No. 808,133. PATENTED DEC. 26, 1905.

M. F. WILLIAMS.

SHREDDING MACHINE.

APPLICATION FILED JULY 9, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

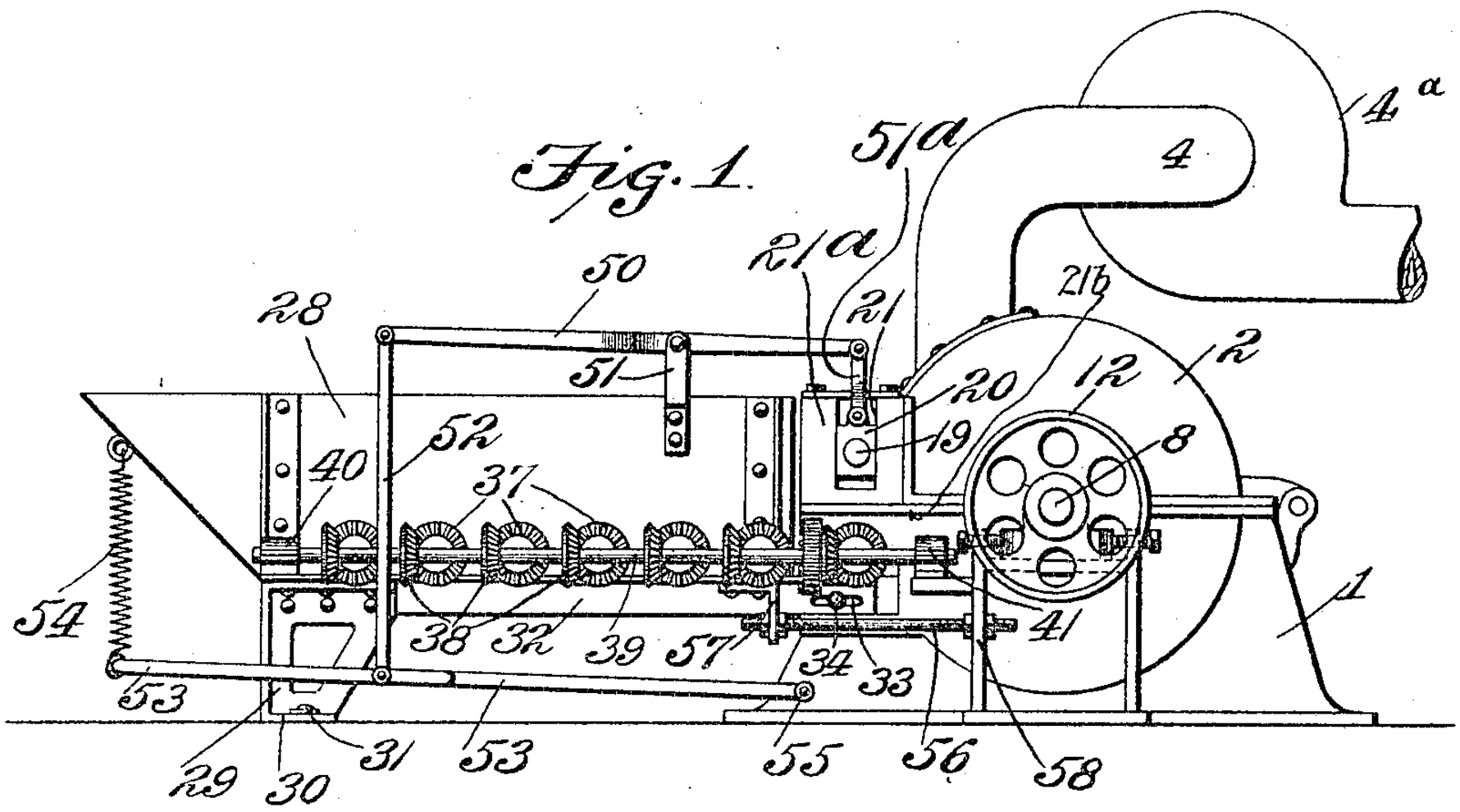

Fig. 2.

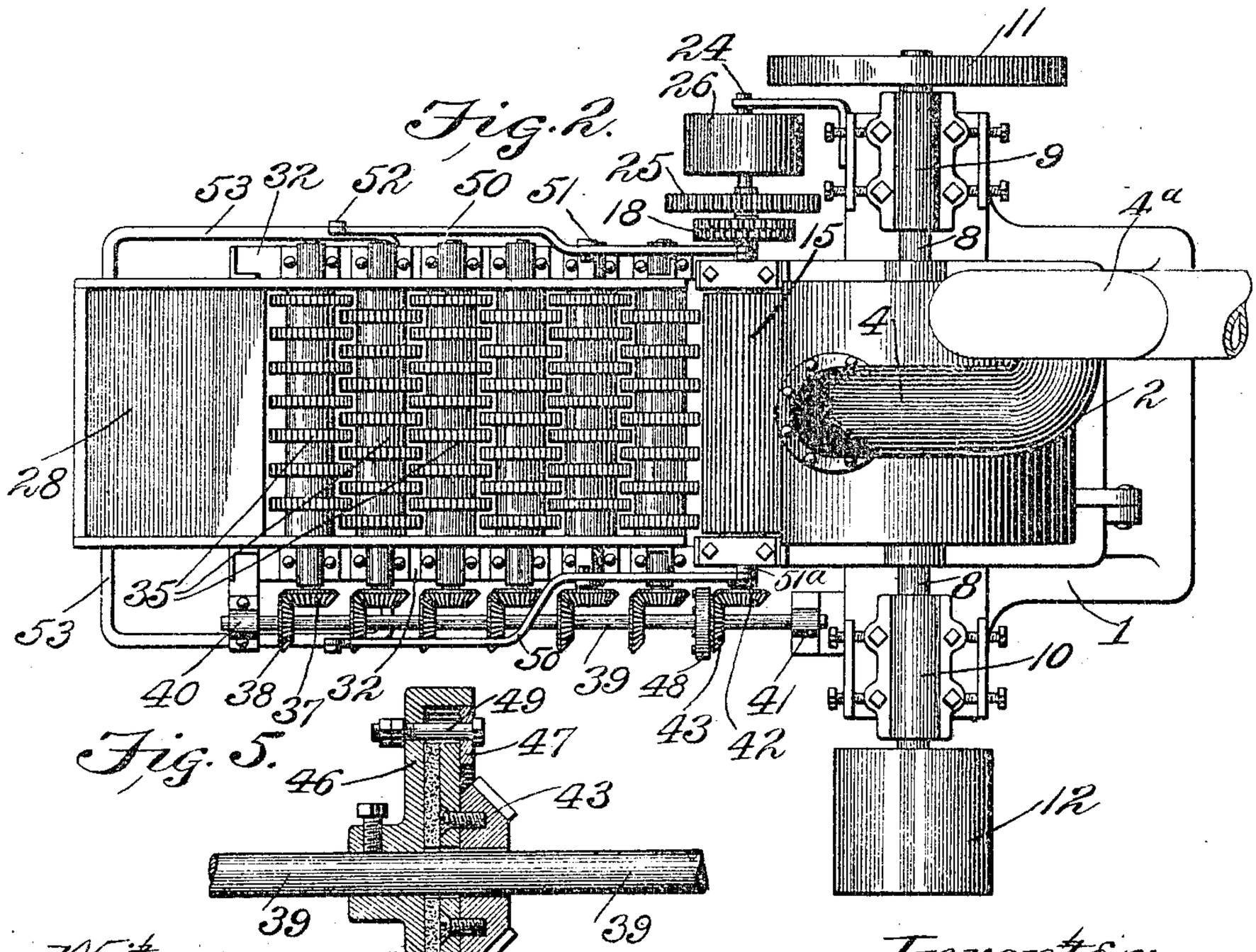

Fig. 5.

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2 SHEETS—SHEET 2.

Fig. 3.

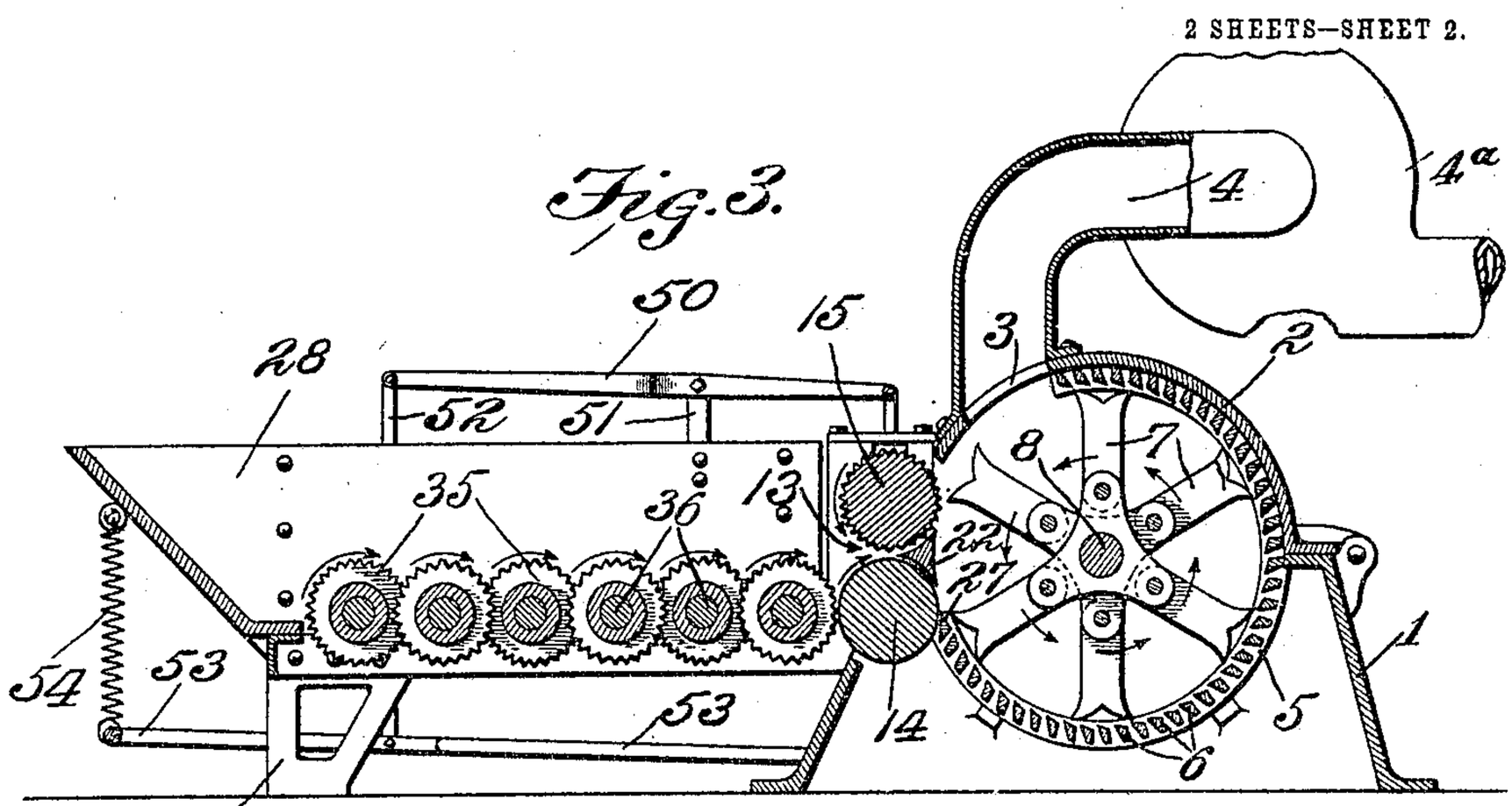

Fig. 4.

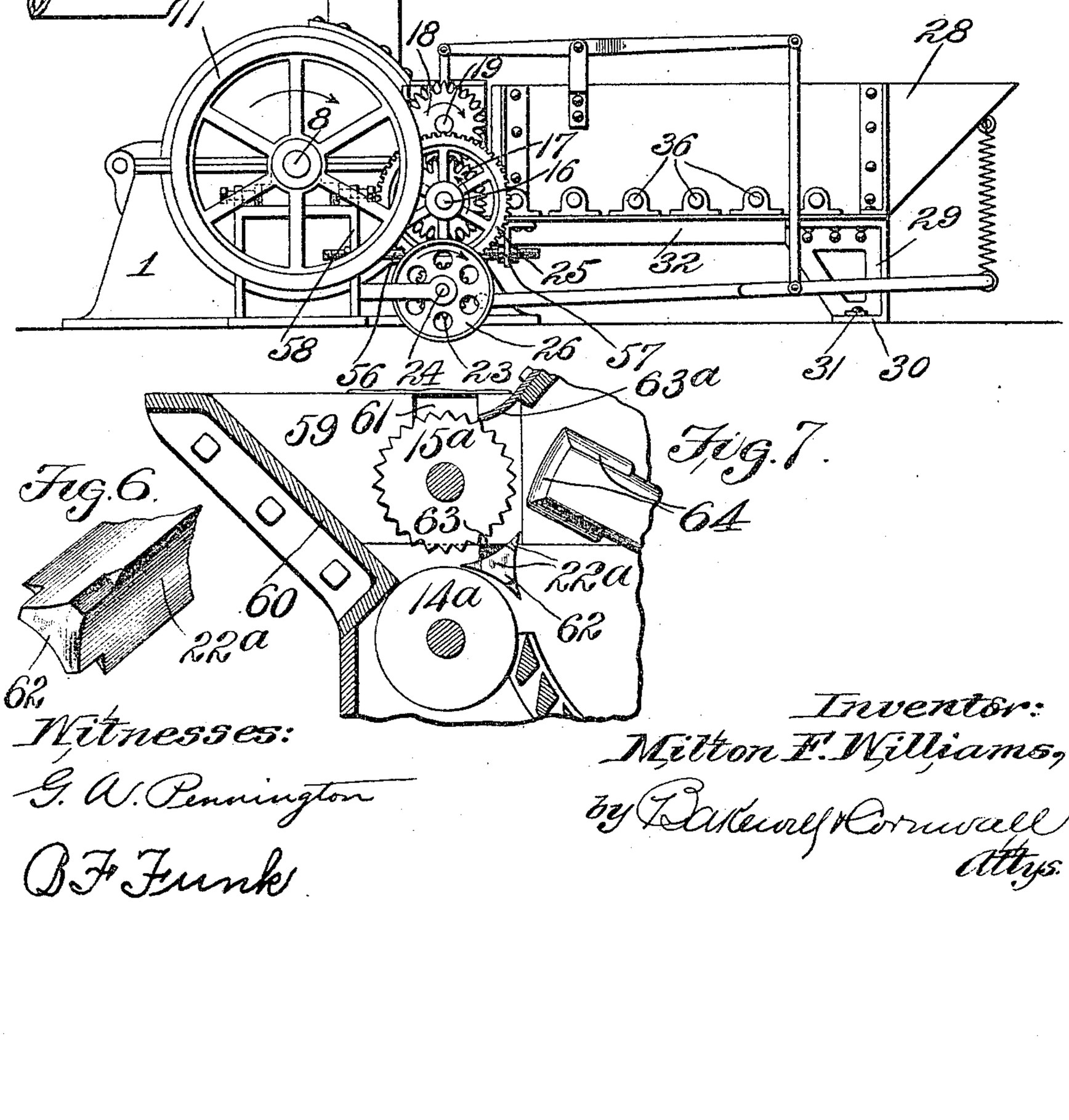

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

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SHREDDING-MACHINE.

No. 808,133. Specification of Letters Patent. Patented Dec. 26, 1905.

Application filed July 9, 1904. Serial No. 215,936.

To all whom it may concern:

Be it known that I, MILTON F. WILLIAMS, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Shredding-Machines, of which the following is a full, clear, and exact description, 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, forming part of this specification, in which—

Figure 1 is a side elevational view of a shredding-machine constructed in accordance with my invention. Fig. 2 is a top plan view of the shredding-machine. Fig. 3 is a vertical longitudinal sectional view through the shredding-machine. Fig. 4 is an elevational view on the side opposite to that illustrated in Fig. 1. Fig. 5 is an enlarged detail sectional view of a clutch used as a part of the machine. Fig. 6 is a fragmentary enlarged perspective view of a portion of the shredding-knife; and Fig. 7 is a fragmentary sectional view through a modified form of feed mechanism, a portion of a modified form of hammer being shown.

This invention relates to a shredding-machine adapted to reduce or shred fibrous material; and it is particularly designed for disintegrating rubber articles—such as old boots, shoes, and other rubber composition—so that the same will be reduced to a suitable mass and properly prepared, whereby the rubber can be dissolved by benzin or some other suitable dissolvent. One of the essential requirements of a machine of this type is to provide means for preventing foreign matter from entering the disintegrating mechanism. In the practical operation of the machine it frequently happens that foreign substances—such as nails, particles of rock, and the like—become mixed with the material to be shredded, and these foreign substances are detrimental to the hammers and to the cutting edges of the shredding device.

It is the purpose of this invention to avoid the introduction of such foreign substances into the shredding part of the machine.

It is also the purpose of the invention to provide an interchangeable knife having different cutting edges, which may be adjusted to independently act upon the material passing through the machine.

Another object of the invention is to provide an efficient feed mechanism.

A further object is to provide a suitable drive mechanism which will permit part of the mechanism to operate irrespective of the remaining portion.

Another object is to provide a feed mechanism which may readily be attached to and detached from the shredding portion of the machine.

Other objects and advantages, as well as the novel details of construction of this invention, will be specifically described hereinafter, it being understood that changes in the form, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages thereof.

The preferred embodiment of my invention is illustrated in the accompanying drawings, in which is shown a base 1, forming a cage-casing provided with a hinged cover 2. The casing is provided with an outlet-opening 3, communicating with a discharge-tube 4, which tube is connected to a suitable exhaust, preferably a pneumatic fan 4^a.

5 designates a skeleton cage, which is positioned within the casing, said cage being provided with a plurality of circumferentially-disposed transverse bars 6, having knife-edges, so that the interior wall of the cage is provided with a disintegrating or shredding surface coöperating with the hinged hammers 7, carried by the triangular heads 7^a on the shaft 8. The shaft 8 projects through the opposite sides of the casing and is supported in adjustable bearings 9 and 10. On one end of the shaft is a fly-wheel 11, while on the other end is placed a drive-pulley 12. Below the discharge end of the casing and approximately in line with the horizontal axis of the shaft 8 is an inlet-opening 13, through which the material is introduced into the cage 5. The feed-rollers 14 and 15, adjacent to the inlet-opening 13, are provided with different surfaces. The roller 14 is journaled in stationary bearings, while the roller 15 is journaled in slidable bearings in the machine, whereby said roller 15 is movable vertically to provide an automatic adjustment for different thicknesses of the material which passes between said feed-rollers. On the ends of the roller 14 are shafts 16. A double

gear 17 is keyed to one of the shafts 16, the double teeth alternating with each other, said teeth meshing with similar alternating teeth on the gear 18, carried by one of the end shafts 19 of the roller 15. The end shafts 19 of the roller 15 are carried in the sliding bearings 20, which are vertically movable in the slots 21 in the removable plates 21[a], which are carried by the projecting flanged portions 21[b] of the machine.

Interposed between the rollers 14 and 15 and in the space forming the entrance to the disintegrating-cage is a horizontally-disposed knife triangular in cross-section, so as to provide a plurality of cutting edges to be independently brought into operative position, whereby they can independently act upon the material to be shredded.

23 designates a gear-wheel carried on a shaft 24 and meshing with a gear 25 on the shaft 16 of the roller 14.

26 is a drive-pulley carried on the shaft 24 and adapted to receive motion from a suitable source of energy (not shown) and different from the source of energy which applies power to the shaft 8 on which the pulley 12 is located.

27 designates a transverse bar similar to one of the bars 6, except that one edge is contiguous to the surface of the roller 14, so that any material which may adhere to the roller during the introduction of the bulk of the material into the machine will be removed.

A suitable feed device for receiving the material in bulk and removing the foreign matter and for feeding the material into the shredding portion of the machine is illustrated in Figs. 1 to 4. This feed device is shown as comprising an elongated hopper 28, which is adjustably and removably secured to a base 32, supported on the standards 29. The feet of the standards 29 are provided with slotted flanges 30, in which fastening devices 31 are arranged so that the standards may be moved toward and away from the machine to effect the adjustment thereof. The side bars or base members 32 are provided at their extremities distant from the standards 29 with slots 33, in which are bolts or pins 34, said bolts or pins constituting fastening and guiding devices and being carried by the base 1. The bottom of the hopper consists of a plurality of revoluble grate bars or cylinders 35, which are rigid with the shafts 36 projecting through the hopper sides, said shafts carrying beveled gears 37 on their ends. These beveled gears 37 mesh with similar gears 38 on the longitudinally-disposed shaft 39, which shaft is carried in suitable bearings 40 and 41 on the hopper and the base, respectively. The shaft 39 is driven by a clutch from the beveled gear 42 on the shaft 24, which beveled gear meshes with a beveled gear 43, forming part of a clutch on the shaft 39. The object of providing the clutch on the shaft 39 is to permit the shaft 24 and the complementary mechanism to operate independently of the mechanism driven by the shaft 39. The reason for this is that it sometimes happens that the material to be shredded contains nails, rocks, or some other foreign substance, which clogs the spaces between the grate-bars, so as to prevent their rotation. By providing a friction-clutch the stopping of the grate-bars can be effected and the non-rotation of the shaft 39 permitted without affecting the operation of the remaining parts driven by the shaft 24.

The clutch preferably used consists of a boxing or housing in which is a disk provided with a friction-surface, which disk is carried by the beveled gear 43, loosely mounted on the shaft 39. The disk is indicated in Fig. 5 and designated by the numeral 44, and may consist of suitable metal, on one face of which is a friction-facing 45, adapted to contact with the adjacent face of the disk 46, which is rigid on the shaft 39. This clutch is arranged to be automatic in its operation, and this is accomplished by providing a tension-ring 47, which bears against the disk 46 and is guided within the circumferential flange 48, carried by the disk 46, which ring 47 is held in place by the fastening devices 49, on the ends of which are suitable nuts 49[a]. By adjusting the nuts the degree of tension can be regulated so that different degrees of resistance must be offered by the shaft before the clutch contact will be broken. However, this can be regulated for the various conditions under which the machine will operate.

As heretofore stated, the material to be shredded is dumped into the hopper and then fed into the machine, this being done by the alternately-arranged toothed collars, which are carried by the respective cylinders 35. Under ordinary conditions the gravitation of the roller 15, due to its weight, will be sufficient to compensate for the varying thicknesses of the material entering the disintegrating-cylinder. It sometimes happens, however, that the voluntary movement of the roller 15 is in itself not sufficient to permit the passage of the material, in which event the machine becomes choked. Means is provided for instantaneously relieving this choking of the machine, and the means is so conveniently arranged that the operator feeding the material into the hopper would have no difficulty in promptly relieving the stagnation of the material which is being fed into the cage. By reference to Figs. 1 to 4 it will be noticed that the roller is adapted to be actuated or vertically raised by levers 50, which are fulcrumed to standards 51, projecting from the opposite sides of the hopper. One end of each lever is connected to the sliding bearing 20 of the shaft 19, on which the roller 15 is carried by a link 51[a]. The opposite end of each lever is attached to a pitman 52, each

pitman being fastened to a pedal-yoke 53, which is spring-retracted by the spring 54, said lever being pivoted at 55.

It is sometimes found desirable to effect an adjustment between the disintegrating portion of the machine and the feed mechanism. This is accomplished by the adjusting-rods 56, having their respective ends threaded and adjustably connected to the brackets 57 on the hopper 28 and to the standards 58, carried by the base 1. This adjustment is permitted by the slotted portions 32 of the hopper-base and by the slotted portions 30 of the standards 29.

Another advantage gained by providing the feed mechanism so that it can be removed is that different forms of feed devices can be substituted for feeding certain kinds of material. One of these feed devices is illustrated in Fig. 7, and it consists of the removable side plates 59, which can be substituted in lieu of the side plates 21[a] in the preferred construction. These side plates 59 carry an inclined hopper-plate 60, whereby a hopper is formed to receive the material to be fed into the disintegrating-cage. In suitable sliding bearings in the slots 61 of the plates 59 is a shaft of the gravitating-roller 15[a], which corresponds or is similar to the roller 15 in the preferred construction. The stationary roller 14[a] is approximately the same as the roller 14 in the preferred construction, and the knife 22[a] is formed like the knife in the preferred construction, said knife in either or both constructions being provided with polygonal projections 62, which rest in bearings 63 in the sides of the machine, said bearings being closed by the side plates, so that after the knife is placed in its operative position it will remain rigid with relation to the remaining portion of the machine.

63[a] is a flexible lip secured to the front edge of the cover and having its free edge bearing against the corrugated feed-roller to prevent the material within the cage and being acted upon by the hammers from being thrown outwardly.

The advantage of the triangular bar resides in the fact that it may be adjusted to three different positions without being reground. The triangular bar 22 or 22[a], as the case may be, may be turned to bring an unused cutting edge into proper position by first removing one of the plates—as, for example, 59—carrying either the roller 15 or 15[a]. The upwardly and inwardly projecting edge acts as an overhanging breaker-plate beyond which the material is positively projected by the corrugated feed-roller, and while held suspended the material is struck by the hammers and shredded or torn, so as to be divided into fine particles or pieces. In the event that fabric is to be shredded it will be obvious that the inner upper edge of this triangular bar acts as a tearing edge and support for the material while it is being acted upon by the downwardly-moving hammers. Where the material acted upon is rubber hose or the like, the hammers will remove a considerable portion of the rubber before the woven body portion is shredded. The triangular cage-bars also contribute materially to the shredding action, in that their forwardly-presented sharp corners hold the material while being acted upon by the hammers. Material which is reduced to sufficient fineness to pass through the cage-bars will be discharged from the shredding-chamber; but the particles which are too large to pass through the cage-bars will be repeatedly acted upon until reduced to sufficient fineness to pass through said cage-bars.

The purpose of the exhaust-pipe 4 (shown in Figs. 1 to 4) is to carry off the lighter particles in the machine which are kept in a state of agitation by the hammers. For instance, in shredding material such as rubber hose the rubber being the heavier will be acted upon by gravity and centrifugal force to a much greater extent than the woven material embedded in the rubber, so that when said woven material is shredded and carried around by the hammers it will be acted upon by the exhaust-fan and drawn up through the pipe 4, and thus effect an initial separation of the rubber and woven material.

Instead of employing hammers similar to those designated by the numeral 7 I may employ hammers having chamfered heads 64, (see Fig. 7,) which hammers may be pivotally carried by heads on the shaft 8 and may alternate with each other, so as to act upon the entire mass of material within the cage.

Attention is directed to the fact that the feed mechanism is operated at a comparatively low rate of speed, while the hammers are operating at a comparatively high rate of speed. The reason for this is to permit the material to be acted upon to the greatest extent during the period within which it is in the cage and to so slowly feed the material into the cage that the cage will not become congested during this action. After the material has been suitably acted upon it will be drawn off through the tube 4 to a suitable chamber previously provided therefor.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a machine of the class described, the combination with a casing having inlet and outlet openings, of coöperating feed-rollers adjacent the inlet-opening, a knife interposed between the rollers, said knife being approximately triangular in cross-section with a knife-edge at each angle, and hammers within the casing; substantially as described.

2. In a device of the class described, the combination with a disintegrating mechan-

ism having a casing provided with an inlet-opening, of a feed mechanism connected to the casing for feeding material into the inlet-opening, said feed mechanism including a plurality of rotatable elements having shafts with terminal gears, a drive-shaft having gears to mesh with the first-named gears, said shaft having fixed bearings, and adjusting devices connecting the feed mechanism with the casing, whereby the teeth of the gears on the feed mechanism and the shaft can be adjusted to properly mesh; substantially as described.

3. In a machine of the class described, a disintegrating mechanism having a casing provided with an inlet-opening and an outlet-opening, coöperating rollers at the inlet-opening, a knife interposed between the rollers, said knife being approximately triangular in cross-section with a knife-edge at each angle, and roller-supporting bearing-plates for one of the rollers adjacent to the opening, said bearing-plates having portions for holding said knife against movement; substantially as described.

4. In a machine of the class described, a disintegrating mechanism provided with a casing having an inlet-opening, bearings in the casing, a knife having angular ends resting in the bearing, said knife being approximately triangular in cross-section with a knife-edge at each angle, rollers above and below the knife, and means for locking said knife against movement when any of the edges are presented for contact with the material; substantially as described.

5. In a machine of the class described, a disintegrating mechanism provided with a casing having an inlet-opening and an outlet-opening, bearings in the casing, a knife having angular ends resting in the bearings, said knife being approximately triangular in cross-section and provided with a cutting edge at each angle, the respective cutting edges being adapted to be respectively positioned for contact with the material, rollers above and below the knife, and roller-carrying plates for locking said knife against movement when any of the edges are presented for contact with the material; substantially as described.

6. In a machine of the class described, a disintegrating mechanism provided with a casing having an inlet-opening, bearings in the casing, a knife in the bearings approximately triangular in cross-section and having a cutting edge at each angle, the edges being adapted to be respectively positioned for contact with the material, rollers above and below the knife, and removable roller-carrying plates for locking said knife against movement when any of the edges are presented for contact with the material; substantially as described.

7. In a machine of the class described, the combination with a casing having a disintegrating mechanism, said casing being provided with inlet and outlet openings, rollers carried by said casing and adjacent to the inlet-opening, one of said rollers being in fixed bearings and the other in slidable bearings, a lever 50 connected to the movable bearings, a treadle 53 below the lever 50, and a connection between the lever 53 and lever 50 whereby the depression of the lever 50 will raise the movable bearings; substantially as described.

8. In a device of the class described, the combination with a casing having a disintegrating mechanism therein, said casing being provided with inlet and outlet openings, rollers carried by the casing and adjacent to the inlet-opening, one of said rollers being in fixed bearings and the other in slidable bearings, a spring-retractable treadle 53 pivoted at one end, an intermediately-pivoted lever 50 connected to the slidable bearings, and a connection between the levers 50 and 53; substantially as described.

9. In a device of the class described, the combination with a disintegrating mechanism, a casing surrounding said mechanism and having an inlet-opening and an outlet-opening for communication with a pneumatic exhaust, a pair of feed-rollers adjacent to the inlet-opening of the casing, one of which is in stationary bearings and the other in movable bearings whereby the latter is adapted to gravitate toward the former, a knife between the rollers, and a scraper-knife adjacent to the roller in fixed bearings; substantially as described.

10. In a device of the class described, the combination with a casing having a disintegrating mechanism therein, of a feed device comprising a hopper, the bottom of which consists of a plurality of rotating elements having gears, a rotatable shaft having gears fixed thereto and in mesh with the gears on the rotatable elements, a gear loose on said shaft, a driving-shaft, a gear on the driving-shaft in mesh with the loose gear, and a friction-clutch one member of which is fixed on the shaft and adjacent the loose gear, the second member of the clutch being loose on the shaft and rigid with the loose gear; substantially as described.

11. In a shredding-machine, the combination with feed-rollers, one of which positively advances the material to be shredded into the machine, and a removable bar triangular in cross-section and having a knife-edge at each angle, one edge of the bar bearing upon the other of said feed-rollers for guiding the material into the machine; substantially as described.

12. In a shredding-machine, the combination with feed-rollers one of which positively feeds the material into the machine, of a triangular bar arranged between said rollers

and having a knife-edge at each angle, one of the knife-edges coöperating with the lower roller to guide the material therefrom and direct it upwardly and inwardly to the machine in a path coincident with the circumference of the positive roller, the upper inner edge of said bar forming an overhanging tearing edge, and revolving beaters or hammers coöperating with the material after it has been positively moved past the tearing edge and while it is held by the positive feed-roller; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 5th day of July, 1904.

MILTON F. WILLIAMS.

Witnesses:
F. R. CORNWALL,
GEORGE BAKEWELL.