

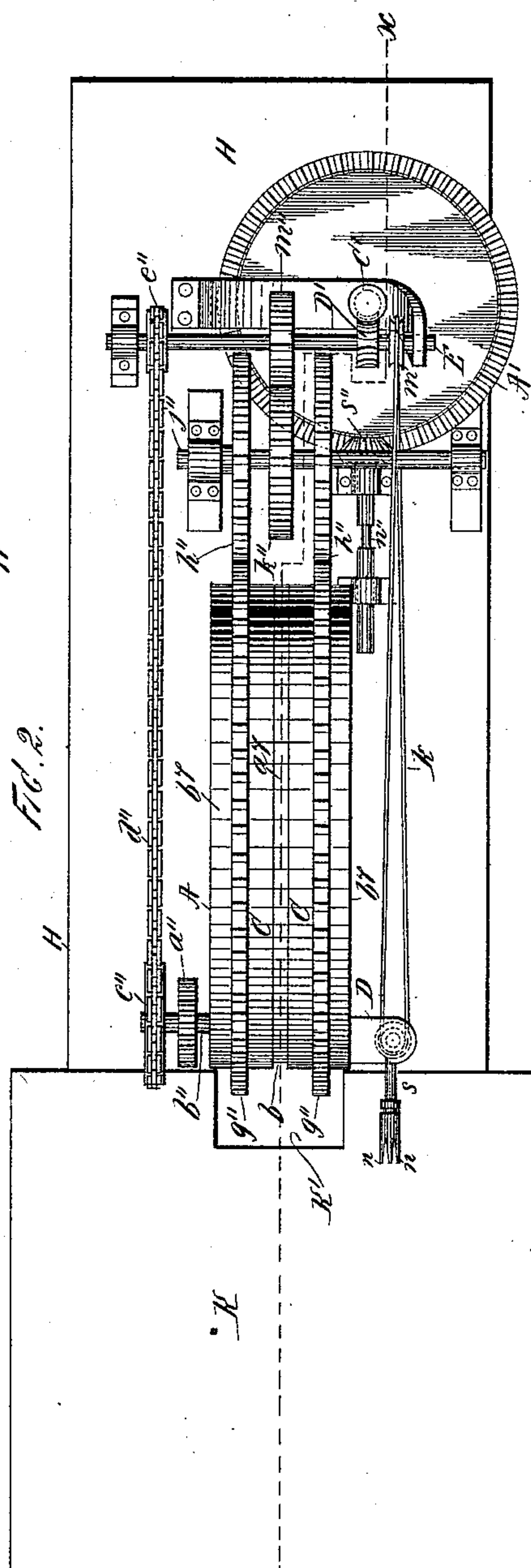
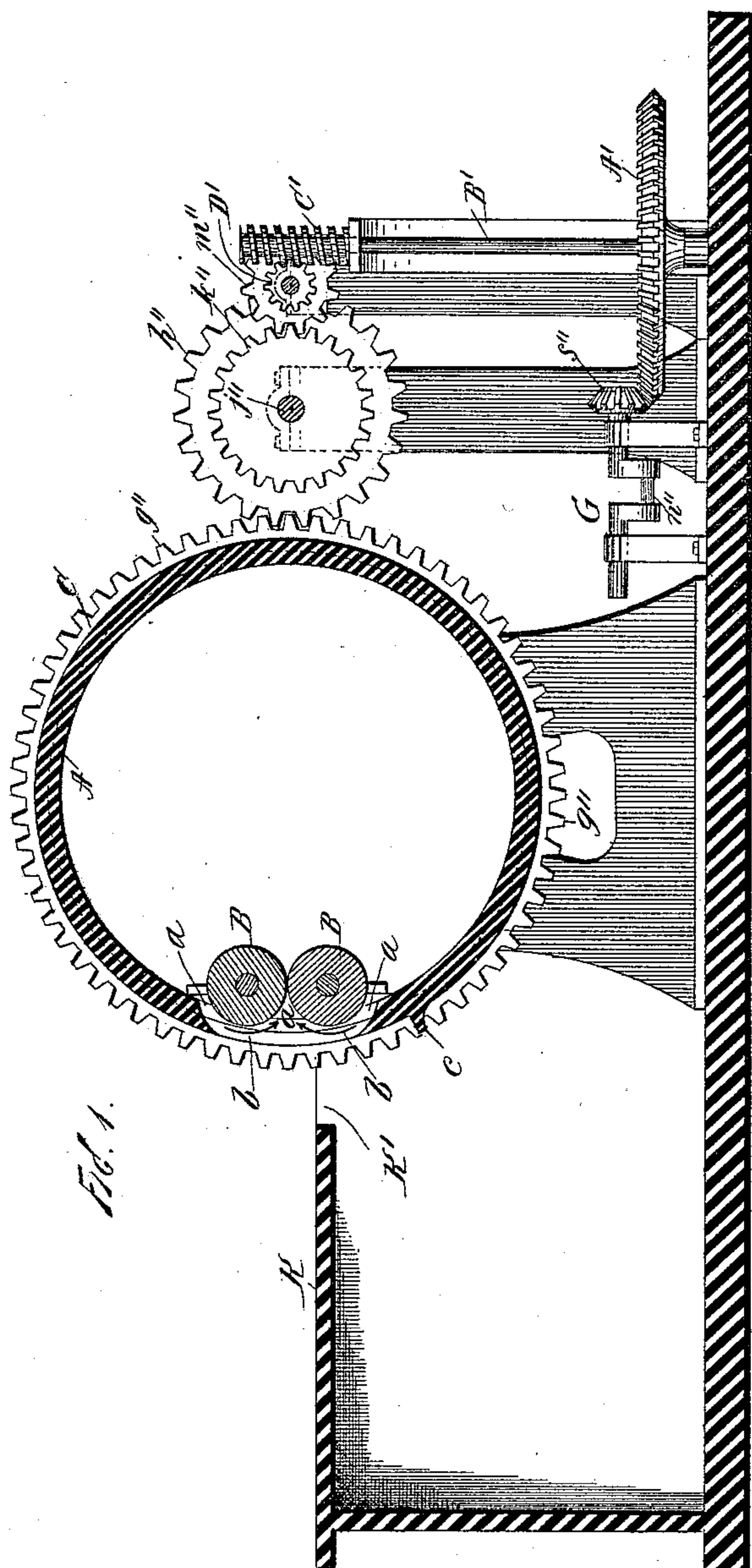
(No Model.)

3 Sheets—Sheet 1.

**J. A. WHITNEY.**  
**HOP PICKING MACHINE.**

No. 536,675.

Patented Apr. 2, 1895.



Witnesses:  
John Buckler,  
Sydney Taylor

Inventor:  
James Whitney

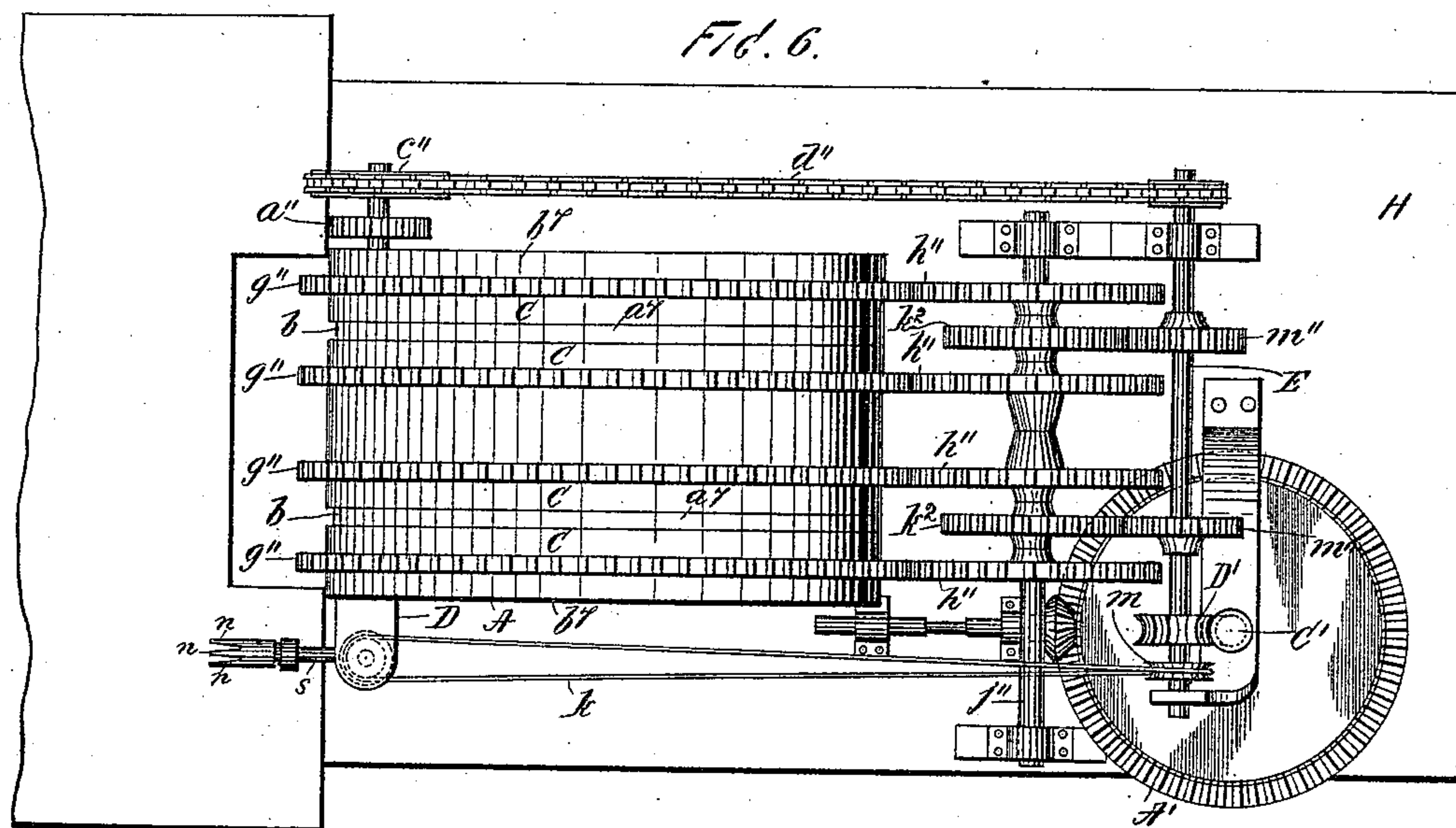
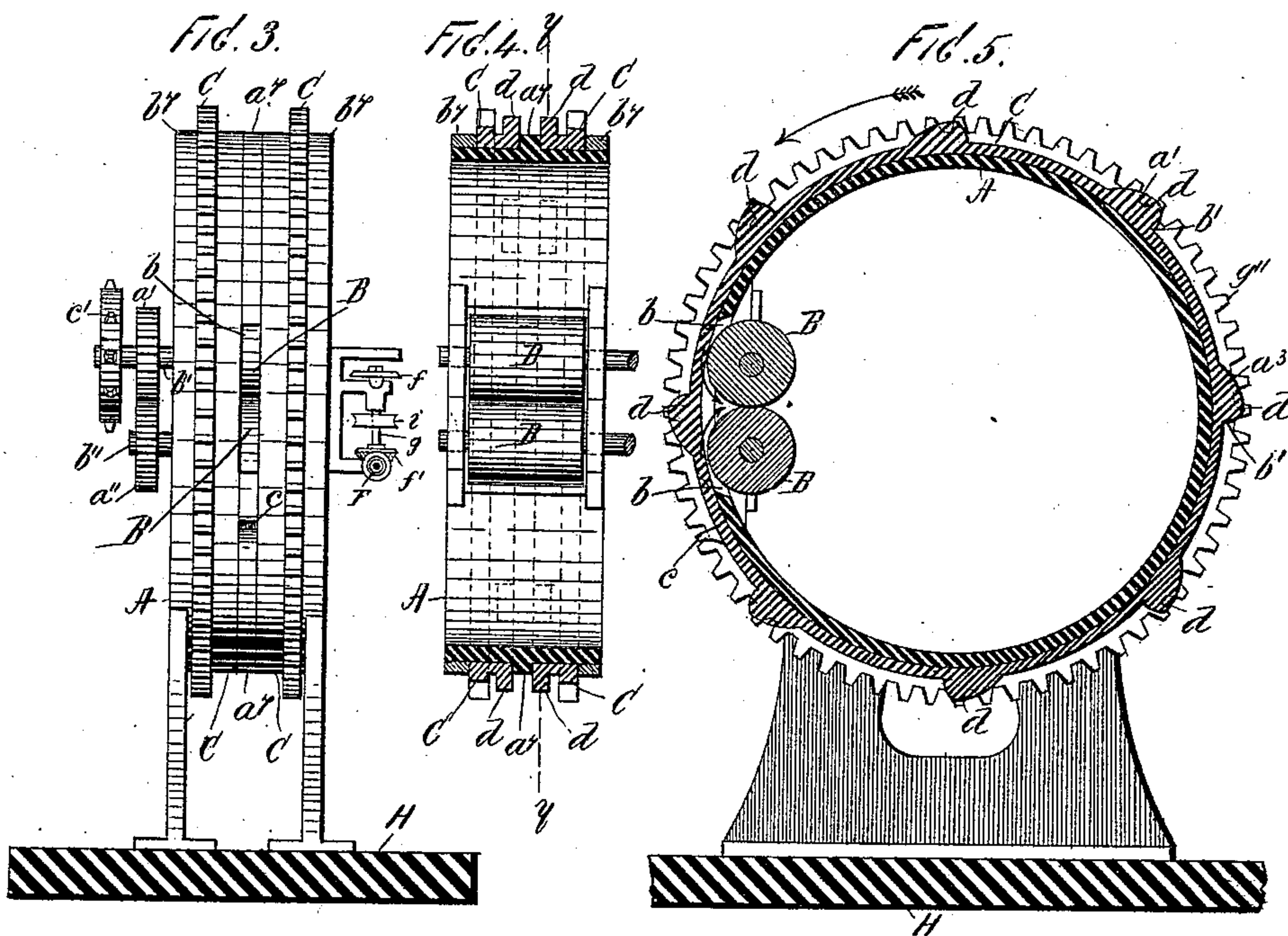
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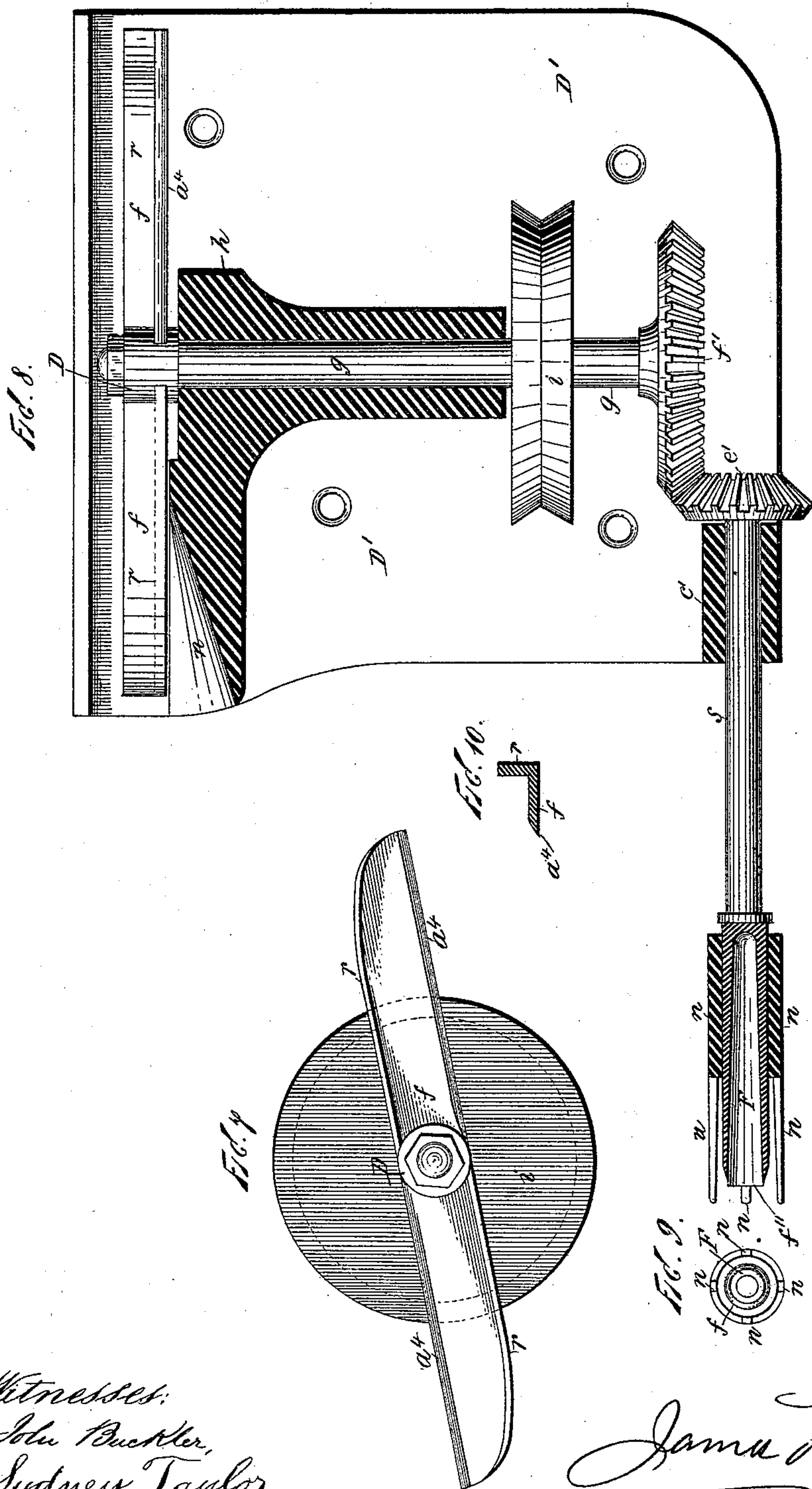
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3 Sheets—Sheet 3.

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Witnesses:  
John Buckler,  
Sydney Taylor

Inventor:  
Jama A. Whitney



# UNITED STATES PATENT OFFICE.

JAMES A. WHITNEY, OF BROOKLYN, NEW YORK.

## HOP-PICKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 536,675, dated April 2, 1895.

Application filed May 31, 1894. Serial No. 512,961. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES A. WHITNEY, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Hop-Picking Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a vertical longitudinal sectional view; Fig. 2, a plan view and Fig. 3 a front view of an apparatus made according to my invention. Fig. 4 is a vertical transverse sectional view and Fig. 5 is a vertical longitudinal sectional view illustrating other and additional parts of my said invention. Fig. 6 is a plan view illustrating the manner in which certain combinations of parts included in my said invention may, when desired, be multiplied for simultaneous use in one and the same machine. Figs. 7 to 10 inclusive, are detail views, on a large scale, still further illustrating my said invention.

This invention is designed to provide an efficient means for picking hops; in other words, for detaching hops from the hop-bearing material, bines, stems, branches, &c., on which they are grown.

The invention comprises certain new and useful combinations of parts and instrumentalities whereby said object is effectually attained.

Referring first more particularly to Figs. 1, 2, 3 and 6, A, is a fixed cylindrical bearing or support. As shown in the drawings this cylinder is hollow, open at one or both ends, and at one side is open or provided with an opening, *a*. Placed in this cylinder at the opening, *a*, are two drawing rolls, B. Placed loose upon the cylinder and movable about the axis thereof are two rings, C, which have a space, *b*, between them. This space is of such a width as to permit the insertion through it of the hop-bearing bines, stems, branches, &c., from which the hops are to be detached, but not of sufficient width to permit the hops to pass through. The rings run in suitable guides provided upon the circumference of the cylinder. Thus, for example, as shown in Fig. 2 a central spline, *a*<sup>7</sup>, serves as a guide

to the inner edges of the rings and determines the width of the space, *b*, between the rings, while two outside splines, *b*<sup>7</sup>, serve as guides for the outer edges of the rings. It is of course manifest that the guides must be so proportioned and arranged as not to interfere with access of hop-bearing material through the space, *b*, as the rings are turned about the axis of their cylindrical support. As shown in the drawings the rolls, B, are placed within the rings, C. When said rolls are set in motion in the directions indicated by the arrows in Figs. 1 and 5 and the hop-bearing material is introduced endwise through the space, *b*, to and between the rolls, B, the action of the latter draws the bines, branches, stems, &c., through the space, *b*, while the hops coming against the adjacent edges of the rings which bound the sides of the space, *b*, are torn off or detached and fall at the outer circumference of the rings. It will be noticed that as thus arranged the stripping edges of the rings in their movements pass in front of the rolls in a plane or direction transverse or substantially so to that of the length of the rolls,—in other words, transverse to the line of gripping contact of said rolls as they operate to draw inward the hop-bearing material through the space, *b*. As said material is thus drawn through said space the gliding contact of said edges of the rings as they pass with a sweeping movement past the front or indrawing face of the rolls and transverse to their line of gripping contact, exerts a very efficient action in detaching the hops. By this means, also, I am enabled, as hereinafter more fully explained, to place a number of stripping mechanisms side by side for simultaneous use in one and the same machine so that a considerable number of separated hop-bearing branches, stems, &c., may be simultaneously stripped of their hops, by being simultaneously drawn through the several stripping mechanisms by one and the same pair of drawing rolls. This arrangement also, as hereinafter explained, permits the use in one and the same apparatus, of multiple stripping mechanisms adapted to different diameters of hop-bearing branches, stems, &c., and also the operation of such multiple stripping devices at different rates of speed. Further, by this means, I am enabled to place a



number of stripping mechanisms within a space of such lateral dimensions as to permit a single operation to conveniently keep them supplied with hop-bearing material for their simultaneous use and operation.

The rings, C, being turned or revolved upon the cylinder as the hop-bearing material is passed through the space, *b*, the latter under ordinary conditions tends to readily free itself from hops which if the stripping edges were stationary would become wedged in it by the draft exerted upon the hops by the inward movement of the hop-bearing material. To insure the clearing of the said space from any hops which under some conditions may resist this tendency of the space, *b*, to free itself, there is provided a clearing device, *c*, which, at a point suitably remote from the rolls, extends into said space so that as the rings are turned the inner edges of the rings are swept past the said device and any hops which may have been retained or become wedged between them are cleared or swept out by said device. By this means the edges of the rings where they come in contact with the hops to strip the latter from the hop-bearing material are kept always clear. In other words, the space, *b*, is kept unclogged to insure the effective operation of the parts in the separation of the hops from the hop-bearing material.

The clearing device, *c*, may be of any suitable construction and applied in any suitable way, but as shown in the drawings it comprises a simple fixed stud or spur which projects into the space, *b*, at a point a little distant from where the hop-bearing material is introduced through the said space to the drawing rolls. This stud or spur may be fixed to the contiguous surface of the cylinder and project outward therefrom into the space, *b*, as shown in Fig. 1. The feeding movement of the rolls, and the revoluble motion of the rings may be provided by any suitable means. Efficient mechanism for the purpose is hereinafter presently described.

To promote the more rapid and effective separation of the hops from the hop-bearing material as the latter is drawn through the space, *b*, there is provided to each ring a projection, or series of projections, *d*, as illustrated in Figs. 4 and 5. These projections I term "pickers" and preferably each ring has several of them as shown in the drawings. The picker, or pickers, on the one ring should coincide in position with the corresponding picker or pickers on the other. The projections or pickers, *d*, may extend to any desired width across the faces of the respective rings. It is sufficient, however, if they form only a part of such width, but their inner surfaces should be placed at the edges of the rings contiguous to the space, *b*, the space between two coincident pickers of the two rings corresponding substantially to the width of said space, in other words the said space being extended between the coincident pickers.

These projections or pickers, *d*, may be of any desired or appropriate shape but are preferably of the angular form shown in Fig. 4, with the forward edge, *b'*, of each at a less acute angle to the circumference of the ring which carries it than is its rear edge, *a'*. The rings being moved across the lines of direction in which the hop-bearing material is drawn inward by the rolls, as for example revolved in the direction of the curved arrow external thereto in Fig. 5, and the rolls, B, being operated as described to draw inward the hop-bearing material through the space, *b*, and consequently through the space existent between coincident pickers, *d*, of the two rings, it follows that the pickers at intervals in the rotation of the rings strike against the hops as they are drawn toward the inner edges of the rings which bound the space, *b*, and this somewhat sudden impact of the pickers being in direction contrary to or different from that in which the hop-bearing material is drawn strikes or pushes the hops in said contrary direction. This detaches the hops from the hop-bearing material with a quicker and more positive action than if their separation were wholly dependent upon the resistance offered by the edges of the rings to their passage through the space, *b*.

To prevent the clogging of the pickers, *d*, by the lodgment of hops, &c., in the space between opposite and coincident pickers a suitable clearing device is provided to the pickers. This may be done by extending the device, *c*, as shown in Fig. 4, so that said pickers in their movement pass upon opposite sides of said device with the result of effectually clearing the space between the pickers as they pass from where the hop-bearing material is introduced to the drawing mechanism. To prevent the hop-bearing material from being carried around the axis of motion of the pickers, a stop, which may connect in the lower limit of the opening may be provided. This stop may, when desired, be constituted by the clearing device, *c*. After the hops have been detached the stripped bines, stems, branches, &c., pass out at the rear of the drawing rolls to make their exit from the cylinder through the open end or ends of the latter.

It will be observed that the pickers, *d*, placed opposite each other with the space, *b*, between them move across the indrawing face or front of the drawing rolls and consequently across and transversely, or substantially so, to the path or line of travel of the hop-bearing material as the latter is drawn inward through the space, *b*, and that the pickers in their successive action brush or strike the hops from the said material in a direction opposite to that in which said material is drawn by the drawing mechanism.

In practice the larger hop-bearing branches of the hop-plant are, ordinarily, torn from the bine. This leaves upon the torn ends of such branches large knot-like butts which are



of greater diameter than the branches proper. The greater size of these knotted ends or butts would require for their introduction to the drawing mechanism a width of passage-way inconsistent with the most effective separation of the hops from the hop-bearing material when the latter is drawn through the stripping device or mechanism. To obviate the inconveniences arising from such enlarged ends of hop-bearing branches I provide a cutter which is maintained in operative motion in such connection with the stripping device or mechanism and with the drawing mechanism that such branches prior to their introduction to the drawing and stripping device or mechanism may be placed in the path of the said cutter and thereby have their enlarged or knotted ends removed. This is done preferably in such a manner that the knotted ends are severed with an oblique cut which leaves the remaining ends of the branches of a wedge-like form which permits their easy insertion into and through the stripping device or mechanism and their convenient introduction to the drawing mechanism. The structure and character of this cutter and the means for operating the same may be varied within wide limits. Its preferred construction is shown at D in the drawings, Figs. 7 and 9, and comprises two blades, *f*, fast at their inner ends to a rotatory shaft, *g*, which works in suitable bearings, *h*, located at any desired part of the apparatus. Said shaft is provided with a pulley, *i*, to which motion is given through a band, *k*, from a similar pulley, *m*, on a driving shaft, D, as shown in Fig. 2. Below these blades is a rest, *n*, upon which the end of the branch may be placed to intersect the path of the edges, *a*<sup>4</sup>, of the blades, *f*, in their rotation. This rest, *n*, should be oblique to the path in which the blades rotate, as shown in Fig. 8, so that the butt or knot at the end of the branch to be severed may be cut off obliquely from the main length of the branch, leaving the end of the latter tapering or wedge-shaped to facilitate its introduction to and through the stripping and drawing mechanisms as hereinbefore explained. The severed knot or butt may be automatically swept out of the way by a flange, *r*, provided to the back of each blade as shown in cross-section in Fig. 9, and which by the continued rotation of the blades strikes the severed butt or knot immediately after it is cut off as described. The cutter is placed in any suitable position with reference to the stripping and drawing mechanisms. As shown in the drawings it is supported upon a bracket, D', intended to be attached at the end of the cylinder, A. When, as hereinafter set forth, more than one pair or system of rings is used, the respective spaces, *b*, thereof may be of different widths adapted to vines, stems, branches, &c., of different diameters. In such cases, it is convenient to have at one side of the machine a system of rings in which the space, *b*, is comparatively wide for the inser-

tion of the larger hop-bearing branches, &c., and the cutter may be arranged in close proximity to and preferably somewhat to the right hand of, the said system. When desired but one blade, *f*, instead of two may be employed, or a greater number than two if desired, or any other suitable form or structure of cutter having any appropriate motion may be used in lieu of one or more blades arranged for operation as described.

It frequently occurs in practice, especially with the small stems of single clusters of hops, that the portion of the stem extending beyond the hops is too short to reach from the outer surface of the stripping device or mechanism to the line of gripping contact of the drawing mechanism. To overcome any difficulty arising from this, I provide in suitable relation with the stripping and drawing mechanisms, an axially revoluble knife, F, which is constructed and arranged to operate in connection with the operative action of said mechanisms to shear off the hops from a sufficient length of the butt-end portion of the stem to enable said portion to be passed to the drawing mechanism and grasped thereby to draw the stem through the stripping mechanism to detach the hops. This knife, as shown in the drawings, Figs. 9 and 10 is in form a cylindrical tube which at its rear end is attached to a rotatory shaft, S, which latter is carried in a bearing, *c'*, provided to the bracket, D', and which receives motion from the shaft, *g*, through two bevel gears *e'*, and, *f'*, as shown in Fig. 8. The open front end of this knife is brought to a suitable cutting edge, *f''*, so that when a hop-bearing stem is thrust endwise and butt-end first into and through the said open end of the knife, F, the stem is sheared longitudinally of hops to a distance sufficient to provide an extent of denuded stem long enough to reach through the stripping device or mechanism to the drawing mechanism, as, for example, through the space, *b*, to the drawing rolls, B. The construction of this knife may be varied within wide limits so long as it has an axial movement. Instead of being rotated by the gears described it may, when preferred, be driven or operated by any other suitable means, and instead of being located in immediate connection with the cutter, D, it may be placed in any desired relation with regard to the stripping device or mechanism.

When more than one pair or system of rings is used in one machine the pair at one side of the latter may have its space, *b*, of less width than that (or those) at the other side, and may be thus more especially adapted to detach hops from hop-bearing stems of small diameter. In such case, the axially revoluble knife may be more conveniently located in front of such relatively narrow space, *b*, and preferably somewhat lower than the point at which the hop-bearing material is inserted into and through the said space.

To prevent the hand of the operator from



coming in contact with the cutting edge,  $f''$ , of the knife, F, I provide to the latter a guard which is composed of prongs  $u$ , extended parallel with the knife at intervals of its circumference and which should project somewhat beyond the cutting edge,  $f''$ , as shown in Fig. 8. These prongs may be formed upon the outer end of a fixed sleeve,  $u'$ . The spaces between the prongs afford room for the inward movement of the hop-bearing stem to denude the same to the extent desired, while preventing contact of the fingers or hand of the operator with the cutting edge of the knife.

The rolls, B, and the rings, C, may be actuated by any suitable means. The devices shown in the drawings as arranged to afford a rotary or revoluble movement to the rings are, however, ordinarily to be preferred for that purpose. As concerns the rolls they also, may be operated by any suitable means. It is preferred, however, that they be geared together by pinions,  $a''$ , fast upon their shafts,  $b''$ , to insure their simultaneous and correspondent rotation. In the construction shown in the drawings, to the shaft of one of the rolls is provided a sprocket wheel,  $c''$ , which connects by a chain,  $d''$ , with a sprocket wheel,  $e''$ ; but on the shaft, E, a suitable shaft and bevel and bevel pinions may be employed in place of the chain and sprocket wheels when desired. As concerns the rings, B, each has upon its outer circumference a series of teeth forming in effect a spur-wheel,  $g''$ . Into these gear spur-wheels,  $h''$ , fast upon a shaft,  $j''$ , which also carries a spur wheel,  $k''$ , and into this latter gear a spur-pinion,  $m''$ , on the shaft, E, which latter, as hereinbefore mentioned, carries the pulley,  $m$ , from which through the belt,  $p$ , motion is transmitted to the cutter for severing the knotted ends of hop-bearing material and to the knife, F. It will be seen that the speed of the stripping rings, C, and of the drawing rolls, B, may be readily proportioned to each other and that the cutter, D, and the knife, F, may be run or operated simultaneously and in connection with each other, and each, also, simultaneously and in connection with, the operative motion of the rolls, and of the rolls and the rings.

When desired the apparatus may be operated by hand power applied to a crank provided, for example, to the shaft, E. It is desirable, however, that motive power be employed, but as the speed of a useful motor is ordinarily very much greater than that at which it is desirable, or ordinarily practicable to operate the hop-picking mechanisms it is necessary that means especially adapted to adjust the speed derived from the motor to that desired in the said mechanisms should be employed. To accomplish this in a practical and effective manner I provide a driving shaft, G, in suitable bearings upon a platform, H, the latter preferably movable to permit the easy transfer of the apparatus from

place to place. This shaft is provided with a crank,  $n''$ , or with any other suitable means for connection with a motor or prime mover to rotate the said shaft. This driving shaft is, preferably, provided with a suitable balance wheel which may be of any preferred size and proportions. Upon the driving shaft, G, is a small bevel pinion,  $s''$ , which gears into a large bevel gear,  $A'$ , on a shaft,  $B'$ , which has at its opposite end a worm,  $C'$ , which meshes with a worm wheel,  $D'$ , on the shaft, E. The relatively high speed given to the driving shaft, G, by the motor, (which latter may be of any suitable kind and, as just mentioned, connected with the driving shaft by any suitable means) is thus slowed down to the relatively low and moderate speed in the rings and rolls, either or both, requisite to their convenient and proper operation.

When desired two or more pairs or systems of rings may be mounted side by side, each pair with its own space,  $b$ . Fig. 6 shows an arrangement of two pairs of rings in such relation to each other, but, three, four, five, or more pairs may, when desired, be similarly included in one apparatus. Where more than one pair is employed the length of the supporting cylinder and of the drawing rolls is proportionately increased. The system of gearing may, when desired, be modified in the relative proportions of its parts to drive the several pairs of rings at differing speeds.

Placed in front of the cylinder is a table, K, upon which the hop-bearing material may be laid convenient to the operator preparatory to the operation of the stripping and drawing mechanisms, a space,  $K'$ , being provided at the rear of the table to permit the picked or separated hops to fall into any suitable receptacle placed below.

What I claim as my invention is—

1. The combination with pickers,  $d$ , placed opposite each other with a space between them for the passage of the hop-bearing material and mechanism for drawing the said material through said space, of means for giving motion to the pickers across the front of the drawing mechanism and in a direction transverse, or practically so, to the path of the material when drawn by the said mechanism, substantially as herein set forth.

2. The combination with a cylindrical support, of pickers,  $d$ , placed opposite each other with a space between them for the passage of the hop-bearing material, of means for drawing the said material through said space, and mechanism for giving motion to said pickers about the axis of said support and across the path of the hop-bearing material, substantially as herein set forth.

3. The combination with stripping devices provided with a space,  $b$ , for the passage of the hop-bearing material, of rolls for drawing said material through said space to detach the hops, and mechanism for giving to said devices a sweeping movement past the indrawing face of said rolls and transverse to their



line of gripping contact when in operation, substantially as herein set forth.

4. The combination with stripping devices provided with a space, *b*, for the passage of the hop-bearing material, of rolls for drawing said material through said space to detach the hops, mechanism for giving to said devices a sweeping movement past the indrawing face of said rolls and transverse to their line of gripping contact when in operation, and a clearing device arranged to clear the said space during the said movement of the stripping devices, substantially as herein set forth.

5. The combination with a cylindrical support, of rings movable about the axis of said support and having between them a space for the insertion of the hop-bearing material, and mechanism placed within said rings for drawing said material through said space to detach the hops, substantially as herein set forth.

6. The combination with a cylindrical support, of rings movable about the axis of said support and having between them a space for the insertion of the hop-bearing material, mechanism placed within the said rings for drawing the hop-bearing material through said space to detach the hops, and a clearing device arranged to operate in said space to clear the same during the movement of the rings, substantially as herein set forth.

7. The combination with a cylindrical support, of rings movable about the axis of said support having between them a space for the insertion of the hop-bearing material and provided with projections to act as pickers in detaching the hops from the material as the latter is drawn through said space and mechanism placed within the said rings for thus drawing the material through the space, substantially as herein set forth.

8. The combination with a cylindrical support, of revoluble rings having between them a space for the insertion of the hop-bearing material and provided with projections to act as pickers in detaching the hops from the material as the latter is drawn through said space, mechanism placed within the said rings for thus drawing the material through the space, and a clearing device arranged to prevent the clogging of the pickers, substantially as herein described.

9. The combination with a hollow cylinder open or having an opening in its side, rings placed upon said cylinder, revoluble thereon and having between them a space for the insertion of the hop-bearing material, of mechanism placed within said rings and cylinder at the open side of the latter for drawing the said material through said space to detach the hops, substantially as herein set forth.

10. The combination with a hollow cylinder open or having an opening in its side, of rings placed upon said cylinder, revoluble thereon and having a space between them for the insertion of the hop-bearing material, mechanism placed within said rings and cylinder and at the open side of the latter for drawing the

said material through said space to detach the hops, and a stud or projection extended into the said space to clear the same during the movements of the rings, substantially as herein set forth.

11. The combination with a hollow cylinder open or having an opening in its side, of rings revoluble upon said cylinder, having between them a space for the insertion of the hop-bearing material, and provided with projections to act as pickers in detaching the hops from the material as the latter is drawn through said space, and rolls placed within said rings and cylinder and at the open side of the latter to draw the material through the space, substantially as herein set forth.

12. The combination with a hollow cylinder open or having an opening in its side, of rings revoluble upon said cylinder, having between them a space for the insertion of the hop-bearing material, and provided with projections to act as pickers in detaching the hops as the material is drawn through said space, rolls placed within said rings and cylinder and at the open side of the latter to draw the material through the space, and a device arranged to clear the space by the revolution of the rings, substantially as herein set forth.

13. The combination with a cylindrical support, of rings movable about the axis of said support and having between them a space for the insertion of the hop-bearing material, mechanism placed within said rings for drawing said material through said space to detach the hops, and means connecting said rings and mechanism to operate the same in determinate unison with each other, substantially as herein set forth.

14. The combination with a hollow cylinder open or having an opening in its side, and rings revoluble upon said cylinder having between them a space for the insertion of the hop-bearing material, and provided with projections to act as pickers in detaching the hops as the material is drawn through said space, of rolls placed within said rings and cylinder and at the open side of the latter to draw the material through the space, and a system of gearing connecting the rings and rolls to operate the same in determinate unison, substantially as herein set forth.

15. The combination with a stripping mechanism and rolls for drawing the hop-bearing material to subject the same to the action of said mechanism of a cutter and means for maintaining the same in operative motion simultaneous or substantially so with the operation of the said rolls to provide for the removal of knotted ends of stems and consequent easy introduction of the latter through said mechanism to the rolls, substantially as herein set forth.

16. The combination with a stripping mechanism and drawing rolls for subjecting the hop-bearing material to the action of said mechanism, a cutter, means for maintaining said cutter in operative motion simultane-



ously or substantially so with the operation of the said rolls, and a rest placed obliquely to the path of movement of said knife, whereby the knotted butts of hop-bearing material  
5 may be cut obliquely to leave the same with a tapering end fitted for convenient insertion through the stripping mechanism to the rolls, substantially as described.

17. The combination with a stripping mechanism and drawing rolls for drawing the hop-bearing material through said mechanism, of a rotatory cutter, means for maintaining said cutter in operative motion simultaneously or  
10 substantially so with the operation of said rolls, and a flange provided to the said cutter to automatically discharge the severed butts or ends, substantially as herein set forth.

18. The combination with a stripping mechanism and rolls for drawing the hop-bearing material through said mechanism, of a rotary  
20 cutter, means for maintaining said cutter in operative motion simultaneously or substantially so with the operation of said rolls, a rest placed obliquely to the path of movement of  
25 said cutter, to provide for an oblique cut upon the material to be severed, and a flange on the rear of the cutter to sweep away the severed butts or ends, substantially as herein set forth.

30 19. The combination with a stripping mechanism and drawing rolls for subjecting the hop-bearing material to the action of said mechanism, of an axially revoluble knife and means for rotating the same in connection

with the operative action of the stripping 35 mechanism and the rolls to provide for the longitudinal shearing of short stems to enable them to reach the rolls through the stripping mechanism, substantially as herein set forth.

20. The combination with a stripping mechanism and drawing rolls for subjecting the hop-bearing material to the action of said mechanism to detach the hops, of a driving shaft and a motion-transmitting mechanism comprising a worm, worm-wheel, and gears, 45 and interposed between the driving shaft and the rolls, whereby a relatively high-speed motor may be used to afford a relatively low speed to the rolls in the operation of drawing the material through the stripping mechanism, substantially as herein set forth. 50

21. The combination with a cylindrical support, rings revoluble upon said support and having a space between them for the insertion of the hop-bearing material, and drawing rolls 55 placed within said rings to draw the material through said space to detach the hops, of a driving shaft and a motion-transmitting mechanism comprising a worm, worm-wheel and gears, arranged to convert a relatively 60 high speed in the driving shaft into a relatively low speed in the rings and rolls, substantially as herein set forth.

JAMES A. WHITNEY.

Witnesses:

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