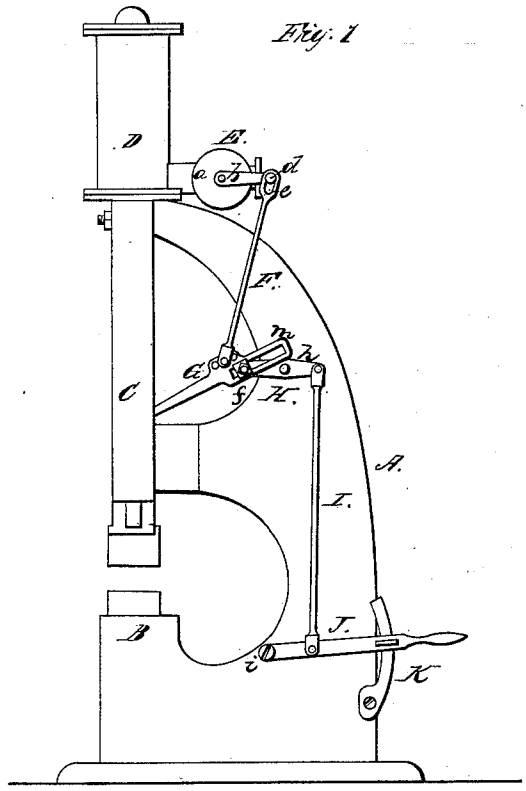
2 Sheets-Sheet 1.

F. B. Miles,

Steam Hammer.

No. 80,082. Patented July 21, 1868.

Fig. 1



Witnesses.

Wm. A. Lee.
John Parker

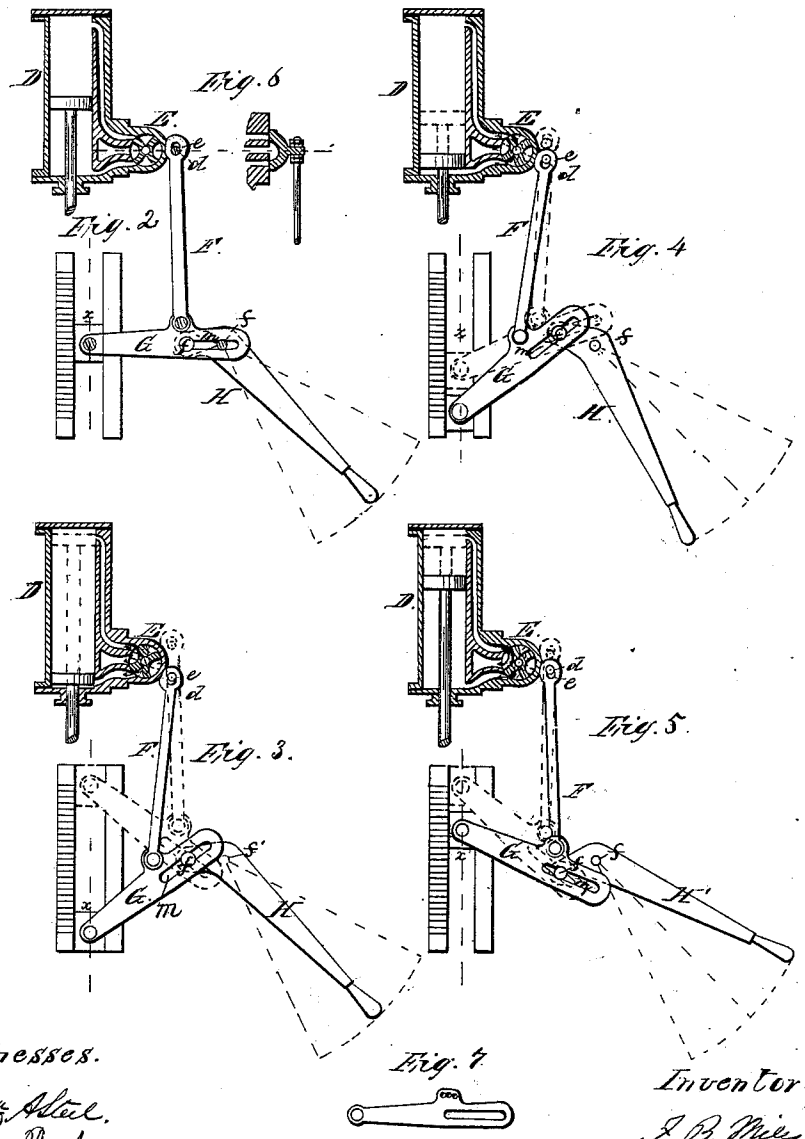
Inventor
F. B. Miles
By his Atty
J. H. Lourie

2 Sheets-Sheet 2.

F. B. Miles,

Steam Hammer,

No. 80,082. Patented July 21, 1868.



Witnesses.

Wm. Steel.
John Daiker

Inventor:

F. B. Miles
By his Atty
W. Howson

United States Patent Office.

FREDERICK B. MILES, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO BEMENT AND DOUGHERTY, OF SAME PLACE.

Letters Patent No. 80,082, *dated July* 21, 1868.

IMPROVEMENT IN VALVE-GEAR FOR STEAM-HAMMERS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, FREDERICK B. MILES, (assignor to Bement and Dougherty,) of Philadelphia, Pennsylvania, have invented an Improved Valve-Motion for Steam-Hammers, Steam-Engines, &c; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to a valve-motion for steam-hammers, in which the steam acts below the piston for raising the ram, and above the piston for forcing it down, an ordinary cylindrical or common slide, or other valve being used; and my invention consists of a lever connected to and operated by the ram or other reciprocating part of the hammer, in combination with an adjustable fulcrum, on which the lever can slide, and by which and the sliding and vibrating-lever, such variable differential movements may be imparted to the valve from the said lever that the valve will be operated quickly at each end of the stroke, and more slowly in the middle of the same, and that the quantity of steam used will be proportionate to the work required, as more fully described hereafter.

In order to enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation, reference being had to the accompanying drawing, which forms a part of this specification, and in which—

Figure 1, drawing No. 1, represents a side view of a steam-hammer with my improved valve-motion.

Figures 2, 3, 4, and 5, drawing No. 2, are diagrams illustrating the operation of the same.

Figure 6, a view showing the mode of using an ordinary slide-valve in connection with the valve-motion; and

Figure 7, a detached view of the main operating-lever.

On reference to drawing No. 1, A represents the frame of the hammer, B the anvil-block, and C guides for the ram; D being the steam-cylinder, and E the chest, containing the valve, which, in the present instance, is the well-known cylindrical vibrating-valve, having a spindle, *a*, projecting through the cover of the chest. As the steam-cylinder, its ports, passages, piston, and piston-rod, attached to the ram, are all similar to those of other steam-hammers, and as they are shown, together with the valve, in the diagrams, figs. 2, 3, 4, and 5, drawing No. 2, a minute description of them will not be necessary.

To the valve-spindle *a*, fig. 1, is secured an arm, *b*, to the pin *d* of which is connected the upper slotted end *e* of the rod F, the lower end of the latter being jointed to a lever, G, the fulcrum of which is a pin, *f*, on a lever H, which is hung by a pin, *h*, to the frame of the hammer. This pin *f* passes through and is secured to a block arranged to slide in a slot, *m*, of the said lever G, the long arm of which is connected to the ram or other reciprocating part of the hammer. The lever H is connected by a rod, I, to a lever, J, hung by a pin, *i*, to the side of the frame, and provided with any suitable appliances by which it can be secured to a quadrant, K, after adjustment.

This lever J and the rod I may be dispensed with, and a lever, H′, shown in figs. 2, 3, 4, and 5, drawing No. 2, substituted for the lever H, fig. 1, the lever H′ being of a bell-crank form, its long arm forming the operating-handle, and its short arm being provided with a pin, *f*, projecting through the slot *m* in the lever G.

The operation of my improved valve-motion will be best observed by reference to the diagrams, figs. 2, 3, 4, and 5, drawing No. 2, in which the sliding block *x* is supposed to represent a part of the ram of the hammer to which the lever G is connected.

In fig. 2, the lever H′ has been adjusted to a position which insures the longest movement of and the heaviest blow from the ram, the steam being supposed to be cut off from the valve-chest, and the operating parts in a quiescent state, and the piston, and consequently the ram, being at half stroke, while the lower steam-port is slightly open. The moment steam is admitted to the valve-chest, the piston and ram will rise until the lever G and its appendages assume the position shown by red color in fig. 3. The valve, however, has been at the same time moved to such a position that steam is admitted to the cylinder above the piston, while there is free egress for the steam below the same; hence, the piston and ram and the moving parts of the

valve-motion have no sooner reached the positions indicated by red color, than the piston and ram are forced downwards to the point indicated by blue color, fig. 3, the lever being brought to the position shown by the same color, and the valve to the position shown in the same figure, the lower steam-port being fully open for the admission of steam to the cylinder below the piston, while the space above the same is open to the exhaust; hence, a blow has no sooner been effectually imparted by the ram than it ascends, to be again forced downwards after reaching the point indicated by red color, and thus a succession of long movements is imparted to the ram, and proportionately heavy blows will be struck by the same; and this will continue as long as the lever H′ is retained in the position indicated in figs. 2 and 3, but if the lever be moved to the point shown in fig. 4, the position of the fulcrum-pin *f*, of the lever G, will be so altered that an entire change will take place, and the movement of the said lever, and its operation on the valve in respect to the movement of the hammer, will be changed.

Thus after the ram has reached the position indicated by blue color, and it begins to rise, the movement imparted by the lever G to the valve will be more rapid than in the case of fig. 3, and the ram will consequently fall after it has reached the position indicated by red red color; hence, as long as the lever H′ remains in the position shown in fig. 4, the ram will make a succession of rapid strokes rising but a short distance above the anvil. When the lever H′ has been adjusted to the position shown in fig. 5, the fulcrum-pin has been again altered with another result.

In this case the ram, after reaching the limit of its upward movement, indicated by red color, will not descend further than the point shown by blue color before it again rises, so that the ram will make a series of short strokes between the points indicated.

It will now be seen that when the lever H′ is adjusted to the position shown in fig. 3, the ram makes a full stroke, while in fig. 4 it makes a short lower stroke, and in fig. 5 a short upper stroke, and it will be evident that by adjusting the lever to positions between those pointed out, a longer or shorter top stroke, or a longer or shorter lower stroke may be obtained as the exigencies of the work to be operated on may demand. This variation of stroke is accomplished by leaving the valve open for a longer or shorter interval in the various positions, and thereby proportioning the quantity of steam used to the work required, which is the principal advantage of this valve-motion.

The movement transmitted by the ram, through the medium of the lever G, to the rod F, and consequently to the valve, depends upon the position of the fulcrum-pin *f*, a very slight alteration of which will insure a change of stroke in the ram, as will be understood by a careful examination of the diagrams, figs. 2, 3, 4, and 5, without a lengthy explanation.

Although I prefer the rotary valve shown in these figures, it will be evident that the results described may be obtained by the use of an ordinary slide-valve, as shown in fig. 6. No matter what description of valve be used, it is important that there should be some lost motion between the lever G and the valve. This is obtained in the present instance by causing the pin *d*, of the valve-arm *b*, to pass through a slot, *e*, in the rod F, fig. 1. The object of this is to permit the valve to complete its movement by its own momentum, after the operating-lever G has been arrested.

By this lost motion the ram is enabled to strike the iron without any cushion steam under the piston to lessen the force of the blow. Although on striking the blow, the lever G is arrested before the lower port is open, the valve-arm *b*, by its momentum, moves downward in the slot *e* in the rod F, and opens the lower port, thereby admitting steam beneath the piston to raise the ram.

In practice, I make three or more holes, fig. 7, in the lever G, into any one of which the pin of the rod F may be adjusted to suit the pressure of steam employed.

It will be evident that a fulcrum, *f*, for the lever G, may be operated through devices other than a lever, H′, although I prefer the latter, or a system of rods and levers, as shown in fig. 1, as being both simple and effective in practice.

It will be evident that the above-described valve-motion may be used in connection with direct-acting steam-engines.

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

The slotted lever G, arranged to slide and vibrate on an adjustable fulcrum, and constructed and operating in connection with the ram of a steam-hammer, or with the piston-rod, or other reciprocating part of a steam-hammer or engine, substantially as and for the purpose set forth.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

F. B. MILES.

Witnesses:

JOHN WHITE,

C. B. PRICE.