

(No Model.)

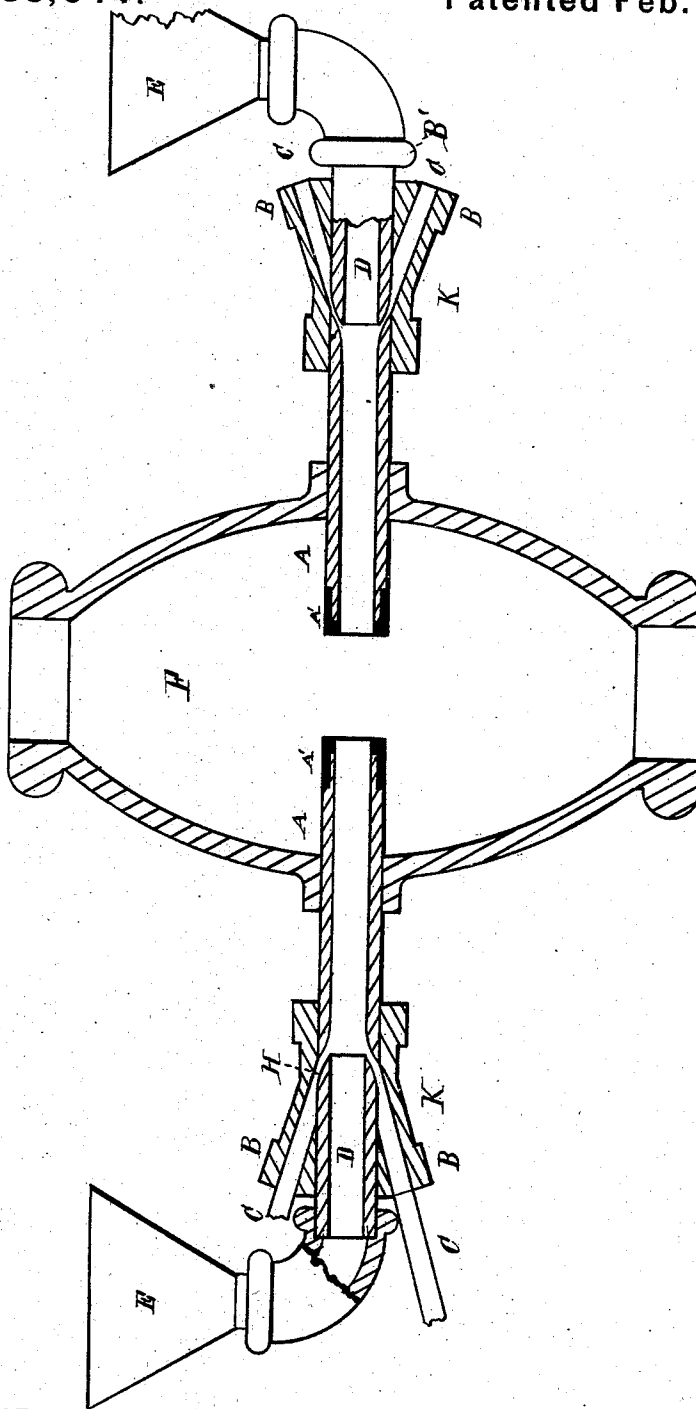
2 Sheets—Sheet 1.

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Method of and Apparatus for Pulverizing Mineral and
other Substances.

No. 238,044.

Patented Feb. 22, 1881.

Fig. 1.



WITNESSES

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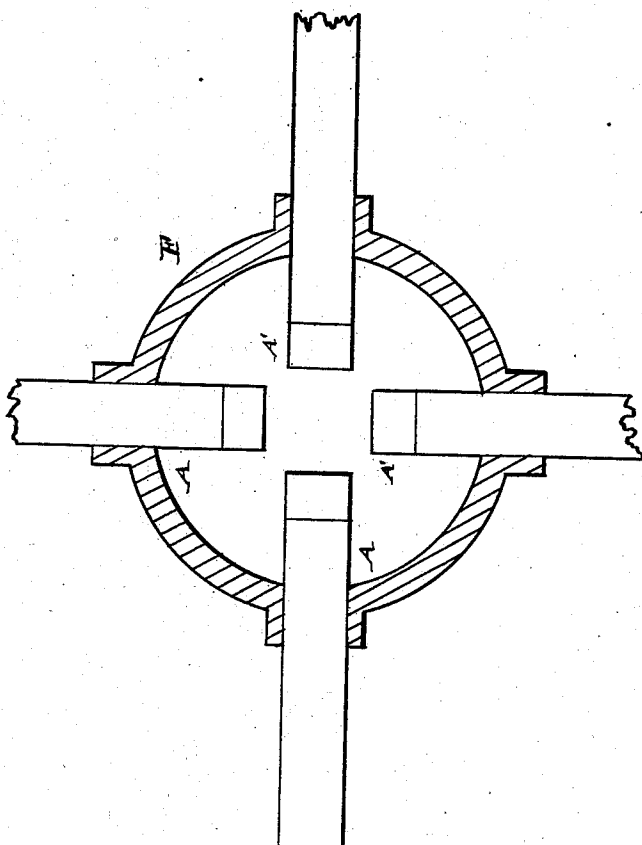
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Fig. 2.



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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR PULVERIZING MINERAL AND OTHER SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 238,044, dated February 22, 1881.

Application filed August 13, 1880. (No model.)

To all whom it may concern:

Be it known that we, FREDERIC A. LUCKENBACH and JOHN WOLFENDEN, both of the city, county, and State of New York, have invented a certain new and Improved Method of and Apparatus for Pulverizing Mineral and other Substances; and we do hereby declare that the following is a clear, full, and exact description thereof, reference being had to the accompanying drawings.

Heretofore mineral and other substances have been pulverized to varying degrees of fineness by crushing, stamping, and grinding, and also by forcing the mineral or other substances against a metallic disk by means of a powerful current of air. These devices have proven to be inefficient and too expensive, owing to the rapid wear and destruction of the working parts of the apparatus.

The objects of our invention are to provide a method and apparatus which is more simple in its construction, quicker and more effective in its action, of greater durability and less expense in its operation than has been heretofore known.

The objects are accomplished with our improved method and means by concentrating and combining two or more currents of air, steam, or water, or other suitable gases or fluids, which are discharged under suitable high pressure through pipes or tubes arranged in such a manner that minerals or other substances to be pulverized will be drawn into the current, and discharged therewith into a focal or converging point, when the abrasion of the particles from the opposing currents will instantaneously reduce them to a powdered condition.

In obtaining the power of compressed gases, we do not confine ourselves to any kind in particular, as under varied conditions and circumstances certain gases are found to be better adapted and more economical than others. But for general use it is found that steam under high pressure is preferable for some purposes, and in some cases it should be superheated prior to its use. Compressed air and other gases can be used where absolute dryness is required, and also water can be applied when obtained from natural sources

and at high elevation, as is now done in hydraulic mining, or from high pressure derived from mechanical means. In carrying out our invention suitable reservoirs for storing compressed gases are placed in proper position, having pipes attached thereto, and connected with the pulverizing apparatus for conducting the gases therein.

The pulverizing apparatus shown in Fig. 1 consists of two short sections of pipes or tubes, A A, placed in alignment with each other, the inner ends of each tube terminating at a suitable distance from each other. Upon the end of each tube a soft metal or an elastic ferrule, A' A', is placed, in order to prevent the end of the tube being worn away by the rebound of the substance being pulverized. The other ends of the tubes A A are finished on the inside next to the end in a convex form, which constitutes the part of an annular nozzle. These ends of the tubes are screwed to the outlet end of a branch fitting, K. This fitting is provided with three induction ports or inlets terminating in one passage leading to the exit.

The two ports B B are connected with pipes C C, which conduct the current of water, steam, air, or other gases from a receiver to the concentrating pulverizer. The central port or inlet, B', is provided with an induction-pipe, D. The inner end of this pipe is made tapering and slightly convex, and projects just beyond the junction of the two passages leading from the inlet B B and into the expanded end of pipe A, thus forming a nozzle through which currents of air, steam, or water are forced. This nozzle is made adjustable by means of a screw which is cut on the pipe and screwed into the end of the fitting. When adjusted to the required position it is held by a suitable lock-nut, a.

To the outer ends of the tubes D elbows are attached, which support suitable hoppers E E for holding the material to be powdered.

The apparatus is securely fastened to a suitable frame-work.

An incasement, F, incloses the ends of the tubes A A to prevent the pulverized material from waste. An opening at the bottom allows its discharge into suitable receivers.

The apparatus thus described is operated in

the following manner, to wit: Suitable valve-connections between the pipes C C and steam or gas generator or air-compressor are employed for controlling the currents emanating
5 from said generator or compressor, the power of which is raised to one hundred and fifty pounds per square inch, more or less, as circumstances require. The hoppers E E are charged with mineral or other substance, after
10 which steam, water, or gases are turned in and are forced into the branch fittings K K and around the nozzles H H into and through the tubes A A, by the action of the current in passing through the branch fittings, and around
15 and through the annular nozzle H H a partial vacuum is formed in the tubes D D, whereby the mineral or other substance in the hopper E E is drawn into and through the tubes D D and joins with the rapid current of steam or
20 gases, and thence through tubes A A into the open space between the outlet of the two pipes, where, by the action of the two opposing currents, the granular material is brought in contact, and with sufficient velocity to reduce the
25 material to a powder by the concussion or abrasion.

The distance between the two pipes A A should vary according to the nature of the material. That having the greater specific gravity will require the greatest distance, consequently the pipes A A should be made adjustable to meet that requirement.

30 The case F can be made of any suitable material; but to prevent too great wear upon the inner surface it should be lined with some semi-elastic material, or some material in which the fine particles of mineral substances will adhere, thus presenting a mineral surface for the succeeding atoms to abrade against, thereby securing
40 the case from wearing away too rapidly. We

do not limit ourselves to the form of the case, for the form may, from necessity, be required to change to meet the varying conditions of the substance to be pulverized.

The material which meets at the converging 45 or focal point will not all be reduced to a powder on its first concussion, but will fall out of the current onto suitable screens and be conducted back to the hopper and again returned to the focal point, where it will receive another blow. Thus the operation will be repeated 50 until the substance is all reduced to the required fineness.

Fig. 2 represents a horizontal sectional view of our apparatus provided with four conducting or discharging pipes, A. These pipes are all arranged within the same plane and discharge their contents into one common center. By this means the reduction is accelerated.

What we claim, and desire to secure by Letters Patent, is—

1. The herein-described method of pulverizing mineral or other substances, by introducing them into two or more opposing currents, by which said substances are discharged into 65 a convergent or focal point, where, by their extreme velocity, the substance becomes pulverized by the concussion.

2. In combination with the case F, two or more pipes, A, for conducting opposing currents of water, steam, or gases under pressure, fitting K, pipe D, and hoppers E, from which the substance to be pulverized is drawn into the current in pipes A and discharged at the focal point. 70

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