(No Model.) 2 Sheets—Sheet 1.

K. H. TERNSTEDT & J. H. TEMPLIN.

GYRATORY CRUSHER.

No. 575,015. Patented Jan. 12, 1897.

FIG. 4.

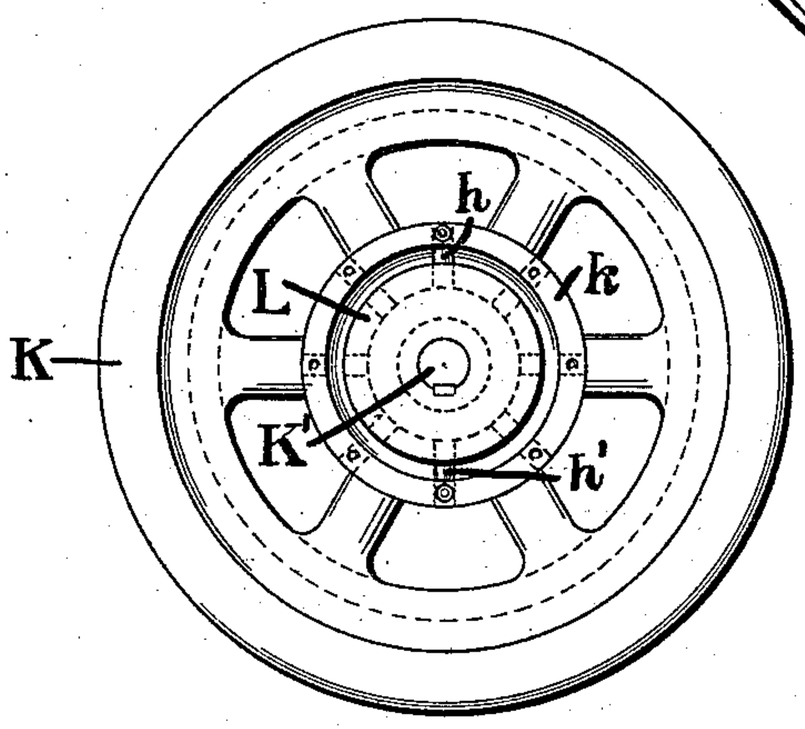
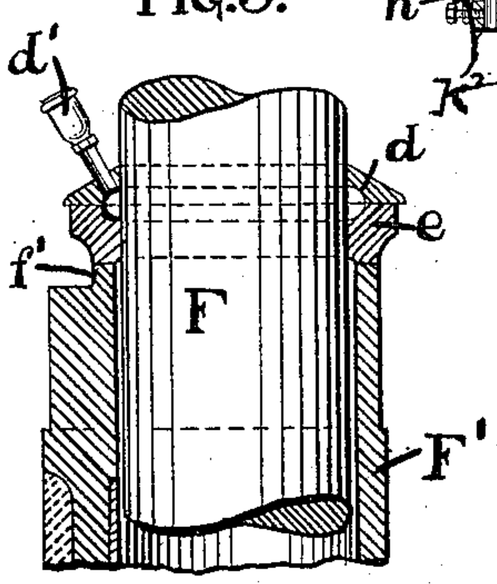


FIG. 3.



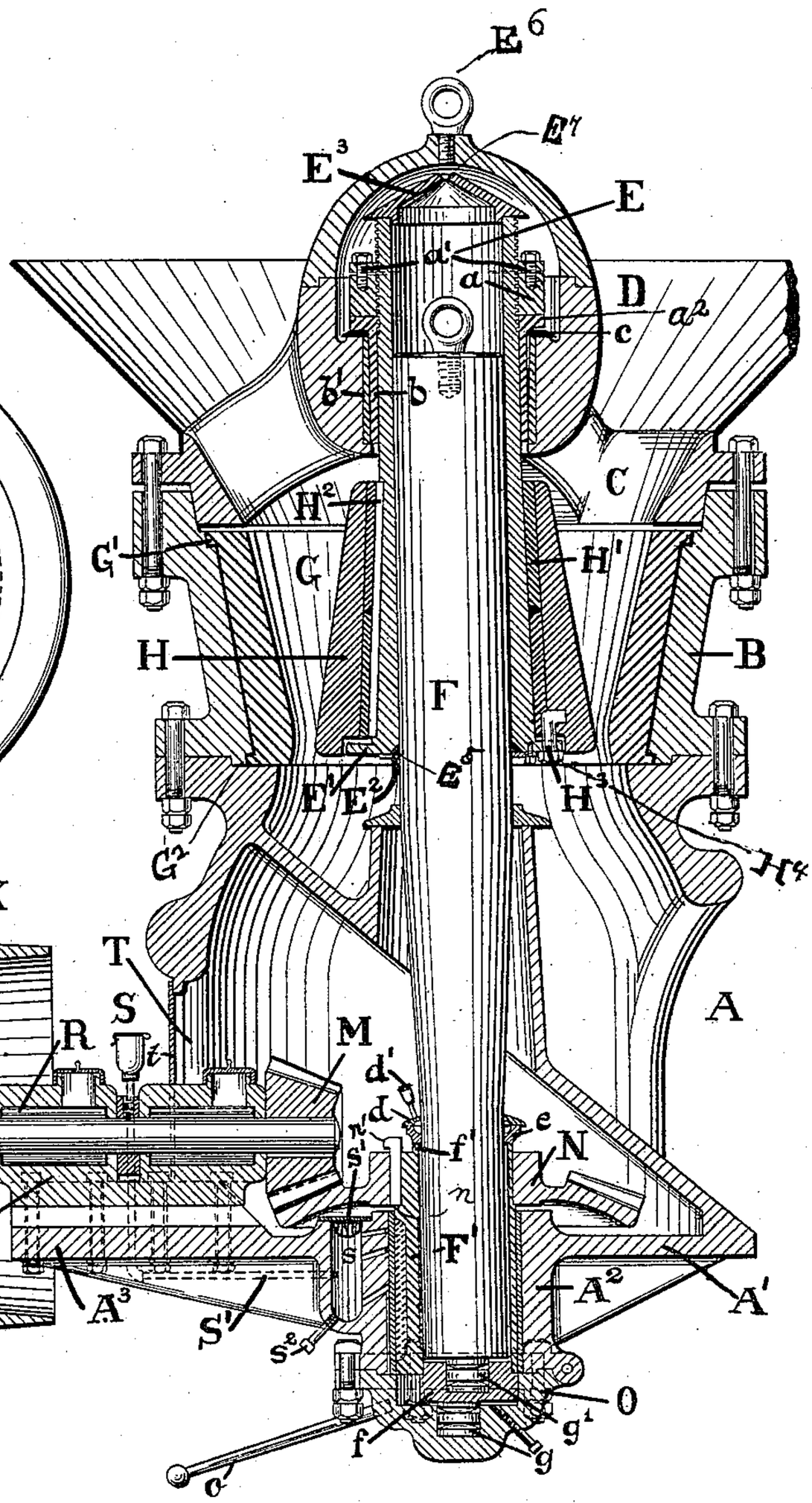


FIG. 1.

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(No Model.) 2 Sheets—Sheet 2.

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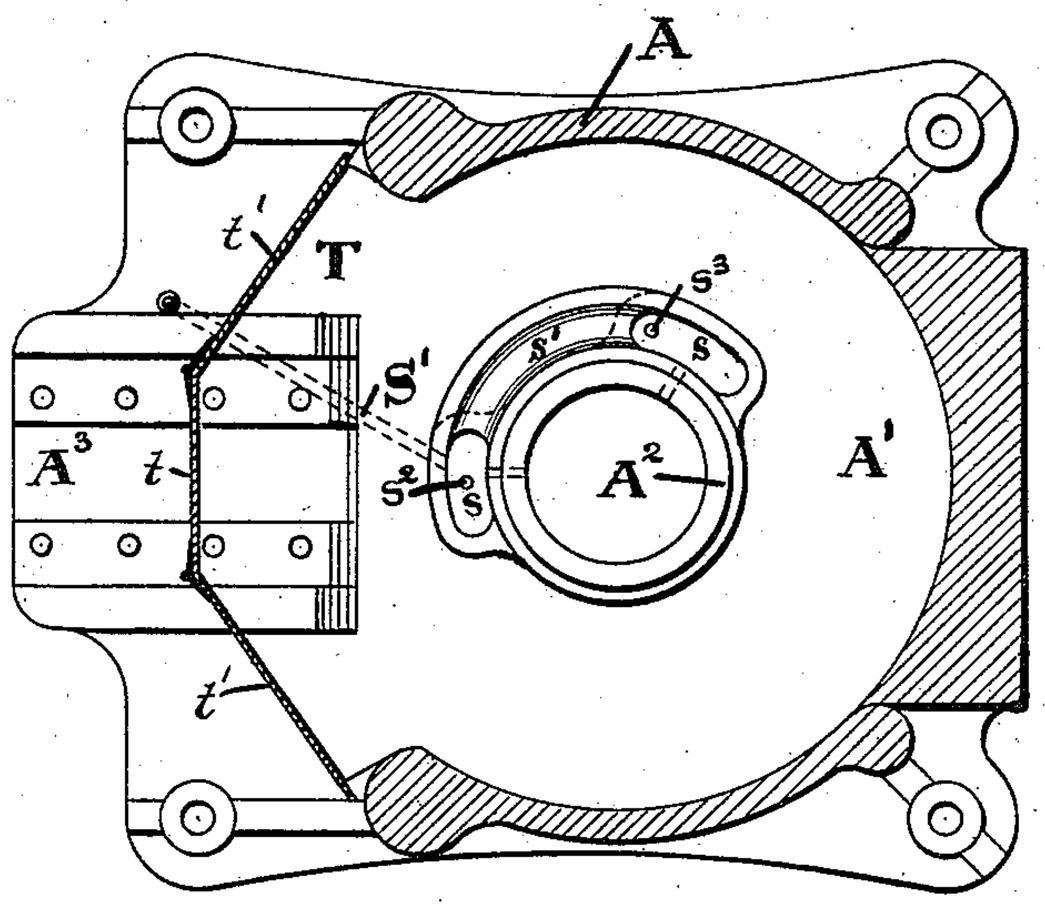
GYRATORY CRUSHER.

No. 575,015. Patented Jan. 12, 1897.

FIG. 2.



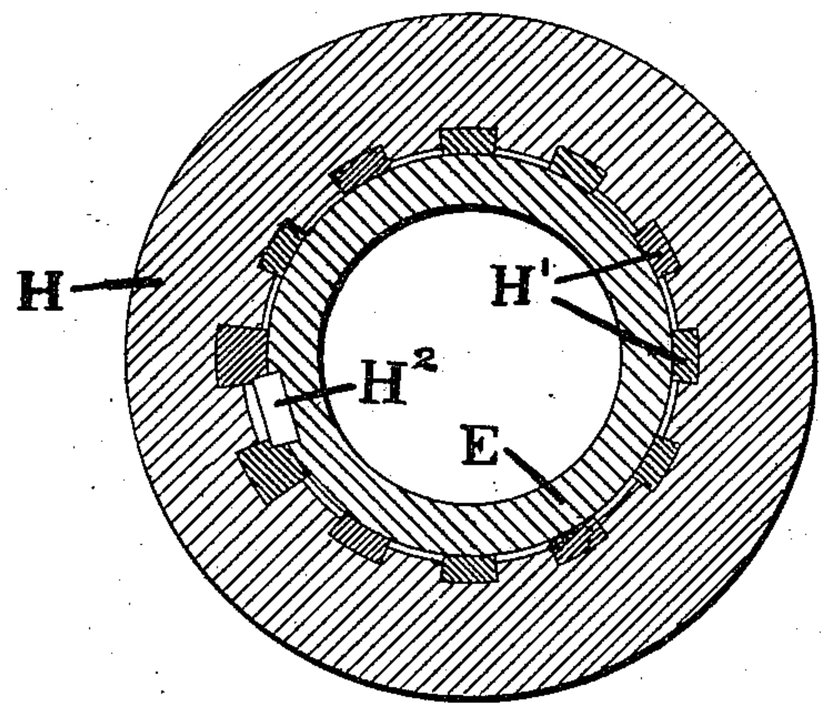


FIG. 6.

FIG. 7.

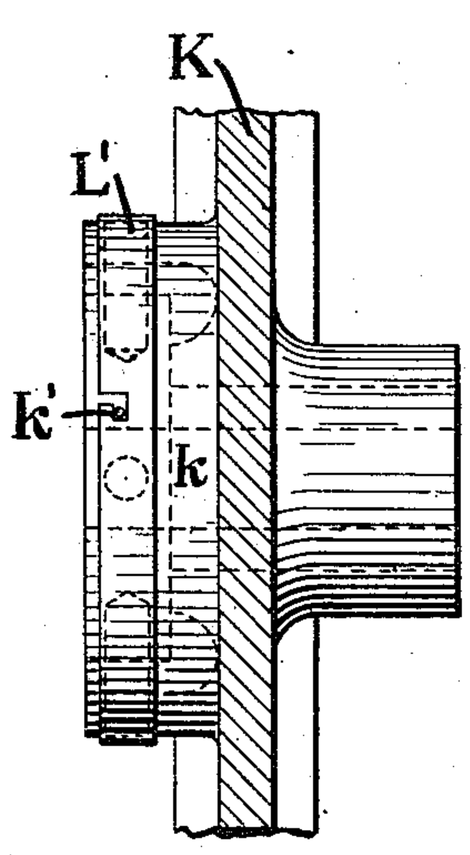


FIG. 5.

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UNITED STATES PATENT OFFICE.

KLAS H. TERNSTEDT AND JOSEPH H. TEMPLIN, OF BIRDSBOROUGH, PENNSYLVANIA, ASSIGNORS TO THE DIAMOND DRILL AND MACHINE COMPANY, OF SAME PLACE.

GYRATORY CRUSHER.

SPECIFICATION forming part of Letters Patent No. 575,015, dated January 12, 1897.

Application filed September 9, 1896. Serial No. 605,321. (No model.)

To all whom it may concern:

Be it known that we, KLAS H. TERNSTEDT and JOSEPH H. TEMPLIN, citizens of the United States, and residents of Birdsborough, in the county of Berks and State of Pennsylvania, have invented certain new and useful Improvements in Gyratory Crushers, of which the following is a specification.

Our invention relates to improvements in "gyratory crushers;" and the object of the invention is to suspend the head freely and independently of the shaft, as set forth in an application filed by Klas H. Ternstedt, dated August 21, 1896, Serial No. 603,481, and to improve and otherwise simplify the construction of the present device and reduce to a minimum the friction consequent upon its operation; and with these ends in view the invention consists in the novel combination and arrangements of parts, as will be hereinafter more particularly and in detail described, and pointed out in the claims.

In the accompanying drawings, to which reference is had and which fully illustrate our invention, Figure 1 is a central vertical section through the machine. Fig. 2 is a horizontal section showing plan of base with loose parts detached. Fig. 3 is a central section of the upper part of the eccentric bushing on an enlarged scale. Fig. 4 is a front elevation of the fly-wheel and brake-collar. Fig. 5 is a side elevation of same, showing the device for holding the brake-pins. Fig. 6 is a section through crusher head and sleeve on the line *y y* of Fig. 1. Fig. 7 is a front view of the hinged doors detached from the casing.

Similar letters of reference indicate corresponding parts throughout the several figures of the drawings.

Referring by letter to the drawings, A designates the support or discharge piece of the machine, and B the hopper, within which are rigidly placed a number of chilled iron pieces G, conforming with the inner face of the hopper and forming the crushing-faces of the machine.

C designates the spider or support for the head H, which is of the truncated-cone shape, chilled on the outside. Into the opening in the head are projected a number of soft-iron staves H′, as clearly shown in Fig. 6 of the drawings, each of these staves consisting of two pieces cast into the head and allowed longitudinal motion as the head shrinks in cooling, this construction being found in practice to give a stronger head than continuous staves.

The two pieces forming one stave are set in the core, so that when the head is cooled and shrunk they abut against each other and form, practically, one stave, with bearing on the sleeve the whole length. The head thus formed is bored out tapering to fit the lower portion of a sleeve E, which carries the head. This sleeve is made, preferably, of steel and turned parallel on its upper part. The lower part is turned tapering with its largest end at the bottom. This is done to keep the head from being forced down by the downward pressure in crushing. This sleeve terminates at its lower end in a flange E′, which is provided with openings H^4 to allow the bolts H^3 to be passed through them. These are cast integral with the head and are threaded at their lower ends, so that nuts can be entered on them and the head drawn down firmly on the tapered portion of the sleeve and held there. Between the flange E′ and the body of the head H space is left, so that as the head works loose it can be drawn tight again.

The upper end of the sleeve E is threaded to receive a nut *a*, which is split horizontally for some distance on the opposite sides, having holes through its thinner portion through which are passed bolts *a′ a′*, tapped into the body of the nut. When the head has been adjusted by *a* to its proper position, *a′ a′* are screwed up tight, whereby the thinner portion of the nut is forced close to the body, thus clamping the whole nut by impingement on the threads of the sleeve. Nut *a* rests on the flange a^2 of a bushing *b*, the inner face of which is made parallel to slide over the sleeve E, and the top part of the flange on which *a* rests is faced at right angles to this bore, which insures a square bearing for the nut *a*. The outer face of this bearing is turned tapering from the bottom up on angles corre-

sponding to the set angle of the head and the lower side of the flange faced off at right angles to this. By these means we insure a full-length vertical bearing on a bushing b' and a horizontal bearing on c in the same plane. Bushing b' is inserted, so that in case of wear it can be taken out and replaced and the head and sleeve kept in their proper position. c is beveled off on the edges, so as to throw any dust entering the chamber into the annular groove surrounding it, and from there it can be cleaned out.

The inside of the sleeve E is bored out to loosely receive the upper end of the shaft F. At its lower end it is beveled off to receive a suitable packing E^5, which is held in place by ring E^2. The function of this packing is to keep dust from getting between the shaft and sleeve E, which would cause wear. The top of this sleeve is covered by a conical cap E^3, which serves to keep out dust from above and at the same time provides a convenient means for oiling both inside and outside of the sleeve E.

E^6 is an eyebolt which when removed the inside of the sleeve may be oiled through the hole E^7 in the top of the conical cap E^3 and the outside by simply letting the oil run over the face of the conical cap E^3.

G designates chills provided with beads G′ on the outside, both at the top and bottom. These beads fit into grooves G^2, formed in the hopper B, and by having them so located the strain is lessened and liability to tear off in case of lifting or tilting of the chills is avoided.

F′ designates the driving-bushing, which snugly fits into a projection in the base A, and which is bored out eccentrically on the line of the head to receive the lower end of the shaft F, the sleeve or bearing for the shaft being bored out slightly flaring from bottom to top to give a clearance to the shaft and form a receptacle for oil and is extended beyond the top face of the bushing and beveled off, as shown in Fig. 3 of the drawings. On this beveled portion is located a ring e, conforming in shape with f', but fitting the shaft snugly. The upper portion is cup-shaped to form a reservoir for oil and waste, which forms the dust-protector for the shaft-bearing. Oil-grooves d are cut in the face bearing against the shaft and its top is covered with a plate fitting the shaft loosely, and into this cover is inserted an oil-cup d'. This design enables the operator to hold the covering-plate and oil-cup stationary while the machine is running and fill the cup with oil.

The driving-bushing F′, to which the bevel-gear N is secured, is smaller in diameter than the part in the bearing. Thereby a shoulder n is formed for the gear to rest on. The gear is held by a hook-key or keeper n', which can be easily withdrawn when the bushing is to be taken out for rebabbitting. By having a straight face on the bushing it can be dropped down through its bearing, leaving the gear central and intact and ready to slip over the bushing when the same is replaced. Into an enlargement in the lower part of the shaft-bearing is loosely inserted the protracted portion of f, which forms the support for the shaft F. The friction is minimized by the use of the hardened-steel disks g g'.

The radius of the main body of f is a little less than the distance from the center of shaft F to the nearest point on the outside face of the bushing. Thus a shoulder is obtained on which rests the bushing itself, and at the same time contact between f and the bottom plate O is avoided under all circumstances. f is supported eccentrically on the center line of the bushing F′ itself by hardened anti-friction steel disks, the whole submerged in a bath of oil. The bottom plate O is hinged to the downwardly-projecting part A^2 of the base-plate A′, which forms the bearing for f', and is secured to it by means of bolts and nuts.

o designates a hand-bar used to lessen the weight of the bottom plate O on the operator when dropping it.

s s designate oil-wells communicating with each other through the channels s', and also with the bearing for F′ through suitable oil-holes. These wells and connecting-channel are covered by a plate and communicate by means of the pipe S′ with the cup S, which is placed either outside or inside of the base A. The bottom of these oil-wells have means for drawing off sediment and oil, as at s^2, and also an overflow-pipe s^3.

M designates a bevel-pinion which meshes with gear N, and is secured to the driving-shaft K′, which is carried on rollers R in bearing P, which is secured to the overhanging part A^3 of the base A′.

To the outer end of the driving-shaft K′ is secured the sleeve L, which is flanged, as shown in the drawings, and has radial annular pockets therein disposed at proper points. On the body of this sleeve L is secured the hub of the combined driving-pulley and fly-wheel K.

k designates an annular ring formed on the combined driving-pulley and fly-wheel K and projecting over the flange or sleeve L. This ring is provided with holes k^2, corresponding in size and in alinement with the pockets in the flange or sleeve L, and through them are inserted the brake-pins h and h'. To keep these brake-pins in their places against the action of the centrifugal force, a band L′ is used, which is clearly shown in Fig. 5 of the drawings, which encompasses the annular ring k, and is held in place by a pin k', entered in an L-shaped slot k^3 in the band.

When the pins break and have to be replaced, it is only necessary to disengage the band L′ from the pin k' and push it back toward the arms of the fly-wheel. By having the bottom bearing for the shaft F and bushing F′ arranged as shown the base A′ can be cast in one piece with the body A, and only

the small bottom plate O has to be swung to one side when the bushing is withdrawn for repairs.

T designates an opening formed in the base A at a point where the bearing P is entered. This opening is formed large enough to allow the gear-wheel N to pass in and out of the same, and said opening is closed or opened by means of a sectional door $t\,t'$, as shown clearly in Figs. 2 and 7 of the drawings, the central part of the door being made large enough to allow of the insertion and withdrawal of the pinion. Either side door can then be opened and the running-gear inspected and oiled through the same.

The advantage of hinging the wings or sections of the door to the central or main section is such that it enables the operator to have access within the casing from each side of the machine from the point where the operator may be standing, instead of his having to pass all of the way around the machine for the purpose of entering the casing, as would be the case if the door was made of the ordinary construction, which would occasion loss of time and inconvenience in removing bodily the door of the casing.

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

1. In a gyratory crusher, the combination with the body and base A′, hopper, spider, and vertical shaft of the machine; of the flanged sleeve surrounding the vertical shaft, truncated cone-shaped crushing-head supported or suspended by the spider and vertical sleeve, and through the medium of a number of interposed sectional staves, the lower portion of the head being secured by bolts and nuts to the flange of the sleeve, substantially as described and for the purpose set forth.

2. In a gyratory crusher, the combination with the body and base A′ hopper, spider, vertical shaft, vertical sleeve surrounding the same, truncated cone-shaped crushing-head, suspended from the vertical sleeve and spider, interposed sectional staves, chilled pieces located in the hopper, perforated conical cap located upon the upper end of the vertical sleeve, flanged bushings b, b', encircling the upper part of the vertical sleeve, split nut located upon the flange of bushing b, packing-ring E^2, packing E^5, and eyebolt, all arranged and operated substantially as and for the purpose set forth.

3. In a gyratory crusher, the combination with the body and base A′, hopper, spider, vertical shaft, vertical sleeve, truncated cone-shaped crushing-head, interposed sectional staves, chilled pieces located in the hopper, perforated conical cap, flanged bushing b, b', split nut, packing-ring, and its packing, and eyebolt located in the upper part of the vertical shaft; of the downwardly-projecting extension A^2, of the base A′, of the body, driving-bushing located therein, having its upper portion cup-shaped whereby an oil and waste reservoir, and dust-protector for the vertical-shaft bearing is formed, oil-cup d', antifriction-disks g, g', hinged-bottom bearing-plate, hand-bar, oil-wells s, s, channels s', plate covering said wells, and channels, communicating pipe S′, oil-cup S, overflow-pipe s^3, gear N, located in the base of the body of the machine, and secured to the driving-bushing, all arranged and operated substantially as described and for the purpose set forth.

4. In a gyratory crusher, the combination with the body and base A′, hopper, chilled pieces located therein, spider, vertical shaft, vertical sleeve, crushing-head suspended or supported from said vertical shaft through the medium of said spider and sleeve, interposed sectional staves between the crushing-head and sleeve, perforated conical cap flanged bushings b, b', split nut, packing-ring and its packing, eyebolt located in the upper part of the shaft F downwardly-projecting extension A^2 of the base A′ of the body, driving-bushing located in the extension A^2, having its upper portion cup-shaped, thus forming an oil-reservoir and dust-protector for the vertical-shaft bearing, oil-cup projected from the cover, antifriction-disks g, g', hinged-bottom bearing-plate, hand-bar o, oil-wells s, s, channels s', plate covering said wells and channels, communicating pipes S′, oil-cup S, overflow-pipe s^3, gear N, located in the base of the body of the machine and secured to the driving-bushing; of the overhanging portion of the base, driving-shaft and rollers carrying the same, pinion secured to the inner end of the driving-shaft and meshing with the gear N flanged sleeve secured to the opposite or outer end of the driving-shaft, pockets in the flange of said sleeve, combined pulley and fly wheel, annular ring formed thereon, perforations formed in said ring, brake-pins passed through these perforations and in the pockets of the flanged sleeve, band encircling the annular ring, and L-shaped slot formed in said band, substantially as described.

5. In a gyratory crusher, the combination of the supporting-casing A, provided with an opening T in the base thereof adjacent to the bearing P; of a sectional door comprising a central vertical plate, extending down and over the shaft and doors t', t' hinged to the central plate or section and adapted to be opened and closed substantially as shown, and for the purpose specified.

Signed at Birdsborough, in the county of Berks and State of Pennsylvania, this 7th day of September, A. D. 1896.

KLAS H. TERNSTEDT.
JOSEPH H. TEMPLIN.

Witnesses:
WM. H. HALL,
ALBERT FRITZ.