T. G. SAXTON.

FIBER LIBERATING MACHINE OR BREAK.

APPLICATION FILED OCT. 1, 1907.

944,509.

Patented Dec. 28, 1909.

4 SHEETS—SHEET 1.

Fig. 1.

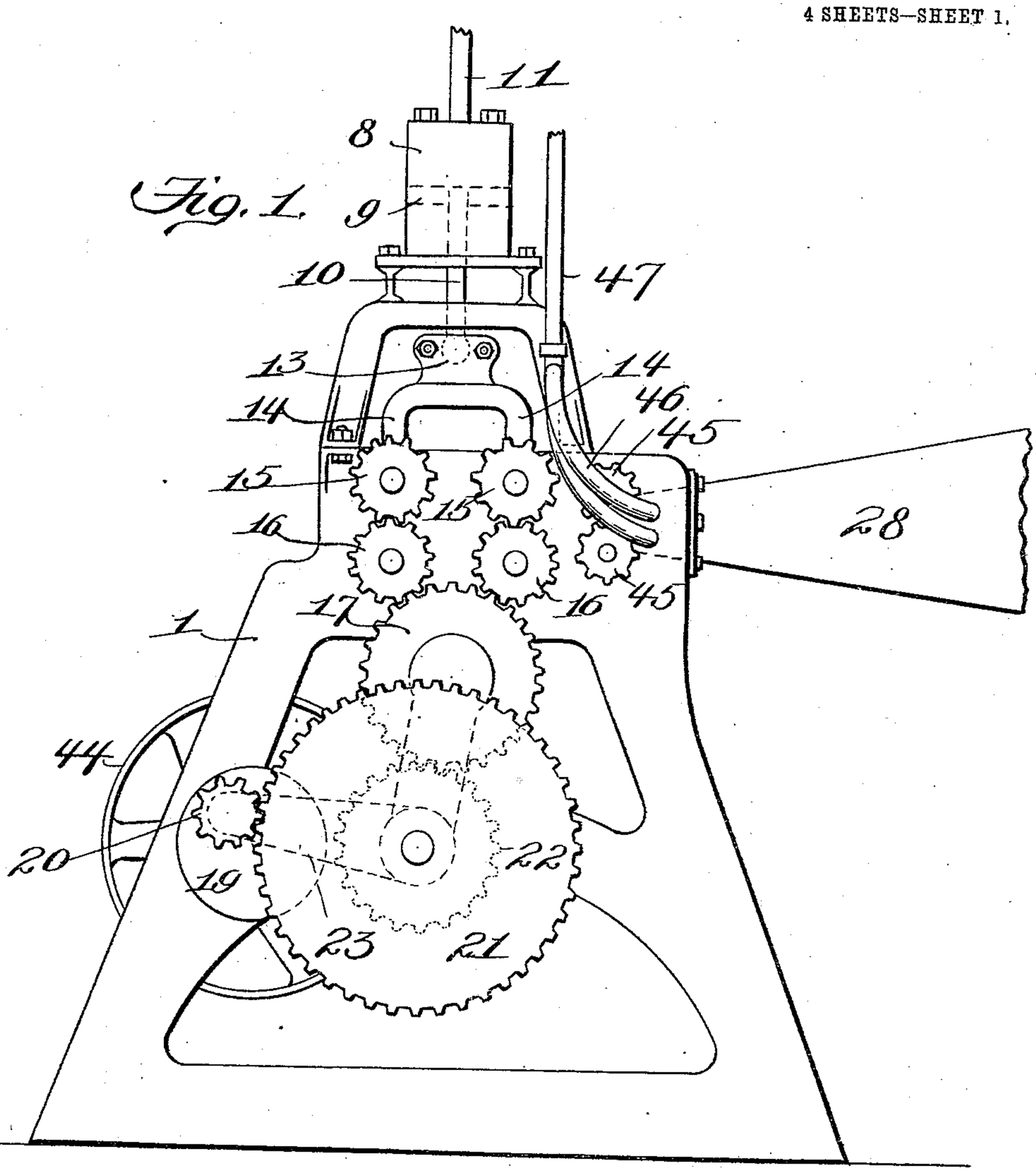
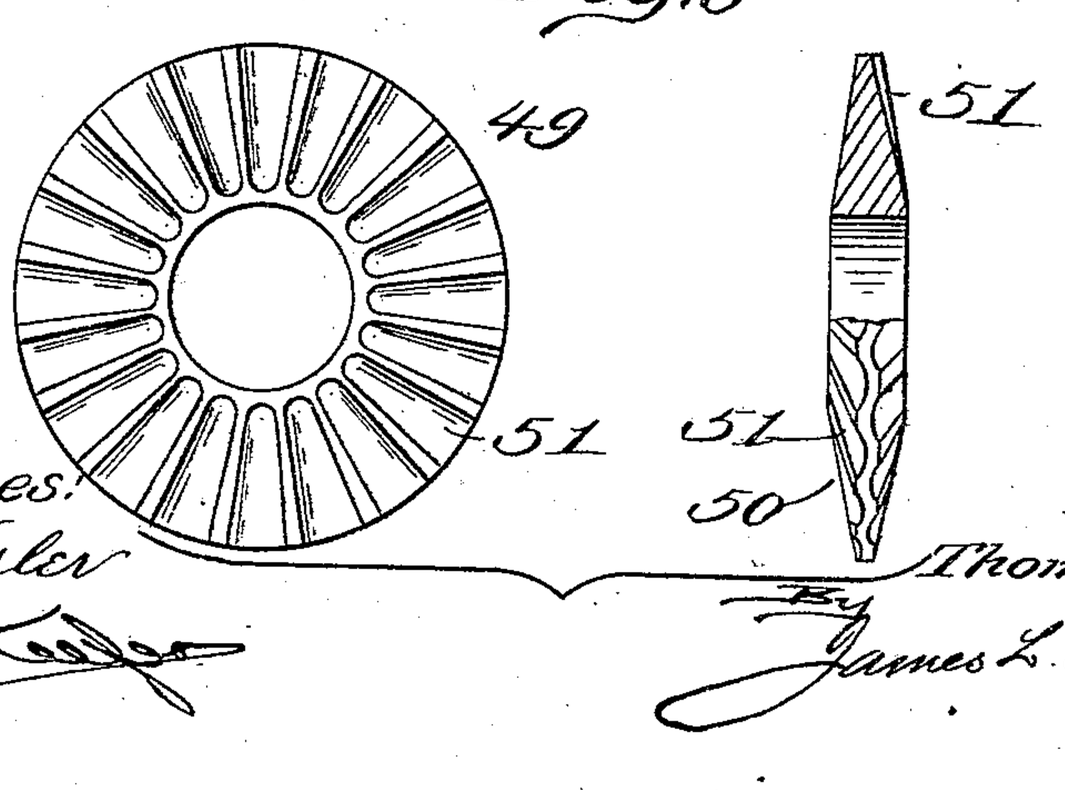


Fig. 8



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4 SHEETS—SHEET 2.

Fig. 2.

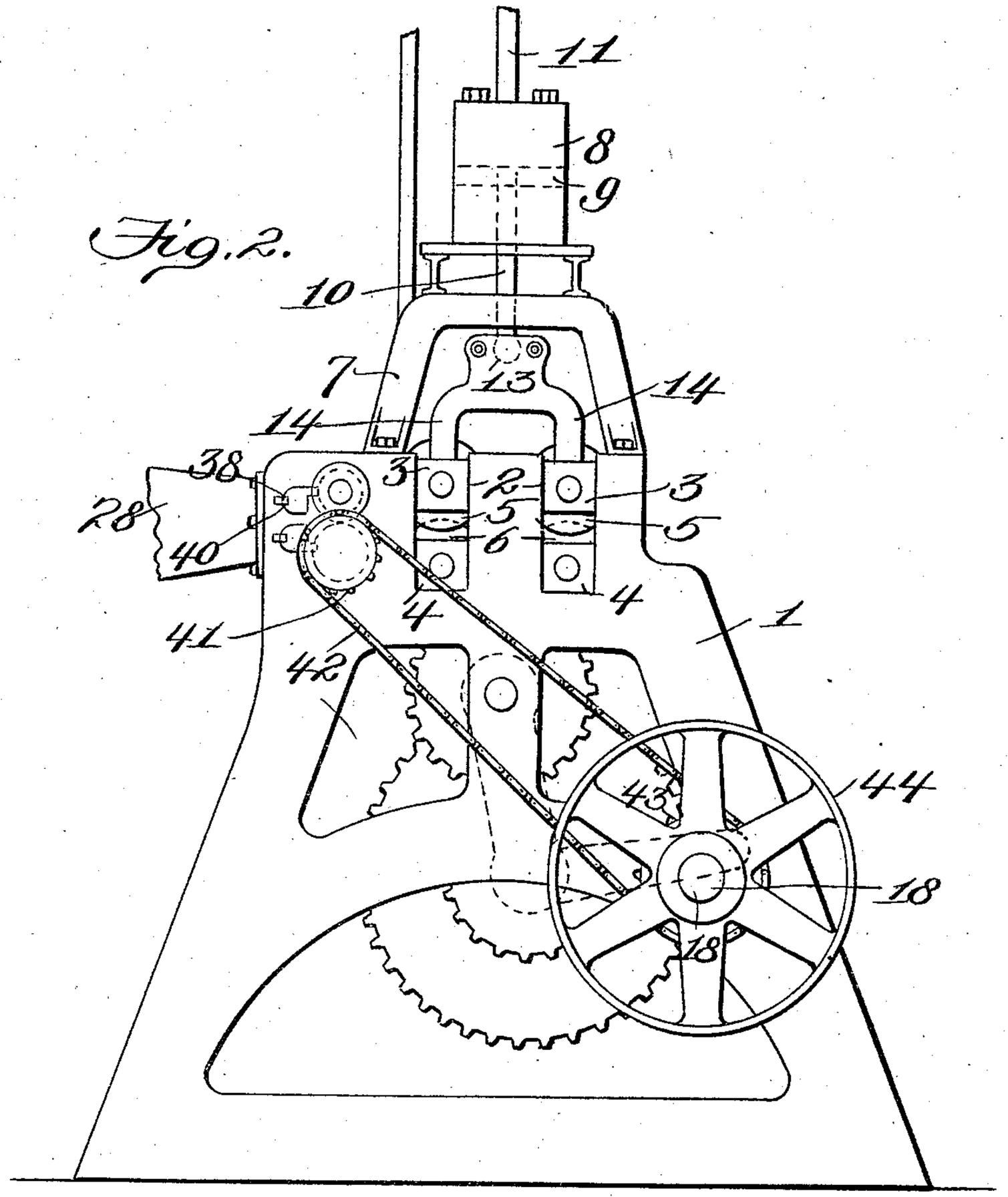
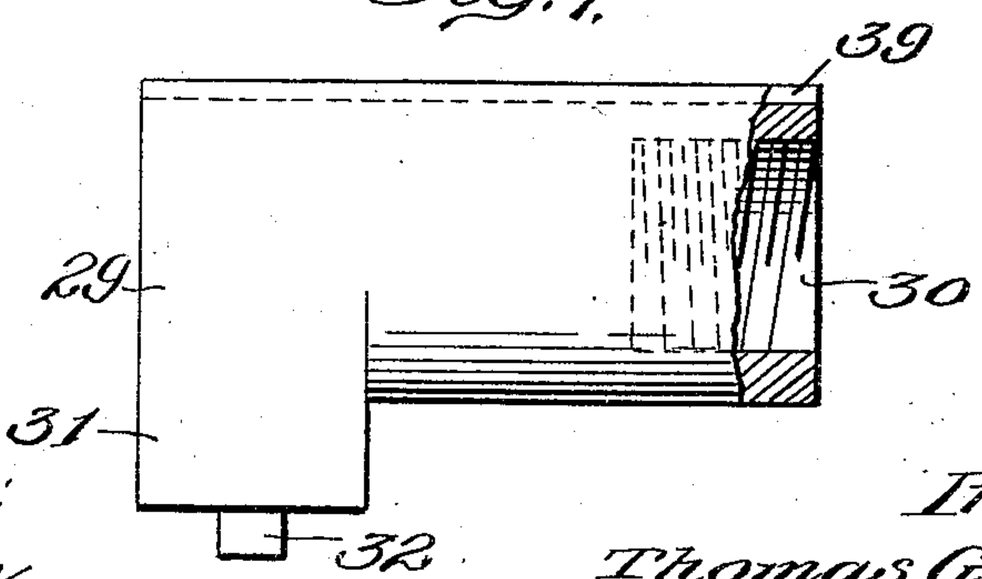


Fig. 7.



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4 SHEETS—SHEET 3.

Fig. 3.

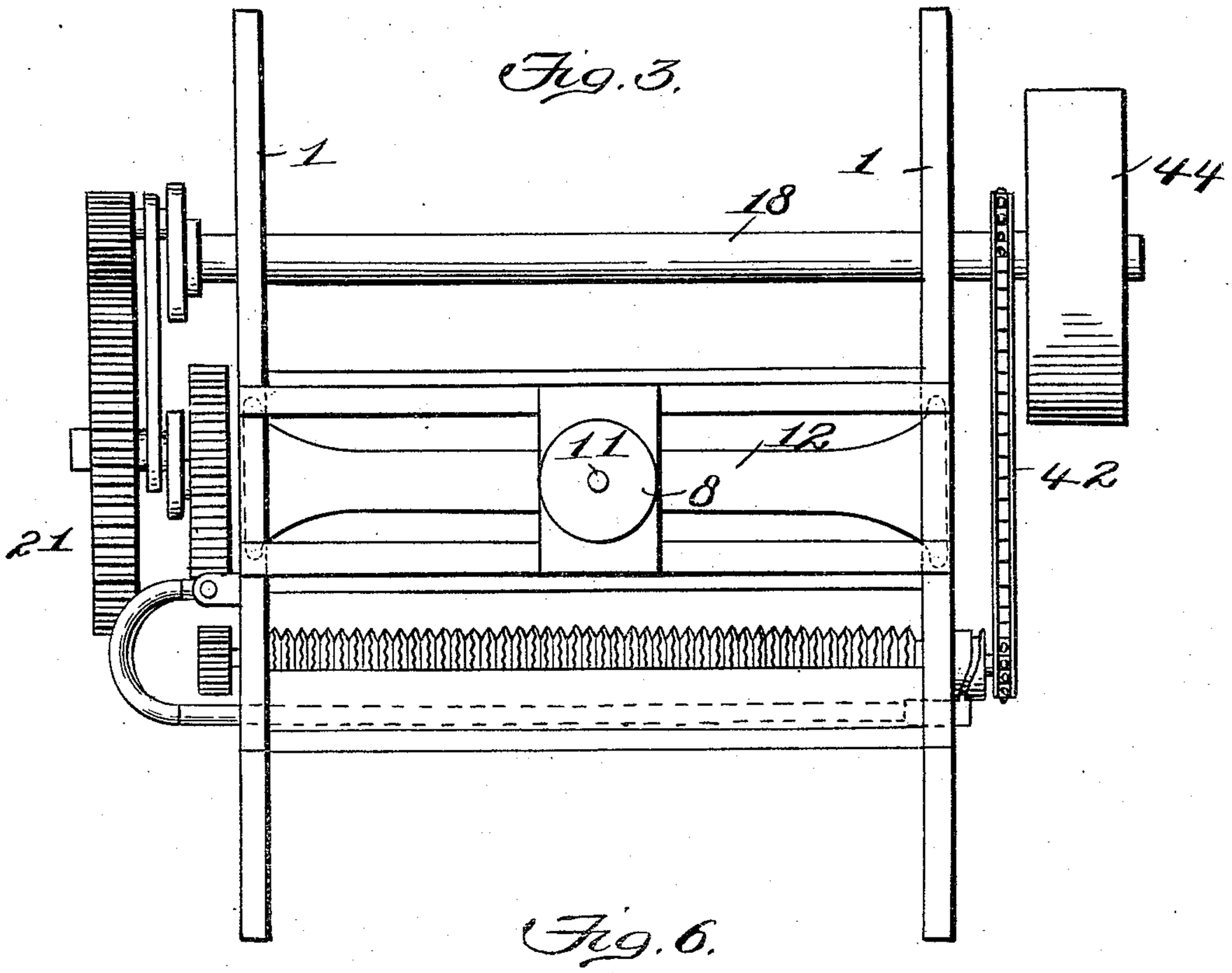
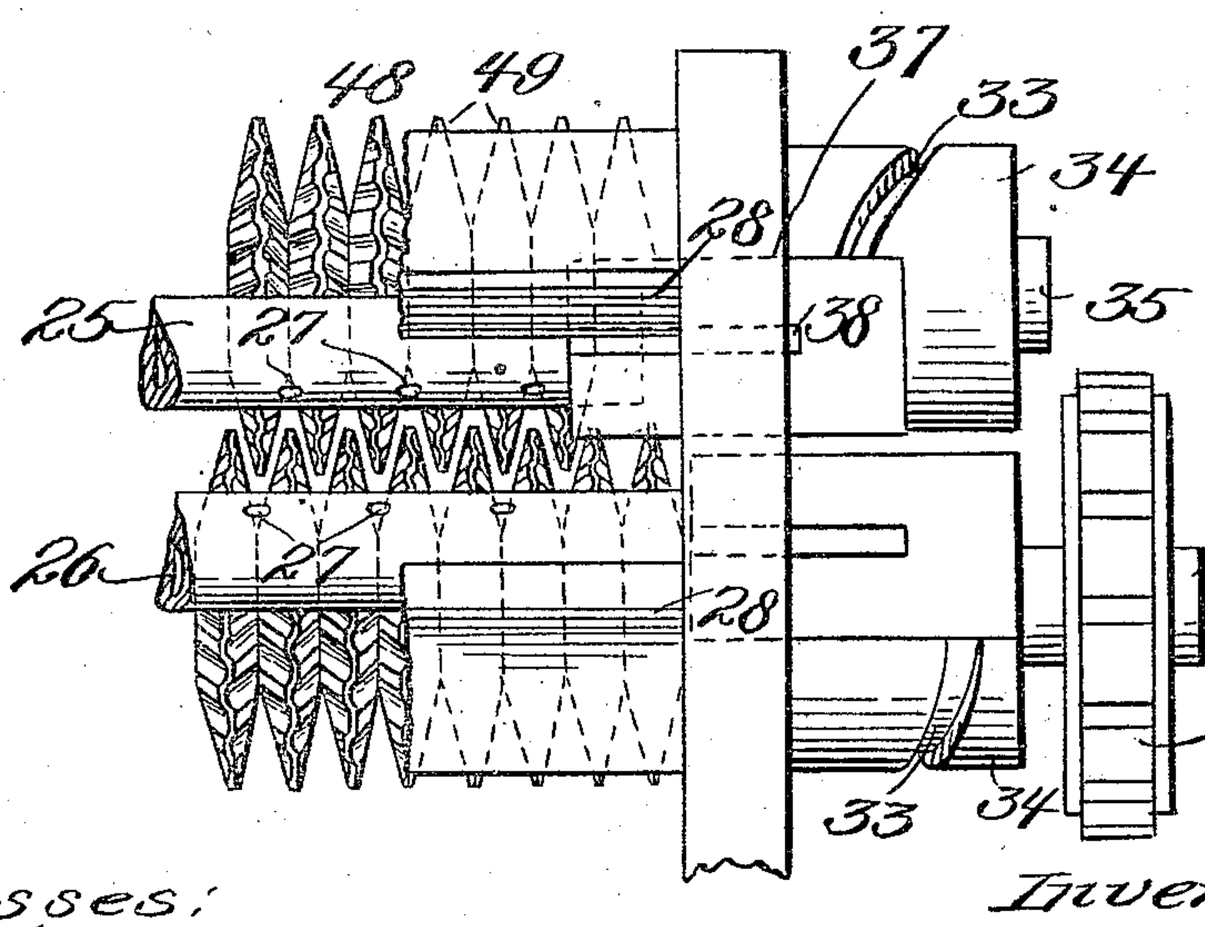


Fig. 6.



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4 SHEETS—SHEET 4.

Fig. 4.

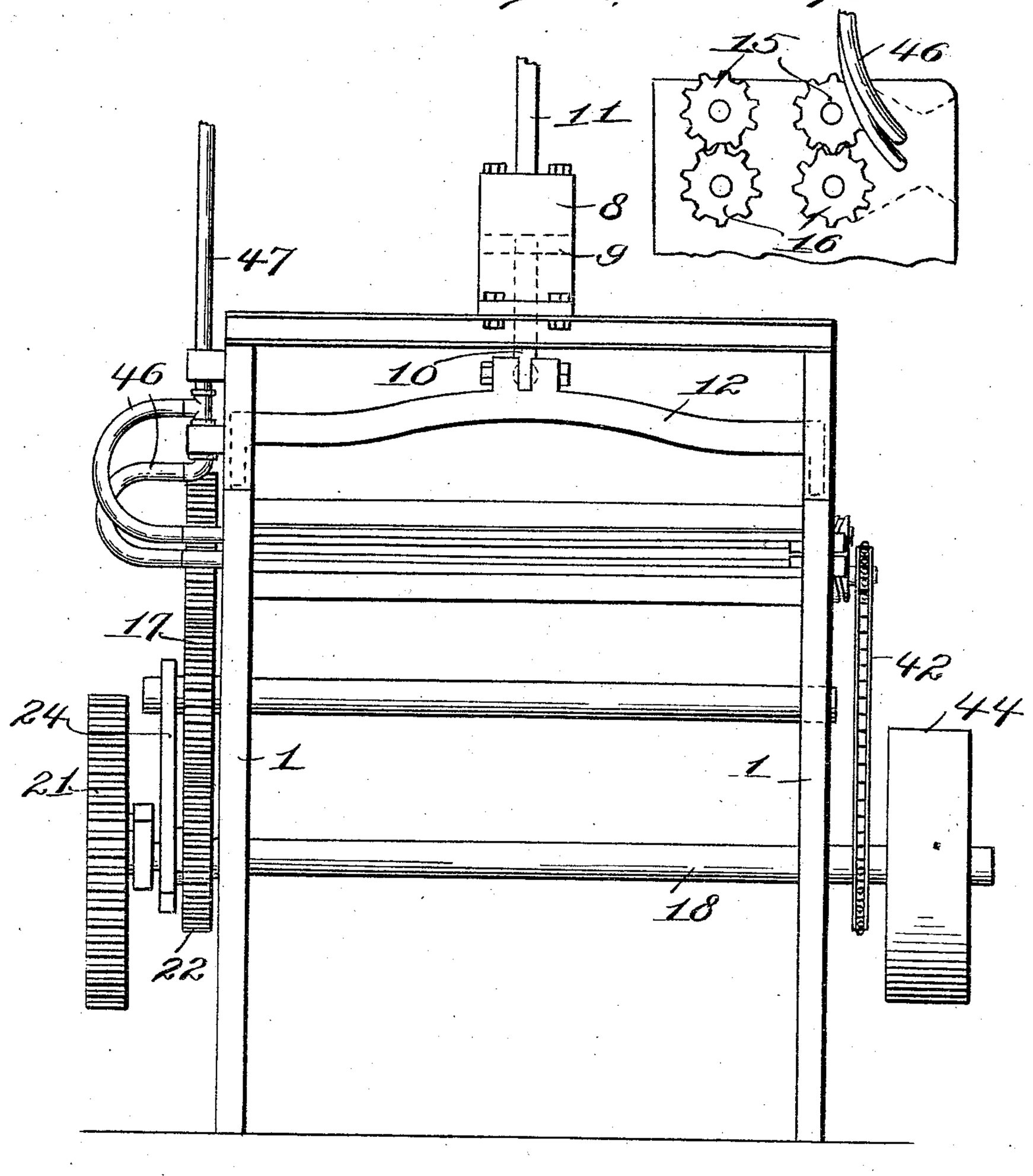

Fig. 5.

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UNITED STATES PATENT OFFICE.

THOMAS G. SAXTON, OF LEXINGTON, KENTUCKY, ASSIGNOR OF FIFTY-ONE ONE-HUNDREDTHS TO CHARLES J. BRONSTON, OF LEXINGTON, KENTUCKY, AND TWELVE ONE-HUNDREDTHS TO JOHN P. McKEEVER AND TWELVE ONE-HUNDREDTHS TO EDWARD L. McKEEVER, OF FAYETTE COUNTY, KENTUCKY.

FIBER-LIBERATING MACHINE OR BREAK.

944,509. Specification of Letters Patent. **Patented Dec. 28, 1909.**

Application filed October 1, 1907. Serial No. 395,442.

To all whom it may concern:

Be it known that I, THOMAS G. SAXTON, a citizen of the United States, residing at Lexington, in the county of Fayette and State of Kentucky, have invented new and useful Improvements in Fiber-Liberating Machines or Breaks, of which the following is a specification.

This invention relates to an apparatus or machine for crushing or dismembering the stalk or woody part of hemp, jute, ramie, manila, or other similar fibers, and is in the form of a break with which scutching rollers may or may not be used.

This apparatus or break is an improvement in part of the type of machine disclosed by the patent granted to Sandford and Mallory, April 28, 1863, No. 38340, and also embodies improved features with relation to the apparatus or machine disclosed by my Patent 845,267, dated February 26, 1907. In my Patent 845,267 I have disclosed an apparatus wherein the final cleaning of the fiber liberated by crushing or dismembering the stalk or woody part of the material is effected by the use of compressed air or gas under high compression and delivered the fiber at such point as to thoroughly remove leaves or other parts detrimental to the use of fiber for textile purposes, and also to completely permeate the fiber preferably within an inclosure in which the air or gas expands and is confined in a current thereby.

In the treatment of different materials to liberate fiber by the use of crushing rolls, it has been found that the thicker or heavier ends of the stalks entering the pass between the said rolls are subjected to too great compression and the fiber is embedded in the stalks or herds and necessitating an excess of pressure of compressed air or gas to remove said herds. The patent to Sandford and Mallory, above noted, discloses spring means coöperating with a part of the rollers to permit such rollers to automatically accommodate variations in the thickness of stalks passing therethrough and equalize the pressure on the stalks irrespective of their thickness. This spring means, sooner or later, becomes ineffective for the purpose in view of the inconstancy or variability of the spring devices due to a relaxation and dissipation of the primal resilient force of the spring devices.

In lieu of the spring devices the present apparatus or machine comprises, among other essential features, crushing rolls having vertical movement with respect to companion rolls and under pneumatic pressure or control which is always constant and insures an accurate regulation of the pressure of the rolls on the stalks irrespective of the thickness of different portions thereof and whereby the fiber is prevented from being forced into the stalks or herds and materially less compressed air or gas pressure is required to effect the final cleaning of the fiber in the apparatus.

The present apparatus or machine also involves as an essential improved feature automatically movable compressed air or gas feeding or delivering elements or pipes which operate to more thoroughly permeate the fiber and facilitate the removal of all particles that may be clinging or adhering thereto when subjected to the compressed air or gas treatment.

Other advantageous details of construction and arrangement of the several parts will be hereinafter more fully specified, and while the improved apparatus or machine is shown in preferred form in the accompanying drawings, it will be understood that the invention is not in the least limited to the exact details of construction and the use of all equivalents is contemplated and will be adopted within the scope of the invention.

In the drawings: Figure 1 is a side elevation of an apparatus or machine embodying the features of the invention. Fig. 2 is a similar view looking toward the opposite side of the machine. Fig. 3 is a top plan view of the machine. Fig. 4 is an end elevation of the same. Fig. 5 is a side elevation of a portion of the machine showing a simplified construction and wherein the scutching rollers are eliminated. Fig. 6 is a detail elevation of a part of the machine and particularly illustrating the compressed air or gas feeding pipes and operating mech-

anism. Fig. 7 is a detail view of one of the air or gas tube heads. Fig. 8 illustrates detail views of one of the members or disks embodied in the scutching roller organizations.

Similar characters of reference are employed to indicate corresponding parts in the several views.

The numeral 1 designates the main supporting frame of suitable width and height and having in the upper portion of the opposite sides vertical seats or slots 2 arranged in parallel relation to receive the journal boxes 3 and 4 of upper and lower pairs of rolls 5 and 6. These journal boxes or bearing elements are located at opposite extremities of the rolls, the upper pair of rolls 5 and upper journal boxes 3 being vertically movable for a purpose which will be presently explained. The upper and lower pairs of rolls 5 and 6 will be provided with suitable teeth, corrugations, or other projecting means to adapt them for crushing stalks of hemp and other material or growths to liberate the fiber.

Disposed on the main supporting frame 1 is a supplemental frame 7 and vertically fixed on the central portion of the latter frame is a cylinder 8 containing a piston 9 from which a piston rod 10 depends through the bottom of the said cylinder. To the top of the cylinder 8 a compressed air feeding pipe 11 is connected and may run to any source of supply or air compressing means. The operation of the piston 9, however, is not limited to the use of compressed air, as any other fluid medium may be equally well employed. Below the cylinder 8 is a pressure bar or member 12, and to the center of the upper portion thereof the lower end of the piston rod 10 is connected by a ball and socket joint 13, the ball being formed as a terminal of the said piston rod. It will be obvious that the ball and socket connection between the pressure bar or element 12 and the piston rod 10 provides for a movement of the said bar or element that will be beneficial and advantageous in equalizing the pressure through the medium of the bar and as applied to the piston 9 in the cylinder 8 for a specific object which will be more fully hereinafter set forth. The pressure bar or element 12 has two pairs of legs 14, one pair of said legs being located at each extremity of the bar and engaging the upper journal boxes 3 of the upper pair of rolls 5, and by this means an equality of pressure may be maintained on the said rolls 5 irrespective of the thickness of the stalk passing between the upper and lower pairs of rolls.

The journals of the upper and lower pairs of rolls 5 and 6 at one end of the machine respectively have pairs of meshing pinions 15 and 16 thereon for imparting thereto the proper direction of rotation. The lower set of pinions 16 continually meshes with a gear 17 forming part of a variable gear mechanism of a known type and operated by a driving shaft 18 carrying at one end a disk 19 having a pinion 20 fixed thereon and controlling the operation of intermediate gear means 21 and 22 and links 23 and 24 between the said pinion 20 and gear 17. The function of this variable gear is to modify the speed of the rolls 5 and 6 so that during a part of the operation of the latter there will be a slow movement followed by a materially accelerated movement.

As hereinbefore noted, the present machine embodies means for subjecting the liberated fiber to the action of compressed air or gas through the medium of pipes or tubes 25 and 26 preferably arranged in vertical alinement and having outlet orifices or openings 27 directed at an angle to each other in reverse directions and toward the rear of the machine so that the compressed air or gas from the upper pipe or tube 25 will be fed downwardly and that from the tube or pipe 26 will have an upward tendency to thoroughly permeate and affect the fiber passing between the tubes or pipes. In the simplified form of the machine as shown in Fig. 5, these pipes 25 and 26 will be disposed in operative adjacency to the rear vertically alined pair of crushing rolls 5 and 6 and may have a fixed position as in the apparatus shown by my patent aforesaid. These delivery tubes or pipes 25 and 26 will have supply pipe means attached thereto in a manner which will be presently explained in preferred form, and in rear of the tubes or pipes 25 and 26 is a tubular outlet or chute 28 of any suitable form in cross-section and into which the compressed air or gas expands and forms a current which carries the fiber treated and disposes said fiber in the best possible position for cleaning purposes.

The tubes or pipes 25 and 26 in the preferred construction are mounted in such manner as to have a transverse reciprocation in alternation and are provided with heads 29, each tube or pipe having a distinct head secured to one end thereof. Each head 29 has an inner screw-threaded socket 30 and an outer projection 31 carrying a stud or pin 32. The studs or pins 32 of the two heads 29 are in reverse positions, or that of the upper head is located at the top of the head and that of the lower head at the bottom, as clearly shown by Fig. 2. The studs or pins 32 engage spiral cam grooves 33 of rotating cams 34 fixed on shafts 35 and 36. The heads 29 move transversely in suitable openings 37 in one side of the main frame 1 and are maintained in proper operative position, or prevented

from turning, by means of keys 38 engaging grooves 39 and 40 formed in the heads and adjacent portions of the frame side. By the use of these keys or splines 38 the orifices or openings 27 are always held in the angular relation to each other best adapted for delivering the compressed air or gas to the fiber.

The cam grooves 33 are so arranged in their cams 34 that one head 29 and its tube or pipe will be drawn or moved outwardly and the other tube or pipe and its head will be moved in a reverse direction, this operation continuing in alternation, and consequently the compressed air or gas escaping from the tubes or pipes 25 and 26 will be practically brought into contact with the fiber in two directions, namely, transversely and longitudinally and will thereby be more effective in cleaning the fiber. The lower shaft 36 has a sprocket wheel 41 keyed on one extremity thereof and traversed by a chain belt 42 from a sprocket wheel 43 on the drive shaft 18, the latter shaft having a suitable band pulley 44 secured thereto and adapted to be belted to a suitable power source. The upper shaft 35 is operated from the shaft 36 through the medium of intermeshing pinions 45 on the ends of the said shafts opposite the location of the sprocket wheel 41 on the shaft 36, as clearly shown by Fig. 1. It will therefore be understood that the pipes 25 and 26 may either be fixed as shown by Fig. 5 in the simplified form of the machine or have a transverse reciprocating movement in alternation as shown particularly by Figs. 2 and 6. The compressed air or gas is supplied to the ends of the pipes 25 and 26 preferably by flexible pipe connections 46 terminally attached to a main supply pipe 47 which may connect with the same pressure source as the pipe 11 of the cylinder 8 or any other medium of supply, and also attached to the ends of the pipes 25 and 26 opposite the ends on which the heads 29 are secured. The flexibility of the pipes 46 compensates for the movement or reciprocation of the pipes 25 and 26. The pipes 25 and 26, as hereinbefore indicated, have a pass between them formed by vertically separating the said pipes a suitable distance to permit the fiber to move therebetween, the pass being in alinement with the pass between the rear pair of rolls 5 and 6 or between scutching rollers which will be presently specified.

The improved machine will also be preferably equipped with scutching rollers 48 disposed in vertical alinement and mounted on the shafts 35 and 36 carrving the cams 34. The scutching rollers in the present instance are made up of a plurality of disks 49 having opposite converging faces 50 to provide reduced peripheral edges, the edges of the several disks or members 49 included in the two scutching rollers having a loose or free intermeshing relation as shown by Fig. 6, or the contiguous faces of the opposing disks or members are separated with material advantage in the scutching operation. The converged faces 50 of each disk or member 49 are formed with radial corrugations 51, and the said corrugated or scalloped faces are within such close relation to each other that they will effectively break and clean the fiber passing therethrough from the crushing rolls 5 and 6. The space between the faces of the disks or members 49 may be varied to accommodate the treatment of different kinds of fiber. These scutching rollers are rotated by the shafts carrying the same through the positively acting gearing or driving devices coöperating with said shafts and the said scutching rollers will be operated either simultaneously at the same rate of speed or in some instances gears having a differential ratio may be used to rotate the upper roller at a greater speed than the lower roller. The use of the compressed air or gas feeding pipes or tubes in connection with the scutching rollers results in a very effective operation on the fiber treated, and the compressed air or gas escaping from the pipes or tubes, say for example with a pressure of not less than forty pounds, causes a suction to be set up which will prevent wrapping of the fiber around the said scutching rollers.

From the disclosure of the mechanism herein it is obvious that the reciprocating compressed air or gas feeding pipes may be used with the crushing rolls 5 and 6 without the scutching rollers for treating certain fibers with which the use of the scutching rollers would be a disadvantage or is unnecessary.

The operation of the machine will be readily understood. The stalk or stalks to be crushed to liberate or release the fiber is or are fed into the crushing or breaking rolls 5 and 6 from the left side of the machine, the difference in diameter throughout the length of the stalk or stalks being automatically compensated for by the upper vertically movable rolls 5 under the pressure influence of the bar or element 12 controlled by the piston 9 in the cylinder 8 and piston rod 10. The upper rolls 5 will be normally held down by a pressure on the piston in the cylinder 8 sufficient to effect a thorough breaking of the reduced portion of a stalk without injury to the fiber or forcing the latter into the herds, and as the stalk increases in thickness or diameter the upper rolls 5 respond to such increase by moving upwardly against the resistance of the pressure on the piston 9 in the cylinder 8 and the same crushing force is maintained propor-

tionate to the increase of thickness of the diameter of the stalk and resistance of the latter to breakage without pressing the fiber into the herds and with the material advantage of a uniformity of crushing pressure throughout the whole length of the stalk treated irrespective of variation in diameter or thickness of the stalk. As soon as the stalk is clear of the crushing or breaking rolls 5 and 6 the upper rolls 5 are forced down into normal position and so maintained until again elevated by engagement with subsequent stalks having diametrical variations. From the rear pair of crushing or breaking rolls 5 and 6, the liberated fiber passes fully between the air pipes or tubes 25 and 26 into the outlet inclosure or chute 28 and becomes thoroughly treated with the compressed air or gas by the latter being brought with full pressure over the fiber and the confinement of the fiber in a current of the compressed air or gas within the said inclosure or chute. After this final cleaning of the fiber by compressed air or gas the operation will be completed under ordinary conditions and the fiber will be prepared for use in weaving textiles. It is obvious, however, that a number of the machines may be disposed in alinement and the fiber passed through the successive machines for similar treatment if such operation is found necessary in preparing certain classes of fiber.

Having thus fully described the invention, what is claimed as new, is:

1. A machine of the class specified, comprising upper and lower pairs of crushing or breaking rolls, the upper pair of rolls being vertically movable with relation to the lower pair of rolls and a pressure element with pneumatic pressure means intermediately coöperating with the same, said element having a plurality of extremities at each end individually engaging the opposite extremities of the upper pair of rolls and having unrestricted movement with the rolls and uniformly transmitting and applying pressure to the extremities of the rolls from the intermediate pneumatic pressure means.

2. A machine of the class specified, upper and lower pairs of crushing or breaking rolls, the upper pair of rolls being vertically movable, a pressure element having extremities engaging the bearings of the upper pair of rolls, and a fluid pressure means movably secured to and disposed above the intermediate portion of said element and upper pair of rolls and imparting a uniformity of pressure to the extremities of the element from a single point of application of the pressure means whereby the bearings at the opposite ends of the upper pair of rolls have an equal pressure applied thereto.

3. In a machine of the class specified, upper and lower pairs of crushing or breaking rolls, the upper rolls being vertically movable, a rocking pressure element having a plurality of extremities engaging the opposite pairs of extremities of the upper pair of crushing or breaking rolls and a single fluid pressure controlled piston disposed over and engaging and coöperating with the intermediate portion of said element.

4. In a machine of the class specified, upper and lower pairs of crushing or breaking rolls, the upper rolls being vertically movable, operating mechanism for rotating the rolls, a pressure element disposed over and having a plurality of extremities engaging the opposite pairs of extremities of the upper pair of rolls, the opposite extremities of the pressure element having self-rising and falling movements, and a single fluid pressure controlled piston disposed over and to which the said element is movably attached at an intermediate point.

5. In a machine of the class specified, upper and lower pairs of crushing or breaking rolls, the upper rolls being vertically movable, a pressure element disposed over the upper pair of rolls and having a plurality of extremities at opposite sides of its center engaging the extremities of the upper rolls, and a fluid pressure means arranged over the said element and having a piston with a piston rod movably connected to and depending therefrom and movably attached to the intermediate portion of the said pressure element to impart to the extremities of the latter and the upper rolls a constant uniform pressure irrespective of the diameter or thickness of the material passing between the rolls.

6. In a machine of the class specified, upper and lower pairs of crushing rolls, the upper rolls being vertically movable, a pressure bar having terminal legs engaging the opposite extremities of the said upper rolls, and a fluid pressure means comprising a cylinder, a piston in the cylinder, and a piston rod depending from the piston and connected to the center of the bar by a ball and socket joint to permit the said bar to have a rocking movement.

7. In a machine of the class specified, upper and lower crushing or breaking rolls, the upper rolls being vertically movable, pneumatic means for instituting a constant and uniform pressure on the upper rolls, an inclosure in which the material treated is delivered from the said rolls, and air or gas delivering means in operative relation to the rolls within the inclosure and through which the fiber is passed after leaving the rolls.

8. In a machine of the class specified, upper and lower pairs of crushing or breaking rolls, the upper rolls being vertically mov-

able, pressure means engaging the upper pair of rolls and automatically movable air or gas delivering devices adjacent to the rolls and through which the fiber is passed for final cleaning purposes.

9. In a machine of the class specified, upper and lower crushing rolls, and reciprocating air or gas delivering means in operative adjacency to the said rolls.

10. In a machine of the class specified, crushing or breaking rolls, and alternately reciprocating air or gas delivering devices in operative adjacency to said rolls.

11. In a machine of the class specified, crushing or breaking rolls, reciprocating air or gas feeding devices in operative adjacency to said rolls, and flexible supply connections for said devices.

12. In a machine of the class specified, crushing or breaking rolls, reciprocating compressed air or gas tubes arranged in operative adjacency to the rolls and provided with orifices arranged at an angle with relation to each other, and means for supplying the tubes with compressed air or gas.

13. In a machine of the class specified, crushing or breaking rolls reciprocating compressed air or gas feeding tubes in operative adjacency to said rolls, heads on the ends of the tubes having projecting means, and grooved cams rotatably mounted adjacent to the said heads, the grooves of the cams being engaged by the projecting means of the heads.

14. In a machine of the class specified, crushing or breaking rolls, reciprocating compressed air or gas feeding means arranged adjacent to the rolls and having angularly disposed openings therein, and key devices coöperating with the said feeding means to prevent turning of the same.

15. In a machine of the class specified, crushing or breaking rolls, reciprocating compressed air or gas feeding means arranged in operative adjacency to said rolls, and an outlet into which the compressed air or gas is delivered and confined in a current.

16. In a machine of the class specified, crushing or breaking rolls, reciprocating compressed air or gas feeding tubes arranged in operative adjacency to the rolls and provided with grooved heads at one end, a frame, and key devices engaging the grooves of the heads and adjacent portions of the frame.

17. In a machine of the class specified, crushing or breaking rolls, scutching rollers in operative adjacency to said rolls, and compressed air or gas delivering means having automatic movement in operative relation to the scutching rollers.

18. In a machine of the class specified, crushing rolls, scutching rollers in operative adjacency to the said rolls, and reciprocating compressed air and gas feeding devices disposed in operative relation to the scutching rollers.

19. In a machine of the class specified, crushing or breaking rolls, and scutching rollers disposed in operative relation to the rolls, both of the scutching rollers being rotatable and made up of a plurality of disks having corrugated faces.

20. In a machine of the class specified, crushing or breaking rolls, and scutching rollers disposed in operative relation to the rolls, both of the scutching rollers being rotatable and made up of a plurality of disks having corrugated faces, the peripheries of the disks of the two rollers having loose intermeshing relation.

21. In a machine of the class specified, crushing or breaking rolls, and scutching rollers disposed adjacent to the rolls and made up of a plurality of disks having converging radially corrugated faces, the reduced peripheries of the disks of the two rollers projecting alternately into the spaces between the same.

22. In a machine of the class specified, crushing or breaking rolls, scutching rollers rotatably disposed in operative relation to the said rolls, and compressed air or gas feeding means arranged in operative relation to the scutching rollers and serving as a final cleaning medium and also to institute a suction with respect to the scutching rollers to prevent the fiber from winding around the latter.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

THOMAS G. SAXTON.

Witnesses:
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HUGHES BRONSTON.