

(No Model.)

R. D. GATES.

MACHINE FOR BREAKING STONE AND CRUSHING ORE.

No. 249,331.

Patented Nov. 8, 1881.

Fig 1.

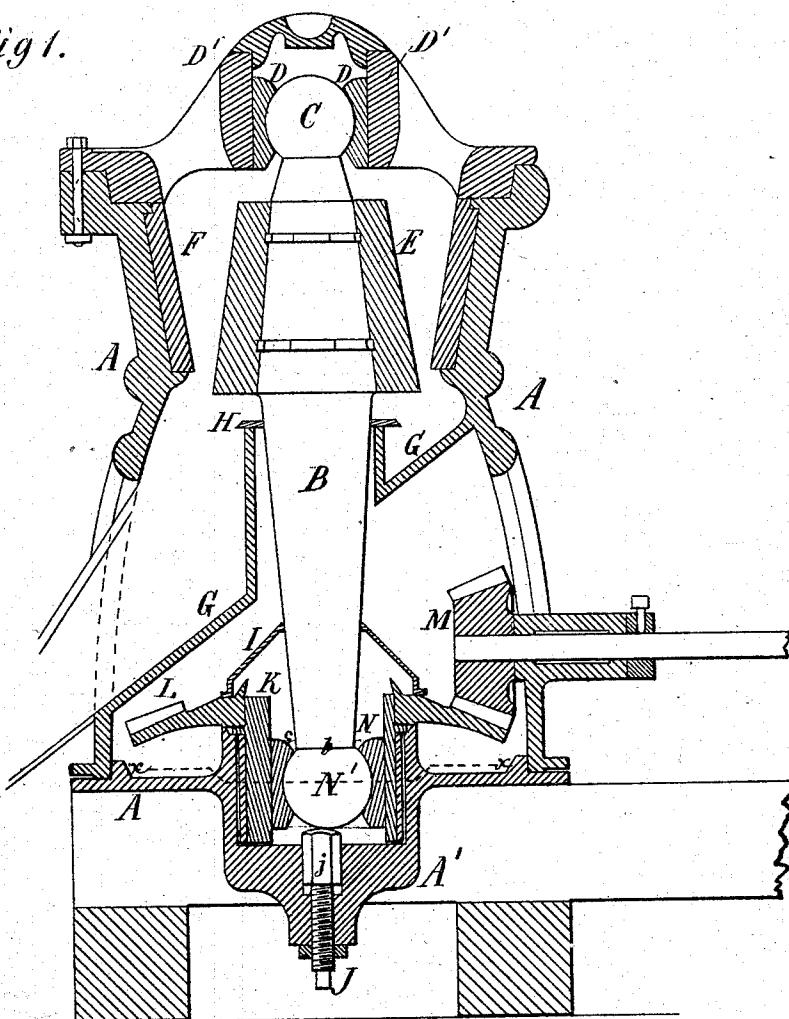
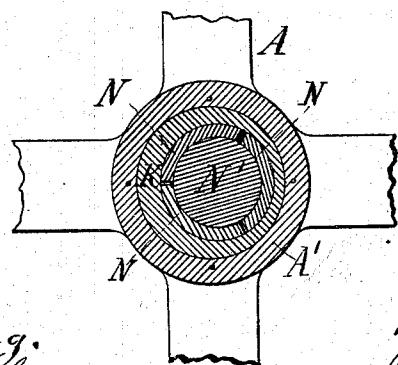


Fig 2.



Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

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MACHINE FOR BREAKING STONE AND CRUSHING ORE.

SPECIFICATION forming part of Letters Patent No. 249,331, dated November 8, 1881.

Application filed July 19, 1881. (No model.)

To all whom it may concern:

Be it known that I, RYERSON D. GATES, of Chicago, in the county of Cook and State of Illinois, and a citizen of the United States, have invented a new and useful Improvement 5 in Machines for Breaking Stone and Crushing Ore, and for other Purposes, of which the following is a specification.

This invention relates to an improved means 10 for applying the crusher-carrying shaft in an auxiliary bearing located at the lower end of the shaft, whereby the same bearing as originally prepared for the lower end of the shaft to turn in is maintained, no matter how great 15 may be the vertical adjustment of the crusher-head with its shaft for the purposes of breaking coarser or finer.

The improvement is specially applicable to the style of stone-breaker patented to P. W. 20 Gates, June 28, 1881, No. 243,545; but it may be found useful in connection with other stone-breakers constructed in some respects differently from said P. W. Gates's machine.

My invention is the result of experience with 25 the machines having the crusher-head on a gyrating shaft. In operating with such machines it is found essential that the gyrating shaft shall always remain in the bearing which was originally turned true for it to work in, or 30 as nearly so as possible; but in raising the shaft by means of the step-adjusting screw the point of bearing in the ordinary eccentric bearing-box is changed, from the fact that the act 35 of raising the shaft by said screw lengthens the distance between the bottom of the step-box and the ball-bearing at the top of the shaft, and as the gear-wheel attached to the eccentric box cannot move upward with the shaft, the said wheel, as well as the eccentric bearing- 40 box, must find new points of bearing upon the journal of the shaft, and as these new points of bearing very often prove untrue with respect to the bore of the said bearing-box and gear-wheel, the shaft crowds on opposite sides when 45 raised or lowered from its original true position, and for this reason it has never been practical to raise the shaft much without rendering the journal liable to become injuriously heated. With my invention the shaft can be raised to 50 any desired height without changing the point of bearing-contact or affecting the journal injuriously; and with it the machine can be set

to do very coarse or very fine work with the same crushing-head.

In the accompanying drawings, Figure 1 is 55 a vertical central section and partial elevation of the aforesaid P. W. Gates's stone-breaking and ore-crushing machine with my improvement applied thereto, and Fig. 2 is a horizontal section in the line x x of Fig. 1. 60

The frame A and all the parts for crushing and discharging the crushed stone or ore may be constructed in the manner described in the aforesaid patent of P. W. Gates, or in any other approved manner. In the said patent 65 the shaft B is provided with a ball, C, at its upper end, and this ball bears in a bearing, D, formed of several segmental pieces. The bearing D is nearly spherical on its inner bearing- 70 surface and chilled, and it is fitted to slide, when the shaft is adjusted, in a stationary box, D', of the frame A. Below the ball C a crusher-head, E, is applied on the shaft B, and this head works in a flaring hopper or concave, F. The said machine is also provided with a dia- 75 phragm, G, upon which the crushed stone falls, and by which it is conducted out at one side of the frame. It is also provided with guard- 80 collars H and I, a step-box, A', with step-adjusting screw J, and an eccentric bearing-box, K, and gear wheels L and M, for giving motion to the eccentric box and crusher-head shaft B. To this machine, or any other operating on the 85 same general principle, I apply my invention, which is as follows:

In the eccentric bearing-box an enlarged eccentric bore is provided, and within this bore a bearing, N, similar in all respects to the bearing D, is truly fitted so as to slide up and down when the crusher-head shaft is raised or 90 lowered by the screw J. The lower portion of the crusher-head shaft is reduced gradually in diameter from some distance above the bearing N down to the base b of a flared depression, C, in the top of said bearing, and then it 95 is enlarged in the form of a ball, as shown at N'. The shaft along its reduced diameter does not touch the wall surrounding the eccentric bore of the eccentric bearing-box, and owing to this the shaft is permitted freedom to gyrate 100 while its lower end is revolved. The ball N' fits within the bearing N, and turns and rolls in the nearly spherical socket of said bearing when the shaft is revolved and gyrated at its

lower end by the action of the gearing and the eccentric bearing-box K. The shaft and its balls are made of wrought or forged metal, and the bearing N is cast in segments and chilled 5 on the inner surface, or it may be made in any other approved manner.

To fit the bearing N to the ball N' and within the eccentric bearing-box K, the segmental pieces of the bearing are placed around the ball 10 N', and, together with the ball, are slid down into the eccentric box until the ball rests upon the sliding prismatic bearing-block j of the adjusting-screw J. The other bearing, D, for the upper ball, C, is fitted to the ball in like manner as the bearing N, and is then slid up into 15 the box D', as described in the aforesaid patent of P. W. Gates. The parts thus constructed and arranged will, it is evident, permit the shaft to be raised or lowered for crushing 20 coarser or finer, as occasion requires, by the screw J, without changing the relation of the ball N' to its bearing N, for as the shaft is raised or lowered its bearing N will move along with it, and as bearing N moves up or down, 25 so will bearing D be moved up or down along with the ball C. Thus the shaft B, at both top and bottom of the machine, maintains its original points of bearing-contact in the bearings which were originally fitted true to its balls, 30 and owing to this much friction and undue wear and destruction from heating of the bearings will be avoided.

In operation the shaft B can revolve at its lower end, and also gyrate when the eccentric 35 box is revolved within the step-box A'; but when stone is placed in the hopper and offers resistance to the revolution of the shaft the shaft simply swings to and from the walls of the hopper or concave, and thus the action upon 40 the stone is a breaking or crushing action, instead of a grinding action. This mode of operation is not peculiar to my invention only, for the same intermittent swinging action takes place in the aforesaid patented machine of P. 45 W. Gates, and it is only referred to here in order to show that the ball-bearing at the lower part of the machine does not interfere with this very important operation of the crusher-head upon the stone or ore which is required to be 50 broken or crushed into pieces rather than ground up into powder.

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

1. The combination, with the crusher-shaft, of the eccentric bearing-box, adapted to be revolved, and the adjustable sliding bearing for the lower end of the crusher-shaft, substantially as and for the purpose described. 55

2. The eccentric bearing-box and the sliding bearing for the lower part of the crusher-shaft, 60 in combination with a vertically-inovable shaft, the lower end of which is fitted within said bearing, and with an adjusting means whereby both the shaft and the bearing are adjusted together simultaneously, substantially as and 65 for the purpose described.

3. The crusher-shaft provided with a ball at its lower end, in combination with the sliding bearing in which the ball of the shaft is fitted, and with the eccentric revolving bearing-box, 70 having a bore of greater diameter than that portion of the shaft which extends into it, and also having the sliding bearing applied within it, substantially as and for the purpose described. 75

4. The combination of the sliding bearing for the lower ball of the shaft, formed with a flared depression, c, the crusher-shaft decreased in diameter from its ball, and the eccentric bearing-box, having the sliding bearing fitted within its bore, substantially as and for the purpose described. 80

5. The combination of the crusher-shaft provided with a ball at each end, the upper and lower sliding bearings, an eccentric revolving 85 bearing-box having one of the sliding bearings fitted within it, and means for adjusting the lower bearing, shaft, and upper bearing together simultaneously, substantially as described. 90

6. The combination of the crushing-concave, crushing-head, crusher-shaft, eccentric revolving bearing-box, a sliding adjustable bearing for the lower ball of the crusher-shaft, and means for revolving the bearing-box and means 95 for adjusting the crusher-shaft, substantially as described.

RYERSON D. GATES.

Witnesses:

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