(No Model.) 5 Sheets—Sheet 1.

E. A. HARTSHORN.

HEMP BRAKE.

No. 420,575. Patented Feb. 4, 1890.

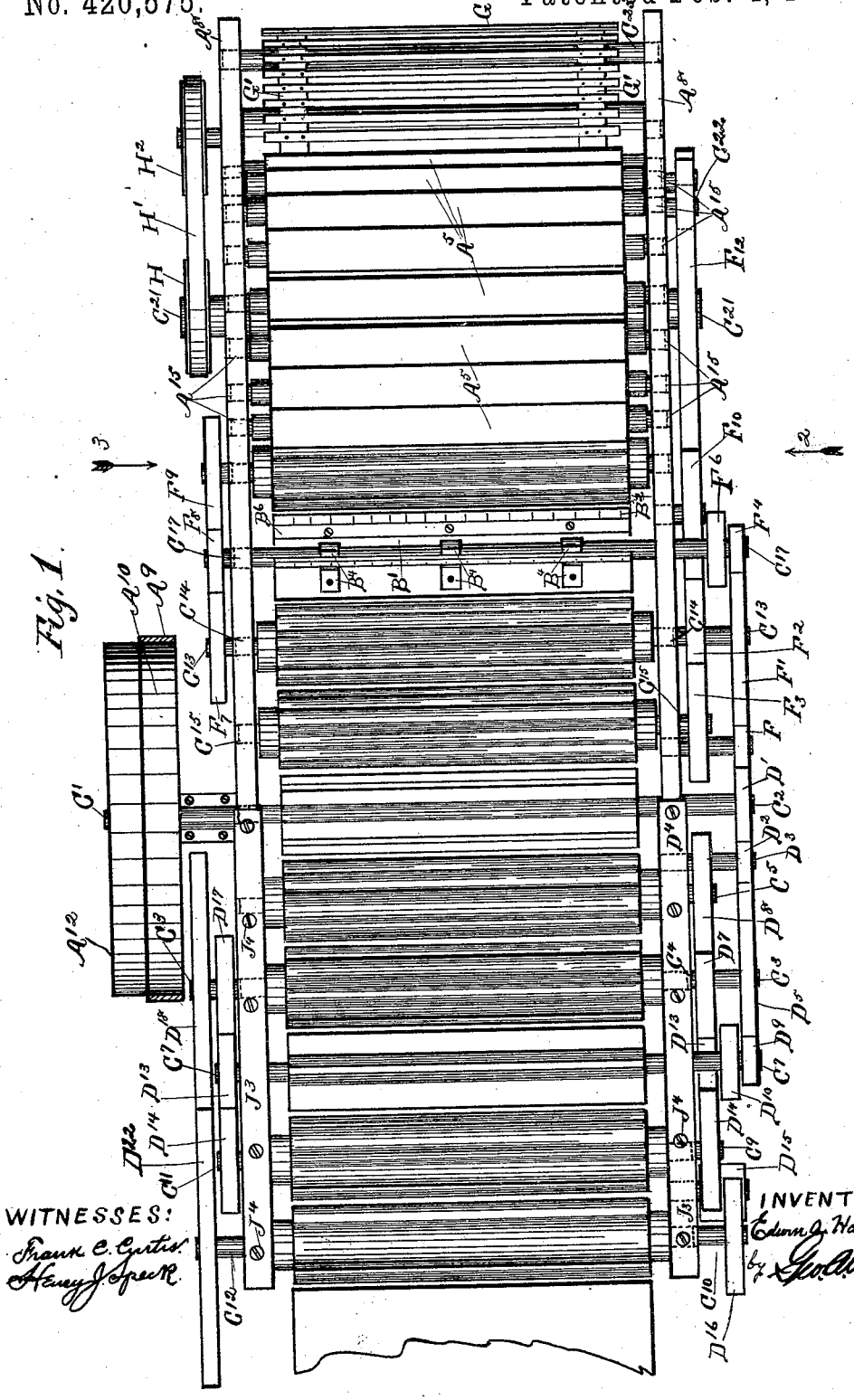


Fig. 1.

WITNESSES:
Frank C. Curtis
Henry J. Speer

INVENTOR:
Edwin A. Hartshorn
by Geo. W. Morris
Atty.

(No Model.) 5 Sheets—Sheet 2.

E. A. HARTSHORN.

HEMP BRAKE.

No. 420,575. Patented Feb. 4, 1890.

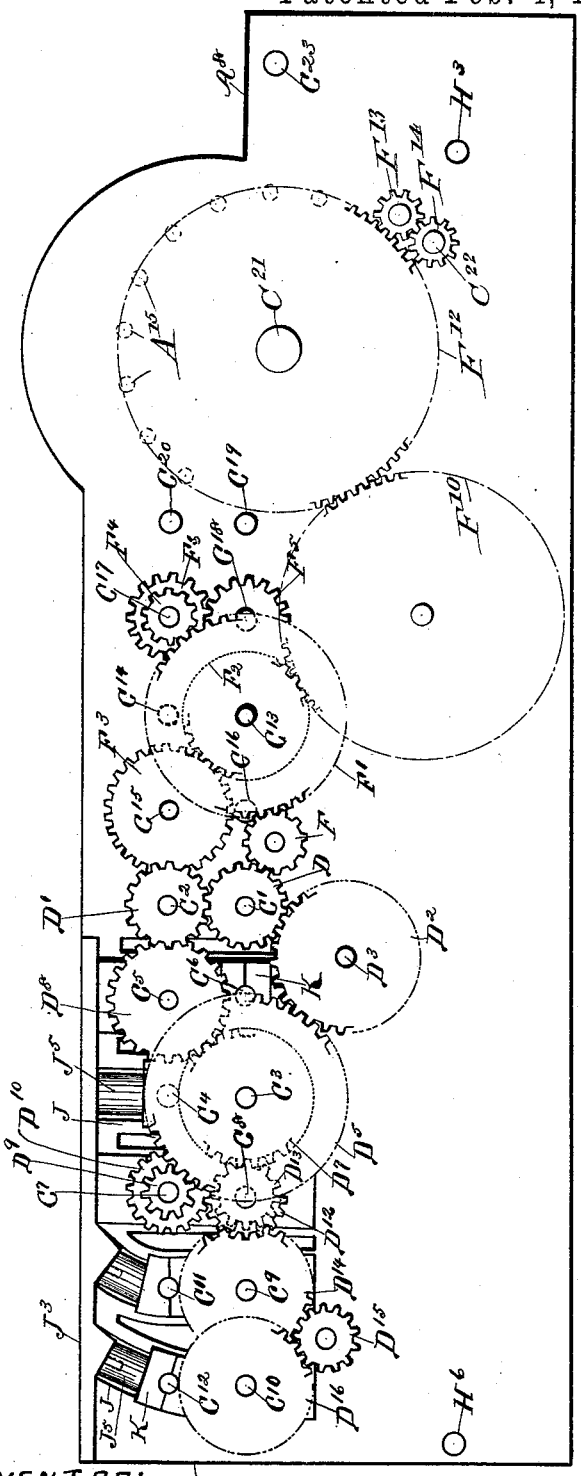


Fig. 2.

WITNESSES!
Frank C. Curtis
Henry J. Spencer

INVENTOR!
Edwin A. Hartshorn
by Geo. Allen & Son Attys.

(No Model.) 5 Sheets—Sheet 3.

E. A. HARTSHORN.

HEMP BRAKE.

No. 420,575. Patented Feb. 4, 1890.

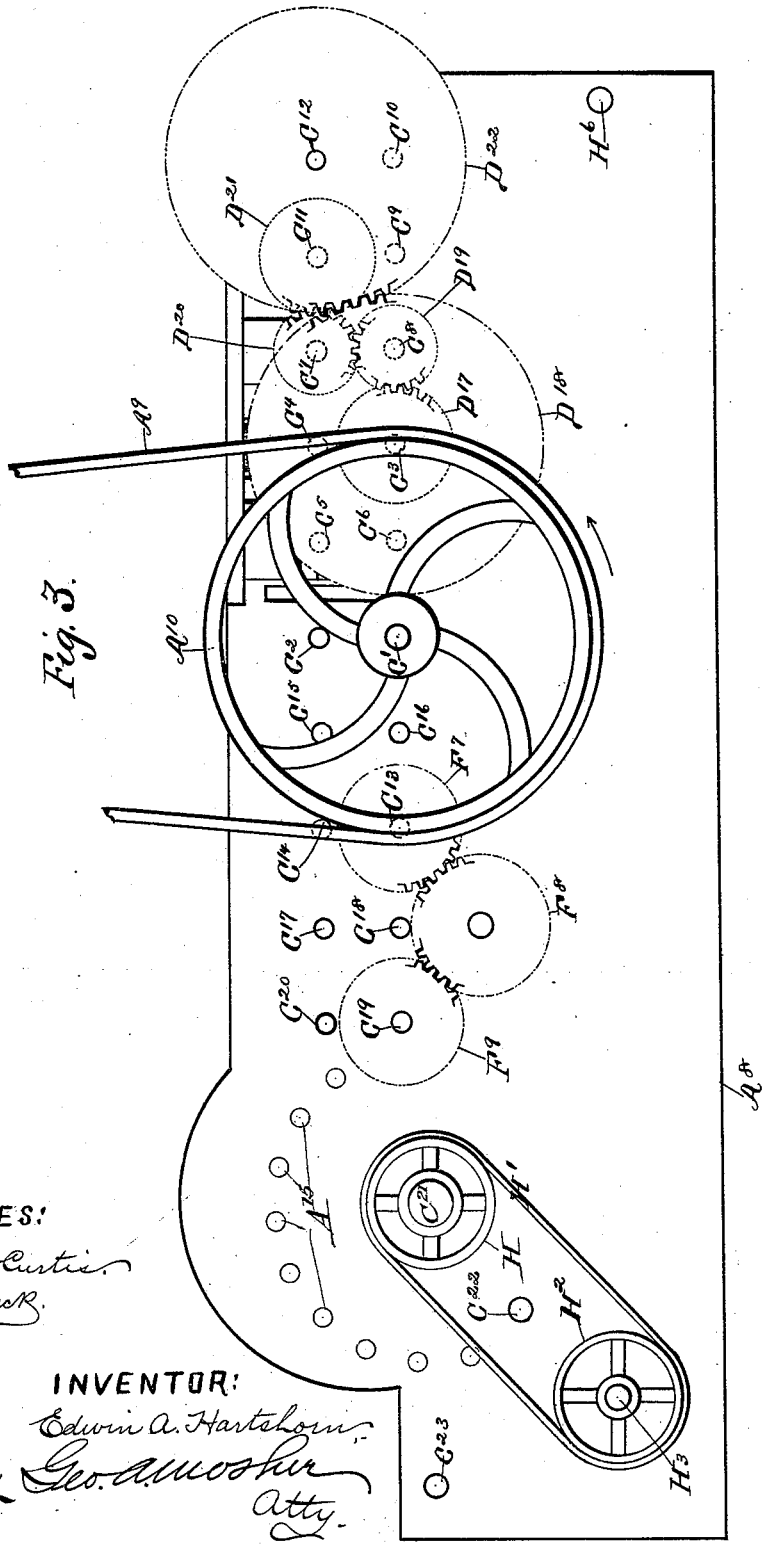


Fig. 3.

WITNESSES:
Frank C. Curtis
Henry J. Speck

INVENTOR:
Edwin A. Hartshorn
by Geo. A. Moosher
Atty.

(No Model.) 5 Sheets—Sheet 4.

E. A. HARTSHORN.

HEMP BRAKE.

No. 420,575. Patented Feb. 4, 1890.

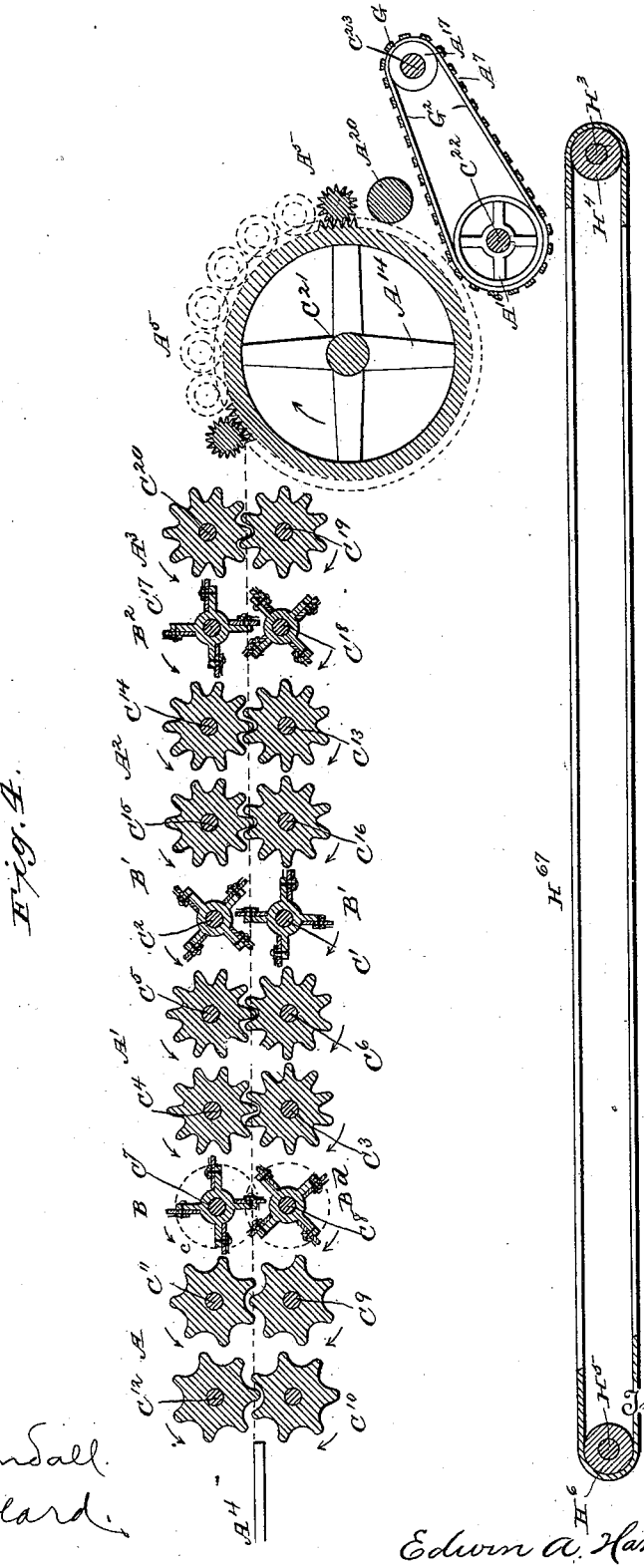


Fig. 4.

Witnesses
Chas. F. Randall.
W. F. Woolard.

Inventor
Edwin A. Hartshorn

(No Model.) 5 Sheets—Sheet 5.

E. A. HARTSHORN.

HEMP BRAKE.

No. 420,575. Patented Feb. 4, 1890.

Fig. 9.

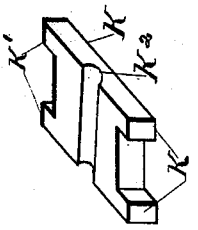


Fig. 10.

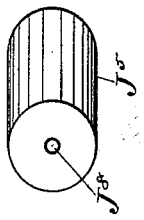


Fig. 7.

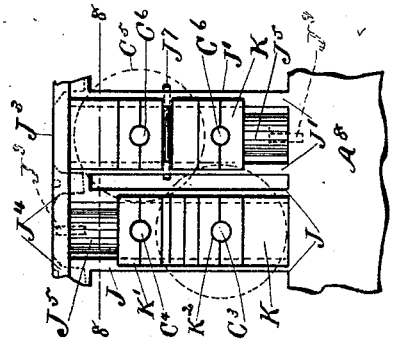


Fig. 8.

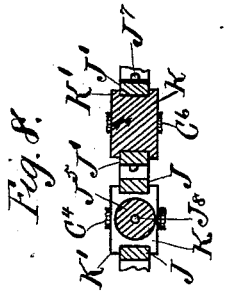


Fig. 5.

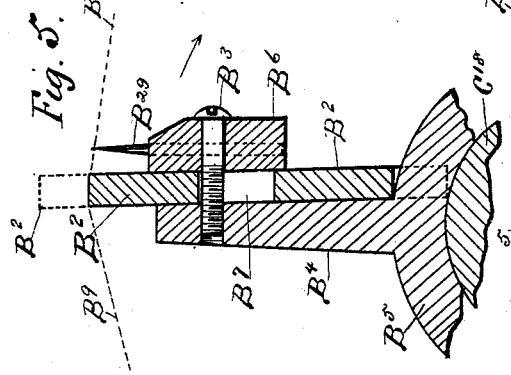
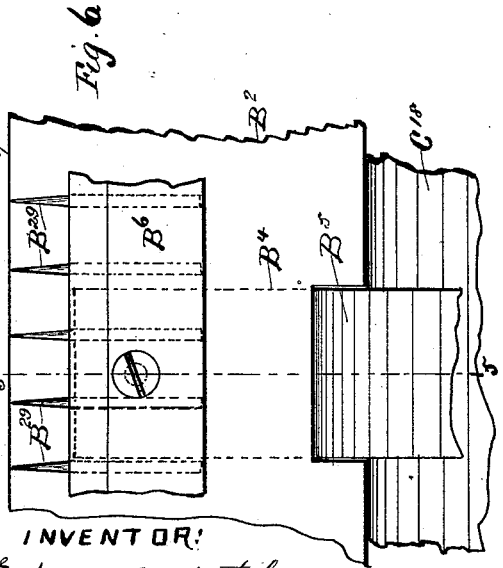


Fig. 6.



WITNESSES:
Frank C. Curtis
Henry J. Speck.

INVENTOR:
Edwin A. Hartshorn
by Geo. A. Wood & Co.
attys.

UNITED STATES PATENT OFFICE.

EDWIN A. HARTSHORN, OF TROY, NEW YORK.

HEMP-BRAKE.

SPECIFICATION forming part of Letters Patent No. 420,575, dated February 4, 1890.

Application filed November 6, 1889. Serial No. 329,428. (No model.)

To all whom it may concern:

Be it known that I, EDWIN A. HARTSHORN, a resident of Troy, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Hemp-Brakes; and I do hereby declare that the following is a full, clear, and exact description of the invention, that 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 of reference marked thereon, which form a part of this specification.

Similar letters refer to similar parts in the several figures therein.

My invention relates to improvements in machines for braking and cleaning hemp; and it consists of the novel construction and combination of parts hereinafter described and subsequently claimed.

Figure 1 of the drawings is a top plan view of my improved machine, with the gear-wheels and rollers A^5 outlined only. Fig. 2 is a side elevation of the same viewed in the direction of arrow 2 in Fig. 1. Fig. 3 is a side elevation viewed in the direction of arrow 3 in Fig. 1. Fig. 4 is a central vertical longitudinal section of the machine shown in the preceding figures without the supporting-frame. Fig. 5 is a vertical cross-section of a stripper-bar and scraper secured to a supporting-arm and a portion of the arm-supporting shaft, taken on the broken line 5 5 in Fig. 6. Fig. 6 is a side elevation of the stripper-bar and scraper and a portion of the supporting-shaft. Fig. 7 is a side elevation of a portion of the machine with gear-wheels removed to show the yielding and adjustable bearings of the roller-journals. Fig. 8 is a horizontal section of such portion, taken on the broken line 8 8 in Fig. 7. Fig. 9 is an isometric view of one of the bearing-block sections. Fig. 10 is a similar view of one of the rubber cushions or springs for the bearing-blocks.

I make use of a series of groups A A′ A^2 A^3 of fluted rollers to break the previously retted and dried hemp-stems, which are fed in between them from the table A^4. The groups of rollers alternate with the revoluble blades B, B′, and B^2, which serve to beat and scrape or rub the fibers and expel therefrom the broken woody core or shives. The scraper-blades on each roller of the three pairs are provided with teeth or points which serve to separate and open the fibers and assist in the operation of freeing them from the shives. The fiber then passes through the pair of fluted rollers A^3 to the cluster of small rollers A^5, fluted to engage with the fluted cylinder A^6, from which the fiber falls upon the carrier A^7, and is carried away in the direction of the arrow. Power is applied through the belt A^9, which connects pulley A^{10} with a driving-motor. (Not shown.)

The pulley A^{10} is fixed upon one end of shaft C′, which shaft may also be provided with a loose pulley A^{12}, adapted to receive the belt when it is desired to stop the machine. The shaft has end bearings in the opposite sides of the main frame A^8. Both ends of the shaft project beyond the bearings, one end to receive the driving-pulley and the other to receive a gear-wheel D, (see Fig. 2,) fixed thereon and adapted to engage with a similar gear-wheel D′, fixed upon shaft C^2. These two shafts carry the beating-blades B, radiating therefrom and so arranged that each blade on either shaft bisects the space formed between two blades on the other shaft. The direction in which the several shafts rotate is shown by the contiguous arrows.

The gear D engages with an intermediate loose gear D^2, which is revoluble upon axle D^3, fixed to project from the main frame, as indicated by dotted lines D^4 in Fig. 1, and through such intermediate gear actuates the gear-wheel D^5, fixed upon the shaft C^3. The fluted roller A′, fixed on such shaft C^3, engages with the correspondingly-fluted roller A′ on shaft C^4 and causes it to rotate in the opposite direction. Fixed upon shaft C^3 is the gear-wheel D^7, which actuates gear-wheel D^8, fixed upon shaft C^5. The fluted roller A′, fixed upon shaft C^5, engages with and actuates the correspondingly-fluted roller upon shaft C^6. The gear-wheel D^5 actuates the small gear-wheel D^9, which is fixed upon the shaft C^7. The gear D^{10}, fixed upon shaft C^7, actuates gear D^{12}, fixed upon shaft C^8. These two shafts C^7 and C^8 also support beating-blades B. The gear D^7, fixed upon shaft C^3, also engages the small intermediate gear D^{13}, loose upon shaft C^7, and through it actuates the gear D^{14}, fixed upon shaft C^9.

The gear D^{14} engages with the loose intermediate gear D^{15}, and through it actuates the gear D^{16}, fixed upon the shaft C^{10}. The shaft C^3, which supports on one end the gears D^5 and D^7, has fixed upon its opposite end the gears D^{17} and D^{18}. The gear D^{18} actuates gear D^{22}, fixed upon shaft C^{12}. The gear D^{17} actuates, through gear D^{19}, loose upon shaft C^8, and gear D^{20}, loose upon shaft C^7, the gear D^{21}, which is fixed upon shaft C^{11}. The shafts C^9 and C^{10} support the two lower and the shafts C^{11} and C^{12} the two upper fluted rollers A.

It will be observed that each of the four rollers A is given a positive rotary movement independent of the movement of the other rollers, whereby their flanges formed by the flutes are prevented from engaging with each other, each flange on either roller bisecting a flute on its supplementing roller, as shown in Fig. 4. The gear-wheel D on driving-shaft C′ also engages with the intermediate gear F to cause the same to actuate the gear-wheel F′, fixed upon shaft C^{13}, which shaft supports one of the fluted rollers A^2, and through such roller drives the roller upon shaft C^{14}. The shaft C^{13} is also provided with a gear F^2, which actuates gear F^3, fixed upon shaft C^{15}. This shaft C^{15} supports one of the fluted rollers A^2, and through it drives the fluted roller fixed upon shaft C^{16}, as shown in Fig. 4. The gear-wheel F′ meshes with and actuates the pinion F^4, fixed upon the upper blade and pin shaft C^{17}. The lower blade and pin shaft C^{18} is provided with a gear F^5, fixed thereon, which is actuated by the gear F^6, fixed on shaft C^{17}. The shaft C^{13}, which supports on one end the gears F′ and F^2, has a gear-wheel F^7 fixed upon its opposite end and adapted to engage with the loose gear-wheel F^8, and through it actuate the gear F^9, fixed upon the shaft C^{19}. The shafts C^{17} C^{18} are provided with arms carrying scraper-blades B^2. The fluted roller A^3, fixed upon shaft C^{19}, engages with and actuates the other roller A^3 upon shaft C^{20}. The gear F^2 also engages with the loose intermediate gear-wheel F^{10}, and through it actuates the gear-wheel F^{12}, fixed upon the shaft C^{21}. Fixed upon the shaft C^{21} is the fluted cylinder A^6, the cylinder and shaft being connected by the spokes A^{14}.

The small fluted rollers A^5, some of which are represented by circular dotted lines, are supported by end journals A^{15}, having suitable bearings in the sides of the main frame, as indicated partly by dotted lines in Fig. 1.

The large gear-wheel F^{12} engages the loose intermediate gear F^{13}, and through it actuates the pinion F^{14}, fixed upon the shaft C^{22}. The shaft C^{22} is provided with a drum A^{16}, fixed thereon and adapted to support one end of the endless-belt carrier A^7, the other end being supported by a small drum or cylinder A^{17}, supported by the shaft C^{23}.

The carrier may be of any known form. I have shown a series of slats G, secured at or near each end by rivets G′ to a belt G^2, passing around the drums in a manner to receive motion therefrom like an ordinary belt.

The shaft C^{21} is provided at one end with a pulley H, fixed thereon, and connected by a driving-belt H′ with pulley H^2, fixed upon the journal or gudgeon H^3, fixed in one end of the roller H^4, located near one end of the main frame. A similar roller H^5 is provided at the opposite end of the frame. These two rollers H^4 and H^5 support a connecting belt-carrier H^{67}, which may be of any known form and desired width. This carrier, being located beneath the braker-rolls and stripper-blades, serves to catch the falling shives and carry them away from the machine to some point convenient for removal. The gudgeons or journals H^3 and H^6 have suitable bearings in the sides of the main frame, as shown in Figs. 2 and 3.

All the shafts from C′ to C^{23}, both inclusive, have end bearings in the opposite sides of the main frame. One of each pair of oppositely-located shafts between which the material to be broken and cleaned or scutched passes is preferably provided with yielding bearings. For sake of convenience and clearness in illustration I have shown most of the bearings fixed, though all may have the same form of bearings as those shown in connection with the shafts C^3, C^4, C^5, and C^6.

It will be seen from inspection of Fig. 7 that the main frame is provided with parallel uprights J and J′, arranged in pairs to form a slideway extending from the foot of the uprights to their upper ends. These slideways are adapted to receive the slide-blocks K, having guide-flanges K′ on their ends adapted to partially inclose the uprights and guide the blocks during their slide movements. A bearing is formed by providing the contiguous sides of two blocks with a semicircular groove K^2, so that the two grooves will register when the blocks are inserted in their slideways and form a perfect journal-bearing adapted to receive the shaft-journal. Only those blocks which are contiguous to the shaft require to be grooved, and the blocks intervening between the bearing-blocks of the shafts occupying the same slideway may be exchanged for other blocks of different thickness, and the distance apart of such shafts thereby varied as desired. When a slideway is filled with the blocks, they are held in place by a bar or keeper J^3, secured to the ends of the uprights by screws J^4, making the bearings rigid.

When a yielding bearing is desired, a spring, which may be of any known form, as rubber block J^5, is inserted in the slideway to form a support for one of the movable bearing-blocks.

In Fig. 7 the bearings for the shafts are formed by superimposing one block upon another, beginning at the base of the slideway, until the blocks reach nearly to the upper end of the slideway, a rubber block J^5 being then inserted and the slideway closed by the

keeper. It is evident, therefore, that the lower shaft C^3, which supports the driving-gears D^5 and D^7, would remain rigid under pressure, tending to separate the shafts C^3 and C^4, while the shaft C^4 would yield to such pressure in proportion to the compression of the spring. When the upper shaft supports the driving-gears as the shaft C^5 supports the gear D^8, it can be made rigid by inserting the proper blocks to fill the space between the shaft and the keeper J^3. At the same time the bearing of the lower shaft C^6 can be made yielding by introducing the spring J^5 between the bottom block and the bottom of the slideway, as seen in the right-hand slideway shown in Fig. 7.

When desired, a pin J^7 may be inserted in suitable apertures through the uprights to occupy a position between the bearing-blocks of the upper and lower shaft and positively keep the upper shaft in a fixed position, and thereby prevent the possibility of disengagement of the gear-wheel fixed upon such shaft from any other gear-wheel with which it meshes. The rubber spring may have a central aperture J^8, adapted to receive a guide-pin J^9, secured either to the keeper or bottom plate of the slideway, as indicated by dotted lines in Fig. 7.

When it is desired to insert a slide-block in place of the spring, the pin can be withdrawn, or the block can be provided with a central aperture adapted to receive the pin.

When the yielding spring-controlled shaft is provided with a gear-wheel fixed thereon to drive the same, as is the case with the shafts C^{11} and C^{12}, the slideways are given the form of an arc of a circle, the radius of which circle is equal to the distance from the center of such shaft to the center of the shaft supporting the gear-wheel which meshes with such driving-gear, and the slide-blocks are preferably thinner on their inner ends, whereby their contiguous faces occupy planes radiating from the axis of the latter shaft. For example, the gear D^{21} on spring-controlled shaft C^{11} meshes with its driving-gear located upon shaft C^7, and the uprights forming the slideway for the bearing-blocks of shaft C^{11} are curved to form the arc of a circle, having its center in the axis of shaft C^7. In the same manner the gear D^{22} on spring-controlled shaft C^{12} meshes with its driving-gear D^{18}, fixed upon shaft C^8, and the uprights forming the slideway for the bearing-blocks of shaft C^{12} are curved to form the arc of a circle having its center in the axis of shaft C^3, as shown in Fig. 2.

In Figs. 5 and 6 I have shown on an enlarged scale portions of the scraping-blades B^2 and stripper-points B^{29}. The blades are of the same length as the fluted rollers, and are secured by set-screws B^3 to radial arms B^4, projecting from hubs B^5, fixed upon the supporting-shafts C^{17} and C^{18}. The points or teeth B^{29} are supported by the bar B^6, and may be made integral with a metallic bar or inserted in a bar of wood or other material, as indicated by dotted lines in Fig. 5, a bar B^6 being secured on the outer side of a blade B^2 by the screws B^3. The points point outwardly from their supporting-shaft on lines about radial to the shaft. The blades are provided with screw-slots B^7, which permit of the adjustment of the blades on lines radial to their supporting-shaft and relatively to the points, as indicated by the dotted lines B' in Fig. 5, the blades being held in their adjusted positions by the screws B^3.

The operation of the machine is as follows: The stock to be treated, consisting, in the case of hemp, of long, thick, and dry woody stems surrounded by a thin fibrous bark, is fed from table A^4 in between the double pair of fluted rollers A, which are actuated positively and independently of each other, so that they maintain the same relative positions toward each other during each successive revolution, and those positions are such that each successive flange on each roller presses a portion of the stems so fed between the rollers into the bottom of a flute on one of the other rollers, thereby breaking the stem and accomplishing this desired object with the least possible expenditure of force, because the flanges through which this breaking-pressure is exerted always strike the stems at points midway between the two flanges on another roller, which support the stems and inclose the flute into which the stems are pressed and broken, thus affording the best possible leverage to all the stem-breaking flanges. The stems thus broken into short pieces are forced in between the beaters B on shafts C^7 and C^8. As will be seen by inspection of the driving-gears, the beater-shafts revolve much more rapidly than the rollers and beat the stems violently up and down, throwing out many pieces of the broken woody core and assisting in freeing the fiber from the core. The flanges on the succeeding pairs A' and A^2 of fluted rollers engage with and actuate each other, the flutes gradually becoming narrower and the flanges sharper, and the woody substances thereby being reduced in size and quantity, the three pairs of beaters B, B', and B^2 throwing out about equal quantities of shives. The beaters B^2 are provided with points B^{29}, previously explained, which serve to penetrate the mass of passing fiber and strip off woody substances which still cling to the fiber and push out the waste material, as well as open it up so that the blades B^2 will beat out such material. The blades B^2 also act in connection with the points as doffers to push the fibers from the points and prevent any winding or entanglement of fiber upon the points.

The dotted lines B^9 in Fig. 5 represent the position of the fiber after the blades B^2 and points B^{29}, secured to the same blade, have been in engagement with it through nearly an eighth revolution, traveling in the direction of the arrow seen in Fig. 5 to the vertical position shown. It will be observed that

the blade has just pushed the fiber up to the very ends of the points, the latter having completed their work. The fiber is then carried by the rollers A^3 onto the sharp fluted cylinder A^6, where it is more sharply broken by the series of correspondingly-fluted rollers A^5. The last roller A^{20} is not fluted, but left comparatively smooth, this roller being of wood and resting against the flutes of cylinder A^6, and its office being to prevent the fiber from lapping around the last of the small rollers A^5. The fiber falls from the cylinder A^6 upon the carrier A^7, upon which it is carried away for other treatment. It should be observed that each pair of fluted rollers acts to feed the product, thereby suspending the long fiber and holding it taut between the successive pairs of rollers, and especially between each two double pairs, and that the pairs of beater-supporting shafts located in the spaces between the double pairs of rollers are most favorably located to alternately beat and scrape the taut fiber upon its opposite sides and expel the shives therefrom.

I have ascertained by experiment that as the butt-ends of the stems approach the beater-blades the more rapid revolutions of the latter serve to draw the butts through the pairs of rollers faster than they would be fed by the rollers, thereby causing the flanges on the rollers to perform in part the function of the beater-blades and scrape the woody substances from the fibers.

I have indicated in Fig. 4 by the dotted lines *a b* the path which is taken by the stems and fiber in passing through the rolls, and term such path the "fiber-line." In the same figure I have shown by dotted circular lines *c d* the circles described by a revolution of the blades on shafts C^7 and C^8, from which it will be seen that such circles intersect each other, as well as the fiber-line.

It will be observed that by gearing the diagonally-opposite shafts of two adjacent pairs of fluted rollers together, as C^3 with C^5, and driving the other two rollers C^4 and C^6 by means of their flanges I am able to provide one of each pair of rollers with yielding bearings and impart rotary movements in the right direction to all the rollers without the use of intermediate gears to reverse such movements.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a hemp-brake, the combination, with a pair of roller-journals, of a gear-wheel fixed upon one of the journal-shafts, a drive gear and shaft engaging such gear-wheel, a slideway curved to form an arc of a circle described about the axis of the drive-shaft as a center, and a plurality of detachable blocks movable in such curved slideway, some of which blocks have each a journal-bearing on one side, substantially as described.

2. In a hemp-brake, the combination, with a pair of roller-journals, of a gear-wheel fixed upon one of the journal-shafts, a drive gear and shaft engaging such gear-wheel, a slideway curved to form an arc of a circle described about the axis of a drive-shaft as a center, a plurality of detachable blocks movable in such curved slideway, some of which blocks have each a journal-bearing on one side, and a spring or cushion at the end of the series of blocks.

3. In a hemp-brake, the combination, with a pair of roller-journals, of a gear-wheel fixed upon one of the journal-shafts, a drive gear and shaft engaging such gear-wheel, a slideway curved to form an arc of a circle described about the axis of the drive-shaft as a center, a plurality of detachable blocks movable in such curved slideway, some of which blocks have each a journal-bearing on one side, a spring or cushion at the end of the series of blocks, and gearing connecting the other of the journal-shafts with the drive-shaft.

4. In a hemp-brake, the combination, with a series of fluted rollers arranged to co-operate with each other in pairs, of a pair of blade-supporting shafts located to cause the circles described by the blades in their revolution to intersect each other and the fiber-line between such pair of rollers, and a row of points secured to and extending longitudinally of each of the several blades and pointing radially from the blade-supporting shaft, substantially as described.

5. In a hemp-brake, the combination, with a shaft provided with radial arms, of stripper-bars provided with radial points, doffer and beater blades, and means for securing said bars and blades adjustably to such arms, whereby the relative distance of the outer edges of the blades and ends of the points from the center of the supporting-shaft may be varied as desired, substantially as described.

6. The combination, with a shaft, of a series of arms projecting therefrom, beater and scraper blades mounted on the said arms, and rows of points also secured to the said arms at the sides of the said blades, which latter not only serve to beat and scrape the fibrous matter under treatment, but act as doffers for the points, as described.

7. In a hemp-brake, the combination, with the main frame, of a series of fluted rollers co-operating with each other in pairs, wherein the flutes gradually diminish in width and the flanges gradually become sharper in the successive pairs, a plurality of pairs of shafts provided with beater-blades, those upon one of each pair of shafts co-operating with those upon the other, whereby the fiber is alternately beaten upon its opposite sides while suspended by the rollers, a fluted cylinder and coacting fluted rollers arranged at the end of the series, a belt-carrier, and means for moving the various parts, substantially as described.

8. In a hemp-brake, the combination, with the main frame, of a series of fluted rollers

co-operating with each other in pairs, wherein the flutes gradually diminish in width and the flanges gradually become sharper in the successive pairs, a plurality of pairs of shafts provided with beater-blades and with rows of points, as described, the blades and points upon one of each pair of shafts co-operating with those upon the other, whereby the fiber is alternately treated upon its opposite sides while suspended by the rollers, a fluted cylinder and coacting fluted rollers arranged at the end of the series, a belt-carrier for receiving the fibers from said cylinder and rollers, and means for moving the various parts, substantially as described.

9. The combination of one or more pairs of fluted rollers and gearing for separately driving each roller of the pair or pairs, a pair of blade-supporting shafts geared to rotate in unison and provided with blades and with rows of points placed alongside said blades, one or more pairs of fluted rollers having gearing for communicating movement to one roller of the pair or of each pair, a second pair of shafts geared together and carrying blades and points, and a pair or pairs of fluted rollers having gearing for communicating movement to one roller of each pair.

10. In a hemp-brake, the combination, with a series of fluted rollers arranged in adjacent pairs, the members of which engage with each other and are located on opposite sides of the fiber-line, roller-actuating gears connecting one of such rollers with that roller of an adjacent pair of rollers which is located on the opposite side of the fiber-line, slideways, a plurality of blocks movable in each of such slideways, some of which blocks have each a journal-bearing on one side, and springs or cushions acting upon end blocks of the two series, substantially as described.

In testimony whereof I have hereunto set my hand this 4th day of November, 1889.

EDWIN A. HARTSHORN.

Witnesses:
GEO. A. MOSHER,
W. H. HOLLISTER, Jr.