

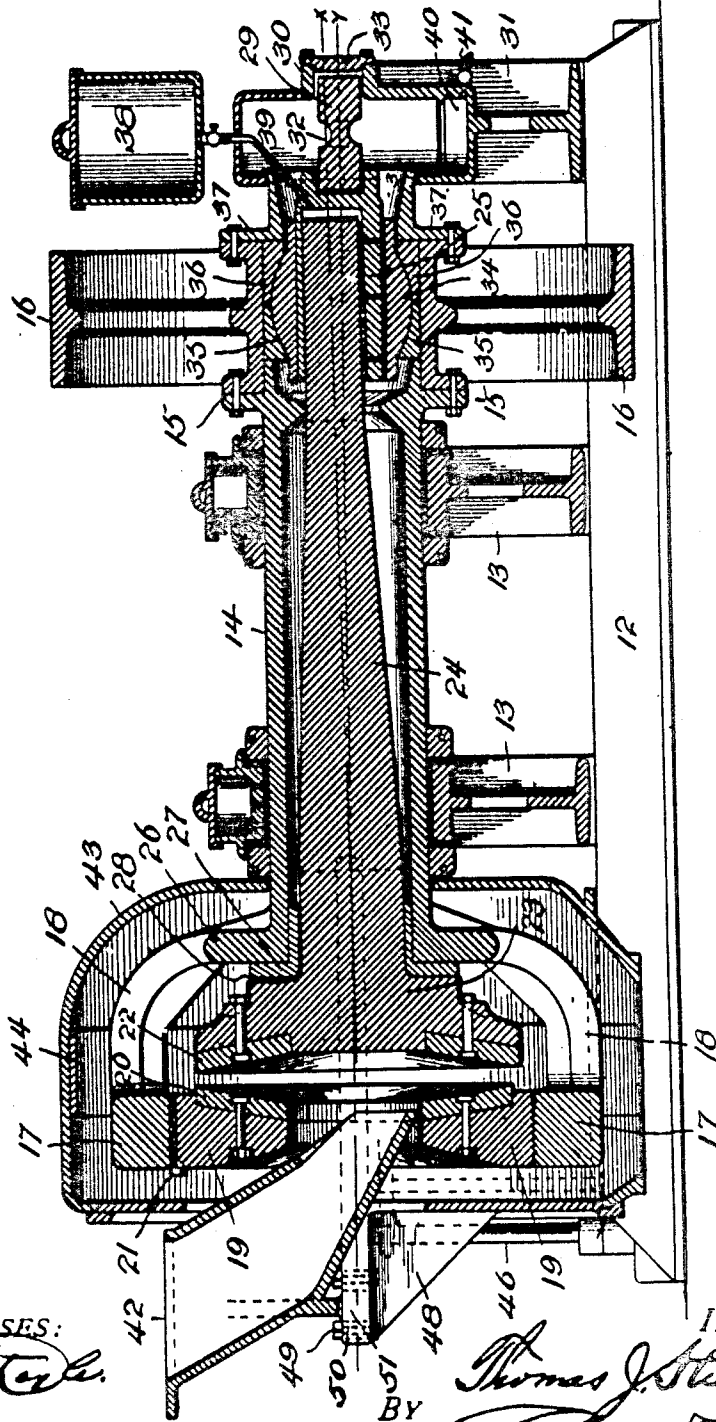
977,235.

T. J. STURTEVANT.
CRUSHING MILL.
APPLICATION FILED FEB. 2, 1910.

Patented Nov. 29, 1910.

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

H. F. Taylor
L. M. Sawyer

INVENTOR:

Thomas J. Sturtevant
Calvin K. ...
BY

Attorneys.

T. J. STURTEVANT.
CRUSHING MILL.
APPLICATION FILED FEB. 2, 1910.

977,235.

Patented Nov. 29, 1910.

2 SHEETS-SHEET 2.

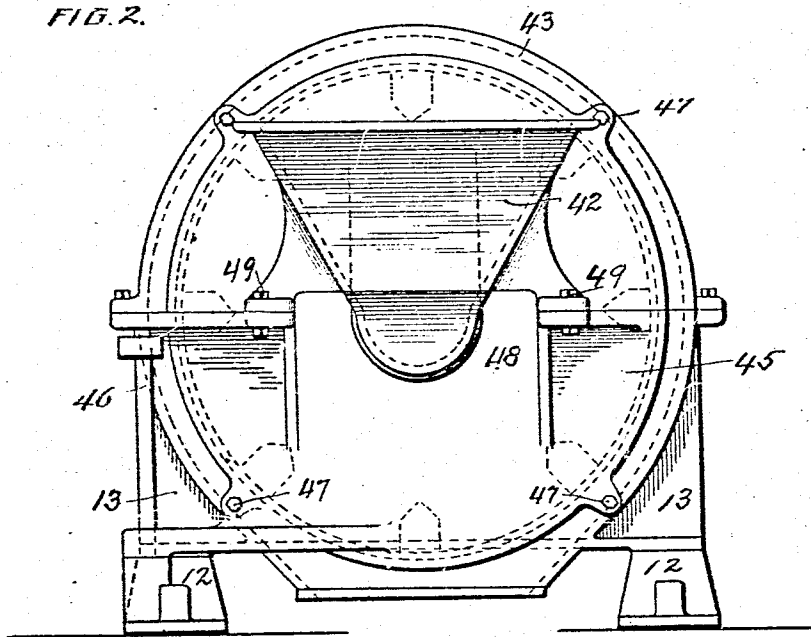
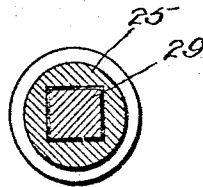


FIG. 3.



WITNESSES:

H. F. Kyle
L. M. Duncanson

INVENTOR:

Thomas J. Sturtevant
BY *Calvin K. Ralston*
Attorneys

UNITED STATES PATENT OFFICE.

THOMAS JOSEPH STURTEVANT, OF WELLESLEY, MASSACHUSETTS, ASSIGNOR TO
STURTEVANT MILL COMPANY, A CORPORATION OF MAINE.

CRUSHING-MILL.

977,235.

Specification of Letters Patent. Patented Nov. 29, 1910.

Application filed February 2, 1910. Serial No. 541,657.

To all whom it may concern:

Be it known that I, THOMAS JOSEPH STURTEVANT, a citizen of the United States, residing at Wellesley, in the county of Norfolk and State of Massachusetts, have invented or discovered certain new and useful Improvements in Crushing-Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention consists of certain improvements on the crushing mill shown and described in the Sturtevant Patent No. 641,654, Jan. 16, 1900, and has for its object to provide a bearing between the inner and outer shafts which is better adapted to take the crushing strain and with less friction than the corresponding bearing of the machine of said patent; as also to provide a crushing mill, working on the general principle of the mill of said patent, but which will be more convenient for use and more efficient in operation than the former mill, all as will hereinafter more fully appear.

In the present improved mill, as in the former mill, two rotating crushing disks which are inclined or tilted relative to each other are employed; the said disks being carried by two rotating shafts mounted on axes which are inclined to or out of line with each other, so that when the mill is in operation certain parts of said disks will be constantly approaching each other, while the diametrically opposite parts of said disks will be constantly receding from each other, thereby causing an opening and closing crushing action of the said disks as they rotate, said opening and closing action crushing the material between the disks in a manner analogous to the operation of crushing jaws.

In the accompanying drawings Figure 1 is a longitudinal section of the improved crushing mill. Fig. 2 is an end view of the same looking from the left of Fig. 1, and Fig. 3 is a detail section on line 3—3, Fig. 1.

Referring to the drawings, 12 denotes a suitable base from which rise standards 13 affording bearings for a hollow driving shaft 14, the said shaft being preferably provided at its rear end with a flange 15 to which is bolted a driving pulley 16. The shaft 14 carries at its forward end the head 17 which is connected with said shaft by a spider 18 the separated arms of which afford spaces for the free discharge of the

crushed material, and in the said head is mounted a ring 19 to which the outer crushing disk 20 is rigidly secured. The ring 19 is preferably adjustably mounted in said head by screw-thread connections, so that by turning said ring said crushing disk may be adjusted in or out, the said ring being secured in any desired position of adjustment by a key, as 21.

The key 21 engages notches formed in contiguous portions of the head 17 and the ring 19, at the screw threaded juncture of said ring and head, so that when the desired adjustment of said ring 19 has been effected, by turning it in its threaded bearing in the head 17, said key will retain the said ring 19 in place; the notches in the head and ring, formed for the reception of said key, being at this time in register, as shown in Fig. 1.

Coöperating with the outer crushing disk 20 is an inner crushing disk 22 bolted to the head 23 of a solid shaft 24 inclosed within the hollow driving shaft 14, said inner shaft 24 having a bearing at its rear end in an eccentric sleeve 25 which is held stationary, the axis of the said shaft 24, denoted by the dotted line *x*, being thus held out of line from the axis, denoted by the dotted line *y*, of the hollow driving shaft 14.

Interposed between the head 23 of the shaft 24 and the hub portion 26 of the spider 18 is a flanged bearing or wear bushing 27 which receives a large portion of the crushing strain, but which avoids much of the objectionable friction resulting from the ball and socket or semi-spherical bearing behind or below the inner crushing disk of the mill of said Patent No. 641,654. To get a proper contact to resist the stresses due to crushing, the inner face 28 of the head 23 is formed slightly conical to an angle proportional to the inclination between the shafts, so that the surfaces touch on a radial line, while the bore of the wear bushing carries the weight of the head 23 and is shaped so as to give a line contact bearing for the shaft, and is bored large enough to prevent cramping, due to the inclination of the shafts. In other words, the flanged bearing or wear bushing 27 affords a fair radial bearing between the head 23 of the inner shaft 24 and the hub portion 26 of the spider 18 of the outer shaft, as well as a longitudinal bearing between parts of said shafts, notwithstanding the inclination of

the axis of said inner shaft to the axis of the outer shaft, and this bearing contact remains in the same position relative to the frame of the machine whether said shafts are at rest or in rotation, and affords what is practically a rolling contact bearing when said shafts are in rotation. When the mill is in operation the shaft 24 is caused to rotate by reason of the frictional connection between the crushing disks afforded by the material gripped between them, as also by the frictional contact with the flanged bearing or wear bushing 27 interposed between the two shafts, and thus, owing to the fact that the two shafts carrying the crushing disks are out of line with each other, so that the said disks will be tilted relative to each other, the opening and closing crushing movements of the disks above referred to will result.

The eccentric bearing 25 is preferably held against rotation, or maintained stationary, by a square breaking piece or plug 29 which engages a square hole formed for its reception in the outer end of said eccentric bearing, and which also engages a square aperture 30 in the standard 31. Said plug or piece 29 is preferably weakened by an annular groove 32 formed therein; so that should any extraordinary strain occur said plug will be broken to relieve the strain and prevent the breaking of other parts of the machine. The opening 32 in the standard 31 is closed by a removable cap 33 which can be taken off when it is desired to insert or remove said breaking piece or plug 29.

Encircling the eccentric bearing 23 is a bearing sleeve 34 having a central ball-like or convex portion encircled by concave bearing rings 35 and 36 within the hub of the driving pulley 16, the said bearing rings being maintained in place by the collar 37 bolted to the outer face of said driving pulley. This construction enables a convenient assembling of the parts, as will be understood, and also permits of a slight ball-and-socket movement so that the eccentric sleeve bearing 25 will not become cramped by any slight change in the inclination of the axis of the shaft 24 as the two shafts rotate together, and in such a manner as to avoid binding.

Mounted on the standard 31 is an oil cup 38 from which extends a suitable pipe or conduit 39 to convey oil to the bearing parts within the driving pulley 16, the waste lubricating oil from said parts draining into a pocket 40 in said standard 31 and from which pocket the waste oil may be suitably drained by a faucet 41.

The crushing disks 20 and 22 are dish-formed or conical so that they will be relatively close together at their outer edges, but will be inwardly flaring, thereby afford-

ing a proper chamber for the reception of the material to be crushed, and which material will be fed through an eye or opening of the outer disk from a hopper 42 provided with a suitable spout leading to the chamber between the said disks.

The crushing disks are inclosed by a casing 43 which is open at its bottom for the discharge of the crushed material, and which casing is preferably provided with a lining 44 to take the wear resulting from the centrifugal discharge of hard pieces or rock or ore from the crushing disks. The end of the casing 43 is closed by a door 45 which is preferably hinged on a standard 46 so that it may be swung aside when its attaching bolts 47 have been removed. The said door 45 is provided with a suitable support or bracket 48 on which the hopper 42 is preferably adjustably mounted by means of bolts 49 passing through slots 50 in the base 51 of the said hopper. This construction enables the hopper to be adjusted in and out to accommodate the in and out adjustment of the outer crushing disk 20 afforded by the screw connection of the ring 19, on which said disk is mounted, with the head 17. The adjustment of the disk 20, toward and from the disk 22, is provided for the purpose of regulating the size of the crushed material, as will be understood.

In the present improved mill the shafts thereof are arranged horizontally, instead of vertically as in the mill of the said Patent No. 641,654, this arrangement of the shafts resulting in a vertical arrangement of the crushing disks which permits of a better discharge of the crushed material than in the arrangement of the parts of the mill of said patent, and also affords a more convenient arrangement for the feeding to the mill of the material to be crushed.

In the operation of the present improved crushing mill the material gripped between the crushing disks 20 and 22 will cause the disk 22 and the shaft with which it is connected to be rotated in unison with the driving shaft 14 carrying the outer crushing disk 20, and in the rotation of these tilted crushing disks the material will be reduced owing to the opening and closing movements of the disks 20 and 22, as in the mill of the Sturtevant Patent No. 641,654, hereinbefore referred to, the operation of this improved mill being thus substantially the same in principle as the operation of the mill of the said patent.

Having thus described my invention I claim and desire to secure by Letters Patent:

1. In a crushing mill, the combination with two rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one inclosed within the other, by which said disks are carried, and which

shafts have their axes inclined relative to each other, and a rolling contact bearing between portions of said shafts.

2. In a crushing mill, the combination with two vertically disposed rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one inclosed within the other, by which said disks are carried, and which shafts have their axes inclined relative to each other, and a rolling contact bearing between portions of said shafts.

3. In a crushing mill, the combination with two rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one inclosed within the other, by which said disks are carried, and which shafts have their axes inclined relative to each other, and a flanged bearing or wear bushing interposed between parts on said shafts and comprising longitudinal and radial bearing portions between said parts, thus affording practically a rolling contact bearing.

4. In a crushing mill the combination with two vertically disposed rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one inclosed within the other, by which said disks are carried, and which shafts have their axes inclined relative to each other, and a flanged bearing or wear bushing interposed between parts on said shafts and comprising longitudinal and radial bearing portions between said parts, thus affording practically a rolling contact bearing.

5. In a crushing mill, the combination with two rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one of which is inclosed within the other, by which said disks are carried, and which shafts have their axes inclined relative to each other, an eccentric sleeve affording a bearing for the inner shaft at a point widely removed from the disk carried by said shaft, means for maintaining said sleeve stationary while said shaft rotates, and a ball and socket device encircling said sleeve and permitting of variations of the inclination of the axis of said inner shaft relative to the axis of the outer shaft without binding.

6. In a crushing mill, the combination with two vertically disposed rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one of which is inclosed within the other, by which said disks are carried, and which shafts have their axes inclined relative to each other, an eccentric sleeve affording a bearing for the inner shaft at a point widely removed from the disk carried by said shaft, means for maintaining said sleeve stationary while said shaft rotates, and a ball and socket device encircling said sleeve and per-

mitting of variations of the inclination of the axis of said inner shaft relative to the axis of the outer shaft without binding.

7. In a crushing mill, the combination with two rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one of which is inclosed within the other, by which said disks are carried, and which shafts have their axes inclined relative to each other, an eccentric sleeve affording a bearing for the inner shaft at a point widely removed from the disk carried by said shaft, a weakened plug for maintaining said sleeve stationary while said shaft rotates, and a ball and socket device encircling said sleeve and permitting of variations of the inclination of the axis of said inner shaft relative to the axis of the outer shaft without binding.

8. In a crushing mill, the combination with two vertically disposed rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one of which is inclosed within the other, by which said disks are carried, and which shafts have their axes inclined relative to each other, an eccentric sleeve affording a bearing for the inner shaft at a point widely removed from the disk carried by said shaft, means for maintaining said sleeve stationary while said shaft rotates, a ball and socket device embracing said sleeve and permitting of variations of the inclination of the axis of said inner shaft relative to the axis of the outer shaft without binding, a casing inclosing said disks, and a hinged door closing the end of said casing.

9. In a crushing mill, the combination with two vertically disposed tilted crushing disks one of which is adjustable relative to the other, of two shafts, one inclosed within the other, by which said disks are carried, a casing by which said disks are inclosed, a hinged door closing the end of said casing, and a hopper supported by said door and having a spout extending into an opening in said adjustable disk.

10. In a crushing mill, the combination with two vertically disposed tilted crushing disks, one of which is adjustable relative to the other, of two shafts, one inclosed within the other, by which said disks are carried, a casing by which said disks are inclosed, a hinged door closing the end of said casing, and a hopper supported by said door and having a spout extending into an opening in said adjustable disk, said hopper being adjustable to accommodate the adjustability of said disk.

11. In a crushing mill, the combination with two rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one of which is inclosed within the other, by which said disks are carried, and which shafts have their axes inclined

relative to each other, an eccentric sleeve affording a bearing for the inner shaft at a point widely removed from the disk carried by said shaft, and a weakened plug for maintaining said sleeve stationary while said shaft rotates.

12. In a crushing mill, the combination with two vertically disposed rotating crushing disks which are tilted or inclined relative to each other, of two shafts, one of which is inclosed within the other, by which said disks are carried, and which shafts have their axes inclined relative to each other, an

eccentric sleeve affording a bearing for the inner shaft at a point widely removed from the disk carried by said shaft, means for maintaining said sleeve stationary while said shaft rotates, a casing inclosing said disks, and a hinged door closing the end of said casing.

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

THOMAS JOSEPH STURTEVANT.

Witnesses:

L. H. STURTEVANT,
W. H. ELLIS.