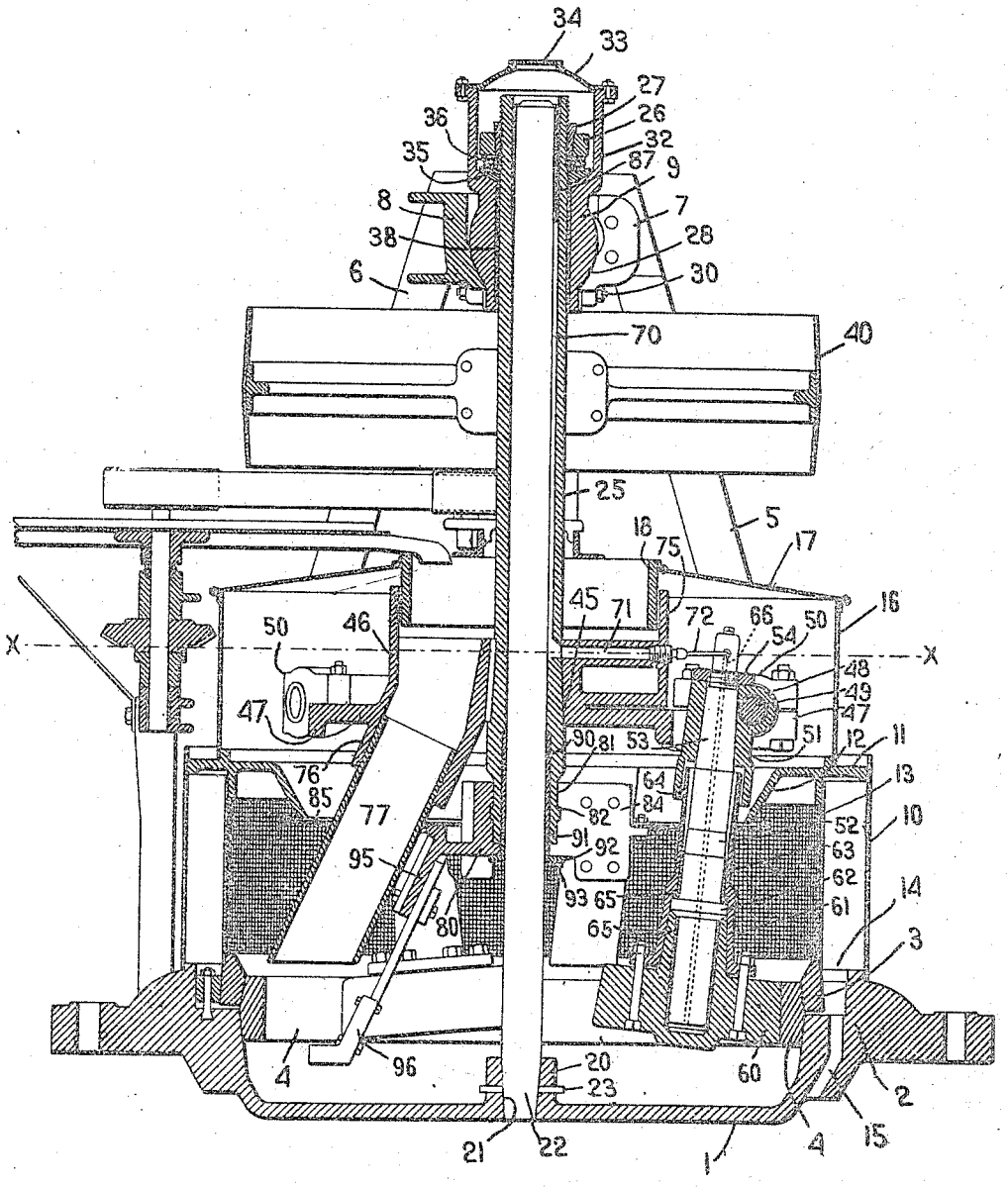
E. C. GRIFFIN, DEC'D.
L. M. GRIFFIN, EXECUTRIX.
GRINDING MILL.
APPLICATION FILED AUG. 10, 1914.

1,175,436.

Patented Mar. 14, 1916.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

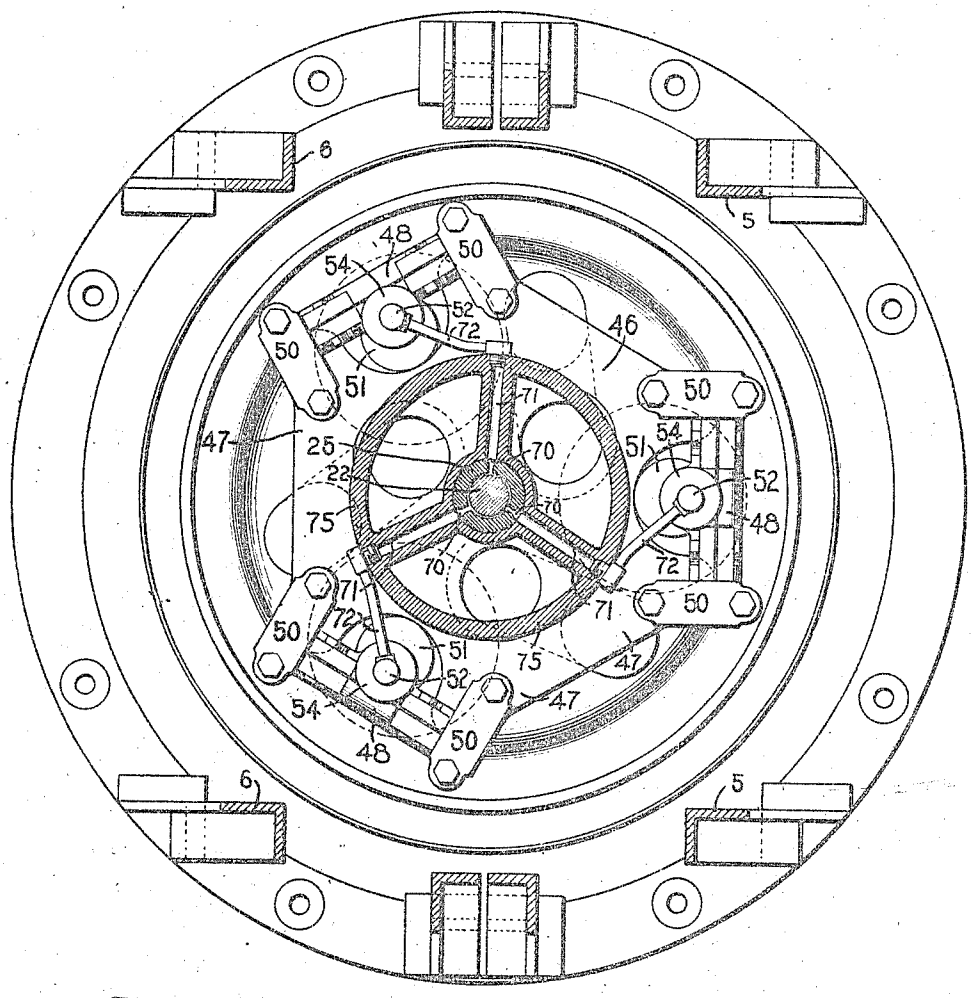


Fig. 3.

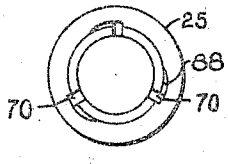


Fig. 4.

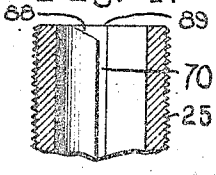


Fig. 5.



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UNITED STATES PATENT OFFICE.

EDWIN C. GRIFFIN, DECEASED, LATE OF NEWTON, MASSACHUSETTS, BY LOVINA M. GRIFFIN, EXECUTRIX, OF BRIGHTON, MASSACHUSETTS, ASSIGNOR TO BRADLEY PULVERIZER COMPANY, A CORPORATION OF MAINE.

GRINDING-MILL.

1,175,436. Specification of Letters Patent. Patented Mar. 14, 1916.

Application filed August 10, 1914. Serial No. 856,084.

To all whom it may concern:

Be it known that EDWIN C. GRIFFIN, deceased, late of Newton, county of Middlesex, State of Massachusetts, did invent an Improvement in Grinding-Mills, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to improvements in crushing or pulverizing mills, particularly to the type in which the material is pulverized between a series of centrifugally actuated crushing rolls and a coöperating annular die. In mills of this type it is usual to provide overhead supporting and driving shafts for the crushing rolls and heretofore it has been necessary to utilize a heavy shaft and heavy bearings to afford sufficient rigidity and strength to withstand the torque and vibratory stresses caused by the engagement of the crushing rolls with the material in the grinding chamber.

One of the objects of this invention is to provide means adapted to more rigidly support the centrifugally actuated crushing rolls and to reduce the stresses upon the overhead bearings which support the rotating members.

In the preferred embodiment of the invention illustrated herein this is accomplished by hanging the carrier for the centrifugally-actuated rolls upon a quill shaft which is supported from an overhead bearing and is also rotatably mounted upon a central upright shaft, suitable bearings being provided between the quill shaft and the upright shaft above the carrier and also below the same, the latter preferably being disposed in close proximity thereto to reduce vibration of the shaft as much as possible.

Another object of the invention is to provide a suitable journal bearing for an overhead shaft, preferably a quill shaft which will provide for the lubrication of the supporting bearing for said shaft.

Another object of the invention is to provide means included within a quill shaft of the character above described for conducting a lubricant from a reservoir inclosing the end of said shaft to the journals of the shafts of the centrifugally actuated rolls.

Another object of the invention is to provide means for continuously supplying a lubricant to the bearings of the shaft upon which the centrifugally-actuated rolls are mounted.

Another object of the invention is to provide a shorter and more rigid support for the plow which agitates the material in the grinding pan and forces the same into the path of the rolls.

Other objects of the invention will more fully appear from the following description and the accompanying drawings and will be pointed out in the appended claims.

In the drawings: Fig. 1 is a vertical axial section of a grinding mill embodying one of the preferred forms of the invention, Fig. 2 is a horizontal sectional view on the line *x*—*x* Fig. 1, the supporting frame and mechanism for operating the feeding mechanism being omitted, Fig. 3 is a detail view of the upper end of the quill shaft illustrated in Fig. 1, Fig. 4 is a vertical sectional view of a portion of the upper end of the quill shaft showing the form of the oil groove. Fig. 5 is a detail sectional view illustrating a modified form of quill shaft having longitudinally drilled oil ducts and the inclosed upright shaft.

The preferred embodiment of the invention illustrated herein comprises a bed plate 1 having an upturned annular curb 2 forming a pan adapted to receive the material to be ground said annular curb 2 being provided with an upper detachable section 3 and coöperating therewith to embrace an annular die 4.

The base 1 may be provided with lateral projections adapted to receive the lower ends of a preferably A shaped frame comprising standards 5 and 6 having suitable cross pieces 7 and 8 adapted to support the head 9 which carries the rotating driving shaft for the centrifugally-actuated rolls.

A suitable grinding chamber is formed by a preferably cylindrical inclosing casing 10 having an annular cover 11 extending inwardly a portion of the distance toward the center of the mill and provided with a downwardly projecting flange 12 terminating near the circumference of the path in which the shafts of the grinding rolls move. A screen 13 is preferably supported between the upper edge of the removable curb 3 and

the under face of the cover 11 in the usual manner to provide an annular channel 14 adapted to receive the pulverized material, there being suitable means for causing the latter to be discharged through downwardly directed openings 15 in said base communicating with the annular channel.

A superposed casing comprising a cylindrical shell 16, a cover 17, and a central cylindrical hopper casing 18, may be suitably supported by the cover plate 11 to inclose the carrier for the rotating crushing rolls and their bearings and also to provide means for directing the material to be pulverized into the grinding chamber.

The bed 1 is preferably provided with a central boss 20 having a tapered opening 21 to receive the end of a shaft 22 which may be secured therein by a pin 23 or in any other suitable manner. The shaft 22 is preferably solid and extends vertically from the center of the base to a point a short distance above the top of the supporting frame and terminates within a suitable lubricant reservoir carried by the head 9, which will hereinafter be fully described.

The rotating grinding members are carried by a quill shaft 25 having integral bearings preferably adjacent to its ends rotatably mounted upon said central shaft 22, and having at its upper end a wear plate or collar 26 which may be secured to said quill shaft by a tapered or wedge shaped nut or collar 27 screwed upon the threaded end of the quill shaft 25.

The quill shaft is preferably supported in a suitable vertical bearing or journal in the head 9, which is partly spherical in form and engages concaved faces 28 of the cross supports 7 of the frame. Suitable bolts 30 may be provided in the lower portion of the frame 7 to bear upon the depending end of the head 9 so that said bearing may be universally adjusted within the frame. The upper portion of the bearing 9 is preferably provided with an integral upstanding annular flange 32 forming a reservoir adapted to receive a lubricant for the shaft bearing. This reservoir may be closed by a suitable cover 33 having a removable cap 34.

The base of the lubricant reservoir is preferably made concave to receive a steel bearing plate 35 forming one of the elements of the thrust bearing which supports the quill shaft, the other element of the bearing comprising the collar 26. Suitable anti-friction means such as a ball bearing 36 may be interposed between the members 26 and 35.

A pulley 40 secured to the quill shaft below the head 9 serves to impart rotation to the shaft and the centrifugally-actuated rolls supported thereby. The lower portion of the quill shaft 25 preferably is enlarged and tapered as at 45 to support a cylindrical carrier 46 having lateral arms or yokes 47 adapted to support suitable rocker heads 48 carrying the shafts of the crushing rolls.

The yokes 47 desirably may be provided with suitable recesses or boxes to receive the lower halves of journals for the trunnion shafts 49 of the rocker heads, the upper halves of said journals being formed in cap plates 50 bolted to the yokes 47 in the usual manner.

The rocker heads are provided with sockets 51 to receive the ends of the roll shafts 52 which desirably are tapered as shown at 53 so that the shafts may be secured in the sockets by means of nuts 54 screwed upon the projecting ends of the roll shafts.

The crushing rolls 60 are rotatably connected with and retained upon, the roll shafts by coupling sleeves 61 bolted to the rolls and shaped to overhang a suitable shoulder or collar 62 upon said shafts, the upper ends of the sleeves being elongated to form tubular guards 63 extending into recesses 64 in the under portions of the rocker heads, suitable metal packing 65 being provided between the roll shafts and the rolls and the surrounding couplings.

The roll shafts 52 are preferably provided with longitudinal apertures or bores 66 forming oil ducts adapted to conduct a lubricant from the upper ends of the shafts to the lower ends thereof from whence it is permitted to work up between the relatively rotating surfaces of said shafts and the rolls and sleeves to maintain the same in a constant state of lubrication. In mills of this character it has heretofore been customary to provide said roll shafts with caps forming lubricant chambers but such reservoirs can not be made of large enough capacity to supply a sufficient quantity of lubricant to the roll shafts to permit the mill to operate for any considerable length of time, and therefore it has been necessary to frequently shut down the mill in order to replenish these oil reservoirs. One of the principal features of the present invention consists in providing means for supplying a suitable lubricant to said bearings without shutting down the mill. This means preferably comprises a series of grooves or ducts 70 in said quill shaft leading from the upper end thereof to lateral orifices 71 extending through the carrier 46 and connected with the ducts in the roll shafts 66 by suitable flexible tubes 72. The oil ducts 70 may be cylindrical apertures bored longitudinally in the quill shaft as illustrated in Fig. 5 but preferably are in the form of grooves cut or milled in the internal surface of the quill shaft and extending axially thereof. In the embodiment of the invention illustrated herein the barrel of the quill shaft 25 is slightly larger than the upright shaft

22 and is provided with enlarged recesses at the top and bottom to receive circumferential metallic bushings 87 and 90 to separate the interior of said quill shaft from the upright inclosed shaft as well as to form bearings for the upper and lower ends of said quill shaft.

The lower bearing 90 desirably is located in proximity to the carrier in order that the greater portion of the strains of vibration may be transmitted to the solid vertical shaft and the quill shaft relieved thereof. The upper bushing 87 does not extend to the plane of the ends of the shafts but terminates a sufficient distance below the same to form a reservoir adapted to communicate with the ends of the oil ducts 70 in the quill shaft.

In order to facilitate the entrance of the lubricant into the ducts 70 the end of the quill shaft may be provided with beveled portions 88 inclining downwardly to the ducts 70 from a point in advance of the ducts to the mouths thereof, the rearward walls of the ducts being preferably vertical to form shoulders 89 to arrest the further flow of the lubricant and cause it to enter said ducts.

The centrifugal force of the rapidly rotating quill shaft serves to retain the lubricant in the longitudinal ducts or grooves in the interior of the quill shaft while the action of the force of gravity causes it to flow downwardly in said grooves to the lateral or radial orifices 71 in the carrier whence it is caused by centrifugal force to flow through the flexible tubes 72 into the ducts in the roll shafts.

The carrier which supports the crushing rolls, as illustrated in the preferred embodiment of my invention, is shown herein provided with a cylindrical or annular flange 75 which surrounds the stationary hopper member 18 and is rotatable relatively thereto. The base portion of the carrier is apertured and provided with downward extensions 76 to which chutes 77 are preferably attached leading to the lower portion of the grinding chamber immediately in front of the crushing rolls. Suitable mechanism may be provided for supplying material to the hopper such as that illustrated in the drawing but this forms no part of the present invention and need not be further described.

The lower end of the quill shaft supports a horizontally disposed spider 80 which is made in sections adapted to fit around and inclose the reduced lower end 81 of the quill shaft 25, which may be provided with a rib 82 adapted to enter an annular recess in the spider 80 and prevent the latter from longitudinal movement on the quill shaft. Integral lugs 84 on the spider sections afford means for assembling them upon the shaft.

The spider 80 serves to support downwardly extending arms or carriers for the plows 96, which travel in the grinding chamber beneath the path of the grinding rolls and forces the material in the grinding pan into the path of the rolls. By thus supporting the plows from relatively short arms projecting downwardly from the spider 80 a very strong construction is provided which withstands the stresses imposed by the contact of the plows with the material in the grinding pan much more effectively than where the plows are carried upon relatively long arms, as is common in prior constructions, and the liability of the plow carriers to breakage or distortion is greatly decreased.

The spider 80 preferably carries a horizontally disposed shield 85 extending beyond the inner edge of the stationary flange 12 aforesaid and serves to retain the pulverized material and the dust in the grinding chamber.

The interior of the lower end of the quill shaft 25 is provided with a suitable packing 91 such as fiber or soft metal which may be secured therein against the lower bushing 90 by a suitable stuffing box 92 having a flange secured to the underside of the spider 80 by bolts 93 or other suitable fastenings.

It is to be understood that the construction illustrated and disclosed herein is illustrative merely and that it is not restrictive; and that the invention may be embodied in other forms; for example, while the central shaft is shown as being solid and stationary, it may within the contemplation of the invention, be made hollow, or may be provided with means for rotating the same. Means may also be provided for supporting a fan upon a rotatable central shaft inside of the quill shaft and many other and various changes in form and construction, etc., may be employed without departing from the spirit of this invention.

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

1. A centrifugal crushing mill comprising a chamber containing an annular die, a central upright shaft, a quill shaft rotatably mounted thereon, means carried by said quill shaft to support a series of centrifugally-actuated rolls adapted to coöperate with said die, means for supporting said quill shaft independently of said central shaft, and means for rotating the same.

2. A centrifugal crushing mill comprising a grinding chamber containing an annular die, a central upright shaft, a quill shaft rotatably mounted thereon, means for supporting said quill shaft independently of said central shaft, a carrier secured to said quill shaft, a series of centrifugally-actuated grinding members depending from said carrier and movable in substantially

radial planes in respect thereto to coöperate with said annular die and circumferential bearings between said quill shaft and said upright shaft both above and below said carrier.

3. A centrifugal crushing mill comprising a grinding chamber containing an annular die, a central upright shaft, a quill shaft having interior journal bearings adjacent its ends rotatably mounted thereon, a carrier secured to said quill shaft intermediate of said journals, a series of centrifugally-actuated grinding rolls depending from said carrier and movable in substantially radial planes in respect thereto to coöperate with said annular die, means for supporting said quill shaft independently of said central shaft and means for rotating the same.

4. A grinding mill having a base forming a grinding chamber containing an annular die, a central boss on said base, an upright shaft detachably mounted in said boss, a quill shaft rotatably mounted on said central shaft, overhead means for supporting said quill shaft, means carried by said quill shaft to support centrifugally-actuated grinding rolls, and means for rotating said quill shaft.

5. A grinding mill comprising a grinding chamber containing an annular die, a central upright shaft, a quill shaft mounted thereon having an overhead carrier, rolls pivotally supported by said carrier in operative relation to said annular die, an inclosing casing, a screen within said casing and spaced therefrom, a spider carried by the lower end of said quill shaft provided with downwardly extending arms supporting plows adapted to force the material in the grinding pan into the path of the grinding rolls.

6. In a grinding mill comprising a grinding chamber containing an annular die, a central upright shaft, a quill shaft mounted thereon and supportel independently thereof and having an overhead carrier pivotally supporting a series of depending rolls in operative relation to said annular die, an inclosed casing, a screen within said casing and spaced therefrom, a spider carried by said quill shaft provided with downwardly extending plow carriers and a shield to form a cover for the grinding chamber and to prevent the rising of the comminuted material or dust therefrom.

7. A centrifugal crushing mill comprising a grinding chamber containing an annular die, an upright shaft, a quill shaft having interior journals adjacent its ends rotatably mounted thereon, means for supporting said quill shaft independently of said upright shaft including a frame, a head adjustable thereon and coöperating bearing members in said head and upon said quill shaft.

8. A centrifugal crushing mill comprising a grinding chamber containing an annular die, a central upright shaft, a quill shaft rotatably mounted thereon, means for supporting said quill shaft independently of said upright shaft comprising a frame, a head supported thereby, and universally adjustable therein, a journal to receive said quill shaft, and thrust bearing members carried by said head and said quill shaft to support the latter.

9. A centrifugal crushing mill comprising a grinding chamber containing an annular die, a central upright shaft, a quill shaft rotatably mounted thereon, means for supporting said quill shaft independently of said upright shaft comprising a frame, a head supported thereby, and universally adjustable therein, a journal to receive said quill shaft, and thrust bearings carried by said head and said quill shaft to support the latter comprising a wear plate secured to said head, a wear plate fastened to said quill shaft, and antifriction means intermediate of said plate and said ring.

10. A grinding mill comprising a grinding chamber containing an annular die, a central upright shaft, a quill shaft mounted thereon, an overhead carrier secured to said quill shaft, centrifugally operable rolls depending from said carrier and means for supplying oil to said shafts and rolls comprising oil ducts formed by grooving the inner wall of said quill shaft and communicating ducts leading to the bearings of the grinder rolls.

11. A grinding mill comprising a grinding chamber containing an annular die, a central upright shaft, a quill shaft mounted thereon, an overhead carrier secured to said quill shaft, centrifugally operable rolls depending from said carrier, and means for supplying oil to said shafts and rolls comprising oil ducts formed by grooving the inner wall of said quill shaft, radial ducts in said carrier connecting therewith and flexible means connecting said radial ducts with the oil ducts leading to the grinders.

12. An overhead carrier for the rolls of a centrifugal roller grinding mill comprising a base having openings therein through which material to be ground may be fed to the grinding chamber, an upwardly extending flange forming a hopper, and laterally projecting members provided with bearings forming fulcrums for the spindles of said grinding rolls.

13. An overhead carrier for the rolls of a centrifugal roller grinding mill comprising a base having openings therein, an upwardly extending flange forming a hopper, and laterally projecting members provided with bearings forming fulcrums for the spindles of said grinding rolls to permit swinging movement in planes raidial thereto, said carrier being provided with lateral apertures therethrough to conduct a lubri-

cant from the supporting shaft to the journals of said spindles.

14. A spider for a centrifugal roller grinding mill made in a plurality of sections adapted to embrace a supporting driving shaft, means for clamping the sections of said spider upon the driving shaft, and downwardly extending integral arms adapted to support plows.

15. A spider for a centrifugal roller grinding mill made in a plurality of sections adapted to embrace the lower end of a supporting driving shaft, and having an annular groove adapted to receive a rib on said shaft, means for clamping the sections of said spider upon the driving shaft, and downwardly extending integral arms adapted to support plows.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

LOVINA M. GRIFFIN.

Witnesses:
ALBERT H. FEATHERSTONE,
E. G. GUAEDINGER.