May 14, 1940. J. L. ANDERSON 2,200,816

APPARATUS FOR REMOVAL OF SURFACE METAL FROM SLABS, BILLETS, OR THE LIKE

Filed Nov. 6, 1937 3 Sheets-Sheet 1

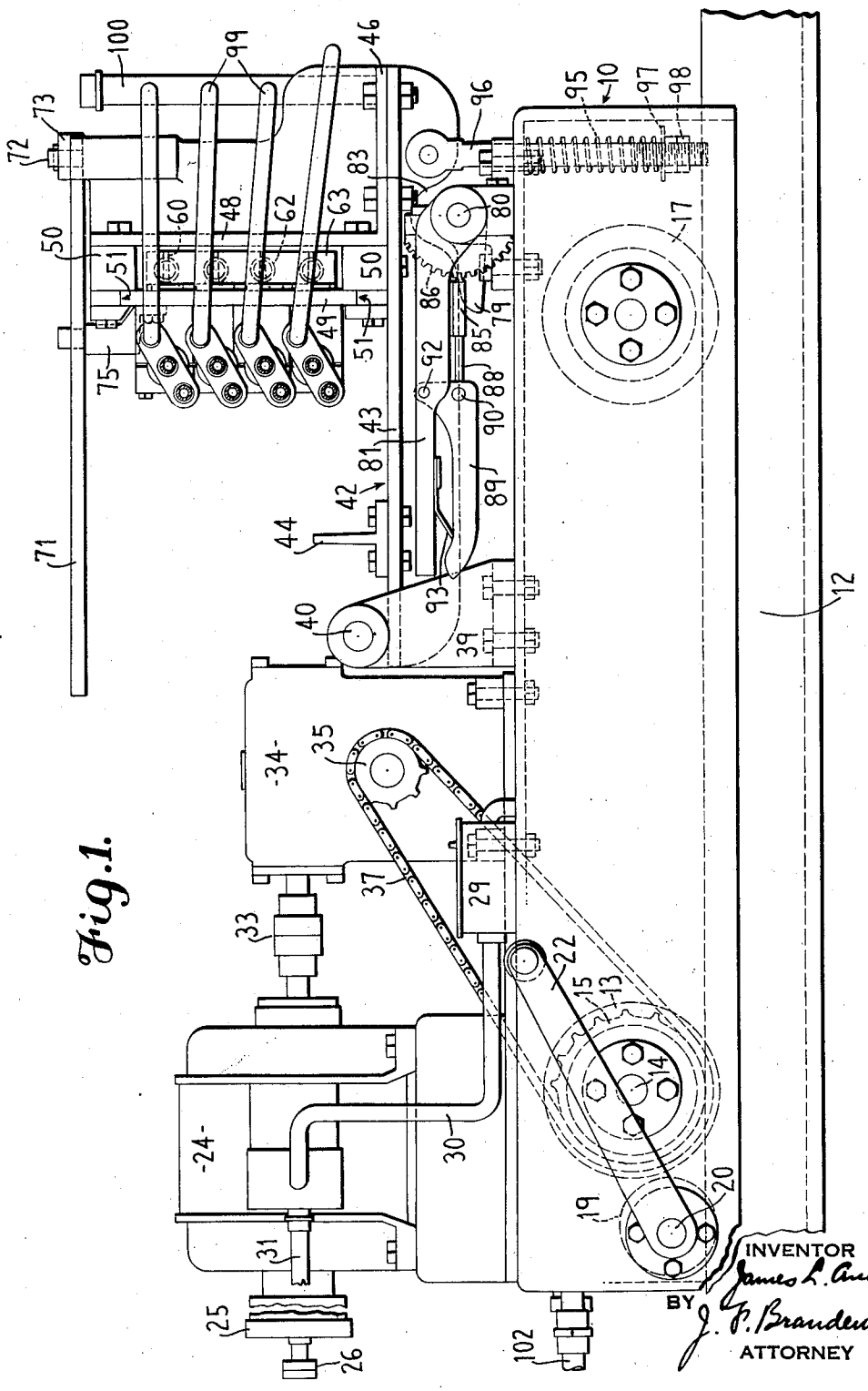


Fig. 1.

INVENTOR
James L. Anderson
BY
J. F. Brandenburg
ATTORNEY

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Filed Nov. 6, 1937 3 Sheets-Sheet 2

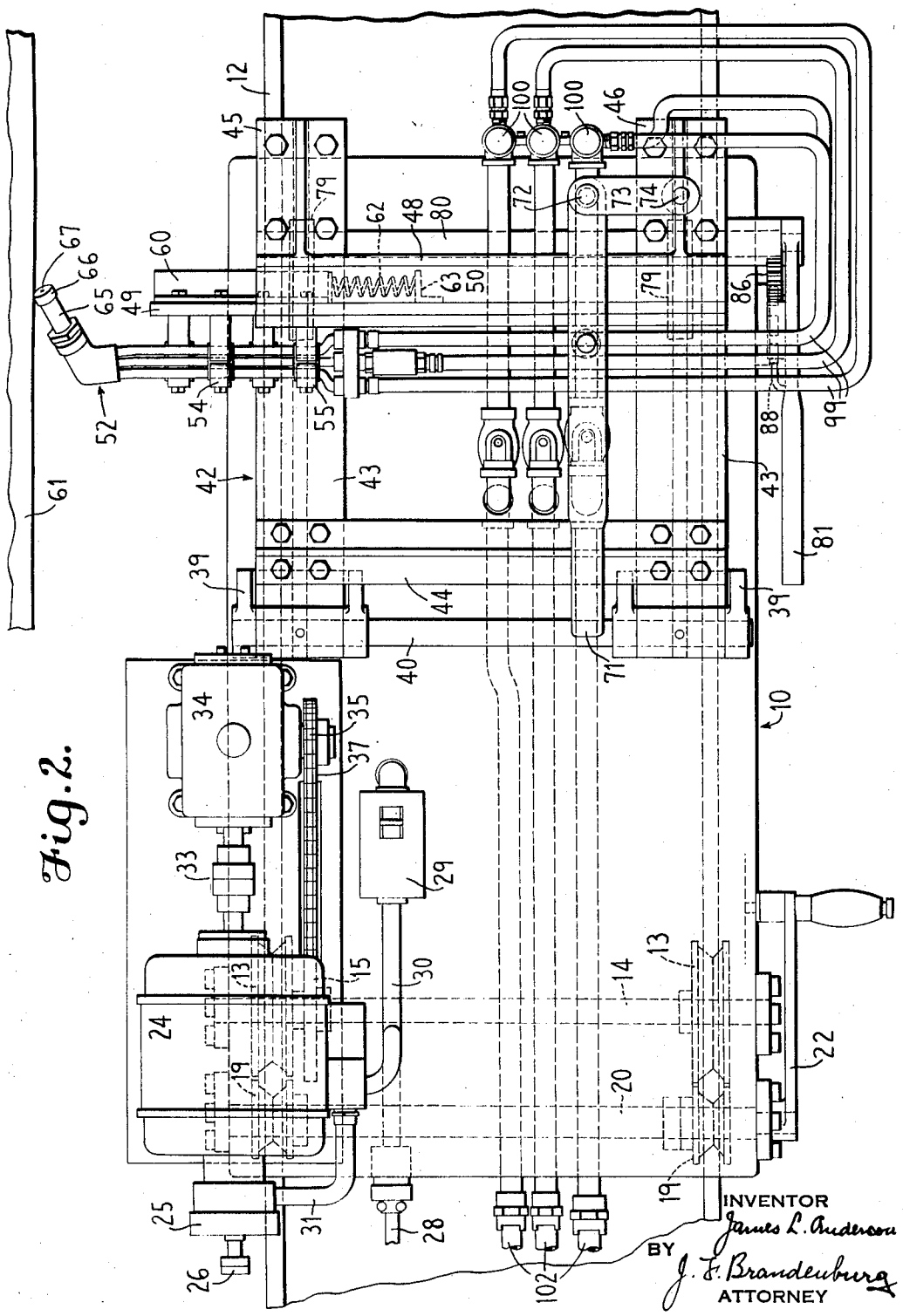


Fig. 2.

INVENTOR
James L. Anderson
BY
J. F. Brandenburg
ATTORNEY

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Filed Nov. 6, 1937 3 Sheets-Sheet 3

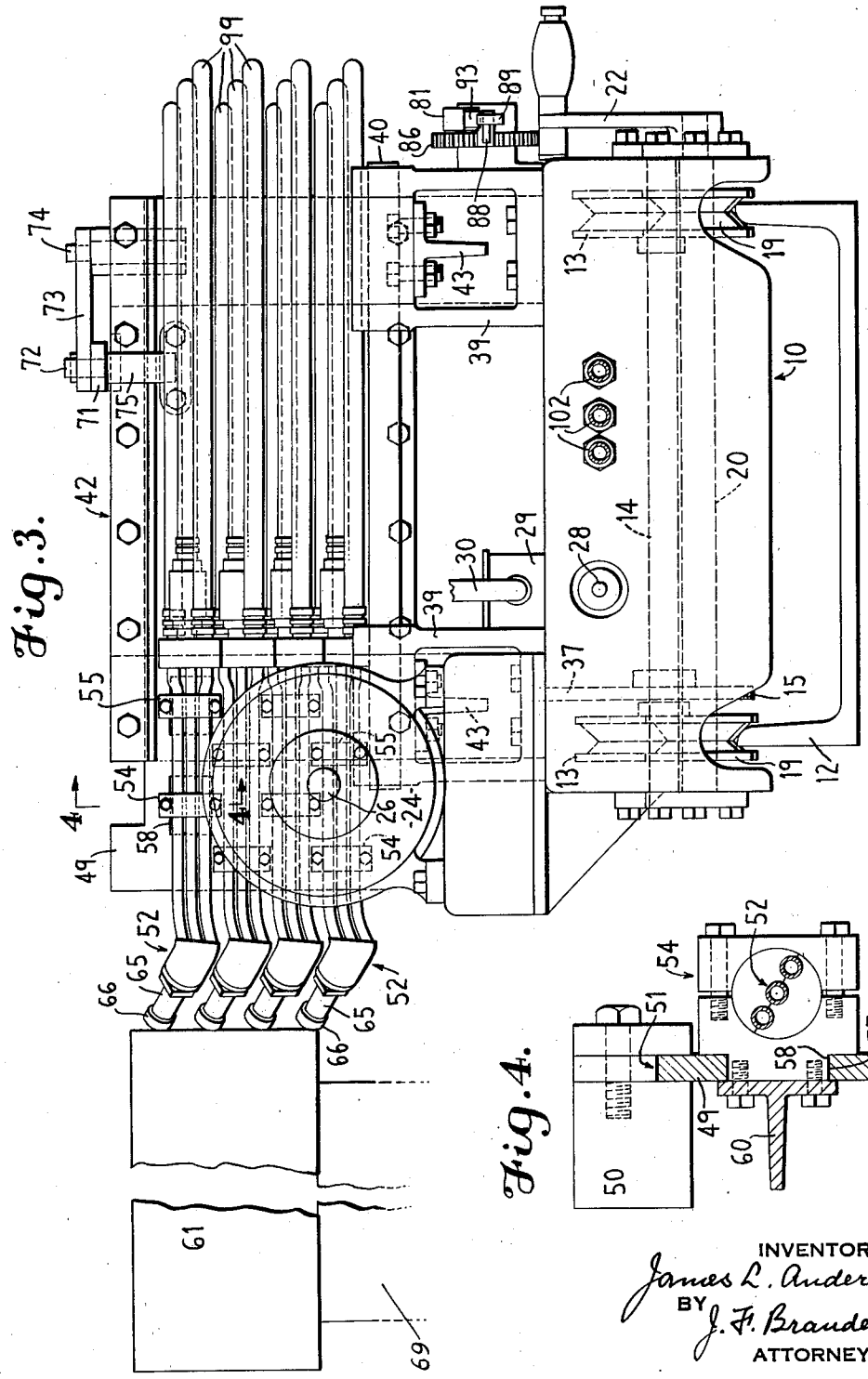


Fig. 3.

Fig. 4.

INVENTOR
James L. Anderson
BY
J. F. Brandenburg
ATTORNEY

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2,200,816

UNITED STATES PATENT OFFICE

2,200,816

APPARATUS FOR REMOVAL OF SURFACE METAL FROM SLABS, BILLETS, OR THE LIKE

James L. Anderson, Closter, N. J., assignor to Air Reduction Company, Incorporated, New York, N. Y., a corporation of New York

Application November 6, 1937, Serial No. 173,154

2 Claims. (Cl. 266—23)

This invention relates to apparatus for removing metal from the surface of billets, slabs, or other metal bodies by means of oxygen streams in preparation for subsequent rolling of the pieces.

In place of the old-style hand clipping methods, and the more modern oxygen-torch gouging practice, by which individual imperfections in billet and slab surfaces were removed, it has been found more advantageous to remove the entire surface from the billet or slab before it goes to the rolling mill. By taking off the entire surface metal, scale and small surface cracks and gas pockets and oxide inclusions are eliminated in addition to the larger imperfections formerly removed individually with great expenditure of time and labor.

It is an object of this invention to provide improved apparatus for removing the entire surface from a billet, slab or other work piece by means of oxygen streams. In the case of slabs, imperfections from rolling or other causes are more prevalent in the edges of the slab. It is usually necessary, therefore, to remove a thicker layer of the surface from the edges of a slab than from the top or bottom surfaces. It is another object of the invention to provide improved apparatus for taking off the edge surface of a slab to the required depth without turning the slab up on its edge.

The invention includes apparatus for moving a plurality of torches with respect to a billet, slab, or the like, and novel structure for positioning the torches in the desired relation to the work piece and for maintaining that relation during a surfacing operation. The entire edge or face surface is preferably removed from one or both sides of the work piece in a single pass; the torches are effective to remove the metal from overlapping areas and are maintained in such relation to the metal surface that their effectiveness and the overlap of the areas surfaced are not disturbed if the surface over which the torches operate is curved or warped.

Other objects, features and advantages of the invention will appear or be pointed out as the specification proceeds.

In the accompanying drawings, forming part hereof:

Fig. 1 is a side elevation of a machine for removing the edge surface of a slab in accordance with this invention;

Fig. 2 is a top plan view of the machine shown in Fig. 1, with the machine in working relation to a slab;

Fig. 3 is an end view of the machine shown in Figs. 1 and 2, a portion of the slab being shown as in Fig. 2; and

Fig. 4 is an enlarged sectional view on the line 4—4 of Fig. 3.

A carriage body 10 has grooved wheels that stably support it on a track 12. The carriage wheels include two driving wheels 13 secured to an axle 14 which is driven through a sprocket 15. There are two wheels 17 at the front of the carriage, but no power is applied to the front wheels.

Instead of a clutch, the carriage has two free-turning wheels 19, best shown in Fig. 2, on an axle 20 carried in eccentrics which are turned by a handle 22 to push the free-turning wheels 19 against the track and lift the carriage body sufficiently so that the driving wheels 13 no longer touch the track. The carriage can then be pushed freely to any position along the track more quickly than when operating under power.

The carriage is driven by a motor 24 controlled by a centrifugal governor 25 that holds the motor to a constant speed but can be adjusted by a knob 26 to change the motor speed. Power for the motor comes from a conductor 28 which passes through the carriage body to a switch 29. Wires from the switch 29 pass through conduits 30 and 31 to the motor 24.

The motor 24 has a coupling 33 through which it drives a reduction gear 34. A driving sprocket 35 at the low-speed end of the reduction gear 34 is connected with the sprocket 15 by a chain 37.

Brackets 39 at each side of the carriage body support a cross shaft 40, to which is connected a frame 42 which includes two T sections 43 fastened together into a rigid structure by an inverted T cross-tie 44, and brackets 45, 46, connected by a cross plate 48. Another cross plate 49 is spaced from the plate 48 by blocks 50 which form one side of guides 51 in which the plate 49 is slidable transversely of the machine.

A gang of oxygen torches 52 are supported by the plate 49. Each of the torches is supported by a separate torch holder comprising two spaced clamps 54 and 55 which grip the torch. These clamps bear against the plate 49 and have ridges 57 (Fig. 4) fitting into short horizontal slots 58 in the plate 49. The clamps 54, 55 are fastened to a T section 60 on the other side of the plate 49.

The torches 52 are disposed in position to direct their oxygen streams at an acute angle, in both a longitudinal and transverse plane, to the surface of the work. The transverse inclination

of the streams has proved very advantageous in practice. The slag and molten metal are blown at an angle across the surface, and the torches mutually assist each other in the surfacing operation to a greater degree than would otherwise be the case because of the fact that the streams are generally parallel and the stream from each torch passes angularly across in front of the next adjacent torch. In the drawing the transverse inclination of the torches with respect to the side of the slab 61 is toward the upper edge, but it may be toward the lower edge.

The ridges 57 are shorter than the slots 56 and slightly higher than the thickness of the plate 49 so that the clamps 54, 55 slide freely along the slots 58. The T sections 60 and the parts of the clamps 54, 55 that hold them in place constitute slides which move in the slots 58 within the limits imposed by the ends of the slots. The slot ends comprise limiting abutments. All of the torch holders are similar in construction, but the clamps of adjacent torch holders are in the staggered relation shown in Fig. 3 so that the torches can be closer together without interference between the clamps.

Each of the torch holders is independently movable and is urged toward the outer ends of the slots 58 by a spring 62 (Fig. 2) compressed between the torch holder and an angle 63 which is secured to the plate 49.

Each torch has a tip 65 with a collar 66 at its discharge end. The collar is of hard material and protects the tip from abrasion, and bears against the side face of a slab 61 resting on a support 69 at a level higher than the carriage body. The pressure of the torch tips against the slab 61 depends upon the strength of the springs 62. This yielding pressure of the tips against the slab causes the torches to follow irregularities in the surface of the slab and to remain in the desired relation to a curved or warped slab surface as well as to a plane surface. The invention is not limited to a construction in which the tips bear on the surface of the slab.

The drawing shows the torches operating over a vertical surface of the slab, but the surface may be at an acute angle to the vertical, the expression "vertically extending" being used hereinafter to designate a surface that is either vertical or slopes upward in a direction that has its major component vertical.

The tips 65 deliver oxygen streams from central orifices 67, and since the ends of the tips are at an angle to the surface of the slab the collars 66 hold the orifice at a constant distance from the surface of the slab.

All of the torches 52 can be moved away from the slab as a unit by pulling the plate 49 back until the outer ends of the slots 58 abut against the ridges of the clamps 54. Further movement of the plate 49 causes the torches to be pulled away from the slab. The plate 49 is moved in the guides 51 by a hand-operated lever 71 which has a fulcrum 72 at one end of a short link 73. The other end of the link 73 is connected to the bracket 46 by a pivot connection 74. A bracket 75 on the plate 49 has a cylindrical upper end that extends through the lever 71 and forms a pivot connection between the slidable plate 49 and the lever 71.

The frame 42 is supported near its forward end by cams 79 (Figs. 1 and 2) on which the T sections 43 rest. These cams are fixed on a cross shaft 80 that can be turned by a handle 81 to cause the cams 79 to raise or lower the front end of the frame 42. The lower portions of the T sections 43 have recesses 83 over the shaft 80 so that they can move lower than the position shown in Fig. 1. All raising and lowering movement of the forward end of the frame 42 is about the axis of the shaft 40 as a center.

The handle 81 can be held in different set positions by a pawl 85 which fits between teeth of a gear segment 86 fastened to a bracket on the carriage body. The pawl 85 is moved into and out of engagement with the gear teeth of segment 86 by a rod 88 connected to a release lever 89 by a pivot 90.

The release lever 89 is connected to the handle 81 by a pivot pin 92. A leaf spring 93 on the handle 81 urges the release lever to move counter-clockwise about its pivot pin 92 and thus holds the pawl 85 in engagement with the segment 86.

The torch-carrying frame 42 is held down against the cam 79 by springs 95 within the carriage body near its front end. Eye-bolts 96 attached to the frame 42 extend freely through openings in the carriage body. A washer 97 backed by nuts 98 compresses each spring 95 against the top wall of the carriage body.

The torches are supplied with gas through hose 99 from manifolds 100 secured to the front end of the carriage body and connected by pipes through the carriage body with supply hose 102 at the rearward end of the carriage. The flexing of the hose 99 permits the torches to move with respect to the carriage body while the manifolds 100 are fixed.

The preferred embodiment of the invention has been described, but changes and modifications can be made, and some features may be used without others, without departing from the invention as defined in the claims.

I claim:

1. Apparatus for removing the surface from a billet, slab, or the like by means of oxygen streams directed against said surface, including in combination a truck having wheels on which it runs on an underlying support, a frame on top of said truck, a hinge connection between the truck and one end of the frame, torch holders on the frame in position to support torches in working relation to a work piece alongside the truck, a cam for moving the frame on said hinge to raise and lower the other end of the frame, and pawl and segment means for holding the cam in any set position.

2. Apparatus for removing surface metal from a metal body including in combination a carriage with wheels on which it runs on an underlying support, a frame, a pivot connection between the carriage and one end of the frame, torch holders on the frame at a substantial distance from the pivot connection and in position to support torches in working relation to a side surface of a metal body alongside the carriage, a device operable to lift the free end of the frame and adjust the height of the torch holders with respect to the metal body, and means for holding the frame in different angular positions around the pivot connection.

JAMES L. ANDERSON.