(No Model.) 3 Sheets—Sheet 1.

B. C. WHITE.

CHASING MILL.

No. 511,380. Patented Dec. 26, 1893.

Fig. 7.

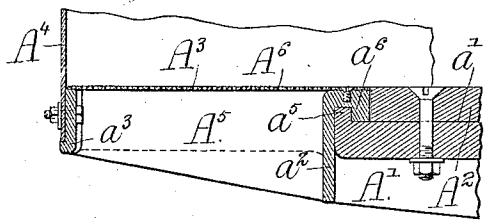

Fig. 6.

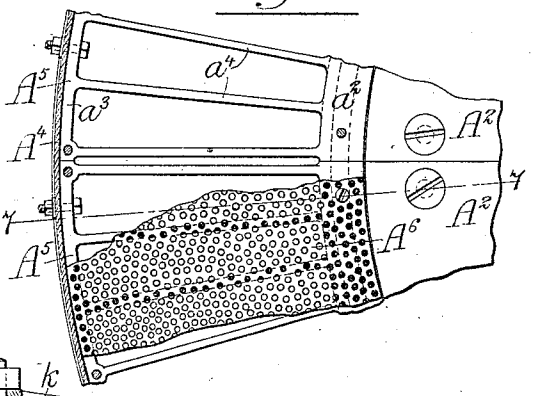

Fig. 1.

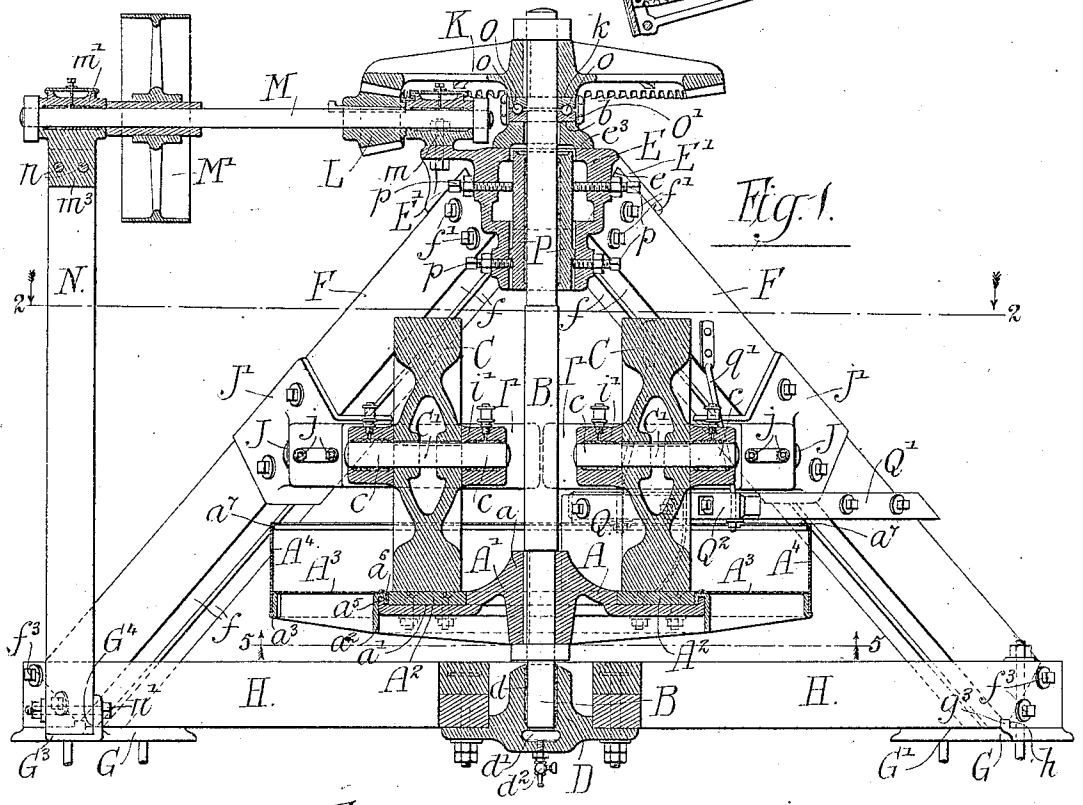

Fig. 5.

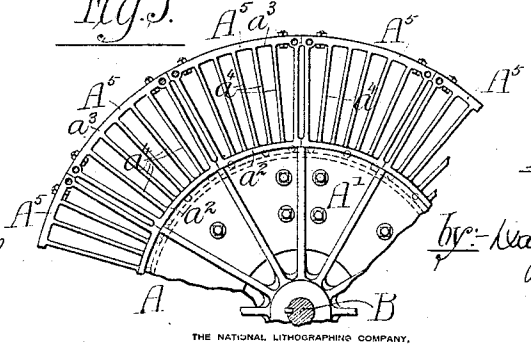

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Fig. 8.

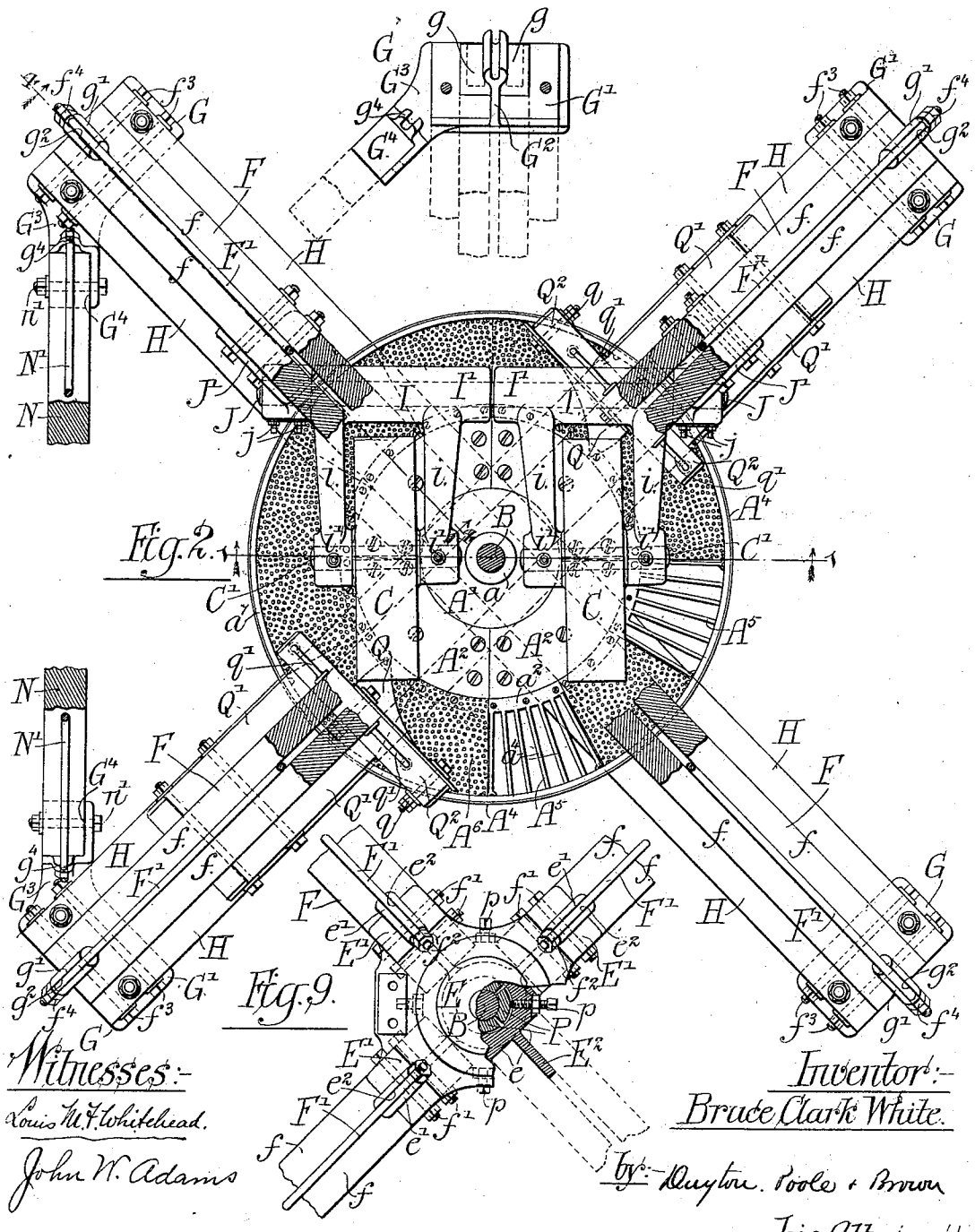

Fig. 9.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 4.

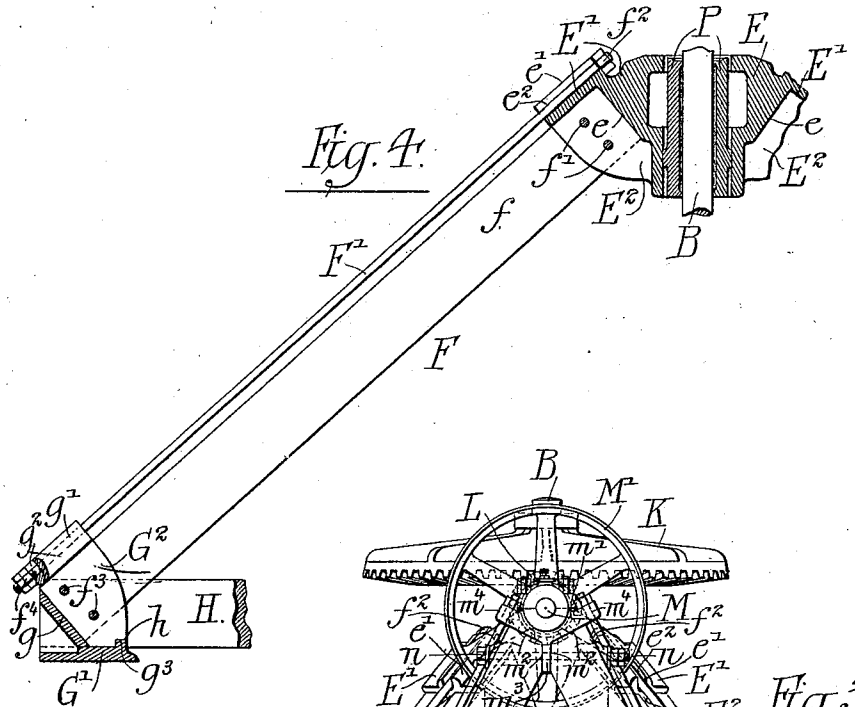
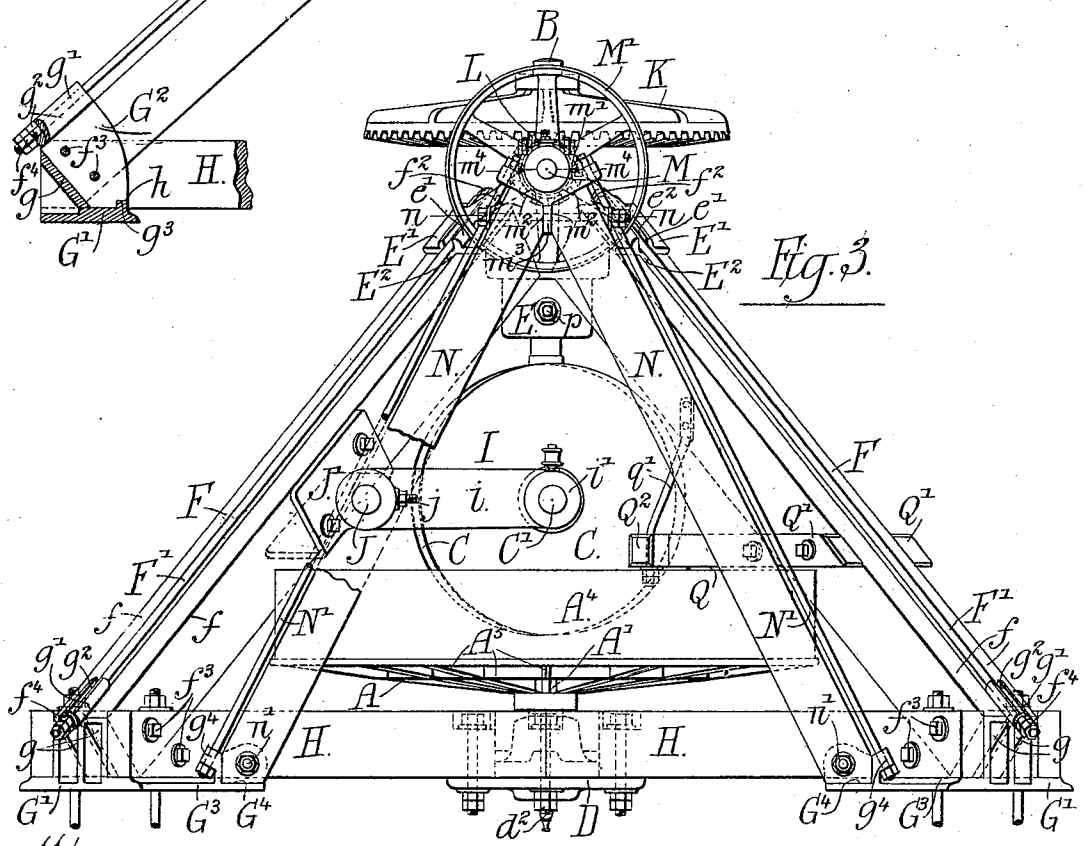


Fig. 3.



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UNITED STATES PATENT OFFICE.

BRUCE CLARK WHITE, OF CHICAGO, ILLINOIS.

CHASING-MILL.

SPECIFICATION forming part of Letters Patent No. 511,380, dated December 26, 1893.

Application filed August 11, 1892. Serial No. 442,763. (No model.)

To all whom it may concern:

Be it known that I, BRUCE CLARK WHITE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Chasing-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in that class of grinding or pulverizing machines known as chasing mills and which embrace a revolving bed or table upon which the material to be acted upon is placed, and one or more heavy rollers adapted to rest and roll upon said table, and which are mounted in supports affording free vertical movement of the rollers, while holding them from movement with the table.

The machine herein shown as embodying my invention is more especially intended for use in pulverizing or grinding clay for use in brick making, but the principles of construction shown and claimed may be applied to machines used for other purposes.

The invention consists in the matters hereinafter described and pointed out in the appended claims.

In the accompanying drawings illustrating my invention: Figure 1 is a view in central vertical section taken on the line 1—1 of Fig. 2, of a machine embodying the same. Fig. 2 is a plan section of the machine taken on line 2—2 of Fig. 1. Fig. 3 is a view of the machine in side elevation. Fig. 4 is a detail section illustrating the construction of one of the struts or inclined supports for the machine, taken upon line 4—4 of Fig. 2. Fig. 5 is a detail showing part of the revolving table of the machine as seen from beneath, taken on line 5—5 of Fig. 1. Fig. 6 is an enlarged detail plan view of the outer parts of said table. Fig. 7 is a sectional view of the same taken on line 7—7 of Fig. 6. Fig. 8 is a detail plan view of one of the castings which support the lower ends of the struts or inclined supports of the machine. Fig. 9 is a detail plan view, with parts in section, of the central casting with which the upper ends of the struts are connected.

As shown in the said drawings, A indicates the revolving bed or table of the machine, which is generally made of circular form and is attached to and sustained by a vertical shaft B.

C C indicate two crushing rolls, which are located over and rest upon the table A, said rollers being located at opposite sides of the shaft B, with their axes of rotation generally radial with reference to the central axis of said shaft, but slightly inclined with reference to the radial lines of the shaft axis, for the purpose hereinafter explained. Said shaft B is suspended in the machine frame by the engagement of the upper end of the shaft with a casting or bearing box E, while the lower end of the shaft is held from lateral movement by engagement with a bearing-box D. Said frame consists of four inclined supports or struts F F F F, connected at their upper ends with the bearing box E and resting at their lower ends in base castings G G G G, which rest upon suitable supporting piers or foundations. The opposite pairs of said base castings G G G G are connected with each other by means of horizontal stringers or tension pieces H H H H, which for convenience are adapted to form also a support for the lower bearing box D of the shaft B.

The crushing rollers C C are each provided with two journals or trunnions *c c*, herein shown as formed by means of short shafts C′ C′, which pass through and are secured to the said rollers. Said rollers C C are mounted by means of the trunnions *c c* in swinging frames I I, which are pivotally connected with the machine frame in such manner as to allow the free vertical movement of the crushing rollers; the pivotal connection between the said frames I I and the machine frame, for this purpose being arranged at a distance above the top surface of the table approximately equal to the radius of the crushing rollers.

For convenience in construction each of the frames I I consists of two arms *i i*, in the outer ends of which are provided bearings *i′ i′* for the trunnions *c c;* said arms being cast integral with the tubular rock-shafts or sleeves I′ which are mounted end to end on a single, stationary, horizontal bearing shaft J. Said shaft J is supported upon the machine frame by the engagement of its ends with brackets J′ J′, bolted to adjacent struts F F at one side

of the machine frame, as clearly seen in the drawings Fig. 2; said brackets J' J' being provided with hubs containing apertures into which the ends of the bearing shaft J are inserted and in which they are secured by means of set screws *j j*, or by other suitable means.

For giving rotary motion to the table the shaft B is provided at its upper end above the bearing box E with a beveled gear wheel K, arranged to intermesh with a beveled pinion L, mounted on a shaft M, which is arranged radially, with its inner end supported in a bearing *m*, secured to the bearing box E beneath the wheel K and its outer end mounted in a bearing box *m'*, which is supported by inclined struts N N from the base of the machine frame. The shaft M is provided with a belt wheel, M', over which is trained a belt for giving rotary motion to said shaft.

The operation of the main parts of the machine above described is generally like that of similar machines as heretofore made, the table A being rotated continuously by the action of the gearing described, while the material to be pulverized is delivered to the table and there subjected to the crushing action of the rollers C C by being brought or carried beneath said rollers in the revolution of the table.

To now refer to the details of construction illustrating the several parts, it will first be noticed that the rollers C C instead of being set with their axes of rotation exactly radial with reference to the revolving table and its supporting shaft, are set at a slight inclination, or, in other words, the central axes of the rollers are slightly inclined to the radial lines of the said shaft. The object of this construction is to prevent the rollers from tending to continually move outward in their bearings during the rotation of the table. It has been found that when the axes of the rollers are exactly radial, while the roller will theoretically rest in contact with the table along a radial line thereof, yet the presence of the material to be pulverized has the effect of bringing the actual line of contact of the roller with the table somewhat in advance of said radial line of the table. This will be made clear by consideration of the fact that the material over which the roller passes, by reason of its greater thickness in front of the roller, produces the same result as would arise were the roller moving upwardly on an inclined plane; it being obvious that the point of contact with the roller on such inclined plane would be in advance of a vertical line passing through the axis of rotation of the roller. The tendency of a radially arranged roller when acting against a mass of material on the table is, therefore, to move outwardly, so that a constant strain or end thrust is maintained against the bearings which take the end thrust of the rollers. I propose, therefore, to incline the rollers or set them obliquely to just such an extent as will overcome their tendency to move outward from the cause stated. In other words, I so set the rollers that when there is no material in the machine and they are resting directly upon the revolving table they will tend to move or press inward, so that when a layer of material is placed on the table and the rollers are at work, the tendency of the material accumulating in front of them to carry them outward, will be counterbalanced by their own inclination to move inward and there will be practically no considerable endwise pressure or end thrust of the said rollers against their bearings. The absence of such end thrust is important, not only because it avoids friction and thereby enables the rollers to be driven more smoothly and with the expenditure of less power, but because the rollers and their bearings are thereby rendered much more durable.

To now refer to the construction of the table A, said table consists of a main part or casting A', provided with a central hub *a*, through which the shaft B is inserted and in which it is secured. In the outer part of said casting A' is formed a broad shallow annular groove *a'*, in which are secured, preferably by means of bolts as shown, a plurality of separate segmental plates A^2 A^2, which form the wearing surfaces against which the crushing rollers act and which may be renewed or replaced when they become worn without requiring renewal of the entire table. Exterior to the main part or body A' of the table against which the crushing rollers act, is an annular perforated part or screen A^3, surrounded by a cylindrical upwardly extending wall, flange or curb A^4. The purpose of the perforated part A^3 is to allow the escape from the table of that part of the material which has been sufficiently pulverized and to secure the retention on the table of the coarser fragments which it is desired to again submit to the action of the crushing rollers. The perforated section A^3 consists of an annular, skeleton, open work or ribbed support, and a covering of sheet metal, indicated by A^6, secured to the top of said support. As shown said support is formed by a plurality of segmental castings or gratings A^5 A^5 (Figs. 5, 6 and 7) each consisting of inner and outer curved members a^2 a^3, connected by radial bars or ribs a^4. For rigidly securing the apertured castings A^5 to the central part A' of the table, the latter is provided at its margin, outside of the plates A^2, with an upwardly extending rib or flange a^5, and each segment is provided at its inner edge with a flange a^6, of inverted L-shape, adapted to fit over the flange a^5 of the table and thereby securely lock or hold the segments in place. The frame a^5 is shown as forming the outer wall of the shallow groove *a'* and the flanges a^6 as being inserted in and filling the space between said flange a^5 and the segmental plates A^2 A^2.

The outer wall, flange or curb A^4 is conveniently made of a strip of sheet metal extending around and bolted to the outer margins of the segments A^5 A^5, and stiffened or strengthened at its upper edge by means of an angle-iron a^7, secured to the same in the manner illustrated, Fig. 1. The exterior wall, flange or curb A^4, arranged as described, obviously prevents the escape of any material from the margin of the table and confines the coarser particles which cannot pass through the perforations of the screen section A^3 so that they may be easily returned into the path of the crushing rollers for the further action thereof.

Referring now more particularly to the details of construction of the frame illustrated, each of the struts or inclined supports F F consists of two parallel timbers *f f*, the opposite ends of which are held in place by attachment to the bearing box E at their upper ends and the base castings G G at their lower ends. Said timbers *f f* are secured by bolts to the box E and base castings G, and as an additional means of giving strength and rigidity to the frame as a whole, the base castings are connected with the said box E by means of tension rods F′, arranged parallel with the timbers *f f* and provided with nuts applied to their ends in such manner as to draw the metal parts or castings referred to against the ends of the timbers.

To receive the upper ends of the several timbers *f f* forming the frame struts, the box E is provided with four outwardly or downwardly inclined flanges E′ E′ E′ E′, and beneath the same with wide or deep vertical flanges E^2 E^2 E^2 E^2, which flanges, together with inclined flat surfaces *e e e e* on the body of the casting which constitutes the box, form recesses or partial sockets adapted to receive the ends of said timbers *f f*, the upper ends of which latter are placed one at each side of the vertical flanges E^2 E^2 with their ends abutting against the flat surfaces *e e* and are secured in place by transverse bolts *f′ f′* inserted through the ends of the timbers and through said flanges E^2 E^2. For connecting the upper ends of the tie rods F′ with the said box E, the latter is provided on the top surfaces of the inclined flanges E′ E′ with outwardly projecting lugs *e′ e′*, provided with open slots e^2, adapted to receive the upper ends of the said tie rods; the nuts or heads f^2 on said tie rods being arranged to bear against the upper end surfaces of the said lugs *e′*, in the manner illustrated, (Fig. 4.)

The base castings G G each consists of a horizontal bottom plate G′, an inclined plate *g*, forming a surface against which the lower ends of the timbers *f* abut, and a central vertical web G^2; said wall *g* and the web G^2 constituting a recess or partial socket to receive the lower ends of said timbers, which latter are placed at either side of the said web G^2 and secured thereto by bolts f^3 f^3. The lower ends of the tie rods F′ are secured to the castings G by means of lugs *g′*, which are cast upon the upper margins of the webs G^2 and are provided with open notches g^2, into which the lower ends of the tie rods are inserted; the nuts f^4 on the lower ends of the rods bearing against the lower end faces of the lugs *g′*, as clearly seen in Fig. 4.

From the construction described it is obvious that the timbers *f f*, being arranged with their end surfaces in contact with opposing flat surfaces on the box E and base castings G G, constitue strong and rigid struts or supports to take the weights of the parts carried by the said box, while the tie rods F′ tend to take any strain which might tend to separate the parts.

The horizontal or tension members H H of the frame preferably consists of wooden stringers or timbers which are bolted to opposite base castings G G and intersect each other beneath the table, where the timbers of each pair are placed at opposite sides of the bearing box D, being separated sufficiently to afford ample space for said box. When the said timbers H H are arranged with their upper and lower margins in the same horizontal planes, as herein shown, they will be conveniently cut away at their points of intersection or halved into each other, as shown. The base plates G′ of the said castings G are, in the construction shown, arranged to project at the sides of the timbers *f f* a sufficient distance to receive the ends of the stringers H H, which latter are placed against the outer faces of said timbers *f f* and secured thereto and to the base castings by the horizontal bolts f^3 f^3, hereinbefore referred to. As a further means of securing the said stringers to the base castings and to prevent strains which tend to spread apart the said base castings or the lower ends of the inclined struts, from coming entirely upon the bolts f^3 f^3, the said stringers are shown as provided on their lower surfaces with gains or transverse notches *h h*, (Fig. 4,) and the base plate G′ with corresponding transverse ribs g^3, adapted to fit within said gains or notches.

As herein shown the inclined struts N N, which support the outer bearing *m′* of the bearing shaft M, are connected at their upper and lower ends with the said bearing and with the two adjacent base castings G G in the same general manner as hereinbefore set forth in connection with the main frame struts E E. That is to say, the bottom plate G′ of each base casting G is provided with a wing or extension G^3, provided with a socket G^4, to receive the lower end of the strut, while the bearing box *m′* is provided with similar sockets m^2 m^2. The upper ends of the struts N N are secured to the bearing box by a horizontal bolt *n* passing through a vertical flange m^3, located between the sockets m^2 m^2, while the lower ends of the struts are secured in the sockets G^4 G^4 by means of bolts *n′ n′*. Tie rods N′ N′ similar to the tie rods F′ are employed in connection with the struts N N,

said tie rods being engaged at their upper and lower ends with the base castings G G and the bearing box m' by means of notched lugs g^4 g^4 on the sockets G^4 G^4 and similar notched lugs m^4 m^4 on the sides of the bearing box m'.

The weight of the table A and shaft B and connected parts is sustained solely by the upper bearing box E, so that the said table is in fact suspended by the shaft from the upper part of the machine frame, the lower bearing D being intended and adapted solely for holding the lower end of the shaft from lateral movement and taking no part of the weight of the same. For so carrying the weight of the shaft, the box E is provided at its top with an annular bearing surface or shoulder e^3, and the shaft with an opposing shoulder b, which may be formed in any desired manner on the shaft, but which, as herein shown, is formed by the lower end of the hub k of the gear wheel K. The downward pressure on the supporting shoulder e^3 being great by reason of the weight of the parts suspended thereon, an anti-friction device is preferably employed, herein shown as consisting of upper and lower bearing rings O O', and intermediate anti-friction balls or rollers o.

For centering the shaft B within the bearing box E, said box is provided with an interior segmental lining or bushing P, made smaller in diameter than the interior of the box and the parts of which are adjustably held in place or in contact with the shaft by means of set-screws p p, inserted through the walls of the box and bearing against the parts of the segmental bushing. Preferably, the bearing is made of considerable length and two sets of set-screws are employed one in the upper and the other in the lower part of the box. The bushing is desirably divided into four segments (Fig. 9) and two set-screws are arranged to bear against each segment, the set-screws being located at points between the upper ends of the frame struts F', as clearly seen in the drawings Fig. 9.

The bearing box D for the lower end of the shaft, inasmuch as it takes no part of the weight of the shaft or table, and is adapted solely for holding the lower end of the shaft from lateral movement, requires no special provision for its vertical support, but as herein shown is secured for convenience to the frame stringers H H, although it may be attached to any other suitable stationary part. Said bearing is shown as provided with a lining or bushing d, engaging the sides of the shaft, and as having an oil recess or chamber d', beneath the lower end of the shaft, which recess or chamber is provided with a valved outlet d^2 to permit the discharge of sediment.

For the purpose of returning automatically to the central part of the table A the crushed material which rests upon the perforated part of the table but is too large to pass through the perforations of the same, I employ scrapers or deflectors Q, the same consisting of plates sustained on the machine frame by suitable supports located above the table and extending downwardly adjacent to the top surface of the perforated plate A^6 thereof; the lower or working edge of said plates constituting the scrapers being extended from the outer edge of the table inwardly or rearwardly (referring to the direction of motion of the table) so that material carried against the said plates in the revolution of the table will be deflected inwardly thereby and deposited in the path of the rollers to be again acted upon. For supporting the deflectors Q, horizontal bars Q' Q' are shown as bolted to the opposite sides of the struts F F and as extending inwardly over the table, and to the inner end of said bars are secured other horizontal bars Q^2 Q^2 to which the deflectors Q are directly attached by means of bolts q q. Metal braces q' q' are shown as extending from the ends of the bars Q^2 upwardly to the struts F for the purpose of affording more rigid support to the said bars. The deflectors thus arranged obviously act to constantly carry inward and deliver in position to be again acted upon by the rollers all material too large to pass through the perforated part of the table, securing automatic operation of the machine and avoiding attention on the part of the attendant except to see that the table is supplied with material as rapidly as it is discharged therefrom in pulverized form.

I claim as my invention—

1. A chasing mill comprising a revolving table, a crushing roll or rollers resting thereon, a shaft supporting the table, a bearing for the upper end of the shaft, said shaft and bearing being provided with opposing surfaces or shoulders by which the weight of the table is suspended from the said upper bearing, and a bearing for the lower end of the shaft adapted to hold the same from lateral movement, only, substantially as described.

2. The combination with a revolving table, of a crushing roller or rollers resting thereon, a vertical shaft supporting the table, a bearing for the lower end of the shaft adapted to hold the same from lateral movement, and means for giving rotary motion to the table comprising a gear wheel attached to the shaft above the upper bearing thereof, substantially as described.

3. The combination with a revolving table, a crushing roller resting thereon, and a vertical shaft supporting the table, of an upper bearing for the shaft carrying the weight of the table, a lower bearing engaging the lower end of the shaft and adapted to hold the same from lateral movement, a machine frame embracing a plurality of radially arranged inclined struts attached at their upper ends to the said bearing, and stringers connecting the lower ends of the opposite pairs of struts, said lower bearing being connected with the middle parts of said stringers, substantially as described.

4. A chasing mill comprising a revolving table, a crushing roller and a vertical shaft supporting the table, of a bearing for the upper end of the shaft adapted to sustain the weight of the same, and a machine frame comprising a plurality of struts engaged at their upper ends with the said bearing, base castings engaged with the lower ends of the struts, tie rods connecting said upper bearing with the base castings, and means for connecting said base castings with each other, substantially as described.

5. A chasing mill comprising a revolving table and a crushing roller, of a vertical shaft supporting the table, a bearing for the upper end of said shaft carrying the weight of the table and a frame comprising inclined struts and base castings, each of said struts consisting of two parallel timbers; the said bearing and base castings being provided with vertical webs or flanges against the opposite sides of which the ends of the timbers forming each strut are placed and to which they are secured by bolts, substantially as described.

6. A chasing mill comprising a revolving table, crushing roller, shaft and a bearing for the upper end of the shaft, of a frame consisting of struts each of which consists of two parallel timbers, tie rods, and base castings, said bearing box and base castings having sockets to receive the ends of the said timbers and apertured or notched lugs to engage the ends of said tie rods, substantially as described.

7. A chasing mill comprising a revolving table and crushing roller, of a vertical shaft supporting the table and a bearing for the upper end of the shaft constructed to sustain the weight of the same, provided with a segmental bushing and with set-screws for adjusting the parts of said bushing, substantially as described.

8. The combination with a revolving table and two crushing rollers, of oscillating frames for supporting the rollers, and means for pivotally supporting the frames embracing a horizontal shaft located at one side of the table and engaging both of said frames, substantially as described.

9. The combination with a revolving table and a crushing roller, means for supporting the roller consisting of a frame having two arms engaged with trunnions or journals of the roller at opposite sides thereof, a tubular rock-shaft rigidly connecting said arms and a stationary shaft affording a bearing for the said tubular rock-shaft, substantially as described.

10. The combination with a crushing roller, of a revolving table comprising a central imperforate part having an upwardly extending marginal flange and an external perforated part, said external part consisting of a plurality of cast segments, each provided at its inner edge with an L-shaped flange adapted to interlock with the marginal flange of the central part of the table, and a perforated plate attached to the top surface of said segmental castings, substantially as described.

11. The combination with a crushing roller, of a revolving table comprising a central imperforate part having an upwardly extending marginal flange and an external perforated part consisting of a plurality of cast segments, a perforated plate attached to the said castings and a cylindrical flange or curb attached to the outer margins of said castings, substantially as described.

12. A chasing mill comprising a revolving table and crushing roller, of a vertical shaft supporting the table, a bearing for the upper end of the shaft constructed to sustain the weight of the table, a machine frame comprising a plurality of radial struts attached at their upper ends to the said bearing, and means for connecting the lower ends of the struts with each other, a gear wheel attached to the said shaft above the said upper bearing, a radially arranged driving shaft provided with a pinion engaging said gear wheel, and bearings for the said shaft one of which is mounted on the upper end of the main frame and the other of which is sustained by inclined struts attached at their lower ends to the struts of the main frame, substantially as described.

13. A chasing mill comprising a crushing roller and revolving table, of a vertical shaft supporting the table, a bearing for the upper end of the shaft carrying the weight of the table, radially arranged struts attached at their upper ends to the said bearing, stringers connecting the lower ends of the opposite struts, and base castings provided with sockets for the lower ends of the inclined struts and with seats for said stringers, said stringers being provided with gains or notches and the base castings with transverse ribs engaging the same, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

BRUCE CLARK WHITE.

Witnesses:
TAYLOR E. BROWN,
G. W. HIGGINS, Jr.