May 8, 1928. 1,669,264

L. C. REIS

BILLET SURFACING MACHINE

Filed July 12, 1926 7 Sheets-Sheet 1

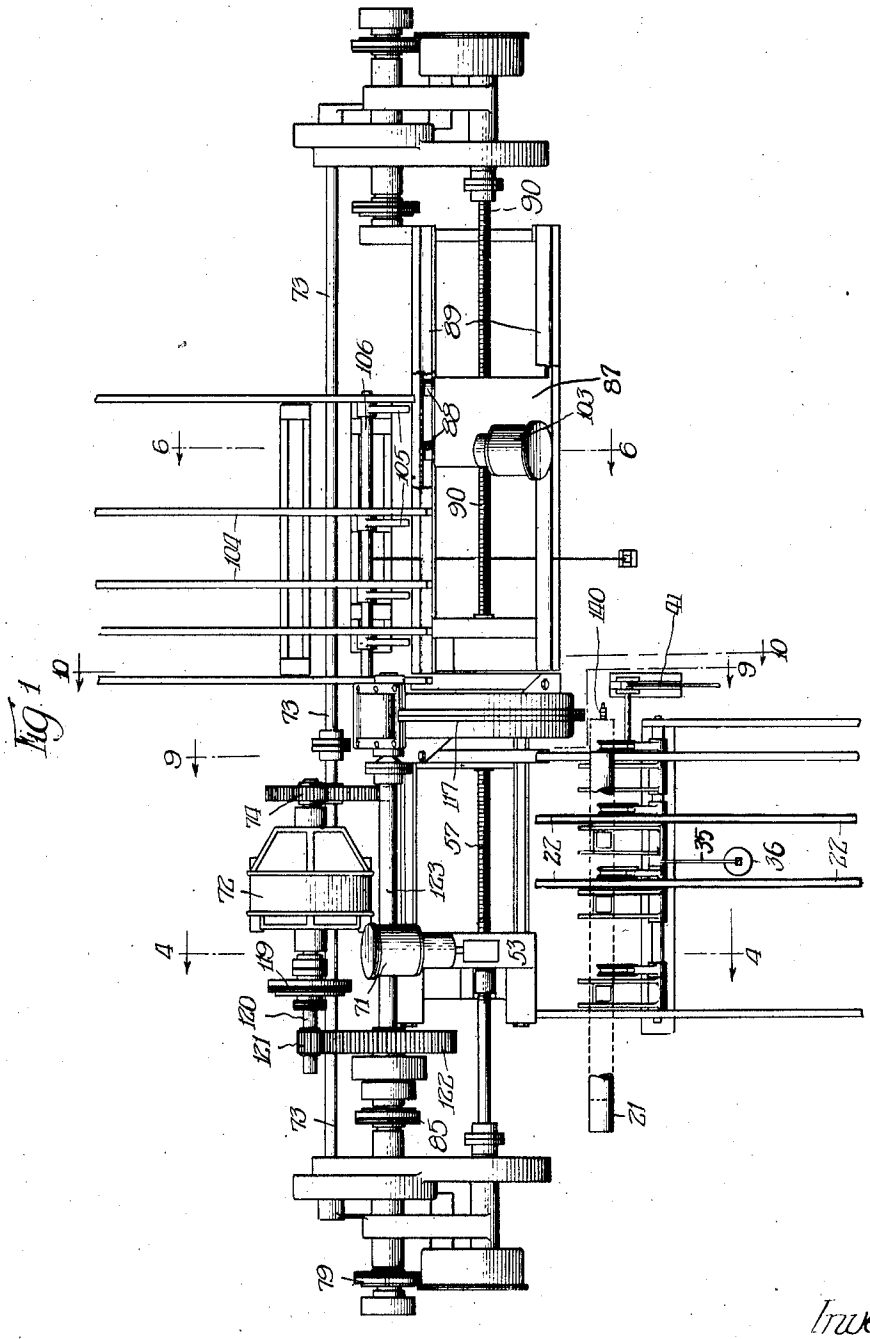


Fig. 1

Witness:
R. Burkhardt.

Inventor:
Louis C. Reis.
By A. Anthony Usina
Atty.

May 8, 1928. 1,669,264

L. C. REIS

BILLET SURFACING MACHINE

Filed July 12, 1926 7 Sheets-Sheet 2

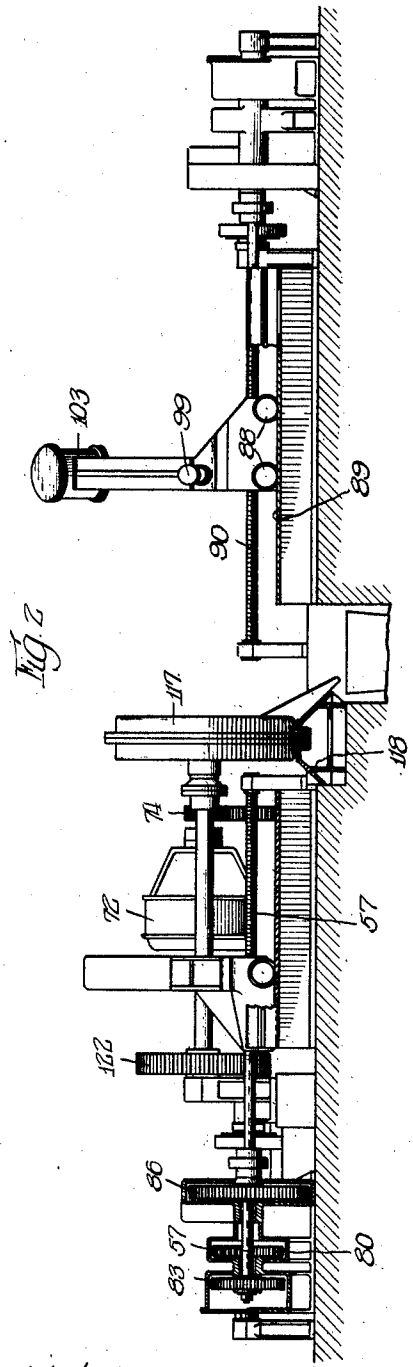


Fig. 2.

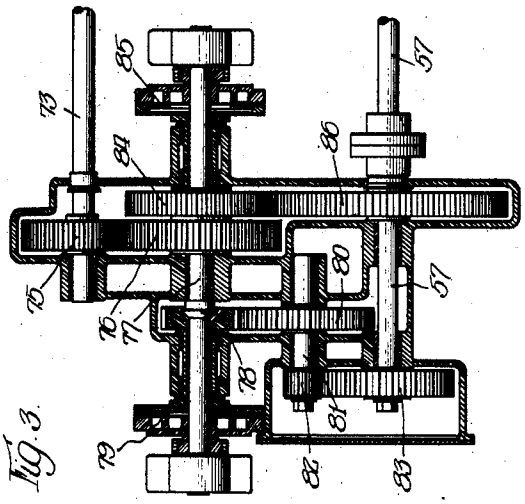


Fig. 3.

Witness:
R. Burkhardt.

Inventor:
Louis Reis,
By L. Anthony Reis
Atty.

May 8, 1928. 1,669,264

L. C. REIS

BILLET SURFACING MACHINE

Filed July 12, 1926 7 Sheets-Sheet 3

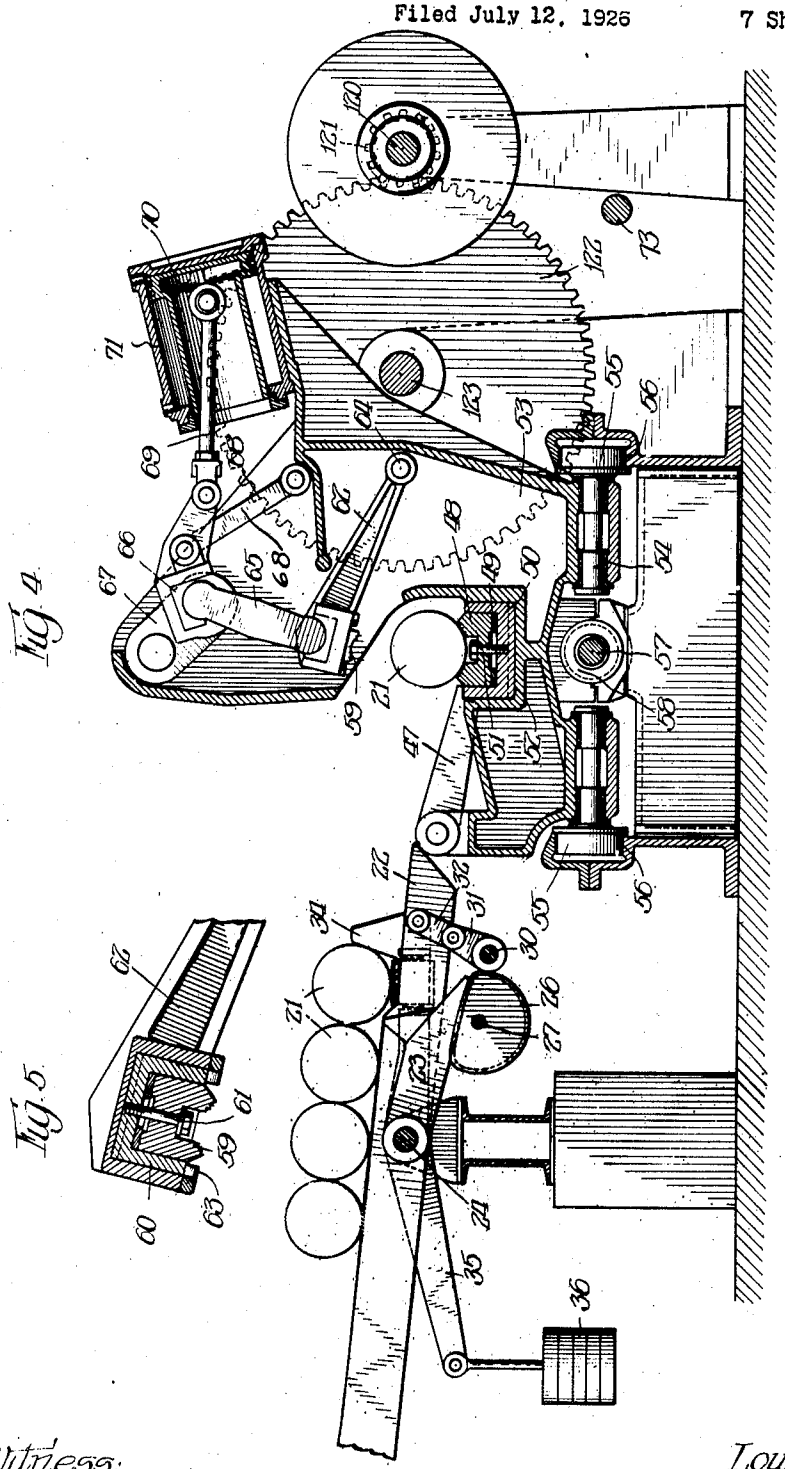


Fig. 4

Fig. 5

Witness:
R. Burkhardt

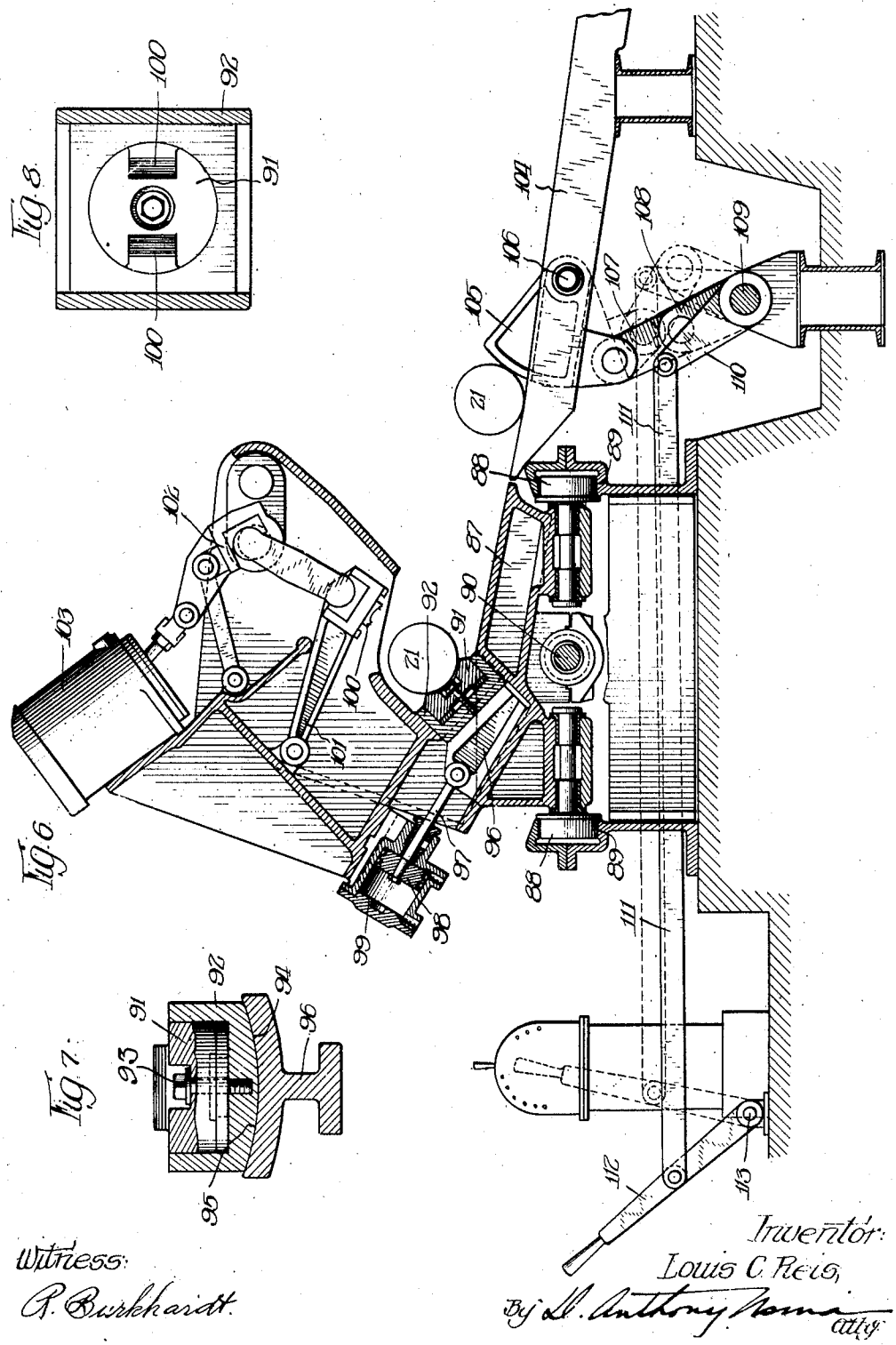
Inventor:
Louis C. Reis.
By S. Anthony Manna
Atty.

May 8, 1928. 1,669,264

L. C. REIS

BILLET SURFACING MACHINE

Filed July 12, 1926 7 Sheets-Sheet 4



Witness:
R. Burkhardt.

Inventor:
Louis C. Reis,
By A. Anthony Thomas
Atty.

May 8, 1928. 1,669,264

L. C. REIS

BILLET SURFACING MACHINE

Filed July 12, 1926 7 Sheets-Sheet 5

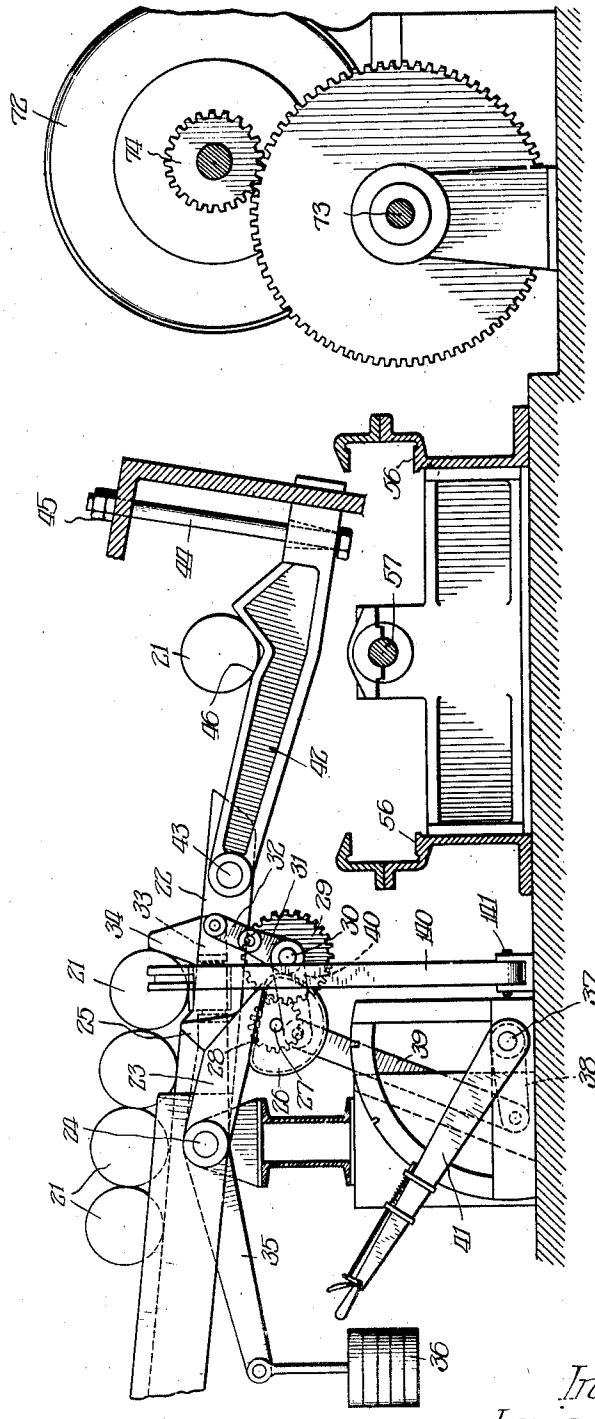


Fig. 9.

Witness:
R. Burkhardt

Inventor:
Louis C. Reis,
By H. Anthony Kline
atty.

May 8, 1928. 1,669,264

L. C. REIS

BILLET SURFACING MACHINE

Filed July 12, 1926 7 Sheets-Sheet 6

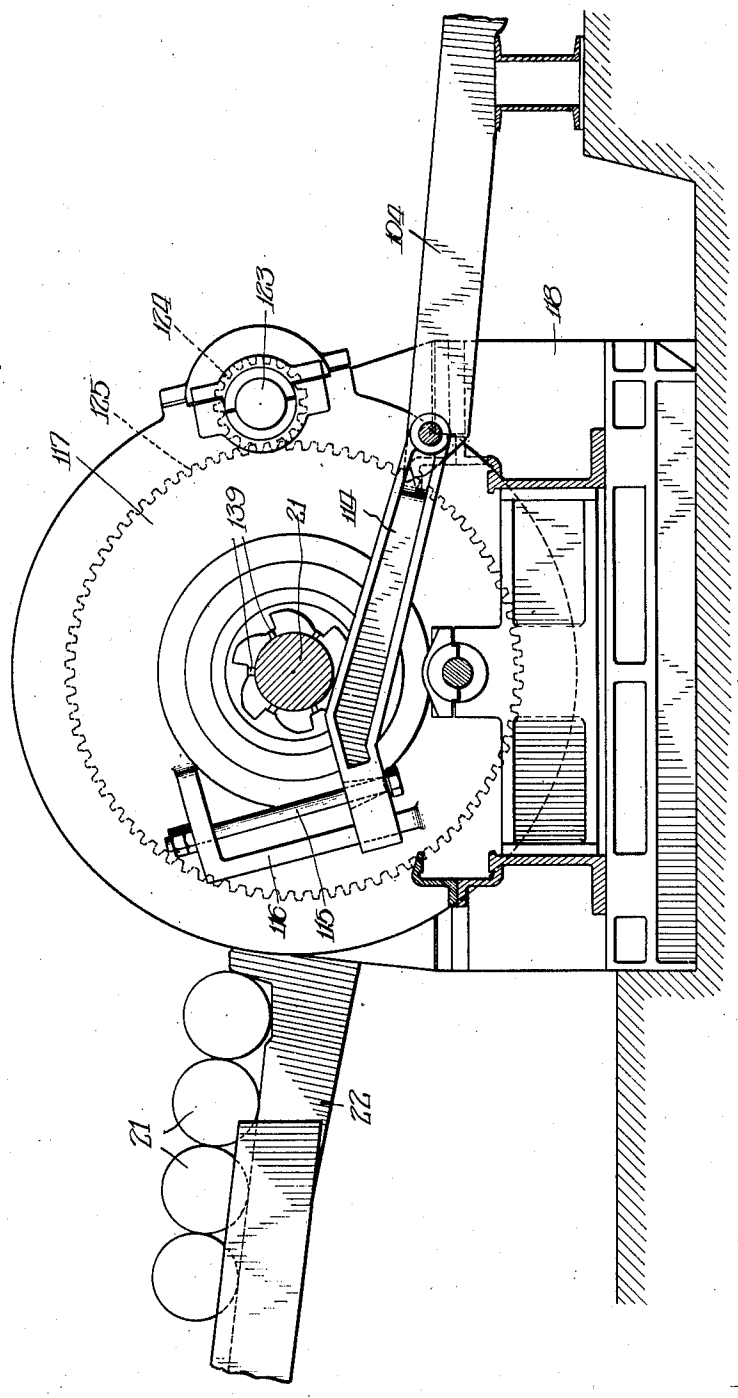


Fig. 10.

Witness:
R. Burkhardt.

Inventor:
Louis C. Reis,
By H. Anthony Usina
Attg.

May 8, 1928. 1,669,264

L. C. REIS

BILLET SURFACING MACHINE

Filed July 12, 1926 7 Sheets-Sheet 7

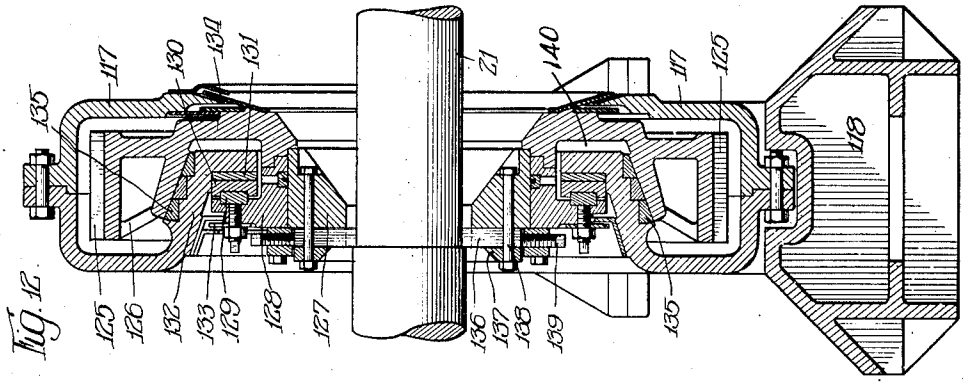


Fig. 12.

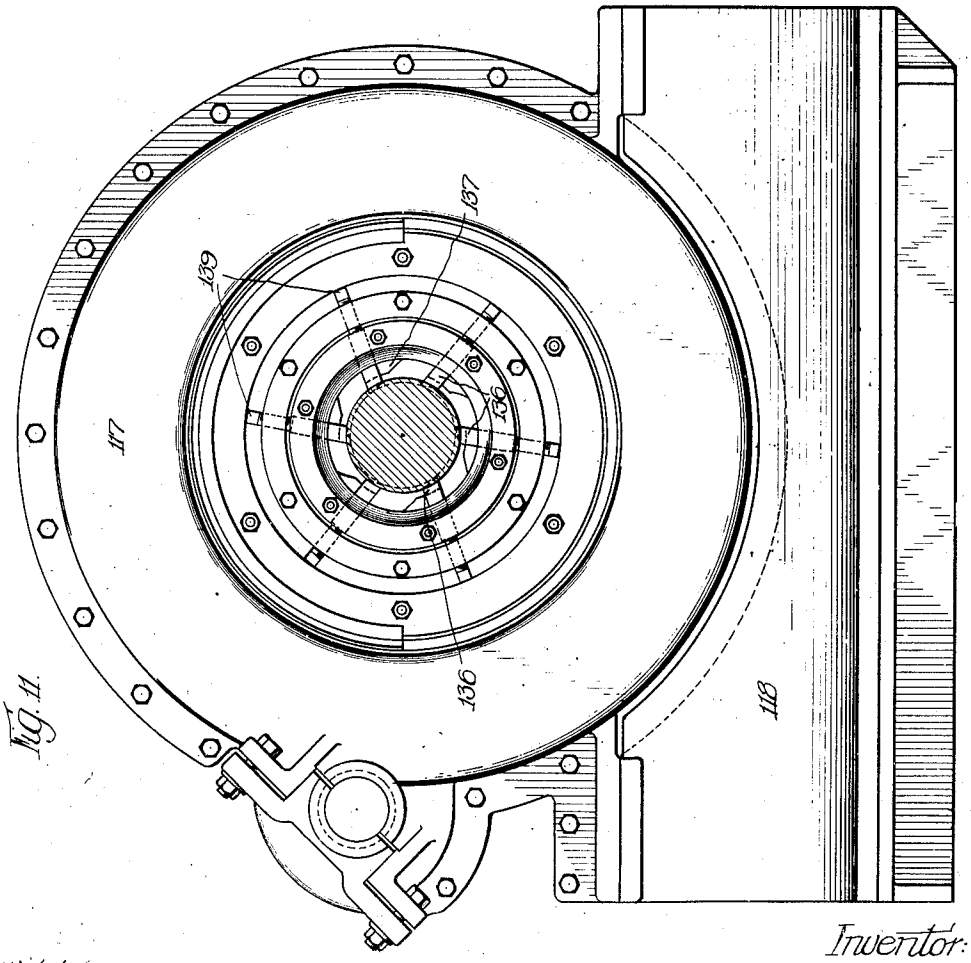


Fig. 11.

Witness:
R. Burkehardt

Inventor:
Louis C. Reis,
By L. Anthony Reis
Atty.

Patented May 8, 1928. 1,669,264

UNITED STATES PATENT OFFICE.

LOUIS C. REIS, OF DULUTH, MINNESOTA.

BILLET-SURFACING MACHINE.

Application filed July 12, 1926. Serial No. 121,857.

This invention relates to a new and improved billet surfacing machine, and more particularly to a machine adapted to remove a surface layer from billets which are not absolutely straight.

In the making of seamless tubing, billets are rolled down to cylindrical form usually six or eight inches in diameter and are afterwards pierced. Billets as rolled have a number of surface defects which must be removed, if the tubing made by the piercing operation is not to be defective. These billets are not absolutely straight as they come from the rolls and it would be a matter of considerable expense to straighten them. The variation from exact straightness is not great and seldom exceeds one-half inch in a billet six or eight feet long. This, however, is sufficient to render it impossible to turn the billets in a turret lathe as there would be lack of uniformity of cut and a considerable loss of metal. An attempt has heretofore been made to remove the surface defects by a chipping operation but this has proven expensive and inefficient. While some of the defects are readily visible to the eye, others which will develop in the piercing operation are not readily apparent on the surface of the billet. For the maximum amount of out-put of perfect tubes, therefore, it is highly desirable that the entire surface of the billet be removed to a depth sufficient to eliminate the surface defects.

In its preferred form my invention comprises a rotating cutter head and gripping members movable toward and away from the head for passing the billets through the head. The cutter head is fixed in position but rotates about the axis of the billet to perform its cutting action. The feeding mechanisms move in a line perpendicular to the plane of the cutting head. Since the axis of each billet is somewhat bent or curved, it will be apparent that this axis will not coincide exactly with the line of movement of the feeding mechanisms. For this reason the feeding mechanisms must be provided with gripping members which will firmly grip the billets although their axes make an angle with the line of movement of the gripping mechanism. The angle between the axis of the billet and of the line of movement will vary in each case and also vary as the gripping mechanisms approach or recede from the rotating cutter head. For this reason the gripping elements are so constructed as to permit this oscillation of the axis of the billet while retaining the billet firmly gripped and preventing its rotation about its axis.

It is an object of the present invention to provide an apparatus adapted to remove a portion of the entire surface of billets or the like which are not straight.

It is a further object to provide a machine of this character adapted to cover the entire surface of such billets with the removal of substantially a uniform amount of metal.

It is an additional object to provide a machine which is adapted to mechanically feed the billets to the machine and remove them therefrom rapidly and with a minimum of hand labor.

Other and further objects will appear as the description proceeds.

I have illustrated a preferred embodiment of my invention in the accompanying drawings, in which

Figure 1 is a plan view of the apparatus;

Figure 2 is a longitudinal elevation of the apparatus with parts broken away;

Figure 3 is a fragmentary section on an enlarged scale showing the drive entering the side grip assembly;

Figure 4 is a section on an enlarged scale taken on line 4—4 of Figure 1;

Figure 5 is a fragmentary section of the upper grip of Figure 4;

Figure 6 is a section on an enlarged scale taken on line 6—6 of Figure 1;

Figure 7 is an enlarged fragmentary section of the lower grip of Figure 6;

Figure 8 is an enlarged face view of the upper grip of Figure 6;

Figure 9 is an enlarged cross section taken on line 9—9 of Figure 1;

Figure 10 is an enlarged cross section taken on line 10—10 of Figure 1;

Figure 11 is an enlarged face view of the cutter mechanism; and

Figure 12 is a longitudinal section through the cutter mechanism.

Referring first to Figure 9 which shows the apparatus for feeding billets to the machine, the billets 21 rest upon the sloping skids 22 down which they roll toward the machine by gravity. The arm 23, pivoted on shaft 24 carries the stop lug 25. The arm 23 rests on cam 26 which latter is se-

cured to shaft 27, this shaft also carrying the gear 28 meshing with gear 29 on shaft 30. The shaft 30 carries the arm 31 which is connected by link 32 to the end of lever 33 carrying stop lug 34. The lever 33 is pivoted on shaft 24 and its opposite end 35 carries the counterbalance weights 36.

The shaft 30 is rotated by means of shaft 37 which carries the arm 38 connected by link 39 to the arm 40 secured to shaft 30. The shaft 37 is rotated by lever 41. The billets may be moved longitudinally to properly position them by means of lever 140 pivoted at 141 as shown in Figure 9.

The billets 21 roll from the skids 22 on to the adjustable support 42, one end of which is pivotally connected to one of the skids 22 at 43, while the other end is supported from the hanger rod 44. This rod may be adjusted vertically by means of nuts 45. The seat 46 on the member 42 is so adjusted as to direct the end of the billet properly along the axis of the rotating cutter which will be described hereafter.

Figure 4 shows the entering side grip which engages a portion of the billet spaced from the support 42, which latter is closely adjacent the cutter. The billets roll down the guide 47 to rest on the lower gripping face 48. This member 48 is circular in plan and is rotatably supported on the wear plate 49 in the rocking member 50. The member 48 is retained in place by the screw 51. The lower face 52 of the member 50 is cylindrical in contour and adapted to rock about an axis perpendicular to the axis of movement of the billets through the machine.

This gripping construction is supported by the movable carriage 53 which is supported by axles 54 and wheels 55 from the tracks 56. The carriage is movable along the tracks by means of the threaded shaft 57 which is engaged by the threaded traveler nut 58 upon the carriage.

The upper gripping face 59 is rotatably secured in the rocking member 60 by the bolt 61. The member 60 has a cylindrical upper face and is retained in its seat in the gripper arm 62 by the overhanging edges 63. The gripper arm 62 is pivoted at 64 on the carriage 53. The arm 62 is connected by lower toggle link 65 to toggle head 66 and upper toggle link 67. The toggle head 66 is connected by the cam link 68 to the carriage 53 and by the piston rod 69 to the piston 70 working in the cylinder 71.

The motor 72, shown in Figures 1 and 2, drives the main power shaft 73 through the reduction gearing 74. The threaded shaft 57, for moving the carriage 53, is driven from the shaft 73 by means of the gearing shown in Figure 3. The shaft 73 carries gear 75 meshing with gear 76 on the intermediate shaft 77. The gear 78 is carried by shaft 77 and is adapted to be locked to the shaft to rotate with it by means of the magnetic clutch 79. The gear 78 meshes with gear 80 on stub shaft 81 which also carries gear 82 meshing with gear 83, which latter is secured to the threaded shaft 57. This gearing serves to drive the carriage toward the cutter at relatively slow speed.

The high speed gearing for retracting the carriage comprises the gear 84, carried by shaft 77 and adapted to be secured to that shaft by the magnetic clutch 85. This gear 84 meshes with gear 86 carried by the threaded shaft 57.

The discharge side grip is supported upon the carriage 87 which runs upon wheels 88 resting on tracks 89 as shown in Figure 6. This carriage is moved by the threaded shaft 90 which is driven by shaft 73 through a system of gears and clutches exactly similar to those described in connection with the threaded shaft 57.

The lower gripping face 91 is carried upon the rocking member 92 and is rotatably secured thereto by the screw 93 as shown in Figure 7. The member 92 has the cylindrical face 94 bearing on a similar face 95, formed on the upper surface of the wedge member 96. The wedge member 96 is connected by rod 97 with piston 98 working in cylinder 99. By means of this cylinder the wedge may be moved to move the gripping face 91 toward or away from the axis of the billet in the machine.

The upper gripping face 100 is supported and operated similarly to the upper gripping member of the entering side grip. It is provided with a universal support similar to that shown in Figure 5 and is carried upon arm 101 and operated by the toggle construction 102 and cylinder 103.

Billets released by the gripping faces 91 and 100 roll down the sloping surface of the carriage on to the skids 104 against the paralleling stop members 105. The ends of the billets as they leave the cutters drop on the guide member 114, shown in Figure 10, which is adjustably supported by the hanger 115 from the bracket 116 on the cutter assembly housing 117. The other end of the member 114 is pivotally connected to one of the skids 104. The member 114 is parallel to the sloping carriage surface.

The stop members 105 are carried upon the rock shaft 106 which is connected through link 107 and arm 108 to the shaft 109. The shaft 109 also carries arm 110 which is connected by rod 111 to the operating lever 112, which latter is pivoted at 113.

The cutter assembly housing 117 is supported on the base 118 between the two billet feed assemblies. The main drive motor 72 is connected by the magnetic clutch 119 to shaft 120 carrying the pinion 121 meshing with the gear 122 on the cutter drive shaft

123. The shaft 123 also carries the gear 124 which meshes with the cutter gear 125 as shown in Figure 10.

The cutter assembly is shown in detail in Figures 11 and 12. The gear 125 is formed on the cutter body 126 to which is secured the cutter carrying ring 127 and the thrust bearing ring 130. This ring 130 engages ring 131 which abuts against the flange 132 formed integrally with the cutter casing 117. Dust guards 133 and 134 are provided on opposite sides of the assembly. The member 126 engages the packing 135 carried by flange 132.

The cutters 136 are clamped in place by ring 137 secured to member 126 by bolts 138. The space 140 is provided to hold lubricant which is retained in place by packing 135. The cutters 136 are adjusted toward and away from the work by the screws 139.

The operation of the machine will be generally apparent from the foregoing description. The billets are placed on the skids 22 upon the feed side of the machine and are permitted to roll one at a time down on to the adjustable support 42 and the entering side gripping face 48. A movement of the lever 41 as shown in Figure 9 in the clockwise direction serves to rotate the shaft 30 and by means of the arm 31 and link 32 pull down the stop members 34, thus releasing the foremost billet 21. As the shaft 30 is rotated the shaft 27 carrying the cam 26 is also rotated which forces up the stops 25 in front of the next billet 21, thus only one billet is allowed to roll down on to the machine. The reverse movement of the lever 41 raises the stops 34 and lowers the stops 25, thus permitting the series of billets to roll down against the stops 34.

When the billet rests upon the seat 46 of the support 42 and upon the gripping face 48, the upper gripping face 59 is brought down against the billet by the introduction of fluid under pressure into the cylinder 71. This serves to operate the toggle construction and the billet is firmly gripped so as to prevent rotation about its axis. Due to the pivoted support of the gripping faces and the cylindrical faces of the members carrying the gripping faces, a limited universal movement of the billet is permitted. The forward end of the billet rests on the seat 46 which is adjusted to center this end of the billet and properly introduce it into the cutter assembly. It will be understood that the support 42 will be adjusted according to the size of billets being worked, but there will be no need of adjustment for individual billets which will be substantially uniform.

The motor 72 is running and power is given the threaded shaft 57 by throwing in the magnetic clutch 79. This causes the shaft 57 to rotate in such direction as to feed the carriage 53 toward the cutting head. The billet slides into the head over the seat 46, being carried forward by the entering grip. The cutting head is rotating through power also supplied by the motor 72. The magnetic clutch 119 being thrown in, the cutters 136 successively engage the billet and its surface is uniformly turned down as it is forced through the rotating cutting head. When the end of the billet extends through the cutting head sufficiently for it to be gripped, the carriage 87 is moved toward the cutting head by the threaded shaft 90, operated by the gear and clutch assembly at the right end of the apparatus. The lower gripping face 91 is brought against the billet by proper application of fluid under pressure to the cylinder 99 actuating the wedge member 96. The upper gripping face 100 is then brought against the billet by operation of the toggle mechanism 102 by power supplied through cylinder 103. It will be understood that this gripping is accomplished while the carriage 87 is moving in the same direction as the billet and at the same speed so that there is no interruption to the passage of the billet or the working of the cutters.

After the billet has been gripped by the discharge side gripping mechanism, the entering side gripping mechanism releases the billet and the carriage 53 is retracted ready to receive another billet. The carriage 87 continues its movement drawing the billet through the cutting head and permitting such movement of the axis of the billet as is caused by any curvature which may exist in the axis of the billet.

As the rear end of the billet leaves the cutting head it rests upon the support 114. The grip of the billet by the upper gripping face 100 is released by the reverse movement of the toggle 102 and the billet rolls by gravity down the support 114 and the sloping surface of the carriage 87 against the parallel stops 105. In the meantime, as soon as the rear end of this billet has cleared the support 42 on the entering side a new billet has been permitted to roll down upon this support, has been gripped by the entering side mechanism and is fed through the cutter immediately following the preceding billet. It will be apparent, therefore, that the machine is capable of continuous operation and will turn out a large quantity of work.

While I have illustrated one preferred embodiment of my invention by way of example, it is capable of modification to meet varying conditions and I contemplate such changes and modifications as come within the spirit and scope of the appended claims.

I claim:

1. A billet surfacing machine comprising cutting mechanism, and gripping members

for gripping a billet to move it axially past the cutting mechanism, said gripping mechanism permitting oscillation of the axis of the billet.

2. A billet surfacing machine comprising cutting mechanism, and gripping members for gripping a billet to move it axially past the cutting mechanism, said gripping mechanism restraining the billet against rotation but permitting oscillation of the axis of the billet.

3. A billet surfacing machine comprising a rotating cutting mechanism and means for passing billets through said cutting mechanism, said means gripping the billets and permitting oscillation of the axis of the billet about the point of gripping engagement.

4. A billet surfacing machine comprising a rotating cutting mechanism and means for passing billets through said cutting mechanism, said means gripping the billets and permitting oscillation of the axis of the billets about the point of gripping engagement, said grip preventing rotation of the billet about its axis.

5. A billet surfacing machine comprising cutting mechanism, a pair of movable carriages on opposite sides of the cutting mechanism, gripping mechanism carried by said carriages and adapted to grip billets and to permit them to oscillate about the gripping point.

6. A billet surfacing machine comprising cutting mechanism, a pair of movable carriages on opposite sides of the cutting mechanism, gripping mechanism carried by said carriages, each said mechanism comprising a pair of gripping faces, and supports for said faces permitting a limited universal movement thereof.

Signed at Duluth, Minnesota, this 6th day of July, 1926.

LOUIS C. REIS.