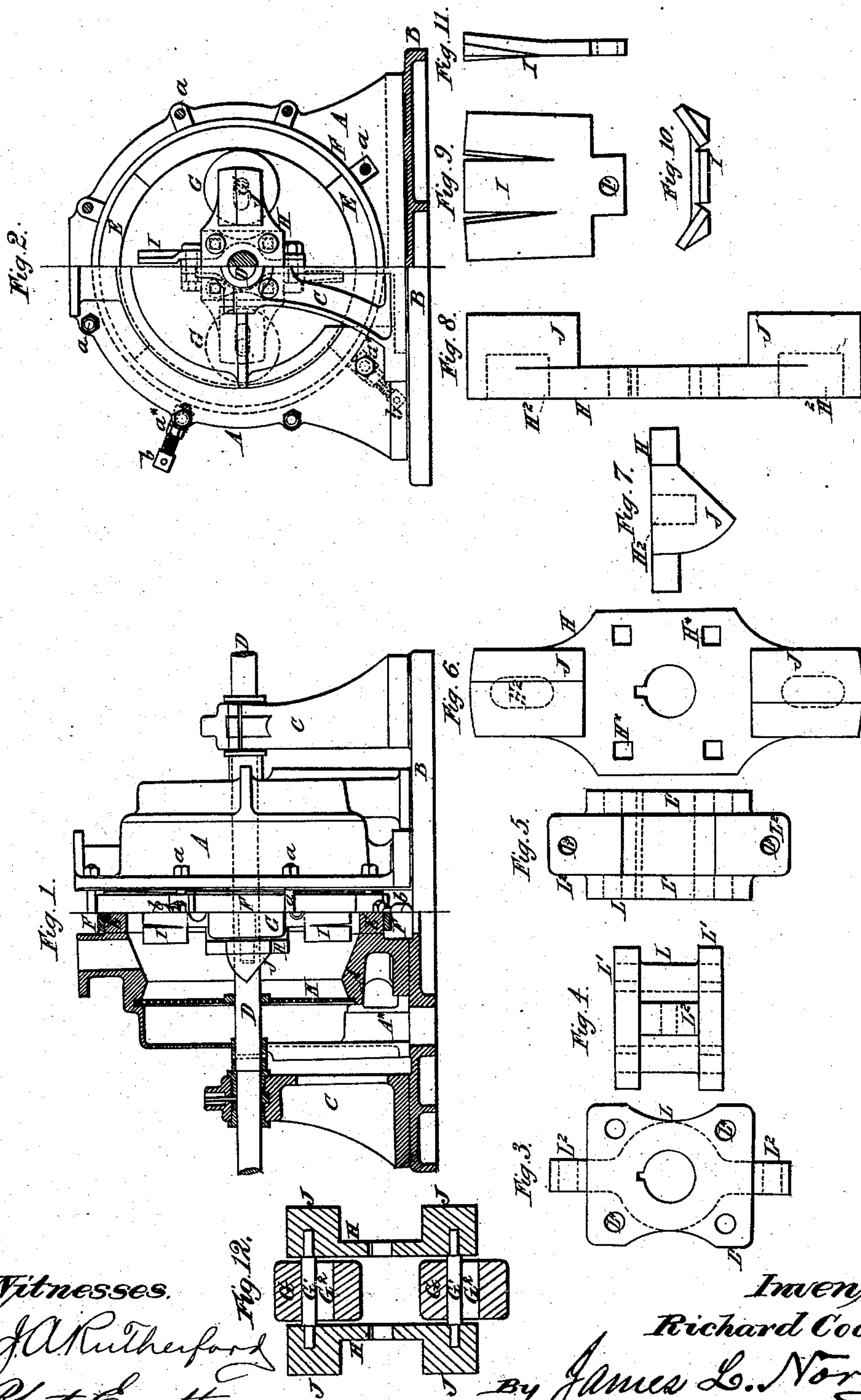


(No Model.)

R. COOK.  
GRINDING MACHINE.

No. 258,194.

Patented May 16, 1882.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 258,194, dated May 16, 1882.

Application filed October 17, 1881. (No model.) Patented in England October 18, 1880, No. 4,244; in Germany March 14, 1881, No. 16,242; in France March 18, 1881, No. 141,801; in Belgium March 19, 1881, No. 54,161, and in Canada October 19, 1881, No. 13,549.

*To all whom it may concern:*

Be it known that I, RICHARD COOK, of Sheffield, England, have invented new and useful Improvements in Grinding-Machines, (for which I have obtained patents in Great Britain, No. 4,244, October 18, 1880; in Germany March 14, 1881, No. 16,242; in France, No. 141,801, March 18, 1881; in Belgium, No. 54,161, March 19, 1881, and in Canada October 19, 1881, No. 13,549,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to machinery of that class in which the crushing, grinding, or pulverizing effect is obtained by the rotation and centrifugal action of rollers or balls within a cylindrical casing; and it comprises various improvements, hereinafter described, whereby the efficiency of such machinery is increased to a very considerable extent.

My improvements are illustrated in the accompanying drawings, in which Figure 1 represents, partly in side elevation and partly in longitudinal section, a machine constructed according to my invention for crushing and pulverizing dry materials; and Fig. 2 is an end elevation, partly in transverse section, of the same. Fig. 3 is an end view, Fig. 4 a plan, and Fig. 5 a side view, drawn to an enlarged scale, of a central piece, to which the arms or plates forming the driver for carrying the rollers or balls are connected. Fig. 6 is an end view, Fig. 7 an under side view, and Fig. 8 a side view, also drawn to an enlarged scale, of one of the said arms or plates; Fig. 9, a side view, Fig. 10 a plan, and Fig. 11 an end view, also drawn to an enlarged scale, of a curved blade or fan, hereinafter described. Fig. 12 is a longitudinal section, showing a modified method of securing the rollers or balls to the arms or plates for carrying the same.

In the accompanying drawings, the letter A indicates the cylindrical case of the machine, which is made in two parts, as shown, and is supported upon a bed-plate, B.

C C represent standards provided with bearings, in which the driving-shaft D is supported outside the case.

E represents a metal ring, and F a metal hoop surrounding the same.

G G represent the rollers by which the grinding, crushing, or pulverizing is effected, and H H arms which constitute the driver or carrier in which the said rollers are supported.

I I represent curved or scoop-shaped fans or stirrers attached to the central piece, L, and J J are curved blades or fans attached to or forming part of the arms H.

K represents a sieve or screen in one side of the machine, a similar sieve or screen being placed on the opposite side of the machine, but not shown in the drawings.

One important feature of my said invention consists in providing the ring E of steel or other hard and durable material, which is placed within the case A in such a position that it forms a circle within which the rollers or balls G rotate. The materials to be treated are crushed, ground, or pulverized between the said rollers or balls and the inner face of the said ring. The latter fits between the two halves of the casing A, as shown, these halves being bolted together by means of the bolts *a* and their nuts. The ring E is securely held in position by the wrought-iron hoop F, encircling the outer periphery of the same. As shown, the said ring is composed of several parts or segments, (preferably four,) which, when placed in position, fit accurately together and form a complete annulus. This ring E is so placed between the two halves of the case A that it may be raised or lowered by means of set-screws *b*, whose inner ends rest upon the outer periphery of the hoop F, and whose outer ends are outside the case A, where they may be manipulated in a convenient manner; but I make no claim to such features of adjustment.

The object of making the ring E movable is to provide means for readily adjusting the same to suit different materials to be treated, or to cause such materials to be reduced to a greater or less degree of fineness, as may be desired, also to provide for compensating for the wear of the ring E and rollers G. By turning the set-screws *b* in one direction the ring E is caused to ascend, and thus to approach nearer to the path of the rollers G at the lower or grinding part of the case A, and by turning the set-screws *b* in the opposite di-



rection the ring E is allowed to descend, and is consequently proportionally removed from the path of the rollers G at the same part of the case A. The set-screws *b* may be arranged  
 5 in any convenient position; but I prefer to place one on each side toward the lower part of the case A and one on each side toward the upper part thereof, as shown in the drawings.

10 The object of making the ring E in sections is that when the lower parts thereof, which are subject to the greatest amount of friction, have been worn away to a certain extent they may be moved to the upper part of the case A,  
 15 the parts of the ring previously occupying the said upper part being then moved to the lower part, where they will be subjected to more friction. The wear upon the said ring may thus be equalized. This may be repeated any  
 20 number of times as long as the ring E remains of sufficient thickness. Therefore a ring made and applied in this manner is practically indestructible, and will consequently last for as long a time as the machine itself, unless de-  
 25 stroyed by accident. A further object in making the ring E in parts or segments is that should one of the latter be broken by accident or otherwise injured a new segment may be inserted, thus avoiding the necessity for pro-  
 30 viding a completely new ring. When it is desired to adjust the ring E to a higher or lower position in the case, the nuts of the bolts *a* are somewhat slackened, and the set-screws *b* are then operated in the desired direction. The  
 35 hoop F keeps the separate segments together. In some cases I may make the ring E in one piece and dispense with the hoop F.

Another feature of the present invention consists in providing improved means for at-  
 40 taching the balls or rollers G to the driving-shaft D by means of a driver or propeller of improved construction, which I will now proceed to describe. This driver or propeller, as shown, is constructed in separate parts or cast-  
 45 ings H, one of which is shown detached in Figs. 6, 7, and 8. These parts are so made that they can be put together and taken apart with the greatest facility, so that should one of such parts become broken or otherwise ren-  
 50 dered unfit for use it may be readily replaced by another, thus avoiding the necessity for an entirely new driver or propeller. I also provide a central piece, L, (see Figs. 3, 4, and 5,) designed to fit upon the driving-shaft D in  
 55 such a position that it is between the two rollers G, one of which is upon one side of the shaft and the other upon the other side thereof. This central piece, L, has a flange, L', on each side, and a central part, L<sup>2</sup>, which extends be-  
 60 yond the flanges at each end thereof, and is provided with holes L<sup>3</sup>. The flanges L' are also provided with holes L<sup>4</sup> to receive bolts, by means of which I attach to this central piece, L, the two plates or arms H, which carry the  
 65 rollers G, and together form the driver or propeller for the same, as above described. The said flanges L' are curved inward, as shown

in Fig. 3, on the two sides thereof which are next to the rollers, so that the latter may have free play as far as is necessary toward the  
 70 shaft D. Each of the aforesaid plates or arms H is made as follows—that is to say, its central portion is flat, and it is wider at this central portion than at its two extremities, as shown at Fig. 6. At each end of the said arm  
 75 there is a projecting piece, blade, or fan, J, which partially covers and so aids in protecting the rollers G, and in each of these projecting pieces J, I provide a slot, H<sup>2</sup>, which serves as a bearing for the trunnion or spindle end  
 80 G', projecting from the roller G. These slots H<sup>2</sup> are made of the desired length to provide for the centrifugal action of the rollers. The flat central part of each of the carrying plates or arms H of the driver is provided with bolt-  
 85 holes H\*, which are so arranged as to coincide with those provided in the central piece, L, to which the said carrying plates or arms are to be attached. Two of the latter are employed,  
 90 as above described, one being bolted to one side of the central piece, L, and one to the other side of this piece, so that the two balls or rollers G fit between the extremities of these  
 95 carrying plates or arms with a capability of rotating therein, and moving inward and outward radially to provide for the desired cen-  
 trifugal action. Each end of the arms H is furnished with the curved blade or fan J, as above described. These blades agitate the  
 100 material and assist in distributing and mixing the same. They also assist in creating a draft, thereby aiding in cooling the material being treated; but their chief object is to force the  
 reduced material against the side sieves or screens, K, through which the portion of such  
 105 material which has been pulverized sufficiently escapes into a chute or delivery-spout, A\*, and thence to a suitable receptacle. These blades or fans J render unnecessary the employment  
 110 of brushes, as heretofore used, and the draft created by the rotation of the said blades prevents the meshes of the sieves from becoming clogged. The two carrying plates or arms H, and also the central piece, L, to which they  
 115 are bolted, are provided with a central aperture, through which the driving-shaft D passes, and they are secured tightly upon the latter by means of keys.

The sieves or screens K at the sides of the machine may be so arranged that they can be  
 120 adjusted nearer to or farther from the blades or fans J to suit the material being treated.

In Fig. 12 I have shown the balls or rollers G provided with an aperture, G<sup>2</sup>, completely through their center, and the spindle G', which  
 125 passes through the same, stationary or fixed in the ends of the arms H of the driver or propeller. In this case the aperture G<sup>2</sup> through the balls will be of proportionally larger di-  
 130 ameter than the diameter of the stationary spindle, to allow the desired centrifugal movement of the rollers G. I find in practice that the relative proportions should be as one to two—that is to say, the diameter of the spin-



dle G' should be one-half that of the aperture G<sup>2</sup> in the roller. The relative proportions may, however, be varied, if desired.

A further improvement consists in providing fans or stirrers I I of novel construction, one of which is shown detached in Figs. 9, 10, 11. Two of such fans are carried by the central piece, L, as shown in Fig. 2, and are arranged in such a position that the said fans or stirrers I project radially at right angles to the axis of the driving-shaft D, and are situated about midway between the two rollers G, one of these fans being on one side of the driving-shaft D and one on the opposite side thereof. Therefore, in the rotation of said shaft, each fan or stirrer I follows one roller and precedes the other. These fans or stirrers I are designed to create a strong current of air to cool the material being pulverized, and also to act as stirrers or mixers for constantly agitating the said material in their rotation. They are made of metal, and are slightly scoop-shaped, as shown, there being a concavity on their front face. Part of the metal therein is cut away longitudinally, as shown, to facilitate the bending of the metal to the required shape. Each fan I has at one end a narrow portion provided with a hole, I', through which a bolt passes for securing the fan to the part L<sup>2</sup> of the central piece, L, the bolts passing through the holes I<sup>3</sup>. Two of such fans will ordinarily

be used with each pair of rollers, as above stated.

Having thus described my invention, what I claim is—

1. The combination of the ring, the rollers therein, the sieves or screens at the sides thereof, and the blades or fans J, arranged to agitate and fan the material being operated on and force the same against the screens or sieves, substantially as described. 35 40

2. The combination of a casing, A, a ring, E, a grinding-roller traveling within the ring, a driving-arm, H, supporting the roller, a shaft sustaining the driving-arm, a blade or fan, J, attached to said arm, and screens or sieves at the sides of the ring, substantially as and for the purpose described. 45

3. The combination, with the shaft D, of attached roller drivers or propellers, composed of plates H H, and the central piece, L, attached to the shaft and carrying the said plates, and rollers G, arranged between the ends of the latter and supported thereby, substantially as described. 50

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