(No Model.) 2 Sheets—Sheet 1.

J. T. PHILLIPS.

BARK BREAKING AND GRINDING MILL.

No. 305,711. Patented Sept. 23, 1884.

Fig. 2.

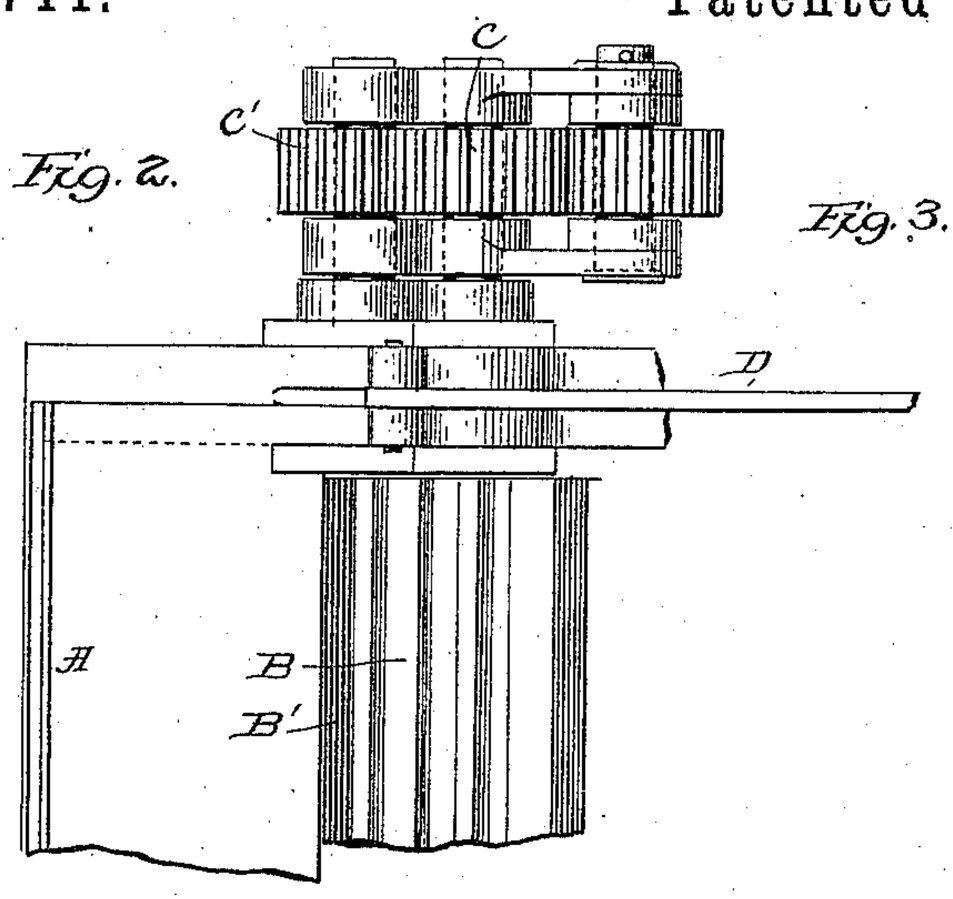


Fig. 3.

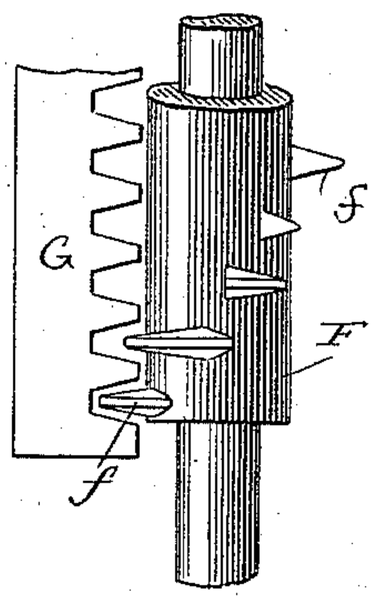


Fig. 1.

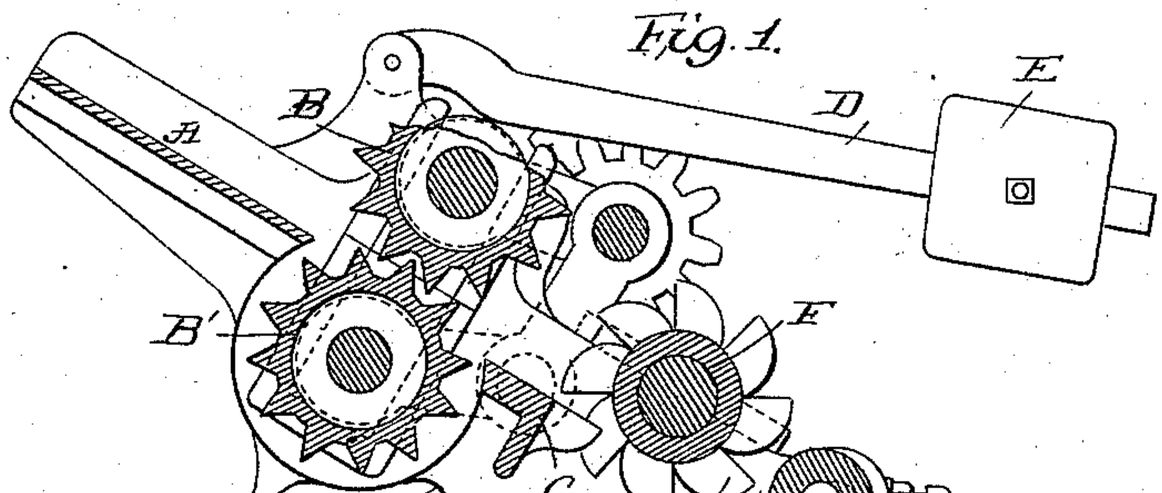


Fig. 6.

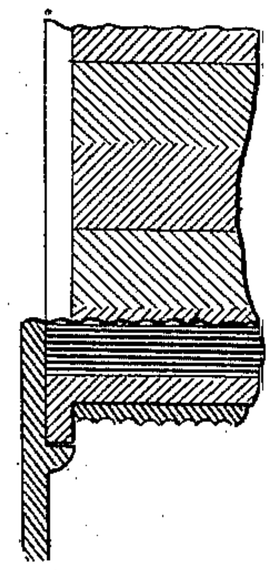
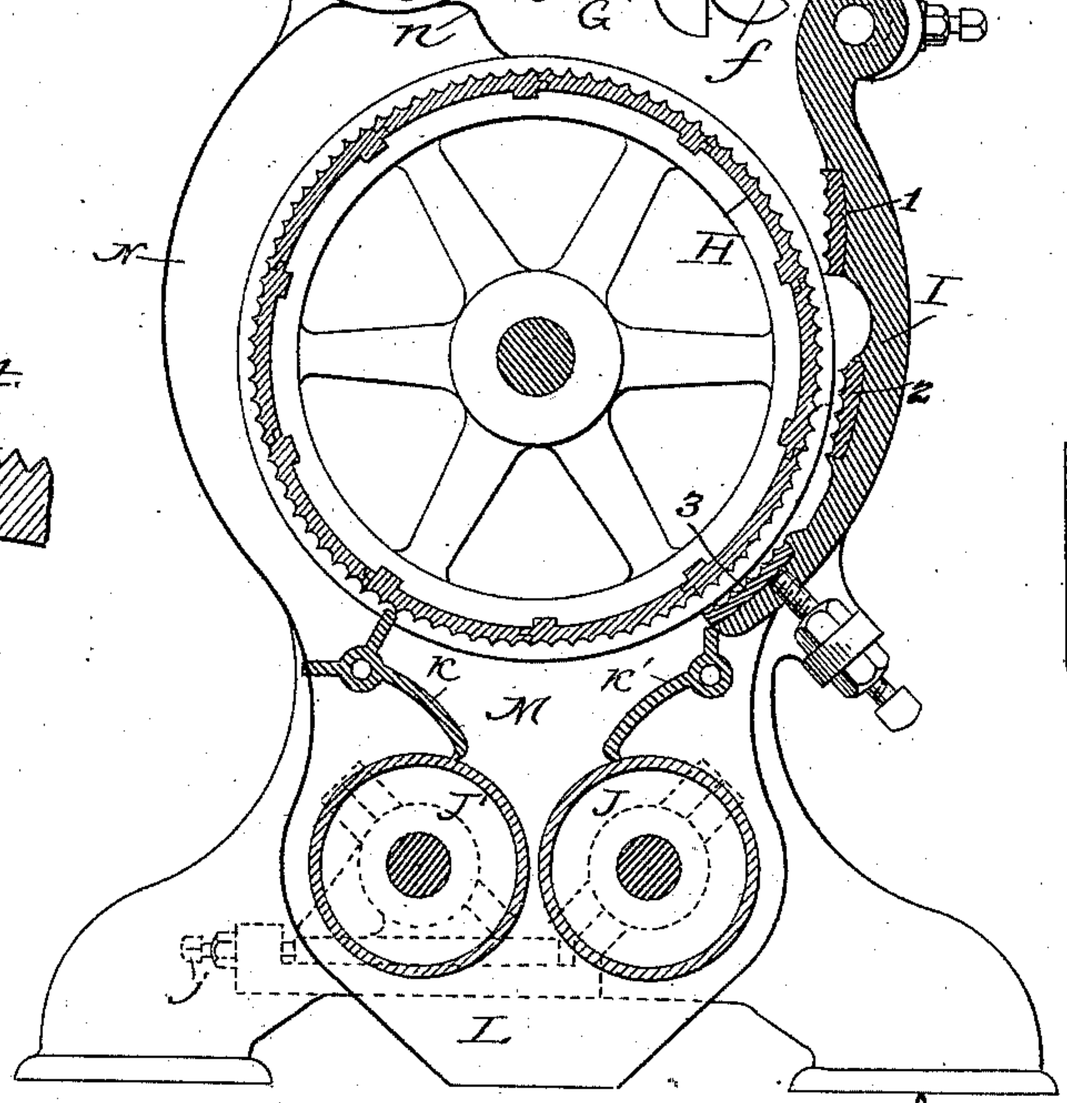


Fig. 4.



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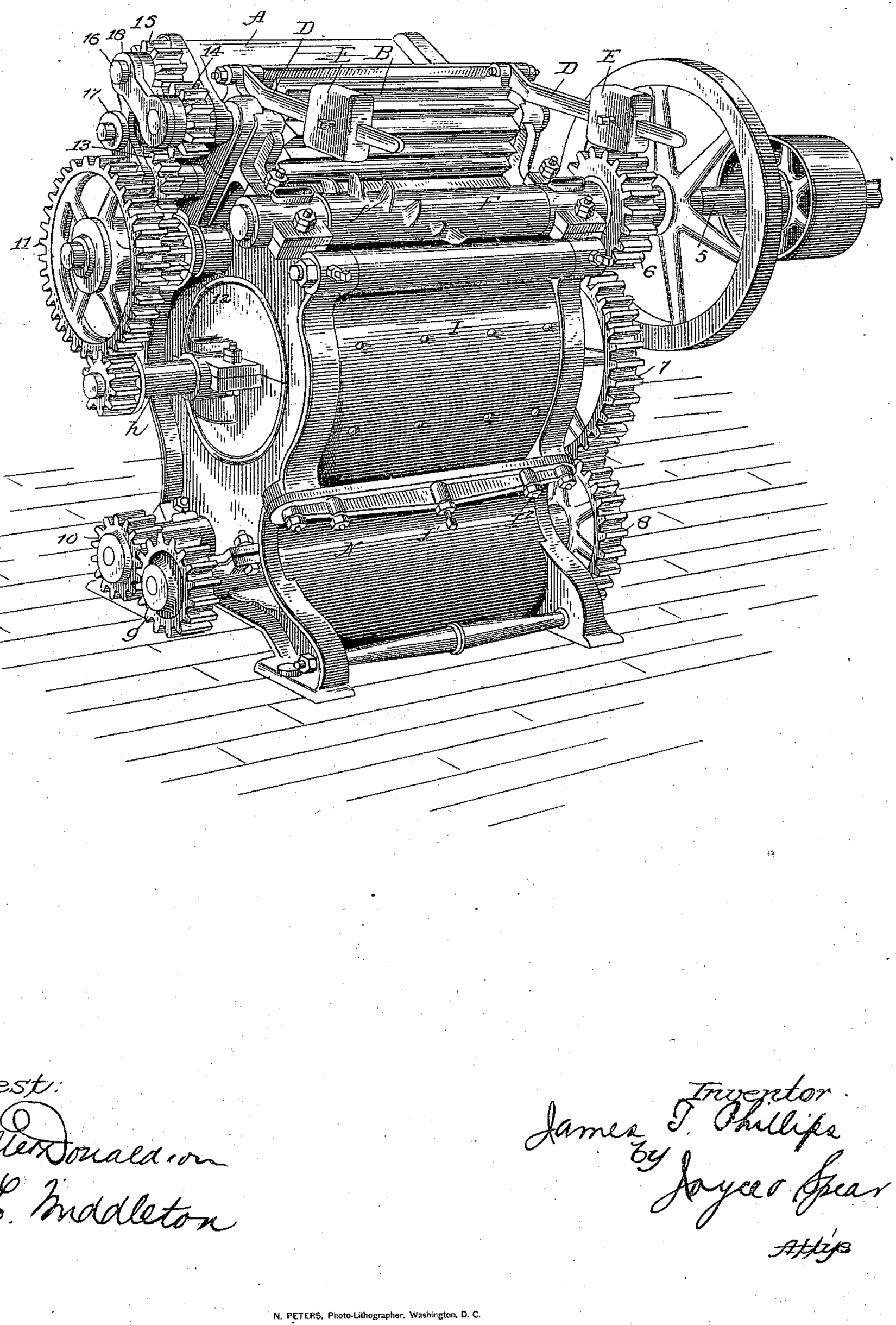
(No Model.) 2 Sheets—Sheet 2.

J. T. PHILLIPS.

BARK BREAKING AND GRINDING MILL.

No. 305,711. Patented Sept. 23, 1884.

Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES T. PHILLIPS, OF GRAND RAPIDS, MICHIGAN.

BARK BREAKING AND GRINDING MILL.

SPECIFICATION forming part of Letters Patent No. 305,711, dated September 23, 1884.

Application filed March 26, 1884. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. PHILLIPS, of Grand Rapids, in the county of Kent and State of Michigan, have invented a new and useful Improvement in Bark Breaking and Grinding Mills; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention is an improvement in mills for reducing bark for use in tanneries and for other purposes. It is specially designed for reducing bark; but it is also applicable and valuable for the preparation of pulp for the manufacture of paper out of poplar and other woods and out of other materials. In respect to the reduction of bark, it is well understood that it is desirable that bark for use in tanneries should be thoroughly disintegrated—that is to say, all the cells in the structure or organization should be thoroughly ruptured—so that the tanning or intercellular material may be easily dissolved out by the water. This is not practicable where large and solid lumps or kernels are left in the pulverized bark. It is also desirable to avoid the production of dust in the grinding of the bark, as the dust, when loose in the ground bark, renders the liquor muddy, is detrimental to the color of the leather, and tends, also, to fill the pores of the hides.

In respect, therefore, to the reduction of bark, the object of my invention is, first, to reduce the bark uniformly and evenly; second, to avoid the dust and kernels made by the machine ordinarily used heretofore; and, thirdly, to reduce the amount of power needed to grind a given amount of bark, whereby the bark may be leached in less leach-room, and the acid may be extracted from the bark more thoroughly and readily. These objects are also in part secured in respect to other materials, such as wood, the reduction of which by my machine I have sought to accomplish thoroughly and with great uniformity of fiber at the least expense of power to run the machine.

My invention consists, first, in a pair of grooved feeding-rolls adapted to break the bark transversely into strips, combined with a finger-bar and toothed roll for splitting said strips into small pieces, and a disintegrating mechanism arranged beneath the rolls and splitting mechanism, and gearing for driving this mechanism.

It consists, further, in the general construction and details of the machine hereinafter fully set forth and specifically claimed.

In the accompanying drawings, Figure 1 shows a vertical section taken transversely through the machine. Fig. 2 is a plan view of a part of the machine, showing part of the upper rolls and gearing. Fig. 3 is a plan view of part of the splitting mechanism. Fig. 4 represents an enlarged transverse vertical section of part of one of the rolls J J′. Fig. 5 is a perspective view of the entire machine. Fig. 6 shows a part of the face of roll H.

The hopper or receptacle of the bark is shown at A, and consists of an inclined way, on which the slabs are placed with one end to the rolls. The inclination of this hopper causes the bark to slide down to a pair of breaking-rolls, B B′. These rolls have sharp longitudinal ribs, and are arranged in relation to each other so that the ribs interlock, as represented in Fig. 1. The lower roll, B′, is in fixed bearings, and the upper is in bearings movable toward or from the bearing of the fixed roller, the upper being pressed toward the fixed by means of levers D, having weights E, said levers resting upon the upper bearings. The gearing by which these rolls are driven is described hereinafter. The construction of these rolls is such that the bark is drawn in and broken across the grain into strips, which strips fall onto a finger-bar, G, Figs. 1 and 3. Opposite this finger-bar is a roller, F, having teeth *f*, which are arranged as shown in Fig. 3, to pass through the notches in the finger-bar. The strips passing down sidewise on the finger-bar are struck by these teeth and split into small pieces. The roll F, with its teeth, also throws the bark between the main roll H and the apron I, and spreads these pieces over the entire length of the said roll H. This roll H and apron I are the main disintegrating mechanisms. The roll H is in the form of a drum or roller mounted upon the shaft *h*. Its surface is formed with a corrugated surface or sharp ridges, as shown in Figs. 1 and 6. Instead of running longitudinally, they are made to run diagonally, and are arranged in sections, as shown in Fig. 6. The object of this arrange-

ment of the teeth is to avoid the filling of the grooves as the roll revolves against the apron, whereby the machine would be clogged, and also to avoid the dropping out of the bark from the grooves thus filled without being finely disintegrated. The diagonal grooves cause the bark to move laterally over the face of the roll, and subjects it to a shearing or disintegrating action of the diagonal ridges against the longitudinal ridges of the apron. This apron (represented at I) is supported on horizontal pivots at its upper edge, and forms a part of the casing which incloses the roll, and it is adjusted toward or from the roll by a set-screw bearing against its lower edge, as shown in Fig. 1. The inside of this apron is provided with bars 1, 2, and 3, which have corrugations on their inner faces, said corrugations running horizontally across the apron. The space between these bars and the surface of the roll H grows narrower downward. The roll H is inclosed by a wall, N, on the side opposite the apron and at the ends of the frames.

Below the roll H is a chamber, M, formed by walls *k k'*, into which the ground bark from the roll H is discharged. Below these are two rolls, J J', one in fixed bearings and the other in movable bearings, as shown in Fig. 1. These rolls have fine longitudinal grooves, as shown in the enlarged section of Fig. 4, and they are geared, as hereinafter more fully explained, to run at unequal speeds. As one roll is pressed toward the other by means of set-screws *j*, (with an interposed spring, if desired,) these rolls at the same time compress the material and tear or disintegrate it still further, so that the dust, if any has been formed in the processes carried on in the upper parts of the machine, will be pressed into or caused to adhere to the fibrous parts of the bark. The result of the whole operation is that the bark is completely reduced and mostly in a fibrous condition, while it is wholly crushed and all the cells ruptured, whereby the water in which it is leached has access readily and uniformly to all the parts.

In respect to the disintegration, the action of the mill is the same on any kind of fibrous material. The roll H, acting against the sharp ridges of the apron, serves to tear and reduce blocks or chips of wood, and the rolls J J' further act to crush and tear, so as to entirely break up the cells and reduce the material to fine fiber. The casing N is continued down and incloses the rolls J J' and forms a discharge-passage from the machine, as shown at L. Power is applied to the shaft 5 of the toothed roll F, and a gear-wheel, 6, on this roll is in mesh with a gear-wheel, 7, on the shaft *h*, and meshes into a gear-wheel, 8, on the shaft of the roll J. On the other end of the shaft of roll J is a pinion, 9, which meshes into a similar pinion, 10, on the shaft of the roll J', the teeth of these pinions being sufficiently long to permit the necessary movement of pinion 10. A pinion on the shaft *h* is in mesh with the gear-wheel 11 on an axle fixed to the frame. On the hub of the wheel 11 is a pinion, 12, which is in mesh with a pinion, 13, on the shaft on the roll B'. Pinion 13 drives the expansion-gears, communicating motion to pinion 14 on the shaft of B. Only one pinion, 15, of this train appears in the figure, this being pivoted upon the stud 16 and receiving motion from another pinion on the stud 17. The shaft of B swings on arms 18, only one of which is shown. A deflecting-partition, *n*, is placed in the chamber above the roll H, to prevent any of the bark which may fly back passing over the roll to the side of the machine opposite the apron I.

I claim as my invention and desire to secure by Letters Patent—

1. In a bark-reducing machine, in combination with rolls B B', having transverse ribs for breaking the bark into strips, a finger-bar and toothed roll arranged to receive these strips as they pass from the rolls B B', whereby they are split into pieces, and a disintegrating mechanism arranged beneath the rolls and the splitting mechanism, and gearing for driving this mechanism, all substantially as described.

2. In a mill for reducing bark and other material, a grinding-roll and apron, combined with grooved rolls J J'—one adjustable toward the other and geared to run at unequal speeds—substantially as described.

3. The combination of transversely-ribbed rolls adapted to break the bark, a finger-bar, a toothed roll operating in connection with said finger-bar, a grooved roll, H, an apron having grooved surfaces, and rolls J J'—one fixed and the other movable and geared to run at unequal speeds—all substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES T. PHILLIPS.

Witnesses:
EDUARD TANDLES,
WILLARD CURTISS.