

(No Model.)

2 Sheets—Sheet 1.

F. M. LEAVITT.

DROP HAMMER.

No. 370,952.

Patented Oct. 4, 1887.

Fig. 1.

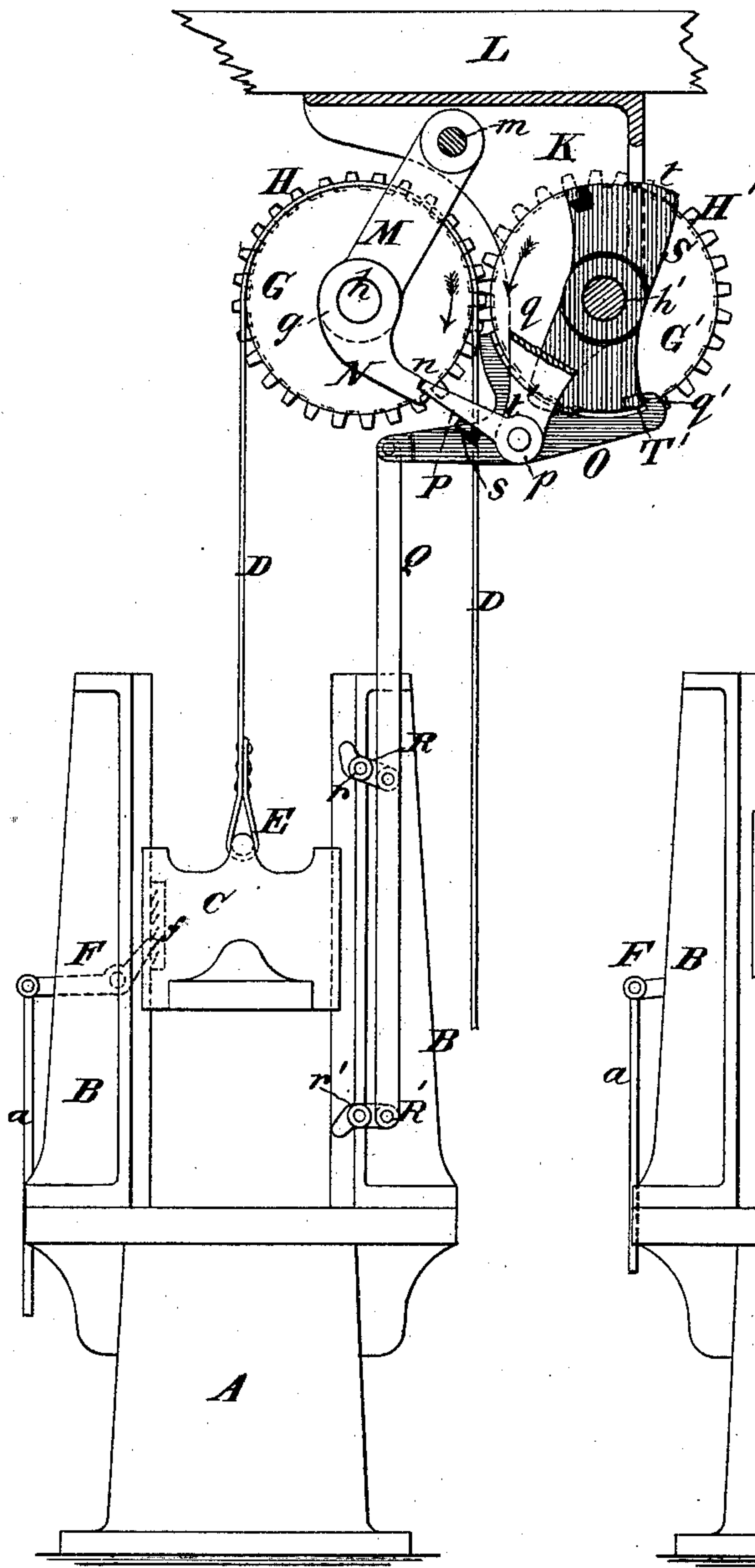
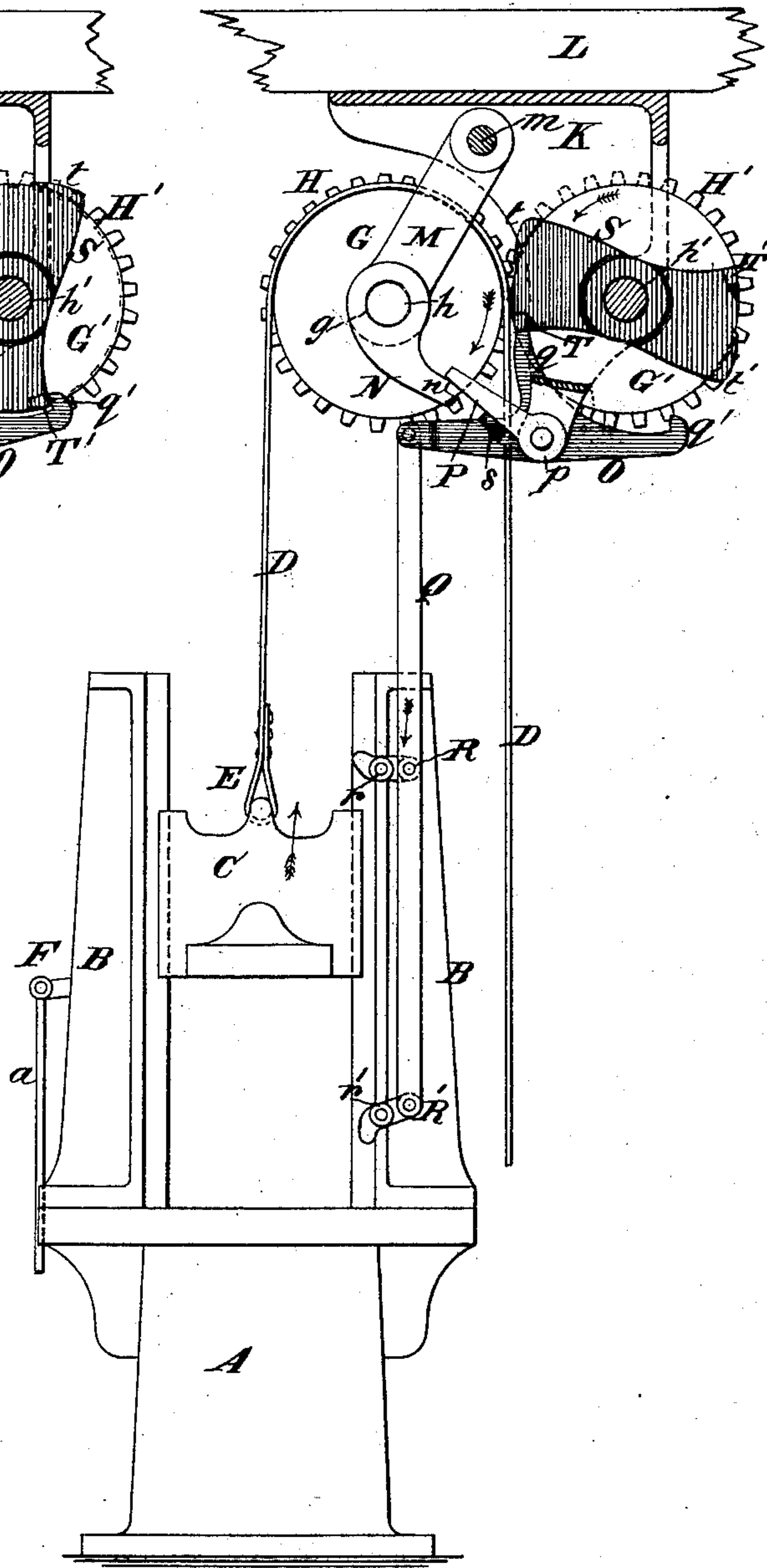


Fig. 2.



WITNESSES

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Fig. 3.

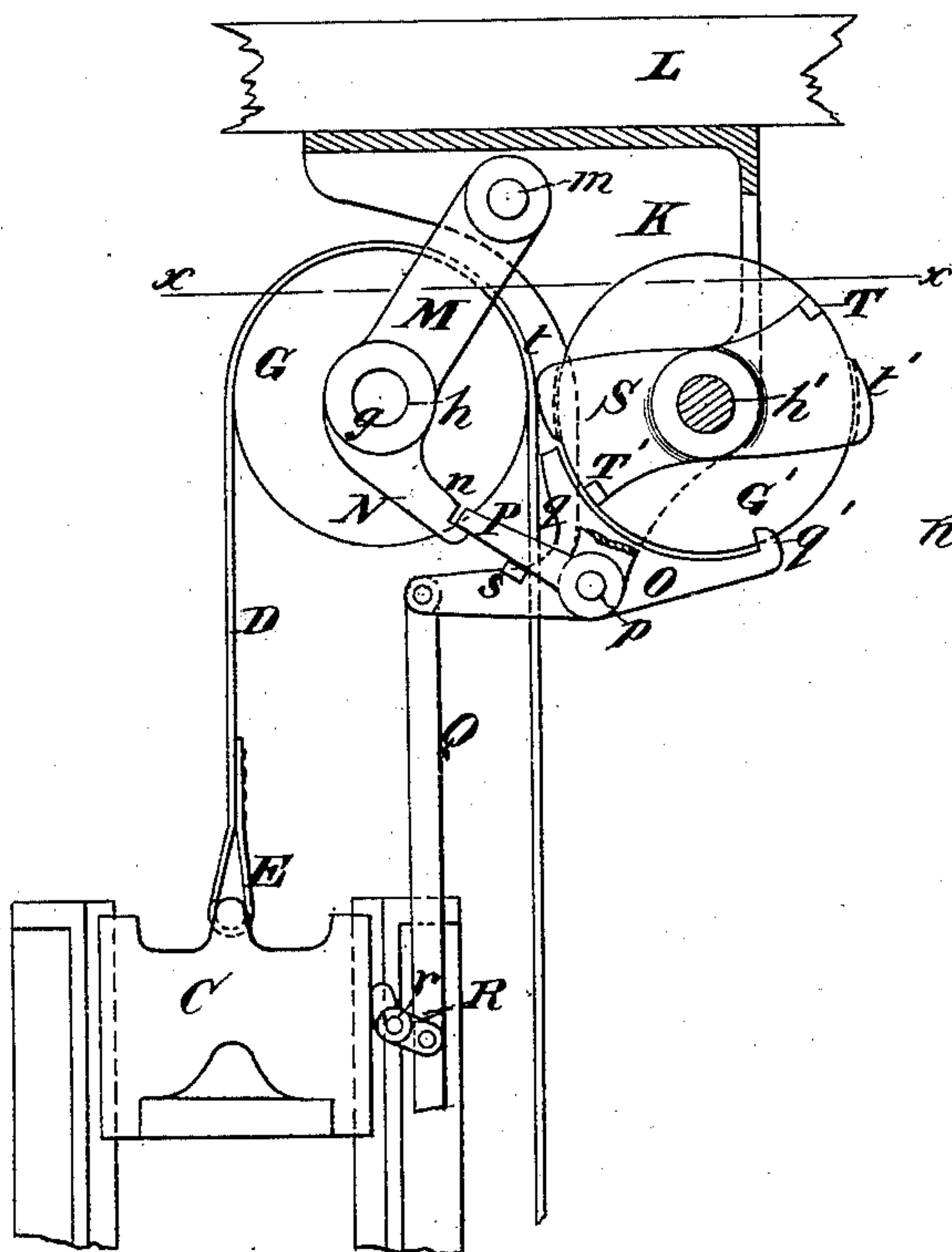


Fig. 4.

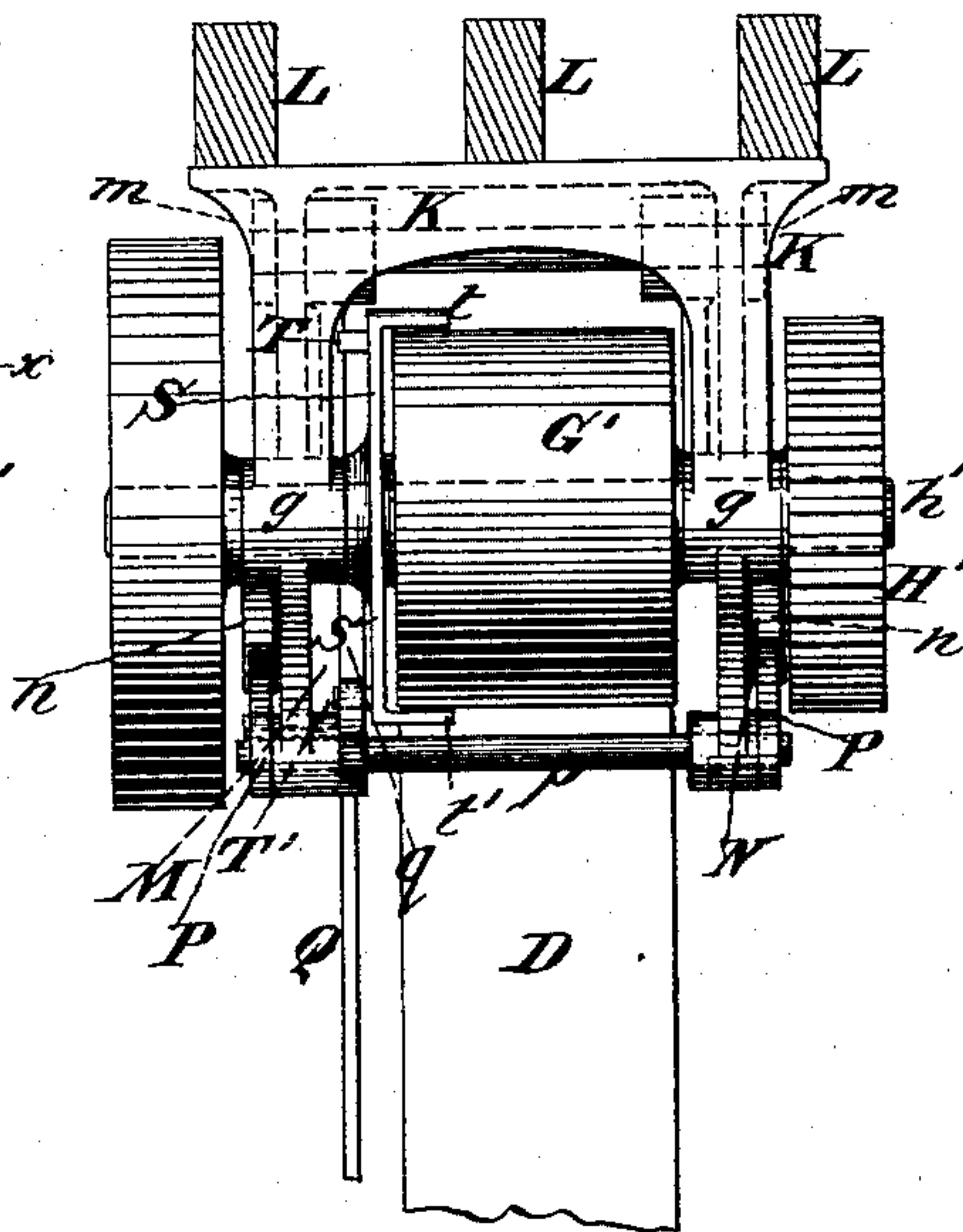
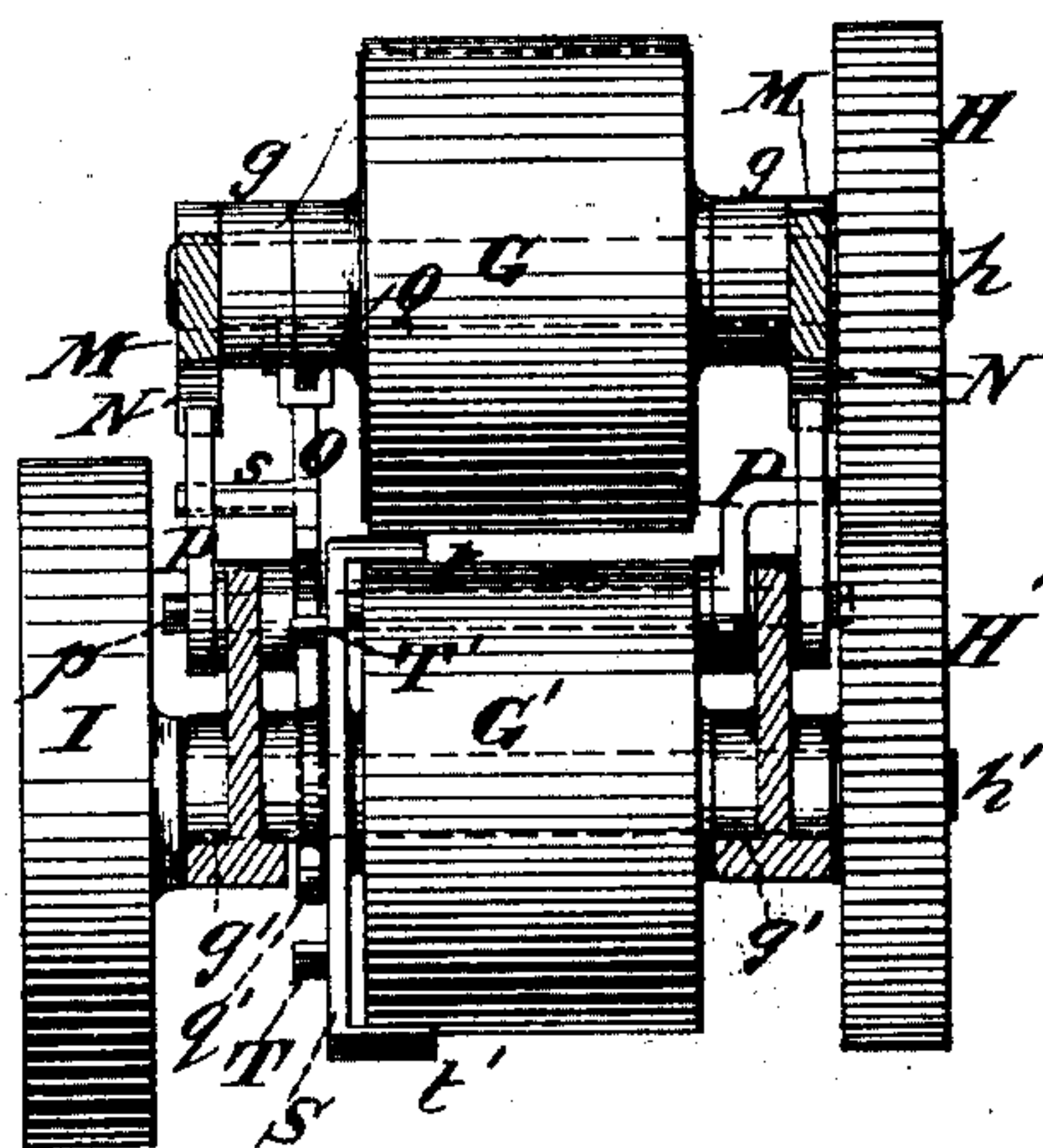


Fig.5.



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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. 370,952, dated October 4, 1887.

Application filed December 17, 1886. Serial No. 221,891. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. LEAVITT, of Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Drop-Hammers; and I do hereby declare that the following, with reference to the accompanying drawings, is a full, clear, and exact description of the same.

My invention relates to that class of drop-hammers in which the hammer is raised by some flexible connection—as a strap, band, or belt—alternately engaged and released from pressure by friction-pulleys, the hammer-head or drop falling by the action of gravity to apply its living force in a blow upon material to be worked, or upon dies, swages, &c., for working such material.

The improvement has for its general object the supply of a gripping and releasing mechanism more certain and reliable in its action upon the flexible connections of this class of hammers than has hitherto been attained, and more particularly in use for the drop-hammer patented to me September 28, 1886, the patent being numbered 350,007, experience having shown that with this drop-hammer, as well as with others that preceded it, the release of the belt is so irregular that the weight sometimes falls before such release is perfectly effected, thus not only retarding the velocity of fall of the hammer-head and lessening its efficiency, but violently straining the belt sometimes to the point of actually tearing it asunder. Of course this strain upon the belt also adds to the wear of the gripping and releasing mechanism, and these defects combine to render a more positive release of the flexible connection of such hammers extremely desirable.

In my former invention the driving-grasp of the friction-pulleys on the belt was effected partly by the weight of the hammer-head hanging from one of the pulleys, but chiefly by the action of gripping and releasing devices, which acted to positively force or clamp the pulleys together, which system was not found to be sufficiently quick or sensitive in the releasing action, and was hence liable to retard the fall of the hammer or tear the belt. In my present invention, however, the driving-grasp of the pulleys on the belt is effected solely by the weight of the hammer itself,

which hangs by its attached belt from a pendulous or movable driven pulley, which is thereby forced against the fixed driving-pulley, between which the belt passes, both of said pulleys being geared together. A wedging or separating device is arranged to relax or separate the pulleys, so as to lift the pendulous or gravitating pulley away from the fixed pulley, and thus allow the hammer to fall free, and this wedging or separating device is operated by tappets struck by the hammer-head at each end of the stroke.

My present invention, therefore, consists, mainly, in the features above outlined, and in the special construction and arrangement of the friction-pulleys and the separating device, as hereinafter fully set forth and claimed.

Figure 1 is partly a section and partly a side elevation of a drop-hammer comprising my improvement, the hammer-head being in the position of rest, which it may occupy as well when the pulleys of the gripping and releasing mechanism are in motion (indicated by the arrows in the figure) as when they also are at rest, which will subsequently more plainly be shown. Fig. 2 is a similar sectional side elevation showing positions of parts when the hammer-head is rising preparatory to striking its blow. Fig. 3 is a partial sectional and side elevation showing the hammer-head raised nearly to the point of release and illustrating the action of certain parts of the mechanism preliminary to the positive release of the strap or belt. Fig. 4 is a front view of a part of the machine, and Fig. 5 is a section on the line *x* in Fig. 3.

A, Figs. 1 and 2, is the base or anvil support, and from this base rise two guides, B, for the hammer-head or drop, in the usual manner. The hammer-head is lettered C. The flexible connection (in this instance a belt or strap) is lettered D. It is attached to the hammer-head at E in the usual manner. To the side of one of the guides B is pivoted a pawl-lever, F, which, engaging recessed teeth *f* on the hammer-head, holds the latter from moving when so engaged, and which, by means of a link, *a*, connecting it with a treadle, may be disengaged from the hammer-head to allow the latter to fall.

The parts thus lettered and referred to, be-

ing all old and well known in the art, will require no further detailed description.

It is in the construction and operation of the mechanism above these parts and in means whereby it is controlled by the movement of the hammer-head that my present invention wholly consists.

The strap or belt D extends up over a pulley, G, and down between said pulley and another pulley, G', the unattached end of the belt below said pulleys hanging free. These pulleys are of equal diameters, and their shafts h h' , to which they are keyed, are geared together by spur-gears H H', which arrangement secures equal circumferential velocity in the perimeters of the pulleys. To the shaft h' is also keyed a driving-pulley, I, at the end opposite the gear H'.

The faces of the pulleys G G', which, when the hammer-head is raised by the belt, firmly grip or clamp the latter between them, are, by mechanism about to be described, slightly moved away from each other to release the belt from such clamping action when the hammer is desired to fall and deliver its blow, the teeth of the spur-gears H H' being sufficiently deep to permit this motion without unmeshing with each other.

The pulleys G G', gears H H', and shafts h h' are all supported by bearings g g' , formed in or on or supported by a stout frame, K, which may be mounted on top of the guides B, or may be attached to overhead supports or floor-beams L by any suitable means, as shown, and in proper relation with the hammer-head—that is to say, in such relation that the end of the belt or strap attached to the hammer-head is in the same vertical plane as that part of the face of the pulley G from which the belt begins to separate when the hammer begins to fall.

The bearings g' of the pulley-shaft h' are fixed to the frame K. Those of the shaft h are movable, to allow the slight motion of separation above mentioned for the release of the strap when the hammer-head is desired to fall. The bearings g of the shaft h are formed in a swinging support, M, which is pivoted to the frame K at m . The center of the pivot m is placed considerably nearer the vertical plane through the center of the shaft h' than is the center of the shaft h , which causes the frame M always to hang in a position inclined to the vertical plane referred to. This is an important principle of the construction. It will be seen that through this feature the pulley G is pendulous and tends to gravitate normally against the pulley G', and that the weight of the hammer-head, acting through the strap or belt hanging from said pendulous pulley, presses the pulley G constantly toward the pulley G' when the hammer-head is being drawn up, and this action alone suffices to firmly grip or clamp the belt without any other mechanism than that described, so that the force of the grip is thus determined solely by the weight of the hammer itself, thus greatly sim-

plifying the construction and securing a powerful pressure upon the belt difficult to attain by other means. This mechanism also permits the employment of other mechanism, described below, of a very simple and positively-acting character for releasing the flexible connection at the proper time for dropping the hammer-head and from any desired height, according to the adjustment of a certain tappet, R, hereinafter described, which mechanism entirely obviates the above-mentioned danger of tearing the strap or belt or appreciably retarding the fall.

From the lower part of the support M, which carries the bearings g for the pulley G, extends backward toward the pulley G' a projection, N, preferably at or nearly at right angles with the main portion of said support. The extremity of the projection N has formed in it a notch, n , the use of which will be hereinafter explained.

To the lower part of the frame K is pivoted at p an escapement, O. This escapement preferably has the form shown, and is pivoted at or about its middle part to the frame K. It has formed upon or attached to it an upwardly-extending flat-ended projection, q , and at one end a hook or tooth, q' . The other end is pivoted to a link, Q, which descends from the escapement, and is also pivoted below to tappets R R', which in their turn are pivoted at r r' to one of the upwardly-extending hammer-head guides B.

To the escapement O is concentrically pivoted a pawl, P, which, when the machine is in action, alternately engages and disengages the projection N in the notch n . The lower face of said notch serves as a support for the pawl, and the upwardly-extending face of the notch acts as an abutment against which the flat end of the pawl presses to hold the support M in the position shown in Figs. 1 and 3, which is its position either at the time the hammer-head is at rest, as shown in Fig. 1, or preparatory to freeing the belt from the pressure of the pulleys for permitting the fall of the hammer-head.

Projecting from the side of the escapement O is a lateral projection, s , which is situated between the central pivot of the escapement and the link Q, and which, when the end of the escapement pivoted to Q is forced upward, lifts the pawl out of its engagement with the notch n in the projection N.

Pivoted to the shaft of the pulley G' is a wedging separator or cam, S, which, when free, turns upon said shaft by the action of friction only. This is an important part of the mechanism, its action being to press apart at proper times the pulleys G and G', in order to release the belt or strap D and permit the fall of the hammer. Its construction is as follows: It consists of a flat body with a central hub bored to fit with sufficient accuracy the shaft h' , and at diametrically-opposite parts of said plate are wedges t t' , projecting laterally in such manner as to overlies the perimeter of

the pulley G, as shown; also, from that side of said plate which faces toward the driving-pulley I are laterally-projecting stops T T', said stops being also placed in diametrically-opposite positions, the preferable relative positions of said stops with reference to each other and the wedges being that shown in Figs. 1, 2, and 3.

The operation is as follows, starting with the hammer-head in the position of rest and supported in that position, as shown in Fig. 1: The hammer is started by the disengagement of the pawl F. The pulleys G and G' are held apart by the action of the pawl P against the projection N of the support M, and hence the belt is freed from the gripping action of the pulleys. The hammer then freely falls. On reaching the tappet R' it forces the inner extremity of said tappet downward and raises the link Q. This forces the projection s upward against the pawl P, and, disengaging said pawl from the projection N, allows the support M to swing downwardly on its pivot m, thus carrying the pulley G toward the pulley G' till the belt is pressed between said pulleys. The action of the pulleys then tightens the belt against the resistance of the weight of the hammer, and the tension thus created draws the pulley G downward and toward the pulley G' with the force due to said weight, thus effectively and positively clamping said belt between said pulleys—a simple and certain method of securing this action, which, so far as I am aware, is entirely novel in drop-hammers. The hammer being lifted in the manner described, in its ascent it strikes against the inner end of the tappet R. This depresses the outer end of said tappet and forces downward the link Q. This rocks the escapement correspondingly and releases the pawl P from engagement of the projection s, allowing the pawl to drop freely and engage the projection N by the notch n as soon as the parts are brought into position for such engagement. Now during the rising of the hammer-head the wedging-separator S turns with the shaft h' and pulley G' by the action of friction till the stop T abuts against the upwardly-projecting part q of the escapement O and there rests, bringing the wedge t of the separator S into the position shown in Fig. 2, and when the hammer-head reaches and raises the inner end of the tappet R to depress the link Q the movement of the escapement O, pivoted to said link, causes the projection q to disengage the stop T on the separator. The wedge t then enters between the pulleys G G' and between the belt D and the pulley G', and, rotating concentrically with and being drawn into the bite of the pulleys, thus forces or wedges the pulleys apart to the position shown in Fig. 3. The pawl then drops into the notch n on the support M, and thus the pulleys are held asunder during the drop of the hammer. The wedge t then passes between the pulleys until the stop T engages the hook or tooth q' on the escapement S, as seen in Fig. 1. This prevents further rotation

of the wedging-separator till the hammer-head reaches and actuates the tappet R', which, raising the link Q, again rocks the escapement into the position shown in Fig. 2, when the opposite end of the wedging-separator repeats the action described, the opposite ends of the separator thus alternately acting to separate the pulleys and release the belt.

If desired to relieve the belt from dragging over the perimeter of the pulley G when the hammer falls, any of the devices heretofore employed for that purpose, especially the one described in the patent above referred to as granted to me, may be employed.

It is evident that changes in proportion and arrangement of parts, as well as in their form, may be made without substantially affecting the principle and operation of my improvement, which attains a combination of efficiency and simplicity that leaves little to be desired.

It will be readily seen that I do not limit myself to any special number of projections t or stops T on the revolving separator S, as they may be from one to many, two, four, or six being, however, preferable. The shape of the projections t t' is preferably wedging; but this is not essential, as a projection of any form will act as a wedge between the pulleys. I do not, however, limit myself to any particular form of wedging or separating device to separate the pulleys, provided the hammer is so hung from the pulleys that its weight alone acts to force them together and determines the grasp of the pulleys on the belt in lifting the hammer, as this is broadly new with my present invention.

What I claim is as follows:

1. In a drop-hammer, the combination, with the hammer-head, of two separable friction-pulleys, to which the power is imparted, one of said pulleys being fixed and the other free to press or gravitate thereagainst, with a belt or band passing from said hammer-head over said free movable pulley and between the two pulleys, whereby the weight of the hammer acts as the sole force to press the pulleys together and cause the hammer to be lifted, with a separating device to separate said pulleys and allow the hammer to fall, substantially as herein set forth.

2. In a drop press or hammer, the combination, with two separable gripping and driving pulleys, one being fixed and the other free to press or gravitate thereagainst, of a flexible strap or connection extending from the hammer-head and passing over the free pulley and between that and the fixed pulley, a movable separator arranged to effect the separation of the free pulley from the fixed pulley, tappets or projections arranged in the path of the hammer at the ends of its stroke, and operative connections between said tappets and separator, substantially as shown and described.

3. The combination, in a drop-hammer, with a fixed driving-pulley, of a pendulous or movable driven pulley tending to gravitate freely against the fixed pulley, a flexible connection or band passing between said pulleys and over

the pendulous pulley and hanging pendent therefrom, and a hammer-head attached to said pendent strap, with a device for separating the pendulous pulley from the fixed pulley at intervals in accordance with the strokes of the hammer-head, substantially as herein set forth.

4. The combination, in a drop-press, of the fixed pulley G' and movable driving-pulley G with the pivoted pendulous frame M, in which the same is hung, flexible connection D, passing between said pulley and over the pulley G, and hammer C, hung to said connection, with a supporting or separating device to normally hold the pendulous pulley away from the fixed pulley and alternately allow the same to gravitate against said fixed pulley by the weight of the hammer-head, substantially as shown and described.

5. The combination, with a drop-hammer head, two separable friction-pulleys, and a flexible connection attached to said head and engaged by said pulleys, of a wedging-separator arranged to pass between and separate said pulleys, and mechanism for holding the pulleys apart when so separated until the hammer-head has effected its blow, substantially as and for the purposes described.

6. In a drop press or hammer, the combination, with the hammer-head and a belt or band whereby the same is lifted, of two separable friction-pulleys, to which the driving force is imparted, and between which the belt is gripped and drawn to raise the hammer-head, with a revolving separator or wedge arranged to enter the bite of the pulleys, and thus revolve with the same and separate the pulleys by the action of the rotating force, and thereby free the belt and allow the hammer to fall, with escapement or detent mechanism controlling the arrest and release of the separator coincident with the motions of the hammer, substantially as herein set forth.

7. The combination of two separable friction-pulleys, a drop-hammer head, a belt or strap attached to said head and engaged with said pulleys, and a wedging-separator pivoted to the shaft of the fixed pulley and arranged to pass between said pulleys at the proper time for forcing said pulleys apart, releasing the belt or strap from pressure and permitting the hammer to drop, substantially as and for the purpose set forth.

8. The combination of a friction-pulley having fixed bearings, a movable pulley, a swing-

ing support for such movable pulley, a drop-hammer head, a strap, belt, or band engaged with said pulleys and attached to said head or drop, and a wedging-separator pivoted to the shaft of the fixed pulley and arranged to pass between and separate said pulleys at the proper time for releasing the belt and permitting the hammer-head to fall, substantially as and for the purposes specified.

9. In a drop press or hammer, the combination, with the fixed driving-pulley G', movable driven pulley G, pendulous frame M, strap D, hammer C, and gearing H H', of suitable means for causing the approach and separation of said geared pulleys, substantially as shown and described.

10. In a drop-hammer, the lifting mechanism of which consists in two friction-pulleys, one of which has fixed and the other movable bearings, and a strap, belt, or band clamped between said pulleys and attached to the hammer head or drop, the separator herein described, which consists of a body, S, pivoted to the shaft of the pulley having fixed bearings, and having formed on it wedges *t* and *t'*, extending laterally from said body over the perimeter of the pulley having said fixed bearings, substantially as and for the purposes set forth.

11. In a drop-hammer, the combination of a hammer head or drop, C, a pulley, G', having fixed bearings, a swinging support, M, having the notched projection N, a pulley, G, having bearings in said swinging frame, a strap, belt, or band, D, attached to the hammer-head, passing over the pulley G and between the pulleys G and G', a wedging-separator, S, pivoted to the shaft of the pulley G', and having formed thereon laterally-extending wedges *t* and stops T T', an escapement, O, pivoted to the supporting-frame of said fixed pulley, and provided with an upwardly-extending projection, *q*, and hook or tooth *q'*, a pawl, *p*, pivoted to said escapement or support for alternately engaging and disengaging said projection N, tappets or tappet-levers R R', pivoted to guide B, and link Q, pivoted to and connecting the escapement O with said tappets or tappet-levers, substantially as and for the purposes specified.

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Witnesses:

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