Feb. 18, 1930. F. L. JONES 1,748,045

METAL WORKING APPARATUS

Filed Dec. 29, 1926

Fig. 1

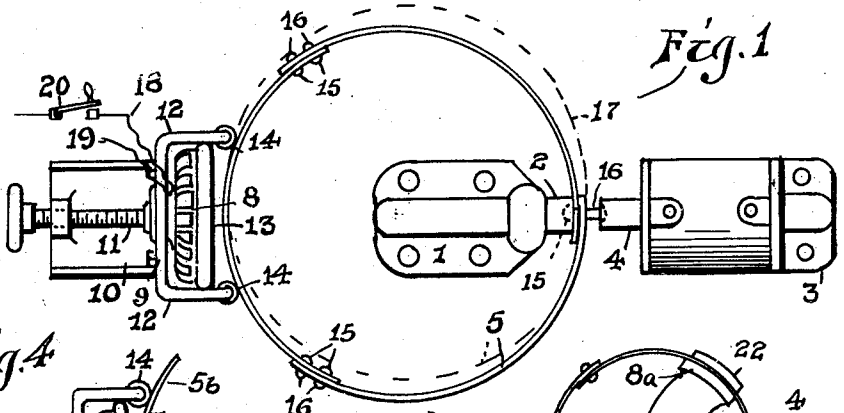
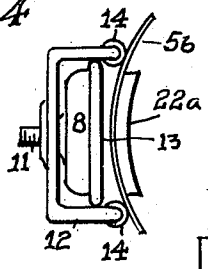


Fig. 4



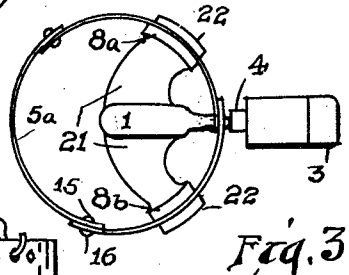


Fig. 3

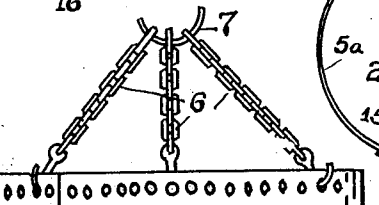
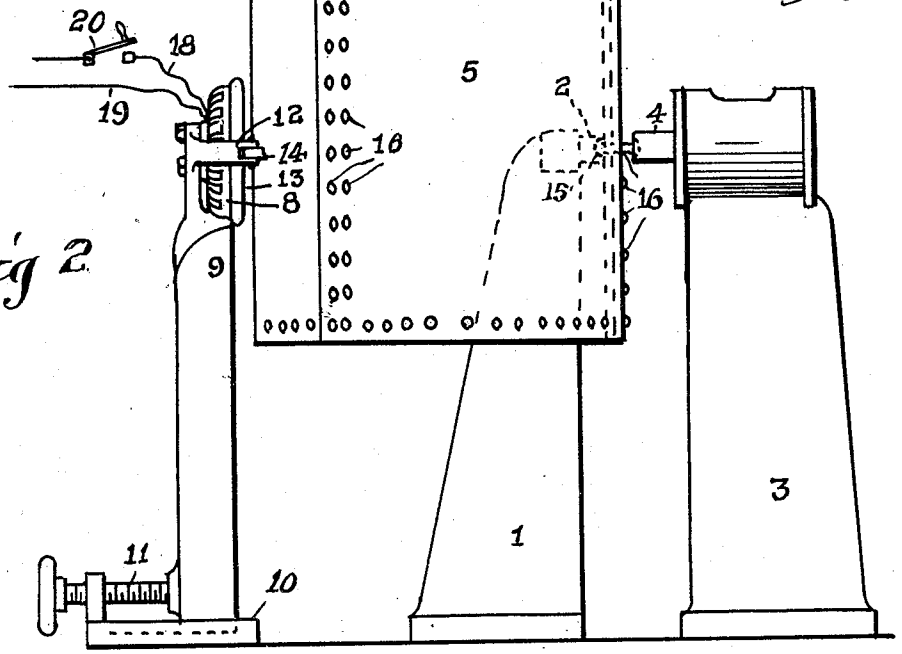


Fig 2



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Patented Feb. 18, 1930

1,748,045

UNITED STATES PATENT OFFICE

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METAL-WORKING APPARATUS

Application filed December 29, 1926. Serial No. 157,661.

My invention relates to metal working apparatus for magnetically holding work material such as boiler shells and tank-car tanks, for example, in proper position while parts thereof are being secured together by riveting, welding or the like, or it is otherwise acted upon, as by a punching machine.

The invention is illustrated in its application to the operation of riveting the seam of a boiler shell. In the operation of riveting such a shell, it is first assembled in cylindrical form, a few pins being driven into some of the rivet holes to hold the parts of the shell together temporarily. The shell is then picked up by a crane so that the seams will be vertical and horizontal. The shell is lowered with a line of rivet holes for a seam between the jaws of a riveting machine. Rivets are inserted in the rivet holes and set by the riveting machine, the shell being lowered step by step as the riveting proceeds from hole to hole. The shell will be turned horizontally step by step in case a horizontal seam is being riveted.

Ideally, the rivets should stand, during the riveting operation, radially with respect to the shell and the movable riveting tool should travel in line with the rivet, which should be in a plane normal to the longitudinal axis of the shell.

When a rivet has been put in place preparatory to riveting and the head of the rivet is brought into its seat in the stationary head or anvil of the riveting machine, the rivet becomes a pivot on which the shell may swing horizontally so that the rivet will stand in line with the center line of the shell or normal with the surface of the shell at the point where the rivet is. Usually two men standing at opposite sides of the riveting machine apply their shoulders to the shell for the purpose of moving the shell laterally until a vertical plane including the axial center of the shell shall be brought as nearly as possible to such a position that the movable tool or hammer of the riveting machine will reciprocate in that plane. The men often fail to satisfactorily position the shell, so that some of the rivets are improperly set. Such rivets may cause leaks and must be chipped out and replaced.

It is one of the objects of this invention to provide electromagnetic means for holding the shell or other work material in proper position for perfect riveting or other operation.

My invention contemplates the use of magnetizing means comprising one or more magnets within or without the shell or work piece, the magnetizing means being located so that the resultant pull or pulls will center or adjust the shell or work piece in any desired position with respect to the operating device. If the shell or equivalent is not made of magnetizable material, a magnetizable piece may be clamped or otherwise connected to the shell or other work piece, adjacent to each magnetizing means, so that the shell or work piece will be adjusted the same as if it were entirely of magnetizable material.

Referring to the accompanying drawing, Fig. 1 is a plan view of an apparatus embodying my invention, the sling being omitted, and Fig. 2, a side elevation thereof. Fig. 3 is a plan view showing a modification in which two magnets are employed within the shell, and also showing how the invention is adapted to work on non-magnetizable work pieces. Fig. 4 is a fragmentary plan view showing how the invention shown in Figs. 1 and 2 may be adapted for use with non-magnetizable work pieces.

On the drawing 1 is a standard supporting the stationary cupped jaw or anvil 2 of a riveting machine and 3 is a standard for supporting the movable tool 4 which engages the outer ends of the rivets in the usual manner.

5 is a boiler shell composed of magnetizable material and suspended in a vertical position by means of the sling comprising the chains 6 connected to the upper end of the shell and the ring 7, which is for connection to the hoisting hook of a crane, not shown. The shell is lowered over the standard 1 with the wall of the shell between the jaw 2 and the tool 4. The rivets are inserted in the rivet holes and set in the usual manner. The apparatus so far as described above is old and well known.

8 is a circular electromagnet supported by the column 9 so that the horizontal or axial

center of the magnet, the jaws 2, and the direction of reciprocation of the hammer to tool 4 are in a straight horizontal line. The column is adjustable horizontally in the base 10 by means of the screw 11 or other appropriate device. The magnet has its active faces arranged in a vertical plane outside the shell, the said plane being normal to a line joining the axial center of the magnet and the jaw 2 and line of travel of the tool 4. The column 9 supports two horizontal arms 12 which extend beyond the active face 13 of the magnet at such a distance that the rollers 14 on the free ends of the arms engage the shell and prevent the magnet when energized from drawing it into contact with said face.

Experiments have shown that if the shell swings laterally on the head 15 of a rivet 16 to such a position as that shown in the dotted surved line 17, the shell will, when the magnet is energized, be swung substantially to the position shown in full lines, that is, so that the center of the magnet, the axial center of the shell and the jaw 2 will be substantially in a straight line, or so nearly thereto as not to cause defective riveting. The magnet will pull the shell so that the metal thereof next to it will be substantially symmetrically disposed on both sides of a vertical plane which includes the center of the magnet and line of travel of the tool 4.

It is not essential that the magnet shall hold the shell with its diameter exactly in line with the center of the magnet. In several instances the diameter of the shell has been held displaced as much as two inches from the center of the magnet without causing defective riveting. My invention therefore comprehends the holding of the shell or other work in such a position that satisfactory riveting can be effected, even if the shell or other work is held displaced from the center of the magnet considerably more than two inches.

Means such as the arms 12 and rollers 14 for contact with the shell may be omitted, but these or equivalent contact means are advisable because, if they are omitted, the shell may engage the face of the magnet which will prevent the shell from swinging as close as may be desired to the ideal position described. The rollers 14 are preferably of the castor type so that they will permit vertical, as well as rotating, movements of the shell with as little friction as possible.

The magnet not only centers the shell as described, but it pulls it tightly against the head of the rivet in the cup of the jaw 2.

18 and 19 are current supply lines for the magnet and 20 is a switch in the line 18 by which current may be admitted to the windings of the magnet or cut off therefrom.

In Fig. 3, I show a shell 5^a assumed to be of non-magnetizable material, and two magnets 8^a and 8^b within the shell. These magnets are shown attached to arms 21 attached to the standard 1. I show pieces 22 of magnetizable material held or supported in any suitable manner on the outer face of the shell 5^a opposite the magnets, though the pieces 22 might be at the inner face of the shell. When the magnets are energized, the flux between them and the pieces 22 will adjust the shell as if the entire shell were made of magnetizable material.

Fig. 4 shows a magnetizable piece 22^a arranged within the shell 5^b which is assumed to be of nonmagnetizable material. Here also the magnetic flux acting on the piece 22^a will adjust the shell the same as in Fig. 1.

I claim:

1. In an apparatus for fastening together two members of a substantially symmetrically shaped piece, a device having a portion acting as a pivot on which said piece may swing, an electro-magnet for swinging said piece into a position of symmetry substantially with respect to said pivot.

2. In an apparatus for working on cylinders, a reciprocating tool arranged to work on the cylinder at one side of the axial center thereof, a centering means having a seat for the side of the cylinder opposite the said center from the said tool, the seat when engaged by the cylinder positioning the cylinder so that the surface thereof at a point where it is engaged by the tool is substantially at right angles to the line of travel of the tool, and an electromagnet positioned to move the cylinder into the seat and hold it therein.

3. In an apparatus for working on cylinders, a reciprocating tool arranged to work on the sheet at one side of the axial center thereof, a seat at the opposite side of the said axial center to receive the convex side of the cylinder, the seat being shaped to accommodate a convex portion of the cylinder and having its effective center in line with the direction of travel of the tool, and an electromagnet at the convex side of the seat to attract the cylinder and hold it in the seat.

4. In a machine for riveting a cylinder for a boiler, tank, or the like, wherein the cylinder is supported with its axial center substantially vertical, an anvil cooperating with a reciprocating tool for heading a rivet extending through the cylinder wall, and electromagnetic means for automatically swinging the cylinder on the anvil as a pivot so that the cylinder wall at the pivot is substantially normal to the direction of travel of the tool.

5. In a machine for riveting a cylinder for a boiler, tank or the like, wherein the cylinder is supported with its axial center substantially vertical, an anvil for supporting one end of a rivet extending through the cylinder wall, a reciprocating tool for heading the rivet, and electromagnetic means for automatically swinging the cylinder on the anvil as a pivot so that the cylinder wall at the

pivot is substantially normal to the direction of travel of the tool.

6. In a machine for riveting a cylinder for a boiler, tank or the like, wherein the cylinder is supported with its axial center substantially vertical, an anvil for supporting one end of a rivet extending through the cylinder wall, a reciprocating tool for heading the rivet, and an electromagnet arranged to attract without engaging that part of the cylinder which is opposite the portion thereof containing the rivet and swing the cylinder on the anvil as a pivot, the magnet being disposed to produce substantially equal attraction at opposite sides of a vertical plane which includes the line of travel of the tool.

7. In a machine for riveting a cylinder for a boiler, tank or the like, wherein the cylinder is supported with its axial center substantially vertical, an anvil for supporting one end of a rivet extending through the cylinder wall, a reciprocating tool for heading the rivet, and an electromagnet having a vertical active face external of the cylinder at a point thereof opposite the anvil, for moving the cylinder about the anvil as a pivot.

8. In a machine for riveting a cylinder for a boiler, tank or the like, wherein the cylinder is supported with its axial center substantially vertical, an anvil for supporting one end of a rivet extending through the cylinder wall, a reciprocating tool for heading the rivet, electromagnetic means for automatically swinging the cylinder on the anvil as a pivot so that the cylinder wall at the pivot is substantially normal to the direction of travel of the tool, and means preventing the cylinder from contacting with the said means.

9. In a machine for riveting a cylinder for a boiler, tank or the like, wherein the cylinder is supported with its axial center substantially vertical, an anvil for supporting one end of a rivet extending through the cylinder wall, a reciprocating tool for heading the rivet, electromagnetic means for automatically swinging the cylinder on the anvil as a pivot so that the cylinder wall at the pivot is moved to be substantially normal to the direction of travel of the tool, and means preventing the cylinder from contacting with the said means, the said preventing means comprising arms projecting beyond the magnet.

10. In a machine for riveting a cylinder for a boiler, tank or the like, wherein the cylinder is supported with its axial center substantially vertical, an anvil for supporting one end of a rivet extending through the cylinder wall, a reciprocating tool for heading the rivet, an electromagnet having a round vertical active face external of the cylinder at a point thereof opposite the anvil, the center of the magnet being substantially in line with the line of travel of the tool, and means preventing the cylinder from contacting with the electromagnet.

11. In an apparatus for working on cylinders, a reciprocating tool arranged to work on a cylinder and a centering device including an electro-magnet and a seat shaped to accommodate the cylinder and having its effective center in line with the travel of the tool, the electro-magnet being at the convex side of the seat and out of contact with the cylinder whereby the cylinder may freely move independently thereof and be centered on the seat by the electro-magnet.

In testimony whereof, I hereunto affix my signature.

FRED L. JONES.