

(No Model.)

2 Sheets—Sheet 1.

C. W. WILLARD.

VALVE GEAR FOR STEAM HAMMERS.

No. 380,155.

Patented Mar. 27, 1888.

Fig. 1.

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Albert H. Adams.

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(No Model.)

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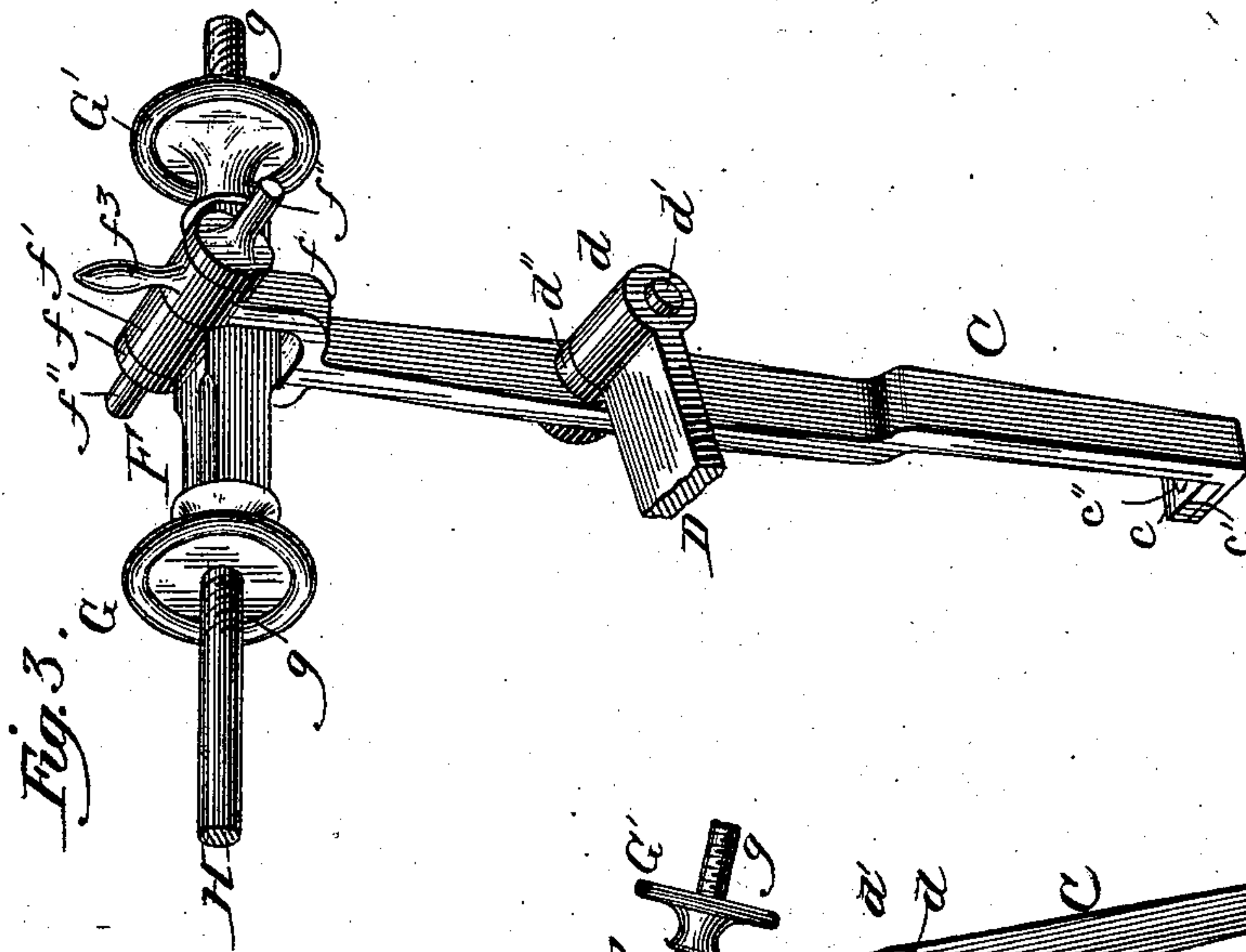


Fig. 4.



Fig. 2.

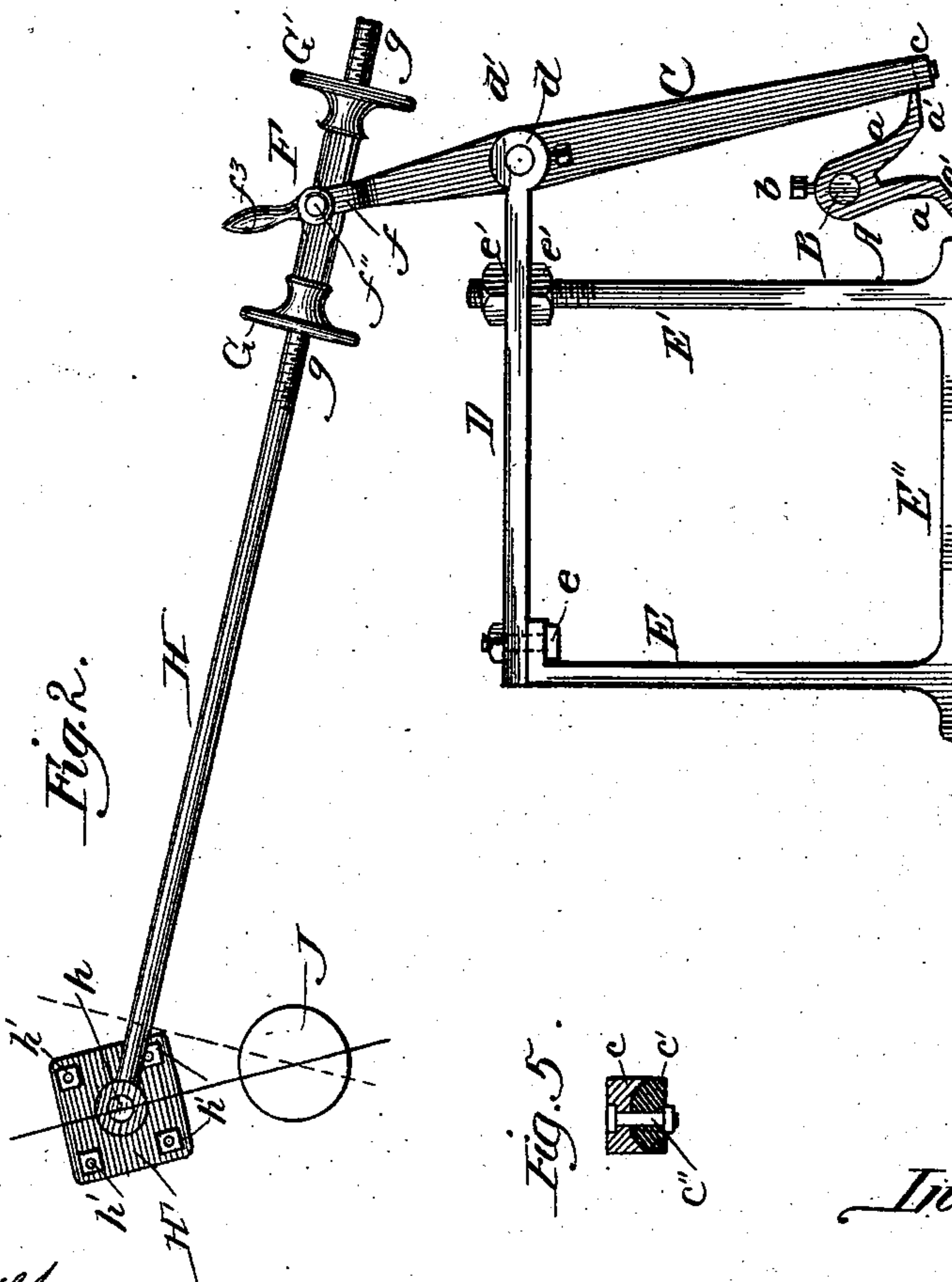
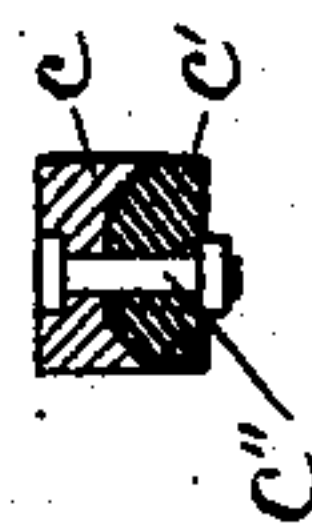


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES W. WILLARD, OF CHICAGO, ILLINOIS.

VALVE-GEAR FOR STEAM-HAMMERS.

SPECIFICATION forming part of Letters Patent No. 380,155, dated March 27, 1888.

Application filed May 10, 1887. Serial No. 237,767. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. WILLARD, residing at Chicago, in the county of Cook and State of Illinois, and a citizen of the United States, have invented a new and useful Improvement in Valve-Gears for Operating Steam-Hammers, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation with the hammer-helve broken out to foreshorten the drawings; Fig. 2, a side elevation of the shifting devices; Fig. 3, a detail in perspective of the shifting devices; Fig. 4, a detail showing the bar which supports the vibrating or oscillating lever; Fig. 5, a detail in section of the acting end of the oscillating lever.

This invention relates to means to be used in connection with a steam-hammer for the purpose of controlling the stroke by shifting the valve through which steam is admitted for the power, and has for its objects to improve the construction and operation of the valve-shifting devices; to improve the location and arrangement of the valve-shifting devices in relation to the movement of the hammer and its helve; to improve the means for adjusting the shifting devices to produce the required blow and give either a long or short stroke, as may be required, without any lost motion and without any injurious results from the concussion, and have the arrangement one that cannot be brought into a position to produce breakage of the devices and cause any damage in case the hammer is left without an attendant, or in case the attendant should neglect his duty, the result being that, so far as shifting the valve is concerned, after the devices are once set the operation will be entirely automatic; and its nature consists in the several parts and combination of parts hereinafter described, and pointed out in the claims as new.

In the drawings, A represents a tappet having two arms, *a*, each of which has a side extension, *a'*, at the end.

B is the stem of a rotary valve or other form of balance-valve located in the steam-chest which supplies steam to the cylinder to actuate the piston by which the hammer is operated. The tappet A is firmly secured to the

projecting end of the valve-stem B by means of a set-screw, *b*, or in any other suitable manner that will allow the tappet to be shifted in its relation to its actuating-lever and when adjusted be locked firmly in position.

C is the actuating-lever, having its acting end provided with a contact for the arms of the tappet, formed by turning the end *c'* of the lever at right angles to the body of the lever and securing thereto, by a rivet, *c''*, or otherwise, a piece of hardened steel, *c*, to form a face that will not wear out quickly; but this contact for the tappet can be formed in some other suitable manner.

D is a bar having at its outer end a socket, *d*, through which and the body of the lever a pivot or bolt, *d'*, is passed for hanging or suspending the lever so that it is free to be vibrated or oscillated, and, as shown, between the end of the socket *d* and the face of the lever C is located an anti-friction washer, *d''*.

E E' E'' are standards and a base-plate, forming a frame or support for the bar D, and, as shown, the inner end of the bar D has a slot through which and the turned end of the standard E a bolt, *e*, is passed. The slot in the end of the support D is for the purpose of enabling the forward end of the standard to be adjusted to bring the lever in proper alignment with the tappet for the contact end of the lever to enter between the arms of the tappet, and, as shown, the upper end of the standard D is screw-threaded, and on this screw-threaded end, on each side of the bar or support D, is located a nut, *e'*, by means of which the forward end of the support can be adjusted vertically for the acting end of the lever C to co-operate properly with the tappet.

F is a sleeve to which the upper end of the lever C is pivoted, the connection, as shown, being made by entering the sleeve between the arms *f* of the forked upper end of the lever and passing a pivot, *f''*, through the ends of the arms and through a socket or bearing, *f'*, on the sleeve F.

G G' are set-screws for adjusting the sleeve F and limiting its movement in either direction, as required, to produce a proper throw for the lever C to actuate the tappet.

H is a rod the outer end of which receives

the sleeve F and the adjusting-nuts G G', the end of the rod having a screw-thread, *g*, for the nuts. The inner end of the rod H is mounted on a pivot, *h*, projecting out from a plate, H', which plate is attached by bolts *h'* to the side face of the pivot-support which carries the hammer-helve.

I is a support for the hammer-helve, between the side walls of which the helve is placed, and is held in position by means of a cap-plate, I', and suitable bolts, *i*, as usual.

J are journals for the support I, a journal being provided for each side of the support, and each journal is mounted in a suitable box or bearing on the end of the uprights or standards J'.

K is the hammer-helve, which may be formed of two parts, as shown, and secured together by suitable straps or in any other suitable manner. This helve at its acting end has a hammer, K', adapted to receive the die or dies K'' to be used therewith.

L is the anvil, adapted to receive a die or dies, L', to correspond with the dies K''.

M is a pitman connected at one end with the hammer-support I, as usual, and at the other end with the piston-head in the steam-cylinder.

N is the steam-cylinder, on one side of which is a steam-chest, N', having therein a balance-valve actuated from the stem B, and having also the usual ports for the passage of the steam to operate the piston-head to work the hammer through the pitman M and support I.

O is the supply-pipe for the steam entering the steam-chest N'.

P is the exhaust-pipe.

The pivot *h* for the rod H is located above and at one side of the center of motion of the support I, as will be seen from Figs. 1 and 2, and this location of the pivot *h* gives to the rod H an easy motion, and one which is parallel, or approximately so, with the motion of the hammer-helve, and this manner of locating the pivot of the rod H in proximity to the center of motion of the hammer brings the support of the rod in such relation to the movement of the hammer that but little, if any, effect of the concussion of the blow will be transmitted to the rod, thus leaving the rod, in effect, non-susceptible to the jar of the concussion of the hammer-blow, and as this rod operates by its reciprocation the lever C it will be seen that the concussion from the hammer cannot be transmitted to the lever to produce ill effects or to shift the valve before the required time. There reciprocating rod, threaded at the end, in connection with the adjustable nuts, one on each side of the sleeve F, enables an easy and quick adjustment to be had for any length of stroke and weight of blow desired. The oscillating or vibrating lever C, suspended from the adjustable bar D, enables the acting end of the lever to be adjusted in position to enter the opening between the arms *a* as required for the end of the lever to pass

the ends of the arms on either side to prevent injurious effects from the continued movement of the lever after the tappet A has been acted upon to shift the valve, and this continuation of the movement of the lever is allowed by curving the ends *a* to correspond with the radius described by the end of the lever, and these curved ends are of a length in excess of the whole length of travel of the lower end of the lever, so that the lever cannot travel to a point beyond its contact with the curved ends *a'*. This construction furnishes a support for the tappet A, by which it cannot drop back and shift the valve until the lever has completed its movement and returned to strike the other arm *a*, the result being that the lever C and tappet A not only furnish the means of shifting the valve, but also the means for holding the valve after being shifted. The nuts G G' are set down for a short stroke, and for a long stroke the nuts are run out correspondingly, and when the nuts are adjusted for a long stroke, and it is desired to shift the valve and operate the hammer before the full stroke has been made, the operator can do so by taking hold of the handle *f'* on one of the arms *f* of the fork at the end of the lever, and thereby swing the lever and cause its acting end to operate the tappet A.

The operation is as follows: The steam passes through the pipe O from the source of supply, enters the steam-chest N', and passes to the cylinder N, above or below the piston, to operate the pitman M and work the hammer. As shown in Fig. 1, the hammer has made its downward stroke and the parts are in the position to raise the helve, and as the steam acts and raises the support I the plate H' is carried around on a circle the center of which is the center of motion of the journals J, and this circular motion of the plate I draws the rod H back, such movement being permitted by the pivotal connection of the rod H to the pin or pivot *h*, and this backward movement of the rod H carries with it the upper end of the lever C through its connection with the sleeve F, moving the lower end of the lever in the opposite direction to engage with the arm *a* on the opposite side and move the tappet A in the opposite direction, as shown in Fig. 2, to shift the valve, and on the descent of the hammer the rod H is advanced by the movement of the plate H' to bring the lower end of the lever into the position shown in Fig. 1, and these movements of the rod H and lever C to change the position of the tappet A and shift the valve will occur with each rise and fall of the hammer, and when the blow is to be increased the nuts G G' are changed accordingly to allow of the proper movement of the lever C to shift the valve, and this adjustment of blow and length of movement is had without any lost motion in the several parts.

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

1. The rod H, approximately parallel with

the hammer-helve K and connected at one end with the frame or support of the hammer-helve at a point within a vertical line passing through the journal of the hammer-helve and at the other end with a valve-shifting lever, substantially as shown and described.

2. The rod H, approximately parallel with the hammer-helve K and connected at one end with the frame or support of the hammer-helve at a point within a vertical line passing through the journal of the hammer-helve and at the other end with a lever, C, in combination with a tappet, A, connected with a balanced valve for shifting the valve, substantially as specified.

3. The rod H, approximately parallel with the hammer-helve K and connected at one end with the frame or support of the hammer-helve at a point within a vertical line passing through the journal of the hammer-helve, and the nuts G G', in combination with the lever C and sleeve F, for actuating the shifting devices of a balance-valve of a power-hammer, substantially as shown and described.

4. The tappet A, having the arms *a*, in combination with the lever C and operating-rod

H, connected with the frame or support of a hammer-helve for shifting the valve in a steam-power hammer, substantially as described.

5. The lever C, adjustable rod D, and a support for the bar, in combination with the tappet A, having the arms *a*, for properly entering the end of the lever between the arms *a*, substantially as specified.

6. The tappet A, having arms *a*, with turned ends *a'*, in combination with an oscillating lever, C, and rod H, operated from a point near the center of motion of a hammer-helve for shifting the balance-valve of a steam-hammer, substantially as described.

7. The tappet A, valve-stem B, lever C, and bar D, in combination with the sleeve F, adjusting-nuts G G', rod H, pivot *h*, and support I, having the journals J, for operating the valve in a steam-power hammer, substantially as described.

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Witnesses:

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