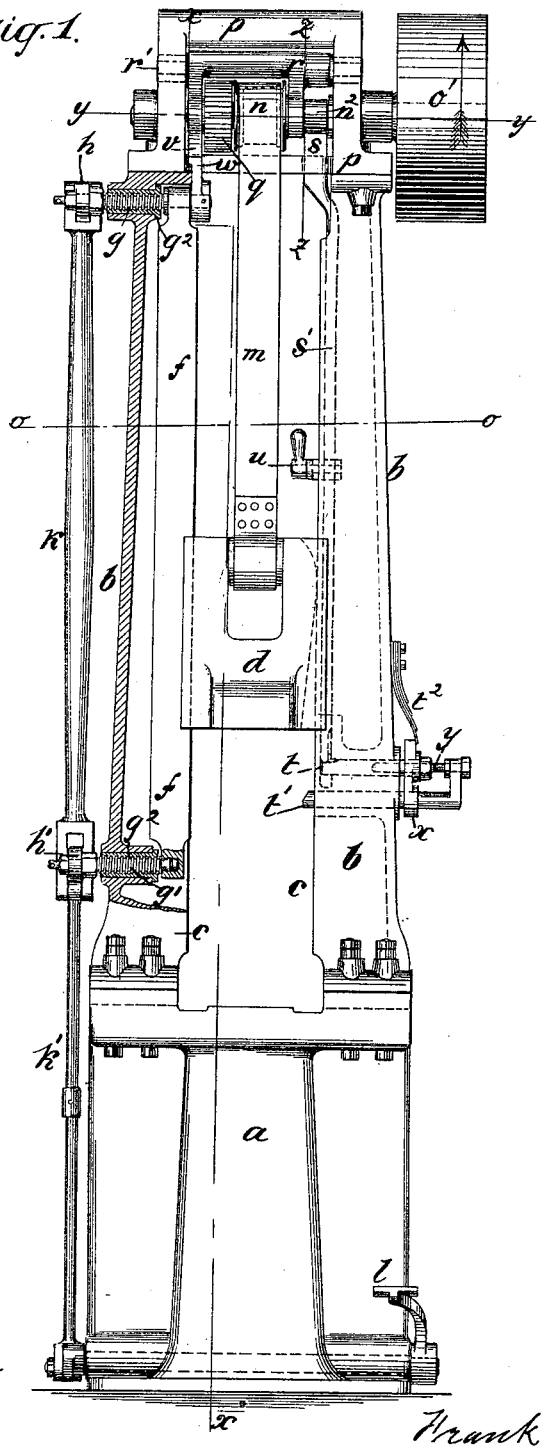
(No Model.) 4 Sheets—Sheet 1.

F. M. LEAVITT.

DROP HAMMER.

No. 386,076. Patented July 10, 1888.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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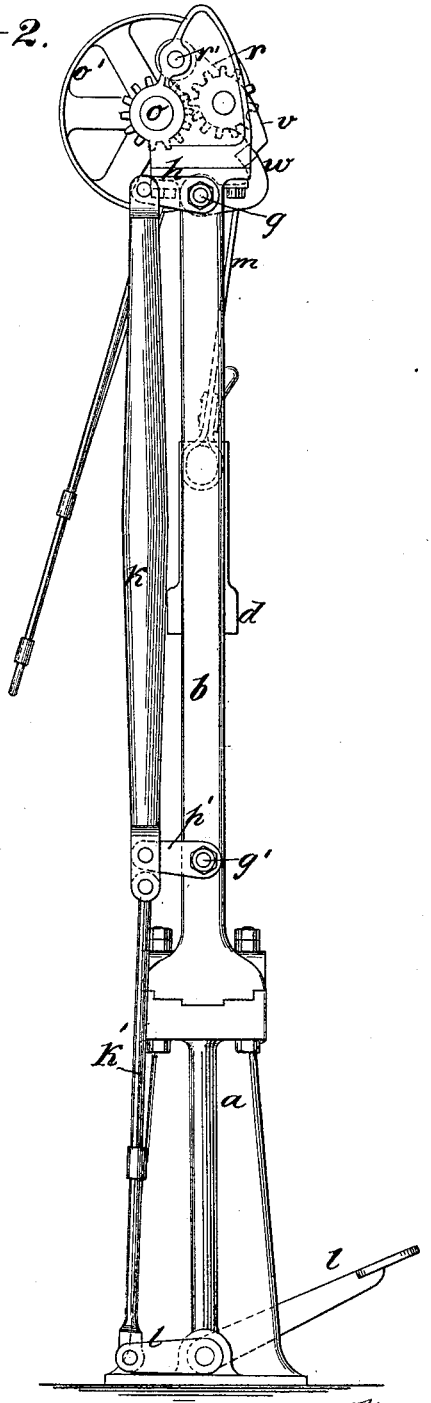
Fig. 2.



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(No Model.)

4 Sheets—Sheet 3

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DROP HAMMER.

No. 386,076. Patented July 10, 1888.

Fig. 4.

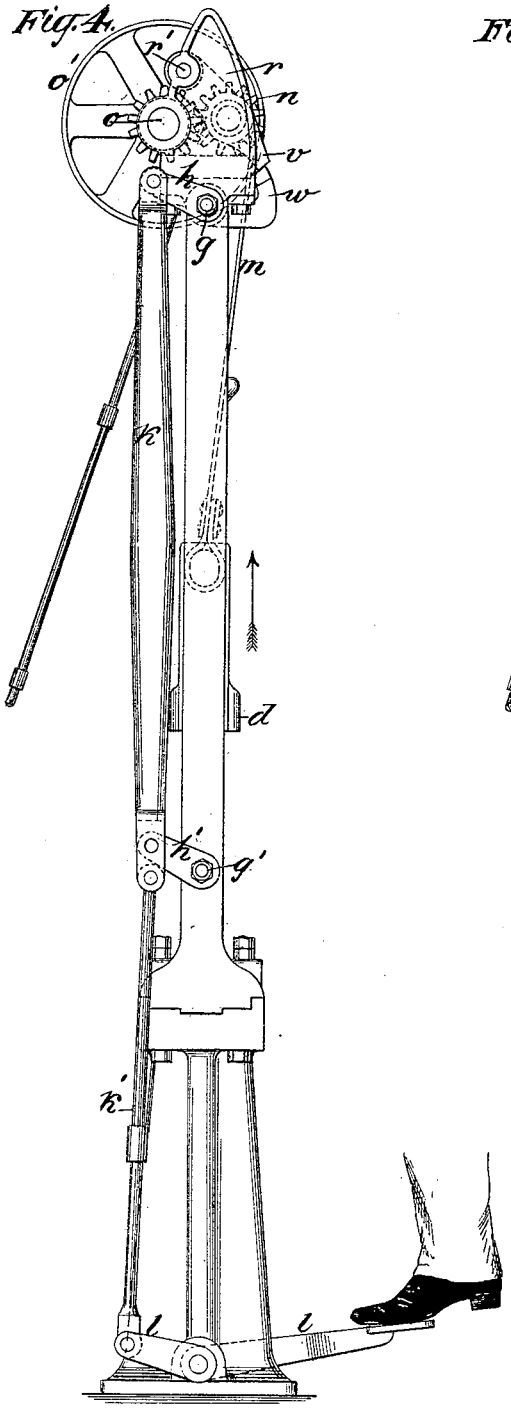
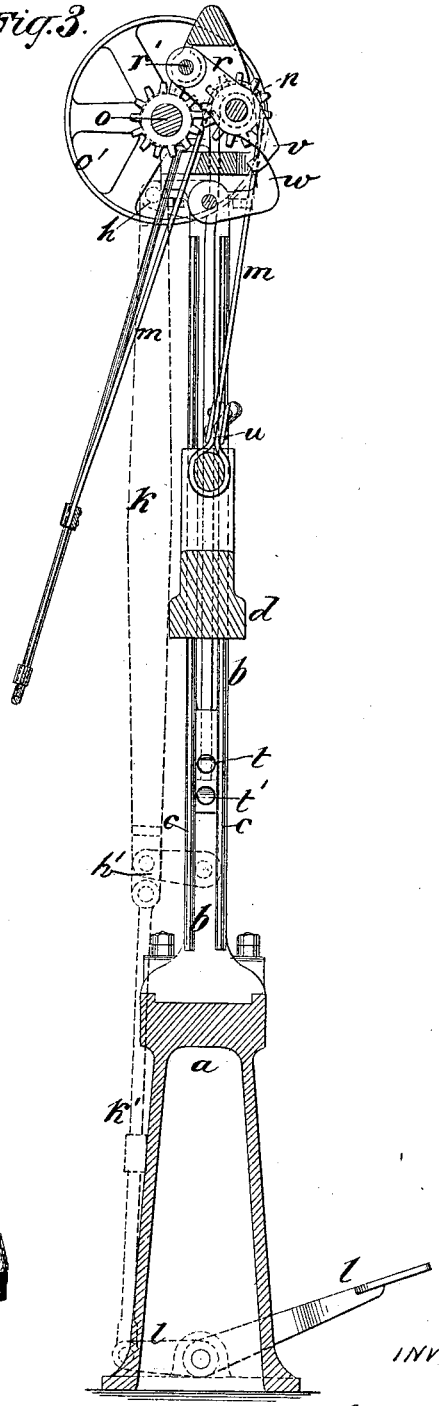


Fig. 3.



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4 Sheets—Sheet 4.

F. M. LEAVITT.

DROP HAMMER.

No. 386,076. Patented July 10, 1888.

Fig. 5.

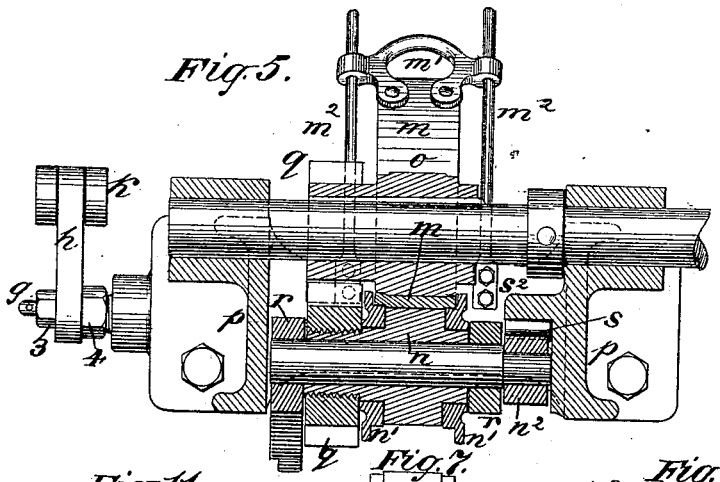


Fig. 6.

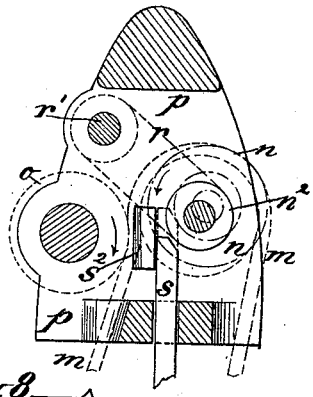


Fig. 11.

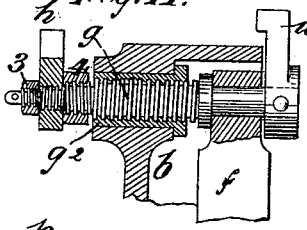


Fig. 7.

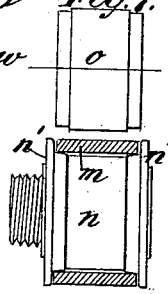


Fig. 8.

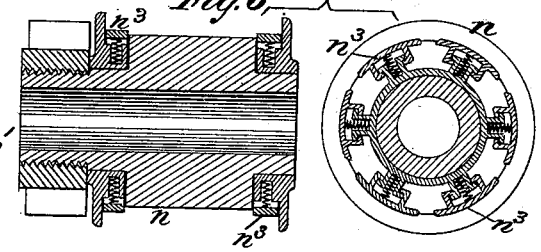


Fig. 9.

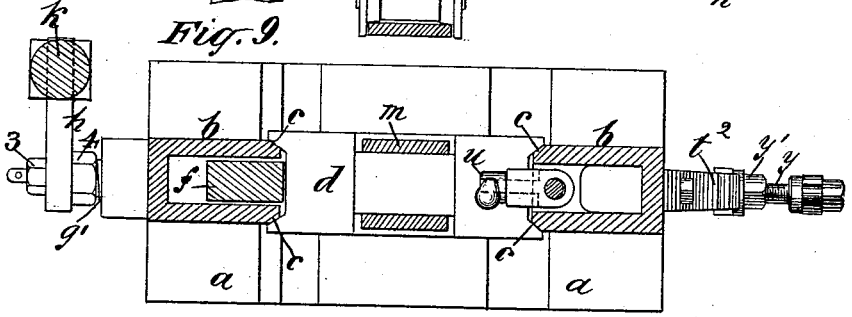
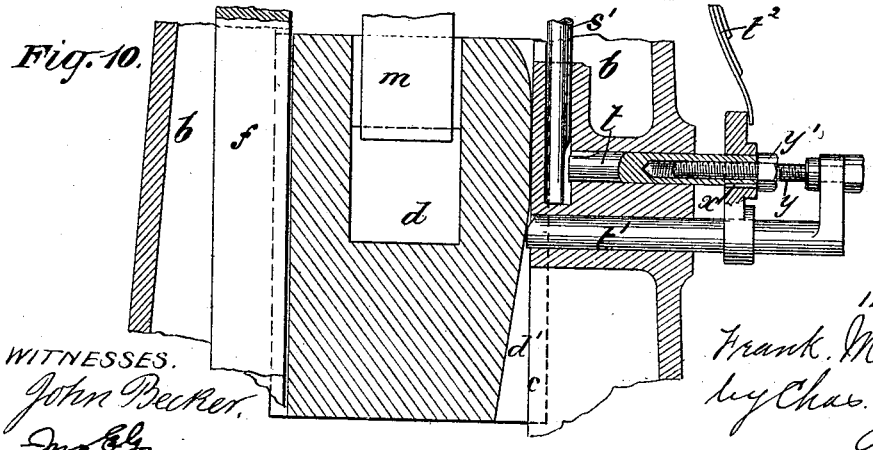


Fig. 10.



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UNITED STATES PATENT OFFICE.

FRANK M. LEAVITT, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE E. W. BLISS COMPANY, OF SAME PLACE.

DROP-HAMMER.

SPECIFICATION forming part of Letters Patent No. 386,076, dated July 10, 1888.

Application filed September 22, 1887. Serial No. 250,391. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. LEAVITT, of Brooklyn, Kings county, New York, (assignor to THE E. W. BLISS COMPANY, of the same place,) have invented certain new and useful Improvements in Drop Hammers and Presses, of which the following is a specification.

My present invention relates more especially to that type of drop-hammer shown in my pending application, No. 221,891, allowed July 13, 1887, in which the belt on which the hammer-head is hung passes over a movable or pendulous pulley, and between said pulley and a fixed driving-pulley, so that the weight of the hammer-head forces the pulleys together to grip the belt, and thus raise the hammer, a separating device being employed to separate the pulleys at the proper moment, and thus free the belt and allow the hammer to fall and deliver its blow, said separating device being operated by tappets in the path of the hammer-head.

My present invention is an improvement on my former machine and aims to render the mechanism more simple, efficient, and complete. In the present machine, therefore, the separator consists of a simple reciprocating wedging device arranged to diverge or separate the pulleys, said wedge acting against a roller on the shaft of the movable pulley or against any part of its pendulous frame, so as to cause the pulleys to approach or recede, according as the wedge is forced in or out. This wedge is mounted on the top of a vertically-reciprocating and gravitating rod, which, when raised up to separate the pulleys, is held by a spring bolt or catch, a connection of which then protrudes in the path of the hammer-head at the bottom of its stroke, so that when the hammer falls it will retract said bolt, cause the rod to drop, and withdraw the separating-wedge, and thus allow the pulleys to come together, which will now grip the belt and raise the hammer until it strikes a tappet or projection on the rod, which will raise the wedge, separate the pulleys, and thus allow the hammer to again fall. The hammer-head moves in guides, on one side of which is arranged a movable friction-bar running the full length of the guides and acting as a friction clamp or brake to clamp the hammer-head firmly at any point of its stroke. This movable clamp guide or bar has a parallel motion or a movement equal at each end by means of clamp-screws urging each end of the bar, said clamp-screws having parallel crank-arms connected by a heavy gravitating connecting-rod acting as a motive weight to turn the screws and operate the clamp-bar. This connecting-rod is also connected with a treadle or operating device, whereby the operator may raise or lower the connecting-rod and loosen or tighten the clamp bar to free or clamp the hammer-head. An escapement or stop lever is also operated by the movement of the clamping device to engage the pendulous pulley or the swinging frame thereof, and thus act to hold out the frame and keep the pulleys separated when the connecting-rod gravitates to clamp the hammer during the descending motion thereof, but prevents the possibility of the rod gravitating to clamp the hammer-head during the positive ascending motion thereof when the pulleys are together and are forcibly drawing up the belt and hammer-head.

My present invention therefore consists, mainly, in the features above outlined and in special details, as hereinafter fully set forth.

In the drawings annexed, Figure 1 presents a front elevation of my improved drop-hammer, shown partly in section at the clamping device. Fig. 2 is a side elevation, and Fig. 3 is a vertical section on line *x x* of Fig. 1. Fig. 4 is a side elevation, but with the treadle represented depressed and the machine in operation. Fig. 5 is an enlarged sectional plan of the gripping-pulleys and their adjuncts on line *y y* of Fig. 1. Fig. 6 is an enlarged fragmentary vertical section of the same parts on line *z z* of Fig. 1. Fig. 7 represents the gripping-pulleys in the separated position. Fig. 8 gives longitudinal and cross sections of a pulley of modified form. Fig. 9 is a sectional plan or cross-section through the guides on line *o o* of Fig. 1. Fig. 10 is an enlarged fragmentary vertical section of the hammer-head and its guides with clamping and tappet devices. Fig. 11 is an enlarged fragmentary sectional detail of the clamping mechanism.

Referring, first, to Figs. 1, 2, 3, and 4, *a* indicates the anvil-base of the frame, which is made of about the usual form and strong and

massive to hold the work operated upon and resist the blows of the hammer-head. Vertical standards *b b* arise from the anvil-base to a considerable height, and are formed on their inner faces with guides or ways *c c*, in which the hammer-head *d* is free to slide up or down, as usual in machines of this class. Referring, however, to Figs. 1, 9, and 10, it will be seen that the guide-standard *b* on the left is hollow and contains a longitudinal or vertical clamping-bar, *f*, which fits between the ways *c* and closely approaches one side of the hammer-head and extends from top to bottom of the guides parallel with the stroke of the hammer, as best shown in Fig. 1. Each end of this bar is connected to a screw, *g g'*, as best seen in Fig. 1, and these screws pass through nuts g^2, fixed in the guide-standard, and are secured to parallel crank arms or levers *h h'*, as best seen in Figs. 1, 2, and 4. These crank-arms are connected by a heavy connecting-rod or gravitating bar, *k*, the lower end of which is linked by the rod *k'* with one arm of the treadle-lever *l*, as shown in Figs. 2, 4, and 1. It will therefore be seen that the mechanism is such that normally or when the treadle *l* is free the gravitation of the heavy connecting-bar *k* will partly rotate the screws *g g'*, and thus force the clamping-bar with a parallel or even motion laterally against the hammer-head, and thereby clamp the hammer-head frictionally in its guides at whatever position the hammer-head may be in its descent, whereas when the treadle is depressed, as seen in Fig. 4, the heavy bar *k* will be raised and the action of the parts reversed, thus releasing the hammer-head and allowing it to fall freely. Normally, however, the treadle will be raised, the bar *k* gravitated, and the hammer clamped in its guides at a point above the bottom of its stroke, as shown in Figs. 1, 2, and 3, the machine being thus at rest. Now, the hammer-head is connected to the lower end of a belt, *m*, of leather or other material, which passes over and around a movable or pendulous pulley, *n*, and down between the same and a fixed driving-pulley, *o*, both of which are mounted in a housing-frame, *p*, secured to the top of the standards, and the free end of the belt is finally attached to a light cross head or guide, *m'*, which is free to slide on guide-rods m^2, projecting downwardly at a slight incline from the back of the housing-frame, as shown in Figs. 2, 3, 4, and 5. The shaft of the fixed or driving pulley *o* is mounted in stationary bearings in the frame *p*, and is provided with a large pulley, *o'*, to which the driving-belt is applied to revolve the same constantly. The shaft of the movable pulley *n* is, however, journaled in a pendulous or swinging frame, *r*, which is hinged to the housing-frame on the axis *r'* at a point above the driving-pulley, as shown best in Figs. 3 and 6, and at such an angle that the movable pulley constantly tends to gravitate toward or against the fixed pulley, and thus forcibly grip the belt *m* between the two, as will be understood from the full and dotted lines in Figs. 6 and 5. Normally, however, the pulleys are separated, so that the belt is loose or free between them, as shown in Figs. 3 and 7, the pulleys being thus separated by a vertically-reciprocating wedging or separating device, *s*, which abuts laterally against a fixed abutment, s^2, on the frame *p*, as shown best in Figs. 5 and 6, and acts against a roller, n^2, on the shaft of the movable pulley *n*, so that hence when the separating-wedge *s* is forced up it will enter between the abutment s^2 and the roller n^2, and thus lift the pendulous frame and separate the movable pulley from the fixed pulley, as shown in dotted lines in Fig. 6, also in full lines in Fig. 3. This separating-wedge *s* is fixed on the top of a long gravitating rod, *s'*, as seen best in Figs. 1 and 3, which extends down between the hammer-ways in the standard *b* on the right, and when thus raised up to separate the pulleys, as described, the wedge-rod *s'* will be sustained by a spring-bolt, *t*, which will be forced in under the same by the spring t^2, while a tappet-rod, *t'*, also connected with the bolt, will protrude from the face of the ways in the path of the hammer when near the bottom of its stroke, and in conjunction with an inclined face, *d'*, on the hammer-head, as shown by full and dotted lines in Figs. 1 and 10. Now, when the pulleys *o n* are thus separated, as described, both will of course be still revolving freely, as a constant rotary motion is imparted to the driving-pulley *o'*, and the pulleys *o n* are constantly and positively geared together by long toothed gear-wheels *q q*, which will admit of the necessary separation and approach of the pulleys without getting out of mesh; but as the hammer-belt *m* now hangs loose between the separated pulleys, as seen in Figs. 3 and 7, the pulleys will revolve idly and have no action on the belt.

In order that the belt shall not drag on the pulleys when thus running idle and will be perfectly free to move when the pulleys are separated, I prefer to make the belt somewhat wider than the grasping portion of the pulleys, as seen best in Figs. 5 and 7, and provide the pulley *n* with loose flanged rings *n'*, of slightly larger diameter than the diameter of the pulley *n*, and on these rings the edges of the belt will rest when free, as seen in Fig. 7, while when the pulleys are forced together the belt will be forced in between the flanged rings and gripped firmly between the pulleys, as seen in Fig. 5.

Instead of the flanged rings the pulley *n* may be provided with a series of spring segments or shoes, n^3, as seen in Fig. 8, on which the belt will rest when free, but which will be contracted or forced in to allow the belt to be gripped firmly between the pulleys when the same are forced together. It will therefore be now seen that when the machine is out of action or in normal position the pulleys *o n* will be held separated by the raised wedge *s*, and the wedge will be retained in such position by the advanced bolt *t*, while at the same

time the hammer-head will be held clamped in its guides above the tappet t' of the bolt t by the gravitation of the weighted rod k and the grip of the clamp-bar f, as before described, and shown in Figs. 1 and 2, while at the same time the hammer-belt m is free between the separated and revolving pulleys and hangs loosely on the flanged rings n, as seen in Fig. 7. If, therefore, the treadle l is now depressed by the pressure of the foot, as shown in Fig. 4, the heavy rod k will be raised and the clamp-bar f relaxed, and the hammer-head being thus released will now fall in its guides toward the anvil-block, the belt running freely over the loose rings n', and thus offering no appreciable resistance to the fall of the hammer. As the falling hammer strikes the tappet t', it will retract the bolt t, and thus allow the rod s' and its wedge s to descend, as seen in Figs. 6 and 10, thus allowing the loose pulley to fall toward the fixed pulley, and thereby gripping the belt between them. The belt being thus gripped between the revolving pulleys (see Fig. 5) will be at once drawn up and the hammer lifted, and as the weight of the moving hammer-head now hangs solely from the belt passing over the pendulous pulley it will hence act to press that pulley forcibly against the fixed pulley, so that the grasp of the pulleys on the belt is determined solely by the weight of the hammer itself, which is greater as the hammer is heavier, and vice versa, which renders the gripping action simple and certain. The hammer-head thus continues to rise until it strikes an adjustable projection or tappet, u, on the rod s', when the rod will now be forcibly raised and the wedge s projected up to separate the pulleys, as before described, when the belt will be again released and the hammer will immediately fall and continue to descend until it strikes the lower tappet, t', and thus again allow the wedge to drop and cause the pulleys to approach to again produce the up motion of the hammer. Hence so long as the treadle remains depressed, as in Fig. 4, the hammer will continue to rise and fall in regular strokes, which may be more or less powerful, according to the height to which the hammer is raised, which will of course be determined by the higher or lower adjustment of the upper tappet, u, on the rod s'. To stop the motion of the hammer, the foot is removed from the treadle, as seen in Figs. 1, 2, and 3, when the action of the clamped device will instantly arrest the hammer at any part of its descent, and thus hold it stationary in its guides, as seen in Figs. 1, 2, and 3. It will now be seen that when the treadle is thus released and the clamping device allowed to act to arrest the hammer it is important that this clamping action should not take place during the upstroke of the hammer, when the pulleys are gripping the belt and forcibly drawing up the hammer-head, for if the hammer-head were clamped at this time it would obviously be likely to cause tearing of the belt or overstraining of the mechanism and leave the mechanism under strain. Hence I have arranged an operative connection between the clamping device and the movable pulley which acts as a stop to prevent the clamp acting, except during the fall of the hammer, when the pulleys and belt are running free. This I accomplish, preferably, by means of a pawl-nose, v, on the pendulous frame r of the movable pulley and a swinging stop or escapement lever, w, attached to the axis of the upper clamp-screw, g, the two being arranged to move in intersecting paths and to engage with each other in two positions, as shown, respectively, in Figs. 3 and 4. The arrangement is therefore such, as seen in Fig. 3, that when the pulleys are separated, with the pendulous frame and the pawl-nose v raised, while the weighted rod k has gravitated and the clamp tightened to hold the hammer, the stop-lever w will be swung in under the pawl-nose, and thus hold the pawl and pendulous frame up and the pulleys separated. As soon, however, as the treadle is depressed to raise the rod k and release the clamp to let the hammer fall, the lever w will be withdrawn from under the path of the pawl, as shown by full lines in Fig. 4 and dotted lines in Fig. 2, thus allowing the pendulous frame to descend and the pulleys to come together, when the pawl-nose now will move in front of the stop-lever w, as seen in Fig. 4, and the belt will be gripped and the hammer raised. If, however, the treadle is now released while the hammer is going up, the rod k cannot descend to clamp the hammer, because the stop-lever w will rest against the tip of the pawl-nose v, as seen in Fig. 4, and thus prevent the clamping mechanism from acting until the hammer shall have been raised high enough to operate the wedging device, and thus lift the pendulous frame and separate the pulleys, when the stop lever will then fly in under the pawl and allow the clamping device to act on the now free or descending hammer, as seen in Fig. 3, so that hence by these simple devices the hammer can become clamped only during the downstroke and not during the upstroke, no matter at what moment the treadle is released, which is an important provision of the machine.

By referring to Fig. 10 it will be seen that the bolt t and tappet t' are provided with a relative adjustment, so that the tappet may be made to project more or less, so as to receive the action of the hammer sooner or later, and thus drop the rod s' at the desired moment relative to the stroke of the hammer. To provide this adjustment an adjusting-screw, y, screws into the bolt t, which latter passes loosely through the arm x, which slides on the tappet t', the bolt t being restrained by a feather from turning in the arm x, but free to slide therein. The hexagonal head of the screw y is free to turn in the bracket on the end of the tappet t', but is restrained from endwise motion by a collar, as shown. It will therefore be seen that by first loosening the jam-nut y'

the screw y may be turned in one way or the other and thus project or retract the tappet t' relative to the bolt t more or less, after which the jam-nut is screwed up tightly against the bolt t to retain said adjustment. The spring t^2 bears, as shown, against the arm x, and of course constantly tends to project the bolt and tappet into the engaging position shown in Fig. 1. By referring to Fig. 11 it will be noted that the crank-arms h h' are screwed into the end of the clamp-screws on a left-hand thread, same as that on the body of the clamp-screw, while for a short distance on each side of the crank-arm right-hand threads are cut, on which are screwed the nuts 3 4, between which the crank-arms will be firmly held in any position in which they may be set when the nuts are screwed up tight against the arms, thus rendering the connection positive and adjustable, as will be readily comprehended from Figs. 5, 11, and 9.

It will be readily understood that the reciprocating separator or wedge s may act on any part connected with the movable pulley or its movable frame; but I prefer to have it act, as shown, on a roller, n^2, on the shaft of said pulley. It will be also understood that a hand-lever or any equivalent operating device may be substituted for the treadle-lever l for throwing the machine into or out of action, and that a strong spring will be the equivalent for a weight in depressing the crank-arms of the clamping device; but the weight k is considered preferable.

What I claim is—

1. In a drop hammer or press, the combination, with the movable hammer-head and the fixed guides in which the same is movable, a hollow standard in which the guides are formed, and mechanisms, substantially as described, for raising the hammer-head, and tappets for tripping said head, of a clamping-bar located on one of the guides in said hollow standard and extending longitudinally or vertically thereupon, and operating devices, substantially as described, connecting with said bar to project or retract the same, and thus clamp or free the hammer-head at any point in the guides, substantially as set forth.

2. In a drop hammer, the combination, with the hammer head and the guides, of the longitudinal clamp-bar f, arranged in or parallel with the guides, clamp-screws g g', connected to each end of the bar, cranks or levers h h', connected to said screws, a bar connecting said levers, and an operating or manipulating device, substantially as described, connected thereto, whereby both screws can be partly revolved simultaneously and the clamp-bar projected against or retracted from the hammer-head, substantially as shown and described.

3. The combination, with the hammer-head and its guiding-frame, of the clamp-bar f, nuts g^2 g^2, screws g g', crank-arms h h', gravitating connection k, and a treadle, l, operatively connected with said parts, substantially as shown and described.

4. In a drop press or hammer, the combination, with two separable friction-pulleys, a belt or band passing between the two, and a hammer-head attached to said belt, of a reciprocating wedge or separator, s, arranged to diverge or separate the pulleys and free the belt when thrust in one way, and to allow the pulleys to approach to grip the belt when moved in the opposite direction, and a gravitating rod carrying said wedge, with tappets in the path of the hammer-head operatively connected with said wedge, substantially as shown and described.

5. The combination, in a drop press or hammer, with a fixed driving-pulley and a separable driven pulley, of a pendulous or movable frame in which said pulley is mounted, a belt or band passing over said separable pulley and between the two pulleys, a hammer-head hung from said band, a vertically-reciprocating separator or wedge, s, arranged to separate one pulley from the other, a gravitating rod carrying said wedge, and projections or tappets arranged in the path of the hammer-head and connected with said separator, substantially as shown and described.

6. In a drop press or hammer, the combination, with the separable pulleys o n, a belt, m, passing between the same, and a hammer-head, d, hung to said belt, of a fixed frame to sustain said pulleys and hammer, with the reciprocating wedge s, a fixed protuberance, s^2, abutting against one side of said wedge, and a protuberance, n^2, abutting against the opposite side of said wedge and connected to the movable pulley, substantially as shown and described.

7. In a drop press or hammer, the combination, with fixed and separable friction pulleys o n, a belt, m, passing between the two and over the friction-pulley, a hammer-head, d, hung from said belt and acting to press the separable pulley against the fixed pulley to grip the belt between them, and a reciprocating wedge, s, acting when raised to separate said pulleys to free the belt and let the hammer fall, and when lowered to allow the pulleys to approach to grip the belt and lift the hammer, of the gravitating rod o', connected to said wedge, spring-bolt t, sustaining said rod, and tappet t', connected to said bolt and arranged in the path of the falling hammer, substantially as shown and described.

8. In a drop press or hammer, the combination, with the separable friction-pulleys o n, the hammer-head d, and the belt m, connected with said head and passing over and between said pulleys, as described, of the reciprocating separator or wedge s, rod s', connected to said wedge, tappets u and t', and spring-bolt t, arranged and operating substantially as set forth.

9. In a drop press or hammer, the combination, with two separable friction-pulleys, o n,

a belt or band passing between the two and over one of them, and a hammer-head hung from said belt, of the loose marginal rings n' on the pulley n, supporting the edges of the belt and holding it free from the pulley when the pulleys are separated, substantially as set forth.

10. In a drop press or hammer, the combination, with a rising and falling hammer-head, of a belt or band on which the same is hung, two separable friction-pulleys between which said belt passes, a vertically-reciprocating separating device for causing the separation and approach of said pulleys, a vertical laterally-movable clamp to clamp the hammer in its guides, a projection connected with the movable pulley, and a projection connected with the clamping device arranged to engage to prevent the action of the clamp when the pulleys are approached, and vice versa, substantially as herein set forth.

11. In a drop-press, the combination, with the hammer-head and a clamping device to hold the same in its guides at any point of its stroke, of the fixed and separable friction-pulleys o n, between which the hammer-lifting belt passes, with the movable or pendulous frame r, in which the separable pulley is mounted, and an engaging pawl-nose, r, on said frame, with the escapement or stop lever w, connected to the clamp mechanism and arranged to move across the path of said pawl-nose, substantially as and for the purpose herein set forth.

12. In a drop press or hammer, the combination, with a fixed and a movable pulley, a belt passing between the two and down over the movable pulley, and a hammer-head hung therefrom, of a movable or pendulous frame in which said pulley is mounted, with a clamp arranged to hold the hammer-head at any part of its stroke, a rotary screw-shaft operating said clamp, and a swinging escapement or stop-arm connected to said screw-shaft and arranged to engage said movable frame, substantially as and for the purpose herein set forth.

13. The combination of the pulleys o n, movable frame r, belt m, and hammer d with the clamp f, screws g g', arms h h', connection k, operating device l, connected therewith, and escapement-arm w on screw g, engaging frame r, substantially as and for the purpose set forth.

14. The combination, with the clamp-bar f, of the screws g g', nuts g^2, arms h h', screwed on ends of said screws, and nuts 3 4, with a reverse thread clamping said arms on opposite sides, substantially as shown and described.

15. The combination, with the tappet t' and bolt t, of the arm x, adjustable screw y, and spring t^2, arranged and operating substantially as shown and described.

FRANK M. LEAVITT.

Witnesses:
JNO. E. GAVIN,
J. E. M. BOWEN.