STILES & MILLER.

Drop Press.

No. 71,080. Patented Nov. 19, 1867.

Fig. 1.

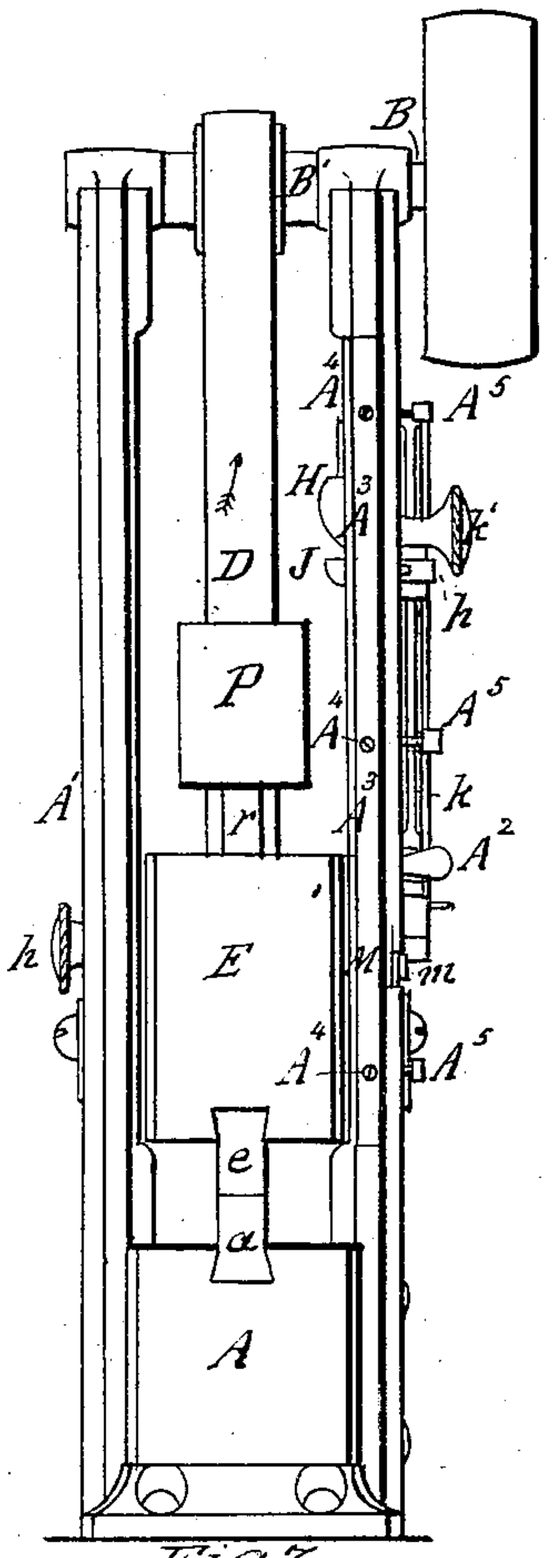


Fig. 7.

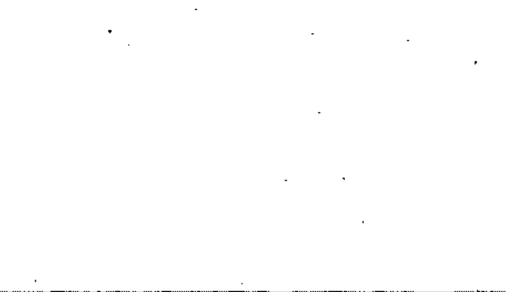


Fig. 8.

Fig. 2.

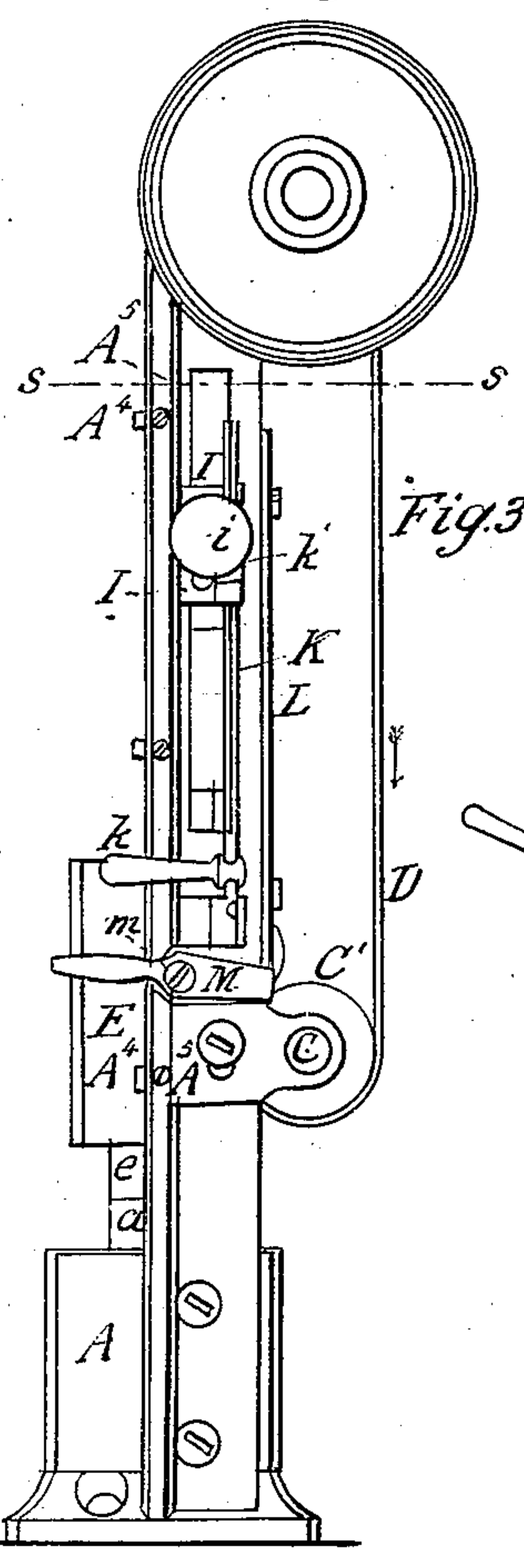


Fig. 4.

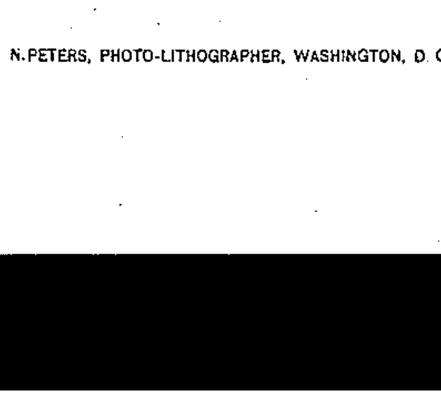


Fig. 3a.

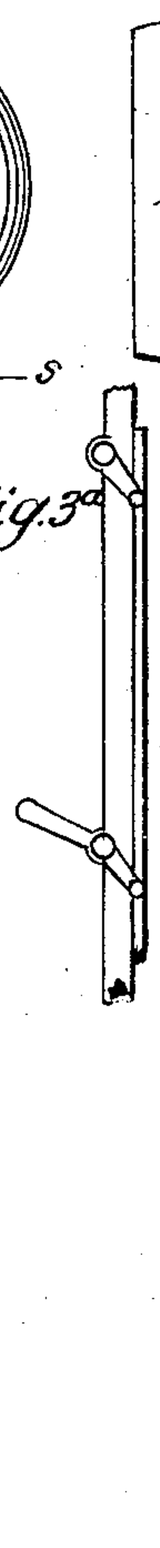


Fig. 3.

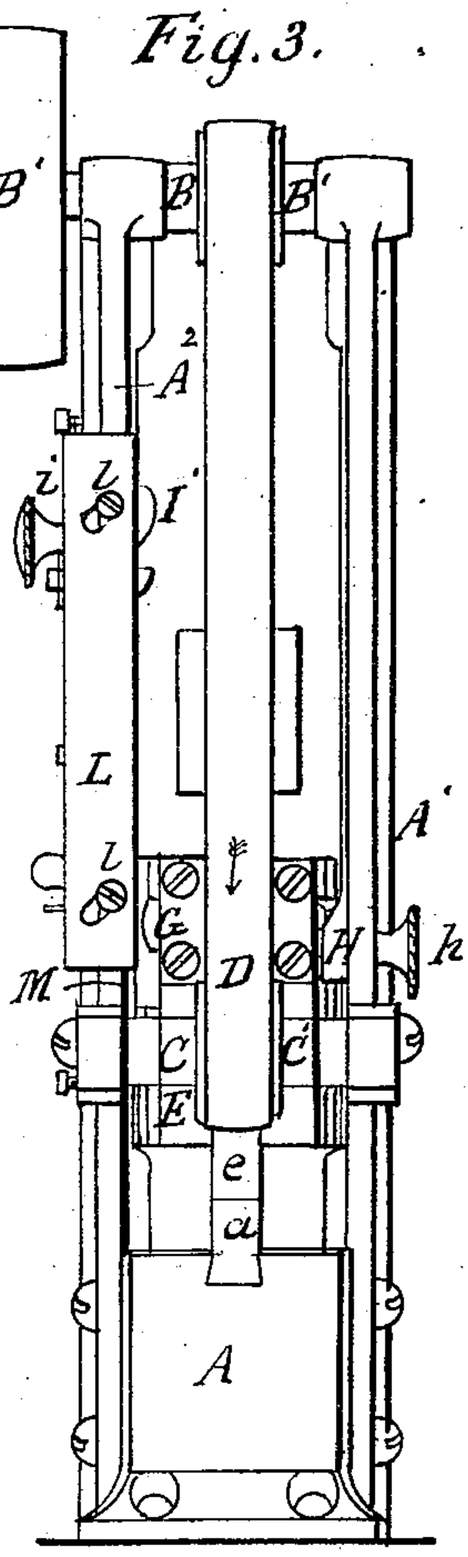
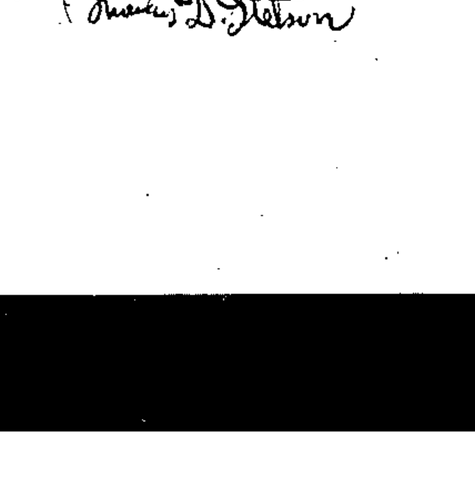


Fig. 5.

Fig. 6.



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Letters Patent No. 71,080, *dated November* 19, 1867.

IMPROVEMENT IN DROP-PRESSES.

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

TO ALL WHOM IT MAY CONCERN:

Be it known that we, NORMAN C. STILES, of Meriden, in the county of New Haven, in the State of Connecticut, and JOHN S. MILLER, of Springfield, in the county of Hampden, in the State of Massachusetts, have invented certain new and useful Improvements in Drop-Presses and analogous machines; and we do hereby declare that the following is a full and exact description thereof.

Our invention relates to the means of lifting the drop or hammer, and to the parts which seize, liberate, and guide the same. Our invention enables the stroke to be graduated with great facility and nicety, and allows the drop to be lifted to any level, where its motion may be arrested, either at the will of the operator or by an automatic movement. It also provides for constructing and adjusting the guiding slides with greater facility and perfection than the ordinary machines.

We will first proceed to describe what we consider the best means of carrying out our invention, and will afterwards designate the points which we believe to be new. The accompanying drawings form a part of this specification.

Figure 1 is a front view,

Figure 2 a side view, and

Figure 3 a rear view of the entire machine.

Figure 3ª represents a modification of the means of temporarily dropping.

Figure 4 is a horizontal section on the line S S in fig. 2.

Figure 5 is a section of the hammer on line T T in fig. 6.

Figure 6 is a vertical section on line U U, fig. 5; and

Figures 7 and 8 represent sections, showing the connection of the uprights to the bed of the machine.

Similar letters of reference indicate like parts in all the figures.

Tints are employed merely to aid in distinguishing parts, and do not indicate the material. The material of all the rigid parts may be iron or steel.

A is a massive block, of cast iron, or other suitable material adapted to withstand the concussion, and *a* is the lower die, which may be secured therein by any of the ordinary means, to allow of easy changing at will. A^1 and A^2 are stout uprights, which may be either cast on the block A, or may be bolted or otherwise secured firmly thereto, and form the upright portion of the framing of the machine. B is the driving-shaft, which is rotated by a steam engine, or other motor, and is supported in bearings on the uprights A^1 A^2, as represented. B′ is a pulley fixed thereon in the position represented. C is a shaft mounted in bearings on the uprights A^1 A^2, in the position represented. We prefer to form those bearings in lugs cast on the uprights, but they may be made adjustable, if desired, by screws or other means, as represented. D is a stout belt, of leather or other flexible material, made as uniform in thickness as possible. This belt is carried by the pulley B′, and necessarily imparts a corresponding rotary motion to the corresponding pulley C′ fixed on the shaft C below.

E is a hammer, of cast iron or other material, and *e* is a die fixed therein, so as to allow of removal and changing by any of the ordinary means. The hammer E is guided by sliding between the parts A^1 and A^2. It is lifted by being united temporarily to the belt, as will be described further on, and falls by gravity. Its fall may be accelerated by a spring, or any analogous device, if desired. The construction and arrangement of the slides, and of the corresponding wings on the hammer E, are peculiar. The upright A^1 contains a groove, of an angular section, the back side of which groove is square, and the front side is bevelled at an angle of forty-five degrees with the back. A similar groove exists in the upright A^2, but while the front and back faces of the groove in the upright A^1 are both planed, or otherwise produced in a single casting A^1, only the back face is thus formed in the upright A^2. The front face is formed upon a separate piece of metal, indicated by A^3, which is held by screw-bolts A^4, and adjusted by set-screws A^5, so as to be further from or nearer to the upright A^1, as is required to form a proper contact with the corresponding wing on the hammer. The holes through which the bolts A^4 pass are sufficiently larger than the bolts A^4 to allow the piece A^3 to be moved and adjusted as far as may be necessary to allow for wear and imperfect fitting. The wings E^1 E^2, on the hammer E, are made with an angular section corresponding to the grooves described, and the result is an accurate fitting and guiding of the

hammer in grooves, which are of such form that they may be planed on ordinary planing machines at a single setting of the frames. Another advantage due to this form, and which we believe to be still more important, lies in the fact that the wings E^1 E^2, on the hammer E, may both be planed complete at a single setting or fastening of the hammer upon the planing-table. As the slides are ordinarily constructed and arranged, only one wing on the hammer can be planed at one setting; and the necessity for turning over and resetting the hammer involves a certainty that the wings will be only approximately parallel to each other. Our invention allows of mathematical exactness, while the slack due to wear or imperfect fitting of the slides to the wings can be taken up by simply moving the front piece A^3 without moving or loosening the connection of either of the uprights to the bed-piece.

In putting together the parts, first the wing E^1 is fitted in the groove in the upright A^1. Then the hammer is turned, so as to bring the wing E^2 in place in the upright A^2, and afterwards the front piece A^3 is put in place and secured. In order to take up any slack, it is simply necessary to loosen the bolts A^4, turn the screws A^5 a little, and retighten the bolts A^4.

Any approved mode of permanently and strongly fitting together heavy pieces of metal may be adopted in connecting the uprights A^1 and A^2 to the bed-piece A, but we prefer the plan represented, in which the top of the bed-piece A is recessed with rectangular cavities, about one inch more or less in depth, having their edges accurately planed. These sockets receive correspondingly-planed feet on the bottom of the uprights, and the uprights are then further secured by bolts, as indicated. The corners of the sockets are cored out, as represented, in order to allow the edges of the socket to be planed with facility. The edges of the socket and of the feet receive all the lateral strain due to the working of the drop.

The belt D runs in the direction indicated by the arrow. The ascending part rises through a hole in the hammer, a little thicker than the belt, so that the belt may traverse loosely.

G is a wedge-shaped slide mounted transversely in the hammer E, directly in front of the hole through which the belt runs. It is fitted to slide horizontally, in one direction and the other, in its seat, so that, as it is moved to the left, it seizes tightly hold of the belt by contracting the hole through which the belt runs, and as it is moved to the right it loosens the hold. The operation of alternately grasping and liberating the belt is effected by simply moving this slide alternately to the left and to the right. Moving it to the left causes it to take hold of the belt, and thus to compel the belt to lift the hammer. Moving it to the right liberates the belt and allows the hammer, with its connections, to fall.

H is an adjustable piece, which may be confined by the adjusting-screw *h*, which passes through a vertical slot in the upright A^1, so as to allow of adjusting up and down to any extent required. The inclined upper surface of this stop H meets the end of the wedge-piece G, and drives it to the left at each descent of the hammer. The adjusting of the stop H, up and down, determines the level to which the hammer may descend before the wedge will be moved, so as to take hold of the belt. By slackening the screw *h*, and raising the stop H, the wedge G will be moved and the belt will be seized when the hammer is at a considerable elevation above the bed; and by reversing this process, the wedge will be moved at a later period, and the hammer will descend further before the belt is seized. In order to allow for the ordinary slackness of the belt, it is well to adjust the piece H a little higher than would be otherwise necessary. It may be adjusted up and down at pleasure, to adapt the machine to different thicknesses of material, and to dies, *a e*, of different lengths.

We propose in some instances to omit the binding-screw *h*, and to substitute therefor a connection to a lever, which may be operated by the foot of the attendant, so as to temporarily adjust the piece H at different levels, as may be required, and to vary the level in the brief interval between the rapid strokes of the machine. This adjustment, not represented, is intended more particularly for forging hammers intended for forging light articles which vary greatly in their dimensions, as, for example, broad flat forging, which has to be struck a number of blows on the flat sides, and an occasional blow on the edge or end.

I is an adjustable block, which may be secured by the adjusting-screw *i* at different levels in a vertical slot in the upright A^2. A swell, I′, projects inward from the face of the block I, and is adapted to meet and push to the left the sliding wedge G. So soon as the motion of the belt D has lifted the hammer and its connections, so as to bring the wedge G into contact with the swell I′, the wedge is moved to the left, and the hold on the belt D is thereby destroyed, and the hammer descends, unless arrested by the stop J.

J is a sliding stop, which slides outward to allow the hammer to ascend past it, and is pressed inward by the spring *j*, not represented, which encircles it and presses it inward, as will be readily understood. K is a vertical shaft, operated by the handle *k*, and having an arm, K′, which draws the stop J outward to liberate the hammer whenever the handle *k* is turned outward. Any suitable connection may be made of the handle *k* to a treadle, not represented, to allow the operation of releasing the hammer at will to be performed by the foot instead of by the hand of the attendant. The rocking-shaft K is flatted as represented, and the hole in the arm K′ is correspondingly shaped, so that the block I may be moved up and down, and adjusted in any position without necessitating any releasing and reconnecting of the arm K′. The latter stands within the bearings on the block I, as represented, and slides up and down on the shaft K freely, when the block I is being adjusted in any new position. The shaft K is supported at its lower end in a bearing fixed upon the upright A^2, and at a higher point in the bearings on the block I immediately above and below the arm K′.

When it is desired to give a heavy blow, we adjust the block I and its several connections at a point near the top of the upright A^2. When it is desired to give a light blow, we adjust it at a low point. In the first case, the hammer will ascend at each stroke nearly to the upper pulley B′ before being liberated. In the latter case, it will rise but a few inches, and will strike but a gentle blow.

L is a piece fitted loosely, and extending up and down the whole travel of the hammer. The face presented towards the hammer is exactly parallel to the motion of the hammer. M is a hand-lever, turning on the pin

m, and adapted to lift the piece L at will. The piece L is connected to the upright A^2 by the bolts *l*, which pass through inclined slots, as represented, so that the raising of the piece L moves it inward towards the hammer, and the lowering of it draws it back from the hammer. Whenever the piece L is raised, and thus moved inward toward the hammer, it strikes the adjacent end of the sliding wedge G, and slides it so as to let go the belt. This piece L, with its connections, therefore, provides a means for dropping the hammer at will at any point. This may be of great use in welding light articles by the aid of our machine. In such work it is frequently desirable to strike the intensely heated metal one or more very light blows, and afterwards give heavier ones. To provide for such work, it is simply necessary to adjust the block I and its connections at a sufficiently high level to provide for striking the heavy blows, and then to operate the lever M, to liberate the hammer at a lower level, for the light blows. It is obvious that the lever M may be connected to a treadle by any approved mechanism, so as to operate by the foot instead of by the hand, and also that levers or other known means of inducing a parallel motion, shown in fig. 3ª, may be substituted for the bolts *l* and the inclined slots in the piece L, without interfering with the successful working of the machine.

We will now describe a feature of our machine which is of great importance in some varieties of work. P is a considerable mass of metal delicately suspended on the spring Q, which is housed in the hammer, as represented. The mass P is guided by the stem R, which is made wedge-form at the point where it passes through the back of the sliding wedge G. It will be observed that we provide a recess, *g'*, in the horizontal web *g*, on the rear face of the sliding wedge G, and that the tapering portion of P passes through the recess *g'*. The force of the spring Q is such as to hold up the weight P, and, in all ordinary conditions, to prevent the wedging part of the stem P from coming in contact with the sliding wedge G, or producing any effect whatever; but when the descending motion of the hammer and its connections is suddenly arrested, by striking the mass of iron or other object which is being hammered, the momentum of the weight P temporarily presses the spring Q, and forces the stem R down to such an extent into the hammer that its tapering portion acts upon the side of the recess *g'*. It thus forces the slide G to the right, providing this operation has not been already effected by contact with the piece H, above described.

In order to hammer blooms of soft iron, or to drive piles, wedges, &c., or to perform any work where the hammer is liable to be arrested at very variable and indeterminate positions, this last-described mechanism, for insuring the prompt griping of the belt, so as to commence lifting the hammer at the moment the blow is struck, is very important. It may be used either in connection with the piece H, above described, so as to act whenever the piece H fails, or it may be relied upon alone, and the piece H may be set down so as to be ineffective, or the machine may be constructed without the piece H.

We do not confine ourselves to the precise construction of all the details herein described. Many mechanical equivalents may be substituted for some of the specific devices which we have represented. We propose to employ other means of suspending the weight P than the spiral spring Q, here described. We can make the spring of any other form, or of other material, such as rubber, or we can enclose air or other permanent gas, and can arrange the mechanism to receive a fresh supply of air previous to each blow, so as to allow the air to be expelled in the manner known as the controlling-chamber in arresting the motion of valves in steam engineering. We propose, in some kinds of work, to provide a slide, extending a little below the face of the die *e*, so as to strike the work and be pressed back at a very brief interval of time before the main blow of the hammer is struck. The motion due to the forcing upward of such a piece may be made to operate the stem R, instead of the momentum of the weight P, if preferred, but in such cases the stem R should, of course, be tapered in the opposite direction, and the spring Q, if any is found necessary, should be arranged to force the stem R down instead of up.

We propose to make the belt D of any other flexible material than leather. Thin iron or steel, rope, raw hide, rubber, or other well-known flexible or elastic material, may be employed, it being important simply that it possesses the proper strength, and is continuous and uniform in character. Instead of the sliding wedge G, we can employ an eccentric which shall grasp and release the belt or its equivalent by a turning instead of a sliding motion. The pulley B' may be provided with points or spurs adapted to increase the reliability of the hold on the belt or equivalent flexible part. The shaft B may be a counter-shaft, mounted on bearings entirely independent of the uprights A^1 A^2, and the uprights A^1 A^2 may be connected at the top, or both may be cast together in a single piece. Again, one or both of the uprights may be cast in one piece with the bed A.

One modification of great importance in very heavy machines of this character is to substitute a series of holes, with bolts fitting tightly therein, and capable of changing from one hole to another, instead of the vertical slot in which to adjust the piece I and its connections. The repeated strains due to the arresting and suspending of a very heavy hammer on the stop J are liable to move it and its connections gradually downward, unless some more efficient means is employed than the mere friction induced by a pinch-screw. The adjusting-screw *i* is sufficient in light work. In very heavy work, a series of bolt-holes and bolts, or other equivalent positive fastening, should be adopted.

We have ascertained, by experiment, that our machine, when properly adjusted, entirely avoids the evils experienced in the use of ordinary drops, due to the rebound of the hammer. With our machine, properly conditioned, the elasticity which causes the rebound only aids in the ascent of the hammer for the succeeding stroke.

Having now fully described our invention, what we claim as new therein, and desire to secure by Letters Patent, is as follows:

1. We claim the endless belt D, of leather or analogous material of uniform character, in combination with the hammer E, and with the wedge G, or its equivalent, for directly connecting and disconnecting the hammer; the whole being combined and arranged substantially as and for the purposes herein set forth.

2. We claim the tripper I′ and suspending-stop J, mounted together on the movable block I, so that both the tripper and the stop may be adjusted at the various heights required by a single operation, substantially as and for the purpose herein specified.

3. We claim the provision for dropping the hammer at will at any desired lower point than the tripper I′, the same consisting of the piece L, standing always parallel with the motion of the hammer, and moved against the wedge G, or its equivalent, at the desired moment, irrespective of the elevation of the hammer at that moment, substantially as and for the purpose herein set forth.

4. We claim the weighted stem R, or its equivalent, operating as specified, in combination with the wedge G, or equivalent device, operated by the said stem, and with the hammer E and belt D, causing the hammer to be firmly connected to the belt, by the act of striking on the object below, so that when the object struck is high, the belt will be seized at a corresponding level, and as the object is hammered down or turned over, so as to cover the upper surface, the belt will be seized at a corresponding lower level, all substantially as and for the purpose herein set forth.

5. We claim the adjustable front-piece A^3, in combination with the guides A^1 A^2, having grooves of the form specified, and with the holding means A^4 and adjusting means A^5, all arranged for joint operation, in connection with the hammer E, or its equivalent, substantially as and for the purpose herein specified.

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Witnesses:
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