Jan. 18, 1955 J. W. KELSO 2,699,697

MANDREL CHANGING APPARATUS

Filed Feb. 7, 1951

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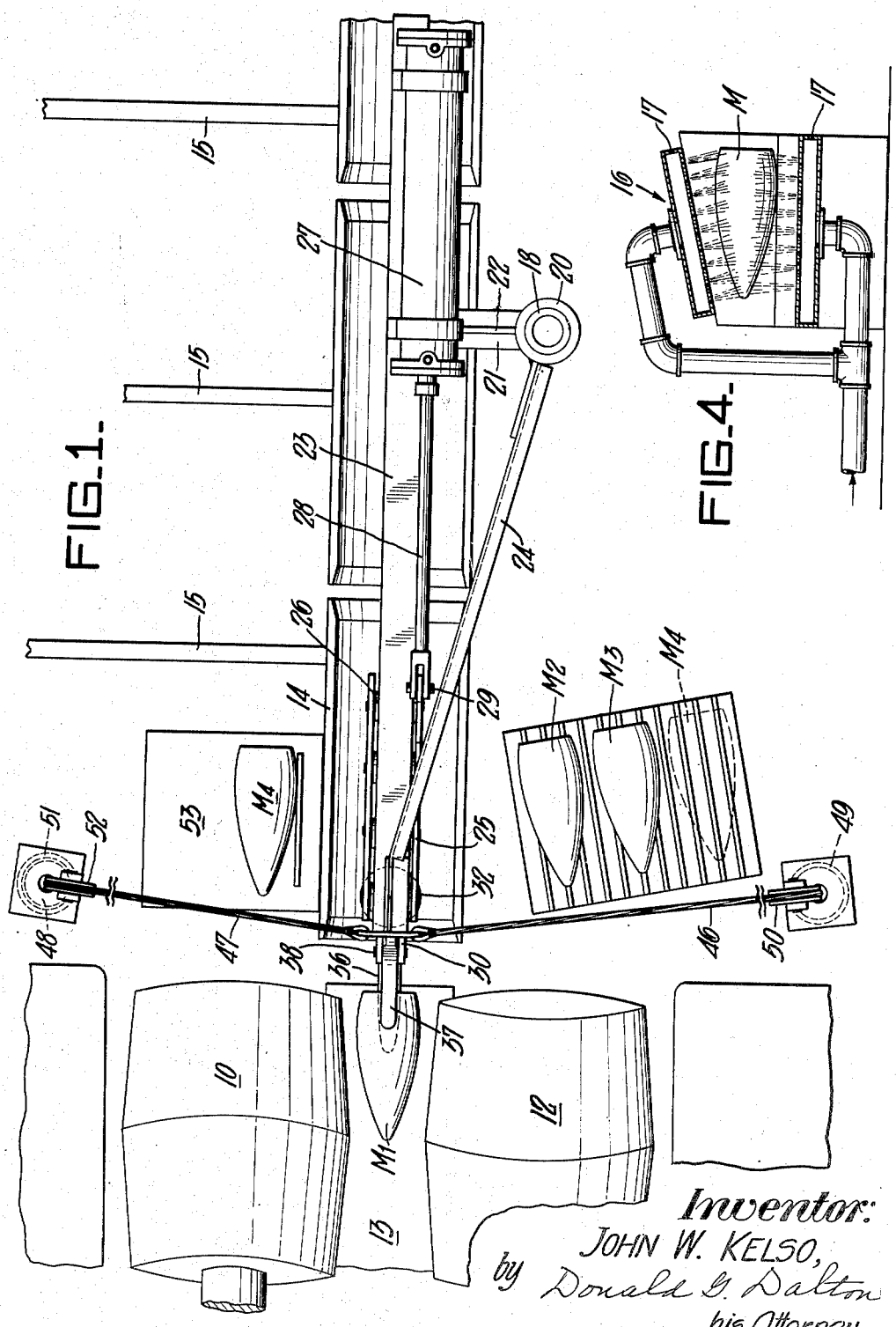


FIG. 1.

FIG. 4.

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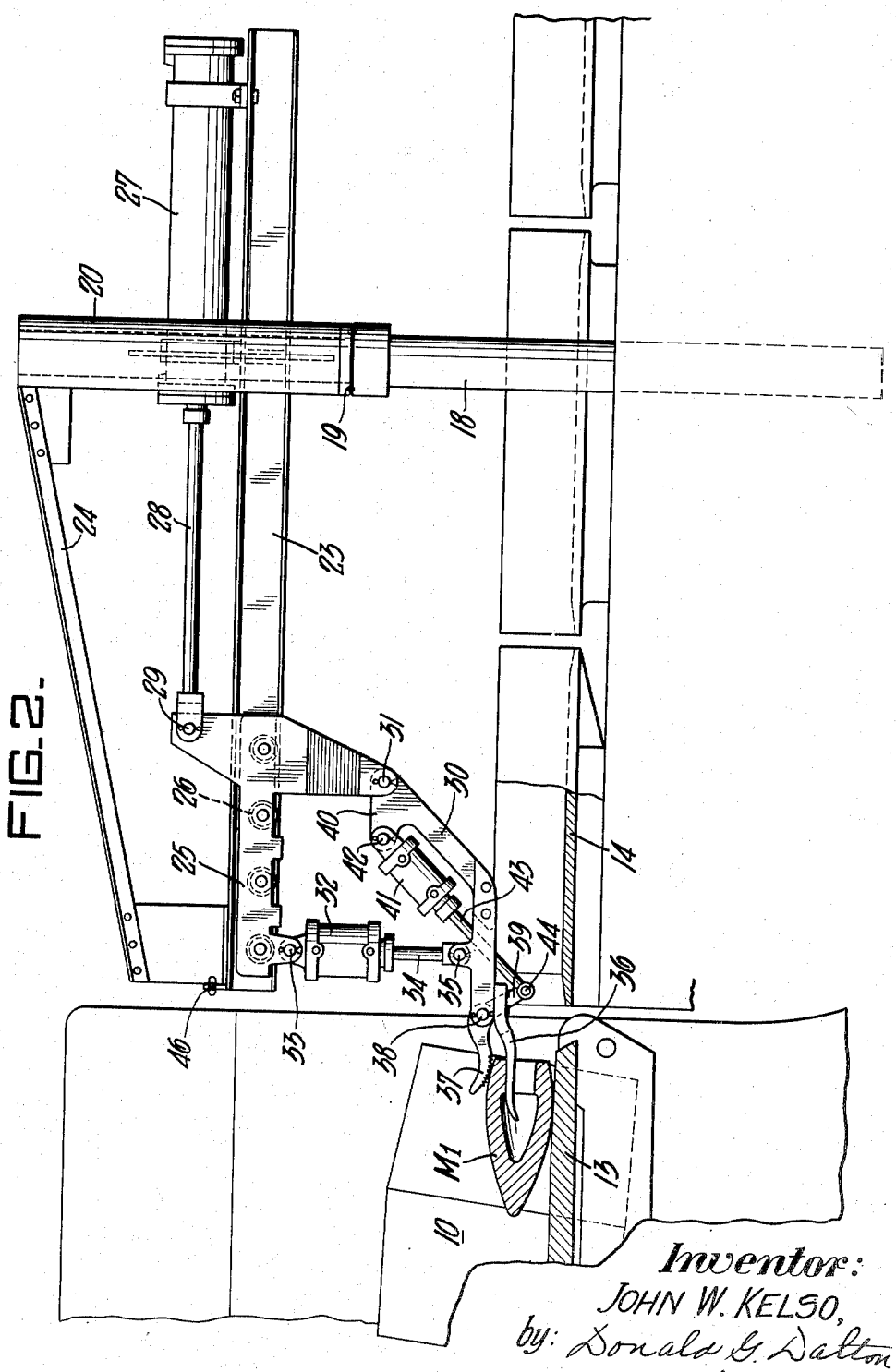
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FIG. 2.



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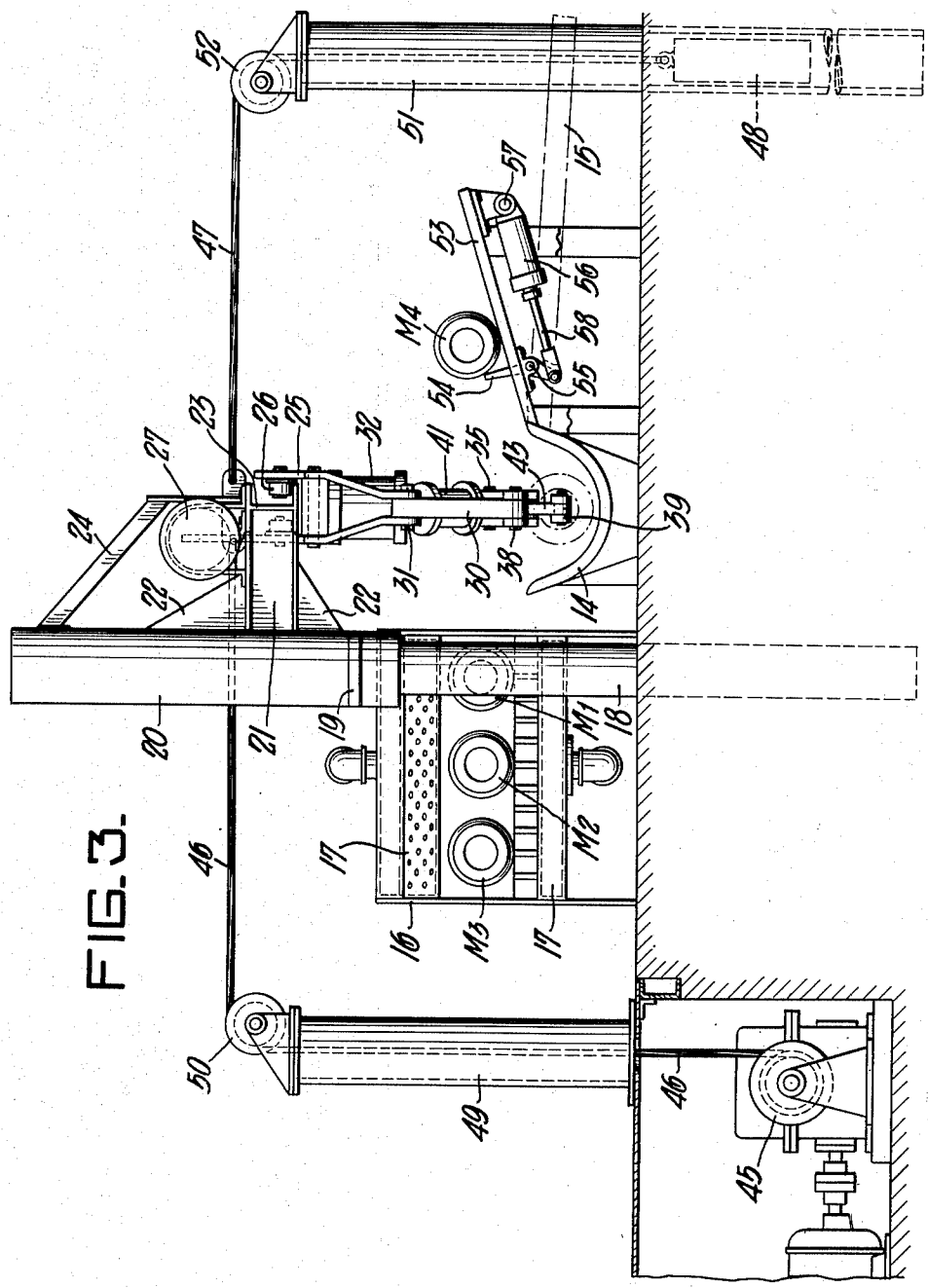


FIG. 3.

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MANDREL CHANGING APPARATUS

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Application February 7, 1951, Serial No. 209,750

1 Claim. (Cl. 80—1)

This invention relates to apparatus for mechanically handling and changing the piercing mandrels in seamless tubing mills.

In operating such mills, the piercing mandrel must be changed after each billet has been pierced and must be thoroughly cooled before it can be re-used. It is customary to employ three or more mandrels for each mill, one of which is in use while the others are cooling. Usually mandrels are changed manually, which is a fatiguing operation, particularly for larger sizes of mandrels.

An object of the present invention is to provide improved apparatus for mechanically handling and changing mandrels and which can be installed on existing mills without otherwise altering the mill or mandrel structure.

A further object of the invention is to provide a mandrel handling apparatus which includes mechanical means for gripping a mandrel and cooperating mechanical means for transferring mandrels thus gripped from the guide shoe of a piercing mill to a cooling bosh and from said bosh to the mandrel trough of the mill.

In accomplishing these and other objects of the invention I have provided improved details of structure, a preferred form of which is shown in the accompanying drawings, in which;

Figure 1 is a top plan view of a portion of a piercing mill which is equipped with a mandrel changing apparatus embodying features of the present invention;

Figure 2 is a side elevational view, with parts broken away, of the mandrel changing apparatus;

Figure 3 is an end elevational view of the mandrel changing apparatus; and

Figure 4 is a vertical sectional view of a cooling bosh for the mandrels.

The drawing shows a portion of a seamless tubing piercing mill which includes the usual rolls **10** and **12**, guide shoe **13**, and mandrel trough **14**. The mill is shown as equipped with four piercing mandrels M_1, M_2, M_3, and M_4. In operation, a cool mandrel is deposited in mandrel trough **14**. The mandrel bar of the mill, moving from right to left but not shown, picks up this mandrel. A hot billet advances through the mill from left to right between rolls **10** and **12**, passes over the mandrel and thus is pierced, and moves on into the mandrel trough, from which it subsequently discharges sidewise onto skids **15**. In the meantime the mandrel bar is retracted, leaving the now heated mandrel resting in the guide shoe **13**. A cooling bosh **16** is situated beside the mandrel trough on the opposite side from skids **15** and has water sprays **17**. The heated mandrel is removed from the guide shoe and placed in the bosh and thus cooled for another piercing. The parts thus far described can be of any standard or desired construction, and therefore are not shown nor described in greater detail.

The apparatus of the present invention includes a vertical column **18** which is situated adjacent the mandrel trough **14**, preferably on the same side as the cooling bosh **16**. This column has a thrust bearing **19** and carries a sleeve **20** which rests on said thrust bearing and is rotatable on a vertical axis. Said sleeve carries a short, radially extending boom **21**, which is fixed thereto, as by gussets **22**. Boom **21** carries a longer, longitudinally extending boom **23**. Preferably a structural member **24** connects the free extremity of boom **23** and the top of sleeve **20** to rigidify these parts. Column **18** is positioned and boom **21** dimensioned so that boom **23** can occupy a position directly over the mandrel trough **14** but also can swing to either side thereof.

Boom **23** serves as a trackway for a carriage **25**, which has wheels **26** riding on flanges on said boom. A double-acting fluid pressure cylinder **27** is fixed to the boom and contains a reciprocable piston and piston rod **28**. The free end of said piston rod is connected to carriage **25** at **29** so that application of pressure to cylinder **27** either projects or retracts said carriage along boom **23**.

A frame **30** is pivoted to carriage **25** at **31**. A double-acting fluid pressure cylinder **32** is pivoted to said carriage at **33** and contains a reciprocable piston and piston rod **34**. The free end of said piston rod is pivoted to frame **30** at **35**, so that application of pressure to cylinder **32** moves frame **30** up or down about its pivot **31**.

Frame **30** carries cooperating fixed and movable mandrel engaging jaws **36** and **37** respectively. The latter jaw is pivoted to the frame at **38** and has an operating lever **39** extending from the opposite side of its pivot. Frame **30** has an overhanging ear **40**. A double-acting fluid pressure cylinder **41** is pivoted to said ear at **42** and contains a reciprocable piston and piston rod **43**. The free end of said piston rod is pivoted to the free end of the operating lever **39** at **44** so that application of pressure to cylinder **41** opens or closes jaws **36** and **37**.

For swinging the boom **23** about the pivot on column **18**, the apparatus includes a motor driven winch **45**, (Figure 3) a cable **46** wrapped around said winch and connected to the free end of said boom, a second cable **47** connected to the free end of the boom and extending in the opposite direction, and a counterweight **48** at the end of the latter cable. For guiding cable **46** between the winch and boom, the apparatus includes a hollow vertical column **49** which is situated above the winch and has a sheave **50** at its upper end. The cable extends up through this column, around sheave **50**, and thence to the free end of the boom. Similarly for guiding cable **47** between the boom and counterweight, the apparatus includes a vertical column **51** which has a sheave **52** at its upper end. Cable **47** extends from the free end of the boom, around sheave **52**, and down through column **51** to the counterweight. Winch **45** can be rotated in either direction. When it winds cable **46**, it swings boom **23** counterclockwise, as viewed in Figure 1. When it unwinds cable **46**, the pull of the counterweight **48** on cable **47** swings boom **23** clockwise.

Skids **15** carry an inclined mandrel supporting table **53**. A retractable stop **54** is pivoted at **55** to the lower part of said table, and when projected retains a mandrel on the table. A double-acting fluid pressure cylinder **56** is pivoted to said table at **57** and contains a reciprocable piston and piston rod **58**. The free end of piston rod **58** is pivoted to the lower end of stop **54**. Application of pressure to cylinder **56** thus either projects or retracts stop **54**. When the stop is retracted, the mandrel retained thereby rolls down into the mandrel trough **14** in a position to be picked up by the mandrel bar of the mill, as already explained. Pierced lengths of tubing travel far enough to the right in the mandrel trough so that table **53** does not interfere with their removal to the skids **15**.

In operation, assume that the mill has just pierced a billet and a heated mandrel M_1 is resting on the guide shoe **13** and a cooled mandrel M_4 on the inclined table **53**. Cylinder **27** is operated to retract carriage **25**, cylinder **32** to raise the frame **30**, cylinder **41** to open the jaws **37** and **38**, and winch **45** to swing the boom **23** to a position directly over the mandrel trough **14**. Next cylinder **32** is operated to lower the frame **30**, and cylinder **27** to project the carriage **25**. This operation moves the fixed jaw **36** within the mandrel bore. Next cylinder **41** is operated to close the jaws and thus grip the mandrel, cylinder **32** to raise the frame **30** and the mandrel, cylinder **27** to retract the carriage **25** and the mandrel, and winch **45** to swing the boom **23** counterclockwise. These movements are coordinated to place the mandrel opposite a vacant space in the cooling bosh **16**. Next cylinder **32** is operated to lower the frame **30** and the mandrel, cylinder **27** to project the carriage **25** and thus project the mandrel into this vacant space, and cylinder **41** to open the jaws **37** and **36** and release the mandrel.

In the meantime cylinder **56** is operated to retract stop **54** and thus release mandrel M_4, which rolls down into

the mandrel trough **14**. The cylinder then is operated to project the stop so that the table can receive and retain another mandrel. Next the carriage, jaws, frame and winch are operated to grip a cooled mandrel from bosh **16**, carry it to a position above table **53** and deposit it on said table.

From the foregoing description it is seen that the apparatus of the present invention affords a simple and reliable means for mechanically handling and changing mandrels in a seamless tubing piercing mill. The apparatus can be installed in conjunction with existing mills without otherwise altering their structure, and it effectively eliminates the need for handling mandrels manually.

While I have shown and described only a preferred embodiment of the invention, it is apparent that modifications may arise. Therefore I do not wish to be limited to the disclosure set forth but only by the scope of the appended claim.

I claim:

An apparatus comprising an upright column, a first horizontal boom extending from and carried by said column for rotation thereabout, a second horizontal boom extending at right angles to and rigidly carried by said first boom at the free end thereof and movable therewith, said second boom being horizontally offset from said column by the length of said first boom leaving the space beneath said second boom unobstructed, means connected to one of said booms for rotating them about said column,

a carriage movably supported on said second boom, a double-acting fluid pressure cylinder and piston on said second boom and connected to said carriage for projecting and retracting the latter with respect to said first boom, a frame pivoted to said carriage and having a free end adapted to be raised and lowered relative to said carriage, a double-acting fluid pressure cylinder and piston connected to said carriage and said frame for raising and lowering the free end of said frame, a pair of mandrel gripping jaws carried by the free end of said frame and being relatively movable on a horizontal axis, and a double-acting fluid pressure cylinder and piston connected to said frame and one of said jaws for opening and closing said jaws.

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