Sept. 8, 1936. J. S. NICHOLAS 2,053,375

BAR MAKING PROCESS

Filed June 3, 1933 2 Sheets-Sheet 1

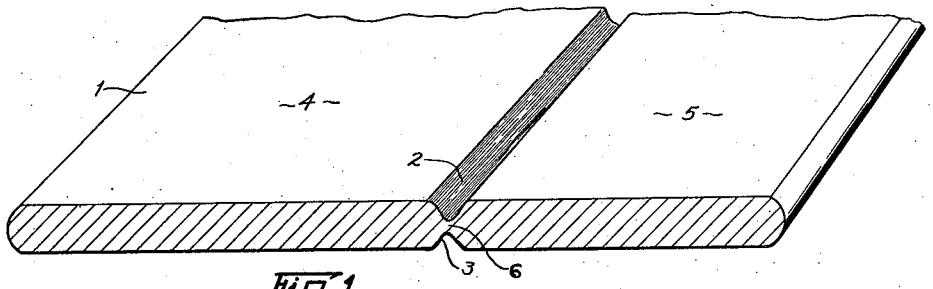

Fig 1

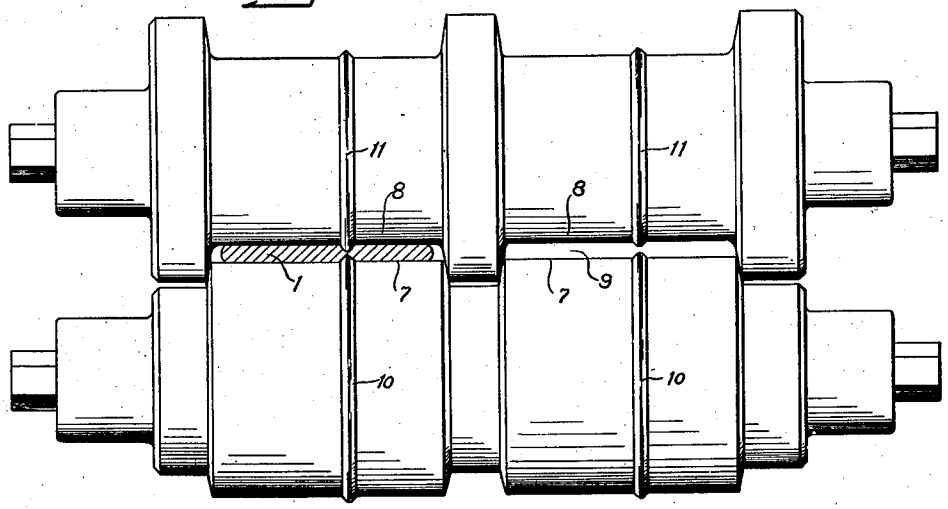

Fig 2

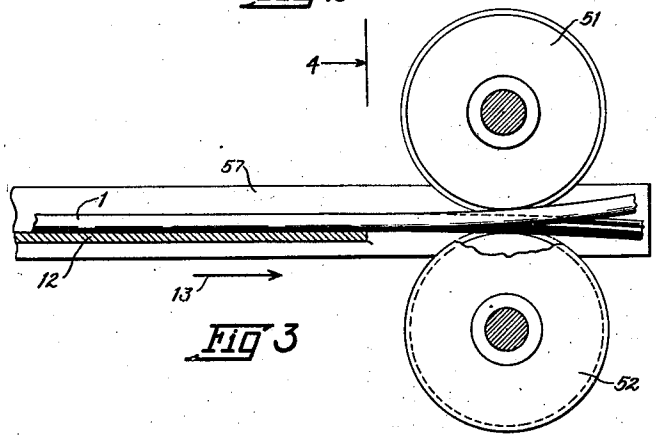

Fig 3

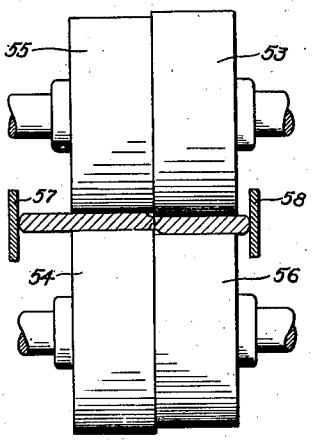

Fig 4

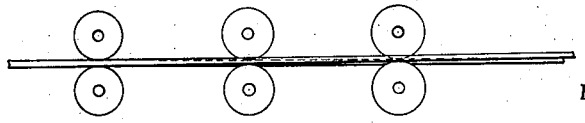

Fig 5

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BAR MAKING PROCESS

Filed June 3, 1933 2 Sheets-Sheet 2

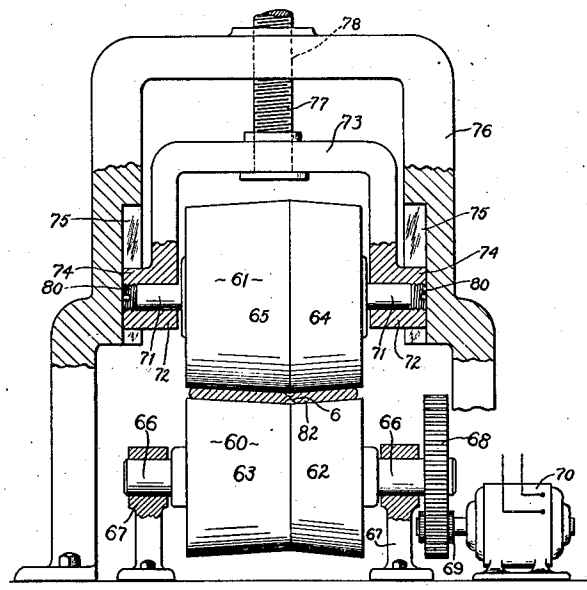
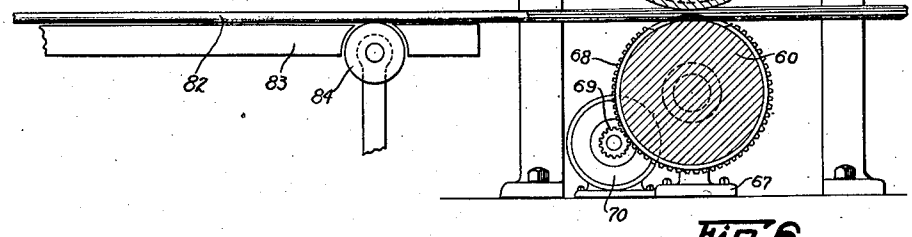


Fig 7



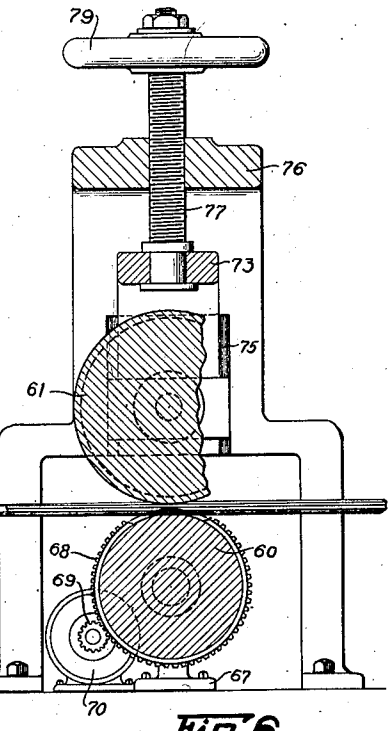


Fig 6

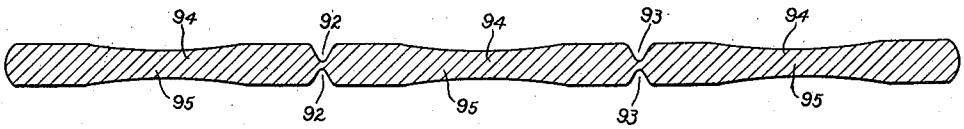


Fig 9

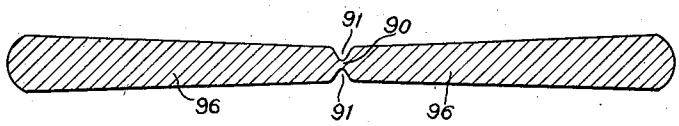


Fig 8

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Patented Sept. 8, 1936 2,053,375

UNITED STATES PATENT OFFICE

2,053,375

BAR MAKING PROCESS

John Simmons Nicholas, Cleveland Heights, Ohio, assignor to The American Fork & Hoe Company, Cleveland, Ohio, a corporation of Ohio

Application June 3, 1933, Serial No. 674,234

3 Claims. (Cl. 29—66)

This invention relates to methods and means for fabricating metals and relates particularly to methods and means for producing steel or other metal bars.

In the manufacture of various articles from metal, such for example as steel, it is common practice to utilize bars of suitable width and thickness as produced in standard sizes in a mill.

For example, there are numerous instances wherein bars of the general dimensions of one-half inch by four inches to four and one-half inches is suitable. Now as the steel mill practice and the market for steel shapes has developed, the rolling of bars, for example bars of these said general dimensions, has been accomplished by what may be called a secondary operation. That is to say, the steel is first made from the original ingot into billets, or into blooms and then into billets; then the billets are reheated and rolled into the bars. The bars thus become what is known as finished product of the mill and are sold at the price of finished product and the transportation or freight charges thereon are determined as for finished mill products.

Again, in the development of the steel business, it has become standardized practice to manufacture at the mill what is known as sheet bars. Some mills, for example, roll sheet bars approximately eight inches wide and of thickness varied as desired within limits. These sheet bars are sometimes rolled in so-called tongue and groove rolls, that is, are rolled in the annular groove of one roll, and the mating roll having an annular collar or tongue which fits into the groove. Thus by adjusting the distance between the roll centers, the thickness of the rolled sheet bar (for the given size of billet) may be varied as desired.

Such sheet bars, because of the size or sectional area thereof, may be made by a continuous rolling process, directly from the original ingot utilizing the ingot heat, and without re-heating; and furthermore are classed as semi-finished or unfinished mill products; and furthermore are sold and transported as semi-finished or unfinished product; and for these several reasons may be laid down at the plant of the manufacturer who can utilize them, at a substantially lower cost per pound than the finished bars above described.

Where, however, the sheet bars are of too great width for the manufacturer's operations, he has heretofore found that the cost of cutting or splitting the wide sheet bars into bars has rendered them more expensive than the bars if originally produced at the mill.

It is therefore an object of the present invention to provide an improved method and means for reducing relatively wide "sheet bars" to relatively narrow "bars".

Another object of this invention is to provide a method and means by which the cost of providing, at a point remote from the steel mill, bars, made from sheet bars, may be rendered less than the cost of providing bars originally rolled at the mill.

Another object of this invention is to provide a method and means for rolling metal sheet bars adapted to be reduced to bars in an improved manner.

Another object is to provide an improved method and means for producing metal bars.

Another object is to provide an improved steel or other metal rolled "section".

Other objects of my invention will be apparent to those skilled in the art to which my invention appertains.

My invention is fully disclosed in the following description taken in connection with the accompanying drawings, in which:

Fig. 1 illustrates a fragment of a sheet bar made according to my invention and which may be reduced to bars by the practice of my invention;

Fig. 2 illustrates, partly in diagrammatic form, a pair of mill rolls by which the sheet bar of Fig. 1 may be produced;

Fig. 3 is a side elevational view of a machine by which the bar of Fig. 1 may be reduced to bars;

Fig. 4 is a sectional view taken from the plane 4 of Fig. 3;

Fig. 5 is a diagrammatic view illustrating a modified form of machine.

Fig. 6 and Fig. 7 are, respectively, views generally similar to Figs. 3 and 4 and illustrating another modification of machine;

Figs. 8 and 9 are views generally similar to Fig. 1 illustrating modifications.

Referring to the drawings, I have shown at 1 a steel sheet bar which may be made according to my invention. The width and thickness of the bar 1 may be that of sheet bars, as sometimes made, i. e. in the neighborhood of 8 inches wide and ½ inch thick.

Fig. 1 illustrates a fragment of such a bar and the bar may be of the length to which it is customary to roll ordinary sheet bars. The bar 1 has in its upper and lower faces opposite grooves 2 and 3 extending the full length of the bar, parallel to its parallel side edges. The grooves may be of any suitable shape but preferably are angular and embrace an angle of 90°; and the grooves are of such depth that at their apices

the metal is about $\frac{3}{16}$ of an inch thick. The bar 1 may therefore be considered as in two portions, 4 and 5, joined by a longitudinal neck 6.

The portions 4 and 5 may be of equal width but in some instances it is desirable to make them of different width such for example as 4 inches and 4½ inches, or 3 inches and 5 inches, etc.

The bar of Fig. 1 is rolled in a sheet bar mill on rolls formed to simultaneously roll the portions 4 and 5 to the desired thickness and to roll the grooves 2 and 3. It will be apparent to those skilled in this art how to make rolls for these operations and rolls of various general types may be employed. In Fig. 2 I have illustrated one type of roll known as tongue and groove rolls or closed path rolls. These rolls are in general of the conventional design for rolling sheet bars and a general description thereof is believed to be unnecessary, except to state that a tongue or collar portion 7—7 on the lower roll rolls in a groove portion 8—8 of the upper roll to roll the sheet bar in the space 9 therebetween, which space in thickness may be adjustably varied by adjusting the distance between the center lines of the rolls to vary the thickness of the sheet bar.

In the practice of my invention the rolls are each provided with beads or ribs 10 and 11, respectively, on the tongue 7 and in the groove 8, a rib 10 and a rib 11 being aligned in a plane at right angles to the rotary axis for rolling the grooves 2 and 3.

Sheet bars having the section of Fig. 1 may thus be produced at a mill and sold and shipped to a manufacturer as semi-finished or unfinished product of the mill.

By a simple apparatus which will now be described, in connection with Figs. 3 and 4, the purchaser, that is, the manufacturer, may reduce the sheet bar of Fig. 1 to two bars corresponding to the portions 4 and 5 of Fig. 1, which bars may be used in various manufacturing processes, for example processes in which a bar of steel is fed through a machine or is cut into short pieces or blanks.

I have shown at 12 a table upon which a sheet bar 1 may be laid and moved in the direction of the arrow 13.

At 51 and 52 are rollers having portions 53 and 54, respectively, which overlap each other in the nature of a shear. The rollers 51 and 52 may also have portions 55 and 56, respectively, of smaller diameter. By this arrangement of rolls, the bar 1 may be split, broken or sheared by the roll portions 53 and 54. Guides 57 and 58 may be disposed at each edge of the sheet bar so that the shearing operation will take place along the line of the grooves 2 and 3 of the sheet bar above described, whereby it is rendered very easy of performance and is not to be compared with the more difficult and expensive operation of shearing into bars a sheet-bar of uniform thickness, that is, without the grooves 2 and 3.

The small diameter portions 55 and 56 of the rolls 51 and 52 are not essential but may be employed, the roll portions 55 serving to hold the sheet bar upon the roll 54 while being sheared, and the roll portion 56 serving to support the sheared off portion of the sheet bar.

The machine above described is illustrated in some respects diagrammatically in the drawings but will be clear to those skilled in this art.

Any suitable mechanism, not shown but of a kind well known in the art, may be provided to support the two rolls or bearings and to rotate them to propel the work therebetween, and to adjust the distance between their axes to adjust the shearing overlap of one roll relative to the other. A very small overlap is sufficient to effect the small offset of the two parts of the bar necessary to sever them.

In Fig. 5 I have shown, diagrammatically, a machine having a plurality of pairs of rolls spaced longitudinally of the bar, each pair effecting a part only of the shearing operation, the operation thus being performed in successive stages.

In Figs. 6 and 7 I have illustrated another type of machine which may be employed to break the sheet bar into bars. In this form, the adjusting means for adjusting the center distances of a pair of rolls is illustrated, as well as a means of driving the rolls, and such means may be employed in connection with the form of Figs. 3 and 4 as referred to above.

Referring to Figs. 6 and 7, I have shown at 60 and 61, lower and upper rolls, respectively concave and convex, the roll 60 comprising frusto-conical portions 62 and 63 joined at their smaller bases, and the roll 61 comprising frusto-conical portions 64 and 64 joined at their larger bases.

The conical angle of the two roll portions in each case is relatively slight for a purpose to be described, and the relative angle of the roll portions is such that a space of substantially uniform width between the upper and the lower rolls is provided at all times.

The roll 60 is mounted by trunnions thereon 66—66 in bearings 67—67, and may be rotatably driven by a large gear 68 secured to one of the trunnions meshed with a pinion 69 driven by an electric motor 70.

The upper roll 61 is rotatably mounted on trunnions 71—71 in bearings 72—72 in the outer ends of a U-shaped yoke 73 vertically adjustably reciprocable by slide portions 74—74 in vertical guides 75—75 formed in a stationary frame 76. A rotatable screw 77 is rotatably mounted in the yoke 73 and anchored against longitudinal movement therein and is threaded as at 78 in the frame 76. A wheel 79 is provided to turn the screw.

By this arrangement, the roll 61 may be elevated or depressed to adjust the space between it and the roll 60, and by means of screws 80—80 in the bearing bores for the trunnions 71—71, the roll 61 may be adjustably shifted axially to position it relative to the roll 60.

The sheet bar, illustrated in these figures at 82, is supported upon a table 83 provided with surface rollers 84 and is fed between the rolls, and as it passes therethrough it is bent along the longitudinal grooves of the sheet bar, cracking the metal in a relatively thin neck portion 6 thereof, breaking the sheet bar into two bars.

In Fig. 8 I have illustrated another sheet bar which may be made according to my invention provided with a neck portion 90 by which it may be broken into two bars. In this form the two bar portions 91—91 are generally of wedge form whereby the bars made from the sheet bar are adapted to be formed into the heads of axes, hatchets and the like.

In Fig. 9 another form of sheet bar is illustrated in which two pairs of opposite grooves 92—92 and 93—93 are rolled which adapts the sheet bar to be broken into three bars 94—94—94 and machines similar to those illustrated and described hereinbefore may be provided for this purpose. It is believed unnecessary to illustrate such machines in view of the complete illustration and

description of the machines of Figs. 3 and 4 and 6 and 7.

The bar portions **94** may be varied from the generally rectangular form of the bars **4** and **5** of Fig. 1 and in the instance illustrated are provided with intermediate thin portions **95—95** as illustrative forms.

In the forms of Figs. 8 and 9, very thin neck portions are provided by the grooves **91**, **92** and **93**.

My invention is not limited to the exact type or design of rolls illustrated and described in the foregoing. Any suitable rolls by which a sheet bar may be rolled with a groove therein or a pair of opposite grooves therein may be employed.

Again, my invention is not limited to the thickness of neck illustrated and described provided between the two parts of the sheet bar. The thickness of this neck may be varied, for example with varying thicknesses of the bar, and in some cases may be very thin or only thick enough to hold the sheet bar in integral form while handling and prior to the time of shearing it apart into two bars.

Whereas I have clearly illustrated two opposite grooves in the bar in each case, it will be apparent that in some aspects my invention may be practiced with a single groove.

I claim:

1. The method of making metal bars from a metal sheet bar having the form of a pair of longitudinally extending substantially flat bar portions joined by a longitudinally extending neck of sufficient restricted width and thickness to render it readily fracturable, which includes feeding the sheet bar longitudinally between a pair of concavo-convex rolls to effect the application of forces to the two bar portions in directions substantially at right angles to the planes of the bar portions to effect progressive bending of the bar portions longitudinally along the neck sufficiently to progressively fracture the neck to progressively produce two separate bars but insufficiently to permanently bend the bars.

2. The method of making metal bars from a flat metal sheet bar having the form of a pair of longitudinally extending flat bar portions joined by a longitudinally extending neck of sufficiently restricted width and thickness to render it readily fracturable, which includes, feeding the sheet bar longitudinally between tool elements in engagement therewith to cause bending forces to be applied to the sheet bar portions at opposite sides of the neck in directions substantially at right angles to the planes of the flat bar portions to thereby bend the sheet bar longitudinally progressively along the neck to progressively fracture the neck to progressively sever the bar portions from each other.

3. The method of making metal bars from a metal sheet bar having the form of a pair of longitudinally extending coplanar bar portions joined by a longitudinally extending neck of sufficiently restricted width and thickness to render it readily fracturable, which includes, feeding the sheet bar longitudinally between tool elements of the roll type in engagement therewith to effect the application of forces to the bar portions on opposite sides of the neck in directions substantially at right angles to the planes of the bar portions to effect bending of the longitudinally moving sheet bar progressively longitudinally along the neck to progressively fracture the neck to progressively sever the bar portions from each other.

JOHN SIMMONS NICHOLAS.