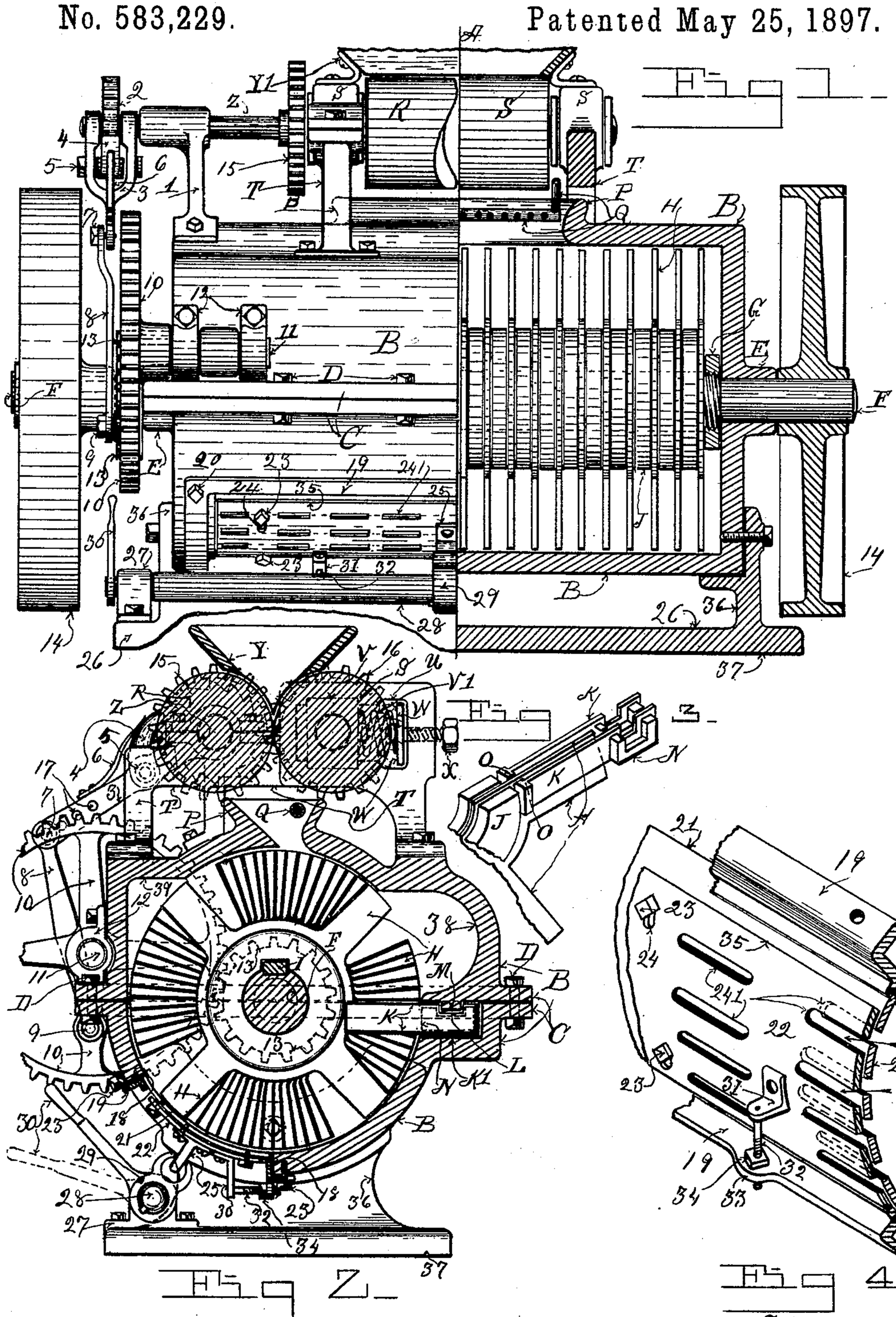
(No Model.)

J. J. HARRELL.

WOOD PULP MAKING MACHINE.

No. 583,229. Patented May 25, 1897.



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JOSEPH J. HARRELL, OF DENVER, COLORADO, ASSIGNOR OF ONE-FOURTH TO CHARLES H. ABBOTT, OF SAME PLACE.

WOOD-PULP-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 583,229, dated May 25, 1897.

Application filed July 9, 1896. Serial No. 598,544. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH J. HARRELL, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Wood-Pulp-Making Machines; and I do 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 and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in machinery for producing wood-pulp from wood chips.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 represents a side view, one half of which is shown in elevation and the opposite half in section. Fig. 2 represents a cross-section of the machine on line A of Fig. 1; Fig. 3, a fragment showing the relative arrangement of the beaters and knives in perspective, and Fig. 4 a perspective fragment of the double screens.

Similar letters and figures of reference refer to similar parts throughout the several views.

Referring to Fig. 1, B designates a cylindrical-shaped casing. It is divided horizontally into two halves and is provided at the division with opposing projecting flanges C, which are bolted together by bolts D. At the ends of the casing suitable bearings E are provided which support a shaft F. The interior of the casing is bored concentric to the axis of said shaft. I cut a thread on each end of the shaft at its largest portion and place nuts G on the threads. These nuts are adapted to form shoulders against the inner ends of the casing and hold the shaft against endwise movement. They can be adjusted from time to time as their bearing sides wear. On the shaft I key a plurality of beaters H. These beaters comprise thin disks of metal with several radiating arms. I arrange and secure these beaters on the shaft with a key I and position each relative to the arm adjacent to it to form of each row of arms a spiral line along the shaft. This spiral arrangement of the beaters operates to feed the wood chips automatically from one end of the machine to the opposite end, as will be more fully described hereinafter. I place by the side of each beater on the shaft a collar J, and between each two beaters I extend a knife K from the side of the casing. The knives K rest on a step K′, cast in the lower half of the casing and are secured in position by being clamped against the seat by the top half of the casing fitting down against their top edges. In order to prevent their working toward the shaft, I cut a keyway L in their top edge and cast a depending lug M on the top half of the casing which fits snugly into the keyways. Between each two knives I place a spacing-block N, which is of a thickness to bring the blocks centrally between the rotative paths of the arms of the beaters in interdigitative order. (See Fig. 3.) These knives comprise blades of steel about one-quarter inch in thickness. The top or impact edge is rounded into an oval shape.

Upon the extreme end of each knife and on each side I form a lateral projection O by wedging and upsetting the metal or by securing thereto pieces of steel or gun-metal. These projections are adapted to fit loosely the space between its adjacent beaters and form lateral bearings for the free ends of the knives against the sides of the disks and prevent the wood chips and pulp which are carried down through the knives by the beaters from springing the free ends of the knives laterally to one side in their rotative path. The knives extend to the collars, and the disk part of the beaters is enough larger in diameter than the collars to form good bearings for the lateral projections on the ends of the knives.

Centrally in the top of the casing a hopper P is formed, and at one side of it I arrange a water-supply pipe Q, which I perforate along its length with small holes in order to feed an evenly-distributed supply of water with the wood chips into the machine. Above the hopper I journal a pair of feed-rolls R and S in suitable brackets T. The roll R is yieldingly and adjustably journaled in a slideway U, formed in the brackets, by means of the boxes V, the spring V′, the plate W, and the

screw X. Above these rollers I place a second hopper Y, securing it to the top of the slideways of said brackets by braces Y'. The trunnion or shaft Z on one side of the stationary roll extends over the end of the machine and is supported by a bearing 1, which is secured to the top of the casing. To the outer end of the shaft I secure a ratchet-wheel 2 and also freely secure the bifurcated end of a pawl-supporting lever 3, to which is pivoted between the bifurcated ends a pawl 4 by means of a bolt 5. A spring 6 is secured to the top of the lever and is arranged to resiliently bear against the pawl and hold it in operative engagement with the ratchet-wheel. The opposite end of this lever 3 is pivotally secured by a bolt 7 to one end of a pitman 8, the opposite end of which is connected by a crank-pin 9 to one arm of a gear 10. This gear is secured to a shaft 11, which is journaled in bearings 12. These bearings are secured to the side of the machine. The gear meshes with and is driven by a pinion 13, which is secured on the main shaft of the machine. The main shaft is provided at each end with a fly-wheel pulley 14, to either of which power may be applied through the medium of a belt. The gears and pitman are adapted to impart, through the medium of lever 3, a reciprocating movement to the pawl, which causes it to intermittently partially rotate the ratchet-wheels and the stationary roller. This partial movement of the stationary roller is imparted to the adjustable roller by means of a pair of gears 15 and 16, which are secured to the opposite end of the trunnions of the rollers from the ratchet-wheel. These gears mesh with one another, the gear 15 driving the gear 16, and consequently its roller. The rotary feed movement of the rolls is adjusted by means of a row of perforations 17 in the end of the lever 3, to any one of which the pitman may be connected. The nearer the pitman is connected to the pawl the shorter will be the throw of the pawl, and consequently the partial rotative movement of the rollers.

One of the essential elements of my invention comprises a screening device through which the pulp can flow after it is properly comminuted. During the operation of the machine the fine wet pulp flowing through the meshes of an ordinary screen clogs them, and unless the meshes can be relieved instantly the work is retarded or stopped until relief is afforded. I preferably carry out this feature of my invention in the following manner: Along one side of the casing I make an aperture 18 and fit into it a frame 19, which I secure by cap-screws 20 to the casing. To this frame I secure a screen 21 by screws 211 of preferably the slot variety. To this screen I secure a second screen 22 by screws 23, which pass loosely through slots 24 and screw tight into the first-named screen. The slots 24 are long enough to allow the second screen to be moved over the surface of the first screen a distance equal to the width of the slots or meshes 241 therein. To the central portion of the screen 22 I secure a projecting lug 25, and to each end of the base 26 which supports the machine I secure a bracket-bearing 27. A shaft 28 is journaled in these bearings, which has secured to it in a position to engage the projecting lug 25 a yoke 29, which is adapted to bear loosely on opposite sides of said lug. To one end of said shaft I secure a hand-lever 30, by means of which the shaft may be partially rotated and the outside screen moved on the inner fixed screen. The slots in both screens register with one another and are made considerably larger than would be used to strain the pulp from the casing. By this arrangement I am enabled to move the slots 241 of the outer screen over the slots of the inner and thus diminish their area to any size or mesh required. I am also able to instantly move the outer screen, so that its slots 241 will register evenly with those of the inner, and thus allow any pulp clogging the normal mesh to be immediately flushed through the enlarged apertures by the water in the casing and to instantly reduce the slots back to the required mesh. In order that the slots may be reduced instantly to the required mesh with precision, I provide the outer screen with one or two adjustable stops, which comprise a lug 31, secured to the outer screen near its opposite ends. A threaded rod 32 is secured to the lug and adapted to extend through a clear hole formed in a projection 33, cast on the screen-frame, and a nut 34, fitted to the threaded part of said rod, which is set against said lug and defines the downward movement of the outer screen. (See Fig. 4.) By adjusting the nuts the normal size of the mesh can be increased or diminished as a finer or coarser pulp product is desired. When the outer screen is moved by the hand-lever to increase the openings and flush out the clogging pulp, the threaded rod moves with it through but not out of the hole in the projection, and when the flushing is accomplished the handle is moved quickly down until the nuts rest against the lugs, which reëstablishes the desired mesh. The outer screen is made just enough shorter at its top edge 35 to allow it to move before it strikes the inner screen-frame a distance equal to the full size of the slots, so that they will register evenly with one another when the outer screen is moved up against the frame.

26 designates a supporting-base which is adapted to be bolted to the lower portion of the casing. It comprises two opposite standards 36, which are arranged to be bolted to the ends of the casing, and a bed-plate 37, which extends from standard to standard under the machine.

The operation of the machine is as follows: The wood to be reduced to pulp is first reduced to chips of approximately an inch by an eighth of an inch in size. By suitable ma-

chinery these are fed to the hopper above the feed-rollers. The beaters are rotated at about seven hundred revolutions per minute, and the gears, with the pitman and the pawl and the ratchet, intermittently rotate the feed-rollers and feed to the lower hopper a supply of chips, which, with a continuous supply of cold water from the perforated pipe, fall before the beaters and are thrown and carried violently by them against the knives and are continually broken, torn, and reduced to a pulp in the casing. I have found that it greatly facilitates the reduction of the wood to pulp to keep the chips moving continuously lengthwise of the machine and back again in a continuous circuit, and for this purpose I arrange the beaters spirally on the shaft, and as they rotate they keep a portion of the mass moving gradually toward one end of the machine, and in order to allow that which is being fed by the beaters to return to the feed-starting end of the casing, I form in the top portion of the casing a recess 38, which extends the whole length of the casing and forms a passage out of the path of that portion of the pulp which is fed by the spiral beaters for the pulp to work back to the opposite end of the casing, thus establishing a continuous endless movement of the pulp across the knives. I also form a step 39 in the opposite side of the top portion of the casing, which is adapted to form a clearance-space to enable the beaters to throw off the chips sticking to them, and this is arranged to allow the beaters to throw the material against a flat surface, which aids by impingement the disintegration of the pulp material. The recess 38 also forms a space into which stones, bolts, nuts, &c., can work out of the path of the beaters should they get into the machine. The chips are soon comminuted and with the water form a pulp which is highly heated during its manipulation, and the pulp is discharged from the casing through the adjustable screen.

My machine is simple, strong, and durable and produces a pulp of a superior quality and much faster than by the present method.

The manufacture of wood-pulp by direct impact is believed to be new, and while I have illustrated the preferred mechanism by which I accomplish it I do not wish to be limited to the exact construction shown, as it is obvious that many changes could be made without departing from the spirit of my invention.

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

1. A machine for making wood-pulp from wood chips comprising a suitable receiving vessel or casing, means for providing a supply of water therefor, a shaft journaled in said casing, means for rotating said shaft, a plurality of radiating arms forming beaters secured to said shaft and spaced at short distances apart, a plurality of stationary arms comprising knives arranged to project between said beaters, an adjustable-mesh screen arranged in said casing for the pulp to flow through, and means for manually changing at will the gage of the mesh of said screen substantially as described.

2. In a machine for manufacturing wood-pulp, the combination with the receiving-casing, of a shaft journaled therein, a plurality of disks having radiating arms arranged in a spiral line on said shaft, a plurality of knives secured to said casing and extending into the interstices of the said beaters in interdigitative order, means for rotating said shaft and beaters, and a recess in said casing parallel with said shaft and adapted for return-passage for the pulp from the feed of said spirally-arranged beaters, substantially as described.

3. In a wood-pulp-making machine, the combination with the casing and the shaft, of the beaters arranged spirally thereon, a spacing-collar between each beater, a plurality of knives secured to said casing and interposed between the rotary paths of said beaters, a spacing-block between each knife, and means for preventing the lateral spring of the free ends of said knives into the path of said beaters, substantially as described.

4. The combination with the divided casing and the shaft, of the beaters arranged spirally thereon, the spacing-collars, the knives between said beaters, means for securing said knives to the casing, a transverse notch or keyway in each of said knives arranged in alinement with one another in said casing and a depending portion on said casing adapted to synchronously fit into said keyway of said knives, as and for the purpose specified.

5. The combination in a pulp-making machine, of a casing or pulp-chamber of substantially cylindrical shape divided horizontally into two parts and having a feed-inlet and a screened outlet, a shaft journaled therein, pulley fly-wheels thereon, a plurality of disks keyed to said shaft, spacing-collars between each two of said disks, arms comprising beaters integral with said disks, a plurality of knives interposing said beaters and disks, means for spacing said knives to register with the intervals between said beaters, means for securing said knives to said casing and a lateral support for the free ends of said knives, substantially as described.

6. The combination of the pulp-receiving chamber, the main shaft, the fly-wheels, the rotary beaters fixed to said shaft and the stationary knives, of an adjustable-mesh, flushing-screen comprising a screen fixed to a discharge-outlet formed in said pulp-chamber, a second screen overlapping the fixed screen and secured in contact therewith and having its apertures registering with those of said fixed screen, means for moving said second screen at will over the surface of said fixed screen and means for gaging the movement of said second screen in both directions whereby the sizes of said aperture are instantly reduced to any mesh required for the discharge

of pulp from said chamber of any desired fineness, and are instantly increased to full size to flush said screen when it becomes clogged, substantially as described.

7. An adjustable-mesh flushing and screening device for pulp-making machines, comprising two screens in contact with one another of like mesh and arranged to register with one another, having one of said screens fixed and the other movable a distance equal to the breadth of its meshes on the surface of the other, means for moving said screen at will and means for defining and maintaining a selectable gage of mesh and for instantly increasing the apertures at will to flush the apertures and for returning instantly to the normal mesh, substantially as described.

8. The combination of the casing having a feed-inlet and a screen-outlet, the shaft, the beaters, and the knives with a pinion secured to said shaft, a gear journaled to the casing to mesh with said pinion, a pair of feed-rollers journaled above the feed-inlet of said casing, a gear on each trunnion or shaft of said rollers and meshing with one another, a ratchet-wheel secured to the shaft of one of said rollers, a lever pivoted to said shaft adjacent to said ratchet-wheel, a spring-controlled pawl pivoted to said lever in engagement with said teeth of said ratchet-wheel, a pitman secured to said gear and to said pawl-supporting lever, and means for changing the stroke of said pawl whereby the said feed-rollers are intermittently rotated.

9. The combination with the casing and the driving-shaft, of the pinion and the gear, a pair of feed-rollers journaled above the feed-inlet to said casing having one of said rollers provided with a yielding bearing whereby it can automatically accommodate and adjust itself to the feeding of irregular wood chips, and means including a pair of equally-sized gears fixed to the journals of said rolls and in mesh with each other, a spring-controlled pawl, a ratchet-wheel and the said gear and pinion for intermittently rotating said feed-rollers a predetermined partial rotation, substantially as described.

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

JOSEPH J. HARRELL.

Witnesses:

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