June 5, 1934. R. M. FENTON 1,961,210

SHEET METAL WORKING APPARATUS

Filed Oct. 8, 1931 4 Sheets-Sheet 1

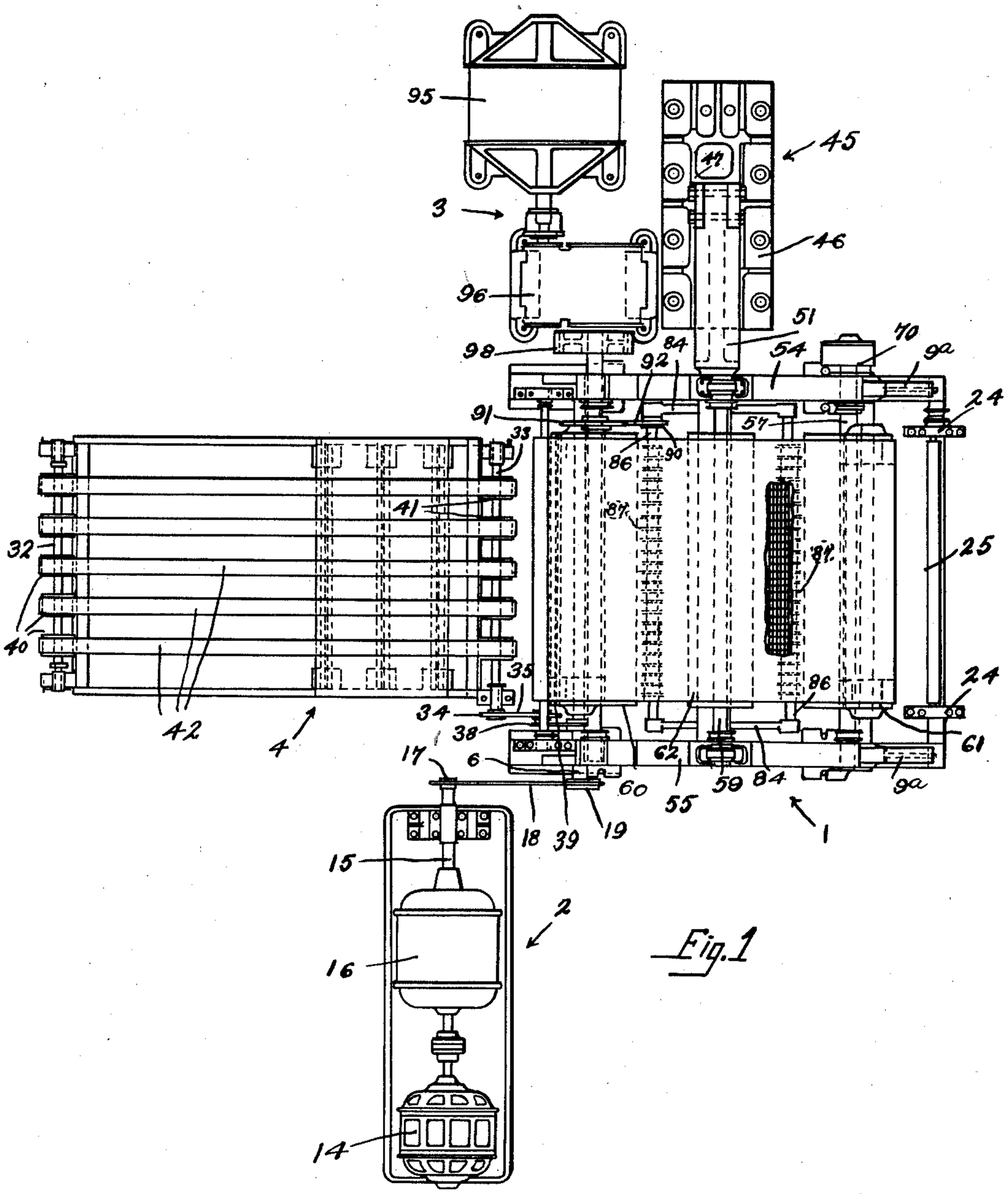

Fig. 1

INVENTOR.
Ray M. Fenton
BY
Fay Oberlin & Fay
ATTORNEYS.

June 5, 1934. R. M. FENTON 1,961,210

SHEET METAL WORKING APPARATUS

Filed Oct. 8, 1931 4 Sheets-Sheet 2

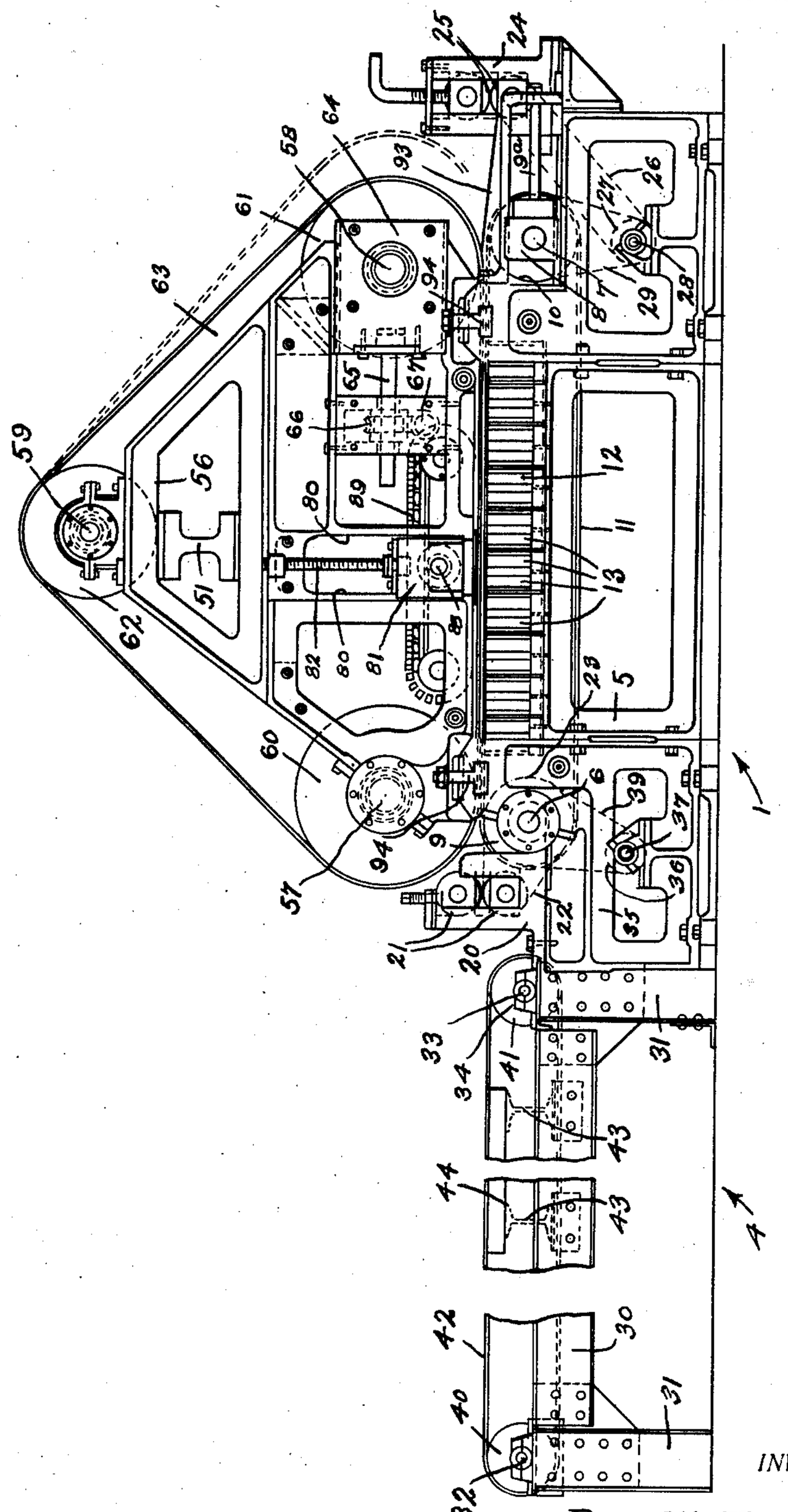

Fig. 2

INVENTOR.

BY Ray M. Fenton

Fay Oberlin & Fay

ATTORNEYS.

June 5, 1934. R. M. FENTON 1,961,210

SHEET METAL WORKING APPARATUS

Filed Oct. 8, 1931 4 Sheets-Sheet 3

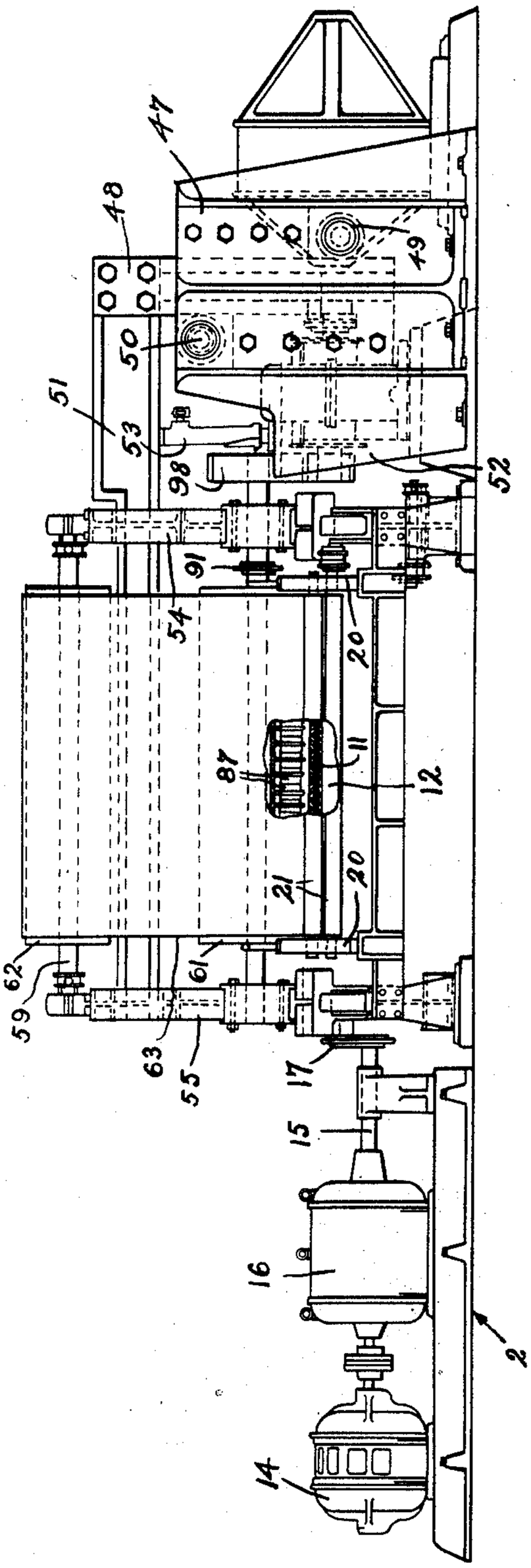

Fig. 3

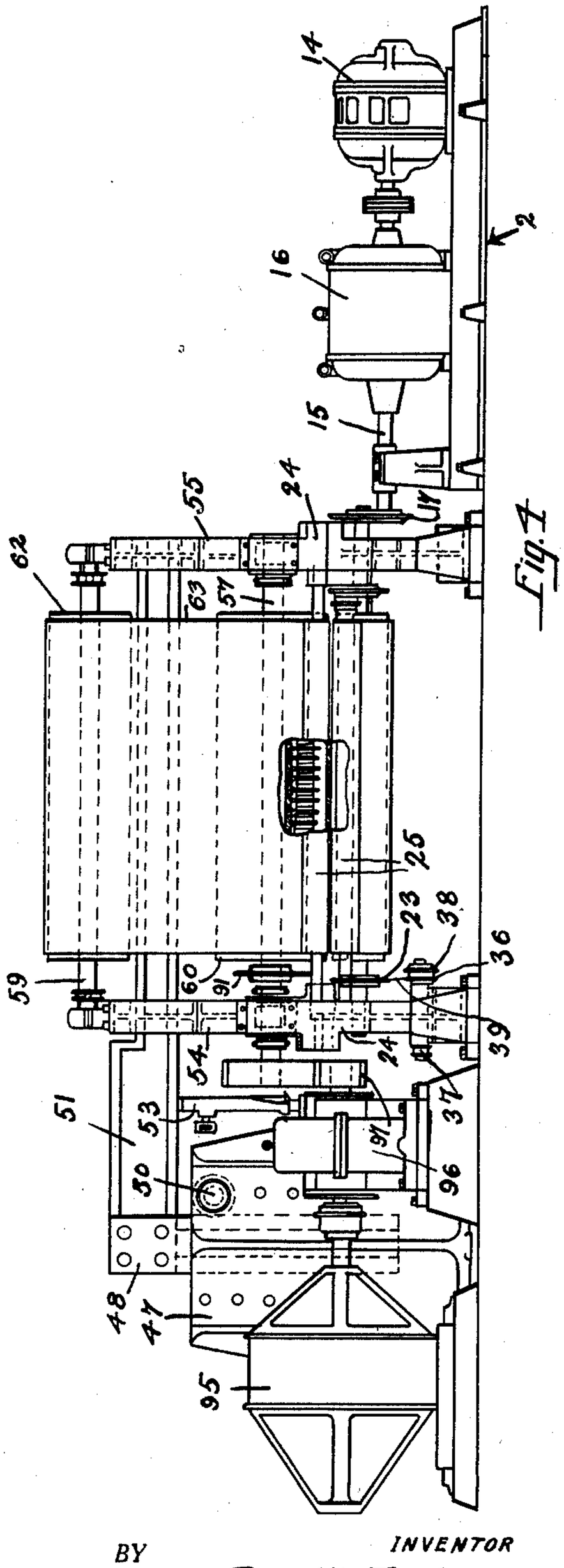

Fig. 4

BY

INVENTOR

Ray M. Fenton

Ray O. Berlin & Ray

ATTORNEYS.

June 5, 1934. R. M. FENTON 1,961,210

SHEET METAL WORKING APPARATUS

Filed Oct. 8, 1931 4 Sheets-Sheet 4

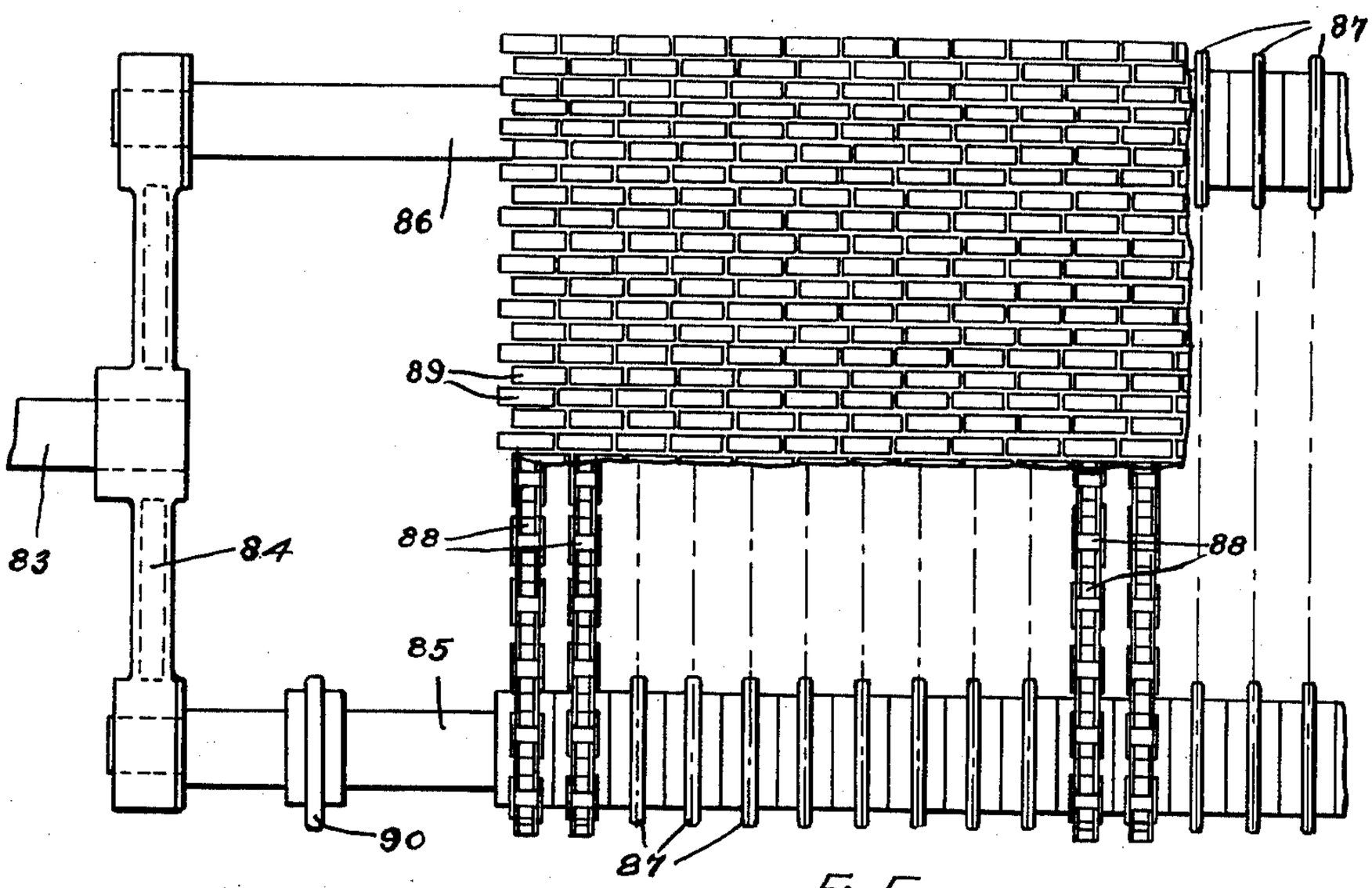

Fig. 5

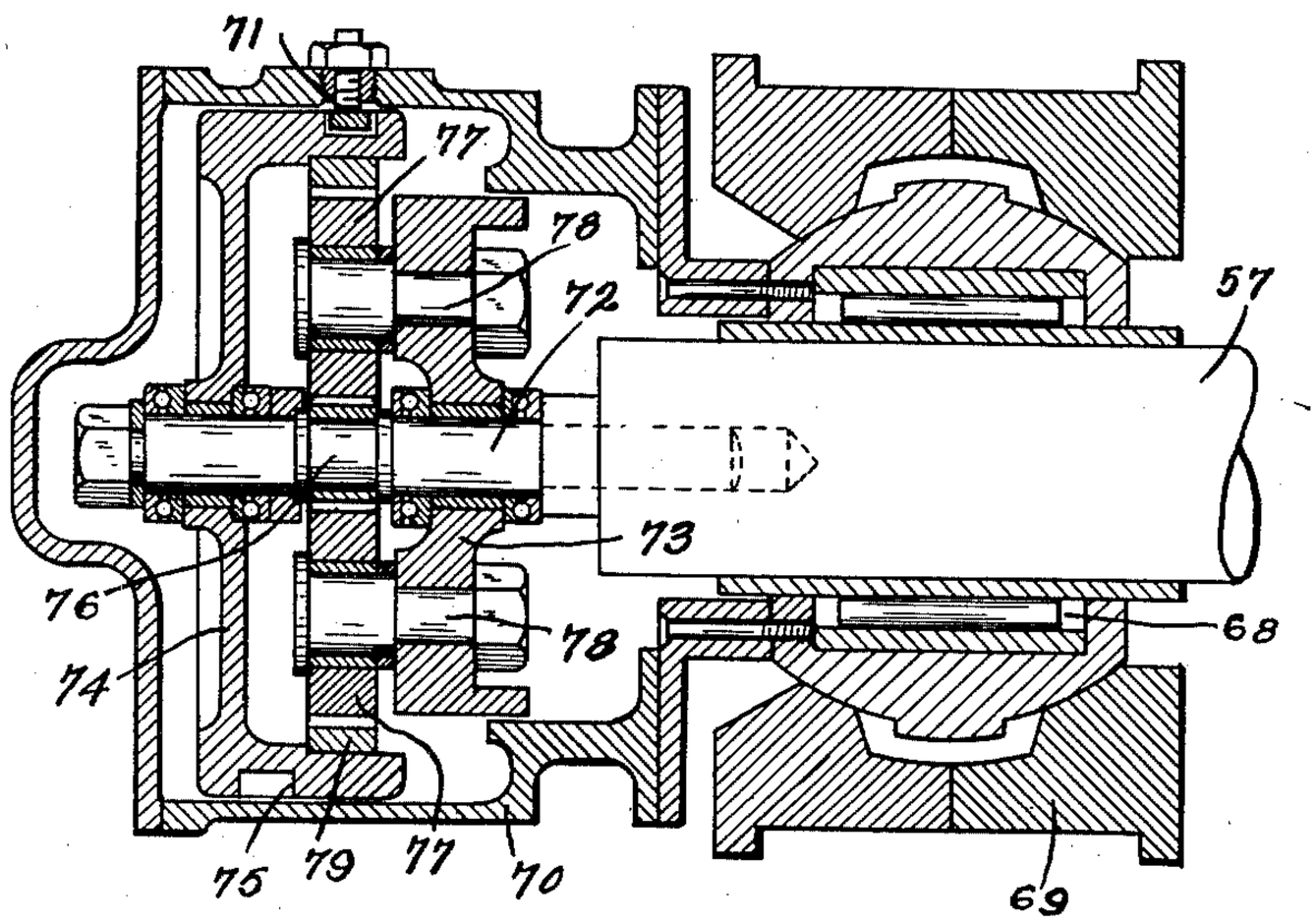

Fig. 7

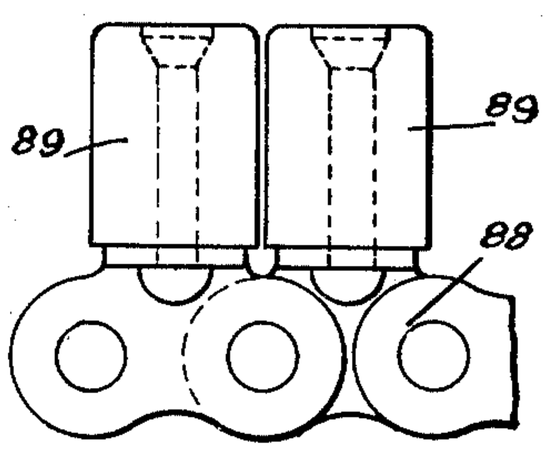

Fig. 6

INVENTOR.
Ray M. Fenton
BY
Fay Oberlin & Fay
ATTORNEYS

Patented June 5, 1934 1,961,210

UNITED STATES PATENT OFFICE

1,961,210

SHEET METAL WORKING APPARATUS

Ray M. Fenton, Monroe, Mich.

Application October 8, 1931, Serial No. 567,596

20 Claims. (Cl. 51—138)

This invention relates, as indicated, to sheet metal working apparatus, has particular reference to apparatus which is designed for the purpose of finishing sheets and the like after the same have been rolled by the common form of rolling mill.

It is among the objects of my invention to provide an apparatus which receives and supports the sheets while a belt or the like coated with a suitable abrasive is moved over the sheet and in contact therewith for the purpose of polishing the sheet, removing adhering scale and the like, and to generally impart a high finish to the sheet and, consequently, remove any imperfections which may be present on its surface. Other objects of my invention will appear as the description proceeds. To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a plan view of the apparatus comprising my invention; Fig. 2 is a side elevational view of a portion of the apparatus illustrated in Fig. 1; Fig. 3 is a right end elevational view of the apparatus illustrated in Fig. 1; Fig. 4 is a left end elevational view of a portion of the apparatus illustrated in Fig. 1; Fig. 5 is a fragmentary plan view of that portion of the apparatus illustrated in the previous figures which is employed for the purpose of maintaining the abrasive coated belt in contact with the sheets to be treated; Fig. 6 is a fragmentary side elevational view of a portion of one of the chains illustrated in Fig. 5 showing on an enlarged scale the tabs carried by the chain for the purpose of pressing the belt to the sheet; and Fig. 7 is a sectional view of the oscillator mechanism associated with one of the rolls about which the sheet treating belt is trained.

Referring now more specifically to the drawings and more especially to Fig. 1, the apparatus comprising my invention consists of a polishing machine generally indicated at 1 which has associated therewith suitable power means generally indicated at 2 for the purpose of driving the sheet supporting web, another power unit generally indicated at 3 for the purpose of driving the sheet treating belt and the apparatus for maintaining such belt in contact with the sheet, and a demagnetizing table generally indicated at 4 for the purpose of conveying the finished sheets away from the apparatus and also for demagnetizing such sheets.

Referring more specifically to Figs. 2 to 4, it will be noted that the polishing or finishing machine generally indicated at 1 in Fig. 1 includes a substructure consisting of a frame 5 which rotatably supports shafts 6 and 7 at opposite ends. The shaft 6 is preferably journalled in bearings fixed with respect to the frame 5 while the shaft 7 is journalled in bearing blocks 8 adjustable longitudinally with respect to the frame by means of screws such as 9*a*. The shafts 6 and 7 carry drums 9 and 10 respectively about which is trained an endless web or belt 11.

The endless web or belt 11 is of any suitable composition and is preferably faced on both sides with rubber so as to secure a grip on the outer peripheries of the drums 9 and 10, and further, to support the sheet in such a manner so that the same may be conveyed past the treating belt presently to be described.

The upper or sheet supporting run of the belt 11 passes over and is supported on a fixed table 12 which consists of a plurality of electro-magnets 13 which will be energized by any suitable means well known in the art.

As most clearly illustrated in Figs. 1, 3 and 4, the belt 11 is driven by means of a suitable motor 14 which is coupled to a drive shaft 15 through a suitable speed reducing means generally indicated at 16. The drive shaft 15 terminally carries a sprocket 17 about which a sprocket chain 18 is trained. The chain 18 likewise passes around a sprocket 19 terminally carried by the shaft 6 which supports the roller or drum 9.

Mounted on the frame 5 adjacent the discharging end of the polishing apparatus are housings 20 which rotatably support rubber faced rolls 21 which engage the sheet as the same is discharged from the apparatus. The lower of these rolls is driven by means of a chain 22 which is trained about a sprocket secured to the shaft of each lower roll and another sprocket 23 secured to the shaft 6 of the drum 9. Adjacent the receiving end of the apparatus the frame 5 carries housings 24 which rotatably support a pair of pinch rolls 25, the lower of which is driven by means of a sprocket secured to its shaft through a chain 26 which is trained about a sprocket 27 carried by a shaft 28 which is rotatably supported in suitable bearings on the substructure frame

of the machine. The shaft 28 is driven by means of a second sprocket secured thereto about which a chain 29 is trained which also passes over a sprocket carried by the shaft 7 of the roll 10. It will be noted from the above description that the means for supporting and conveying the sheets to be treated, which includes the paired rolls 21 and 25 and the endless web 11, are all driven preferably at the same tangential velocity from the motor 14.

As previously indicated, a de-magnetizing and receiving table generally indicated at 4 in Fig. 1 is positioned adjacent the discharge end of the machine. This table, as most clearly illustrated in Figs. 1 and 2, consists of a frame structure generally indicated at 30 which may be supported on suitable legs such as 31. The frame 30 rotatably supports transverse shafts 32 and 33, the latter shaft carrying a sprocket wheel 24 about is trained a chain 35 which also passes around a suitable sprocket 36 carried by a shaft 37 rotatably supported on the frame 5 of the polishing machine. The shaft 37 carries a sprocket 38 about which is trained a chain 39 driven from a sprocket mounted on the shaft 6 of the drum 9. The shafts 32 and 33 carry a plurality of rollers 40 and 41 respectively about which are trained a plurality of sheet supporting belts 42 which receive the sheet and convey the same away from the discharge end of the polishing machine. As indicated by the above description, due to the fact that the shaft 33 is driven through the described chain and sprocket arrangement from the motor 14, the linear velocity of the belts 42 will be proportional to the lineal velocity of the web 11.

The frame 30 of the table 4 carries a plurality of transversely extending beams 42 which support an electro-magnet 44. The electro-magnet 44 is positioned directly beneath the upper or sheet supporting run of the belts 42 and after this electro-magnet is energized by alternating current any residual magnetism which may be present in the sheets discharged from the polishing machine will be removed therefrom.

The superstructure of the polishing machine which carries the adhesive coated web in contact with the sheet for the purpose of finishing or similarly treating the same will now be described.

Positioned on a suitable foundation adjacent the substructure hereinbefore described, is a vertically disposed supporting housing generally indicated at 45 in Fig. 1. This housing consists of a base portion 46 and, as most clearly illustrated in Figs. 3 and 4, a vertically disposed portion 47. The vertically disposed portion 47 of the housing is provided with a vertically disposed recess which serves as a supporting guideway for a vertically disposed column member 48. The column member 48 is supported laterally by means of rollers such as 49 and 50. At the upper end of the movable column member 48 is a cantilever beam 51 which, in the manner hereinafter more fully explained, is capable of supporting the entire superstructure of the polishing machine and move the same upwardly away from the substructure of such machine.

The vertical portion 47 of the housing is provided with an abutment portion 52 on the upper surface of which is seated a screw jack 53 or the like which is adapted to engage the under surface of the cantilever beam 51 and move the same along with the superstructure of the polishing machine and the column member 48 upwardly. It will be noted that as the jack moves the beam 51 upwardly the rollers 49 and 50 laterally support the beam in the proper fashion.

The superstructure proper of the polishing machine includes side frame members 54 and 55, the construction of which is most clearly illustrated in Fig. 2. As indicated in Fig. 2, these side frame members are provided with recesses such as 56 into and through which the cantilever beam 51 extends so that the same may elevate the frames and the mechanism supported thereby in the manner fully described.

The frames 54 and 55 have journalled therein rotatable transverse shafts 57, 58 and 59, the former two being preferably arranged in a plane substantially parallel with the surface of the table 12 of the substructure of the machine and the latter being positioned intermediately of the former and likewise substantially parallel thereto. The shafts 57, 58 and 59 carry drums 60, 61 and 62 respectively about which an endless web or belt 63 is trained. The belt 63 will be of suitable composition and on its outer surface coated with a layer of abrasive grits of suitable fineness for the particular type of work which is to be accomplished by the machine.

Variations in the length of the web 63 are accommodated by the fact that the shaft 58 is journalled in bearing blocks 64 which are adjustable relatively to the frames 54 and 55 by screw shafts such as 65 and the adjustment of these screw shafts, and accordingly, the tension of the belt or web 63, may be facilitated by having the screw shaft provided with a worm gear 66 which is in mesh with a suitable worm 67 secured to the end of an adjustably rotatable manipulating shaft.

The means which I have provided and which is preferably associated with the shaft 57 and the drum 60 for oscillating this drum and accordingly the web 63 carried thereby so as to prevent the occurrence of a longitudinal mark or marks on the sheet if a coarse piece of grit or the like should become lodged on the belt, is most clearly illustrated in Fig. 7.

As most clearly illustrated in this figure, the shaft 57 which is driven by virtue of having the drum 60 secured thereto, which is in turn driven by means of the belt from the drum 61 in the manner hereinafter more fully explained, is supported on suitable friction reducing bearings 68 mounted for universal movement in the adjacent portion 69 of the frame 55. Secured to the body of the bearing 68 and movable therewith so as to be at all times in axial alignment with the shaft 57 is a housing 70 which is substantially cylindrical in form and which carries on its inner periphery a radially projecting lifting cam member 71.

Secured to the shaft 57 and in axial alignment therewith, is a stub shaft 72 on which are rotatably supported by means of suitable bearings a spider 73 and a cam wheel 74. The cam wheel 74 is provided with a substantially helical groove 75 into which the cam member 71 extends.

Intermediately of the bearings which support the spider 73 and the cam wheel 74, the shaft 72 is provided with a sun gear or pinion 76 which is in mesh with a plurality of planet gears 77 rotatably supported on stub shafts 78 carried by the spider 73. The planet gears 77 mesh with an orbit gear 79 which is secured to, or formed on, the inner periphery of the axially extending portion of the cam wheel 74.

The operation of these oscillators may be briefly described as follows:

As the shaft 57 rotates the sun gear 76 will cause a rotation of the planet gears 77. The

planet gears 77 by virtue of their rotation and being in mesh with the orbit gear 79 will cause a rotation of the cam wheel 74 at a speed which is considerably less than the speed of rotation of the shaft 57. As the cam wheel 74 rotates, the cam members 71 cooperating with the groove 75, will cause such wheel to oscillate axially and such oscillation will be translated to the shaft 57 and, accordingly, the drum 60. This oscillation will provide a back and forth motion of the belt with respect to the sheet which passes thereunder so that the abrasive grits on the web 63 will not have a tendency to produce longitudinally extending lands and ridges on the finished sheet.

The means which I have provided for the purpose of maintaining the abrasive covered web or belt 63 in contact with the sheet which is supported on the web 11 is most clearly illustrated in Figs. 2 and 5. The side frames 54 and 55 of the superstructure of the polishing machine are provided with vertical guideways 80 intermediately of which bearing blocks 81 are supported in adjustable vertical position by means of screws such as 82. Oscillatably supported in the bearing blocks 81 are stub shafts 83 which, as most clearly illustrated in Fig. 5, are at their inner ends secured to and support bracket members 84. The bracket members 84 are at their ends provided with bearings in which are journalled rotatable shafts 85 and 86.

The shafts 85 and 86 have secured thereto a plurality of aligned sprocket wheels or sheaves 87 about which are trained endless chains such as 88. The chains 88 are of the usual link construction and, as most clearly illustrated in Fig. 6, the adjacent links of the chains have secured thereto metallic pads 89 which will be pulled downwardly by the electro-magnets 13 in the table 12 of the substructure of the machine.

The shaft 85 has keyed thereto a sprocket wheel 90. The shaft 58 has a sprocket wheel 91 keyed thereto in alignment with the sprocket 90 on the shaft 85. A chain 92 is trained about these sprocket wheels so that the chains 88 and their attached pads will be driven by the same means and with the same lineal velocity as the web 63 with which the same are in contact. The driving means for the shaft 57, and, accordingly, the web 63 and the chains 88, is a motor 95 which, through a speed reducing means 96, drives a pinion 97 which meshes with the gear 98 keyed to the shaft 57.

The operation of the hereinbefore described apparatus is briefly as follows:

The sheets to be treated are introduced to the machine through the pinch rolls 25, and a suitable guide member such as 93 may be employed for directing the edge of the sheet into the space between the webs 11 and 63. As soon as the metallic sheet passes to the space between the webs it will move into the flux zone set up by the electro-magnets 13 in the table 12. The sheet will therefore be drawn down into intimate contact with the web 11 so that the same may move the sheet through the machine even though the lineal velocity of the web 63 is greater than the velocity of the sheet, or if the direction of movement of the web 63 should be opposite to the direction of movement of the sheet. The same flux field which pulls the sheet to the magnets has a similar effect on the tabs 89 carried by the endless chains 88. The mass of these pads and their cross sectional area and their close proximity to the electro-magnets 13 causes the same to push the web 63 down against the surface of the sheet so that the polishing or like action may take place uniformly across the entire sheet. As the sheets move out from under the belts they pass through the resiliently faced rolls 21 onto the delivery table 30 and the electro-magnets 44 employing alternating current will remove any residual magnetism remaining therein. The superstructure of the machine may be bolted to the substructure during the operation of the machine by bolts such as 94 which bolts may be readily removed preparatory to the elevation of the superstructure which is accomplished by a manipulation of the cantilever beam 51 in the manner previously explained.

The elevation of the super structure of the machine, it will be noted, moves the polishing belt 63 away from the table 12 and upon a retraction of the screw 65 which supports the bearing block 64 supporting the drum 61 enables the belt 63 to be quickly removed from its supporting rolls after the same has been worn to such an extent which necessitates its replacement or refinishing.

A further description of the construction and apparatus comprising my invention is believed unnecessary for those familiar with the art. It will be noted that in the foregoing description and in the drawings a number of the elements have been shown diagrammatically, but inasmuch as the construction of such elements is believed to be well known to those in the art of machine construction, a further description and a more detailed disclosure of such parts is believed unnecessary.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In apparatus of the character described, the combination of a work supporting table, an abrasive coated belt movable relatively to said table and adapted to engage the work thereon, an electro-magnet positioned below the surface of said table, and magnetic means overlying said belt and attracted by said magnet to press said belt against the work.

2. In apparatus of the character described, the combination of sheet metal supporting and conveying means embodying magnets, an abrasive coated belt adjacent to and movable relatively to said sheet, and means attracted by said magnets for pressing together said belt and sheet.

3. In apparatus of the character described, the combination of a magnetic table, means for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to said sheet, and means attracted by the magnetism of said table for pressing together said belt and sheet.

4. In apparatus of the character described, the combination of a magnetic table, means for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to said sheet, and means attracted by the magnetism of said table for pressing said belt onto said sheet on said table.

5. In apparatus of the character described, the combination of a supporting table embodying an electro-magnet, means for moving sheet metal across said table, an abrasive coated belt adjacent

to and movable relatively to said sheet metal, and a metallic belt arranged to contact with the back of said belt and press the same onto said sheet metal.

6. In apparatus of the character described, the combination of a sheet supporting table, an endless web for moving a sheet across said table, an endless abrasive coated belt mounted adjacent to and movable relatively to said sheet, an endless belt of magnetic material arranged to move in contact with the back of said abrasive coated belt, and an electro-magnet arranged to attract said magnetic belt and thereby press said abrasive belt onto said sheet.

7. In apparatus of the character described, the combination of a sheet supporting table, electro-magnets in said table for drawing the sheet thereto, an endless web for moving a sheet across said table, an endless abrasive coated belt mounted adjacent to and movable relatively to said sheet, and an endless metallic belt arranged to move in contact with the back of said abrasive coated belt and press the same onto said sheet.

8. In apparatus of the character described, the combination of a sheet supporting table, an electro-magnet in said table, an endless web for supporting sheet metal on said table and for moving the same thereacross, an endless abrasive coated belt arranged to run in contact with said sheet metal on said table, and a chain having pads of magnetic material arranged to contact with the back of said belt and press the same against said sheet metal under the influence of the electro-magnet in said table.

9. In apparatus of the character described, the combination of a sheet supporting table, an electro-magnet in said table, an endless web for supporting sheet metal on said table and for moving the same thereacross, an endless abrasive coated belt arranged to run in contact with said sheet metal on said table, and a chain having pads of magnetic material arranged in staggered relation and adapted to contact with the back of said belt and press the same against said sheet metal under the influence of the electro-magnet in said table.

10. In apparatus of the character described, the combination of a sheet metal supporting and conveying table embodying an electro-magnet, an abrasive coated belt adjacent to and movable relative to the sheet metal on said table, means attracted by said electro-magnet pressing together said sheet metal and belt, and means adjacent said table for demagnetizing said sheet metal discharged therefrom.

11. In apparatus of the character described, the combination of a table embodying an electro-magnet, means for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal on said table, a plurality of rotatable drums about which said belt is trained and by which said belt is driven, and means for axially oscillating one of said drums.

12. In apparatus of the character described, the combination of a table embodying an electro-magnet, means for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal on said table, means attracted by said electro-magnet pressing said belt to the sheet metal on said table, a plurality of rotatable drums about which said belt is trained and by which said belt is driven, and means for axially oscillating one of said drums.

13. In apparatus of the character described, the combination of a table embodying an electro-magnet, means for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal on said table, a plurality of rotatable drums about which said belt is trained and by which said belt is driven, and means responsive to the rotation of one of said drums for axially oscillating the same.

14. In apparatus of the character described, the combination of a table embodying an electro-magnet, means for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal on said table, a plurality of rotatable drums about which said belt is trained and by which said belt is driven, a frame for supporting said drums, and means including a cantilever beam for elevating said frame above said table.

15. In apparatus of the character described, the combination of a table embodying an electro-magnet, an endless web for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal on said table, an endless chain having tabs of magnetic material arranged to contact with the back of said belt to force the same into contact with the sheet metal under the influence of said electro-magnet, a plurality of drums about which said abrasive belt is trained and by which the same is driven, means for supporting said drums and said chain supporting means, and means including a cantilever beam for supporting said frame and elevating the same above said table.

16. In apparatus of the character described, the combination of a table embodying an electro-magnet, an endless web for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal on said table, an endless chain having tabs of magnetic material arranged to contact with the back of said belt to force the same into contact with the sheet metal under the influence of said electro-magnet, a plurality of drums about which said abrasive belt is trained and by which the same is driven, means for supporting said chain, a frame for supporting said drums and said chain supporting means, means including a cantilever beam for supporting said frame and elevating the same above said table, and means for demagnetizing the sheet metal discharged from said table.

17. In apparatus of the character described, the combination of a table embodying an electro-magnet, an endless web for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal on said table, an endless chain having tabs of magnetic material arranged to contact with the back of said belt to force the same into contact with the sheet metal under the influence of said electro-magnet, a plurality of drums about which said abrasive belt is trained and by which the same is driven, means for supporting said chain, a frame for supporting said drums and said chain supporting means, means for driving said abrasive belt and said chain at the same linear velocity, and means including a cantilever beam for supporting said frame and elevating the same above said table.

18. In apparatus of the character described, the combination of a table embodying an electro-magnet, an endless web for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal

on said table, an endless chain having tabs of magnetic material arranged to contact with the back of said belt to force the same into contact with the sheet metal under the influence of said electro-magnet, a plurality of drums about which said abrasive belt is trained and by which the same is driven, paired rolls adjacent each end of said table, and means for driving said first named endless web and said rolls at the same tangential velocity.

19. In apparatus of the character described, the combination of a table embodying an electro-magnet, an endless web for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal on said table, an endless chain having tabs of magnetic material arranged to contact with the back of said belt to force the same into contact with the sheet metal under the influence of said electro-magnet, a plurality of drums about which said abrasive belt is trained and by which the same is driven, and means for driving said first named endless web at a speed different from the speed of said abrasive coated belt.

20. In apparatus of the character described, the combination of a table embodying an electro-magnet, an endless web for moving sheet metal across said table, an abrasive coated belt adjacent to and movable relatively to the sheet metal on said table, an endless chain having tabs of magnetic material arranged to contact with the back of said belt to force the same into contact with the sheet metal under the influence of said electro-magnet, a plurality of drums about which said abrasive belt is trained and by which the same is driven, means for driving said chain and abrasive coated belt at the same velocity, and means for driving said first named endless web at a speed different from the speed of said chain and belt.

RAY M. FENTON.