2 Sheets—Sheet 1.

R. MORRISON.

VALVE GEARING FOR STEAM HAMMERS.

No. 37,457. Patented Jan. 20, 1863.

Fig 1.

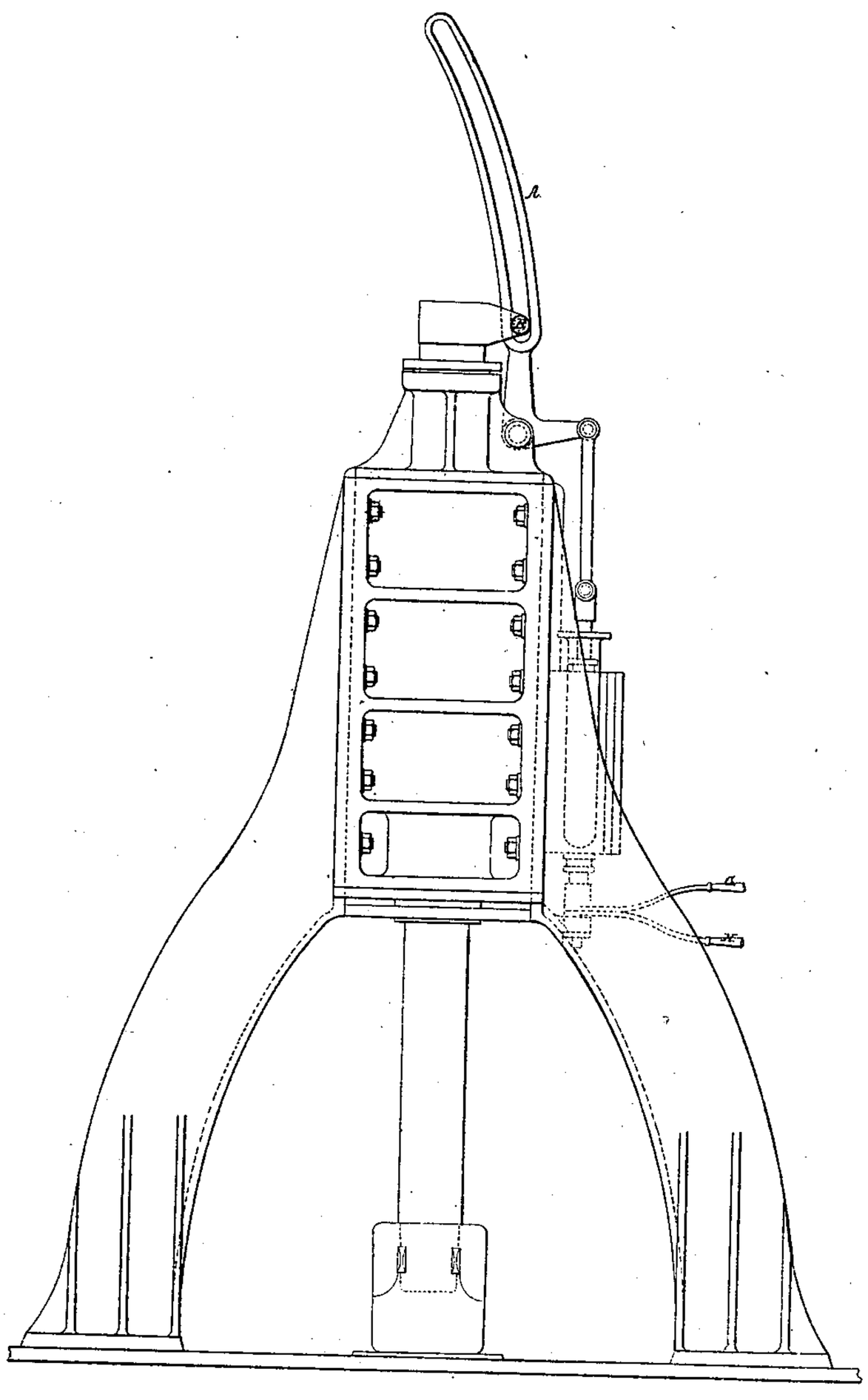
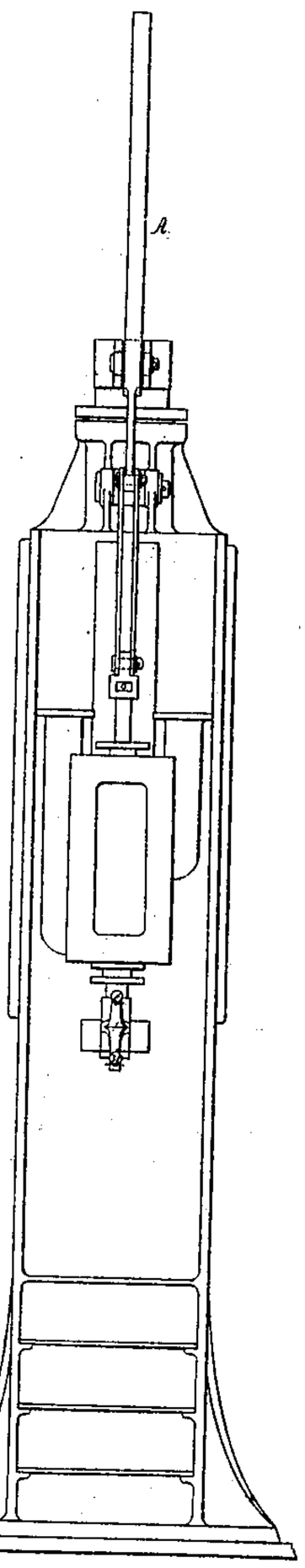


Fig 2.



Witnesses
J. L. Forster
John F. Fleming

Inventor.
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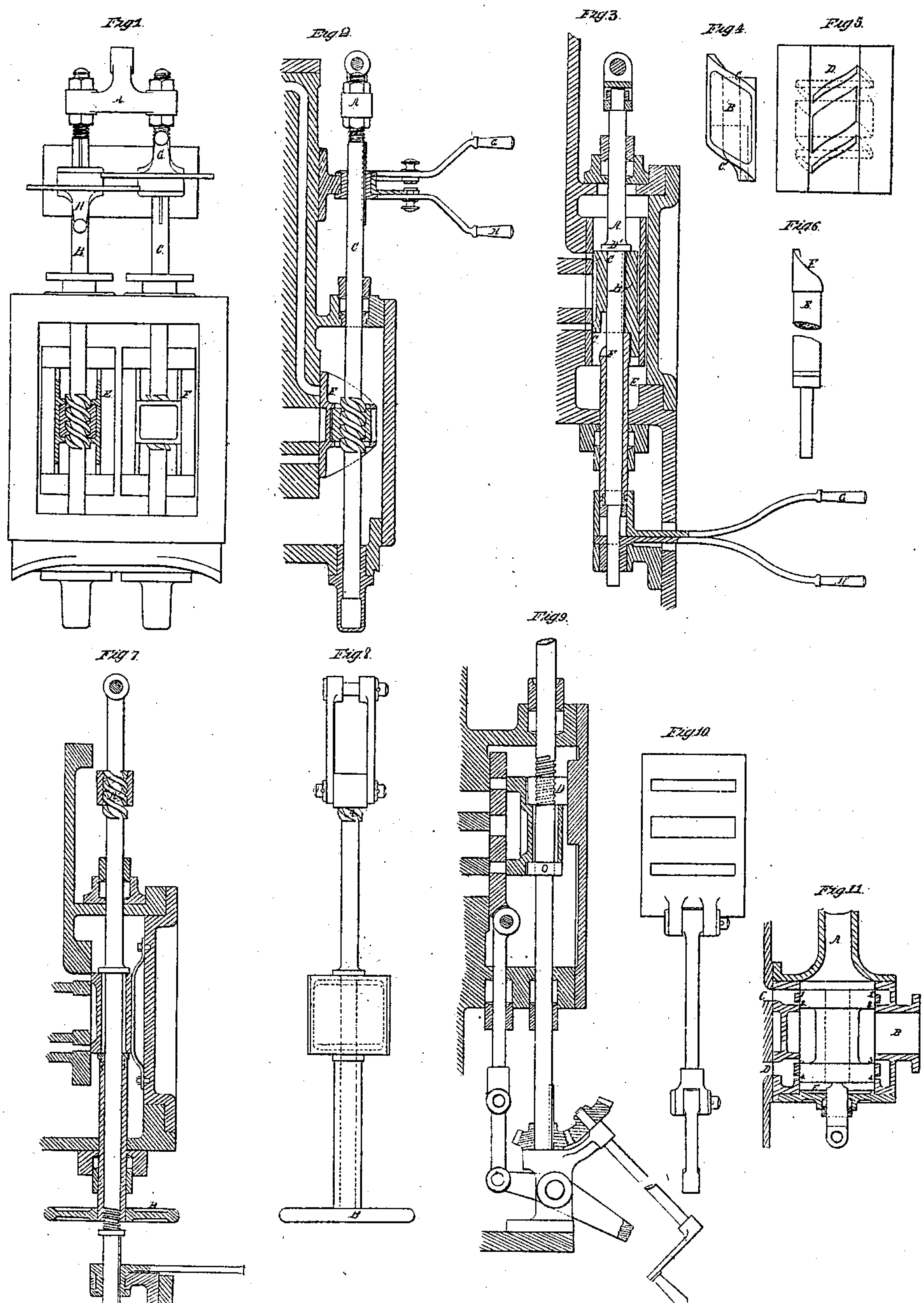
2 Sheets—Sheet 2.

R. MORRISON.

VALVE GEARING FOR STEAM HAMMERS.

No. 37,457. Patented Jan. 20, 1863.



Witnesses:

Inventor:

UNITED STATES PATENT OFFICE.

ROBERT MORRISON, OF NEWCASTLE-UPON-TYNE, ENGLAND.

IMPROVEMENT IN VALVE-GEARING FOR STEAM-HAMMERS.

Specification forming part of Letters Patent No. **37,457,** dated January 20, 1863; patented in England, December 16, 1859.

To all whom it may concern:

Be it known that I, ROBERT MORRISON, of the town and county of Newcastle-upon-Tyne, in the Kingdom of Great Britain, have invented new and useful Improvements in Valve-Gearing for Double-Acting Steam-Hammers, and for which a patent dated 16th of December, 1859, was granted me in the Kingdom of Great Britain; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the figures and letters of reference marked thereon.

My invention consists in the substitution for the present complicated gearing for working double-acting steam-hammers of a spanner or slot-link, so arranged that the valve or valves do not travel the full stroke unless the hammer is working the extreme distance both up and down, while any partial movement of the hammer produces a proportional partial movement of the valve. The respective laps of the top and bottom inlet edges of the valve or valves are so altered or regulated that while in some cases the whole stroke of the valve will not be sufficient to admit steam either above or below the hammer-piston, yet at others the smallest portion of any part of a stroke, whether high or low, will admit steam both above and below the hammer-piston; and this constitutes a characteristic feature of my invention, that by an easy and continuous sliding action the valve is constantly following the motion of the hammer, while the regulation of the lap of the valve or valves admits the steam early or late, or during a longer or shorter period of the stroke, as may be found desirable.

It follows, also, that by the use of the slot-link I can produce a motion uniformly proportional to that of the hammer, but at a greatly-reduced velocity, so that when it is necessary to use less than the full amount of this link-motion the diminished velocity enables me to do so without causing any injury to the valves or detrimental wear to the parts communicating the motion of the link to the valve. It will be seen that by respectively modifying the laps of the top and bottom edges, and altering the relative strokes of the hammer and valves, the steam may be admitted at any desired portion of the stroke, both above and below the hammer-piston, and all the combinations of long and short strokes, heavy or light blows, may be made at will without any part of the valve apparatus being subjected to blows and jerks.

The requisite adjustment of the lap, up or down, as the case may be, is obtained by either using two ordinary valves, and shifting them up and down upon their respective spindles by screws cut on the spindles working in nuts fixed to the valves, or by using two cylindrical valves shifted in the same way, or by fixing two cylindrical or other valves on the same spindle, but jointed in the middle, so that the screw on the top may be turned irrespective of that on the bottom, or by any combination of such slide or valve, or slides or valves, with their spindle or spindles, whereby the motion or adjustment before described may be effected.

I also propose to use cylindrical valves with the edges for the admission and egress of the steam disposed in the form of a spiral or screw on the surface the ports in the cylindrical case being likewise so spirally disposed with a corresponding pitch that the moving of the valve round in its cylindrical case will cause the edges for the inlet and egress of the steam to advance or recede respectively with those parts on the valve-case, and produce the same result as though they were actually lifted and depressed without turning.

In cases where cylindrical valves may not be used I adopt valves with beveled edges, the ports having a corresponding bevel. By moving the valve in this case sidewise the same effect is obtained as by the rotary motion with the cylindrical screw-edged valve.

It will be seen that in all the cases described the same effects can be obtained by moving the slide-faces, the slides and spindles remaining fixed.

In order that my said invention may be fully understood, I will now proceed more fully to describe the same.

On reference to the drawing forming part of this specification, and in which the same letters of reference allude to similar parts throughout the several views, Figure 1 on Sheet 1 represents a front elevation of a steam-hammer with my present improvements fitted thereto. Fig. 2 is a corresponding side view of the same. Figs. 1 and 2 on Sheet 2 represent in detail a modification of my improvements, consisting in the employment of two slide-valves, capable of separate adjustment.

Figs. 3, 4, 5, and 6 show details of the application of a single cylindrical valve to my improvements. Figs. 7 and 8 show details of a single slide-valve applied to my improvements. Figs. 9 and 10 show a mode of applying movable ports to effect the change of the relative positions of the ports and valves. Fig. 11 represents a cylindrical piston equilibrium valve, principally adapted for working the hammer by hand.

A, Sheet 1, is the spanner or slot-link, and B is a roller fixed onto the top of a hammer-bar and working in the slot of the link. This slot-link and roller are so arranged that the lever attached to the slide or slides is up when the hammer is down, although for certain combinations of ports and slides it may be necessary to reverse this.

It will be seen that the curve of the slot-link may be made so that for every inch of motion of the hammer-bar any corresponding amount of motion may be given to the valve that may be required, and the motion may be either regular and uniform or varied—that is to say, it may either be uniformly the same during all parts of the stroke of the hammer-bar, or it may be made to give a more or less amount of motion at different portions of the stroke of the hammer-bar if found desirable. The valve employed in this case is of the cylindrical construction above alluded to, and hereinafter more fully described, G and H being handles for regulating the action of the valve.

Figs. 1 and 2 on Sheet 2 of my drawings represent two views of the application of two slide-valves to my improvements, capable of separate adjustment.

The cross-head A is worked by the slot-link hereinbefore referred to, and moves with it the two slide-spindles B and C, which are so fixed that they may freely turn on their axes. Two slides, E and F, are attached, respectively, to these spindles by means of screws, so arranged that by moving the spindles round the whole or any portion of a revolution the slides may be raised or depressed at will.

E is the valve for admitting steam above, and F the valve for admitting steam below, the piston, and it will be seen that the higher the valve F is screwed the sooner the steam will pass below the piston, and it may even be screwed so far up that the hammer-bar at the very top of its stroke will not have given the valve a sufficient downward motion to shut it off, and will consequently remain suspended, and the same may be said of the valve E. It may be so screwed down as either not to open at all or to open at any part of the stroke of the hammer-bar.

The slide-spindles have keys let in them, so that the handles G and H may give them the requisite rotary motion on their axes.

Figs. 3, 4, 5, and 6 show details of the valve arrangement attached to the hammer, (represented in Sheet 1 of my drawings,) whereby the motion of the hammer-bar is regulated by one cylindrical valve. In this case the steam is always admitted alternately above and below the piston, and the part of the stroke where this change is made depends on the relative height of the covering part of the valve compared with the ports.

The passages and valve are both portions of screws of equal pitches, and it will be seen that, by making the covering part of the valve wider than the openings and turning the valve on its axis, these parts will rise and fall relative to the ports.

A is the slide-rod, fixed to turn in the cross-head hereinbefore referred to. B is the valve, (shown detached at Fig. 4,) with its spiral edges C C. D, Fig. 5, is the cylindrical case for the slide, with the ports likewise spirally disposed and of corresponding pitch to the valve. E is the socket working round the spindle A, the top part F of this socket being part of a screw, as shown at Fig. 6, to fit another part of a screw in the valve, so that by turning this socket the valve can either be jammed fast against the collar D′ or allowed to be loose on the spindle. This allows the valve to remain stationary during a portion of the stroke of the hammer-bar, thereby increasing its stroke by allowing the steam to be acting both above and below during a longer portion of its travel.

G is the handle for turning the socket E and regulating the amount of slack or play of the valve, and H is the handle for turning round the valve and spindle.

Figs. 7 and 8 show details of a mode of working with one valve and regulating its height by means of a screw, A, in the cross-head, while the socket for giving play to the valve is regulated by a hand-wheel, B. C is the handle for raising or lowering the valve.

Figs. 9 and 10 show a mode of effecting the change of the relative positions of the ports and valves by moving the ports or slide-faces by means of a rod and lever, the amount of play in the valve being regulated by turning the rod round in the nut D.

It will be noticed that here the slack or play of the valve is given on the top side of the valve, and in the previous figures on the bottom side. The valve in going down lets the steam onto the top, and in going up onto the bottom side of the piston; consequently, when the nut or socket is on the top side of the valve and play is given, the hammer-bar will have to travel so much higher before it is checked by the steam, and when on the bottom side of the slide the bar will have to descend so much farther.

The same results as above described may be attained by a variety of other combinations, of which these are merely examples.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The use of a slot-link or its equivalent to operate the valves of steam-hammers, for the purpose of maintaining the reciprocating motion of the hammer and valve in the same relative direction during any number of strokes,

if so desired, or, when less than the full motion of the valve is required, causing the parts approaching contact to produce this motion to move at a less velocity than the hammer, substantially as and for the purpose described.

2. Connecting the valve or valves of steam-hammers to the slot-link, as described, or its equivalent, in such a manner that the whole or any portion of the motion due to the link, or its equivalent, may be imparted to the valve or valves, substantially as described, and for the purpose specified.

3. The use of a valve or valves in steam-hammers, so connected with the hammer as to be capable of maintaining with it a continuous movement when the hammer and valve are at full stroke, while at the same time the relative positions of the valves and ports may be varied, substantially as and for the purpose specified.

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