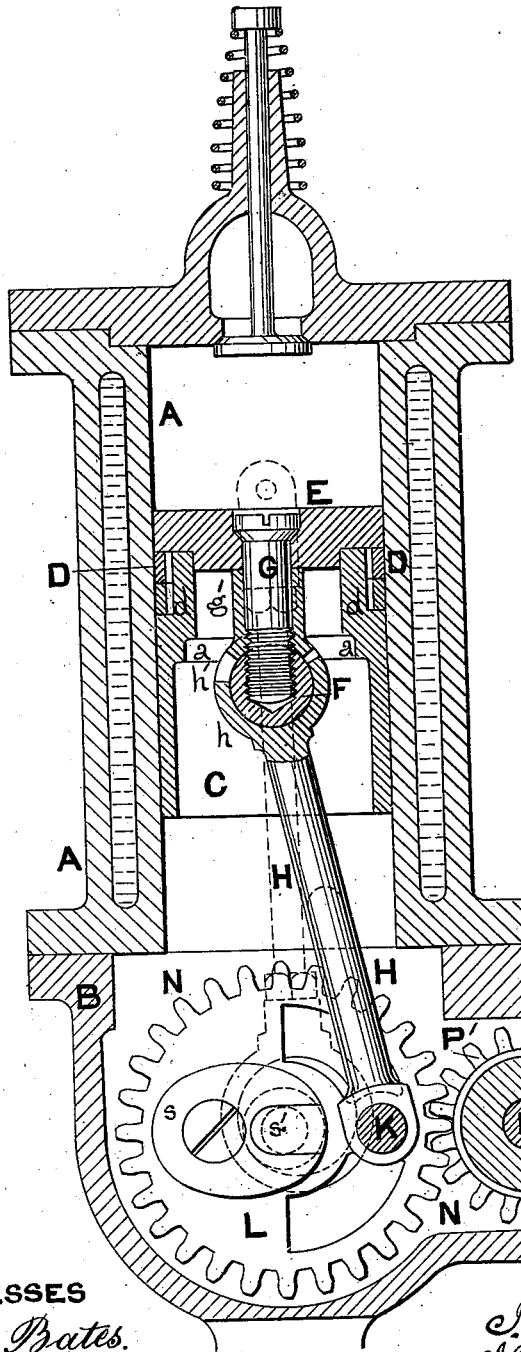
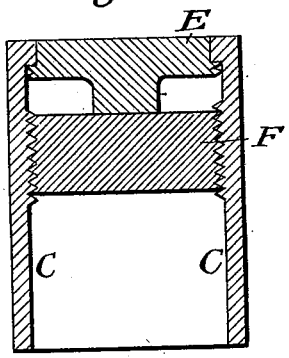


FIG. 2.

Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN E. THORNTON, OF ALTRINGHAM, AND JAMES P. LEA, OF MANCHESTER, ENGLAND.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 646,770, dated April 3, 1900.

Application filed January 6, 1899. Serial No. 701,417. (No model.)

To all whom it may concern:

Be it known that we, JOHN EDWARD THORNTON, residing at Altringham, in the county of Chester, and JAMES POLLARD LEA, residing at Hulme, Manchester, in the county of Lancaster, England, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in Motors, of which the following is a specification.

This invention relates to improvements in motor-engines driven by an explosive charge, such as gas or vaporized oil mixed with air, and is designed to simplify the construction of the operative or working parts; and the invention, although primarily intended to be applied to motors, may also be applied to pumps, the parts being the same, but rotary motion being applied to the shaft to work the piston instead of an explosive force to the piston to be conveyed to the shaft.

The invention will be fully described with reference to the accompanying drawings.

Figure 1 is a longitudinal sectional elevation. Fig. 2 is a longitudinal sectional elevation in a vertical plane at right angles to Fig. 1. Fig. 3 is a transverse sectional plan of the piston and cross-head connecting-pin. Fig. 4 is a longitudinal section of piston, showing a modification.

The cylinder A and the casing B are made of any ordinary or suitable construction to receive and carry the working parts.

The piston C is constructed of a tube of suitable metal machined for a portion of its length to fit and slide truly in the interior of the cylinder A and recessed at *d* to receive or accommodate packing-rings D. The packing-rings are held in position by a head or cap E, secured to the end of the tubular piston. Internally the piston is bored to two diameters, forming a shoulder *a*, against which a cross-head pin F fits or engages; or instead of a stepped shoulder, such as *a*, the interior of the piston may be chased with one or more screw-threads, with which the ends of the cross-head pin F engage, as shown in Fig. 4. The cross-head pin F is turned on its ends squarely with its axis to correspond with the internal contour of the piston and engage truly therewith and is turned down at *f*, forming a shoulder which abuts against the shoulder *a* in the interior of the piston. Instead of the shoulder *f* on the cross-head pin when the interior of the cylinder is screwed the ends of the cross-head pin are chased or cut with corresponding screw-threads.

The cross-head pin F is bored along its transverse axis with a hole *g* to receive a screwed stud G, and the head or cap E of the piston is bored with a hole corresponding thereto. When the cross-head pin F is placed or brought into position in the interior of the tubular piston C, it is truly central and square with its axis, and consequently the center line of the hole *g* is coincident with the center line or central axis of the piston. The hole *g* is tapped to receive the screwed pin or stud G, which also passes through the hole in the piston-head E and serves to tightly secure the cross-head F to the piston C.

The head or cap E of the piston C is preferably in the form of a disk turned down at one side to fit into the interior of the piston, which insures a good and tight fit, and is secured by screws, pins, or bolts.

The packing-rings D can be placed in position before the head or cap is adjusted, thus obviating the necessity of springing them over the piston, as is generally done.

The piston-rod or connecting-rod H is formed with a boss *h* at one end bored or bushed to exactly fit the cross-head pin F. A slot *h'* is cut in at one side to clear the pin G, passing into the cross-head pin, and to permit of the necessary angular movement of the connecting-rod. A sleeve or washer *g'*, partly encircling the cross-head pin F, may be fitted on the holding-pin G and serve to maintain the connecting-rod in position from lateral movement. The other end of the connecting-rod H is fitted with laterally-projecting pins or cylindrical projections K, truly parallel with the hole in the boss *h*. Each of the projecting pins K of the connecting-rod H engages with a hole placed eccentrically in the face of a crank-disk L. The disks L are also bored centrally and fit upon stationary supporting-pins M, upon which they are free to rotate. The holes for the connecting-rod pins K are perfectly parallel with the central holes and central axes of the crank-disks L, and the distance of these

holes from the center is such as to give or permit of the required movement of the piston C.

The crank-disks L work in a chamber or pocket N in the casing B. They are first placed onto the connecting-rod pins K and lowered into position until opposite two suitably-machined holes in the chamber-walls. Through each of these holes one of the disk-supporting pins M is pushed from the outside and enters the central hole of its corresponding disk. Conveniently the piston, with the connecting-rod attached, would have been previously inserted into the cylinder, and so after the insertion of the supporting-pins into the disks the cylinder is rigidly secured to the crank-chamber and the combined parts are in their correct working position.

The crank-disks L engage at their peripheries with a revolving shaft or shafts P, to which they transmit the available power of the engine. They may for this purpose have teeth formed at their peripheries and both gear with one pinion P′ sufficiently wide, which runs in bearings (parallel with the supporting-pins) firmly held in the walls of the crank-chamber N. The pinion-shaft P passes practically air-tight through the chamber-wall and has a fly-wheel and a pulley or other device for transmitting the power of the engine upon it exteriorly.

Any of the working parts of the engine, such as the valves, may be operated from an eccentric R on the end of a rod S, passing through one of the supporting-pins M and actuated by a clip *s*, attached to the crank-disk L, engaging with a head *s′* on the rod S.

When applied as a motor, the expansive force of gas or the like is applied to the piston, and when applied as a pump the action is reversed and rotary motion is applied to the pinion-shaft P, from which the piston is operated.

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

1. In a motor-engine or pump the combination with a tubular piston of a cross-head pin turned at its ends to correspond with the internal contour of the piston and fit into and engage with the interior and a piston connecting-rod with hollow head which fits onto the cross-head pin and through which it passes substantially as described.

2. In a motor-engine or pump a tubular piston bored to two diameters forming an internal shoulder and a head affixed thereto, in combination with a cross-head pin turned at both ends to fit into the interior and engage with the shoulder therein, a screw-stud passed through the cylinder-head and screwed into the cross-head pin, and a piston connecting-rod with hollow head embracing the cross-head pin substantially as described.

3. In a motor-engine or pump a tubular piston, and cross-head pin turned at its ends to fit the internal contour of the piston and engage with the interior in combination with a piston connecting-rod with hollow head at one end embracing the cross-head pin and two projecting pins at the other end and two cranked disks rotating on fixed studs provided with holes with which the projecting pins engage substantially as described.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

J. E. THORNTON.
J. P. LEA.

Witnesses:
J. OWDEN O'BRIEN,
R. OVENDALE.