

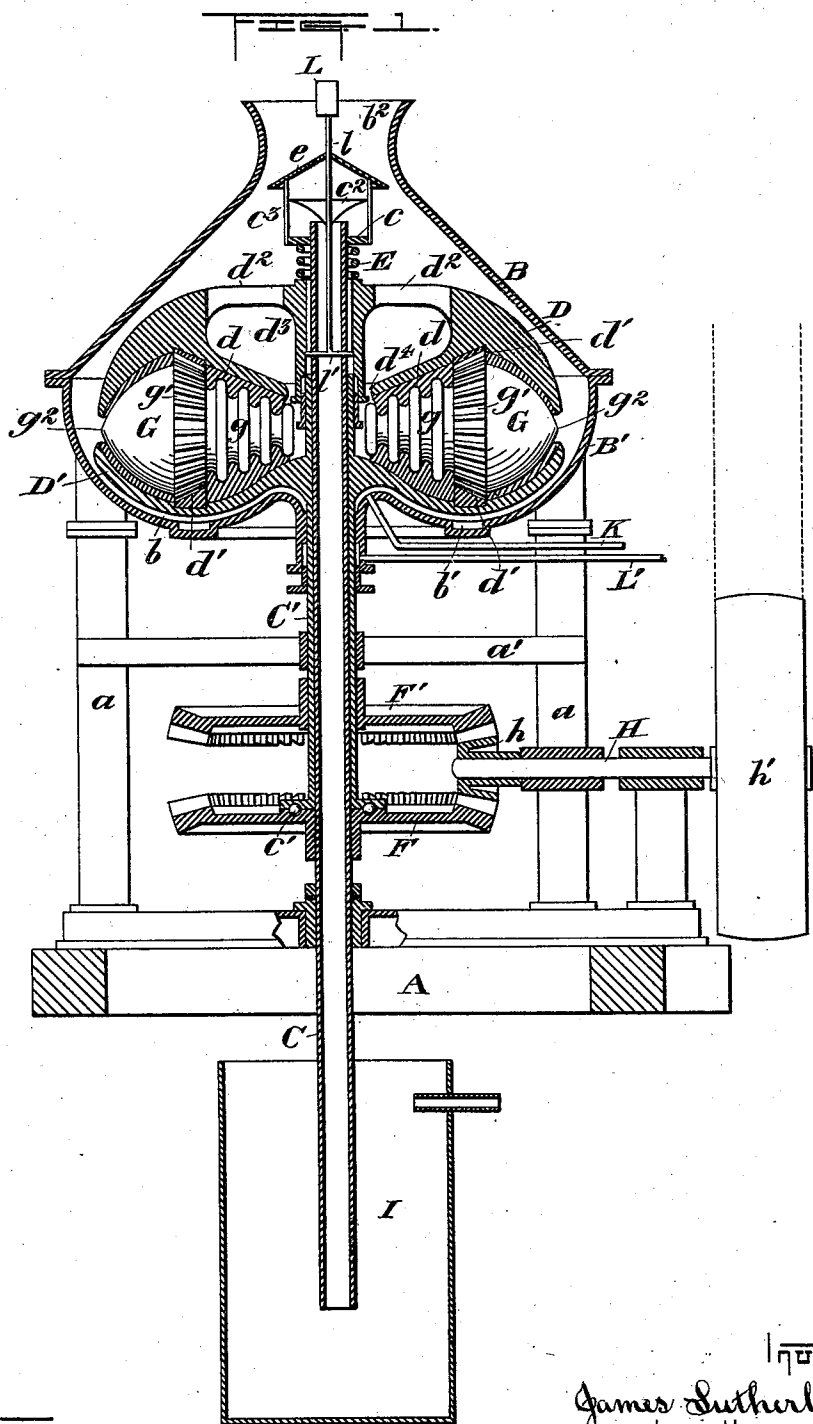
(No Model.)

2 Sheets—Sheet 1.

J. SUTHERLAND.
ORE CRUSHER AND AMALGAMATOR.

No. 533,971.

Patented Feb. 12, 1895.



Witnesses.

Robert Macmillan.
George Barry.

Inventor.
James Sutherland
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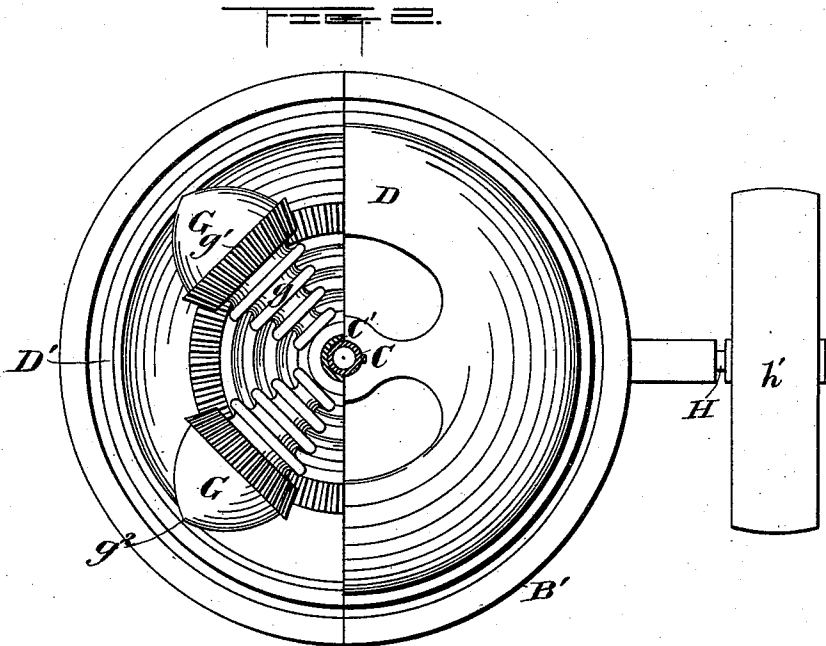
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UNITED STATES PATENT OFFICE.

JAMES SUTHERLAND, OF PARKVILLE, NEW YORK.

ORE CRUSHER AND AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 533,971, dated February 12, 1895.

Application filed August 5, 1893. Renewed August 22, 1894. Serial No. 521,003. (No model.)

To all whom it may concern:

Be it known that I, JAMES SUTHERLAND, of Parkville, in the county of Kings and State of New York, have invented a new and useful
5 Improvement in Ore Crushers and Amalgamators, of which the following is a specification.

My invention relates to an improvement in ore crushers and amalgamators in which two
10 tables are arranged to rotate in opposite directions about a hollow shaft, said tables being spaced apart by mullers geared with the opposite faces of the tables, the hollow shaft serving as an outlet for the pulverized ore and
15 water.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 is a vertical section through the
20 casing, revolving tables, driving gear and supports, and Fig. 2 is a top plan view, the casing being removed and a portion of the upper table to show the position of the mullers with respect to the lower table.

25 The support for the several parts may be of any well known or approved structure, in the present instance consisting of a base frame A surmounted by uprights *a* framed together by cross girders *a'*. A casing, consisting of a top or cap piece B and a base
30 piece B' is supported upon the frame, the base piece B' being provided with an annular concave depression *b* along the lowest portion of which there is an annular recess *b'* for the purpose of retaining any pulp which shall
35 escape between the casing and the lower table and said recess *b'* may be provided with mercury in order that the amalgamation of such escaped ore may take place therein. A vertical
40 hollow shaft C is mounted in suitable bearings in the frame work and in the center of the lower part B' of the casing and is keyed to rotate with the upper table D. The table D, while it is caused to rotate with the shaft, is
45 permitted—by means of the ordinary feather and groove connection with the shaft—to move vertically up and down thereon to a limited extent, a spring E being inserted between the top of said table and a fixed abutment *c* on the shaft to normally depress the
50 upper table into contact with the ore. The lower table D' is fixed to rotate with a sleeve

C' mounted on the shaft C and supported vertically by means of ball bearings *c'* interposed between a flange on its lower end and the hub of a gear wheel F fixed to the shaft
55 C. The opposite faces of the tables D and D' are made of hardened material suitable to withstand, as far as possible, the wearing action of the material to be crushed and are so shaped as to conform in general to the conical shaped mullers G which are interposed
60 between the grinding faces.

The number of mullers interposed may be determined at pleasure. In the present instance I have shown four, located at a quadrant distance apart. The muller is provided with annular ribs *g* at intervals apart beginning from its smaller end toward the central
70 shaft which annular ribs are adapted to work in annular grooves *d* in the faces of the tables. Intermediate of its ends the muller is provided with annular gear *g'* adapted to intermesh with corresponding annular gear *d'*
75 in the opposite faces of the tables and exterior to the gear *g'*, which is preferably located at the largest portion of the muller. The said muller is tapered off bluntly to its apex *g''*, and presents—intermediate of its apex and the gear—a smooth grinding surface.
80

The sleeve which carries the lower rotary table has fixed thereon a gear F', corresponding to the gear F, and a single driving pinion
85 *h* on a drive shaft H provided with a band pulley *h'* intermeshes with the two gears F and F', driving them, and hence the tables, simultaneously in opposite directions. The rotary motion of the tables D and D' in opposite directions also cause the mullers G to rotate upon their axes by the gear connection
90 between the mullers and the faces of the tables.

The ore to be pulverized is fed, together with water, into the open top *b''* of the top portion B of the casing past the tapered shield *e*
95 located over the open upper end of the vertical shaft C and thence down within the casing through suitable openings *d''* into an annular chamber *d'''* in the upper table and thence through openings *d''''* near the center of the
100 table into the space between the two tables where it becomes acted upon by the contact surfaces of the mullers and opposite tables as it gradually finds its way outwardly to the

opening between the outer edges of the two tables and is forced thence upwardly around the upper table, a space being left between the casing and the upper table for its passage back and into the upper open end of the shaft C and thence down into the amalgamator I. The upper open end of the shaft C may be provided with a guide c^2 for deflecting the crushed material into its upper end, the said guide c^2 and shield e being supported on the abutment c by means of standards c^3 .

Water, in addition to that which enters the casing with the ore, is admitted through a pipe K into the space between the lower revolving table and casing and oil to keep the parts lubricated is admitted from a cup L at the top of the casing down through a pipe l extending within the upper end of the vertical shaft C to a cross pipe l' which distributes it to the stuffing box connected with the lower table in which the shaft C rotates. Oil is also admitted through a pipe L' to the stuffing box, forming a joint between the casing and the sleeve C' .

It is to be understood that the gear teeth on the mullers and the faces of the rotating grinding surfaces as the ore in passing from the inner to the outer space between the tables is forced to pass between said teeth.

To accommodate pieces of ore of various sizes or masses of ore which shall vary in hardness, the upper rotary table D is permitted to move up and down against the tension of the spring E.

What I claim is—

1. A grinding mill, comprising upper and lower tables having grinding surfaces between which the material is fed, means for rotating one of the tables relatively to the other, a hollow delivery shaft at the axis of rotation of said rotary table with a receiving mouth above the rotary table and means for directing the ground material along the exterior of the upper table from the grinding surfaces to the receiving mouth of the hollow delivery shaft, substantially as set forth.

2. The combination with the upper and

lower grinding tables and means for rotating them simultaneously in opposite directions, of a hollow shaft having a receiving mouth located above the upper table and the casing surrounding the grinding tables and forming between it and the exterior of the upper table a passageway to the receiving mouth of the hollow shaft, the said hollow shaft forming an outlet for the pulverized ore after it has passed between the grinding tables, substantially as set forth.

3. The combination with the grinding tables and means for rotating one of them relatively to the other, of one or more mullers interposed between the opposite faces of the grinding tables, the said mullers being geared to the opposite faces of the grinding tables, substantially as set forth.

4. The combination with the casing and the rotating grinding tables located therein, of a general outlet for the pulverized ore through the shaft at the center of the grinding tables and an amalgamating trough located in the bottom of the casing beneath the lower table for amalgamating the ore which shall escape between the lower table and the casing, substantially as set forth.

5. The combination with the grinding tables of a casing having an amalgamating trough beneath the tables, the lower table forming a shield or cover over the trough, substantially as set forth.

6. The combination with the grinding tables and means for rotating one of them relatively to the other, of one or more mullers interposed between the opposite faces of the grinding tables, the said mullers being provided with a series of annular ribs and the opposite faces of the grinding tables being provided with a corresponding series of annular grooves, the said mullers being geared to the opposite faces of the grinding tables, substantially as set forth.

JAMES SUTHERLAND.

Witnesses:

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IRENE B. DECKER.