H. C. Gladding,

Drop Hammer.

No. 45,792. Patented Jan. 3, 1865.

Fig. 8.

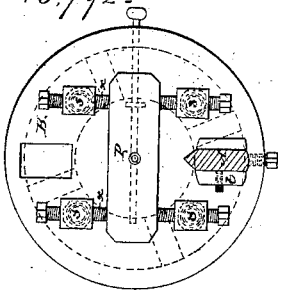


Fig. 6.

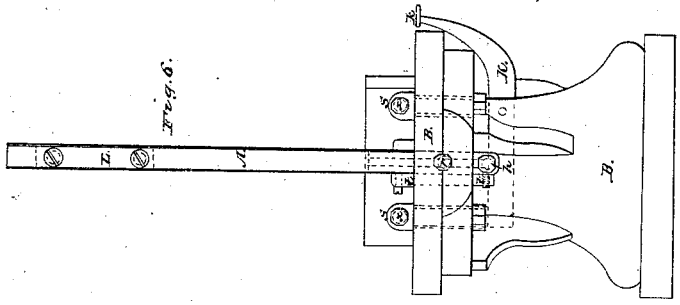


Fig. 7.

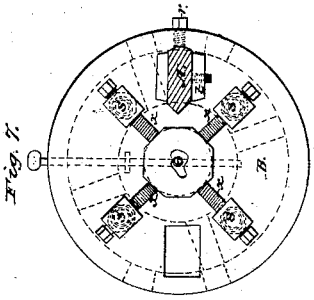


Fig. 5.

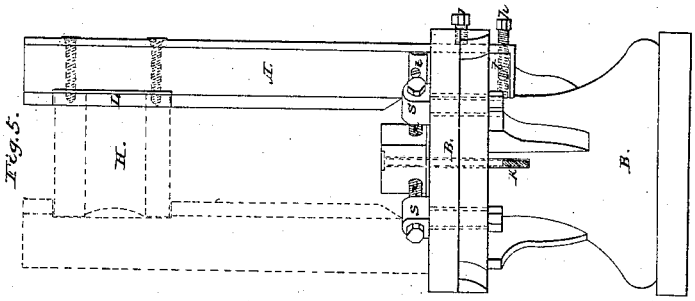


Fig. 2.

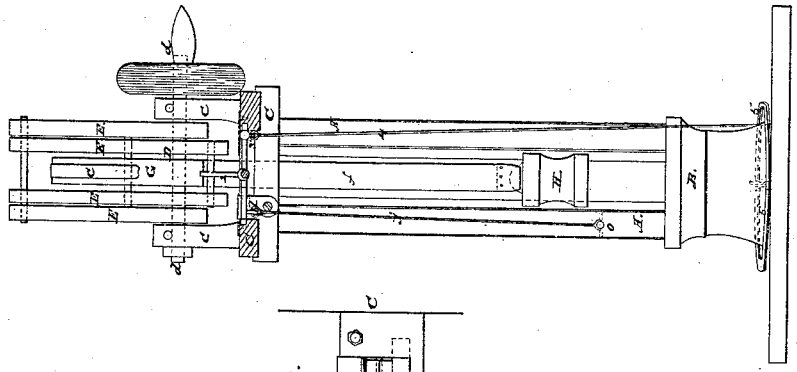


Fig. 3.

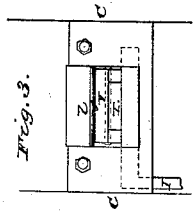
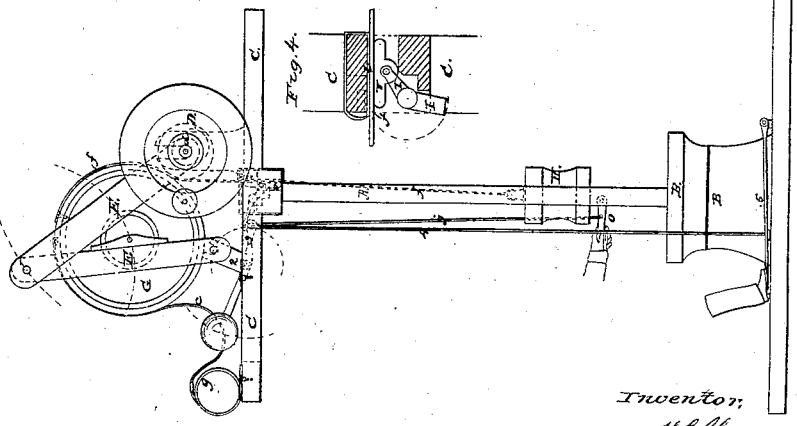


Fig. 4.

Fig. 1.



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UNITED STATES PATENT OFFICE.

HENRY C. GLADDING, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO HIMSELF, W. COLEMAN & SONS, AND JOSEPH RALPH.

IMPROVEMENT IN DROP-PRESSES.

Specification forming part of Letters Patent No. **45,792**, dated January 3, 1865; antedated June 20, 1863.

To all whom it may concern:

Be it known that I, HENRY C. GLADDING, of Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Drop-Presses for Forging Metals, &c.; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a side elevation of my improved drop-press. Fig. 2 is a front elevation of the same. Figs. 3 and 4 are details, which are fully explained in the description. Fig. 5 is a front elevation of the anvil B and a portion of the guides. Fig. 6 is a side elevation of the same. Figs. 7 and 8 are plans of the same, which are fully explained in the description.

Similar letters of reference denote corresponding parts in all the figures.

My invention consists, first, in the method of elevating the hammer by means of a lifting-strap, which is pinched more or less forcibly between two revolving surfaces, to one or both of which power is applied, the pinching force being controlled by a foot-lever or other convenient device, so that the force of the successive blows and every movement of the hammer may with care be completely controlled by the operator; second, in the method of maintaining the necessary tension of the lifting-strap by winding the said strap upon the circumference of a pulley which exceeds the length of the strap, and which derives its motion from friction with the revolving surface to which the power is applied in the act of elevating the hammer, or from any other source which will impart the necessary motion at the proper time; third, in combination with a suitable device for elevating the hammer to any desired height, at will, the use of a spring force acting with a swiftness exceeding, say, five times that of the rebound of the hammer, which serves to keep the strap taut during the rebound of the hammer, so that the hammer may be caught by seizing the strap, and the rebounding or second blow arrested; fourth, in the use of a brake or stop having a nipping or binding action upon the lifting-strap, and so arranged that with a hand-lever or other convenient device the ascent or descent of the hammer may be arrested at any point, or made to descend more or less swiftly or forcibly, or remain suspended, at the will of the operator; fifth, in the method of securing the guides to the anvil, so that their position and connection will not be affected by the concussion produced by the blows of the hammer; sixth, in the peculiar construction and arrangement of the guides to facilitate the removal and replacement of the hammer without disturbing the position of the guides; seventh, in the peculiar construction and arrangement of the hubs which hold the die upon the anvil, to provide for the reception of a long die or dies of various shapes; eighth, in combination with the anvil and die of a drop-press, a vertically-sliding punch, operated by a percussion-lever, for forcing the metal shape from the die.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same.

In the drawings, B is the anvil, of cast-iron, from which ascend the guides A A, which are secured at the top to the frame C. Upon this frame are formed suitable bearings for the driving-shaft *d*, and upon this shaft is a flanged pulley, D. In line with the pulley D, I arrange another pulley, G, having bearings upon each side in a swinging frame, E. The lifting-strap *f* passes between the faces of the two pulleys, and is attached to the hammer H at one end and to the face of the pulley G at the other end, the circumference of said pulley exceeding the length of the strap some six inches or more. The hammer H slides vertically between the guides A A, it being lifted by power and dropping by its own weight. The force of its blow is therefore due to the distance which it falls. It is consequently of great importance that the hammer be so completely under the control of the workman that it may be handled with all the facility of an ordinary hand-hammer, as well in striking a light or heavy blow as in striking the blow at the right time, or arresting a blow, if necessary. The hammer is elevated by swinging the strap upon the pulley G against the face of the revolving pulley D, by which

motion is communicated to the pulley G, and the strap winding thereupon elevates the hammer. The swinging frame E is moved to effect this purpose by means of the rocking arms 2 and 3 upon a horizontal shaft, the rods 4 and the treadle 5, the latter being depressed by the foot of the workman more or less forcibly, according to the degree of force required in the blow, for it will be seen that according to the degree of force and its continuance exerted upon the treadle 5 the lifting-strap will be pressed with greater or less force against the revolving pulley, and the hammer be elevated more or less and strike a heavier or lighter blow. The lifting-strap winds upon the face of the pulley G, in consequence of which the tension of the strap is made equal throughout its whole length by reason of its being wound thereon while subjected to the weight of the hammer, the result being that the hammer falls without restraint, and its fall may be arrested with more certainty and ease than is possible when the strap is slack. When the hammer in its descent meets the die *m*, it rebounds and would strike a second blow if it be not arrested on the rebound, and as the rebound generally displaces the piece of metal in the die, the second blow, if struck, would spoil the piece. It is of importance, therefore, that the hammer be caught on the rebound and the second blow prevented. This is accomplished by seizing the strap by means of a device which will be presently described, to facilitate the operations of which it is necessary to keep a certain tension upon the lifting-strap *f*, which with the rebound is slackened, and must necessarily remain so until power is again applied in the act of elevating the hammer. For this purpose I arrange a spring, *g*, which is connected by a strap, C, to the face of the pulley G, and has sufficient force to take up the slack in the belt at the rebound of the hammer, so that when the belt is seized, as hereinafter described, the hammer will be held suspended nearly to the height of its rebound; and it will be seen by reference to Fig. 1 that the spring *g* and its strap C in no way interfere with the working of the hammer, or practically deprive it of any of its descending force, both remaining slack, except at the end of the descending stroke of the hammer, when it has accumulated its utmost falling force.

The force exerted by the spring *g* for the specified purpose forms another feature of improvement in my invention.

To arrest the descent of the hammer at any point and to hold it suspended for the time, or ease its descent upon the die, I use a brake or stop, which is represented in detail in Figs. 3 and 4, and consists of a shoe, V, attached to the short arm of the lever I, the long arm of which is connected by the rod *j* to the hand-lever *o*. By bearing down this lever with the hand, as shown in Fig. 1, the shoe V is pressed tightly against the lifting-strap with sufficient force to arrest the movement of the hammer, the said strap being gripped between the flat face of the said shoe and a surface of leather, *l*, or other suitable material, properly arranged upon the opposite side of the said strap for the purpose. This brake, with but little effort on the part of the workman, acts so forcibly, and as the arresting force is exerted upon the strap instead of upon the hammer, as formerly practiced, the descent of the hammer may be instantly arrested at any desired point and without any shock to either the machine or the workman. This brake or stop, in combination with the lifting-strap of a drop-hammer, and operating as described, constitutes another feature of improvement in my invention. The concussion produced by successive blows of the hammer has the effect in a short time to break the bolts which secure and adjust the guides to the face of the anvil in machines of ordinary construction. To obviate this I secure the guides A A to the anvil, as shown in Figs. 5 and 6, by forming two apertures in the face of the anvil opposite each other and equally distant from the center of the same, for the reception of the two lower ends of the guides, and of a sufficient width to insert a gib, *t*, upon one side of the end of the guide, as shown in Fig. 6, both fitting loosely in the aperture. In each end of the gib I insert a set-screw, which I set up against the face of the guide sufficiently tight to prevent any actual motion in the aperture without binding, which fixes the guide in position in one direction. I also insert a set-screw, *r*, in the periphery of the anvil, with its point bearing against the guide, and another set-screw, *h*, in the lower end of the guide and parallel with the screw *r*, with its point bearing against the body of the anvil. By means of the first, *r*, I move the end of the guide toward the center of the anvil, and by means of the last, *h*, I move the end of the guide from the center of the anvil, in bringing them into line with each other and perpendicularly with the face of the anvil. When secured to the anvil in this manner, the concussion produced by the falling hammer expends itself upon the anvil, and is not transmitted to the guides, as it would be if the connection were firm and positive. This method of securing the guides to the anvil, therefore, forms another feature of improvement in my invention. In removing the hammer from its position between the guides, which is often desirable, it has heretofore been necessary to disconnect one of the guides from the anvil, which, from being exceedingly inconvenient, it is desirable to avoid. To this end I construct one of the guides with a movable piece at L, Figs. 5 and 6, at a suitable distance above the anvil to avoid the possibility of its causing the descending hammer to deviate from its direct course, which piece I secure to the guide by screws, as shown. This movable piece is re-

moved to release the hammer from the V-slides, and is replaced after the hammer is placed therein. This construction and arrangement form another feature of improvement in my invention.

It is sometimes desirable to use long dies and dies of various shapes, which cannot be held with sufficient firmness and adjusted with sufficient nicety by screws in hubs arranged in the ordinary way, as represented in Fig. 7. To provide for the holding and adjustment of dies of this description upon the avil, I construct the hubs *s s s s* with tapering shanks, and secure the same in the anvil by a nut beneath, and when I wish to confine a long die upon the anvil I lower the nuts beneath and arrange the hubs as represented in Fig. 8 by turning the hubs so that the points of the set-screws *x x x x*, will bear against the long sides of the die P. By turning the hubs I am also enabled to direct the screws *x* at any angle to confine dies of irregular shapes. This construction and arrangement of the hubs *s s* form another feature of improvement in my invention.

To remove the piece of metal from the die, wherein, on account of its form, it is liable to remain fast, I provide a rod or punch sliding freely in a hole drilled in the center of the anvil, and another punch sliding freely in a hole formed for it in the die, as shown in Figs. 5, 6, 7, and 8, the punch in the die being smaller in diameter and resting upon the top of the punch in the anvil, and by means of a blow struck upon the end *k* of the lever K, upon the opposite end of which the latter punch rests, I force the metal shape upward and out of the die. This construction and arrangement of the sliding punches and percussion-lever K, in combination with the anvil and die of a drop-press form another feature of improvement in my invention.

In the foregoing description but one arrangement of the two revolving surfaces which elevate the hammer by means of a lifting-strap passing between the said surfaces is mentioned; but as this device is susceptible of various modifications, I wish it so understood. For instance, the lifting-strap may pass between two revolving pulleys of equal diameter, with power applied to either or both, in which case the pulley G, which winds up the end of the belt, may be arranged above, to operate as above described; and instead of the spring *g*, I can use a spiral spring suspended above the machine to take up the slackness of the belt, the result in each case being the same. I therefore wish it understood that I do not confine myself to the particular arrangement of the revolving surfaces and the device for taking up the slackness in the strap as herein described; but I claim all merely formal variations thereof which produce the same mode of operations by equivalent means, substantially as herein described.

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

1. The combination and arrangement, as set forth, of the friction-pulley D and the winding-pulley G with the strap of a drop-hammer, substantially as herein described, for the purpose specified.

2. In combination with a suitable device for elevating a drop or hammer to any desired height at will, a spring force, suitably arranged, acting with sufficient swiftness to take up any slackness in the lifting-strap occasioned by the rebound of the hammer, substantially as herein shown and described, for the purpose specified.

3. In combination with the lifting-strap of a drop hammer, a brake or stop having a nipping or binding action conveniently arranged with a hand-lever or other suitable device, and operating substantially as herein shown and described, for the purpose specified.

4. The peculiar manner herein shown and described, of securing the guides to the anvil to effect the purpose set forth.

5. Constructing one of the guides with a movable piece, substantially as herein shown and described, for the purpose specified.

6. The peculiar construction and arrangement herein shown and described of the hubs or heads *s s s s*, to effect the purpose set forth.

7. In combination with the anvil and die of a drop-press, the sliding punches and percussion-lever K, arranged and operating substantially as herein shown and described, for the purpose specified.

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