

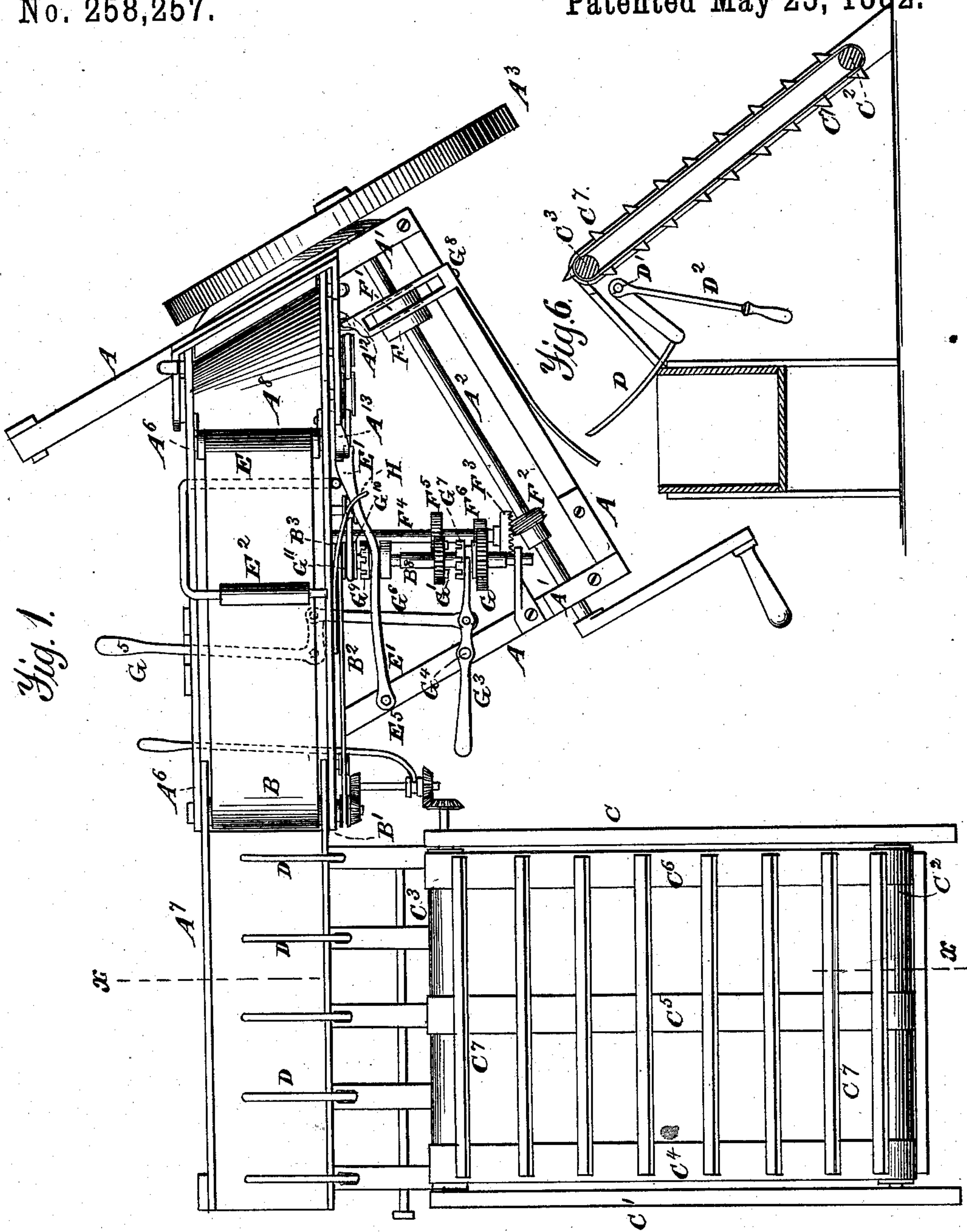
(No Model.)

2 Sheets—Sheet 1.

J. Y. SMITH.
ENSILAGE CUTTER.

No. 258,257.

Patented May 23, 1882.



Witnesses.
A. Ruppert,
C. M. Connell

J. Y. Smith
Inventor.
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Attys.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

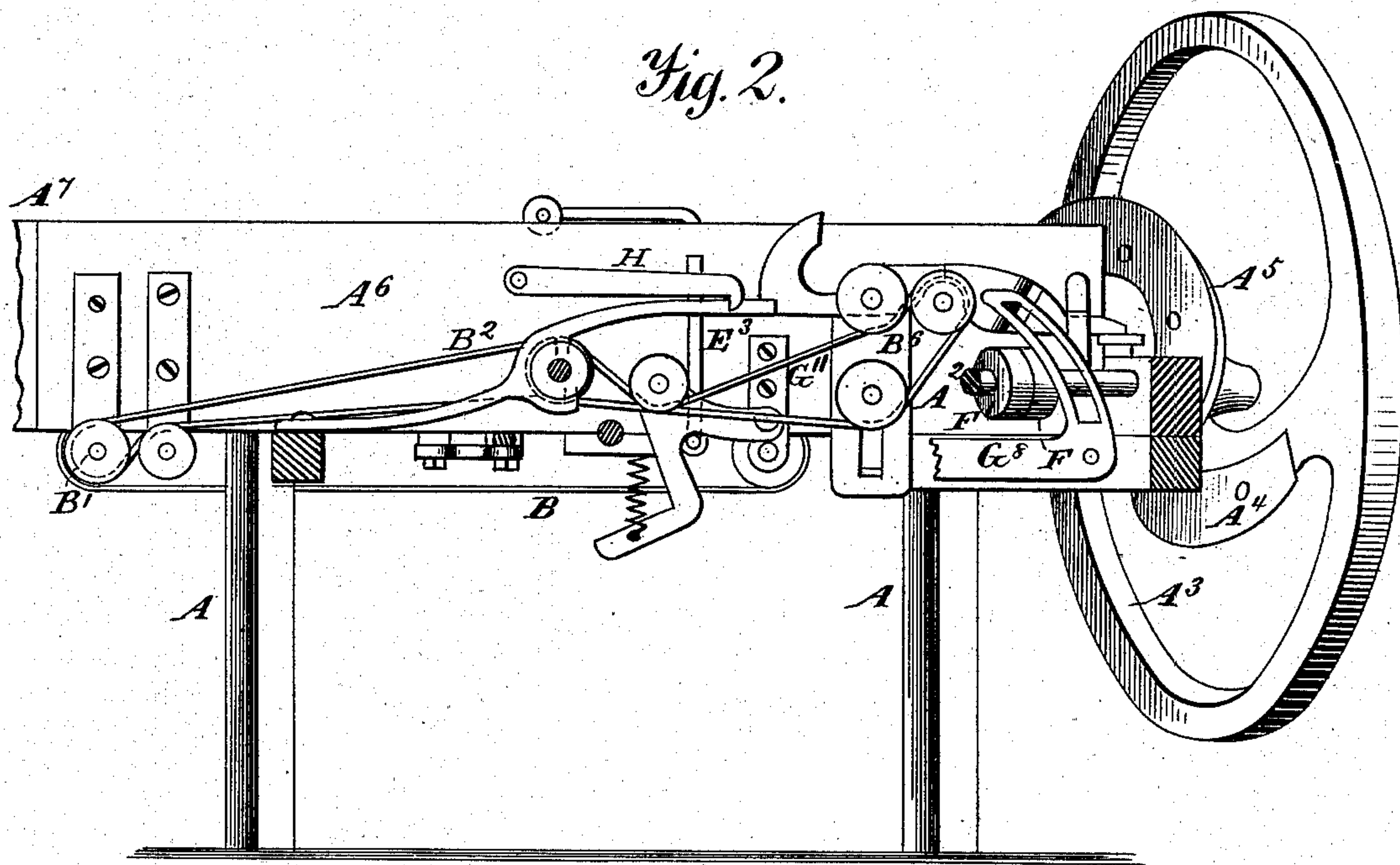


Fig. 3.

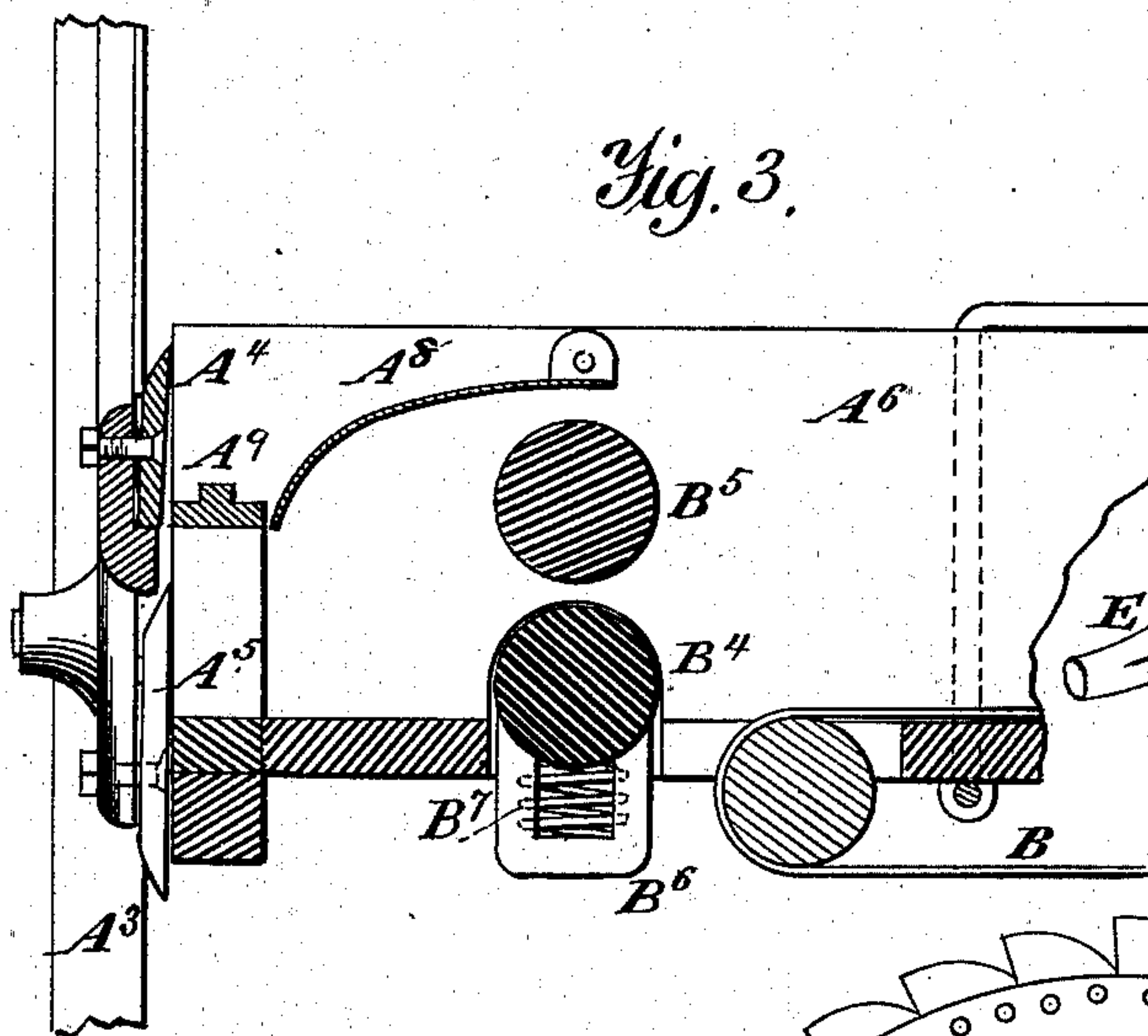


Fig. 4.

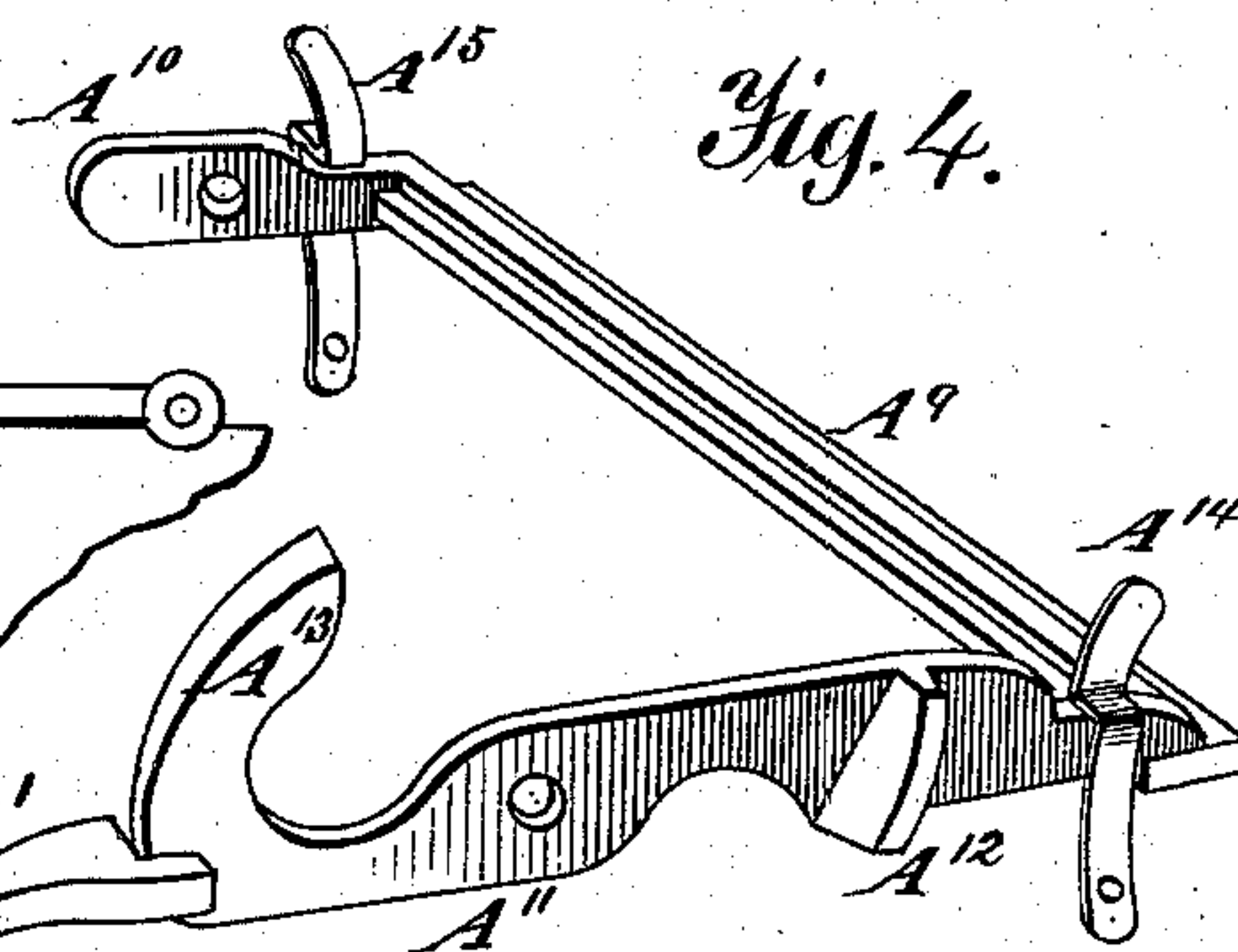
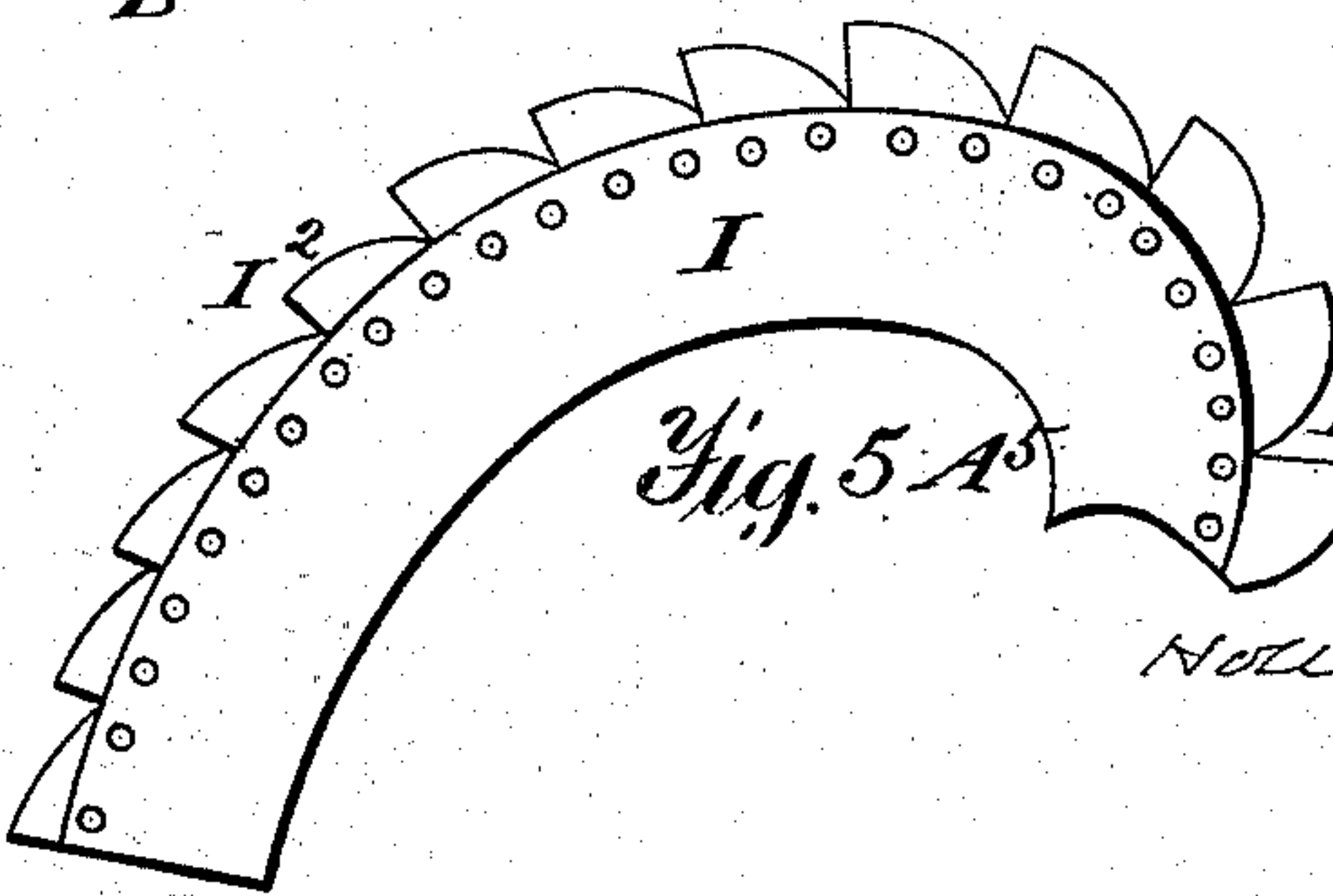


Fig. 5. a



Fig. 5. A^5



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UNITED STATES PATENT OFFICE.

JOHN Y. SMITH, OF PITTSBURG, PENNSYLVANIA.

ENSILAGE-CUTTER.

SPECIFICATION forming part of Letters Patent No. 258,257, dated May 23, 1882.

Application filed September 14, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN Y. SMITH, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Ensilage-Cutters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in machines for cutting hay, grasses, straw, corn-stalks, and other substances in preparing them for present use or for storage in silos or other receptacles as food for animals; and the objects of my improvements are, first, to provide a swinging or yielding cutter-bar which shall be capable of being raised in the event of any solid substance being carried through the feed-rollers and coming in contact with the knives, and thus preventing any serious injury to the knives or the breaking of any of the parts of the machine; second, to provide a knife to be used in a machine for cutting food for animals, having a series of cutting-sections placed thereon, decreasing in curvature upon their outer surfaces from the point where the cutting commences to the outer end of the knife, whereby the greatest amount of cutting is effected at the point where it is commenced, or at the inner end of the knife, where the resistance to its movements is the least, and whereby the tendency to force the material away from the cutting-edges is to a great extent avoided; third, to provide an elevator for carrying the material to the cutting-box, the speed of which is regulated by suitable mechanism in such a manner as to cause it to carry the material to said box as fast as it is required for cutting; fourth, to provide a holder or receiver for the material to be cut, to be used in connection with the elevator and cutting-box, whereby the required amount of material may be introduced into said box at the required times; fifth, to provide an automatically-operating device for stopping the feeding mechanism in the event of there being too much material placed in the

cutting-box, which, if allowed to pass to the feeding-rolls, would be liable to cause the breaking of the mechanism; and, sixth, to provide novel devices and combinations thereof for producing the results hereinafter described. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of my improved machine, showing the driving mechanism, the cutting-box, the swinging or yielding cutter-bar, the mechanism for arresting the motion of the feed and for increasing or decreasing its speed, the elevator for carrying the material to be cut to the cutter-box, and the holder for receiving it. Fig. 2 is a side elevation, partly in section, showing the cutting mechanism, the feed-rolls and the means of driving them, the folding cutter-box, and a portion of the frame of the machine. Fig. 3 is a longitudinal section, showing the mechanism for arresting the movements of the feeding-rolls in the event of there being too much material placed in the cutter-box, the feeding-rolls, a spring for controlling the vertical movement of one of them, the swinging cutter-bar, a portion of the balance-wheel, and one of the knives attached thereto. Fig. 4 is a perspective view of the swinging or yielding cutter-bar, the springs for holding it in position, and a wedge-shaped arm for arresting the movement of the feeding mechanism when the cutter-bar is raised. Fig. 5 is a side view of a knife having my improved method of construction embodied therein, it showing the sectional cutters as secured to its body, and showing also the different curvatures of the sections. Fig. 5^a shows a modified form of the knife, it being in this case shown with the cutting-edges formed upon the concave edge thereof; and Fig. 6 is a sectional elevation on line *x x* of Fig. 1, showing a portion of the cutter-box, an elevator, and the receiver or holder for the material.

Similar letters refer to similar parts in the several views.

Heretofore machines have been constructed with their cutting-boxes placed at an angle to the axis of the driving-shaft. I do not therefore claim broadly such an arrangement of parts; but it is an important feature in machines like mine, which are designed for cut-

ting material so as to cause it to be converted into what is termed "ensilage," and especially in cutting corn and other substances for that purpose, as it provides for cutting it askew to the direction of its fiber, and thus preparing it for being more closely packed in silos or other reservoirs, as the slanting or askew cut given to it as a consequence of this arrangement of the mechanism makes it more readily compressible than it would be if cut straight across the stalk.

The objects of my improvements, therefore, may be stated, in a general way, as being to improve the type of machines above alluded to by the addition of novel devices and novel combinations for the purpose of adapting them for cutting the large amount of material required in the shortest possible period of time, rapid cutting being absolutely necessary when it is to be packed, as above described.

In constructing machines of this type there is to be provided a suitable frame, A, for receiving and holding the working parts. Near one end of the frame A there are placed bearings A' A', in which the journals of a shaft, A², rotate, said shaft carrying upon one of its ends a balance-wheel, A³, to the arms of which the curved knives A⁴ and A⁵ are attached, said knives being constructed as shown in Fig. 2, or as shown in Fig. 5, by preference the latter. Upon the frame A there is placed, at an obtuse angle to the face of the balance-wheel and knives, a cutting-box consisting of a fixed portion, A⁶, and a swinging or folding portion, A⁷. The length of said fixed portion, for convenience, should be sufficient to cause its outer end to extend slightly beyond the portion of the frame upon which it rests, in order that the swinging portion may be conveniently pivoted thereto, so that it may be folded over into or upon the fixed part when not in use, or when the machine is being shipped, it occupying much less room when in its folded position than when opened out for use. This box may be of any required height and width, according to the amount of material to be cut in a given period of time, it being provided at its inner end with a hood, A⁸, for directing the material to be cut beneath the cutter-bar A⁹, which, as shown in Fig. 4, consists of a bar of metal which extends across the cutter-box at the point where the cutting is to be done, its position being shown in Fig. 3. It is provided with two arms, A¹⁰ and A¹¹, through which bolts or pins pass for pivoting it to the cutter-box, the arm A¹¹ being provided with two cam-shaped projections, A¹² and A¹³, for a purpose soon to be described.

For the purpose of holding the cutter-bar in position there are placed upon the sides of the cutter-box, or upon the frame, two springs, A¹⁴ and A¹⁵, their upper portions having formed upon them shoulders, which, when the bar is in position for use, bear upon the upper surfaces of the arms, and thus prevent it from being raised by the upward action or pressure

of the knives in cutting the material, the form of the shoulders and the tension of the springs being such that in the event of a stone or other foreign hard substance passing between the feed-rolls and the knives coming in contact therewith they will release their hold upon the bar and allow it to be swung upward to such an extent as to allow the knives to pass and the stone or other substance to fall out, and thus any serious damage to the knives or other parts of the machine will be avoided. Should the obstruction above alluded to be in the form of a nail, a piece of wire, or even of wood sufficiently large to endanger the machine after it has been carried forward sufficiently far by the feed-rolls to cause its end to be in the path of the knives, they will raise the bar up and thus stop the cutting operation until the obstacle has been drawn out or otherwise removed, when the cutter-bar can be restored to its original position and the cutting be proceeded with.

For the purpose of feeding the material to the cutting-knives there is placed in the bottom of the cutter-box an endless apron, B, of strong cloth, leather, or any other suitable material, it passing over rollers at its ends, which have their bearings in the sides of the cutter-box, or attached thereto, they being driven by a pulley, B', attached to the outer one, over which passes a belt, B², the opposite end of which passes over a pulley, B³, placed upon a shaft, B⁴, the office of which will soon be described.

In front or outside of the forward end of the feeding-apron B there are placed two feeding-rolls, B⁴ and B⁵, their journals resting in plates of metal B⁶, attached to the outer surface of the cutter-box, said plates having in them bearings for the upper feed-roller, which hold it in a fixed position, and in their lower portions slots for the reception of vertically-moving boxes or bearings, in which the lower roller is placed, springs B⁷ being placed beneath it or its bearings, in order that it may be forced away from the fixed upper roller to such an extent as to allow the body of the material to pass between the rollers, and yet to press upon said material with sufficient force to carry it forward to the knives.

For placing the material in the cutter-box in regular order there is attached thereto, or to the folding portion thereof, an elevator, C, its upper end being provided with hooks or other suitable means for attaching it thereto. This elevator should be of sufficient width to carry the material to the box, and it may be of any length required, its outer end resting upon the ground or upon any suitable support. It consists of a suitable frame, C', composed of two side bars and two rollers, C² and C³, placed at the ends of said side bars. At suitable intervals upon the rollers there are placed chains or bands of cloth, leather, or rubber, C⁴ C⁵ C⁶, to which cross or transverse slats C⁷ are secured at intervals, so as to cause them to carry up to a receiver (soon to be described) the

material placed thereon. This elevator may be driven by beveled gearing, as shown in Fig. 1, or in any other desired manner, its movements being so regulated by its driving mechanism that it shall be able to carry up the material as fast as it is required for cutting.

For the purpose of delivering the material to the cutting-box in the proper quantities and at the proper times, there is attached to the upper end of the elevator a receiver or holder, it consisting of a series of arms, D, attached to a shaft, D', as shown in Fig. 6, which may have its bearings in the frame of the elevator or in supports attached to the cutter-box, said shaft being provided with a handle, D², for partially rotating it when it becomes necessary to unload the receiver and to return it to its receiving position. The arrangement of this receiver is shown in Fig. 6, where it will be seen that it is such that as the material is carried up by the elevator it is deposited upon the arms D, so that when the required amount has been thus placed the operator can, by manipulating the handle D², cause it to be at once deposited in the cutter-box in such regulated quantities as not to endanger the breaking or derangement of the feeding-rolls by allowing more material to pass to them at any one time than they can permit to pass between them.

As an additional protection to the feeding-rolls and other parts of the machine, there is placed upon the cutter-box, at a point just in rear of said rolls, a device consisting of an automatically-moving stop, which is so arranged that should more than the usual quantity of material be passing through the cutter-box it would come in contact therewith, and thus unclutch the feeding mechanism. The device shown for this purpose consists of a bar of metal, E, which passes across the under surface of the cutter-box, where it is supported in suitable bearings, its outer portion, upon one side, being bent upward, so as to cause it to pass close alongside of said box to the upper surface thereof, where it is bent at a right angle, so as to cause it to pass over said upper surface, as shown in Fig. 1, that portion thereof which is directly on the box being provided with a roller, E², so that should the material rise above the upper edge of the box it would cause the roller to be raised, the effect of which would be to change the position of an arm, E³, which extends upward upon the side of the box which is opposite to the arm above described, in doing which it comes in contact with a cam-shaped projection formed on a lever or arm, E', the opposite end of which is pivoted to the frame A at E⁵, and moves the same, thus unclutching and stopping the feeding mechanism.

For the purpose of giving motion to the moving parts of the machine there are placed upon the shaft A² two pulleys, F F', one of which is firmly attached to the shaft, while the other is allowed to revolve freely thereon, so that a belt passing over the fixed pulley from

a prime mover will give the operating parts their required movements, but when placed upon the loose pulley will allow such parts to remain at rest.

Upon the shaft A², at a point near its opposite end, or in any other proper position, there is placed a bevel-faced worm, F², its form being of importance, as it enables its periphery to be placed at an obtuse angle to the shaft, upon which the wheel with which it meshes is placed. Another very useful function of this worm is that it provides for reducing the motion imparted by the driving-shaft to such an extent as to adapt it for direct application to the feeding mechanism of the machine without the intervention of reducing-gears. This worm engages with the teeth of a pinion, F³, secured upon a shaft, F⁴, to both of which it gives a rotary motion. Upon the last-named shaft there are placed two other gear-wheels, F⁵ and F⁶, which are of different diameters in order that they may impart to the feed-rolls a differing rate of speed with reference to the speed of the balance-wheel, and consequently of the knives when it is desirable to cut the food into different lengths. The movement necessary to produce this result is effected by placing the shaft B⁸ above the shaft F⁴, or in such relation thereto as to cause the gear-wheels upon the latter to mesh into wheels G and G', mounted loosely, and so as to turn upon the former in such a manner that the largest wheel upon shaft B⁸ meshes into the smallest upon the shaft F⁴ and the largest upon F⁴ into the smallest upon B⁸. Between the wheels G and G', upon the shaft B⁸, there is placed a double clutch, which slides upon and turns with said shaft, it being moved longitudinally thereon by a bifurcated lever, G³, pivoted to the frame A at G⁴; or it may be moved by the lever G⁵ and link G⁶ from the opposite side of the machine, if desirable, it being prevented from turning on its shaft by a feather placed in said shaft, which fits into a spline formed in the clutch, thus allowing it to be moved longitudinally and be clutched to either of the wheels G or G'. The arrangement of the clutch G⁷ with reference to the gear-wheels G and G' is such that when moved so as to cause it to engage with wheel G the parts of the feed mechanism will be driven at their slowest rate of speed, and consequently the cuts taken from the material by the passage of each knife will be shorter than when said clutch is made to engage with wheel G', which will give a more rapid motion to the parts.

For arresting the movements of the feeding-rolls and the knives, in the event of any solid substance passing said rolls, and the knives coming in contact therewith and lifting the cutting-bar up, the cam-shaped projection A¹², formed on the arm A¹¹, is made to come in contact with the end of the belt-shifter G⁸, in doing which it will carry the belt from the fixed pulley to the loose one, and thus cause the movements of all of the parts of the machine

to be arrested. Should the belt-shifter fail to be moved from any cause, the movements of the feeding-rollers would be arrested by the cam A¹³ coming in contact with the lever E' and moving it laterally, thus throwing the clutch G⁹ out of contact with the pulley G¹⁰, which carries the belt G¹¹, which moves the feed-rolls, said lever being returned to its original position by a spring, H, provided for that purpose.

It is apparent that any suitable elevator or conveyer may be employed in connection with this machine for carrying the cut material to the silo or other device in which it is to be stored.

I have described my machine thus far without reference to any particular form of knife, as one of the forms shown in Fig. 5 or 5^a may be used, or such as is shown in Fig. 2 may be substituted. I however regard the knife shown in Figs 5 and 5^a as a part of my present invention, and prefer to use one of these forms in organizing a machine as herein described.

My improved knife A⁵, as shown, consists of a plate, I, of steel or other metal, bent into the required form for causing its cutting-edges to present a form of such differing degrees of curvature as to best adapt it to the work to be done. These cutting-edges consist of plates or sections which are firmly attached to the plate I, each one of which has its cutting-edge curved, beginning with I', which has a certain degree of curvature, and decreasing from that point to the section I². It will be observed that each of the sections, beginning with I', extends outward for a less distance than the one which precedes it, the object being to cause the knife to do the greatest amount of its cutting at the points where the resistance to its movements is the least, and the least amount of cutting near its outer end where the resistance is the greatest.

In the form of knife shown in Fig. 5^a the arrangement of the cutting-edges is the same as in Fig. 5, except that they are arranged upon the concave edge of the plate.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The pivoted swinging cutter-bar provided with arms for attaching it to the cutter-box, one of said arms being provided with cam-shaped projections for operating the mechanism which stops the movements of the feed-rollers, its construction being substantially as shown and described.

2. A knife to be used in connection with a machine for cutting food for animals, consisting of a curved plate of metal having attached to it a number of sections, each having upon it a curved cutting-edge of a greater degree of curvature than the one which succeeds it, and each of which projects beyond the plate to which it is attached to a greater distance than the one which succeeds it, substantially as and for the purpose set forth.

3. The combination of the pivoted swinging cutter-bar having upon its inner end a cam-shaped projection, A¹³, lever E', the clutch G⁹, pulley G, belt B², and pulleys B⁴ and B⁵, whereby to arrest the motion of the feed-rollers in the event of any solid substance passing them and coming in contact with the knives, substantially as and for the purpose specified.

4. The combination of the cutter-box A⁶, the automatically-moving stop E, having a roller, E², placed upon one of its arms, and lever E', the parts being arranged for operation, substantially in the manner described and shown.

5. The combination of the elevator for carrying the material to be cut to the cutter-box, the receiver or holder for delivering the same in regulated quantities, and the cutter-box, or an extension thereof, substantially as set forth.

6. In combination with the feeding-rolls of a fodder-cutting machine and a belt for driving them, the worm F², pinion F³, wheels G and G', clutch G⁷, and wheels F⁵ and F⁶, their arrangement being substantially such as is shown and described, whereby they are made to regulate the length of the parts cut from the material in the cutting-box, as set forth.

7. The combination of a swinging cutter-bar having upon one of its arms a cam for operating a belt-shifter, and the belt-shifter G⁸, the parts being arranged for joint operation, substantially as set forth.

8. The combination of a swinging cutter-bar having upon one of its arms a cam-shaped projection for throwing the feed-motion of the machine out of gear, and a lever pivoted to the frame of the machine for unclutching said feeding mechanism, the parts being arranged to operate substantially as set forth.

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

JOHN Y. SMITH.

Witnesses:

W. H. SMITH,
J. F. MEYERS.