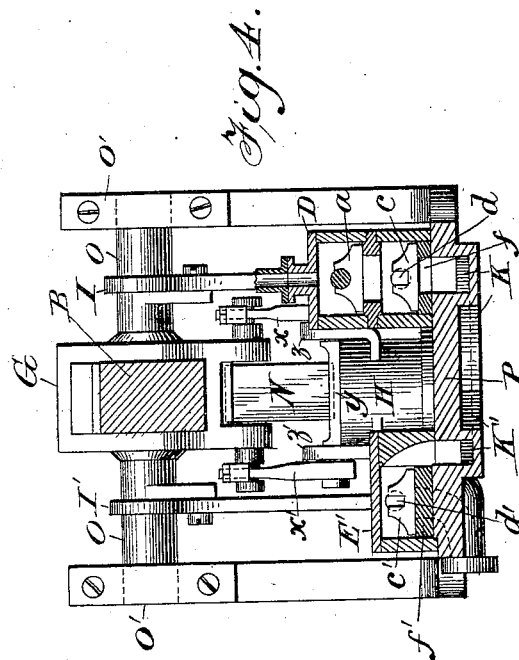
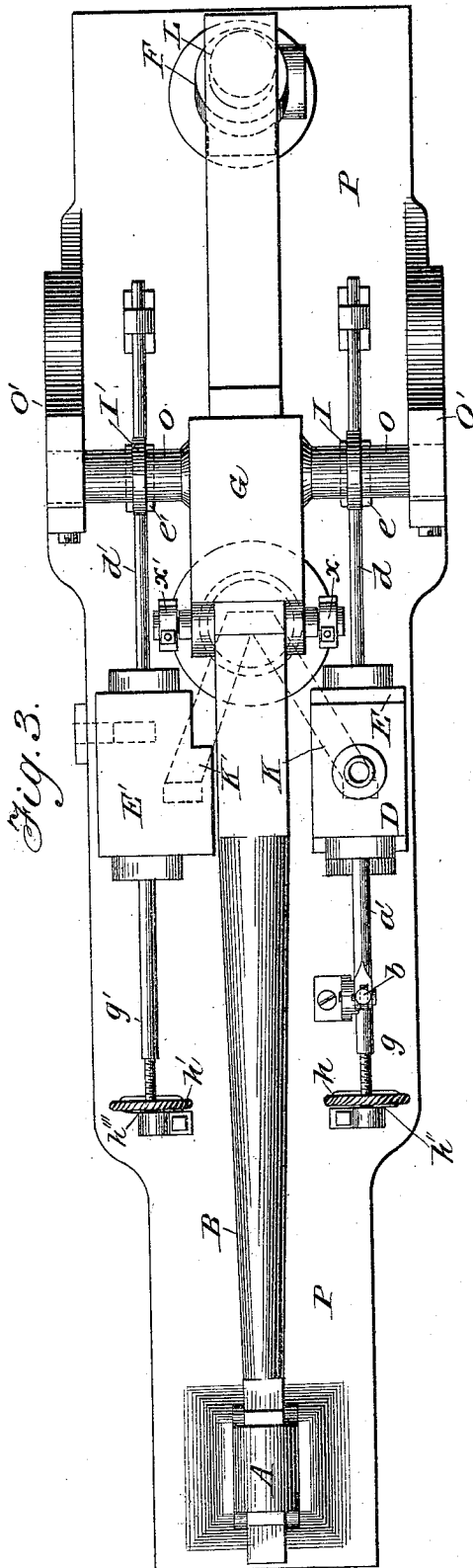


L. KIRK.
MACHINE FOR FORGING IRON.

No. 5,044.

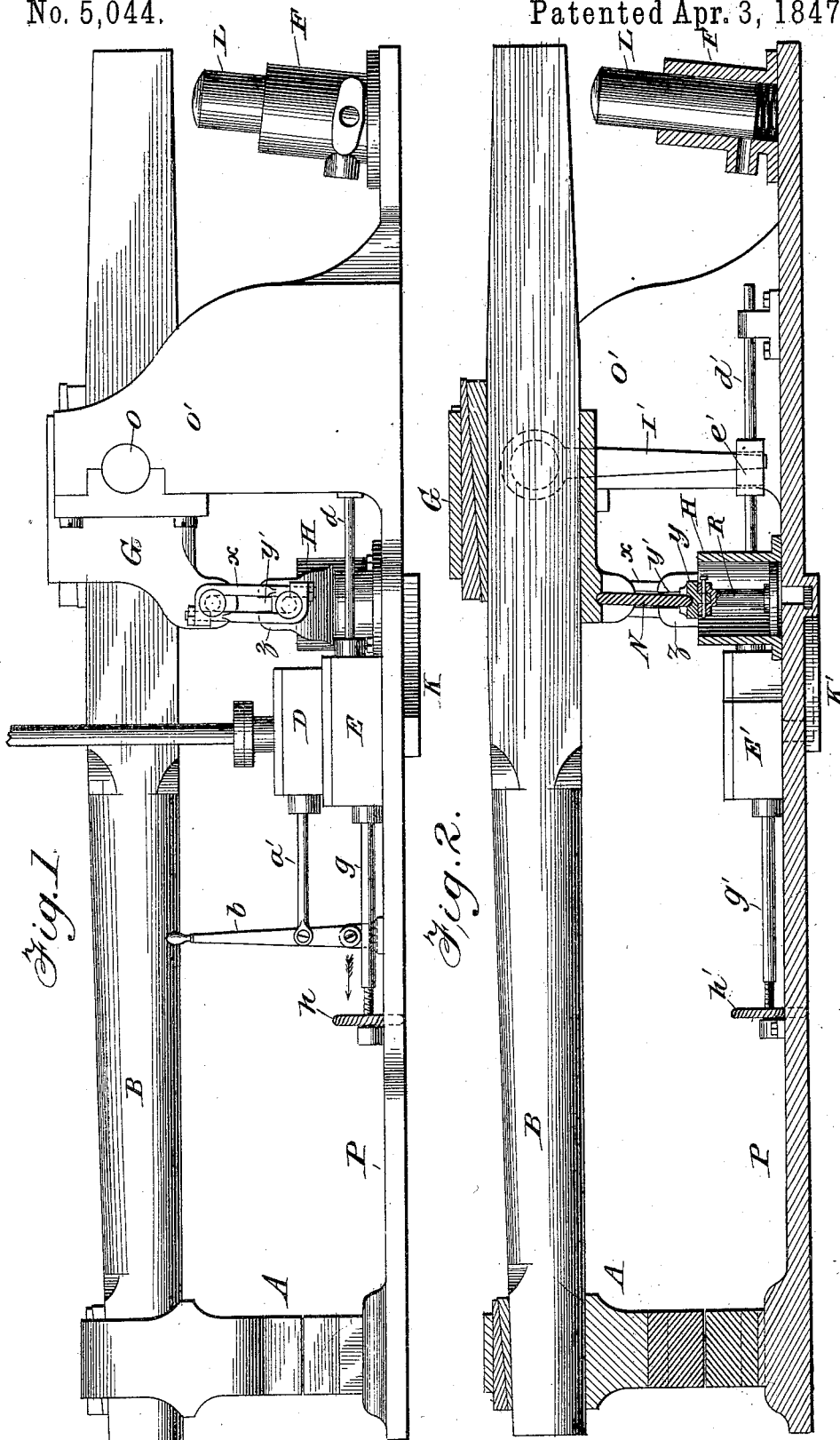
Patented Apr. 3, 1847.



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UNITED STATES PATENT OFFICE.

LEWIS KIRK, OF READING, PENNSYLVANIA.

IMPROVEMENT IN STEAM TRIP-HAMMERS.

Specification forming part of Letters Patent No. 5,044, dated April 3, 1847.

To all whom it may concern:

Be it known that I, LEWIS KIRK, of Reading, in the county of Berks and State of Pennsylvania, have invented a new and useful improvement in the Steam-Hammer for Forges, &c.; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known, and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings making part of this specification, in which—

Figure 1 is a side elevation; Fig. 2, a longitudinal vertical section taken at the line X X of Fig. 3, and representing the steam way and cylinder cut open by a vertical plane; Fig. 3, a plan; Fig. 4, a cross vertical section, taken at the line Y Y of Fig. 1, looking in the direction of the arrow, and Fig. 5 a like section taken at the line Z Z of Fig. 2 and looking in the direction of the arrow.

The same letters indicate like parts in all the figures.

The object of my invention is to apply the direct action of a steam-piston to operate the helve or lever of a hammer; and the nature of my invention consists in so combining a steam-engine with the helve or lever of a hammer and between the hammer and fulcrum that when the steam is let in under the piston it shall lift up the hammer, and when the exhaust-valve is opened the piston will be at liberty to be carried down by the weight of the hammer, the steam and exhaust slide-valves being operated each by a separate arm on the shaft of the helve or lever, and the end of these two arms being so connected with the valve-rods by slots, which permit the arms to move for some distance before they begin to act on the valves, so that the hammer shall nearly reach the end of its downward motion before the steam-valve is opened to admit steam to produce the next upward motion, and so of the exhaust-valve during the upward motion of the hammer, the admission of steam to the steam-valve being governed by a slide-valve that commands a steam-port in a plate immediately above the steam-valve, and operated by hand, by means of which the attendant can start and stop the hammer at any time and at any portion of its motion; and my invention also consists in combining with the

hammer thus operated a slide-plate, with a port in it under the steam-valve, and a like plate under the exhaust-valve, so that the attendant can, by sliding these plates by a screw or lever, cause either the steam or exhaust valves to open or close sooner or later, and thus regulate the length of stroke of the hammer.

In the accompanying drawings, A represents a hammer of the usual construction on the end of a lever or helve B, which passes through a husk or sleeve, G, from the sides of which project trunnions O, that constitute the shaft, with journals on the ends that turn in appropriate boxes in standards O' O' of the bed-plate P, which is securely bolted to the floor-timbers Q.

The helve or lever B extends back sufficiently far beyond the shaft to act on the piston L, that works in a cylinder F, to which steam is admitted by a steam-pipe, S, connected with the steam-chest D, to form a cushion, which will gradually arrest the upward motion of the hammer.

Below the helve or lever B, and between the hammer and shaft, but near to the latter, is placed a vertical steam-cylinder, H, open at both ends, and secured to the bed-plate P by appropriate flanges, and this cylinder is provided with a steam-piston, R, of the usual construction, the rod of which is attached to a cross-head, y, (parallel with the shaft O,) that slides vertically in ways y' y' on each side of the upper end of the cylinder. The upper surface of this cross-head has a semicircular socket, in which rests the semi cylindrical end of a rocker, N, the upper end of which is also semi-cylindrical, and fitted to a semicircular socket in the under side of the husk or sleeve G, so that the hammer helve or lever rests on the cross-head of the steam piston by the interposition of this rocker, which, as the piston moves up and down in a vertical line, will rock to accommodate itself to the segment of a circle described about the axis of motion of the helve by that end of the rocker on which the helve is supported.

The husk or sleeve of the hammer-helve is connected with the cross-head by means of two joint-links, x x, one on each side, which embrace the ends of the cross-head y, that project out beyond the vertical ways y' y', and corresponding ears, z z, on the sides of the husk. These links are made adjustable by

screws in any of the known modes, so as to keep the cross-head and husk, with the rocker, interposed always at the same distance apart, to prevent them from being disconnected or injured by the violent jars to which the whole mechanism is exposed.

The steam valve-chamber E is placed on one side of the steam-cylinder and the exhaust-chamber E' on the other side; and these communicate with the under side of the cylinder by channel-ways K and K', (represented by dotted lines in Fig. 3,) passing through the lower plate or bed of each chamber by an appropriate port in the usual manner of making steam and exhaust ports; and on these plates and under the steam and exhaust valves *c* and *c'* are placed sliding plates or regulating-valves *f* and *f'*, one for each valve, and these plates have each a port for the passage of steam corresponding with the port in the bed, and interposed between the bed and the valves *c* *c'*, which are of the usual construction.

The steam and exhaust-valves *c* and *c'* are operated by arms I and I', that project downward from the shaft O, the ends of the arms working in a slot, *e* and *e'*, in the end of the valve rods *d* and *d'*, and the slots in the rods are of such length that the arms can vibrate for some distance without moving the valves, so that when the hammer descends it nearly reaches the end of the downward movement before the steam-valve begins to open to admit steam for the next upward motion, and so of the exhaust-valve for the upward motion.

It is of great importance that a forge-hammer should be susceptible of having its range of motion in either direction variable, so that the attendant can regulate the force of the blow and so adjust the parts that the valves may be opened by a longer or a shorter range of motion of the hammer, the valves being carried by a motion dependent on the motion of the hammer. This important end is attained by the sliding plates or regulating-valves *f* *f'*, for if these plates are moved in either direction the ports will be kept open for a longer or shorter time, and thus increase or decrease the range of motion of the steam piston and hammer, and therefore these sliding plates have each of them a rod, *g* *g'*, which passes through a stuffing-box in the steam and exhaust chamber with their outer end tapped and passed through a nut *h* and *h'*, which turns in a collar, *h''* and *h'''*, so that by turning either of these nuts the attendant can slide the sliding plates or regulating-valves *f* or *f'* in either direction and cause

either the steam or the exhaust valves, or both, to open and close sooner or later, and thus give a greater range of motion to the piston and hammer at his pleasure. If he moves the slide under the steam-valve in the direction of the arrow as the hammer is descending, the valve will open sooner to admit steam to lift the hammer before it reaches the anvil. If he moves it in the reverse direction, the valve will not close so soon, and hence the hammer will be permitted to descend lower before the fresh supply of steam is admitted, so that in this way the attendant has perfect command of the range of motion of the piston and hammer for it will be obvious that, the exhaust-valve having the same arrangement, the upward motion of the piston and hammer will be regulated in like manner as its downward motion is by the steam valve. Immediately above the steam-valve there is a stop valve, *a*, operated by a hand-lever, *b*, jointed to the valve-rod *a'* and to the bed-plate P, and, as this valve is placed in the steam-chest D, and between the steam pipe S' and the steam-valve *c*, the attendant can at any time regulate the quantity of steam to be admitted or stop the hammer at any time and at any portion of its stroke.

From the foregoing it will be seen that by this arrangement a very great range of motion can be given to a hammer by an engine of very short stroke, and that the motions of the hammer can be controlled, varied in force, or stopped at any time with facility by the attendant. Instead of operating the sliding plates or regulating-valves by screw-nuts, this can be done by levers or other mechanical equivalents.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The arrangement of the vertical single-acting steam-engine, substantially as described, when this is combined with the helve or lever of the hammer by means of the rocker on the cross head and the jointed links, substantially as described.

2. The sliding plates or regulating valves below the steam and exhaust valves, in combination with the engine, combined with the hammer helve or lever, substantially as described, whereby the range of motion of the hammer can be increased or decreased by the attendant at pleasure, as described.

LEWIS KIRK.

Witnesses:

CHS. M. KELLER,
U. P. BROWNE.