No. 632,265.

Patented Sept. 5, 1899.

J. A. HORTON.

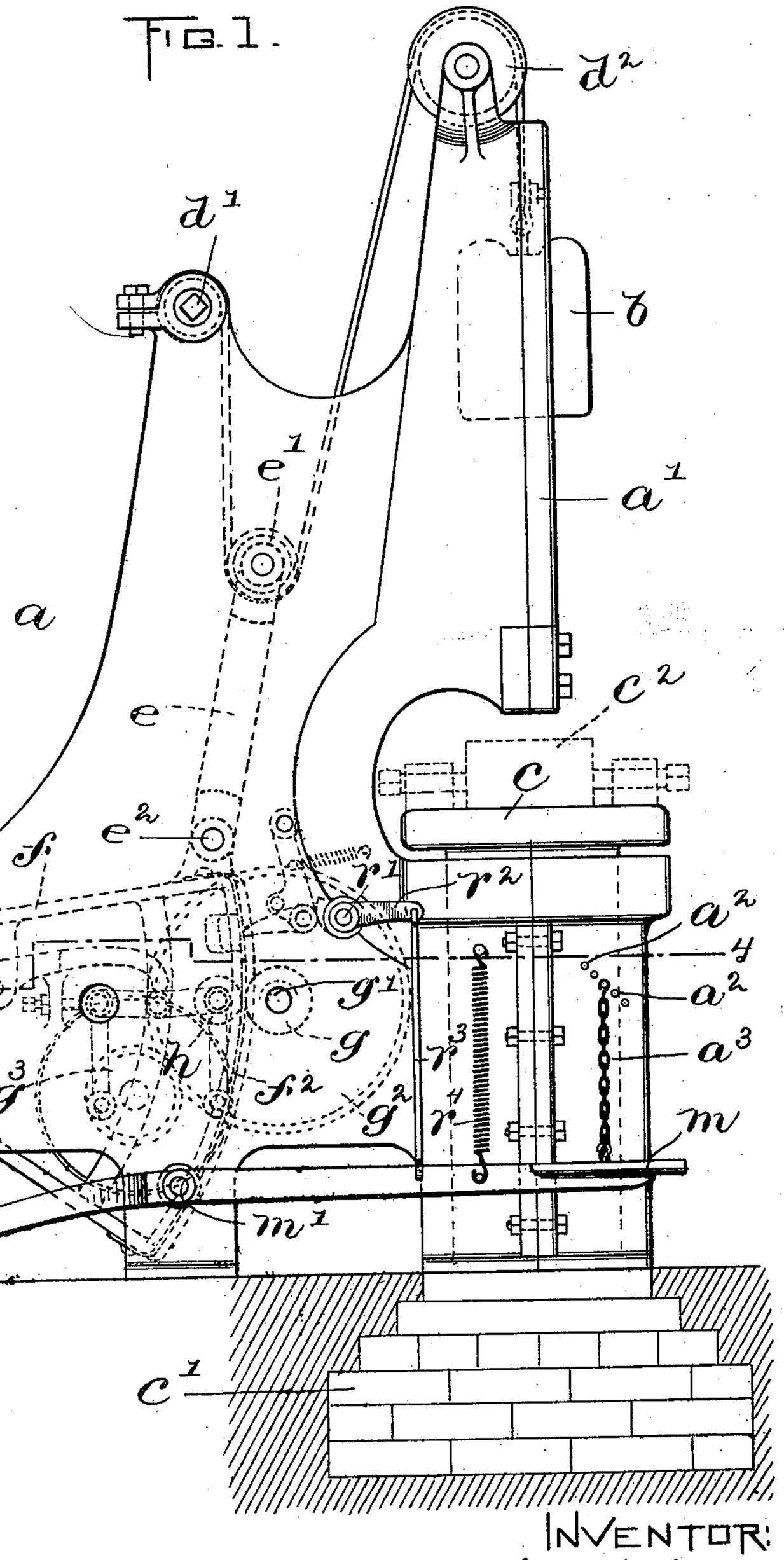
DROP HAMMER.

(Application filed July 9, 1898.)

(No Model.)

4 Sheets—Sheet 1.

FIG. 1.



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(No Model.) 4 Sheets—Sheet 2.

FIG. 2.

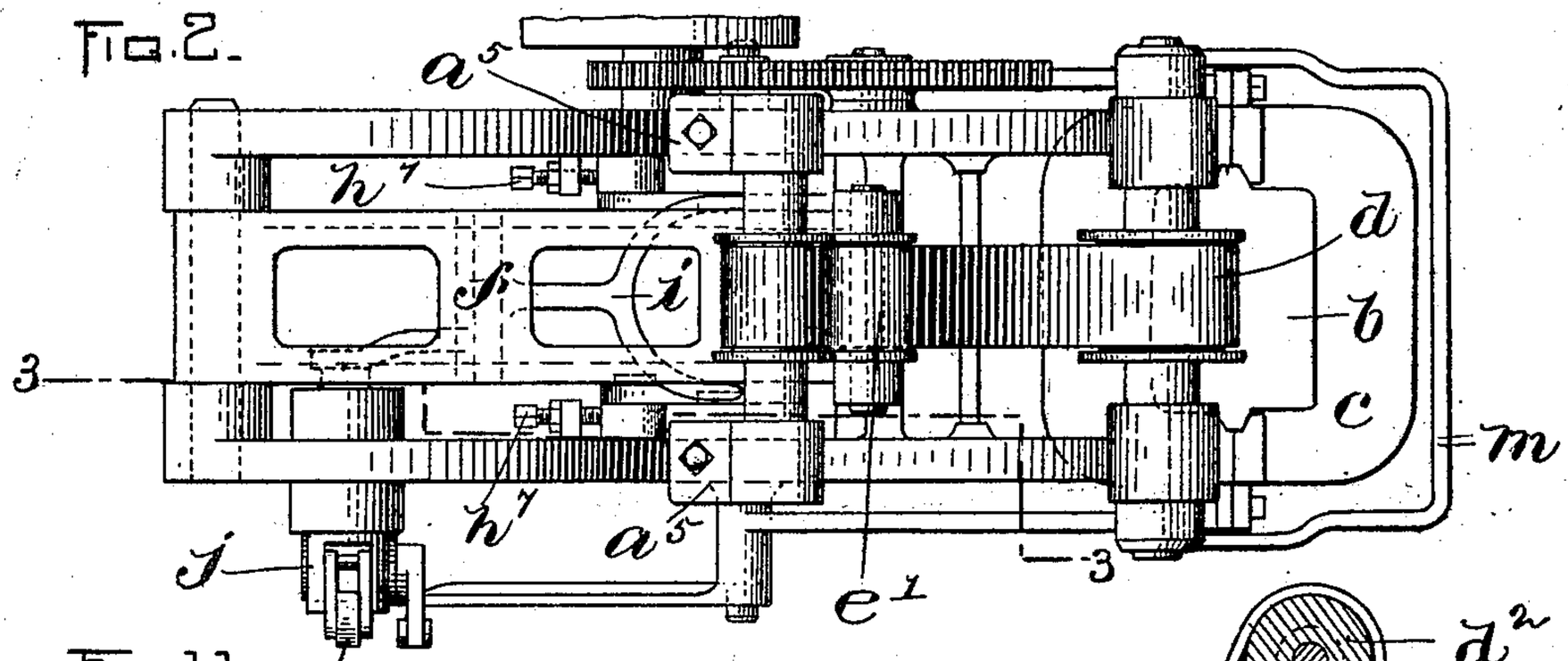

FIG. 11.

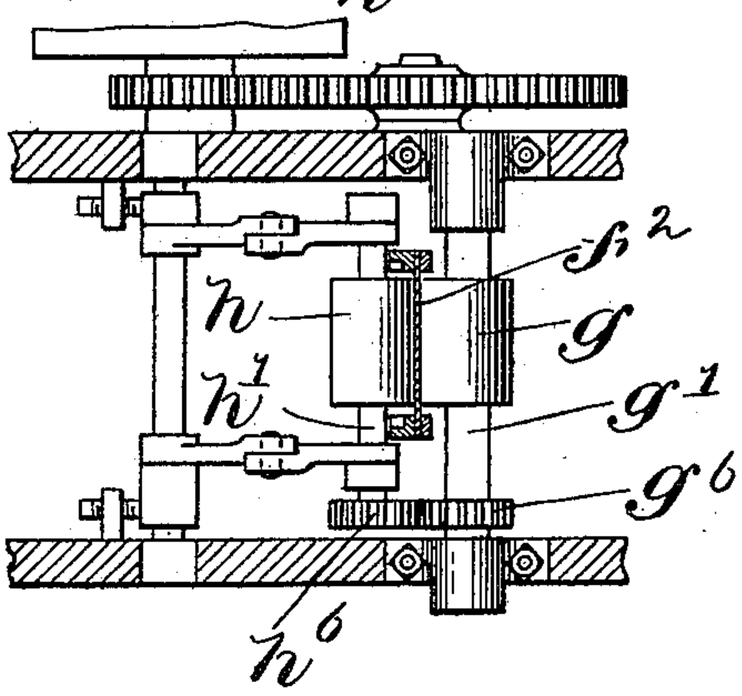

FIG. 3.

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(No Model.) 4 Sheets—Sheet 3.

FIG. 5.

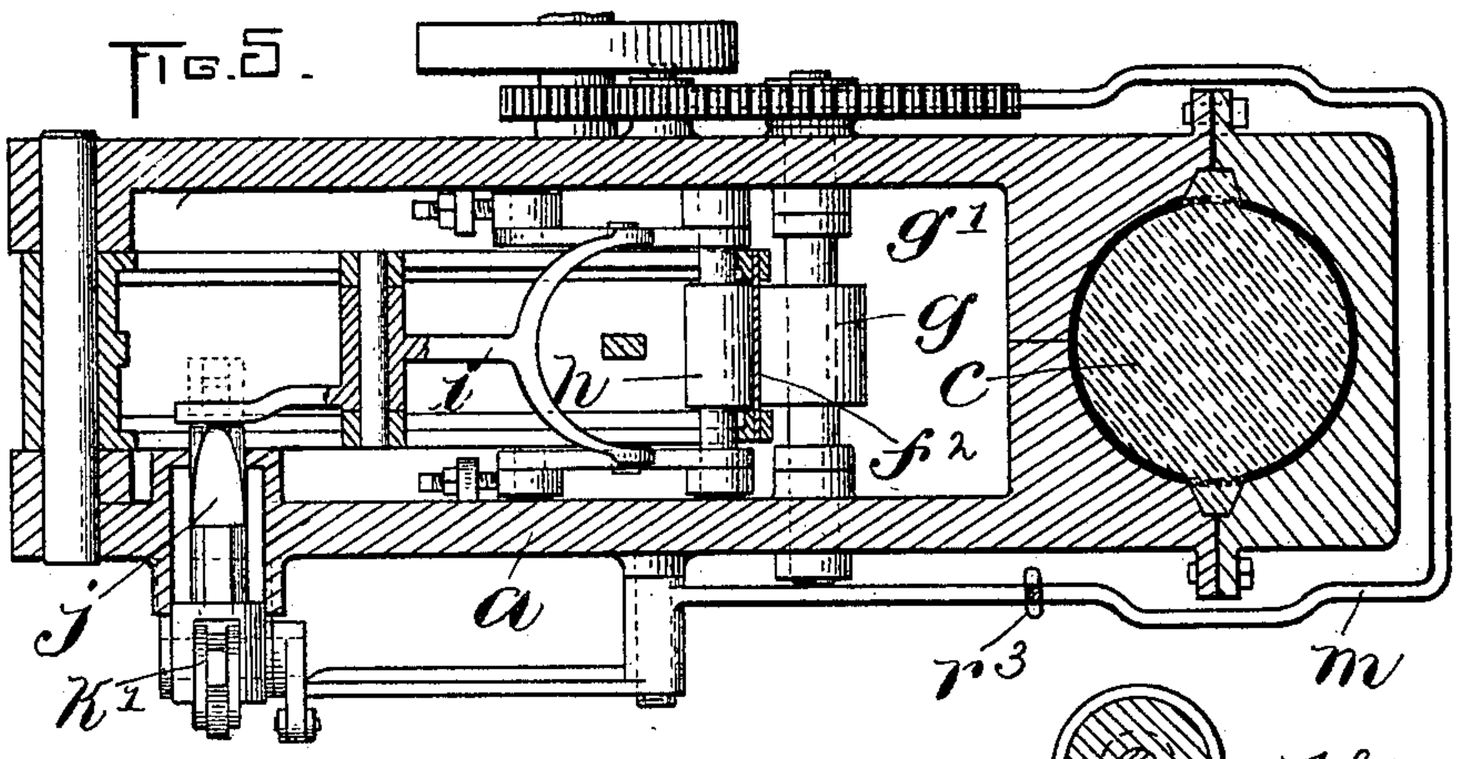


FIG. 6.

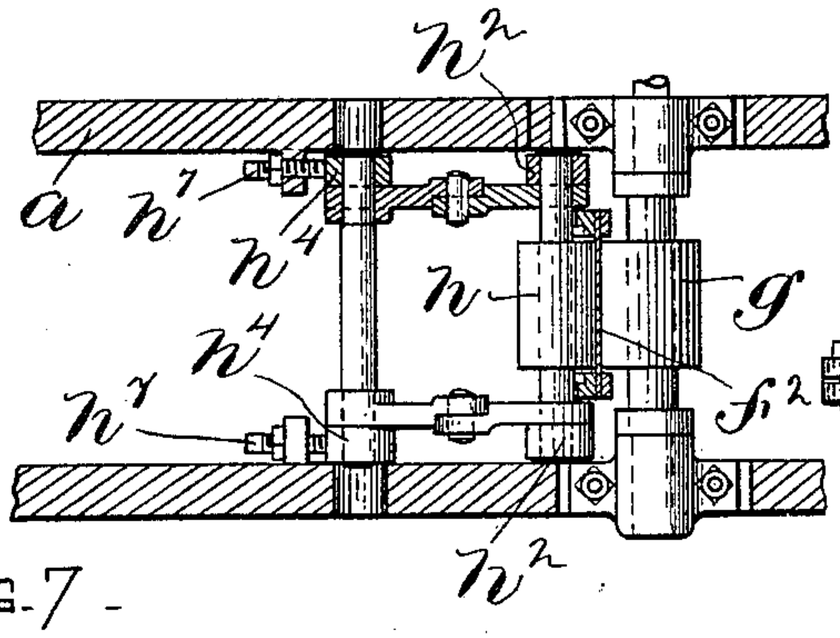


FIG. 7.

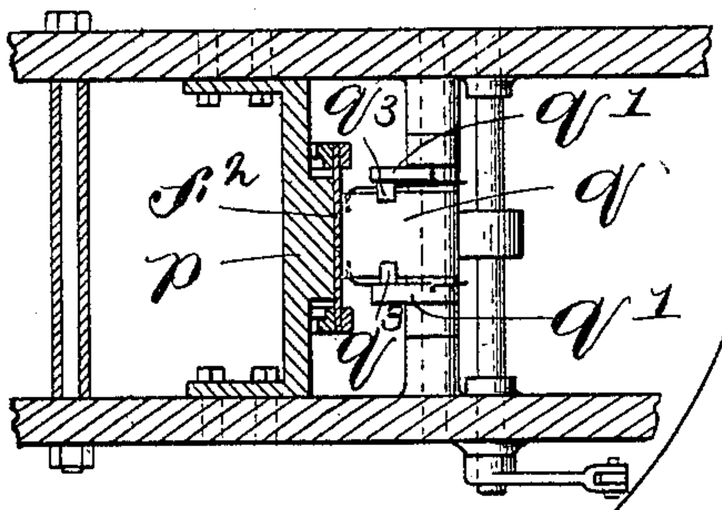
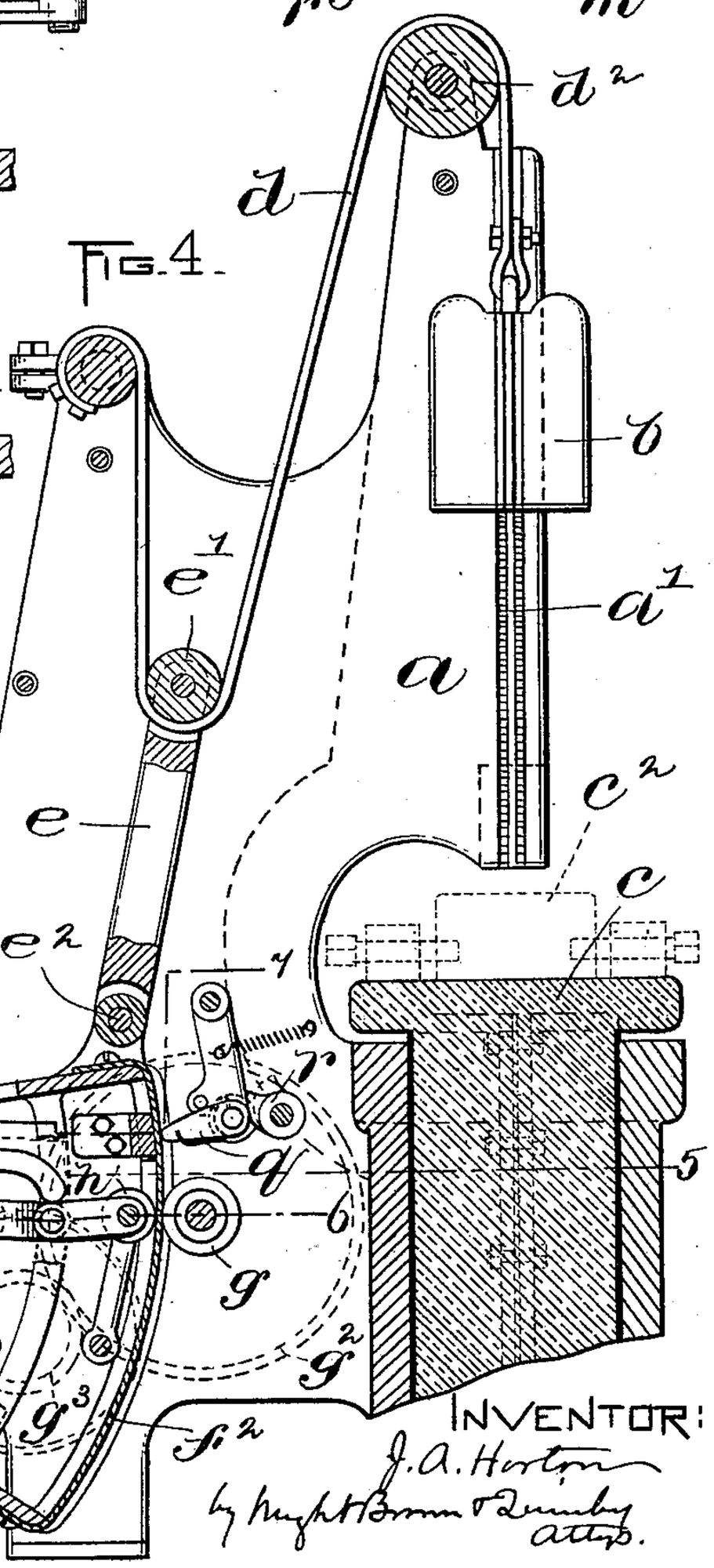


FIG. 4.



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(No Model.) 4 Sheets—Sheet 4.

FIG. 8.

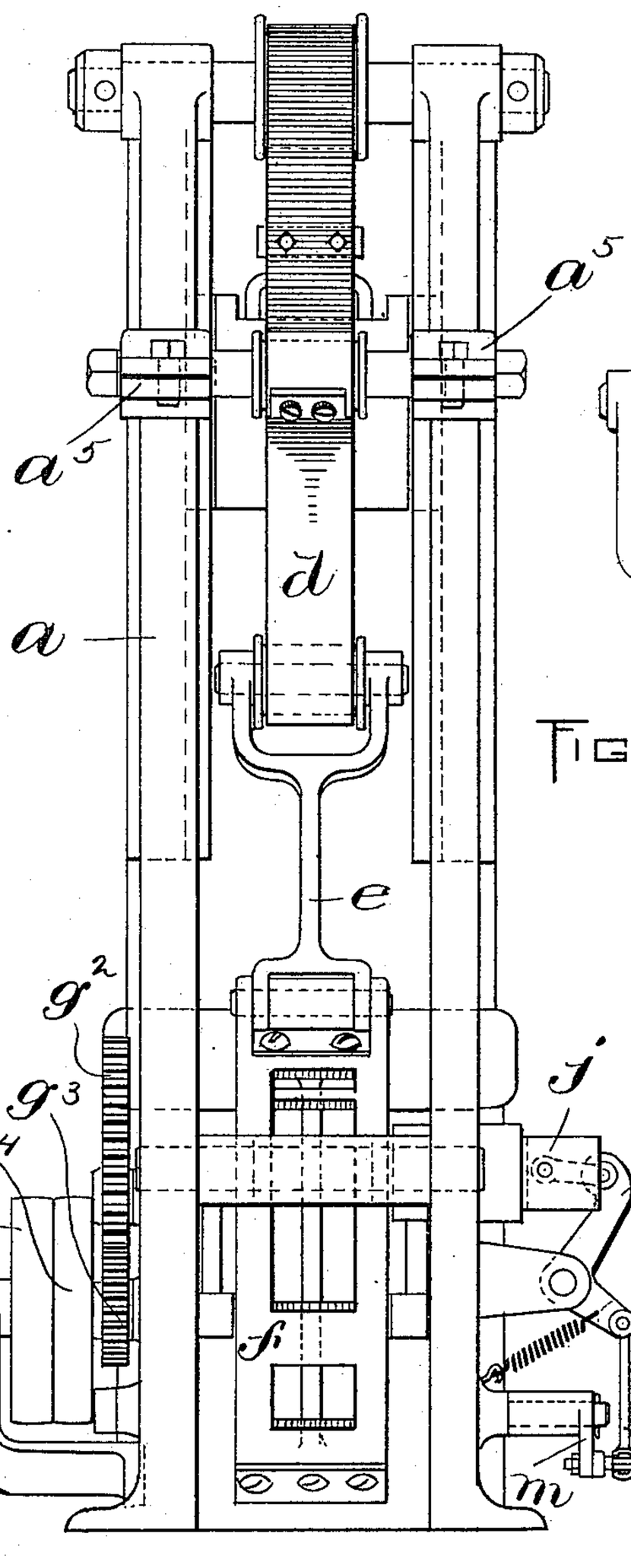


FIG. 9.

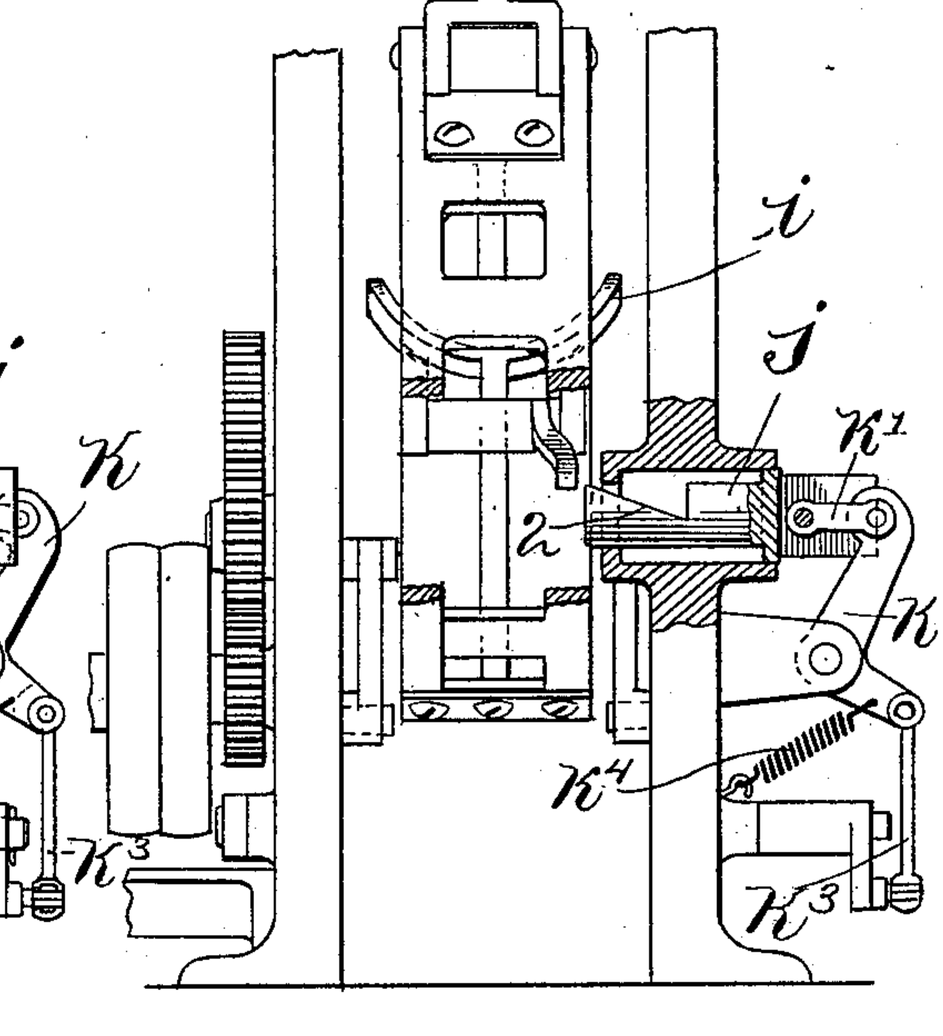
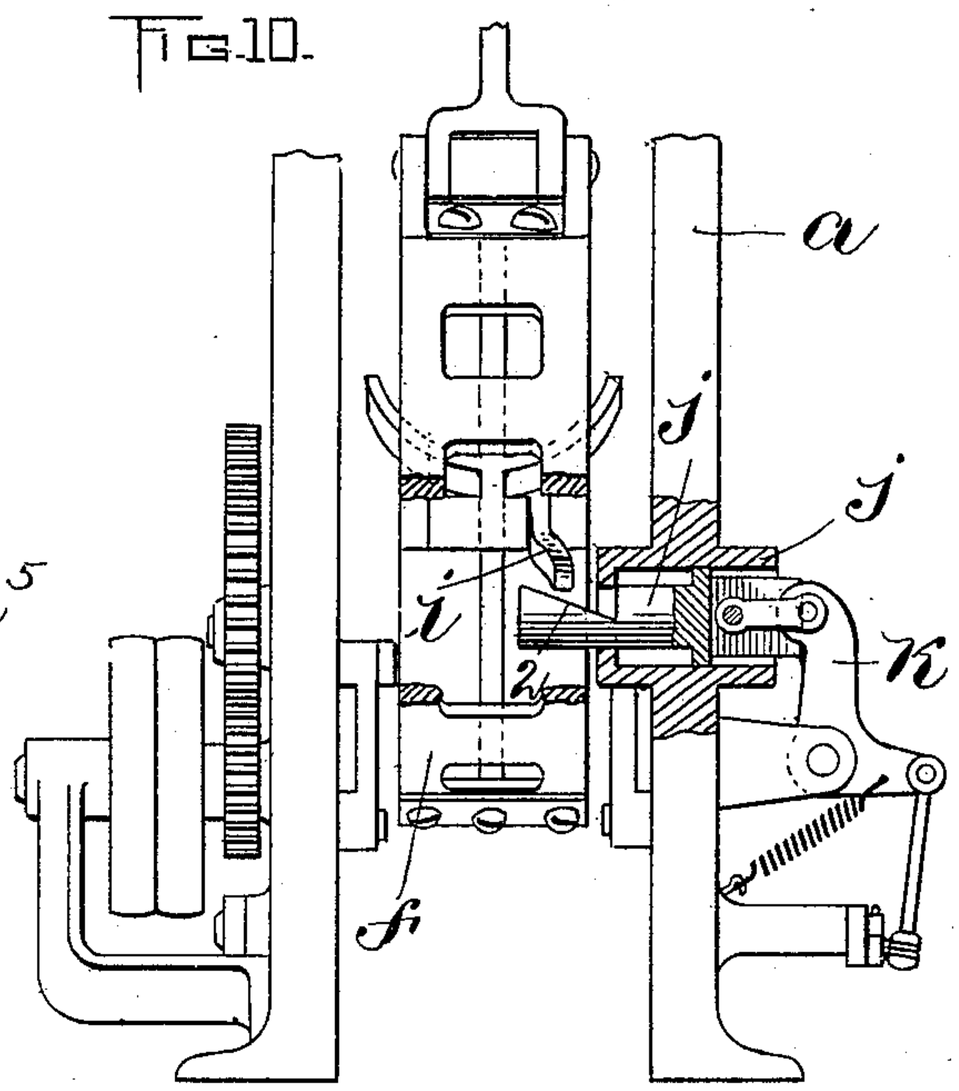


FIG. 10.



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UNITED STATES PATENT OFFICE.

JAMES A. HORTON, OF READING, MASSACHUSETTS.

DROP-HAMMER.

SPECIFICATION forming part of Letters Patent No. 632,265, dated September 5, 1899.

Application filed July 9, 1898. Serial No. 685,486. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. HORTON, of Reading, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Drop-Hammers, of which the following is a specification.

This invention relates to drop-hammers; and it has for its object to provide a machine of the said character in which blows of graduated strength or force may be obtained.

The invention consists in the improvements which I shall now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of a drop-hammer constructed in accordance with my invention. Fig. 2 represents a top plan view thereof. Fig. 3 represents a section on line 3 3 of Fig. 2. Fig. 4 represents a similar view with the parts in another position. Fig. 5 represents a section on line 5 5 of Fig. 4. Fig. 6 represents a detail section on line 6 6 of Fig. 4, with parts in plan. Fig. 7 represents a detail section on line 7 7 of Fig. 4. Fig. 8 represents a rear end elevation. Fig. 9 represents a partial rear end elevation with portions broken away and the parts thereat in section. Fig. 10 represents a similar view with parts in another position. Fig. 11 represents a view similar to Fig. 6, showing a modified construction.

The same reference characters indicate the same parts in all the figures.

Referring to the drawings, a is the frame of the machine, having vertical guides a' a' for the drop-hammer b.

c is a column or bed supported on an independent foundation of masonry c' and carrying on its upper end an anvil-block c^2. (Shown in dotted lines.)

d is a flexible strap attached at one end to the hammer b and at the other end to a bar d', which is held in clamps a^5 on the frame and is adapted to be rotated to adjust the strap. The strap d passes over a roll d^2 at the top of the frame and is arranged to form a bight or loop between the said roll and the bar d'.

e' is a roll occupying the bight of the strap and mounted at the upper end of a link e, whose lower end is pivotally connected at e^2 with a sector f, pivoted at f' to the frame a. By swinging this sector downwardly the hammer b is raised, and upon releasing the sector the hammer is allowed to drop upon the anvil c^2. For the purpose of moving the sector f I provide its front end with a thin and somewhat flexible metal segment f^2, and in close juxtaposition thereto I arrange a roll g upon a shaft g'. Suitable gearing, including the fast and loose pulleys g^4 g^5 and the gears g^2 g^3, is employed to operate the roll g, and when the machine is running said roll is continuously rotated.

h is a second roll, arranged at the rear of the segment f^2 and loosely mounted on a shaft h', which is carried at the upper end of a pair of arms h^2 h^2, pivoted at h^3 h^3 to the frame of the machine.

h^4 h^4 represent a second pair of arms, pivoted at h^5 h^5 to the frame a and connected with the arms h^2 by means of toggle-levers h^6 h^6, forming knuckle-joints. When these levers are moved to straighten out the joints, the roll h' is caused to press the segment f^2 into close frictional contact with the rotating roll g, and the latter because of this engagement depresses the sector f and raises the hammer b. When the knuckles are broken, the pressure is relieved and the hammer drops and raises the sector unless the latter is obstructed, as hereinafter explained.

h^7 h^7 are stops forming a rear support for the arms h^4 and consisting of screws supported by ears a^4 a^4 on the frame a and provided with lock-nuts h^8 h^8. The adjustment of these stops determines the degree of pressure between the rolls g and h.

For the purpose of straightening the knuckles of the toggle-joints I provide the sector-frame f with adjustable lugs f^3, Fig. 3, which may be arranged to come in contact with the knuckles at a predetermined point in the rise of the sector.

i is a forked lever pivoted between ears f^4 f^4, formed on the sector-frame f and adapted to engage the knuckles of the toggle-levers and break the joints at a desired point in the downward movement of the sector under the influence of the friction-rolls. The position of the front end of the lever i, and hence the length of stroke of the sector, is regulated by means of the following mechanism:

j is an adjusting-slide operating on the prin-

ciple of a cam or wedge and having an inclined or beveled portion 2. (Best shown in Figs. 9 and 10.) Said slide occupies a transverse socket in one side of the frame *a* and operates beneath the rear end of the lever *i*. According to the position of this slide the operating end of the lever *i* is raised or depressed with respect to the segment-frame *f*. Thus when a high portion of the slide *j* is underneath the rear end of the lever *i*, as shown in Fig. 10, the forward end of the latter is depressed with respect to the sector-frame and the sector is only allowed to have a short stroke under the influence of the friction-rolls before the toggles are broken and the hammer dropped. When the slide is pushed into its socket, so as to bring its low portion beneath the rear end of the lever *i*, the forward end of the latter is raised with respect to the sector-frame and the knuckles are broken after a longer stroke of the sector. The slide *j* is actuated by means of a bell-crank lever *k*, connected to said slide by a link *k'* and pivoted to the frame *a*. The said lever is operated by a treadle *m*, pivoted at *m'* to the frame and connected to the lever by means of a link k^3. A spring k^4 normally operates to retract or withdraw the slide *j*.

As a means for arresting and sustaining the hammer at any point I provide mechanism including a fixed abutment *p*, arranged at the rear of the segment f^2, and a dog *q*, adapted to coöperate with said abutment to bind the segment and prevent upward motion of the same. The dog *q* is pivotally mounted in front of the segment f^2 at the lower ends of two arms *q' q'*, pivoted at q^2 q^2 to the frame of the machine, said arms carrying stop-pins q^3 to limit the upward movements of the dog and springs q^4 to yieldingly actuate said dog in an upward direction.

r is a cam mounted on a shaft *r'*, whose outer end is provided with a lever r^2, connected by a rod r^3 with the treadle *m*. The arrangement is such that when the said treadle is up the cam operates to move the dog *q* in the direction of the abutment *p*, thus causing the segment f^2 to be gripped between said dog and abutment and held from upward movement. When the treadle is depressed, the said cam operates to release the dog, which is withdrawn by the action of a spring q^5, and the segment is permitted to rise and fall freely.

a^2 a^2 are a series of pins arranged at different heights on the frame of the machine and adapted to be connected by a chain a^3 with the treadle *m*, so as to regulate the distance to which the treadle can be depressed, and thereby determine the position of the bolt *j* and the maximum length of stroke of the sector. A spring r^4 normally operates to raise the treadle.

The operation of the machine will be readily understood from the foregoing description. Supposing the hammer *b* to be raised above the anvil-block and sustained by the action of the dog *q* and abutment *p*, in order to release the hammer the treadle *m* is depressed. As soon as the hammer drops it is immediately raised again by the action of the lugs f^3 in straightening the toggles and causing frictional engagement of the roll *g* with the sector f^2. As soon as the hammer has risen a distance determined by the amount to which the treadle is depressed the toggles are broken by the action of the lever *i*, and if the treadle is still held down the hammer falls again. As long as the treadle is depressed the hammer rises and falls and a quick succession of blows is imparted to the anvil or the material thereon which is being hammered. If at any time the operator desires to maintain the hammer in a raised position, he releases the treadle as soon as said hammer has begun to rise, and the slide *j* is thereby entirely withdrawn from beneath the heel of the lever *i*, as shown in Fig. 9, the cam *r* at the same time moving the dog *q* in the direction of the abutment *p*. The sector *f* is free to move in a downward direction by reason of the yielding of the dog *q* against its springs q^4 and continues to so move until the lever *i* breaks the toggles, when the sector stops, and is then caught between the abutment *p* and dog *q* and restrained from upward movement. A stop f^5 on the frame *f* is provided for limiting the movement of the lever *i* when the slide *j* is withdrawn from beneath said lever. When the hammer is raised away from the anvil, the operator can adjust his work to the desired position, and when he wishes to start the hammer in operation again he depresses the treadle and allows the same to drop, as previously described.

In Fig. 11 I have represented a modification in which the shafts *g'* and *h'* of the rolls *g h* are provided with intermeshing gears g^6 h^6. Both of said rolls are therefore positively and continuously rotated, the movement of the toggles being insufficient to throw the gears out of mesh. By thus gearing the rolls together both rolls have a positive frictional driving engagement with the segment, and the amount of pressure necessary to produce the requisite amount of driving friction is somewhat less than when only one roll is positively driven.

Having thus explained the nature of my invention and described a way of constructing and using the same, although without having attempted to set forth all the forms in which it may be embodied or all the modes of its use, I declare that what I claim is—

1. In a machine of the character specified, a hammer, driving mechanism for raising the hammer, releasing mechanism for said driving mechanism, a device acting automatically on said releasing mechanism at each stroke of the hammer to release the hammer, said device being adjustable to vary the height at which the hammer is released, and an operating-treadle or equivalent constructed and arranged to change the adjustment of said device during the automatic action thereof.

2. In a machine of the character specified, a hammer, mechanism for causing the same to impart automatically a succession of blows, said mechanism having provisions for varying the strength of the blows, a treadle for controlling said mechanism and having successive positions corresponding to the different strengths of blows, a stop for limiting the depression of the treadle, and means for adjusting said stop to vary the limit of depression.

3. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with said hammer, friction-rolls for applying driving power to said segment, and means operated by said segment for causing the engagement and disengagement of said rolls with the segment, whereby the hammer may be automatically raised and released a number of times in succession.

4. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with said hammer, mechanism for applying driving power to said segment, means operated by said segment for causing the engagement and disengagement of said mechanism with the segment, whereby the hammer may be automatically raised and released a number of times in succession, and operating devices acting on said means during such movement of the hammer, for varying the height to which the hammer is raised.

5. A machine of the character specified, comprising an anvil, a hammer, a flexible device such as a strap connected at one end with said hammer and at the other end with a suitable fixed support, a roll operating on said strap, a link connected with said roll, an oscillatory segment connected with said link, and means for operating said segment to raise and release the hammer.

6. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with said hammer, rolls arranged on opposite sides of said segment, means for continuously driving one or more of said rolls, means for automatically causing a driving engagement between the rolls and segment, whereby said segment is moved to raise the hammer, and means for automatically disengaging said rolls and segment, whereby the latter and the hammer are released.

7. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with said hammer, a pair of rolls arranged on opposite sides of said segment, means for continuously driving one or both of said rolls, toggle mechanism connected with one of the rolls and adapted to move the same to cause a driving engagement between the rolls and the segment, or to cause a disengagement of said parts, thereby raising and releasing the hammer, and devices connected with the segment for operating said toggle-levers to cause said movements of the roll.

8. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with said hammer, a continuously-driven roll adapted to engage the segment to move the same and raise the hammer, means for producing such engagement, a device connected with the segment for producing a disengagement of the roll and segment, releasing the hammer, and means for adjusting said device to vary the duration of engagement of the roll and segment and consequently the height at which the hammer is released.

9. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment, a flexible connection between said segment and the hammer, friction-rolls adapted to engage the segment on opposite sides, means for continuously driving one or more of said rolls, and means for producing their operative engagement or disengagement with the segment, whereby the hammer is raised or released.

10. A machine of the character specified, comprising an anvil, a hammer, a reciprocatory part connected with said hammer, a pair of friction driving-rolls adapted to engage said reciprocatory part on opposite sides, means for driving the rolls, a fixed bearing supporting one of the rolls, a movable bearing supporting the other roll, a toggle having one end relatively fixed and the other end connected with the movable roll bearing said toggle when straightened, effecting driving engagement of the rolls with the reciprocatory part, and when broken releasing such engagement, and means operated by the movement of the hammer for breaking and straightening said toggle.

11. A machine of the character specified, comprising an anvil, a hammer, a reciprocatory part connected with said hammer, a pair of friction driving-rolls adapted to engage said reciprocatory part on opposite sides, means for driving the rolls, a fixed bearing supporting one of the rolls, a movable bearing supporting the other roll, a toggle having one end relatively fixed and the other end connected with the movable roll bearing said toggle when straightened, effecting driving engagement of the rolls with the reciprocatory part and when broken releasing such engagement, means operated by the movement of the hammer for breaking and straightening said toggle, and means for adjusting the relatively-fixed end of the toggle to regulate the pressure between the rolls when the toggle is straightened.

12. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with the hammer, mechanism for applying driving power to said segment, a pivotal trip carried by said segment and operating on said mechanism to effect the release of the segment, and an adjusting member mounted on a fixed support and adapted to be moved to change the relative position

of said pivotal trip and thereby vary the point at which said segment is released.

13. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with the hammer, driving-rolls adapted to frictionally engage said segment, a toggle connected with one of said rolls, means for straightening the toggle to cause a driving engagement of the rolls with the segment, a pivotal trip carried by the segment and adapted to break the toggle and cause the release of the segment, and an adjusting member mounted on a fixed support and adapted to engage the heel of said trip, and means for moving said member to vary the point at which the segment is released.

14. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with said hammer, mechanism for applying driving power to said segment, a trip carried by said segment and operating on said mechanism to effect the release of the segment, a cam member mounted on a fixed support and having an inclined face adapted to engage the trip and change its relative position to vary the point at which the segment is released, and a treadle or similar operating means connected with said cam member.

15. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with said hammer, means for operating said segment to raise and depress the hammer, and means for locking said segment to hold the hammer in a fixed raised position, said means including a fixed abutment located on one side of the segment, a second abutment located on the other side of the segment, and movable toward and from said fixed abutment to lock and unlock the segment, and means for operating said second abutment.

16. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with said hammer, means for operating said segment to raise and depress the hammer, a dog adapted to engage and frictionally hold the segment, said dog being so mounted as to yield and permit the movement of the segment in a hammer-raising direction but to lock and prevent the movement of said segment in an opposite direction, and means for moving said dog into and out of locking position.

17. A machine of the character specified, comprising an anvil, a hammer, an oscillatory segment connected with said hammer, means for operating said segment to raise and depress the hammer, the dog q^4 adapted to engage and lock the segment, a pivotal arm carrying said dog, and the rotary cam r adapted to move said dog into and out of engaging position.

In testimony whereof I have affixed my signature in presence of two witnesses.

JAMES A. HORTON.

Witnesses:
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A. D. HARRISON.