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AUTOMATIC TWIN BAR-BRIDGE BENCH PIERCER MILL

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2 SHEETS—SHEET 1

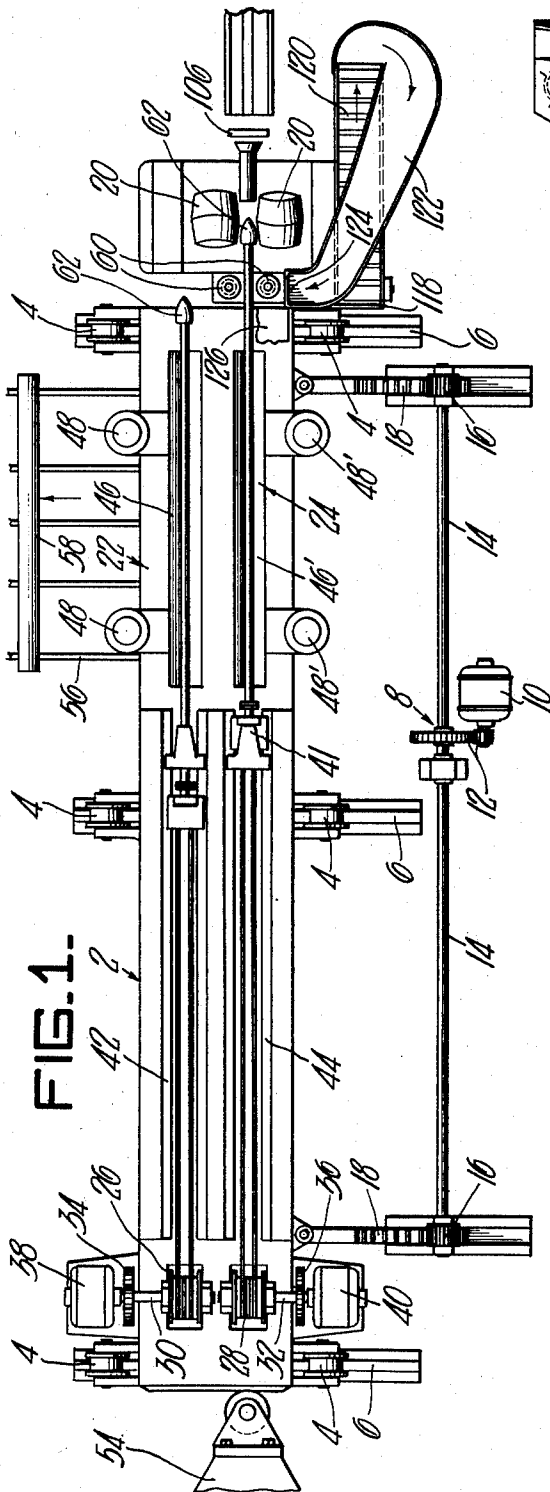


FIG. 1-

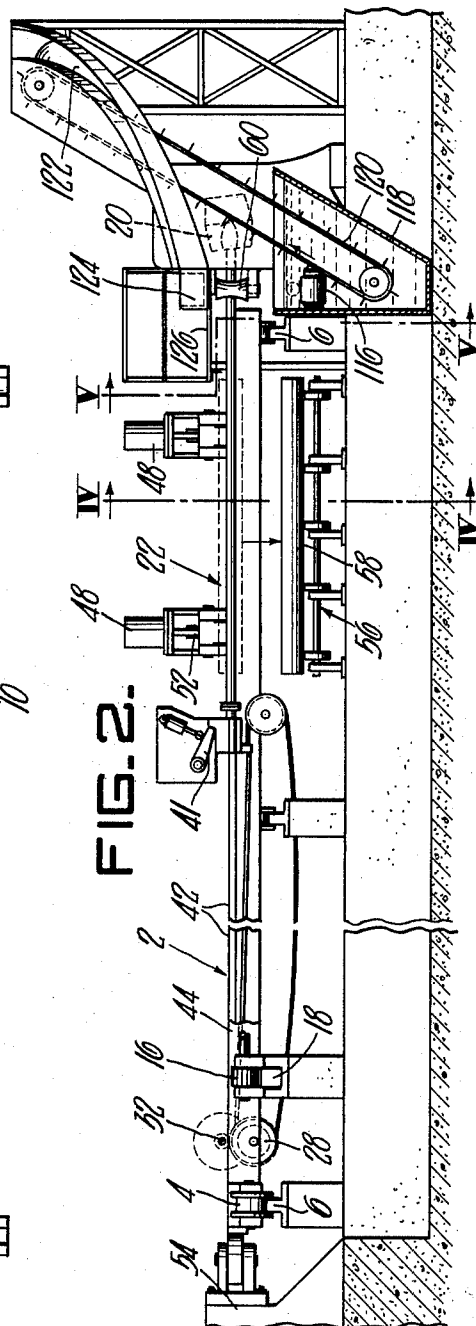


FIG. 2-

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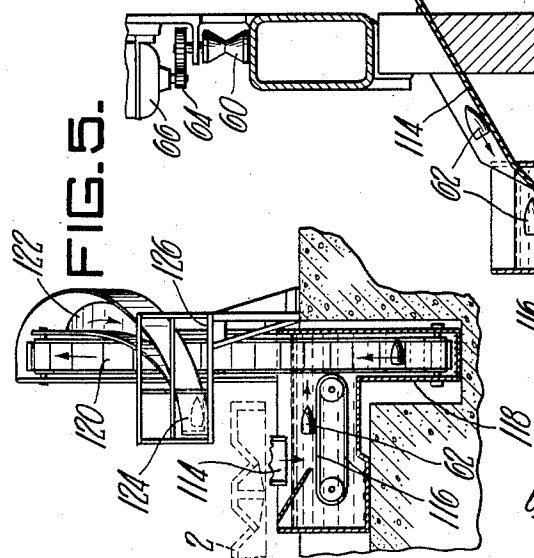
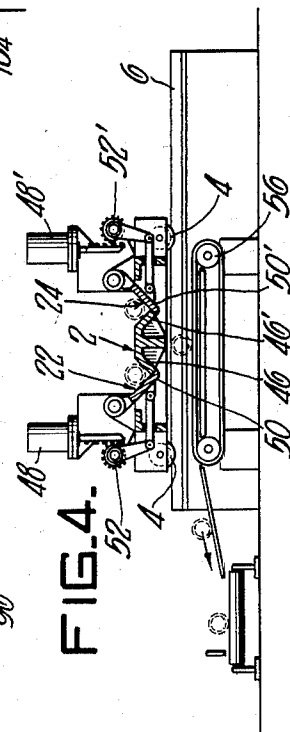
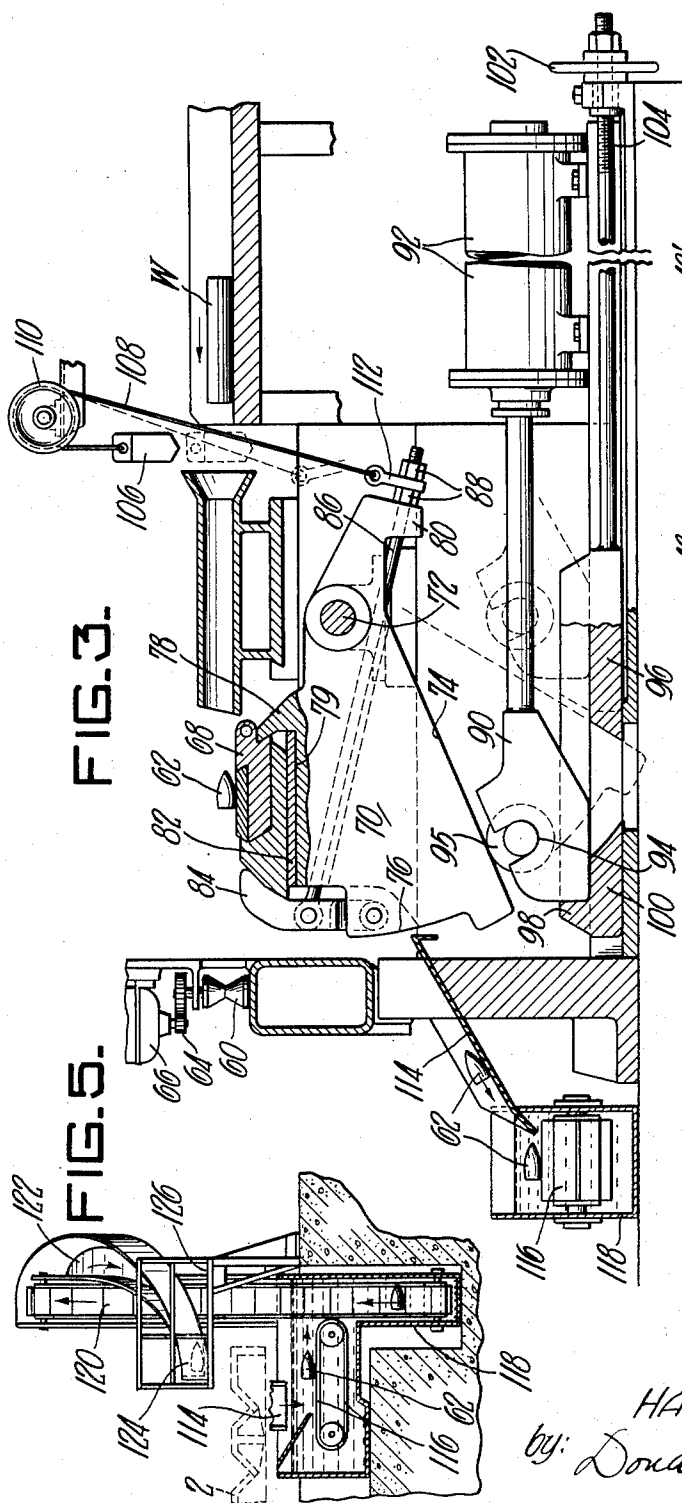
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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

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3 Claims. (Cl. 80—13)

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This invention relates to an automatic twin-bar bridge bench piercer mill and more particularly to such a mill having a pivotally mounted bottom piercer guide.

Prior to my invention, conventional piercing mills were equipped with a single plug-bearing thrust bar on the delivery side of the mill. In the operation of a single bar piercing mill the thrust bar is withdrawn through the pierced shell in order to permit the shell to be removed for a subsequent operation. As the bar is withdrawn, the piercer plug on its end is detached and remains in the roll pass. The used plug is then too hot to be used for piercing another billet and therefore must be removed from the roll pass for cooling. This removal is ordinarily accomplished manually with the aid of a pair of tongs. In order to proceed with operations a fresh plug is placed on the single thrust bar and positioned within the roll pass. Although the time consumed during each plug change is short, the repeated plug changes necessary have a serious cumulative effect on the number of shells the mill is capable of producing within a given period of time. This limiting factor is a common characteristic inherent in all single thrust bar piercing mills and is one which cannot be overcome by the usual measures, such as increasing the operating speed of the mill or refining operating technique. Although taking such measures increases the efficiency of the mill, such increased efficiency is found to be effective to increase production only up to a definite maximum amount, approximately 300 shells per hour, due to the physical limitations of the mill.

Another factor which effects piercing mill production is the tendency for some shells to become lodged within the roll housing after the piercing operation, so that manual manipulation is necessary to loosen them before operations can continue.

I propose to increase seamless tube shell production substantially by providing a piercing mill that is free of the detrimental characteristics described above. The piercing mill of my invention is equipped with two plug-bearing thrust bars positioned adjacent to each other and so adapted that each may be alternately operated in the piercing roll pass while the other remains in stand-by position. While the one thrust bar is operating the other can be prepared in its stand-by position for the next billet piercing operation. In conjunction with this feature I propose to also provide an automatic plug discharge means in the mill which will eliminate

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entirely the need for any manual handling in the plug removal process. The mill I propose is also provided with positive means for pulling or delivering the pierced shell from the roll housing to the bridge bench, thus insuring unimpeded passage for each shell and eliminating mill delays due to shells becoming lodged within the roll housing.

It is, accordingly, an object of my invention to provide an automatic twin-bar bridge bench piercing mill, for seamless tube production, that is capable of increased production through the use of new automatic movement controls and operations.

It is another object of my invention to provide a piercing mill having a bottom drop guide support for automatically discharging a used plug from the mill roll pass.

It is a further object of my invention to provide a piercing mill having pull-out rolls for engaging the pierced shells on the outlet side of the roll pass of said mill.

These and other objects will become more apparent after referring to the following specification and attached drawings, in which:

Figure 1 is a top plan view of a mill embodying my invention;

Figure 2 is a side elevation;

Figure 3 is a central vertical section showing the pivotally mounted bottom guide support and safety gate;

Figure 4 is a sectional view taken on the line IV—IV of Figure 2; and

Figure 5 is a sectional view taken on the line V—V of Figure 2.

Referring more particularly to the drawings, a bridge bench 2 moves transversely on the delivery side of piercing mill rolls 20, 20 on wheels 4 over rails 6. The bridge bench transverse drive 8 comprises a motor 10 which through gears 12 and through a shaft 14 drives pinions 16 which actuate rack bars 18. The bench 2 supports two water-cooled thrust bar units 22 and 24, complete with pulley drives 26 and 28, mounted on shafts 30 and 32 which are rotated through gears 34 and 36 by motors 38 and 40. A drop latch 41 is provided for holding each thrust bar in piercing position. Run outs 42 and 44 and bottom dump troughs 46 and 46' are also provided on the delivery side of the mill. Bottom dump troughs 46, 46' are operated by air cylinders 48, 48' which open and close sides 50, 50' of each trough through rack and pinion connections 52, 52'. Bridge bench 2 is supported longitudinally by a thrust pier 54. A lower floor chain

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conveyor 56 is provided beneath the bottom dump troughs 46, 46' for carrying the pierced shells 58 transversely to the next operation.

A pair of pull-out rolls 60 is provided adjacent the delivery side of rolls 20, 20 for engaging a workpiece W as it clears over a piercing plug 62 in the roll pass. Rolls 60 are driven through gears 64 by vertical motors 66.

Supporting a bottom guide shoe 68, in the roll pass between rolls 20, 20, is a drop guide support 70 pivotally mounted at 72. The guide support 70 is provided with an inclined bottom surface 74, an extended portion 76 at its upper forward end, a vertical abutment 78 projecting from its upper surface 79, and a downwardly extending lug portion 80 at its inner end. The guide shoe 68 rests on a filler plate 82 disposed on the upper surface 79. A vertical clamp bar 84, pivotally mounted on the extended forward portion 76 of the guide support 70, serves to draw together the guide shoe 68, the guide support 70 and the filler plate 82. The clamp bar 84 is, in turn, pulled tightly against the guide shoe 68 and filler plate 82 by means of a forked clamp bolt 86 which extends longitudinally through guide support 70 and projects outwardly from its lug portion 80. The clamp bolt 86 is held in position by means of two lock nuts 88 which are threaded on its projecting inner end.

Guide support 70 is actuated by means of a bar wedge 90 which, in turn, is actuated by a two-way pressure cylinder 92. Rotatably mounted in a recess 94, in the top surface of bar wedge 90, is an idler roll 95 which rolls along the inclined bottom surface 74 of guide support 70 as the bar wedge 90 slides along a rail 96 below the guide support. The forward stroke position of the bar wedge is limited by a vertically hooked end 98 on the forward end 100 of rail 96. The position of the hooked end 98 is controlled by means of a wheel 102, which turns on a threaded bar 104 secured to rail 96, for remote adjustment of bottom drop guide support 70.

In order to prevent the billet W from entering the roll pass between rolls 20, 20 when the guide support 70 is not in working position, a safety gate 106 is provided before the entrance end of the roll pass. Gate 106 is actuated by cables 108 which pass over pulley 110 and are connected to a cable hook 112 affixed to bolt 86 intermediate the lock nuts 88. This arrangement provides for automatic movement of safety gate 106 in connection with the movement of guide support 70, the gate being automatically lowered to block the entrance to the roll pass when guide support 70 is lowered out of position and then being raised when the guide support is raised into working position.

An inclined chute 114 is provided to receive the used plug 62 when the guide support 70 is lowered after each piercing operation has been completed. The lower end of chute 114 is disposed above a continuous chain conveyor 116 which is submerged in a water box 118. Extending upwardly from the discharge end of conveyor 116 is an elevator conveyor 120 having its lower end submerged in the water box 118 for the purpose of receiving the used plug and carrying it upwardly to a spiral chute 122, whereby it is returned to a plug storage box 124 located on the plug man's platform 126. Plug box 124 is positioned so as to be easily accessible to the plug man for preparing the thrust bar in stand-by position. The plug man uses a short hook to place the cooled plug on bridge bench 2 where it is picked up by the thrust bar advancing to stand-by position.

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In operation, the workpiece W is charged into piercer rolls 20, 20 by means of a conventional billet charger. At the beginning of operations, guide support 70 is in working position and safety gate 106 is, therefore, in raised position. As shown in Figure 1, the end of thrust bar 24, carrying plug 62, is positioned in the roll pass between rolls 20, 20. After the workpiece has been pierced, it will be engaged by pull-out rolls 60, as it clears over plug 62, to advance it on to the bottom dump trough 46'. When the thrust bar 24 is withdrawn from its working position in the roll pass the piercer plug 62 is detached from the bar and remains on the guide shoe 68 within the roll pass. After the thrust bar is withdrawn from workpiece W, air cylinders 48' open the side 50' of trough 46' causing the shell to drop onto conveyor 56 which carries it transversely to the next operation. Meanwhile, cylinder 92 is actuated to withdraw the bar wedge 90 from its forward position which withdrawal causes guide support 70 to drop from working position and the safety gate 106 to lower into position, blocking the entrance to the roll pass. Upon dropping guide support 70, the piercer plug 62 slides onto the chute 114 and hence onto conveyor 116 which transfers it horizontally to elevator conveyor 120. The conveyor 116 and the lower end of conveyor 120 are both submerged in water box 118 so that the plug is cooled thereby. The cooled plug, elevated on conveyor 120, drops onto the spiral return chute 122 and from there into the plug storage box 124.

After the plug 62 has been dropped onto chute 114, bar wedge 90 is again advanced forward to raise guide support 70 into working position. This movement causes safety gate 106 to be automatically raised out of blocking position so that another billet can enter the roll pass. Bridge bench 2, meanwhile, has been moved transversely and thrust bar 22, bearing plug 62', has advanced into working position in the roll pass. While thrust bar 22 is in working position a fresh plug will be placed on the bridge bench 2 and thrust bar 24 will be advanced by pulley drive 26 to stand-by position to pick up the plug. It remains in this stand-by position preparatory to moving into working position for piercing the next billet after thrust bar 22 is withdrawn.

While one embodiment of my invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. Plug-handling apparatus for a piercer mill comprising a guide-shoe support pivotally mounted below the mill, a guide shoe on said support, said guide shoe being positioned to catch a piercing plug on withdrawal of the thrust bar therefrom, means for raising and lowering said guide-shoe support, a gate suspended adjacent the entrance side of the mill, and means connecting said gate with said support for operation thereby when said support is raised and lowered.

2. A bottom guide for a tube piercer mill comprising a guide-shoe support pivotally mounted below the mill, a longitudinal rail below said support, a wedge bar slidably mounted on said rail, a roller journaled in said wedge bar and engaging said support, and means for reciprocating said bar over said rail to thereby raise and lower said support.

3. In a piercing mill, the combination with a bottom guide support pivotally mounted below the

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mill, means for raising and lowering the support, a safety gate on the entrance side of the mill and a connection from the support to the gate whereby the gate is moved to an out-of-the-way position when the support is raised.

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