(No Model.) 3 Sheets—Sheet 1.

W. A. KONEMAN & H. H. SCOVILLE.

PULVERIZING APPARATUS.

No. 315,146. Patented Apr. 7, 1885.

Fig. 1.

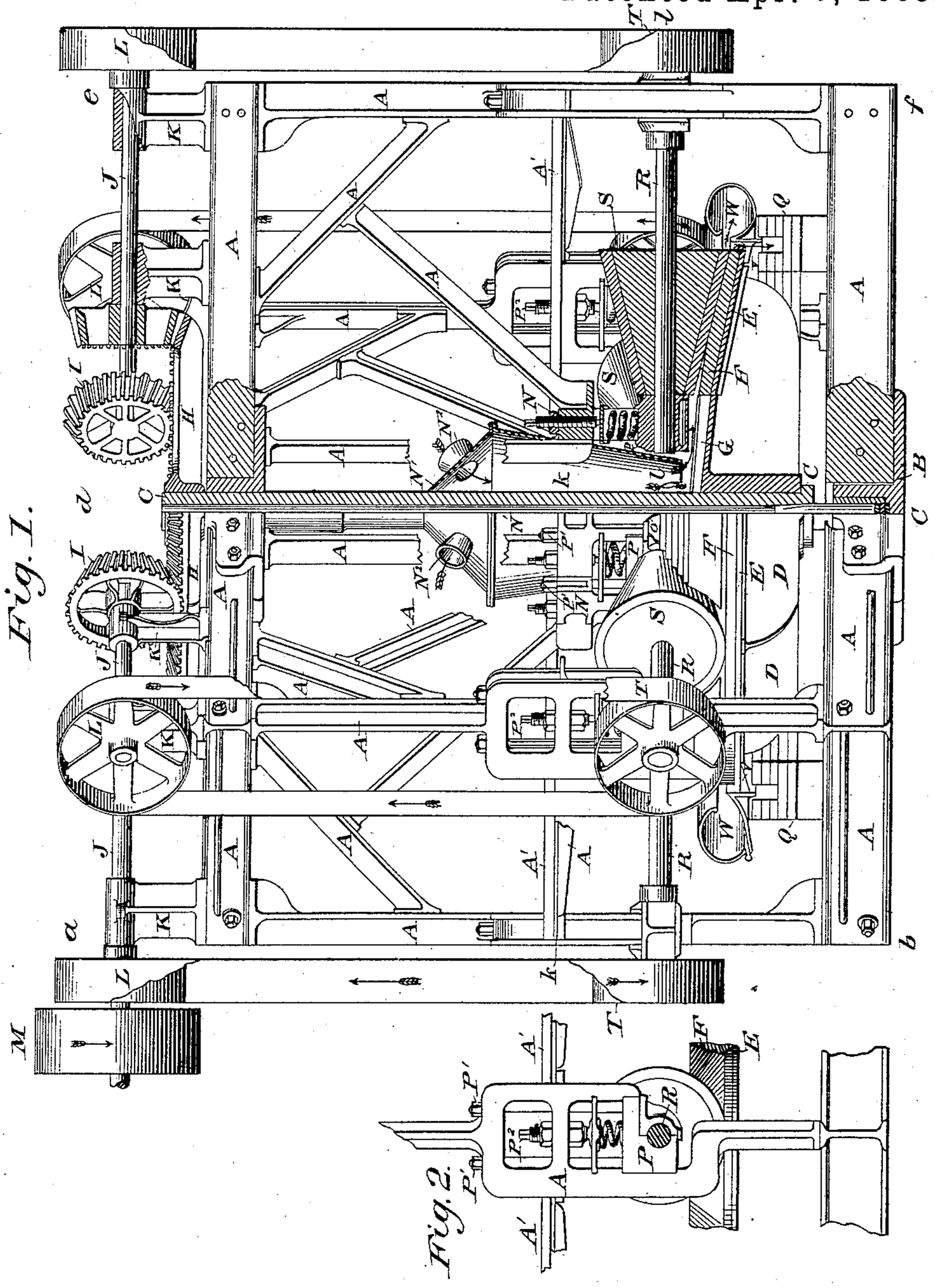

Fig. 2.

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Fig. 4.

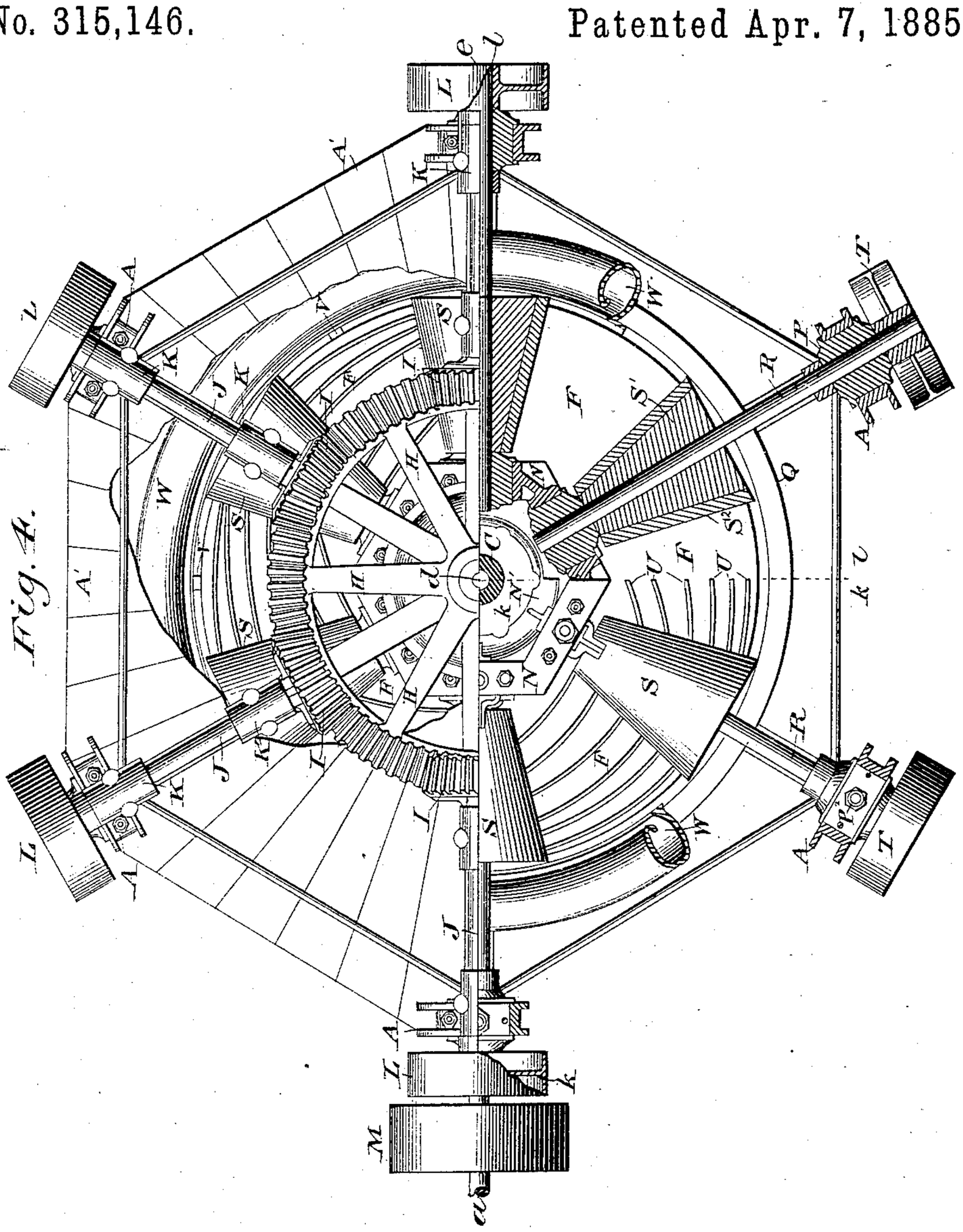
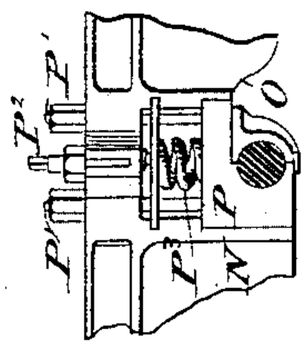


Fig. 3.



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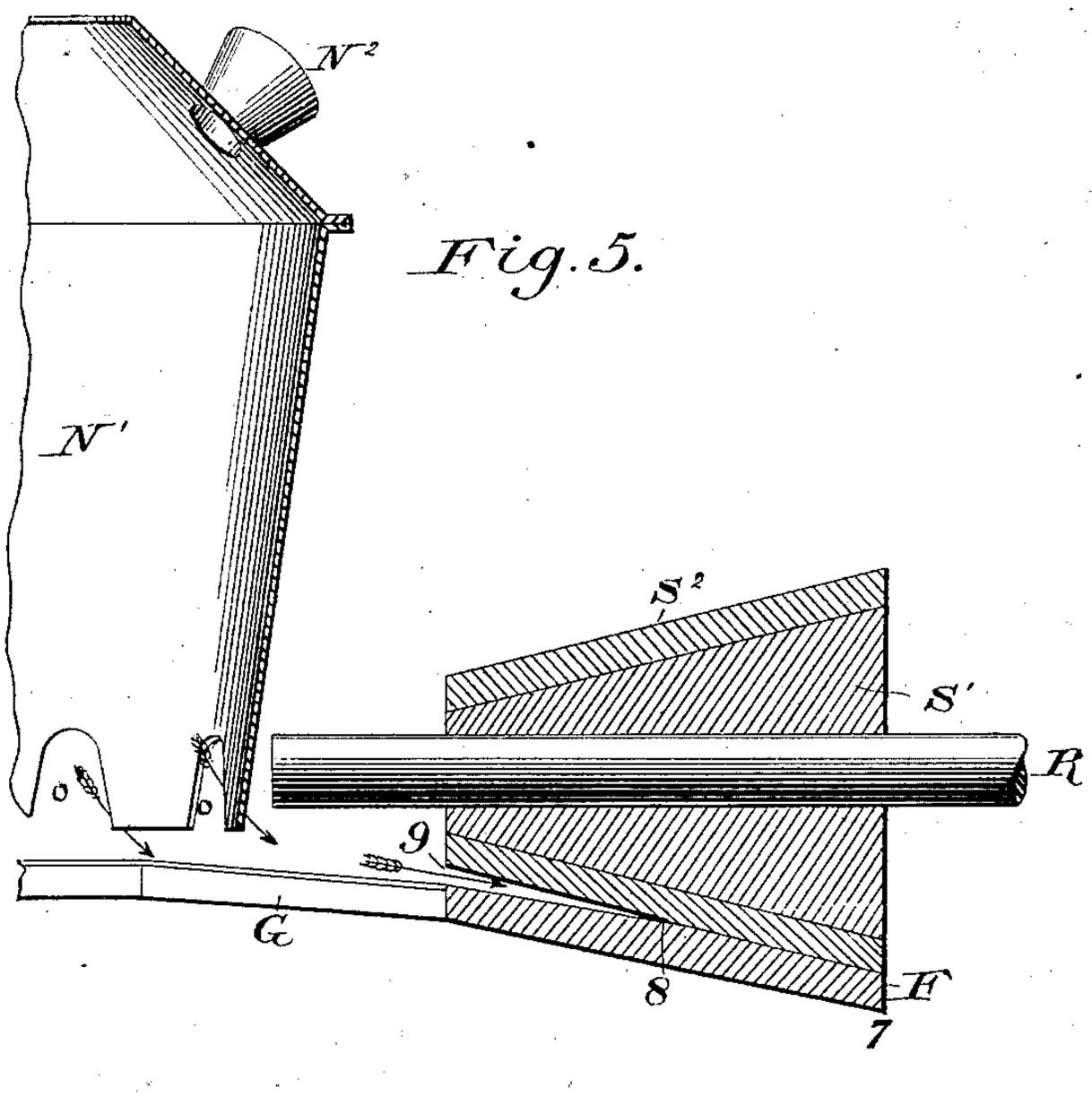


Fig. 5.

Fig. 6.

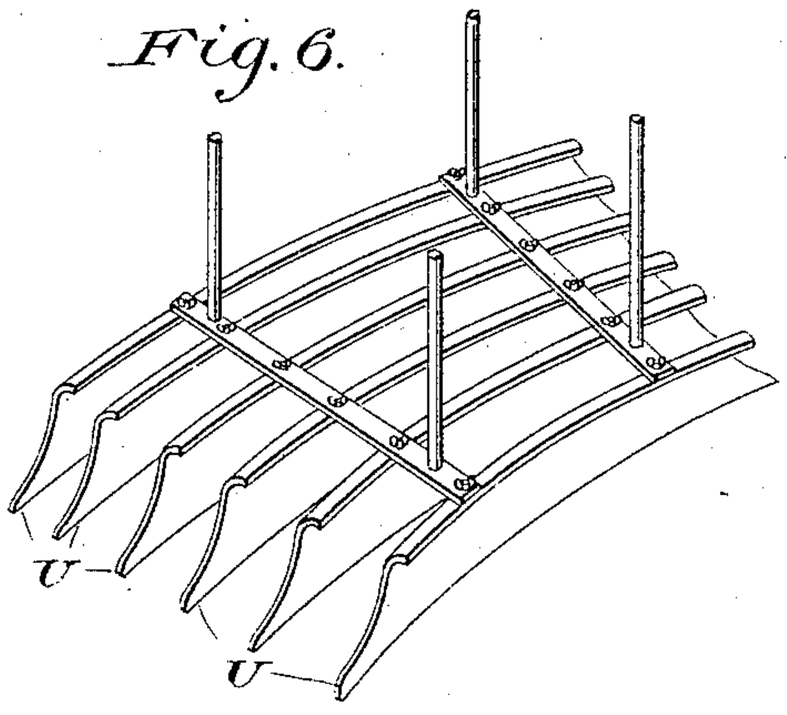
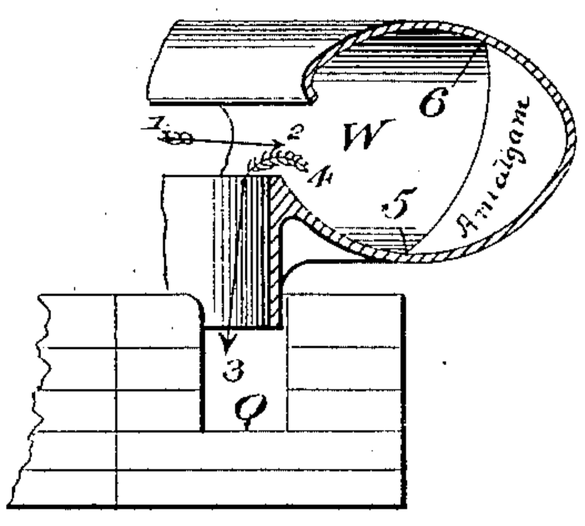


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM A. KONEMAN AND HIRAM H. SCOVILLE, OF CHICAGO, ILLINOIS;
SAID SCOVILLE ASSIGNOR TO AZEL F. HATCH, OF SAME PLACE.

PULVERIZING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 315,146, dated April 7, 1885.

Application filed March 14, 1884. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM A. KONEMAN and HIRAM H. SCOVILLE, of the city of Chicago, county of Cook, and State of Illinois, and citizens of the United States of America, have invented certain new and useful Improvements in Pulverizing Apparatus; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in mechanical art to make and use it, reference being had to the accompanying drawings, which form a part of this specification, in which—

Figure 1 represents a front elevation of the machine, partly drawn in perspective and partly in vertical section. Fig. 2 represents the construction of one outer bearing of one conical crushing-roll. Fig. 3 represents the construction of one inner bearing of one conical crushing-roll. Fig. 4 represents a plan of the machine, partly shown in section taken through planes *k k* and *l l* in Fig. 1. Fig. 5 shows a vertical section through one conical roll, one-half of inner hopper-shell and one-half of bed-plate drawn to double scale. Fig. 6 shows a perspective view of one set of retarding-guards for regulating the feed between the rolls, drawn to double scale. Fig. 7 shows a section, partly in perspective, of amalgamating-trough and centripetal tailing-discharge, drawn to double scale.

The object of our invention is to provide an apparatus which will pulverize hard or brittle substances to any degree of fineness required by means of one or more conical rolls independently revolved above a rotating bed-plate, without the necessity of screening the pulverized material before its final discharge from the machine.

The further object of our invention is to provide an apparatus in which a conical roll or rolls independently revolved and a bed-plate can be so adjusted as to force a gradual reduction to powder or pulp of the material operated upon.

The further object of our invention is to provide an apparatus which will pulverize substances by means of a conical roll or rolls independently revolved and a rotating bed-plate so relatively adjustable that such substances may be pulverized dry or wet by adding water or other liquid substances.

The further object of our invention is to provide an apparatus in which a pulverizing roll or rolls rotating upon a bed-plate are fed and supplied with material from the center, and in which the too rapid moving of such material toward the periphery of the bed-plate is checked and adjusted.

The further object of our invention is to provide an apparatus which will reduce gold and silver bearing ores to powder by means of a revolving conical roll or rolls and a rotating bed-plate, and which will amalgamate the precious metals before the final discharge of the ore-powder.

Referring to the drawings, the parts marked A in Fig. 1 represent the frame of the machine, which may be made in any desired shape or of any material warranting sufficient strength. We preferably use iron. A′ is a platform covering a portion of the machine horizontally above the rolls. B is the step or support in which shaft or axle C rotates, and it forms a connecting member of the frame A, resting upon and firmly held by the foundation of frame A. C is the main shaft or axle, which we prefer to cast hollow in order to give additional strength. D is the spider, which is firmly keyed or fastened to shaft C. The extended radial arms of said spider support and carry the crushing-plate. E, a plate of soft metal fastened to spider D and interposed between the spider and the main crushing-plate F, which is firmly held by plate E. G is a central filling of cheap material, preferably wood covered with sheet-iron, to prevent the material from passing down through the table; H, main driving gear-wheel keyed firmly to main shaft or axle C. Five of the pinions marked I are rotated by gear-wheel H, and are keyed to axles J. Axles J rotate pulleys L. One of the axles J, with its pulley L and pinion I, is rotated by the main driving or power pulley M. K K are the journals and supports for axles J, and are firmly fastened to frame A. N is an angular frame which surrounds the main shaft or axle C, and

is firmly held and supported by braces from the frame A in such a manner that it becomes a part of the frame. The inner bearings of the rollers are attached to and supported by said frame N. It reaches down to within, say, three inches of the bed-plate, and is provided with gates O for the free discharge of material. N′ is an inner hopper-shell, of light iron, and provided with receiving-funnels N^2. The inner bearings for conical roll-axles R (marked P and shown enlarged in Fig. 3) are supported by suspending-bolts, and slide in hopper-frame N. These bearings are so constructed that by turning nuts P′ on the ends of the suspending-bolts the bearing may be raised or lowered, thereby raising the roller farther from or letting it down nearer to the bed-plate, according to the fineness of powder desired. Screw P^2 regulates the pressure of spring P^3. The object of spring P^3 is to keep the roller down to its adjusted height under ordinary working pressure, but to allow the roller to rise should articles of unusual hardness—such as iron or steel—be fed or thrown into the machine thereby saving breakage should such an accident occur. The outer bearings for conical roll-axles R (marked P and shown enlarged in Fig. 2) are constructed like inner bearings P, and are supported by and slide in the upright supports of frame A. Roller-axles R extend outside of and through the outer bearings P sufficient to allow pulleys T to be keyed to them. Pulleys T are connected by belts with upper pulleys, L, which receive motion from the gear-ring H. By this means power is communicated to the conical rolls positively and independently of the motion of the rotating table S. These conical rolls S, of which a number corresponding with the capacity of machine desired are used, may be constructed of one or more pieces or of one or more narrow rolls each, in order to give the length of roll desired, and they may each be made solid or with removable crushing-shells, which latter method we prefer, and for grinding grain or other substances of slight resistance the rolls as well as the bed-plate may be constructed of stone. For general use we construct each roller with a roller-core, S′, which is firmly fastened to roller-axle R, and with crushing-shell S^2, which fits over and is firmly fastened to roller-core S′. The retarding-guards, (marked U,) one set of which is shown in perspective in Fig. 6, are suspended from platform A′, and are so constructed that they may be readily adjusted. They may be made of any desired shape and of solid or perforated substances. They serve to retard the too rapid outward movement of the material being pulverized. V represents the supporting bracket-irons for trough W. These supports are fastened to spider-plate E. The trough W, resting in and fastened to supports V opposite but below the edge of the table F, receives, by centrifugal action, the matter discharged from said table. Line 3 4 in Fig. 7 is the line of tailing-discharge. The overflow from the trough W is from its inner edge into the stationary trough Q, which may be of any shape and built of any suitable material, and so constructed as to discharge at one or more points. The centripetal discharging-trough W serves to amalgamate the precious metals when they are present in a free state in ores which are being pulverized, for which purpose a quantity of mercury is placed in the trough; but the trough is dispensed with when amalgamation is not desired. The crushing-bed F is depressed at its inner edge, so that for a distance outward from said edge the roll does not conform to the surface of the bed F. This deflection of the bed-plate at the head of the roll is, say, three-eighths ($\frac{3}{8}$) of an inch, and it decreases to nothing at a point nearer the periphery of the bed-plate. The ore there is nipped gently and reduced in size, while the finer portions of the ore pass under the rolls without contact at this point, and travel toward the periphery until they reach a point on one of the rolls with less space between it and the bed-plate than the diameter of the ore lump. Its reduction will then commence, and will continue gradually until its final discharge. The deflection referred to is shown in Fig. 5 between the points 8 and 9.

The operation of the machine on, say, ore carrying free gold is as follows: After the machine is set in motion by applying power to driving-pulley M, thus rotating bed-plate F and conical rolls S on their axles, the ore, which has been reduced to a size of one-half inch or more or less by means of an ore-crusher, or by means of a crusher and Cornish rolls combined, is fed into hopper N′ through funnels N^2, and a jet of water is injected into the hopper as well, if a wet pulp is desired, or if the gold is to be amalgamated in the trough. The ore falls on the rotating bed-plate F, and is at once distributed to the head of rollers S by passing between the lower edge of hopper N and bed-plate F, and by passing also through hopper-gates O. The first retarding-guard U prevents the ore from passing outward any farther than the point of its position, but forces the ore to pass under the rolls, it being delivered to the rolls by the rotating bed-plate. The retarding-guards, from the nature of their position, force each particle to pass under the rolls repeatedly, and prevent it from leaving the machine until reduced to a size corresponding with the space between the bed-plate and rolls at the periphery of the plate. The superficial increase on the bed-plate surface from its center toward its periphery furnishes spreading-room to the ore particles in the ratio of their reduction. When the reduced ore particles reach the edge of the bed-plate, they are hurled in a tangent line (1 2 in Fig. 7) into trough W, and are thrown against the body of mercury which has been placed in the trough. The mercury, having a much greater specific gravity than the ore-

powder, banks up against the wall of trough W in a manner similar to line 5 6 in Fig. 7. The ore-powder is forced backward or centripetally over the inner edge of the trough by means of a water-current introduced in any desired manner, and ores having a great tendency to cling or pack may be loosened by means of one or more scrapers or stirrers introduced into the trough W. When the ore and water leave trough W, (in the line 3 4, Fig. 7,) they are delivered into receiving-trough Q, whence they are discharged in any desired manner. When dry pulverizing is desired, the trough W is dispensed with, the machine is inclosed with a casing, and the fine powder or particles are removed as fast as formed by a suction-fan. We prefer to give the bed-plate a downward pitch from its center to the periphery in accordance with the pitch of the rolls, in order to secure a horizontal axle for the conical rolls.

Heretofore when a revolving bed-plate has been employed the revolution of the rolls has been derived by contact with said bed-plate, and when a stationary bed-plate has been employed, and the rolls carried over the surface thereof, the revolution of the rolls on their own axes has also been derived from contact with the bed-plate.

We apply an independent power to revolve the rolls, and thereby may cause them to revolve at the same or a different surface-speed from the bed-plate, and may exert a grinding as well as a crushing force.

In order to keep the roller-axles as nearly horizontal as possible when gradual reduction is desired, we make the bed-plate in such a manner that its face has contact with and is parallel to the face of the rolls for a greater or less distance from the periphery of the plate toward its center, as shown by line 7 8 in Fig. 5, then to deflect, drop, or sink the face of the bed-plate from point 8 to the inner end or head of the rolls, as shown by line 8 9 in Fig. 5. This deflection is greater or less, according to the size of the material to be gradually reduced.

We do not claim any pulverizing process by means of a bed-plate and rolls where the rolls revolve on the bed-plate at or near its periphery, if the rolls have a face parallel to their axle, and where a screen or metal wall surrounds and is fastened to the bed-plate, or where rolls having a parallel face are rotated in a trough on the periphery of a bed-plate, and are rotated by arms fastened to the driving-shaft, numerous devices embodying these principles being in use; but

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

1. The combination, in a pulverizing apparatus, of a surrounding frame, A, step B, resting upon foundation of frame A and secured to said frame, vertical shaft or axle C, rotating in and supported by step B and held in its vertical position by a top bearing, also supported by the frame A, driving wheel or gear H, fastened to vertical shaft or axle C, and in engagement therewith a driving-pinion, the spider D, fastened to axle C, and bed-plate F, fastened to spider D, a series of conical rolls, and means for imparting to them independent and positive rotation, substantially as and for the purpose set forth.

2. The combination, in a pulverizing apparatus, of frame A, hopper-frame N, firmly held suspended by frame A, inner and outer bearings, P, supported by frame A and hopper-frame N, roller-axles R, rotating in bearings P, conical rolls S, held by axles R, bed-plate F, and mechanism for revolving said rollers independent of said bed-plate, substantially as and for the purpose set forth.

3. The combination, in a pulverizing apparatus, of frame A, bed-plate F, having the deflection in its surface from 8 toward the center, as shown and described, and rollers S, rotating on bed-plate F, substantially as and for the purpose set forth.

4. The combination, in a pulverizing apparatus, of a rotating bed-plate, F, independently-rotating conical rolls S, and retarding-guards U, adjusted between conical rolls S and held suspended from floor A′ in stationary position over the rotating bed-plate, substantially as and for the purpose set forth.

5. The combination, in a pulverizing apparatus, of bed-plate F, rotating rolls S, roller-axles R, bearings P, adjusting rods and screws P′ and P^2, for raising and lowering roller-axles R, and springs P^3 on bearings P, substantially as and for the purpose set forth.

6. The combination, in a pulverizing apparatus, of frame A, bed-plate F, rotating rolls S, roller-axles R, bearings P, pulleys T, fastened to axles R, and power-connection with pulleys T, substantially as and for the purpose set forth.

7. The combination, in a pulverizing apparatus, of frame A, shaft C, spider D, bed-plate F, rollers S, trough-supporting brackets V, fastened to spider D, and centripetally-discharging trough W, supported by and resting in supporting-brackets V, substantially as and for the purpose set forth.

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