Feb. 14, 1939. J. C. WOODSON 2,146,875

APPARATUS FOR STRAIGHTENING

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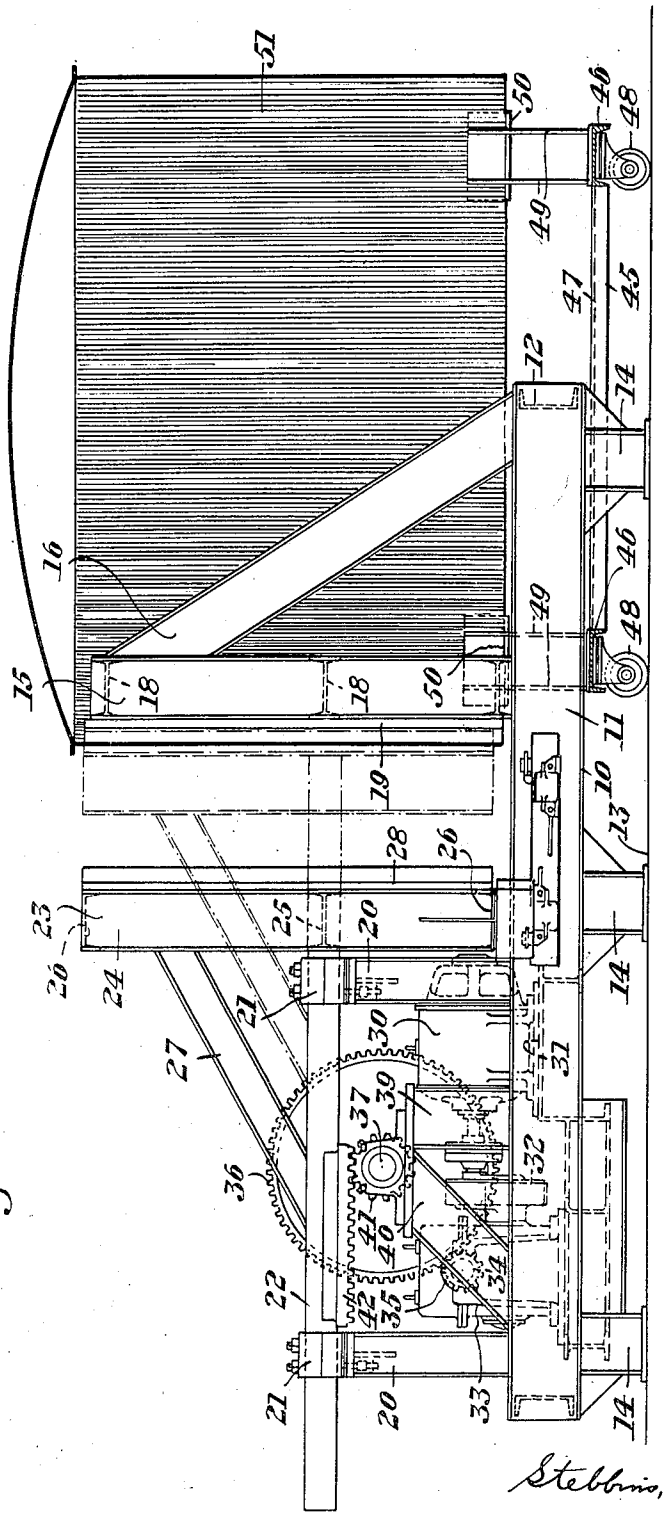


Fig. 1.

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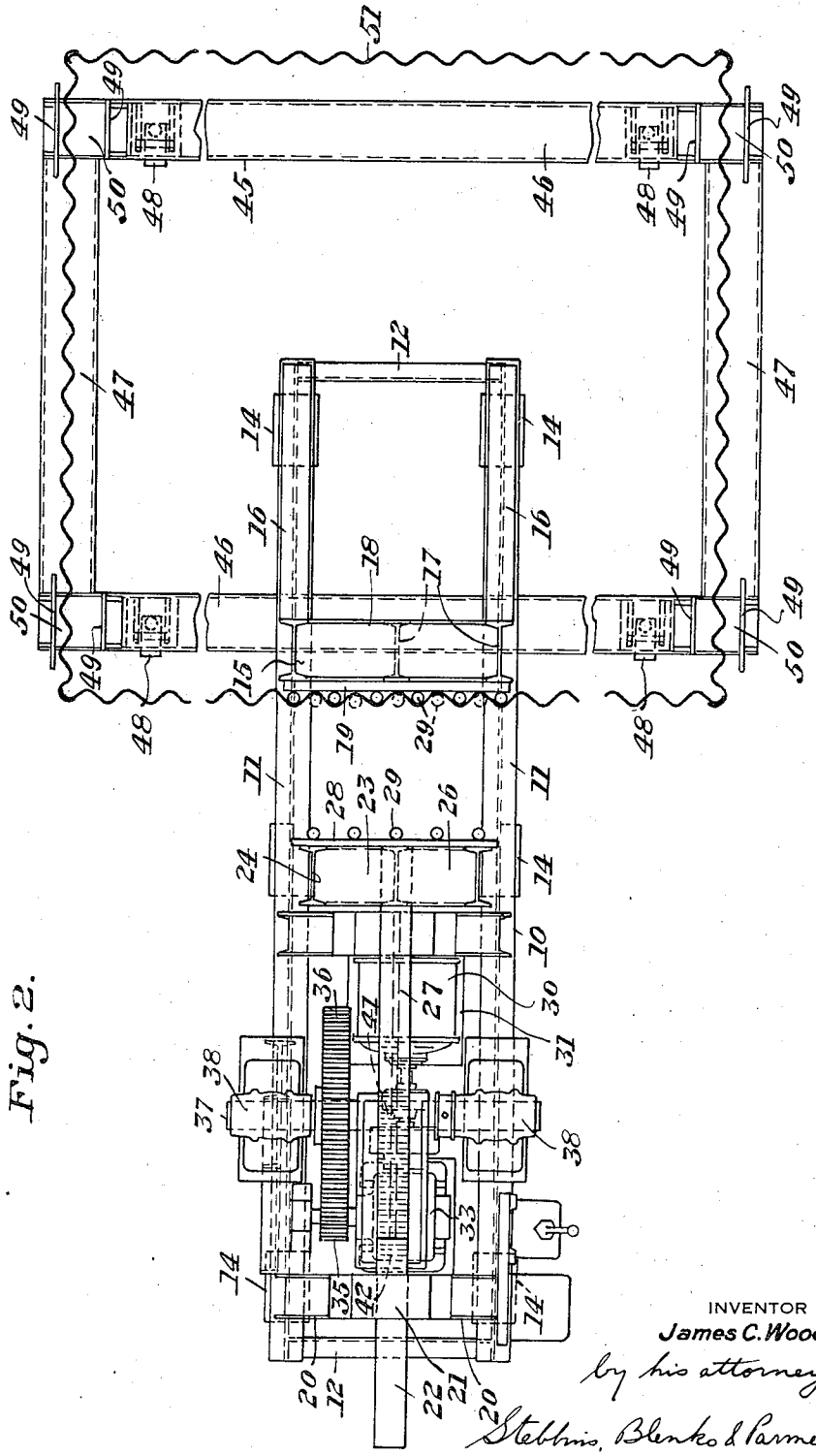


Fig. 2.

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2,146,875

APPARATUS FOR STRAIGHTENING

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3 Claims. (Cl. 153—48)

This invention relates to metal working and in particular to the straightening of the side walls of metallic containers, specifically the inner covers employed with cover type annealing furnaces.

As is well known, such inner covers comprise open bottomed boxes having side and end walls and a top or roof of light plate. The side walls are usually corrugated to give them rigidity and stiffness. In spite of this provision the severity of service required of such covers causes warping and distortion particularly of the side walls. This warping and distortion rapidly reaches a stage such that operation of the furnace is interfered with. The actual life of the covers furthermore is materially reduced thereby because outward warping of the side walls brings them closer to the heating elements of the furnace and this exaggerates the scaling effect.

I have invented a method and apparatus for straightening or reshaping the side walls of inner covers and restoring the corrugations therein, before the warping or distortion has proceeded to a serious extent. By remedying warpage or distortion, I am able to increase the life of an inner cover materially thus reducing the over-all cost of the material such as steel sheets, which the covers are employed to enclose during annealing. In accordance with the invention I provide a relatively fixed abutment extending substantially vertically, and a ram having a head adapted to cooperate with said abutment. The ram and abutment are fitted with means for restoring the corrugations in the side walls of an inner cover in addition to straightening them to remove any warpage or distortion. I also provide means adapted to support a cover disposed over the abutment for movement thereabout in such manner as to bring all portions of the side or end walls of a cover into a position where they can be engaged by said ram and abutment. The ram is provided with driving mechanism for advancing it toward and retracting it from said abutment. The invention will be further described in detail below with reference to the accompanying drawings illustrating a present preferred embodiment. In the drawings:

Figure 1 is a side elevation of the apparatus showing an inner cover in operative relation therewith;

Figure 2 is a plan view.

The apparatus is mounted on a main frame 10 composed of longitudinal I-beams 11 and transverse channels 12. The frame 10 is supported at a convenient height above a working floor 13 on columns 14. An abutment 15 is disposed substantially vertically adjacent one end of the frame 10. Braces 16 extend from the top of the abutment to the end of the frame. The abutment is composed of a plurality of vertical I-beam sections 17 connected by transverse beam sections 18, the sections being welded or otherwise secured together in the manner shown in the drawings. The abutment is provided with a face plate 19 on the side thereof opposite the braces 16.

Bents 20 rising from the frame 10 adjacent the end thereof opposite that on which the abutment 15 is mounted, support bearings 21 wherein a ram 22 is slidably disposed. The ram 22 is provided at the end thereof adjacent the abutment 15 with a head 23 similar in general construction to the abutment 15, being composed of vertical I-beam sections 24 and transverse I-beam and channel sections 25 and 26. A brace 27 extends downwardly and rearwardly from the head 23 to the ram 22. The head 23 is provided with a face plate 28. Round bars 29 are secured, as by welding, to the face plates 19 and 28 in staggered relation and extend substantially the full height thereof for a purpose which will appear shortly.

A motor 30 is mounted on a platform 31 extending between the side members 11 of the frame 10. The motor is connected through gearing mounted in a case 32 to a speed reducing gear 33 having a slow speed shaft 34. A pinion 35 on the shaft 34 meshes with a gear 36 keyed to a shaft 37. The shaft 37 is jornalled in bearings 38 supported by columns 39 and braces 40 extending upwardly from the side members 11 of the frame 10. The shaft 37 is provided with a pinion 41 meshing with a rack bar 42 carried on the under side of the ram 22. By means of the drive just described and a suitable control system for the motor 30, the ram 22 and its head 23 may be advanced toward the abutment 15, as indicated by chain lines in Figure 1, and retracted therefrom. By reason of the multiple gear reduction employed between the motor and the ram, a tremendous force can be exerted by the latter even though the motor is only of moderate capacity.

For supporting an inner cover while being operated on by the apparatus already described I provide a car 45. The car includes a frame composed of longitudinal and transverse channels 46 and 47 suitably secured together. Castor rollers 48 are mounted adjacent the corners of the frame so that the car can easily be shifted by hand in any direction. Spaced plates 49 extending upwardly at each corner of the car are provided

with seats 50 adapted to receive the bottom edge of an inner cover disposed over the abutment 15 as clearly shown in the drawings.

The method practiced with the aid of the apparatus described above requires but little explanation. With the ram 22 and its head 23 retracted to about the position shown in solid lines in Figure 1, an inner cover such as that shown at 51 is disposed over the abutment 15. The cover can most conveniently be handled by an overhead crane. As the cover is lowered over the abutment, it comes to rest on the seats 50 of the car 45 which is positioned in about the manner shown in the drawings for receiving the cover. When the cover has been disposed on the car, the latter is moved so a to bring a portion of one of the side or end walls of the cover 51 as close as possible to the abutment 15 with the corrugations of the cover in alignment with the bars 29 on the face plates of the abutment 15 and head 23. The motor 30 is then started to cause the ram 22 and head 23 to advance toward the abutment 15. The portion of the side wall of the cover disposed between the head of the ram and the abutment is thus subjected to a powerful pressing operation which tends to remove any warpage or distortion which has occurred therein. The bars 29, furthermore, because of their staggered relation on the two face plates 19 and 29 are effective to restore the corrugations originally existing in the side walls of the cover. In addition to restoring the initial rigidity of the side walls, this prevents a lengthening of the latter which might otherwise spread the side walls of the cover to an extent such that it would fit in the furnace only with difficulty. Similar treatment of any portion of the side or end walls of the cover showing signs of warpage or distortion may be effected in the manner explained above. After retraction of the head 23, any desired portion of the side or end walls of the cover may be brought into line with the abutment 15 by manually shifting the car 45 on the floor 13. Since the frame of the car surrounds the columns 14 supporting the end of the frame 10 on which the abutment 15 is disposed, it will be understood that assembly of the car 45 cannot be completed until it is disposed in the illustrated relation to the remainder of the apparatus.

It will be clear from the foregoing description and explanation that the invention provides a convenient and highly useful method and apparatus for removing warpage and distortion from the side and end walls of inner covers and restoring them substantially to their original condition, greatly lengthening the useful life of the covers and reducing the expenditure for replacement thereof which has been necessary heretofore. The apparatus is rugged so as to be capable of exerting the forces necessary. Both the method and the apparatus are characterized by a high degree of simplicity so that operation and maintenance may be safely left to relatively unskilled labor. The invention also permits an inner cover to be restored almost to its original condition without requiring that it be removed from service for more than a relatively short time.

While I have illustrated and described herein but one preferred embodiment of the invention it will be understood that changes in the construction and practice disclosed may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. Apparatus for straightening the side walls of an open-bottomed box of metal plate comprising a press frame having an upstanding abutment thereon and a reciprocable head cooperating with said abutment, supports extending upwardly from a working floor, said frame being supported thereon in spaced relation to said floor, a work support including a wheeled frame traversing said floor, surrounding certain of said supports and lower than the bottom of said press frame so as to be movable thereunder, and supporting members extending upwardly from said wheeled frame above the top of said press frame and adapted to support above said press frame a box disposed over said abutment, for movement relative thereto.

2. Apparatus for straightening the side walls of an open-bottomed box of metal plate comprising a press frame having an upstanding abutment thereon and a reciprocable head cooperating with said abutment, supports extending upwardly from a working floor, said frame being supported thereon in spaced relation to said floor, a work support including a wheeled frame traversing said floor, lower than the bottom of said press frame so as to be movable thereunder, and supporting members extending upwardly from said wheeled frame above the top of said press frame and adapted to support above said press frame a box disposed over said abutment, for movement relative thereto.

3. Apparatus for straightening the side walls of an open-bottomed box of metal plate comprising a press frame having an upstanding abutment thereon and a reciprocable head cooperating with said abutment, means supporting at least that portion of the frame on which the abutment is mounted in spaced relation to a working floor, a work support including a wheeled frame traversing the floor, lower than the bottom of said portion of the press frame so as to be movable thereunder, and supporting members extending upwardly from said wheeled frame above the top of said press frame and adapted to support above said press frame, a box disposed over said abutment, for movement relative thereto.

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