

(No Model.)

A. STEVENS.
PULVERIZER.

2 Sheets—Sheet 1.

No. 502,021.

Patented July 25, 1893.

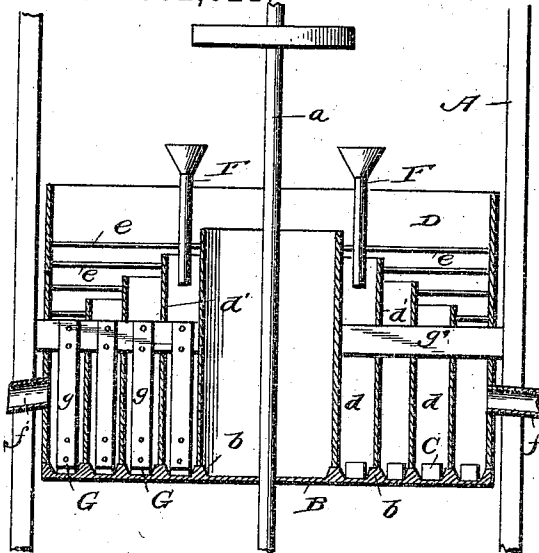


Fig. 1.

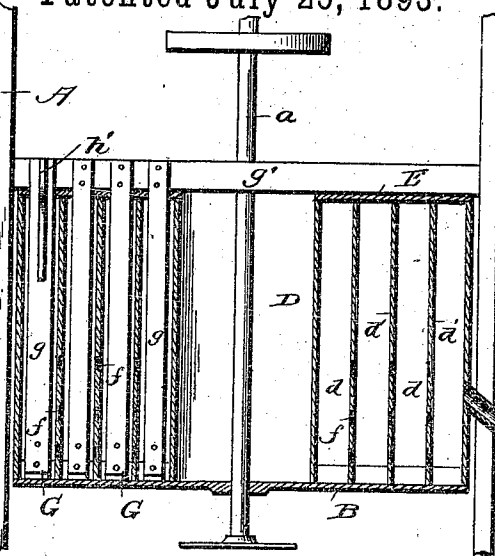


Fig. 2.

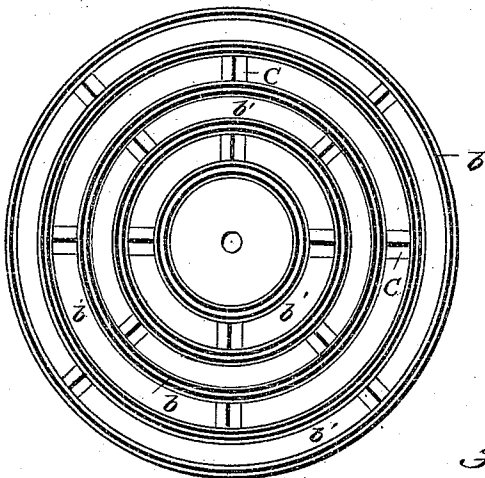


Fig. 3.

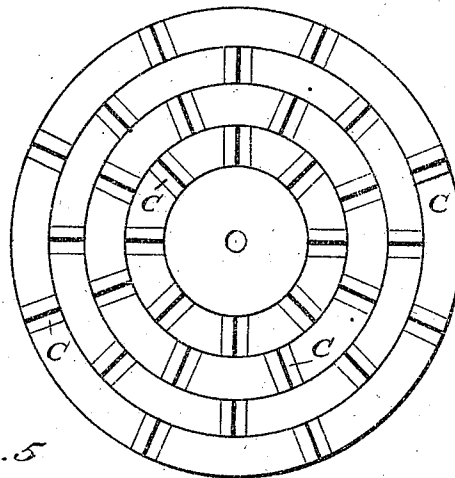
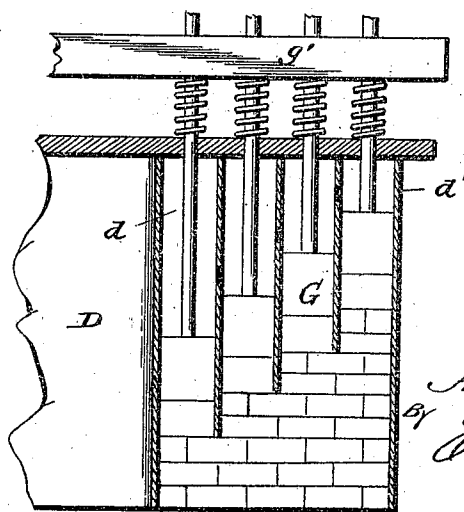


Fig. 4.



Witnesses:

Wm. Christie
William O. Belt.

Inventor:

Austin Stevens.
By *Edoan Burt*
Att'y's.

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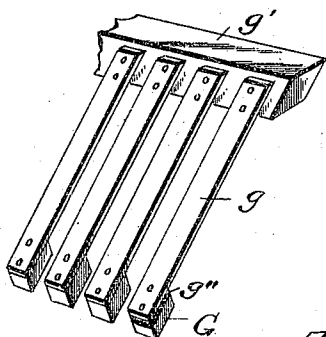
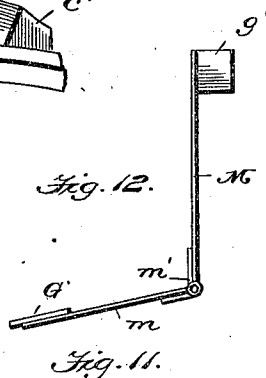
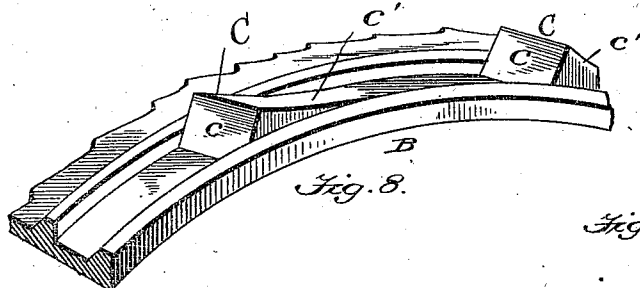
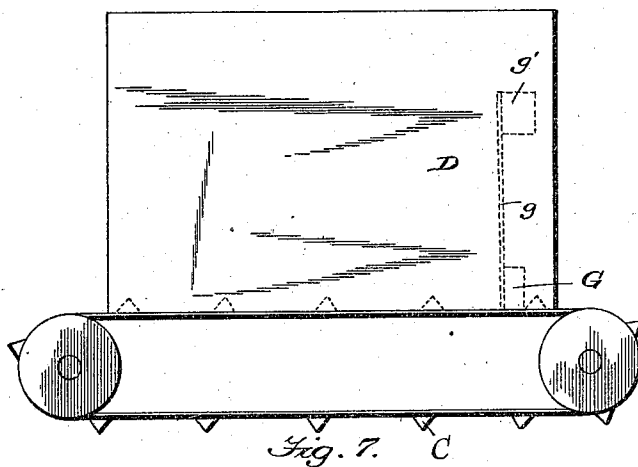
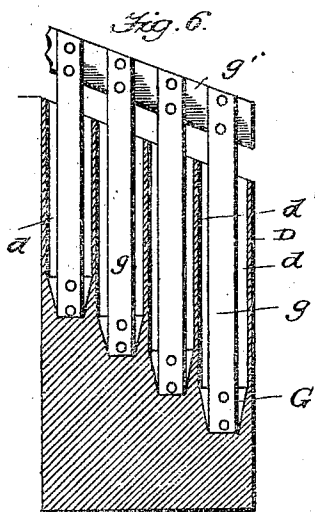


Fig. 10.

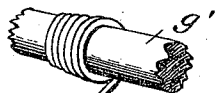


Fig. 9.

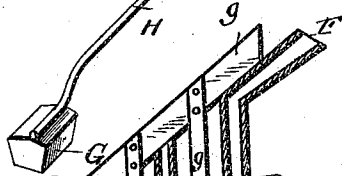
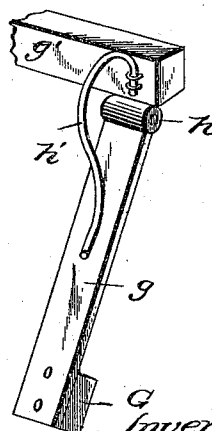


Fig. 13.



Inventor:
Austin Stevens.

Edson Bros.,
Attys.

Witnesses:

Wm. O. Belt.
William O. Belt.

UNITED STATES PATENT OFFICE.

AUSTIN STEVENS, OF BROOKLYN, NEW YORK.

PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 502,021, dated July 25, 1893.

Application filed June 4, 1892. Serial No. 435,487. (No model.)

To all whom it may concern:

Be it known that I, AUSTIN STEVENS, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Pulverizers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to pulverizing machines, and its object is to provide an improved process of and machine for reducing material to a powder of greater or less degree of fineness, with the least possible expenditure of motive power.

With these ends in view, the invention consists of a traveler, preferably in the form of a base, having a series of trips on its surface, a receptacle or chamber arranged above said traveler and divided into a series of compartments, hammers carried by spring arms within the compartments and adapted to engage with the trips on the traveler, and means for imparting motion to the traveler or the receptacle, or both the traveler or receptacle, in the same or opposite directions, whereby the hammers are forced upward by the trips so that the springs may cause them to strike the base and the following trips, all arranged in the manner and for the purpose set forth.

My invention further consists of the construction and arrangement of parts which will be hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a central sectional view of the pulverizer, showing the hammer arms supported within the pulverizing chamber and the base provided with concentric grooves and ridges. Fig. 2 is a corresponding view showing the beam carrying the hammer arms arranged above the pulverizing chamber and springs adapted to operate said arms, and a flat base with a series of trips. Figs. 3 and 4 are plan views of the bases shown in Figs 1 and 2, respectively. Figs. 5 and 6 are sectional views of a pulverizer in which the depth of the several compartments in the pulverizing chamber varies. Fig. 7 is a sectional view of the pulverizer showing an endless belt for the base and a rectangular pulverizing chamber.

Fig. 8 is a detail view illustrating a particular form of trip. Figs. 9, 10, 11 and 12 show different ways of supporting the hammers. Fig. 13 illustrates a plan of feeding the material from one compartment to another.

Referring to the drawings, in which like letters of reference denote corresponding parts in all the figures, A designates a frame on which the improved pulverizer is supported, and it may be of any suitable size and construction most desirable for the purposes and proper operation of the machine. A vertical shaft *a* is journaled in suitable bearings in this frame and it is provided with a power wheel adapted to receive a belt or other means for communicating motive power to the pulverizer.

The base B is rigidly secured on the shaft *a* so that it may be revolved thereby, and it is provided with a series of lugs or projections C which operate as trips for the hammers with which they contact. These trips may be simply pointed projections, as shown in Fig. 4, or they may have a flat inclined front face *c* with a gradual slope *c'* from the top to the next succeeding trip, which latter construction is shown in detail in Fig. 8. The trips may be arranged in any desired manner, but they are preferably in concentric series around the opening in the center of the base; and the trips in each series may be in radial alignment with each other or they may be arranged in each series without reference to those in the others whatever.

The base B may have a flat upper surface with the trips thereon, or, as shown in Fig. 3, it may be provided with a series of concentric ridges *b*, of greater or less height, said ridges forming a number of grooves *b'*; and in this construction the trips are arranged in the grooves and the divisions which form the compartments in the chamber may rest on the ridges *b* or fit loosely in slots therein, as preferred.

The pulverizing chamber D has its shell secured to the frame in any desirable manner and it may be of cylindrical shape when a revolving base is used, or it may be rectangular as shown in Fig. 7, when an endless belt is employed. The chamber is divided into a number of compartments *d* by the concentric

circular partitions d' which rest upon the ridges b on the base or in grooves in said ridges. The cylinder and its partitions are preferably rigid, and said partitions may be secured to a top E for the chamber, as shown in Fig. 2, or to connecting braces e illustrated in Fig. 1. The material—(ores, talc, plaster, cement, soapstone, carbon, feldspar, gypsum, paints and colors, quartz, phosphate, rock, limestone, bones, grains, umber, coal, and many other substances)—which is placed in the pulverizer, is admitted through feed spouts F into the inner compartment of the receptacle, and after it is acted upon by the hammers therein for a while, it will pass through openings f in the partitions to the surrounding compartments successively and then out through spouts f' in the outer chamber to suitable receptacles or conveyers for carrying it away. The partitions d' may not extend to the top of the pulverizing chamber, as shown in Fig. 1, and in this case the openings f in the partitions may be omitted because the material can then pass over the upper edges of the partitions.

The hammers G are made in the form of blocks of porcelain, metal, wood or any other suitable substance and they are fastened on the flexible arms g in any suitable way. These arms are secured to cross-beams g' which may be arranged wholly above the partitions or pass through the same; but when the cylinder is adapted to revolve the beam is preferably arranged as shown in Fig. 2. The arms may be made of spring metal having sufficient inherent elasticity to maintain them in their proper position, or a strong elastic rod H may be employed which is coiled around the beam several times, see Figs. 9 and 10. But the metallic arms may also be hinged to the beam at h and held in place by a spring h' as shown in Fig. 11. In Fig. 5, the spring h' is coiled around the hammer arm and in Fig. 11 a leaf spring is shown, but these are obvious and arbitrary constructions which may be used as preferred.

The hammers are hung in the compartments at suitable intervals so that they will, preferably, just clear the lowest part of the base, whether it is plain or grooved, and they are in the path of the trips C . As the base or chamber is revolved, the hammers will ride up on the trips and as they pass over them the inherent elasticity of the arms g , or the springs h' , will force the hammer against the base and the approaching trips, which will give the desired hammering to pulverize the material. As the inner compartment becomes filled with the material in a more or less pulverized state, it will gradually feed into the next compartment through the openings f or over the top of the partitions and finally out through the exits in the chamber.

In Figs. 5 and 6 I have shown a solid base, which may be of bricks or masonry, and in

which the bottom of each compartment is elevated or lowered more or less than the next adjoining compartment, whereby the base is built in the form of steps.

As hereinbefore mentioned the pulverizing chamber may be rectangular and an endless belt having trips arranged to run beneath the same; such particular construction being shown in Fig. 7.

To obtain a proper amount of pressure on the arms and hammers I may use adjusting devices to increase or diminish the pressure; and it will also be noted that I do not confine myself specifically to the revolving base and stationary chamber.

Fig. 12 shows a novel form of hammer-arm which consists of a vertical rod M and a movable rod m , the latter rod carrying the hammer. In this construction the movable arm is operated by a spring m' and it will be found a very desirable and effective means for holding the hammer in operative position relative to the base.

In order to secure a more perfect stroke of the hammers on the trips or other devices it may be found desirable to provide an elastic or yielding backing for the hammers. I have shown, in Fig. 9, a hammer provided with a yielding cushion g'' of rubber, or other suitable material, which is interposed between the hammer G and its arm g ; but it is obvious that the cushion might be arranged on the trips with equal efficiency.

The material, in a more or less pulverized condition, will pass from one compartment to the other over the tops of the partitions d' or through openings f therein, and an air-draft may be employed if desired. In Fig. 13 I have shown a different plan for conducting the material from one compartment to another, which consists in providing secondary partitions N to form narrow passages n with the partitions d' and the latter partitions have the usual openings f , while the partitions N terminate a short distance above the surface of the bed so as to leave openings or passages between the bed and the lower edges of the partitions. The purpose of this construction is to cause the material to pass from the inner compartment to the bottom of the outer compartment, and thus be delivered directly onto the bed in a manner to be acted directly on by the hammers instead of remaining partly in suspension in the chambers as is the case when the material passes over the tops of the chambers or in openings in the partitions, because it is evident that the material will pass from one compartment through the openings f in the partitions or walls thereof, and thence pass through the chamber n , and beneath the partition N onto the bed in the bottom of the next compartment.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a pulverizer, the combination of a

traveling bed having a series of channels and a series of spaced trips *C* in each of the channels, a series of fixed vertical partitions *d* forming a series of compartments corresponding to the channels on the bed and each partition having a series of transverse perforations *f*, the fixed supports *g*' extending transversely across the compartments, above the bed, the yielding arms *g* fastened to the supports and each having a hammer at its lower end to impinge against the trips on the traveling bed, and the feed pipes discharging into the inner one of the series of compartments, substantially as and for the purpose described.

2. In a pulverizer, the combination of a rotating bed having a series of annular channels each provided with a series of spaced trips *C*, the series of fixed vertical partitions *d*' arranged concentric with each other to form a series of compartments and each having the transverse perforations *f* arranged at a different elevation relative to the perforations of adjacent partitions, the transverse fixed supports *g*' across the compartments, the series of hammer arms hinged to the transverse supports and each provided with a spring and with a hammer which is forced by the spring into contact with the bed and in the

path of the trips thereon, substantially as described.

3. In a pulverizer, the combination with a traveling bed having a series of channels arranged at different elevations and each having a series of trips, of the partitions *d*' arranged to form a series of compartments having the transverse openings *f* arranged at different elevations, another series of partitions *N* arranged close to the partitions *d*' and forming therewith a supplementary chamber *n* into which the powdered material passes from the compartment to the chamber *n* and thereby conducted to the bottom of the surrounding compartment, said partitions *N* being held relatively to the bed to leave passages beneath the partitions leading from the supplementary chambers *n* into the next compartment, and a series of arms having the hammers adapted to contact with the trips on the stationary bed, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

AUSTIN STEVENS.

Witnesses:

R. M. BRUNDIGE,
JOEL HOLCOMB.