(No Model.) 5 Sheets—Sheet 1.

A. J. GREEN.

MACHINE FOR BENDING RAKE TEETH.

No. 321,019. Patented June 30, 1885.

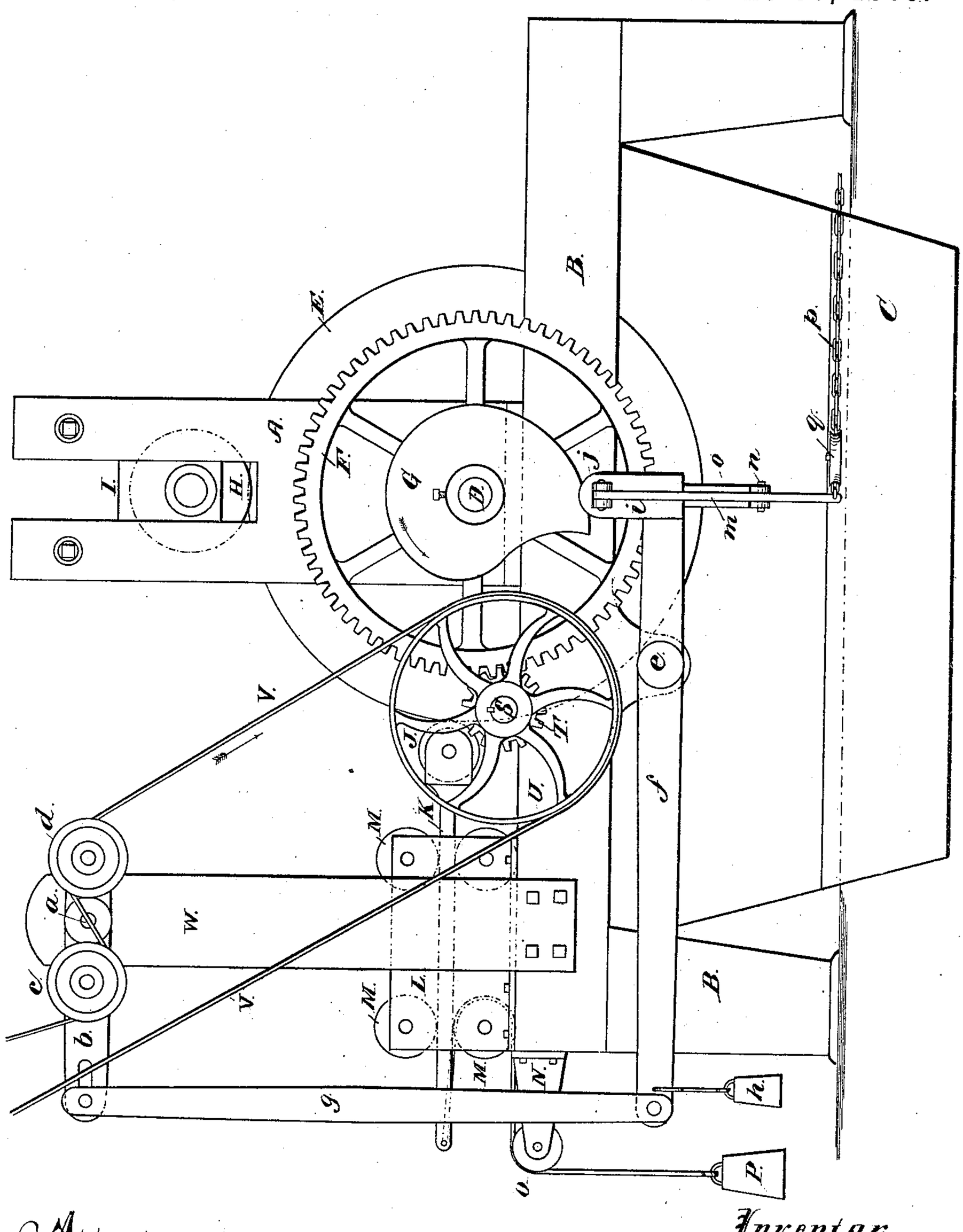

Fig. 1.

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Inventor:
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by Lemp & Peck
his attys

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 5 Sheets—Sheet 2.

A. J. GREEN.

MACHINE FOR BENDING RAKE TEETH.

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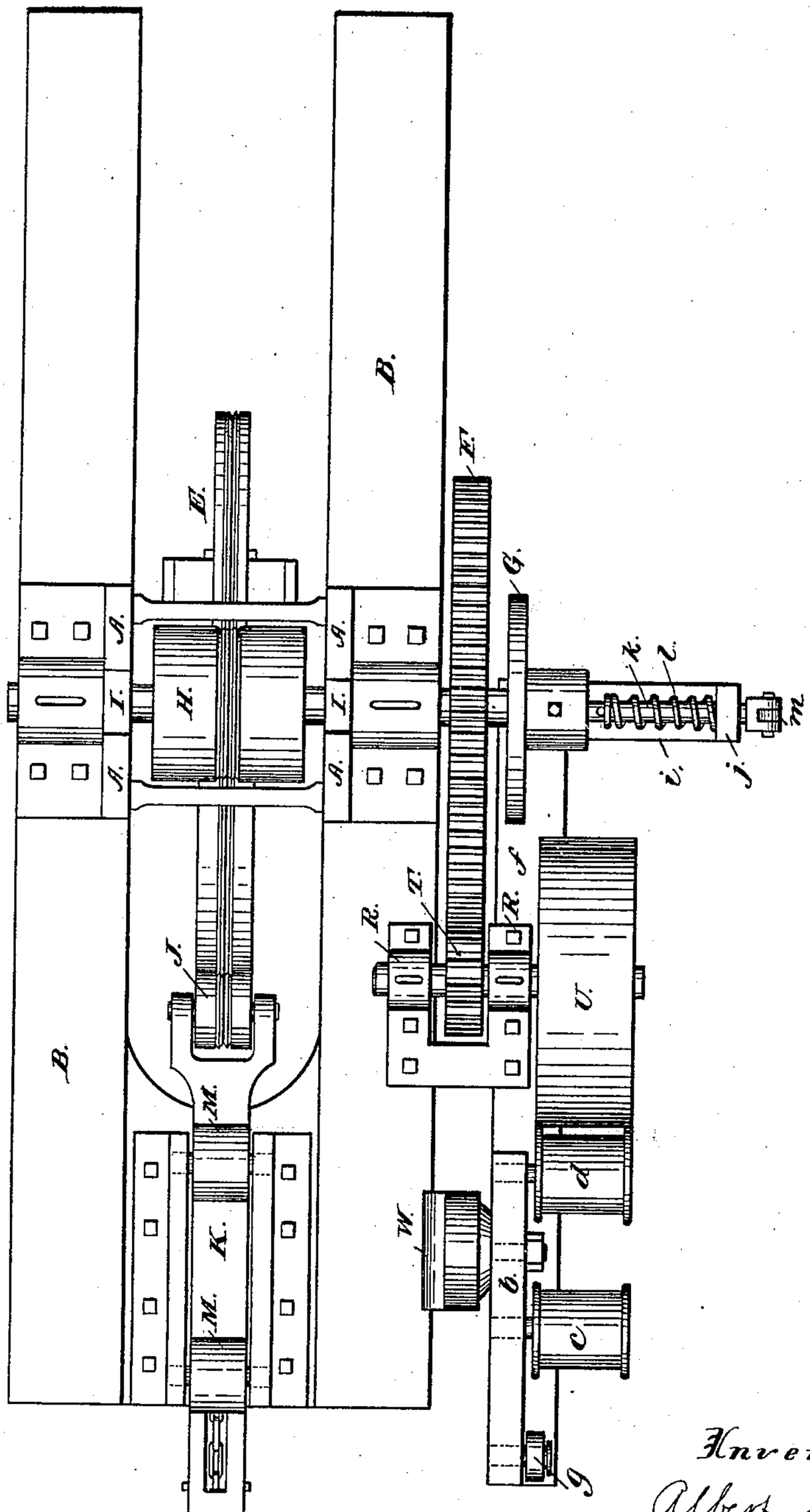

Fig. 2.

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(No Model.) 5 Sheets—Sheet 3.

A. J. GREEN.

MACHINE FOR BENDING RAKE TEETH.

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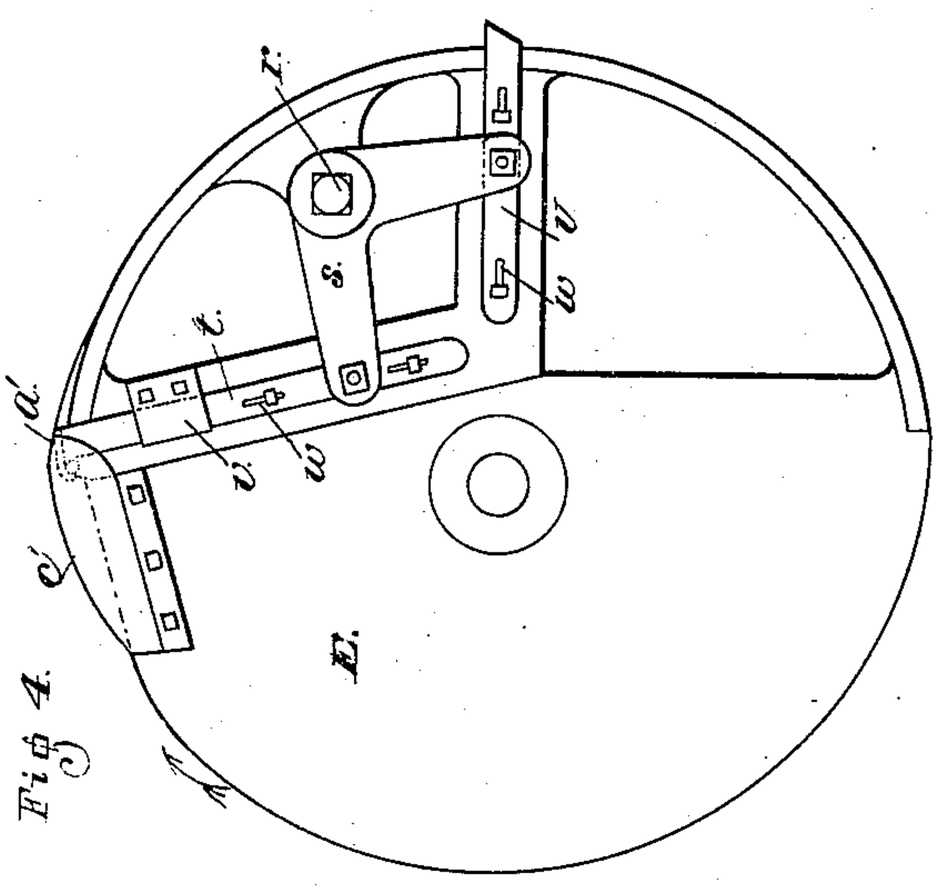

Fig. 4.

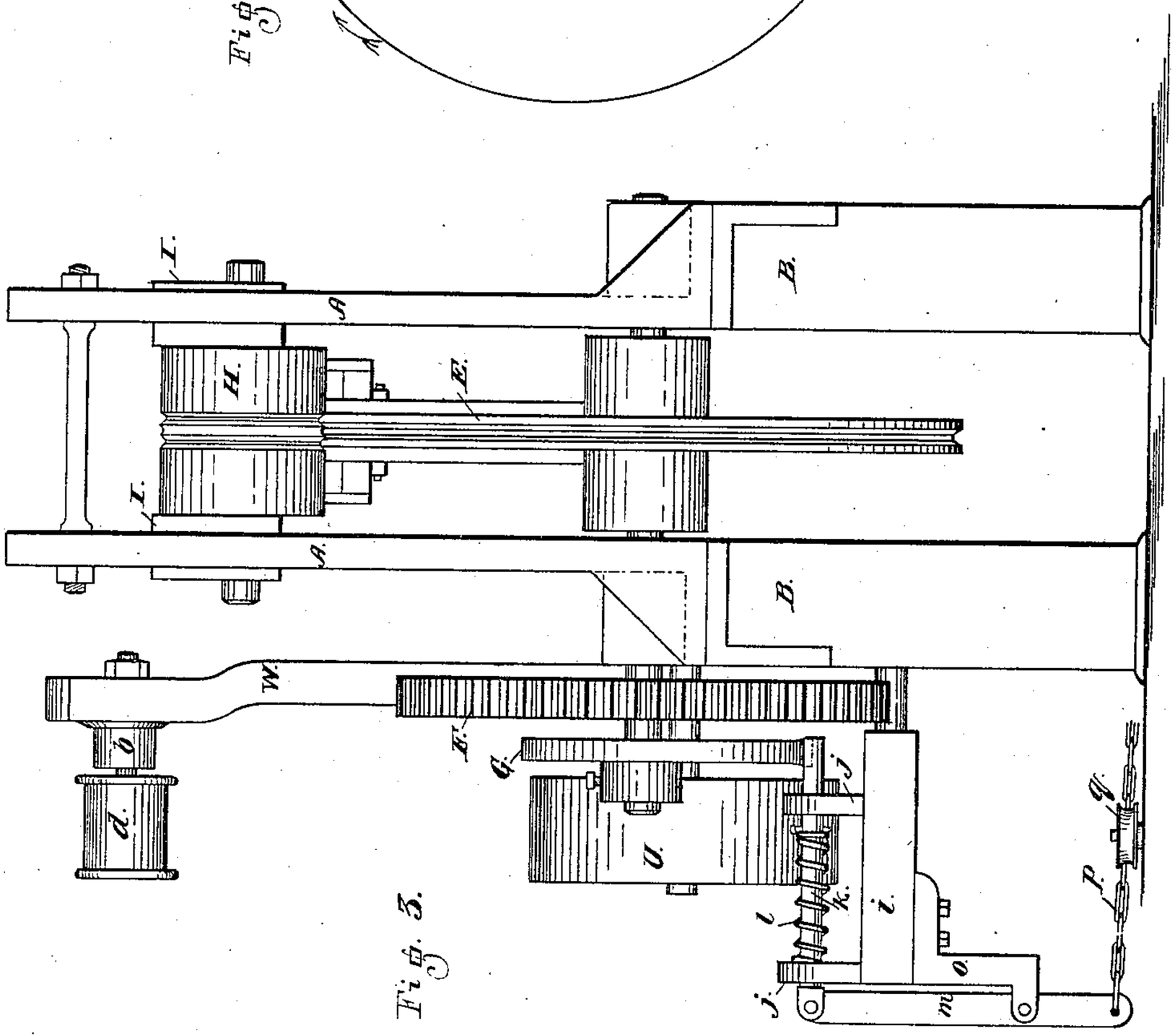

Fig. 3.

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(No Model.) 5 Sheets—Sheet 4.

A. J. GREEN.

MACHINE FOR BENDING RAKE TEETH.

No. 321,019. Patented June 30, 1885.

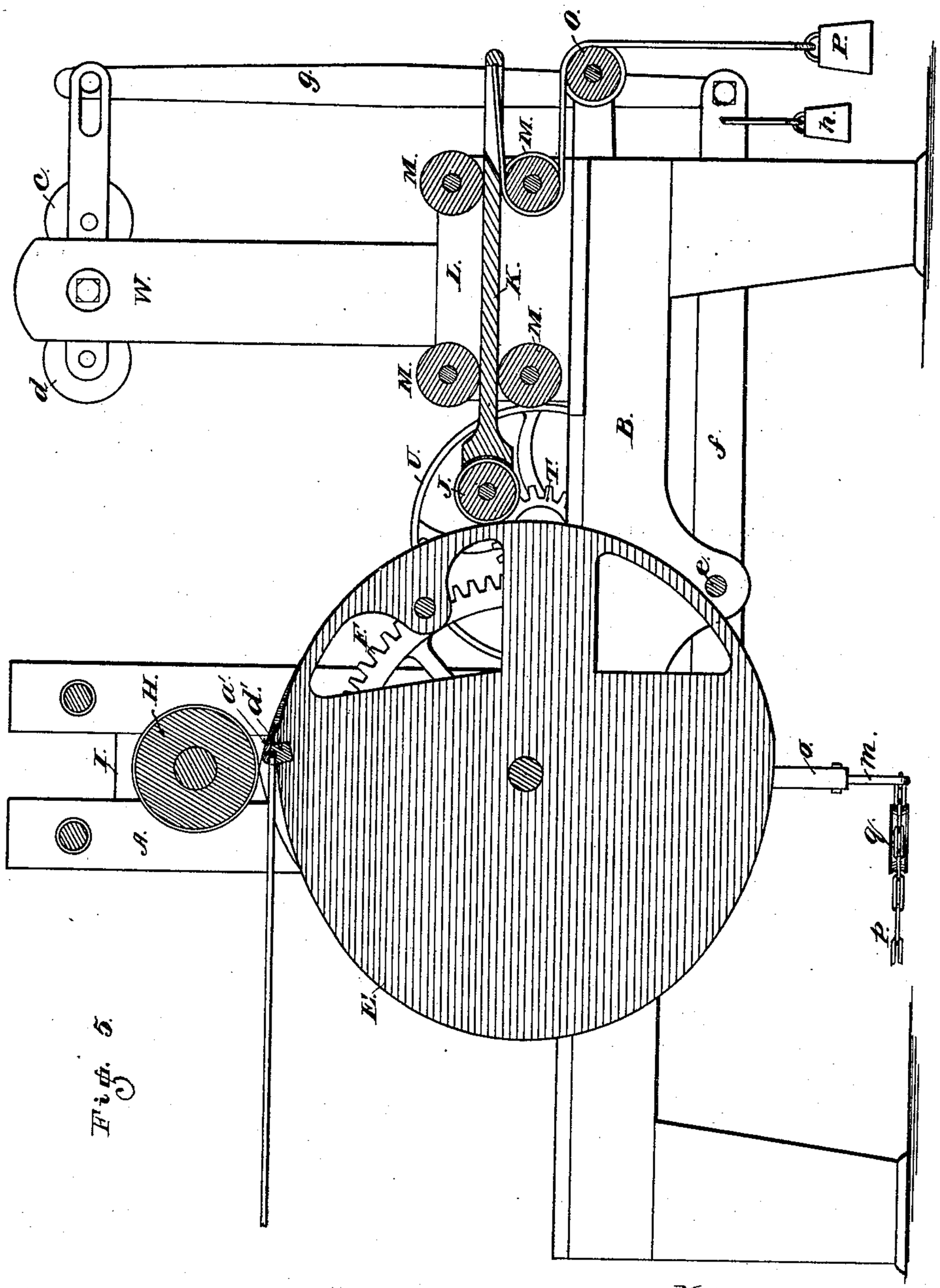

Fig. 6.

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(No Model.) 5 Sheets—Sheet 5.

A. J. GREEN.

MACHINE FOR BENDING RAKE TEETH.

No. 321,019. Patented June 30, 1885.

Fig. 6.

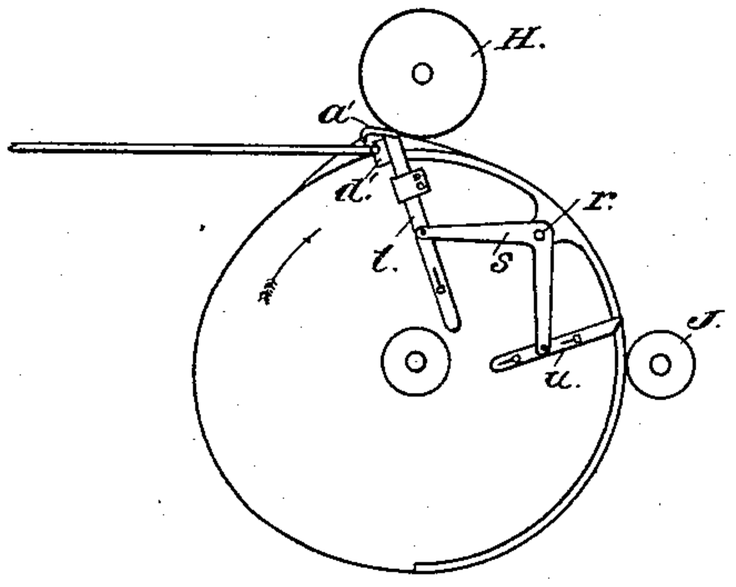


Fig. 7.

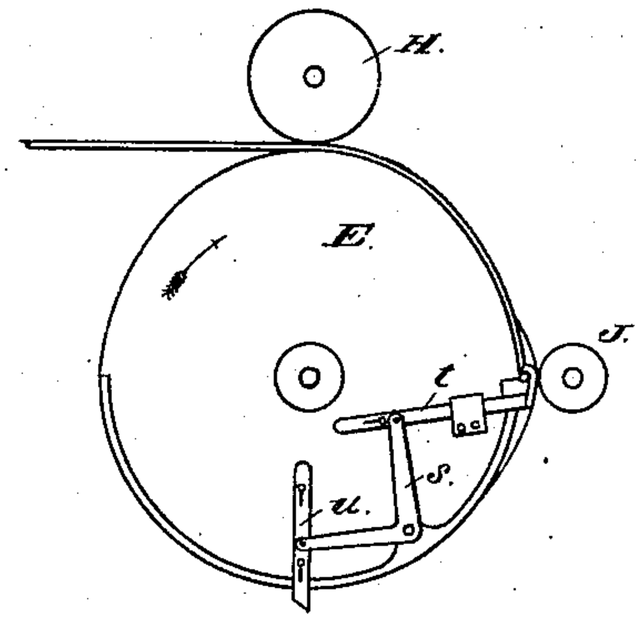


Fig. 11.

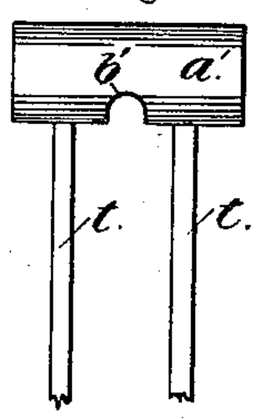


Fig. 8.

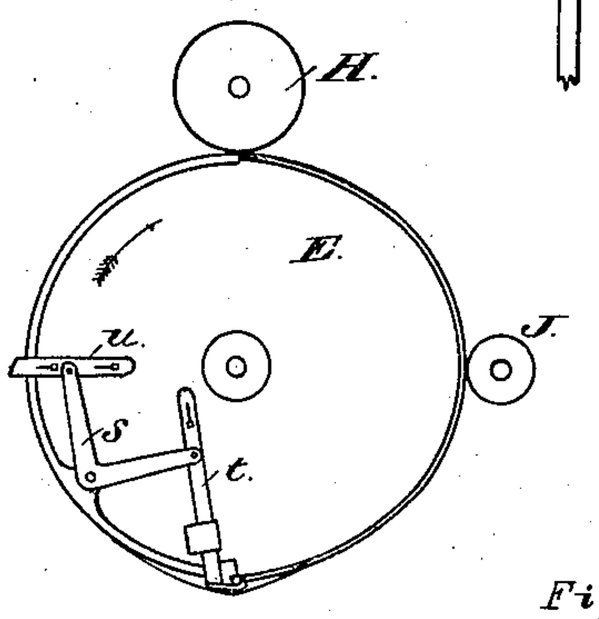


Fig. 9.

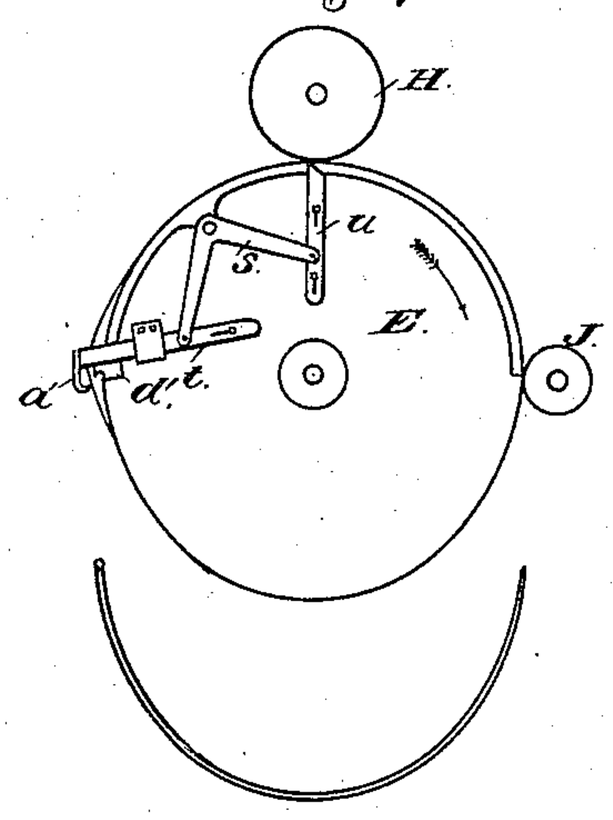
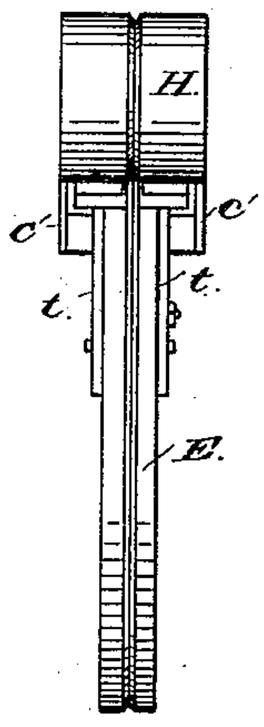


Fig. 10.



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UNITED STATES PATENT OFFICE.

ALBERT J. GREEN, OF DAYTON, OHIO, ASSIGNOR OF ONE-HALF TO THE STODDARD MANUFACTURING COMPANY, OF SAME PLACE.

MACHINE FOR BENDING RAKE-TEETH.

SPECIFICATION forming part of Letters Patent No. 321,019, dated June 30, 1885.

Application filed April 27, 1883. (No model.)

To all whom it may concern:

Be it known that I, ALBERT J. GREEN, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Machines for Bending Rake-Teeth, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making a part of this specification.

The teeth of sulky hay-rakes are usually formed from round bars of steel of the required dimensions, which are bent or curved so as to enable them to be properly attached to the rake-head or frame of the rake, and so as to give them the requisite raking curve or sweep; and the object of my invention is to provide an automatic machine for forming the teeth, by bending to any desired shape, which shall be quick and reliable in its action, to the end that they may enter the tempering-bath in their completed shape at as near the heat at which they leave the heating-oven as possible. For this purpose I provide any suitable frame-work, preferably located over the tempering-bath, upon which is the properly-driven actuating mechanism, consisting, essentially, of a revolving former, to which the tooth is automatically clasped at the forward end, and is held and bent to conform to the shape of the former by a superimposed pressure-roller, and further held in place by a rear pressure-roller, until the former, having made about three-fourths of a revolution, the tooth becomes automatically released and falls into the tempering-bath. The arrangement of the mechanism is, further, such that after the tooth has been applied to the former, the machine started, the tooth bent to proper shape and dropped from the former, the former continues its revolution until it reaches the starting-point, or a position ready to receive the next tooth to be bent, when it automatically comes to a standstill, and so remains until the next tooth is applied and it is again started. The machine is further provided with mechanism by which the operator can by a single movement start it, and which, when the former has made a single revolution, will automatically stop the machine.

The novelty of my invention consists, first, in the combination, with suitable operating mechanism, of a revolving former provided with automatic gripping and releasing devices and acted upon by one or more pressure-rollers, whereby the tooth, when presented to the machine, is automatically gripped, shaped, and released; secondly, in the combination, with the tooth-former and driving mechanism, of other mechanism whereby when the machine is started the former will make one continuous revolution, and then, together with the rest of the machine, come to a standstill; thirdly, in the construction, combination, and relative arrangements of the parts, all as will be herewith set forth and specifically claimed.

In the accompanying drawings, Figure 1, Sheet 1, is a side elevation of my improved machine. Fig. 2, Sheet 2, is a plan view of the same. Fig. 3, Sheet 3, is a front elevation of the same. Fig. 4, Sheet 3, is a side elevation of the former, the arrow indicating the direction of the revolution. Fig. 5, Sheet 4, is a central sectional view in side elevation of the machine from the side opposite to that shown in Fig. 1. Figs. 6, 7, 8, 9, Sheet 5, are diminished side elevations of the former and pressure-rolls at the different stages of introducing, bending, retaining, and releasing the tooth, the arrows indicating the direction of revolution. Fig. 10, Sheet 5, is a diminished front elevation of the former and upper pressure-roller. Fig. 11, Sheet 5, is an enlarged detailed view of the gripping-cap and its arms.

The same letters of reference are used to indicate like parts in all the figures.

Journaled in uprights A upon any suitable frame-work, B, preferably located over the tempering-bath tank C, is a horizontal shaft, D, upon which is securely keyed or fastened between said uprights A, the tooth-forming disk E, a description of the construction and shape of which will be given presently. Likewise keyed or otherwise securely fastened upon said shaft D just outside of one of said uprights A, are a large gear-wheel, F, and a cam G, in the order named. Resting upon the top of the tooth-former E is a heavy pressure-roller, H, whose shaft or trunnions are journaled in sliding boxes I, confined but capable of movement up or down in vertical slots or apertures in the uprights A, as shown. Bearing against

the rear side of the tooth-former is a second yielding pressure-roller or follower, J, whose shaft or trunnions are journaled in the forked head of a horizontal follower-bar, K. This follower-bar is confined between uprights L upon the frame, and, to avoid friction, is held between and supported by two pairs of friction-rollers, M, which are journaled in and between the uprights L. Upon the rear end of the frame is a bracket, N, supporting a pulley or roller, O. A strap or chain, secured to the rear projecting slotted end of the follower K, passes forward over and under the rear lower roller, M, back over the roller O, and has secured to its lower pendent end a weight, P, by means of which the follower K is kept projected forward so as to keep the roller J in constant contact with the tooth-former E. I prefer to use the weight and strap for holding the roller J against the tooth-former with a more even pressure, though it is obvious that a coiled spring, with suitable connections, around the rear projecting end of the follower or at its forward projecting end might be substituted for the weight and strap.

Journaled in suitable boxes, R, upon the frame of the machine is the main driving-shaft S, to which is keyed or otherwise suitably fastened a pinion or small gear-wheel meshing with the gear-wheel F, and a driving-pulley U, which carries an ordinary belt, V, extending to a pulley upon the line-shaft. By means of the pulley U and meshing gear-wheels the tooth-former is caused to revolve when desired.

Pivoted at *a* to an upright, W, upon the frame of the machine is a beam, *b*, carrying at equal distances upon each side of its pivoted joint grooved rollers or pulleys *c* and *d*, under the former and over the latter of which the belt V passes as it descends, as seen in Fig. 1, Sheet 1.

Pivoted at *e* to a pendent lug on the main frame is a beam, *f*, whose rear end is connected to the rear slotted end of the beam *b* by means of a pivoted vertical link or beam, *g*.

Any suitable weight, *h*, if desired, may be secured to the rear end of the beam *f* or to the lower end of the link *g*. The forward end of the beam *f* has an outward right-angular extension, *i*, provided with upwardly-projecting ears or lugs *j*, in which is fitted a horizontally-sliding bolt, *k*, whose engaging end, passing through the inner lug, *j*, extends under and bears against the edge or periphery of the cam G. This bolt is held projected inward by means of an encompassing coiled spring, *l*, which bears against the outer lug, *j*, and a shoulder or pin upon the bolt, as seen in Fig. 2. Its outer projecting and forked end or head has pivoted in it the upper end of a vertical lever, *m*, which is pivoted at *n* between the ears of a pendent bracket, *o*, as seen in Figs. 1 and 3. A chain or rope, *p*, attached to the lower end of the lever *m*, passes around a horizontal pulley, *q*, upon the floor, and has its other end fastened at any point desired, so as to bring it within easy reach of the operator standing in front of the machine.

I will now describe the operation of starting and the automatic stopping of the machine.

Fig. 1 represents a machine at a standstill, with the belt V too slack to turn the pulley U, and with the bolt *k* engaging with the cam G at the point of its longest radius. This engagement of the bolt and cam holds the beams *f* and *b* substantially horizontal, or in such position that the pulleys *c* and *d* allow slack in the belt V. Now, as soon as the operator presses with his foot upon the chain *p* the bolt *k*, through the medium of the lever *m*, is drawn back and disengaged from the cam G, whereupon the beam *f*, being released, is vibrated by gravity, its rear end dropping down, and, through the medium of the link *g*, turns the beam *b* upon its pivot, and with it the pulleys *c* and *d*, which are thus caused to take up the slack of the belt V, whereupon the machine at once starts. A very slight vibration or turning of the beam *b* is necessary to tighten the belt. The machine having started, the bolt *k*, by means of its projecting spring *l*, is at once thrown under the periphery of the cam G at the point of its smallest radius, and the cam in revolving travels upon the projecting end of the bolt until, having made a complete revolution, the point of its longest radius comes over the bolt again, and, pressing down the forward end of the beam *f* through the medium of the mechanism before described, again brings the pulleys *c* and *d* in such position as to slacken the belt, whereupon the machine at once stops. If the chain *p* were held with the foot so as to keep the bolt out of engagement with the cam, the machine would continue to run.

Referring now particularly to Figs. 3 and 4, Sheet 3, and 10 and 11, Sheet 5, I would thus describe the construction of the tooth-former E. As before stated, this tooth-former is a disk of any size or shape desired to suit the shape of the teeth to be bent thereon, and it may be solid in whole or in part, as desired. I have shown it with that half or portion on which the tooth is bent as solid, and containing a V-shaped groove or gutter, into which the tooth is bent, and by which it is kept from slipping out of a vertical plane. The remaining half or portion of the former may have a smooth periphery of greater width than that of the other portion, so as to give a larger bearing-surface for the pressure-rollers, and thereby preventing wear and the breaking down of the edges.

Pivoted upon either side of the former, as at *r*, is a bell-crank, *s*, to the arms of which are pivoted bolts *t* and *u*, which are held by any suitable guides, as *v*, or by bolts passed through slots *w*, or by both means, if desired. The bolts or arms *t* and *u* extend to the periphery of the former, as shown, and when the one is pressed down the other is projected, and vice versa. I prefer that the bolt *t* should

have its duplicate upon the opposite side of the former, both being secured to the arm of the bell-crank by the same pivot, which in that case would work through a slot in the former, as will be readily understood.

Upon the outer ends of the bolts *t*, and integral therewith, if desired, is a hook, clamp, or jaw, *a'*, having a notch, *b'*, in its forward edge directly over the V-shaped groove in the former. On each side of the jaw *a'* guide-flanges *c'* are secured to the former, whose outer edges project beyond the face of the former, as shown, and formed with or let into the face of the former is a slightly-projecting head-block, *d'*, with its front projecting edge slightly channeled out to receive the right-angular bent portion of the tooth when it is placed upon the former to be bent. Both the rollers H and J have circumferential grooves coincident with the groove or gutter in the former, and acting therewith to aid in holding the tooth from slipping out of place.

The operation of applying, bending, and releasing the teeth may be thus described, reference being had to Figs. 6, 7, 8, and 9. The teeth with their attaching ends bent at right angles and in the shape of straight bars, may be supposed to be in the heating-oven near the machine, which is at a standstill, with the tooth-former in the position shown in Fig. 6. The operator siezes a tooth from the heating-oven and thrusts its front and bent end under the hook or jaw *a'* and against the notched edge of the piece *d'*, and immediately starts the machine. As the tooth-former begins to revolve the roller H presses down the jaw *a'*, and so securely clamps the tooth to the former. It is to be noticed that by this pressing down of the jaw *a'* the bolt *u* is projected beyond the periphery of the former, and, owing to the narrowness of the roller J, the bolt *u* does not come in contact with it, but passes by to one side of it. The continued revolution of the tooth-former causes the roller H to press upon the tooth and bend the same to the shape of the former. In Fig. 7 a quarter-revolution has been made, and in Fig. 8 a half-revolution. In the latter figure the tooth is shown as completely bent to the former and just about leaving the roller H. The utility of the roller J here becomes apparent as a means for retaining the tooth against the former and preventing its sagging away before the tooth is ready to be released and dropped into the tempering-bath. While I prefer the use of a roller for this purpose, it is evident that any other yielding-pressure device not a roller might be substituted without departing from my invention. The continued revolution of the former from the position shown in Fig. 8 finally brings the tooth to such a position as if released it would drop into the tempering-bath below, and just at this moment the rear end of the tooth leaves the roller J and the bolt *u* comes under the roller H, which, pressing down said bolt, projects the bolt *t* with its attached clamping-jaw *a'*, through the medium of the bell-crank *s*, whereupon the tooth is instantly released and falls into the tempering-bath. The tooth-former continues its revolution until the parts resume the position shown in Fig. 6, when the machine stops automatically in the manner before described, and the operator inserts another tooth and again starts the machine, and so on indefinitely. Where the attaching ends of the teeth have their ends bent into coils or some other shape than at a right angle, which latter is the most common way of making them, it is only necessary to change the shape of the clamping-jaw to correspond with the shape of the tooth; and by having tooth-formers of different sizes and shapes, which can be readily substituted one for the other in the machine, rake-teeth of any desired size and shape may be bent as above described and dropped into the tempering-bath at almost the same heat at which they left the heating-oven.

I would call attention to the fact that by making the bearing-boxes I extend above the periphery of the roller H weight-bars may be laid across from one box to the other to give the roller H any degree of pressure required.

Having thus fully described my invention, I claim—

1. In a rake-tooth-bending machine, the combination of a rotatable former, one or more pressure-rollers, a gripping mechanism operating to grip the blank after the former commences to rotate, and a device for releasing the gripping mechanism after the completion of the bending operation and after the tooth has left the pressure-rollers and retaining-rollers, whereby the completed tooth is permitted to drop from the former, substantially as described.

2. In a rake-tooth-bending machine, the combination of the rotatable former, one or more pressure-rollers, a gripping mechanism operating to grip the blank after the former commences to rotate, and an automatic device actuated by the pressure-roller to cause the release of the gripping mechanism after the completion of the bending operation, whereby the completed tooth is permitted to drop from the former, substantially as described.

3. In a rake-tooth-bending machine, the combination of a rotatable former, one or more pressure-rollers, a gripping mechanism operated by the pressure-roller to grip the blank after the former commences to rotate, and an automatic device, also actuated by the pressure-rollers, to cause the release of the gripping mechanism after the completion of the bending operation, whereby the blank is gripped, bent around the former, and the completed tooth is permitted to drop, substantially as described.

4. In a rake-tooth-bending machine, the combination, with the tooth-former E, of bolts attached thereto and extending to its periphery, one or one set of which are provided with clamping-jaws, and a connecting-lever whereby the depression of one bolt causes the pro-

jection of the other, substantially as and for the purpose specified.

5. In a rake-tooth-bending machine, the combination and relative arrangement of the revolving tooth-former provided with gripping and releasing mechanism, an upper main pressure-roller for bending the teeth to the former, and a rear retaining-roller or equivalent device for holding the teeth to the former until such time as it is desired to release the teeth from the former.

6. In a rake-tooth-bending machine, the tooth-former E, having a grooved periphery for retaining the teeth in a vertical plane, and provided with inclines *c'*, head-block *d'*, and bolts *t* and *u*, connected by a bell-crank, *s*, the former of which bolts has a clamping-jaw, *a'*, substantially as and for the purpose specified.

7. In a rake-tooth-bending machine having a revolving tooth-former, the combination, with said tooth-former, of a cam arranged upon its shaft, and lever mechanism provided with tightening-pulleys operated by said cam, whereby, upon releasing the lever mechanism from said cam, the tightening-pulleys take up the slack of the driving-belt and cause the starting of the machine, and whereby, when the tooth-former and cam have made one entire revolution, the cam again re-engages with the lever mechanism and causes slack in the driving-belt, whereupon the machine stops, substantially as described.

8. In a rake-tooth-bending machine, the combination, with the cam G, of the weighted pivoted beam *f*, carrying a spring-projected bolt, *k*, engaging with said cam, lever *m*, and chain *p*, the link *g*, and pivoted beam *b*, provided with tightening-pulleys *c d*, substantially as and for the purpose specified.

9. In a rake-tooth-bending machine, the combination of a rotatable former, one or more pressure-rollers, mechanism for automatically gripping the blank after the former commences to rotate, a device for automatically releasing the gripping mechanism when the tooth is fully formed, with mechanism for rotating the former, and a stop mechanism for arresting the former after the completed tooth has been released and discharged from it and the former has returned to its initial or starting point, substantially as described.

ALBERT J. GREEN.

Witnesses:
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