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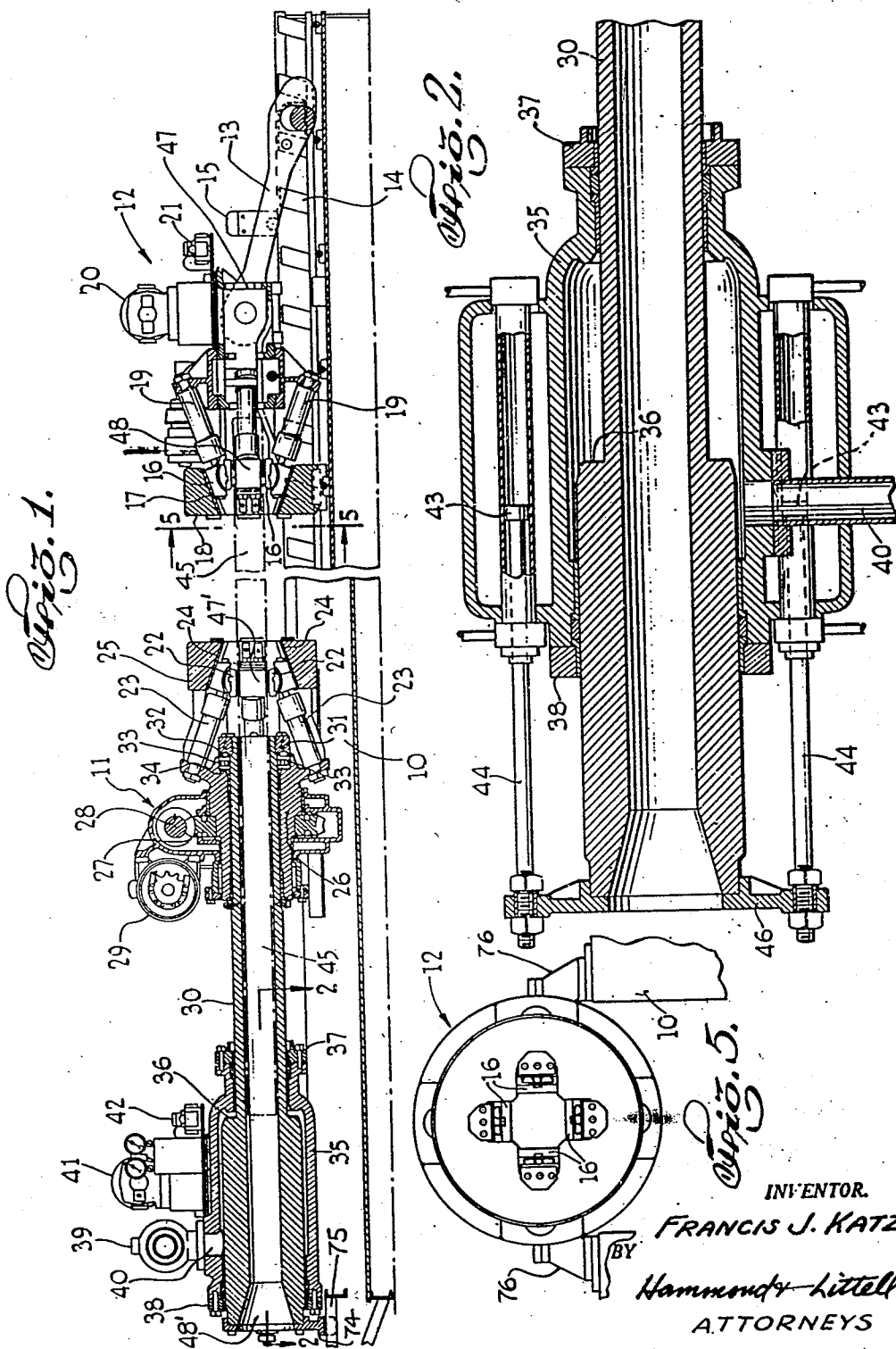
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2,487,972

METAL BAR STRAIGHTENING MACHINE

Filed July 16, 1945

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Fig. 3.

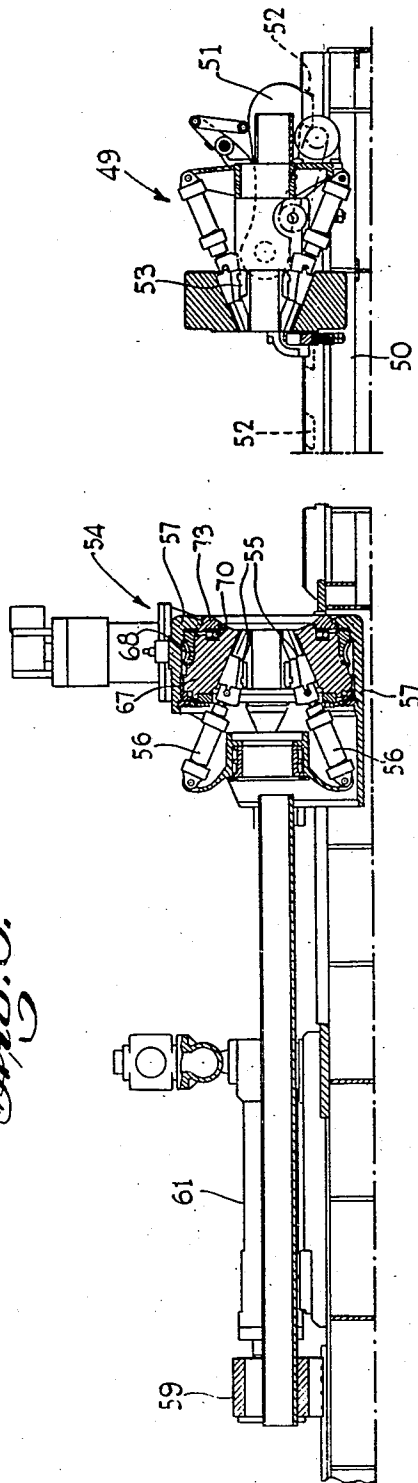
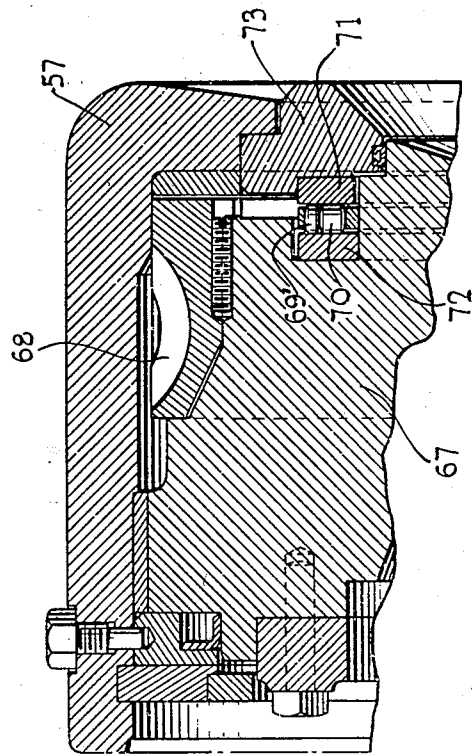


Fig. 6.



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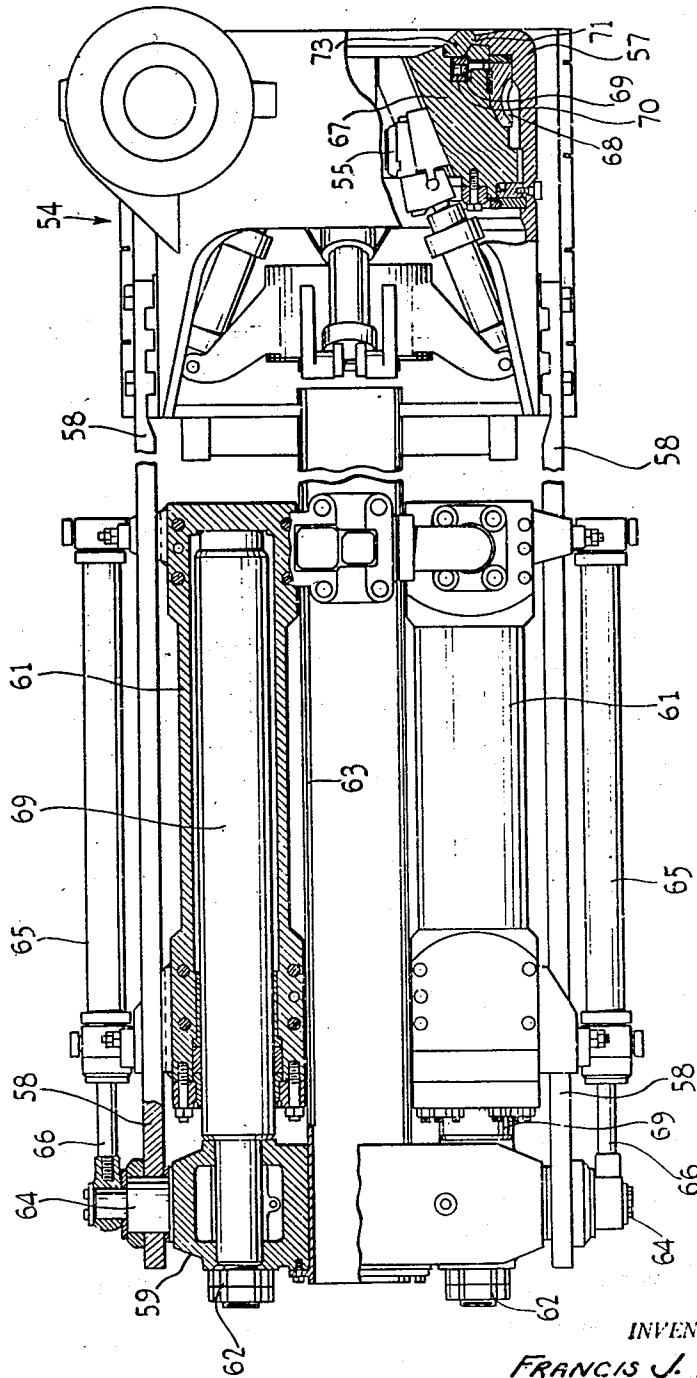
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Fig. 4.



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METAL BAR STRAIGHTENING MACHINE

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Application July 16, 1945, Serial No. 605,271

5 Claims. (Cl. 153—35)

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This invention relates to a machine for straightening metal bars and particularly profiled or flanged bars of nonferrous metals such as aluminum, magnesium, their alloys, and the like.

Bars of intricate shape and large size are produced by extrusion methods and they become deformed for various reasons after extrusion so that they are buckled or twisted either locally or throughout their entire length. It, therefore, is necessary to remove buckling and twists in the bars by some convenient method.

One of the objects of the present invention is to provide a machine having gripping heads with passages completely through the heads and grippers in said heads so that the bars can be passed completely through the machine and gripped between any desired points along the bar. The bar can be gripped and one of the heads moved relative to the other head, which has been previously anchored, so as to stretch the same beyond its yield point and thus remove any buckle that may be therein. If the bar has a twist therein, the present machine provides means for twisting the same in the opposite direction beyond the yield point of the metal so as to untwist the bar. Considerable force is necessary in order to perform these operations. It is preferred that the force applying means be attached to the longitudinally movable head in such a manner that said means is not rotatable as the head is rotated in an untwisting operation. This has proven to be quite difficult because of the high forces involved. In the preferred form of the straightening machine, hydraulic force is employed for the longitudinal stretching action and when such is used it has been found preferable not to rotate the hydraulic piston as the longitudinal force is applied to the stretching and detwisting head. One preferred form of thrust bearing comprises a divided radial roller bearing.

In one form of the invention, the hydraulic piston for stretching purposes is hollow for the passage of the bars therethrough. In another form of the invention, the hydraulic piston or pistons are parallel with a central tube and cross-head, with connecting bars for transmitting the force of the hydraulic means to the stretching and detwisting head.

Bars or shapes can be placed in the machine by passing them through the hollow gripping heads and then adjusting the position thereof so as to lock the desired portions of the bar between the two gripping heads. The bar then can be subjected to a stretching and/or detwist-

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ing operation. These and other objects of the invention will become apparent from the following description and drawings which are merely exemplary.

5 In the drawings:

Fig. 1 is a broken longitudinal vertical section.

Fig. 2 is a fragmentary enlarged plan view of the hydraulic piston operating means of Fig. 1, such section being taken approximately on the line 2—2 of Fig. 1 and showing the piston in an extended position.

Fig. 3 is a broken longitudinal elevation partially in section of a modified form of the invention.

15 Fig. 4 is a fragmentary plan view partly in section of the headstock and hydraulic cylinders of the modification shown in Fig. 3.

Fig. 5 is an end view of the tailstock along the line 5—5 of Fig. 1.

20 Fig. 6 is an enlarged fragmentary sectional view of the headstock of Fig. 3 showing details of the thrust bearing construction.

In Fig. 1, frame 10 supports headstock 11 and tailstock 12, tailstock 12 being adjustably movable along the frame and being locked in place thereon by pivoted anchor 13 engaging locking stops 14 of the frame, lifting cylinder 15 being provided for raising anchor 13. Power means can be provided for longitudinally moving the tailstock 12. Contained within tailstock 12 are gripping fingers 16, preferably there being four located 90° apart such as seen in Fig. 5. The gripping fingers 16 are guided along the cam surface 17 of body 18 of the tailstock, said fingers being operable by hydraulic pistons 19, said pistons obtaining operating force from oil pump 20 through any type of conventional control valve 21. Headstock 11 has similar gripping fingers 22 operable by hydraulic pistons 23, said fingers being slidable on inclined surfaces 24 carried in headstock body 25. The rearward extension 26 of the headstock body has a worm wheel 27 attached thereto, said wheel being driven by worm 28 from motor 29. Hollow stretching force applying tube or plunger 30 has a suitable abutment means such as collar 31 mounted on the end thereof with a thrust plate 32 co-operating with a plurality of radially mounted rollers 33, said rollers being mounted in a suitable race. The axes of said rollers extend radially outwardly from the center of rotation of the headstock. A second thrust plate is shown between rollers 33 and the rotatable gripping head 26. The rollers are preferably longitudinally sub-divided as seen in Fig. 6.

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This is desirable because of the difference in relative motion between the outer and inner ends radially of the rollers and the contacting thrust plate surface, particularly when the bearing surface is extended in order to take the heavy loads involved. The stretching tube 30 extends into hydraulic cylinder 35 and serves as a hydraulic piston therein having a step 36 thereon, stuffing boxes 37 and 38 being provided. Oil pressure can be supplied through valve 39 and passage 40 to operate the hydraulic piston in its stretching operation or movement to the left as viewed in Fig. 1. A pump 41 and valve 42 provide oil pressure for the hydraulic gripper cylinders 23 in a manner similar to that shown in Patent No. 2,352,442 issued June 27, 1944. Mounted on hydraulic cylinder 35 are the return hydraulic pistons 43 (Fig. 2) which are connected by tie rods 44 with apertured cross head 46 fastened to the end of stretcher tube 30. Oil may be admitted to these pistons in order to return the headstock 11 to the right as seen in Fig. 1. It is evident that it is not absolutely necessary that there be more than one return piston 44 and that also there may be more than the two shown. An extension 74 of the crosshead 46 may be provided to co-operate with trough 75 to positively prevent rotation of the crosshead and hydraulic piston.

When it is desired to straighten a bar or shape, such shape is moved through the open passageways 47, 48, 47', and 48', it being possible to feed the same, for example, from the right to left (Fig. 1) through the tailstock. The tailstock and headstock are adjusted relative to each other so that the bar may be gripped at the desired points and the control mechanism is then operated so that the gripping fingers 16 and 22 firmly grip the bar indicated in dot and dash lines at 45. Pressure may be applied to hydraulic cylinder 35 to stretch the bar if there is a buckle therein. If the bar has a twist, the motor 29 can be energized and the headstock body 25 and 26 rotated, stretching tube 30 not rotating therewith, the radial thrust bearing 33 allowing such rotation. If it is desired to stretch and twist at the same time, force also can be applied to hydraulic cylinder 35. The force may be applied after the stretching operation has taken place.

A second modification of the invention is shown in Figs. 3 and 4 wherein the hollow tube for applying longitudinal stretching force to the headstock does not serve as the hydraulic piston. Referring to Fig. 49 is adjustably mounted on bed 50 and is fixed in position thereon by means of anchor 51 engaging stops 52 in the bed 50, said tailstock having work gripping fingers 53 similar to Figs. 1 and 2. Headstock 54 has gripping fingers 55 operable by hydraulic pistons 56 similar to Figs. 1 and 2. Nonrotatable headstock housing 57 (Figs. 3 and 4) has connectors 58 (Fig. 4) extending to crosshead 59. Crosshead 59 has two hydraulic pistons 69 mounted in hydraulic cylinders 61, said pistons being connected to said crosshead at 62. Telescoping tube arrangement 63 may be provided centrally of the gripping head to serve as a guide for the bars being passed through the headstock. The housing 57 can be slidably mounted on the bed by means of feet similar to feet 76 shown in Fig. 5 for the tailstock to assist in preventing rotation of the housing.

When it is desired to perform a stretching operation hydraulic pressure admitted into hy-

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draulic cylinders 61 will cause connecting bars 58 to move to the left with crosshead 59, said bars being connected thereto by pins 64. In order to return the headstock, hydraulic cylinders 65 are provided, the pistons thereof being connected by rods 66 to crosshead 59 at an extension of pins 64. The various hydraulic cylinders 61 and 65 are mounted on the frame so as to be non-rotatable with respect thereto, and may assist in holding housing 57 from rotation although normally all tendency of housing 57 to rotate will be prevented by the machine frame.

The headstock housing is provided with a worm wheel arrangement for turning gripping head 67 in a manner generally similar to that described in Figs. 1 and 2. The worm wheel is seen at 68. A roller thrust bearing assembly has a plurality of longitudinally sub-divided rollers 69' and 70 between thrust bearing plates 71 and 72 similar to that described for Figs. 1 and 2, the axis of the rollers extending radially from the center of rotation of the gripping head. Rollers 69' and 70 are separate and may rotate at different speeds relative to each other. When nonrotatable headstock housing 57 is moved to the left, the thrust will be transmitted through ring 73 and radial split thrust rollers to the rotatable gripping head 67. The operation of the modification of Figs. 3 and 4 for straightening bars is similar to that described for Figs. 1 and 2. The hydraulic cylinders have no rotation and only a longitudinal motion relative to their bearings and stuffing boxes.

It is to be understood that various modifications may be made to the embodiments shown without departing from the spirit of the invention or scope of the claims.

I claim:

1. In a machine for straightening bars of the character described, a frame, two gripping heads mounted on said frame, said heads having housings and having aligned passageways there-through for the passage of bars from end to end of and through the machine, bar gripping means in each of said heads for holding bars at spaced points, anchoring means on one of the gripping heads adjustably positioning said head on the frame relative to the second head, means connected to the second head for rotating the same, a hydraulic piston spaced from said second head and having one of said passageways aligned therewith, a non-rotatable hollow connecting tube extending between the housing of said second head and the hydraulic piston and aligned with said piston and housing passageways, abutment means on said tube, thrust bearing means between said abutment means and said rotatable second head allowing relative rotation between the head and tube, and rotation preventing means connecting said frame and the hydraulic piston and tube.

2. In a machine for straightening bars of the character described, a frame, two gripping heads mounted on said frame, said heads having housings and having aligned passageways there-through for the passage of bars from end to end of and through the machine, bar gripping means in each of said heads for holding bars at spaced points, anchoring means on one of the gripping heads adjustably positioning said head on the frame relative to the second head, means connected to the second head for rotating the same, a hydraulic piston spaced from said second head and having one of said passageways aligned

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therewith, a non-rotatable hollow connecting tube extending between the housing of said second head and the hydraulic piston and aligned with said piston and housing passageways, a flange connected with said tube, thrust bearing means between said flange and said rotatable second head allowing relative rotation between the head and tube, and rotation preventing means connecting said frame and the hydraulic piston and tube.

3. In a machine for straightening bars of the character described, a frame, two gripping heads mounted on said frame, said heads having housings and having aligned passageways there-through for the passage of bars from end to end of and through the machine, bar gripping means in each of said heads for holding bars at spaced points, anchoring means on one of the gripping heads adjustably positioning said head on the frame relative to the second head, means connected to the second head for rotating the same, a hydraulic piston spaced from said second head and having one of said passageways aligned therewith, a non-rotatable hollow connecting tube extending between the housing of said second head and the hydraulic piston and aligned with said piston and housing passageways, abutment means on said tube, thrust bearing means between said abutment means and said rotatable second head allowing relative rotation between the head and tube, rotation preventing means connecting said frame and the hydraulic piston and tube, and hydraulic motor means carried by said frame and connected with said first mentioned hydraulic piston and tube operable to move said second head in a direction different than said first mentioned hydraulic piston.

4. In a machine for straightening bars of the character described, a frame, two gripping heads mounted on said frame, said heads having housings and having aligned passageways there-through for the passage of bars from end to end of and through the machine, bar gripping means in each of said heads for holding bars at spaced points, anchoring means on one of the gripping heads adjustably positioning said head on the frame relative to the second head, means connected to the second head for rotating the same, a hydraulic piston spaced from said second head and having one of said passageways aligned therewith, a non-rotatable hollow connecting tube extending between the housing of said second head and the hydraulic piston and aligned with said piston and housing passageways, abutment means on said tube, thrust bearing means between said abutment means and said rotatable

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second head allowing relative rotation between the head and tube, rotation preventing means connecting said frame and the hydraulic piston and tube, a pair of hydraulic return motors mounted on either side of the cylinder for said first mentioned hydraulic piston, and a cross-head connection between said return motors and said first mentioned hydraulic piston and tube.

5. In a machine for straightening bars of the character described, a frame, two gripping heads mounted on said frame, said heads having housings and having aligned passageways there-through for the passage of bars from end to end of and through the machine, bar gripping means in each of said heads for holding bars at spaced points, anchoring means on one of the gripping heads adjustably positioning said head on the frame relative to the second head, gripping head rotating means mounted on said second head including a motor, worm and worm wheel, a hydraulic piston spaced from said second head and having one of said passageways aligned therewith, a non-rotatable hollow connecting tube extending between the housing of said second head and the hydraulic piston and aligned with said piston and housing passageways, a flange connected with said tube, thrust bearing means between said flange and said rotatable second head allowing relative rotation between the head and tube, rotation preventing means connecting said frame and the hydraulic piston and tube, a pair of hydraulic return motors mounted on either side of the cylinder for said first mentioned hydraulic piston, and a cross head connection between said return motors and said first mentioned hydraulic piston and tube.

FRANCIS J. KATZ.

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

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Certificate of Correction

Patent No. 2,487,972

November 15, 1949

FRANCIS J. KATZ

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 3, line 55, for "Referring to Fig. 49" read *Referring to Fig. 3, tailstock 49*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of March, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.