S. COOPER.

CRUSHING OR GRINDING MACHINE.

APPLICATION FILED JULY 20, 1908.

918,014.

Patented Apr. 13, 1909.

2 SHEETS—SHEET 1.

Fig. 2.

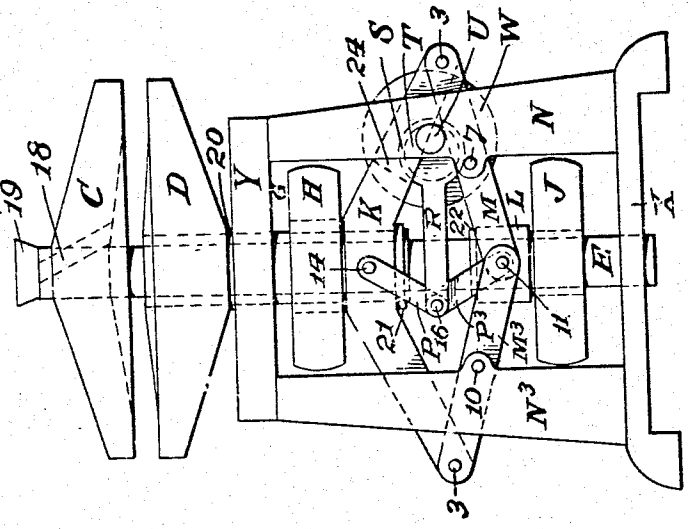
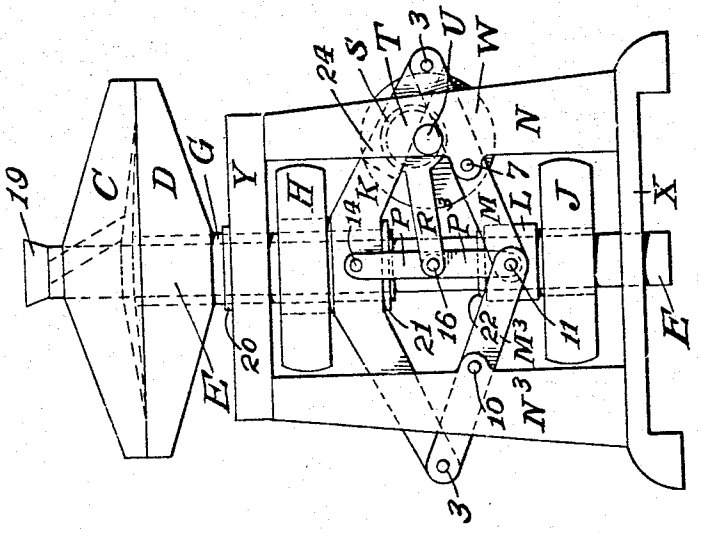


Fig. 1.



Attest:

Edgeworth Greene

Simon Farb

Simon Cooper inventor:

by A. B. Kinnear Atty.

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2 SHEETS—SHEET 2.

Fig. IV

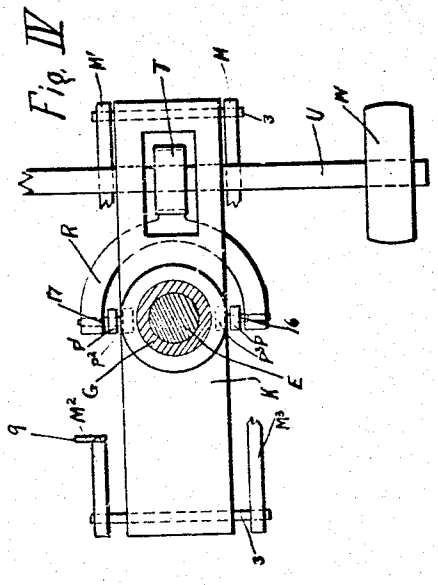


Fig. V

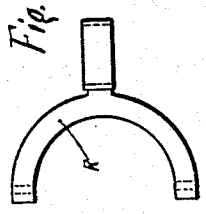
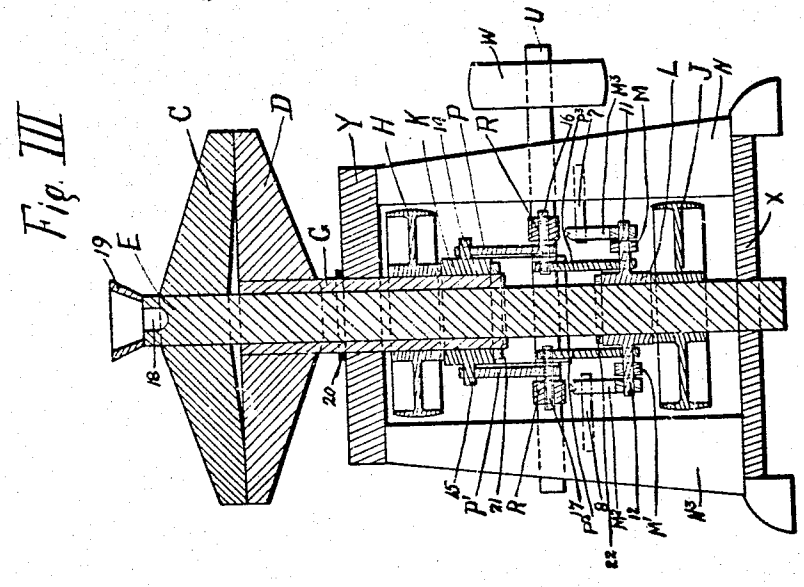


Fig. III



WITNESSES:

John J. Kenny

Senior Earle

Simon Cooper INVENTOR

BY

Atty Kinnear ATTORNEY

UNITED STATES PATENT OFFICE.

SIMON COOPER, OF MEXICO, MEXICO, ASSIGNOR OF ONE-HALF TO CHARLES L. BERNHEIM, OF NEW YORK, N. Y.

CRUSHING OR GRINDING MACHINE.

No. 918,014. Specification of Letters Patent. Patented April 13, 1909.

Application filed July 20, 1908. Serial No. 444,489.

To all whom it may concern:

Be it known that I, SIMON COOPER, a citizen of the United States, residing in the city of Mexico, Republic of Mexico, have invented certain new and useful Improvements in Crushing or Grinding Machines, of which the following is a full, true, and concise specification.

The invention is an improvement in the principle of construction and operation of crushing or grinding machinery and seeks to increase the efficiency of such apparatus by means of a novel construction and disposition of the grinding or crushing members and the operating parts therefor, as hereafter fully described and particularly pointed out in the claims.

The two sheets of drawings, forming a part hereof, illustrate the invention, in more or less schematic manner, without attempting to show the ordinary details of the mechanical design.

Figures I and II are side elevations of a grinding machine showing the grinding members in their closed and open positions, respectively; Fig. III is a vertical section of Fig. I on a horizontal plane beneath the pulley H, with parts broken away; Fig. IV is a detail in plan of the sleeve supporting member and adjacent parts, showing the sleeve and central shaft in section; and Fig. V is a detail of the yoke-form eccentric rod R.

As illustrated in the above figures, the frame of the machine comprises a base X, four upright columns N, N^1, N^2, N^3, one at each corner thereof, and a crown-plate Y carried by said columns. The grinding members are marked C and D, respectively. The upper member C is carried by an upright central shaft E, and the inner central portion of its active or operating surface is concave, as shown, while the corresponding surface of the other member D is convexed, but to a slightly less degree, so that an outwardly converging space is provided between the two members for the reception and preliminary crushing of the ore or other material under treatment. The said material is introduced through the hopper 19 and the feed channel 18 at the end of the shaft E, as will be plain from the drawing. The remaining portions of the operating surfaces of the two members C and D are formed in substantially the same or parallel planes, so as to provide a close grinding contact between the two. The rest of the machine is functioned to produce rotation of the two grinding members in relatively opposite directions and likewise the simultaneous vertical reciprocation of the said members toward and from each other, and it is a particular feature of the invention that the said grinding members are counterpoised, either wholly or in part, so that the work of imparting to them their reciprocating movement is confined merely to the overcoming of inertia without lifting the mass of either of them against the force of gravity. The momentum of comparatively large masses may thus be effectively utilized in producing a crushing impact between the grinding members with a minimum expenditure of power.

The grinding members are preferably mutually counterpoised, the one against the other, and in the form of apparatus shown herein the interconnecting means for producing such balance between the members is constructed as follows: The grinding member D is carried by a sleeve G which surrounds the shaft E and has a bearing in the crown-plate Y permitting rotary and longitudinal movement thereof. A yoke K is secured to the lower extremity of the sleeve G between the pulley H thereon and the retaining thrust-nut 21, so as to be longitudinally immovable thereon but permitting rotation of the shaft within it. A set of four levers, M, M^1, M^2, M^3, is pivotally connected to the opposite ends of the yoke, the point of connection being indicated by 3. The lower ends of each of the levers M, M^1, M^2, M^3, are pivoted to the studs 11 and 12, respectively, of a collar L, which collar is carried by the shaft E and held against longitudinal movement thereon by the pulley J and the fixed collar 22. The levers M, M^1, M^2, M^3, are fulcrumed at intermediate points 7, 8, 9, and 10, to the columns of the frame, so that the downward pressure on the sleeve G thus becomes counteracted by the downward pressure on the shaft E, and preferably the location of the fulcrum points is such that the two members carried by the shaft and sleeve substantially counterbalance each other.

Reciprocating movement is imparted to the shaft and sleeve by means of toggle links P, P^1, P^2, P^3, arranged in pairs on each side of the shaft, the links P, P^1 being pivoted to the yoke K at the points 14 and 15, respectively, and the links P^2 and P^3 being pivoted to the collar L at the points 12 and 11, re-

spectively (Fig. III). The adjacent ends of the toggle links of each pair are pivotally connected by the studs 16 and 17 to the arms of a yoke-form eccentric rod R (Fig. V) by means of which the toggle links are actuated. The eccentric rod R is reciprocated in a lateral direction by means of the eccentric T on the power-shaft U, which is driven by the power pulley.

In operation the sleeve G and the shaft E within the said sleeve, are rotated in opposite directions by means of their pulleys H and J, the sleeve rotating within the collar K and the shaft E within the collar L, both of which collars are held against rotation by their connected links and levers. The movement of the eccentric rod R makes and breaks the toggle between the two collars so as to reciprocate the shaft and sleeve and their respective grinding members C and D toward and from each other during their rotation. The material fed into the hopper 19, is subjected first to the crushing action of the converging space between the grinding members above referred to, and then to the grinding effect of the outer contacting surfaces thereof, the combination of movements imparted to said members producing a crushing blow upon the material in what might be termed a helical or spiral direction. The material under treatment and resting on the lower grinding member moves slowly toward the periphery thereof either by gravity or by virtue of the centrifugal effect, or both, and escapes off the outer edge where it may be collected by any suitable means, not herein shown.

Between the lower grinding member D and the crown plate Y the drawings show a rubber gasket or buffer 20 for preventing injurious contact between the said member and the frame of the machine.

I claim the following as my invention:—

1. The combination, in a machine of the kind described, of two counterpoised and relatively rotary grinding members having a feed channel leading into the space between them and means for causing mutual approach and separation of said members during their said rotation.

2. In a machine of the kind referred to, two relatively rotary grinding members, driving means therefor and means for reciprocating said members toward and from each other during their said rotation, in combination with interconnecting means whereby one of said members and its operating connections substantially counterbalances the other member and its operating connections.

3. In a machine of the kind described, two grinding or crushing members mounted for vertical reciprocation from and toward each other, interconnecting mechanism between said members whereby the one counterbalances the other, and means connected to said mechanism for reciprocating said members.

4. In a grinding machine, a shaft carrying one of the grinding members, a sleeve surrounding said shaft and carrying the other grinding member, said shaft and sleeve being adapted for rotary and longitudinal reciprocatory movement, and means for producing such movements in each of said parts and in relatively opposite directions.

5. In a grinding machine, a shaft carrying one of the grinding members, a sleeve surrounding said shaft and carrying the other, said shaft and sleeve being each mounted for independent vertical movement, in combination with counterbalancing connections between said shaft and sleeve, whereby the pressure on one counterbalances or opposes the pressure on the other, and means for relatively rotating said grinding members.

6. In a grinding machine, two mutually counterpoised and relatively rotatory grinding members and means for reciprocating the same toward and from each other, comprising a pair of toggle links and means for operating said links.

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

SIMON COOPER.

Witnesses:
D. V. CHISM,
A. SORIANO.