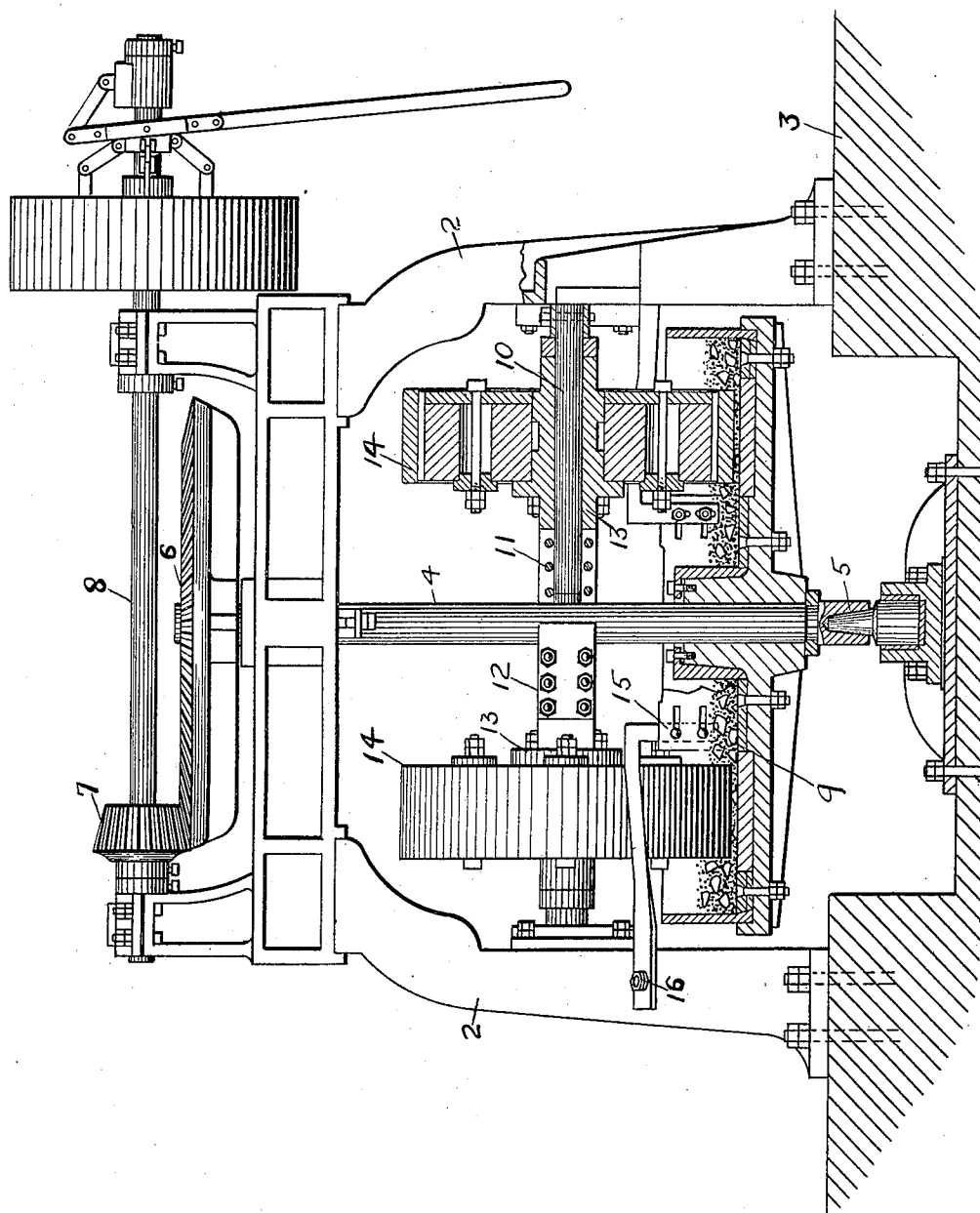


W. WALKER & H. W. CROFT.
 PROCESS OF REDUCING ROCK FOR REFRACTORY MATERIAL.
 APPLICATION FILED JULY 27, 1907.

909,835.

Patented Jan. 12, 1909.



WITNESSES.

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UNITED STATES PATENT OFFICE.

WILLIAM WALKER, OF SHIELDS, AND HARRY W. CROFT, OF PITTSBURG, PENNSYLVANIA,
ASSIGNORS TO HARBISON-WALKER REFRACTORIES COMPANY, OF PITTSBURG, PENN-
SYLVANIA, A CORPORATION OF PENNSYLVANIA.

PROCESS OF REDUCING ROCK FOR REFRACTORY MATERIAL.

No. 909,835.

Specification of Letters Patent.

Patented Jan. 12, 1909.

Application filed July 27, 1907. Serial No. 385,885.

To all whom it may concern:

Be it known that we, WILLIAM WALKER, a resident of Shields, in the county of Allegheny and State of Pennsylvania, and HARRY W. CROFT, a resident of Pittsburg, county and State aforesaid, have invented a new and useful Improvement in Processes of Reducing Rock for Refractory Material; and we do hereby declare the following to be a full, clear, and exact description thereof.

Our invention relates to a process of reducing rock for refractory material to be used in the manufacture of brick.

With the introduction of the open hearth steel process there arose a necessity for roof brick that would stand a higher temperature than any brick that had been made up to that time. To manufacture such brick a hard rock with high refractory qualities must be employed and a rock of this character was discovered in Pennsylvania some years ago which has been generally used in the manufacture of these bricks throughout the United States. This rock may be readily crushed in an ordinary roller grinding mill down to the required size, approximately that of shelled corn. In the grinding of this rock there is a certain proportion of it which is reduced to the form of sand. To this finely ground rock and sand is added a suitable quantity of lime which acts as a bond and the material is then worked up by suitable machinery into the desired shapes of bricks. Rock possessing these same high refractory qualities is found in other parts of the United States, but this other rock is so hard and so difficult to grind that the cost is greatly increased and for that reason it has not been found profitable to make use of it.

The object of our invention is to provide a process of reducing this hard rock to the proper size in a cheap and efficient manner, and the invention consists, generally stated, in introducing the rock into a suitable grinding mill and mixing with it a certain proportion of sand having the proper refractory qualities, the sand acting as a sliding body between the pieces of hard rock and preventing the packing of the same, whereby the rock is readily reduced to the required size.

In the accompanying drawing we have illustrated an ordinary grinding mill suit-

able for carrying out our process which consists of the standards or housings 2 secured to a suitable foundation 3. A central vertical shaft 4 is centered on the stud 5, the upper end of said shaft being journaled in the housings and having the large bevel wheel 6 with which the pinion 7 on the driving shaft 8 engages. Secured to the shaft 4 is the pan 9.

Shafts 10 are journaled in the housings 2 and in the bearings 11 of the ring 12 sliding loosely on the shaft 4. Upon the shafts 10 are the sleeves 13 carrying the grinding rollers 14. The outer ends of the shafts 10 are adapted to move up and down to provide for the raising and lowering of the rollers during the grinding operation. Scrapers 15 are secured at 16 to the housings, said scrapers being so arranged within the pan as to direct the material toward the periphery of the pan so as to bring it under the action of the grinding rollers 14.

In carrying out our improved process with the above described mill the rock which has been previously crushed to a suitable size is introduced into the grinding pan and at the same time a certain proportion of sand, such as that commonly known as glass sand, is introduced with the rock. The sand may be either introduced simultaneously with the rock or may be introduced before or after, as its time of introduction does not affect our process. As the pan rotates the rock and sand are brought under the action of the grinding rollers which crush the rock, the scrapers 15 shifting the rock and sand toward the periphery of the pan so that they come under the rollers. The sand is, of course, very much finer than the broken rock and is intermingled with the latter so that it acts as a shifting support and sliding body between the pieces of hard rock. The consequence is that the pieces of rock move about relatively to each other, flowing, so to speak, and not collecting in one place and are prevented from packing down. The consequence is that the hard rock crushes much more easily and quickly than in case the sand is not used. The crushing is continued until the rock is reduced to about the size of shelled corn, being left much coarser than the sand.

While we do not wish to limit ourselves in any way to proportions we may state that

to every eighty pounds of hard rock we add approximately twenty pounds of sand which gives good results. By our improved process it is only necessary to grind four-fifths of the material used, as the sand itself requires no grinding, and in addition to decreasing the amount that it is necessary to grind it greatly facilitates the grinding of the remaining four-fifths. As this rock is crushed before the grinding operation begins, the addition of the sand reduces proportionately the amount of rock to be crushed. In many cases this extremely hard rock contains more iron than is desirable for the manufacture of high grade brick and the introduction of a portion of sand depending on the hardness of the rock and the amount of iron contained in the same reduces the iron to the desired amount. The presence of iron reduces the refractory qualities of the rock as the iron acts as a flux when the brick is subjected to the high temperature to which such brick are exposed. All rock of this character contains more iron than the sand employed. The introduction of sand, however, to reduce the iron forms the subject of a separate application for Letters Patent filed of even date herewith, Serial No. 385,884.

In addition to the above advantages the sand lightens the color of the brick, giving it a better appearance and at same time acts as a bond between the particles of the hard rock, thereby cheapening the cost of manufacture to a considerable extent by

making the material easier to mold in proper shape and to handle throughout at the works in the operations preceding the burning. As the sand may, in many instances, be procured at a considerably lower price per ton than the rock, the introduction of the sand cheapens the material while at the same time it improves the quality.

What we claim is:

1. The process of reducing hard refractory rock, consisting in mixing the broken rock with a quantity of material in a finely divided condition, and then subjecting the mixture to a rolling crushing pressure, whereby said finely divided material forms a shifting support for the pieces of rock and facilitates its reduction.

2. The process of reducing hard refractory rock, consisting in breaking the rock into small pieces, adding a quantity of sand thereto, and then subjecting the mixture to a rolling crushing pressure, whereby the sand forms a shifting support for the pieces of rock and facilitates reduction.

In testimony whereof, we the said WILLIAM WALKER and HARRY W. CROFT, have hereunto set our hands.

WILLIAM WALKER.
HARRY W. CROFT.

Witnesses as to William Walker:

P. R. HILLEMANN,
GEO. MCKEE, JR.

Witnesses as to Harry W. Croft:

J. A. SMITH,
R. H. YOUNGMAN.