

Dec. 14, 1948.

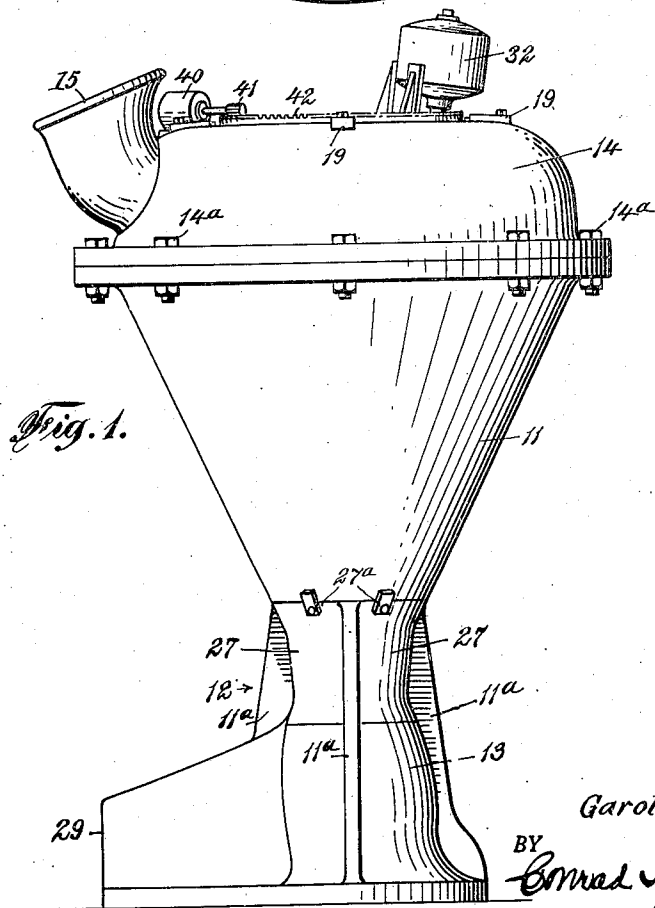
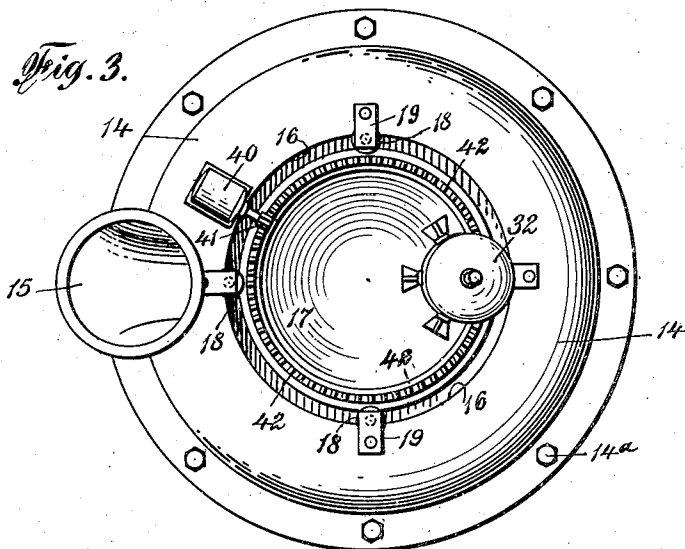
G. N. ROWLEY

2,456,150

GRINDING APPARATUS WITH UPPER GYRATORY DRIVE

Filed Jan. 1, 1945

3 Sheets-Sheet 1



INVENTOR.
Garold N. Rowley

BY *Conrad A. Dierck*
his ATTORNEY

Dec. 14, 1948.

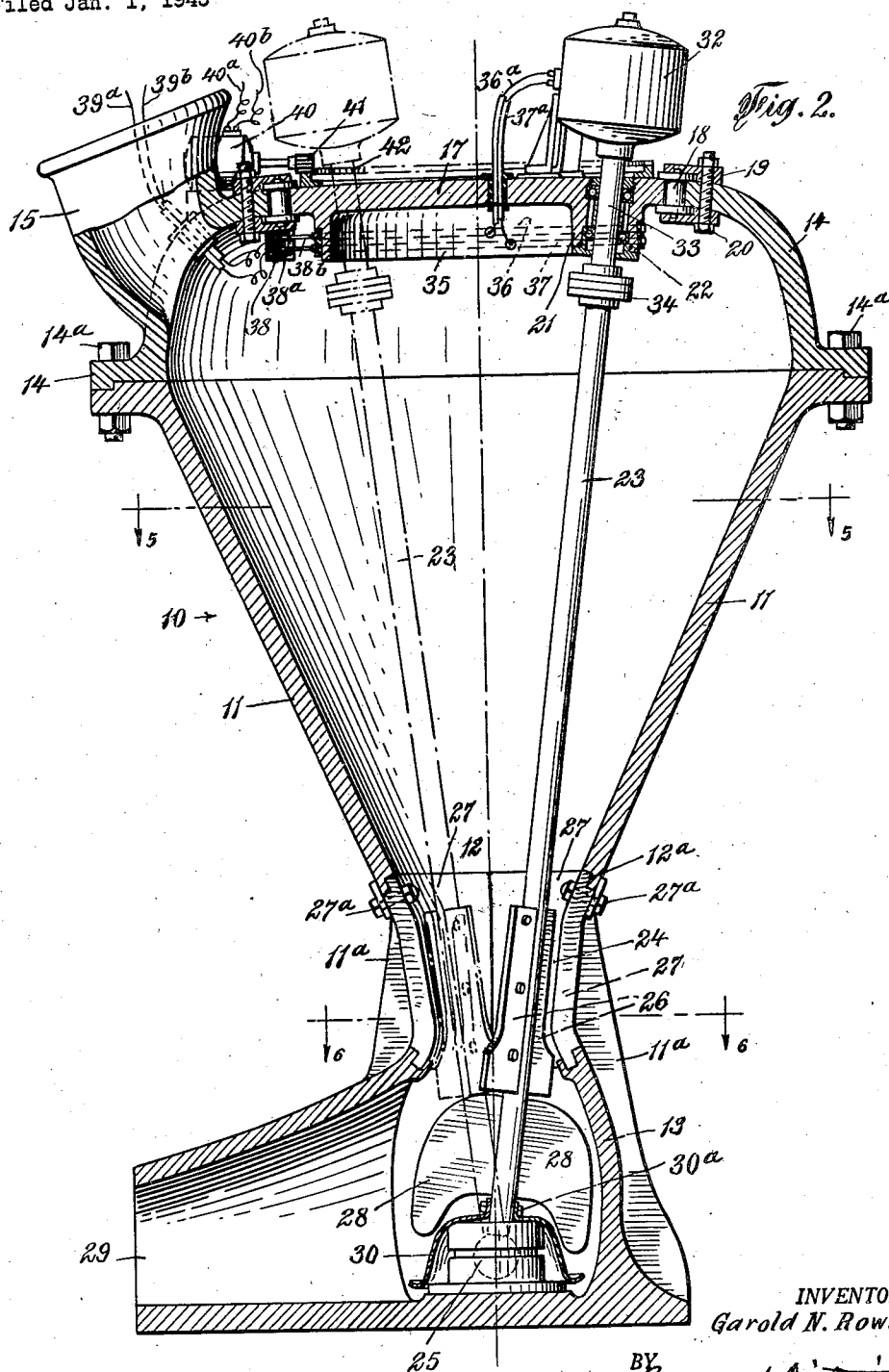
G. N. ROWLEY

2,456,150

GRINDING APPARATUS WITH UPPER GYRATORY DRIVE

Filed Jan. 1, 1945

3 Sheets-Sheet 2



INVENTOR.
Garold N. Rowley

BY
Ernest A. Dietrich
his ATTORNEY

Dec. 14, 1948.

G. N. ROWLEY

2,456,150

GRINDING APPARATUS WITH UPPER GYRATORY DRIVE

Filed Jan. 1, 1945

3 Sheets-Sheet 3

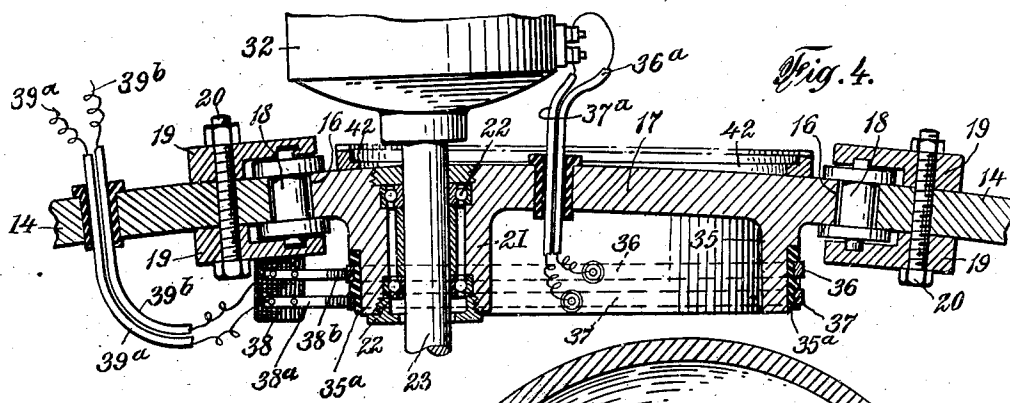


Fig. 5.

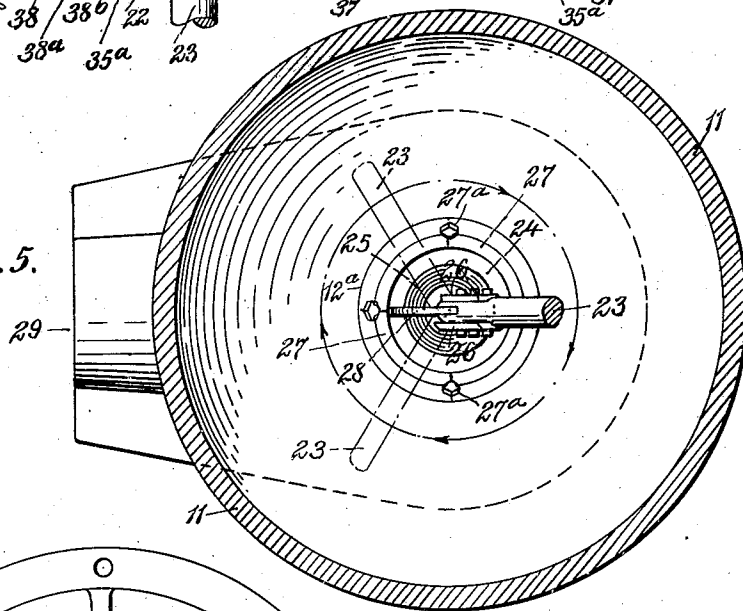


Fig. 6.

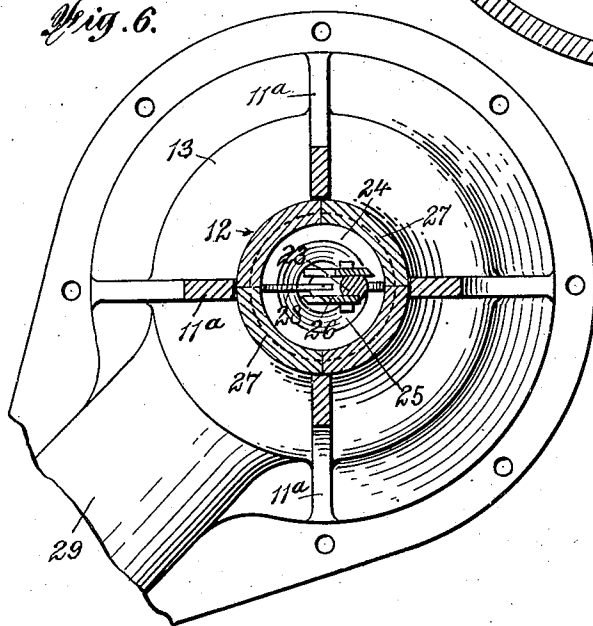
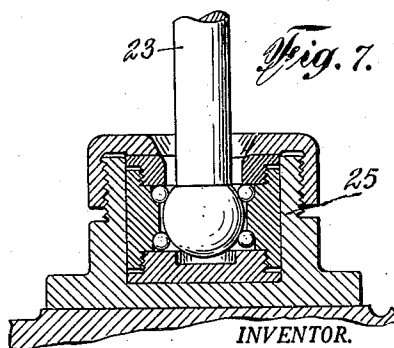


Fig. 7.



INVENTOR.

Garold N. Rowley

BY

Conrad A. Dietrich

his ATTORNEY

BEST AVAILABLE COPY

UNITED STATES PATENT OFFICE

2,456,150

GRINDING APPARATUS WITH UPPER
GYRATORY DRIVE

Garold N. Rowley, Fort Pierce, Fla.

Application January 1, 1945, Serial No. 570,903

9 Claims. (Cl. 241-212)

1

My invention relates to improvements in grinding or crushing apparatus, and the same has for its object to provide a comparatively simple, efficient and reliable apparatus for grinding, crushing or disintegrating wood and other materials.

Further, said invention has for its object to provide an apparatus for readily and effectively reducing or disintegrating wood and other materials in order to render the same suitable for use as fuel, or for other purposes.

Further, said invention has for its object to provide an apparatus in which the wood or material to be acted upon is continuously agitated and fed to the reducing or crushing mechanism.

Further, said invention has for its object to provide an apparatus in which the cutting, reducing or disintegrating means is caused to move in a cono-epicycloidal path to effect the continuous agitation feeding and reduction of the wood or material acted upon.

Further, said invention has for its object to provide an apparatus in which the material is acted upon between the tapering or conical wall of a receptacle and a cutting or reducing medium which is caused to travel in a cono-epicycloidal path in close relation to said conical wall in order to reduce the material in a continuous operation therebetween.

Other objects will, in part, be obvious, and, in part, be pointed out hereinafter.

To the attainment of the aforesaid objects and ends my invention consists in the novel features of construction, and in the combination, connection and arrangement of parts hereinafter more fully described and then pointed out in the claims.

In the accompanying drawings—

Figure 1 is a side elevation illustrating one form of apparatus constructed according to, and embodying my said invention;

Figure 2 is a central vertical section of Figure 1, on an enlarged scale;

Figure 3 is a top plan view of Figure 1;

Figure 4 is an enlarged detail sectional view of Figure 1 of the upper part of the hopper and its associated parts;

Figure 5 is a horizontal section on the line 5-5 of Figure 2;

Figure 6 is a fragmentary section on the line 6-6 of Figure 2, on an enlarged scale; and

Figure 7 is a detail, vertical sectional view of the bearing for the cutter shaft.

In said drawings, 10 designates the apparatus as a whole, which is preferably constructed of

2

metal and comprises a conical hopper 11, a hollow base portion 13 and an intermediate constricted portion 12, provided upon its outer sides with a plurality of radial reinforcing ribs 11^a. The upper portion of the hopper 11 is open and provided with a removable convex cover 14 secured by bolts 14^a. The cover 14 is provided at one side with an intake 15, and at its central portion with a circular opening 16 in which is rotatably supported a cover plate 17.

The cover plate 17 is supported at its edges upon a plurality of finaged rollers 18, supported in vertical position along the inner edge of the opening 16 between upper and lower bearing plates 19 secured to the cover 14 by bolts 20 and extending inwardly from the edge of said opening. The cover 17 is provided with an eccentrically disposed bearing 21, see Figure 4, having a ball bearing 22 in which works a cutter shaft 23. The shaft 23 extends downwardly within the hopper 11, and through the passage 24 of the constricted intermediate portion 12, and has its extreme lower end pivotally supported in a ball bearing or universal joint 25. The portion of the shaft 23 located within the constricted passage 24 has its opposite sides cut away or flattened against which are bolted cutters or knives 26 having their outer or working edges conformed substantially to cooperating segmental wear plates 27 secured by bolts 27^a within the recessed openings 12^a provided in the wall of the constricted portion 12 between the reinforcing ribs 11^a and forming a continuous annular wall, between which and the cutters or knives 26 the material to be treated is ground and reduced. The wear plates 27 are preferably formed of a hard metal or alloy such as, for example, manganese steel.

Below the cutters or blades 26, the shaft 23 is provided with fan blades 28, forming a blower, working in the hollow base 13, and serving to eject the ground or reduced material through the discharge outlet 29 of the base.

The lower end of the shaft 23 and its bearing 25 are enclosed by a dust-cover 30 which is secured by a suitable clamping device 30^a to said shaft 23.

Upon the top of the cover plate 17 is secured the base portion of an electric motor 32, whose shaft 33 is connected at one end by a flexible coupling 34 to the upper end of the cutter shaft 23, thereby axially rotating the cutter shaft 23.

35 denotes an annular flange which projects downwardly from the underside of the cover plate 17 and is provided with a facing of insulat-

ing material 35^a having secured to or imbedded therein annular conductors 36, 37, and connected by conductors 36^a, 37^a respectively, to the field of the electric motor 32. Upon the under side of the convex top 14, adjacent the opening 16 therein, is secured a support 38, see Figure 4, of insulating material upon which are secured brushes or shoes 38^a, 38^b, engaging the annular conductors 36, 37, and connected to conductors 39^a, 39^b, respectively, extending from a source of electric energy which serves to drive the motor 32 to operate the cutter shaft 23.

Upon the upper side of the convex cover 14 of the hopper 11 is mounted an electric motor 40 connected to a source of electric energy by conductors 40^a, 40^b, and having a pinion 41 on its shaft meshing with a circular rack 42 fixed upon the cover plate 17, adjacent the edge thereof whereby, when the motor 40 is energized, the cover plate 17 is rotated and the shaft 23 operated. As the shaft 23 is eccentrically mounted with respect to the cover plate 17, said shaft is bodily rotated thereby and by reason of its axial rotation, said shaft revolves or travels in a cono-epicycloidal path, and the cutters or knives 26 to describe a corresponding movement and cooperate with the wear plates 27 to grind, crush or reduce the pieces of wood or other material as the same pass between said cutters and said wear plates.

The operation of the apparatus will be largely obvious from the foregoing description. It is to be noted, however, that the pieces of wood or other material are fed into the hopper through the intake opening 15, and agitated by the shaft 23, as the same revolves. As the pieces reach the constricted passage 24, the same will be crushed or ground by the action of the cutters 26 moving in a conical path, opposite all portions of the annular wall formed by the wear plates 27 of the constricted passage 24, and then drop into the hollow base 13, and be ejected through the discharge spout 29 by the action of the fan blades 28 on the lower end of the cutter shaft 23.

In order to effect the proper agitation and feeding of the material within the hopper and the reduction of the material, cutter shaft 23 and cutters 26 may be rotated at a higher speed than the cover plate 17 and related parts. For example the cutter shaft 23 might be operated at about 3,000 to 3,500 revolutions per minute, while the cover plate 17, and its related parts, are revolved at about 50 to 75 revolutions per minute.

Further, it is to be noted that the efficiency of the apparatus is attained by the cono-epicycloidal motion with which the cutter shaft 23 is rotated within the hopper. Due to this motion, the wood or other material within the hopper is maintained in a state of constant agitation and fed continuously to the cutting mechanism, and the pieces reduced to the desired degree by the rotary movement of the cutter shaft and cutters in a circular or conical path in cooperation with the conforming wall of the passage 24.

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

1. An apparatus of the character described comprising a conical hopper, for receiving the material to be acted upon, a convex cover having a central circular opening secured to the open top of said conical hopper, said hopper having a constricted passage adjacent its base, a circular cover plate rotatably mounted in said circular opening, said cover plate having an eccentrically disposed opening, a shaft rotatably mounted in said eccentrically disposed opening and extending into said

constricted passage, means for rotating said circular cover, cutting means carried by said shaft and working in said constricted passage, and means carried by said circular cover for axially revolving said shaft, whereby said shaft is revolved and actuated in a conical path adjacent the walls of said hopper, and said cutting means co-acts with the wall of said passage to reduce the material therebetween.

2. An apparatus of the character described comprising a hopper having tapering inner walls, a cover therefor, and a constricted opening in its base, a revoluble member in said cover, an inclined shaft disposed in said hopper with its upper end supported in said revoluble member and its lower end extending through said opening, a fixed bearing below said opening pivotally supporting the lower end of said shaft, means for moving said rotatable member and shaft in a circular path, cutters on said shaft located in said opening, and means for rotating said shaft and cutters independently of the means for rotating said rotatable member and the upper end of said shaft in a conical path to cause said cutters to reduce the material between said cutters and the wall of said opening.

3. An apparatus of the character described comprising a hopper having tapering inner walls, a cover therefor having a central opening therein, and a constricted opening in its base, a revoluble member working in said opening, a bearing eccentrically disposed on said revoluble member, an inclined shaft disposed in said hopper with its upper end supported in said eccentric bearing and its lower end extending through said constricted opening, a fixed bearing below said constricted opening pivotally supporting the lower end of said shaft, means on said cover for actuating said rotatable bearing in a circular path, cutters on said shaft located in said opening, and means on said rotatable member for rotating said shaft and cutters independently of the means for actuating said revoluble member and the upper end of said shaft therein in a conical path to cause said cutters to reduce the material between said cutters and the wall of said opening.

4. An apparatus of the character described comprising a hopper provided with intake and discharge openings, said hopper having tapering inner walls, a cover therefor having a central, circular opening therein, a hollow base, and a constricted opening intermediate said base and hopper, a revoluble plate working in the circular opening in said cover, a bearing eccentrically disposed on said revoluble plate, an inclined shaft disposed in said hopper with its upper end supported in said eccentric bearing and its lower end extending through said constricted opening, a bearing in said base pivotally supporting the lower end of said shaft, means carried by said revoluble plate for rotating the same, cutters on said shaft located in said constricted opening, and means carried by said cover for rotating said revoluble plate and the upper end of said shaft in a conical path to cause said cutters to reduce the material between said cutters and the wall of said opening.

5. An apparatus of the character described comprising a hopper provided with intake and discharge openings, said hopper having tapering inner walls, a cover therefor having a central, circular opening therein, a hollow base, and a constricted opening intermediate said base and hopper, a revoluble plate working in the circular opening in said cover, a bearing eccentrically dis-

5

posed on said revoluble plate, an inclined shaft disposed in said hopper with its upper end supported in said eccentric bearing and its lower end extending through said constricted opening, a bearing in said base pivotally supporting the lower end of said shaft, and means in said hollow base for ejecting the material through said discharge opening.

6. An apparatus of the character described comprising a hopper having tapering inner walls, a cover therefor having a central circular opening therein, a hollow base, and a constricted opening intermediate said base and hopper, a plate revolubly disposed in the circular opening in said cover, a bearing eccentrically disposed on said plate, an inclined shaft disposed in said hopper with its upper end supported in said eccentric bearing and its lower end extending through said constricted opening, a bearing in said base pivotally supporting the lower end of said shaft, a motor carried by said revoluble plate for rotating said shaft, cutters on said shaft located in said constricted opening, and a motor mounted on said cover and operatively associated with said revoluble plate for rotating said plate, and moving the upper end of said shaft in a conical path to cause said cutters to reduce the material between said cutters and the wall of said opening.

7. An apparatus of the character described comprising a hopper provided with intake and discharge openings and having tapering inner walls, a constricted opening in its base, an inclined shaft disposed in said hopper with its lower end extending through said opening, a bearing on said base pivotally supporting the lower end of said shaft, a rotatable bearing adjacent the upper end of said hopper for the free end of said shaft, means for moving said rotatable bearing in a circular path, cutters on said shaft located in said opening, and means for rotating said shaft and cutters and the upper end of said shaft to

6

travel in a conical path, to cause said cutters to reduce the material between said cutters and the wall of said opening, and a blower in said base associated with said shaft for ejecting the material through said discharge opening.

8. An apparatus for grinding material, comprising a hopper having a tapering inner wall and a constricted passage adjacent its base, said hopper having an open top; a convex cover secured to the open top of said hopper, said cover having a circular opening; a circular cover plate for said circular opening, said cover plate having an eccentrically disposed opening; means for rotating said circular cover plate within said circular opening; a shaft extending through said eccentrically disposed opening and inclinedly through said constricted passage; cutting means carried by said shaft in the zone of said constricted passage; means for pivotally supporting the lower end of said shaft; and means for axially rotating said shaft.

9. An apparatus as defined by claim 8, in which segmental wear plates are secured in said constricted passage of the hopper.

GAROLD N. ROWLEY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
74,682	Greenleaf	Feb. 18, 1868
81,526	Montgomery	Aug. 25, 1868
432,446	Simpson	July 14, 1890
1,675,694	Claybourn	July 3, 1928
2,186,596	Spohn, Jr.	Jan. 9, 1940

FOREIGN PATENTS

Number	Country	Date
345,465	Great Britain	Mar. 26, 1931