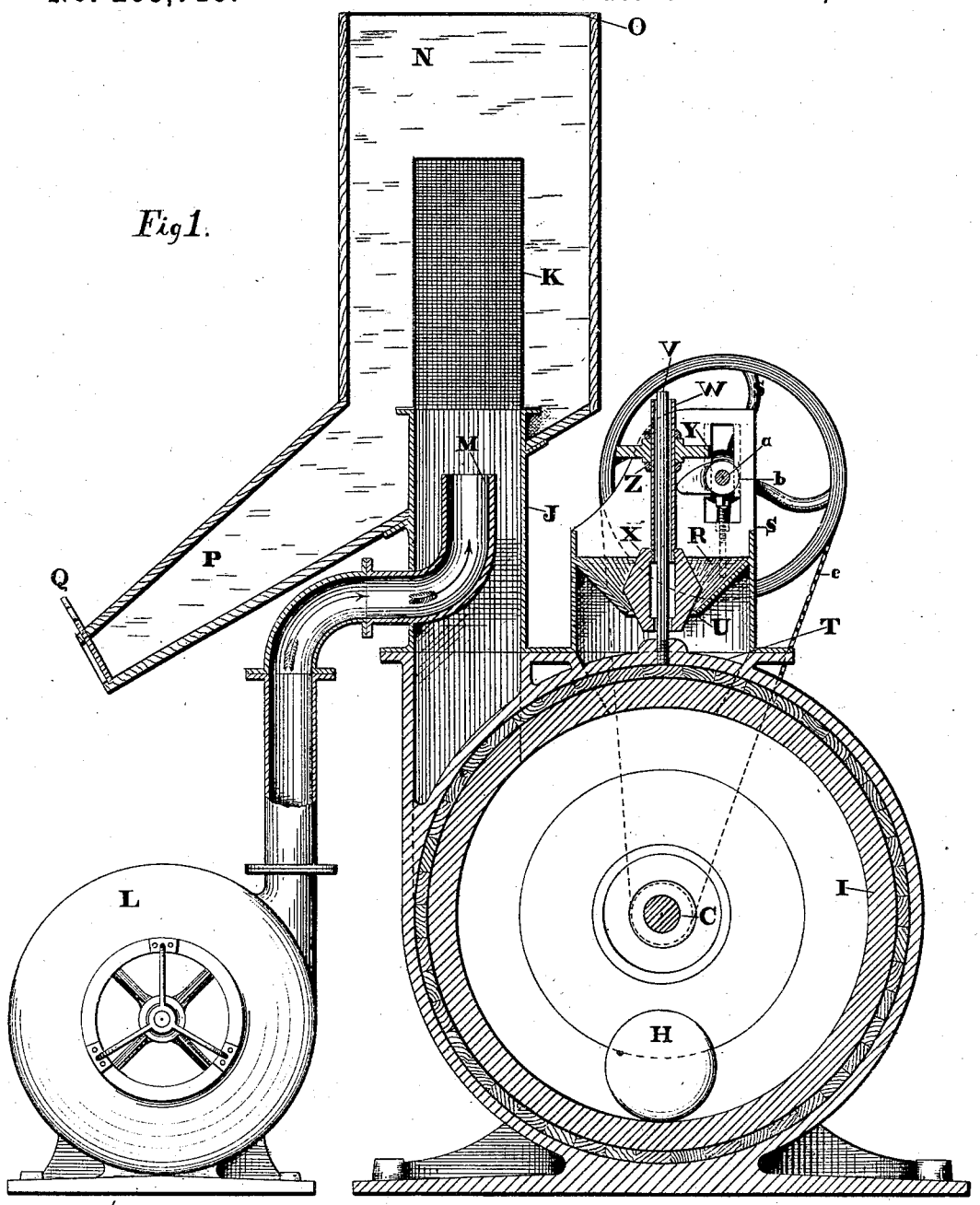
(No Model.) 2 Sheets—Sheet 1.

S. P. M. TASKER.

DRY PULVERIZING MACHINE.

No. 265,715. Patented Oct. 10, 1882.

Fig 1.



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(No Model.) 2 Sheets—Sheet 2.

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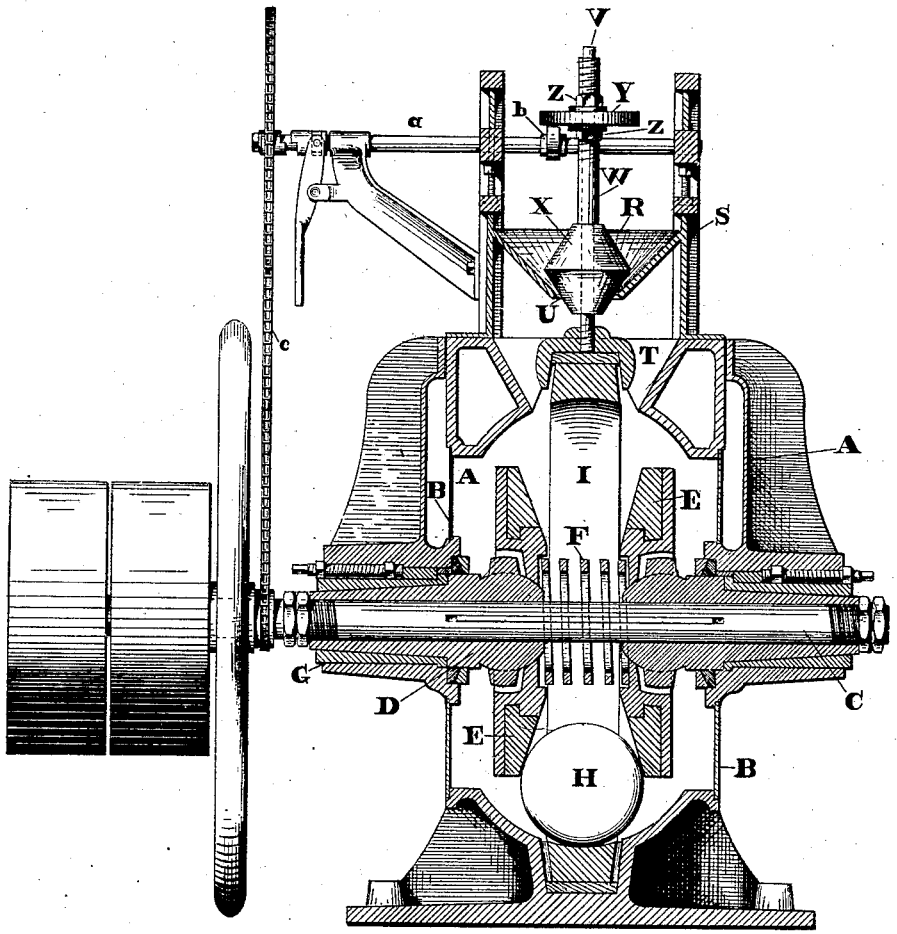
Fig. 2.



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UNITED STATES PATENT OFFICE.

STEPHEN P. M. TASKER, OF PHILADELPHIA, PENNSYLVANIA.

DRY-PULVERIZING MACHINE.

SPECIFICATION forming part of Letters Patent No. 265,715, dated October 10, 1882.

Application filed March 15, 1882. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN P. M. TASKER, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain Improvements in Dry-Pulverizing Machines, of which the following is a specification.

My invention, broadly considered, relates to a certain novel pulverizing-machine invented by William Henry Thompson, of Islington, county of Middlesex, Kingdom of Great Britain, and patented to him in and by Letters Patent of the United States No. 249,489, dated November 15, 1881, to which Letters Patent reference is to be made for a more clear comprehension of my improvements.

Broadly stated, Thompson's invention consists in the combination, within a suitable inclosing case, embodying in its own structure a vertically-erected hollow circular track, of an independent sphere or ball adapted to revolve around the casing and of given means for imparting to the ball not only revolution around the casing-track, but also rotation about its own axis. Certain other features of construction enter into the Thompson invention which are dispensed with by me, as the organization of my machine avoids their employment.

In the Thompson machine, as also in mine, material to be pulverized is fed through a hopper into the casing, and is crushed by the combined revolution and rotation of the sphere or ball. The means employed by Thompson for effecting the combined movement of the ball are a pair of vertically-erected disks provided with peripheral beveled bearing-surfaces, and arranged face to face at some distance on either side of the center of a shaft horizontally journaled through the casing, and by which they are revolved. The disks are capable of rocking movements by virtue of being each loosely hung or supported on the shaft between two collars having curved bearing-faces. The collars prevent a lateral movement of the disks at their centers. Exterior to their peripheral bearing-surfaces the disks are provided with a circular series of blades, adapted, by means of their location, inclination, and proximity to each other, to prevent the escape of material under treatment until it has become sufficiently pulverized, but thereafter adapted to permit of its escape into a receptacle exterior to the casing, from which receptacle the sufficiently-pulverized material is by suitable means removed.

The operation of the disks and ball is described by Thompson in the following language, which I regard as of importance to restate here in order that a more thorough comprehension of my improvements may be had. Thompson says:

"The operation of the disks and ball is substantially as follows: When the disks are revolved their tendency is to assume a position exactly at right angles to the shaft; but as they cannot do this, for the reason that the diameter of the ball at the point of contact exceeds the distance between the adjacent bearing-faces, it follows that they bear or press upon the ball in their effort to assume this position and crowd the latter against the casing with greater or less force, according to the rapidity of the revolution. The disks also, by the friction of the contact, carry the ball with them in their revolution about the casing, and thus communicate to it a centrifugal action. The disks also, by the friction of this contact, communicate to the ball also an axial rotation. The ball, then, it will be understood, is caused to act upon the material to be pulverized with a resultant force, which is obtained from three distinct sources, as follows: first, the direct radial thrust which is received from the efforts of the disks to assume a position at right angles to the shaft, the bearing-faces of the same acting as inclined planes to crowd the ball against the inner surface of the casing; second, the centrifugal action which results from the rapid revolution of the ball around the casing; and, third, the grinding action which results from the rotation of the ball upon its axis. By adapting the disks to rock upon the shaft the ball is permitted to move on radial lines to and from the shaft, according to the amount of material in the casing, without being free at any time from the action of the disks."

My invention also relates to and embodies in its structure certain improvements upon the Thompson machine which are the invention

of Hermann Bernhard Feldmann, of Philadelphia, Pennsylvania, and which are embraced in an application for Letters Patent executed by him February 2, 1882, and filed in the United States Patent Office March 2, 1882.

These improvements, briefly stated, consist of the application to the shaft of sleeve-journals keyed thereto, so as to revolve therewith. Each of these sleeve-journals is of the form of a Parrott gun, the rounded breech of which corresponds in curvature with a hemispherical socket in the rear face of the disks in such manner that the disks fit closely upon the breech.

They also consist in the application of a spiral spring surrounding the shaft and abutting against the opposing faces of the disks.

They also consist of journal-boxes and packings for the shaft and its surrounding sleeve-journals of such construction as not only to enable a very perfect and smooth revolution, but also to exclude pulverized material from the revolving surfaces.

They, in addition, consist of the provision of tightening-up nuts upon the shaft adapted to enable the endwise adjustment or set of the sleeve-journals.

My invention also relates to and embodies in its structure the employment of a certain clutch between the rear faces of the disks and the sleeve-journals invented by me, application for patent for which was executed by me February 8, 1882, and filed by me in the United States Patent Office March 6, 1882.

Generally stated, my present invention consists in a dry-pulverizing machine in which the disks are made without blades and radially-disposed peripheral openings, in which the casing is completely and tightly inclosed, into which material to be pulverized is fed by means of an automatic crushing and feeding hopper, and from out of which the pulverized material is sucked by means of a suitable exhausting device, all substantially as hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 represents in central sectional side elevation an apparatus conveniently embodying my improvements. Fig. 2 represents the same in longitudinal vertical sectional elevation, the exhausting device stack and receiver being, for the sake of clearer illustration, omitted.

Similar letters of reference indicate corresponding parts.

In the drawings, A represents the casing, which is completely and tightly inclosed by the side plates, B. C is the central shaft, D the sleeve-journals, E the disks, F the spiral spring between the disks, G the packing-boxes for the journals, H the crushing-ball, and I the ball-track, all substantially as embraced in the Letters Patent or applications referred to, with the exception that the disks are entirely without exterior peripherally-arranged blades extending from top to bottom of the casing, so as in effect to divide it into separate compartments. My casing is preferably made curved as to its interior periphery, so as to form a spherical compartment with flattened sides.

J is a stack opening from out the interior of the casing and extending vertically upward to a point above the casing, at which it is inclosed with a tubular screen or sifting-cap, K.

L is a blower of any suitable construction, the blow-pipe M of which is entered within the stack, and which opens concentrically therein, the discharging-orifice pointing vertically upward. This discharging-orifice is preferably formed at a level below the level at which the screen is applied to the stack. This blow-pipe, opening, as described, within the stack, has in connection therewith an operation similar to that of an injector, sucking as to the lower portion of said stack and forcing as to the upper. It is of course impossible for the pulverized particles to fall into the blow-pipe against the current continuously issuing therefrom.

N is a receiver or receiving-chamber suitable erected and supported above the opening of the stack, and adapted to receive and contain the tubular screen. The cover of this chamber O is made of cloth or other fibrous or porous material fine enough in texture to hold the dust and yet allow the air to escape, so as to relieve the pressure. The receiving-chamber terminates below in an inclined discharging-chute, P, controlled by a suitable valve or gate, Q.

The operation of the entire contrivance is to suck the pulverized material out from the casing within which the ball revolves and up to the stack, and to discharge it through the tubular screen or sifting-cap within the receiving-chamber, whence it finds its outlet by gravity through the discharging-chute. The blower thus operates not only to suck the pulverized material from out the casing, but also to force it upward through the tubular screen. All such particles as are of too great size to escape through the meshes of the tubular screen fall again into the casing and gravitate upon the ball-track thereof, to be again subjected to the pulverizing action of the ball until they become reduced to sufficient fineness to permit of their discharge through the screen. It will be understood that the exhaust-current of air is only of sufficient strength to lift the pulverized particles, or those of small size, without of course acting upon the uncrushed particles of larger size.

R is a primary hopper, suitably erected between standards S, in turn supported upon the top of the casing on either side of its main hopper T. The primary hopper is conical in form and provided with a discharging-orifice, U, of considerable diameter.

Vertically erected from the exterior of the seat of the ball-track or other suitable support is a stem, V, around which is fitted a tubular sleeve, W, to the lower extremity of which is attached a conical valve, X, which serves to close the orifice in the primary hopper. The

valve is made conical, the better to fit the primary hopper and to effect its crushing operation against it. It will of course be understood that the valve may be made of such other shape (not conical) as shall adapt it not only to act as a valve to the hopper, but as, in connection with said hopper, a crushing device. The sleeve and valve are free to rise and fall upon and revolve around the stem.

Y is a circular horizontally-extending trip-wheel rigidly connected at a suitable point with the sleeve, and vertically adjustable thereupon by means of setting-nuts Z or kindred devices,

a is a shaft horizontally hung between the standards S, and provided with a trip or lifting cam, *b*, which registers in line below the trip-wheel referred to. The shaft is adapted to be revolved, for instance, by means of a sprocket chain or wheel connection, *c*, or other suitable means. Upon the revolution of this shaft the trip-cam is caused to revolve, and to intermittently, but at regular intervals, lift the trip-wheel, sleeve, and conical valve, and as it lifts them gives them a part revolution by virtue of the frictional contact between its lifting-face and the under face of the trip-wheel collar. This operation serves to feed the casing with a given quantity of material at predetermined intervals, and not only so to feed it, but to provide for the dislodgment of material to be pulverized which might otherwise clog the hopper. I regard this contrivance as of much importance in connection with an apparatus of this class.

Having thus described my invention, I claim—

1. In a pulverizing-machine, the combination, with an inclosing casing provided with means for pulverizing metalliferous ores and other substances, and an exhausting device adapted to suck the pulverized material from out the casing, consisting of a stack or exhaust-pipe opening into the casing on the one hand and inclosed by a sifting screen or cap on the other, of a blower or kindred device for producing or inducing a current of air, a blow-pipe communicating with the blower and opening within the stack, and a receiver located at the discharging extremity of the stack and inclosing the sifting-screen thereof.

2. In a pulverizing-machine, in combination with a casing provided with a circular ball-track upon the surface of which the pulverizing action takes place, a vertically-erected exhausting-stack communicating with the casing at a point above the lower face or bottom of the ball-track, and inclosed at its upper portion by a sifting screen or cap, and a blow-pipe (through which a current of air is caused to pass) the discharging extremity of which is within the stack between the point at which the stack opens within the casing and the sifting-screen, and is directed toward the screen, the arrangement being such that pulverized material sucked from the casing and blown against the screen, not being of sufficient size to pass through said screen, gravitates to the ball-track, as and for the purposes set forth.

3. In a pulverizing-machine, in combination with a casing provided with a circular ball-track upon the surface of which the pulverizing action takes place, a vertically-erected exhausting-stack communicating with the casing at a point above the lower face or bottom of the ball-track and terminating in a receiving-chamber, a receiving-chamber, and a blow-pipe (through which a current of air is caused to pass) the discharging extremity of which is within the stack between the point at which the stack opens within the casing and the point at which it terminates in a receiving-chamber, and is directed toward said chamber.

4. In combination with a primary hopper, a conical valve and means for alternately lifting and dropping and revolving said conical valve.

In testimony whereof I have hereunto signed my name this 16th day of February, A. D. 1882.

STEPHEN P. M. TASKER.

In presence of—
J. BONSALL TAYLOR,
JOHN JOLLEY, Jr.