J. F. DUGETT.

TOOL FOR SPREADING THE TUBES OF WATER TUBE BOILERS.

APPLICATION FILED JULY 16, 1908.

903,550. Patented Nov. 10, 1908.

Fig. 3.

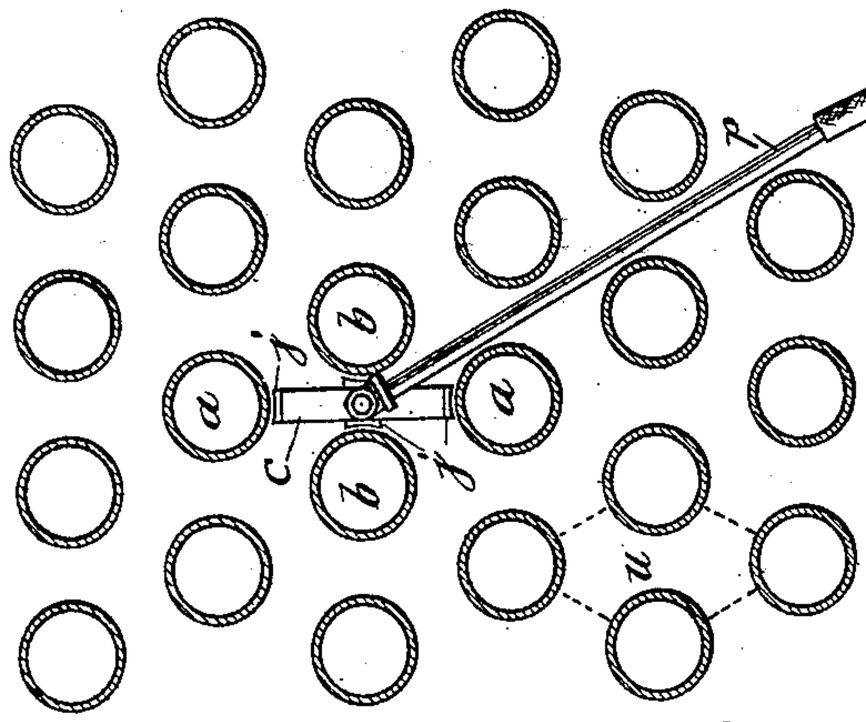


Fig. 4.

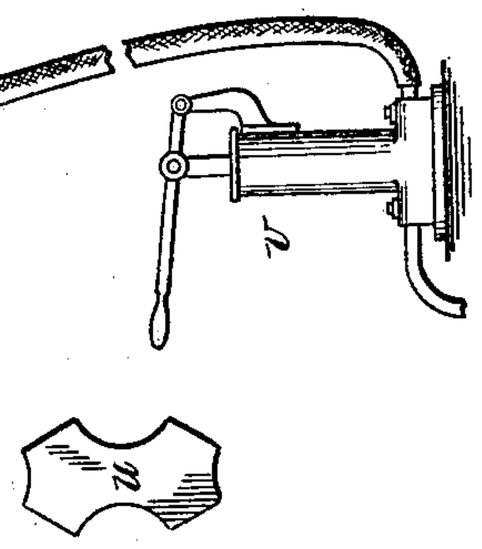


Fig. 2.

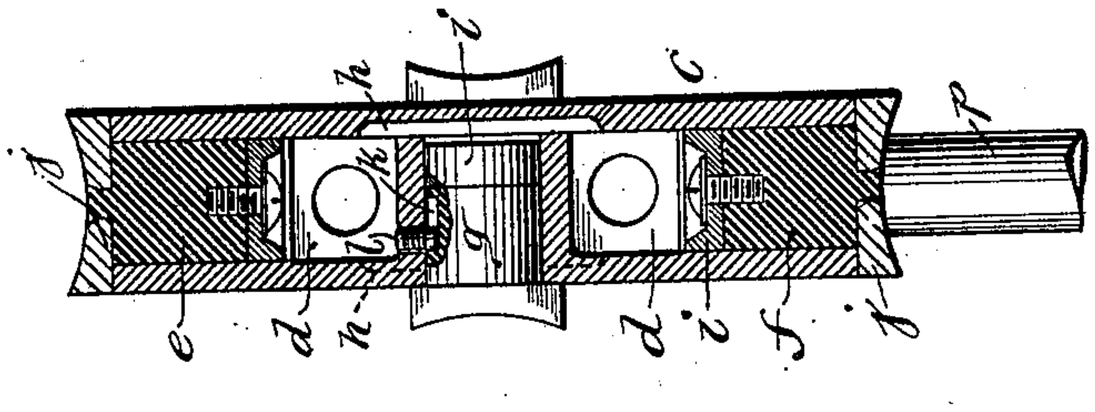
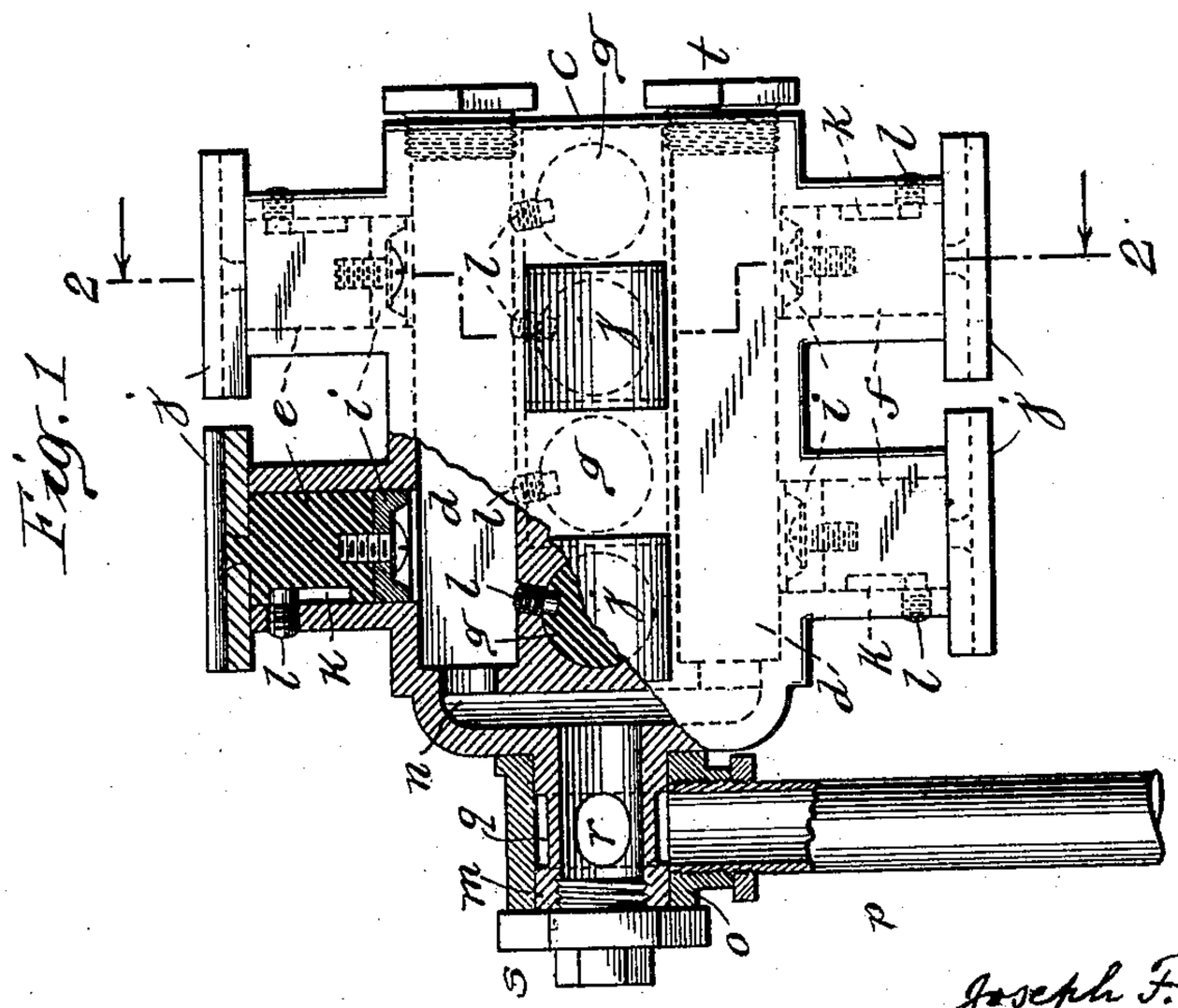


Fig. 1.



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UNITED STATES PATENT OFFICE.

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TOOL FOR SPREADING THE TUBES OF WATER-TUBE BOILERS.

No. 903,550. Specification of Letters Patent. Patented Nov. 10, 1908.

Application filed July 16, 1908. Serial No. 443,811.

To all whom it may concern:

Be it known that I, JOSEPH F. DUGETT, a citizen of the United States, and a resident of the city of New York, county of Richmond, and State of New York, have invented Improvements in Tools for Spreading the Tubes of Water-Tube Boilers, of which the following is a specification.

Between the tubes of water-tube boilers are generally placed fire-bricks of special form to provide protecting walls or facings for the baffle plates &c. of such boilers, the bricks being so shaped as to fit between groups of four tubes and to fill, in the plane of the walls, all space unoccupied by the tubes, but as the tubes are generally staggered, that is the tubes of each row alternating with the spaces between the tubes of adjacent rows, it is practically impossible to set the bricks in place without breaking or cutting away certain portions of them, so that the baffle plates are not fully protected by a refractory facing.

The tool forming the subject of this invention provides a means for temporarily increasing the spaces between groups of four tubes to such an extent as will allow a perfect unbroken brick to be placed between the tubes and be properly seated against the baffle plate.

By reason of the staggered arrangement of the tubes the only straight-away up and down passages between them extend in diagonal directions and it is through these passages the tool flatwise is passed to the groups of four tubes to be spread, it being pivoted to a handling device, and when properly located is turned, without changing its position relatively transversely to the tubes, on the axis of the pivotal connection longitudinally to the tubes, it then being in vertical position with a tube of alternate rows above and below it and between two tubes of the intermediate row. In this position it is actuated to spread the tubes apart.

The tool comprises a body or main portion provided with active members fitted to move in right angular directions to one another against the tubes and so force the tubes of each pair directly apart in straight lines with the horizontal and vertical rows of tubes, thus spreading the tubes with the least distortion in increasing the space between the group of tubes sufficiently for the admission of a brick. As a preferred simple and effective means to this end the active members are made as plungers adapted to be forced outwardly from the body of the tool by fluid pressure, the fluid under pressure, from any suitable source, as a hand pump, being supplied to the tool through the handling device, which is made hollow for this purpose. The active members are provided with concave shoes whereby they act on the tubes to spread them apart without bruising or otherwise injuring them.

The accompanying drawings will now be referred to to more fully describe the construction and operation of this tube spreading tool.

Figure 1. is a side elevation partly in section. Fig. 2. is a vertical section taken on the line 2, 2, Fig. 1. Fig. 3. illustrates, in section, a series of tubes of a water-tube boiler and the application thereto of this improved tube spreader, and Fig. 4. shows one of the bricks used in forming the walls or protective faces of the baffle plates of such boilers.

Groups of four tubes here referred to, see Fig. 3, comprise tubes *a* in the alternate rows of tubes, in a vertical plane, and the two adjacent tubes *b* of the intermediate row of tubes in a horizontal plane; the straight-away up and down passages referred to being diagonally disposed, as here clearly illustrated.

The body or main portion *c* of the tool is substantially rectangular in shape, is flat and is necessarily limited in thickness to permit it to pass into or through the diagonal passages between the boiler tubes; it is preferably made of a single piece of metal and may be a casting with all passages and openings formed by suitable cores: In it are formed two chambers *d*, *d* into which the cylinders of the active members, here shown as hydraulic rams or pistons, open. At the upper and lower sides of the body are fitted two sets of pistons *e*, *e* and *f*, *f*, vertically arranged with the pistons of one set in line with those of the other set. Between the two chambers *d*, *d* are located horizontal pistons *g*, *g*, arranged in a row with the exposed ends of one half of them at each of the flat sides of the body, that is they are so arranged that the direction of their movements alternate in opposite direction, which is necessitated by the thinness of the body affording only about sufficient room for the proper play of the pistons *g*, *g*. The cylinders of the pistons *g*, *g*,

are connected to the chambers *d*, *d* by ports or passages *h*. The opposite acting pistons are so arranged that the strains on them in all directions will be balanced, and any other arrangement of the horizontal tubes than the alternating one shown that will accomplish this may be employed. Each of the pistons *e*, *f* and *g* is provided with a suitable cup packing *i* on its inner end and with a concave shoe *j* on its outer end formed to fit the boiler tubes over considerable extent of their surfaces so there will be no danger of injuring the tubes as they are forced apart by the outward action of the pistons; these shoes may be integral with the pistons or secured to their ends, as by riveting, as shown.

It is advantageous to limit the outward movement of the pistons and avoid their entire separation from the body; this may be accomplished by forming longitudinal grooves *k* in the pistons and providing stop pins *l* passed through the walls of the cylinders with their ends projecting in said grooves. These grooves and pins also prevent the pistons from turning, and thus insure the shoes *j* being held in proper position to act squarely on the boiler tubes. As a convenient way to apply the guiding and holding pins *l* of the central horizontal pistons *g* they may be passed into place through the cylindrical bores of the vertical pistons, as shown at Fig. 1.

To provide a means for handling the tool and setting it in operative position a hollow lug or neck *m* is placed centrally at one end of the body *c* with its bore in communication with the chambers *d*, *d* by the passage *n*, and on this neck is fitted a sleeve *o* provided with a supply pipe *p*, which constitutes the handling device of the tool. The neck *m* is free to turn in the sleeve *o*, and communication is provided between the pipe *p* and interior of the sleeve, as for instance by a groove *q* and opening *r*. The flange nut *s* closes the bore of the neck *m* and holds the handling device *o*, *p* on to the body. The plugs *t*, *t* close the end openings of the chambers *d*, *d*, should such openings be made or left in body, as manufactured.

In using the tool the body is set in line with the handling device *p*, with the active members in their inner positions, and passed into one of the straight-away passages until the tool is located in the group of four tubes to be spread when it is simply turned on the axis of the connection with the handling device to set it uniformly centrally in the group of tubes with the axis of the piston arranged directly in line with the tubes and coincidently in line with the direction the tubes are required to be moved the least distance to afford a sufficient increase in the space between the group of tubes for the admission to said space of a fire brick, such as is shown at Fig. 4, which snugly fits against the tubes in normal position, as indicated by the dotted lines *u*.

With the tool in operative position, generally some distance in front of a baffle plate, fluid under pressure is, from any suitable source, as a hand pump, supplied to it, and forces the piston outwardly against the tubes and so spread each pair of tubes on the center lines of their respective rows; that is, the tubes *a*, *a* are forced apart on a vertical line and the tubes *b*, *b* on a horizontal line. A brick may now intact be easily put between the spread tubes and moved along them to seat against the baffle plate. Upon relieving the active fluid of pressure the tubes assume their normal positions and the pistons are retracted and will be fully seated in the body by the outflow of the fluid, permitting the tool to be readily removed by swinging the body in line with the handling device and again set between another group of tubes.

A hand pump *v*, of any ordinary and suitable construction, is shown at Fig. 4 as a means for supplying fluid under pressure to the tube spreading device, its discharge part being connected to the hollow handle *p* by a hose *w*.

It will of course be understood the tool may be used in removing old bricks and for renewal in making repairs &c. to the boiler. And that the pipe *p* constituting the handling device and supply pipe may in any suitable manner, as by means of a hose, be connected to the source of power.

I claim as my invention:—

1. In a tool of the character described, in combination, a body or main portion, active members carried thereby and adapted to move in outwardly directions, a handling device pivotally connected to the body, whereby the tool may be set in line with the handling device for admission to a group of tubes through a straight-away passage between adjacent rows of tubes with the axis of the connection parallel with the tubes and then turned at an angle to the handling device on said axis, whose position remains unchanged longitudinally to the tubes, to set the tool in operative position among the group of tubes, and means for moving the active members against the tubes to force them apart.

2. A tool of the character described, comprising a body or main portion adapted to be located in a group of oppositely opposed pairs of boiler tubes, active members fitted to move in the body to act in opposite directions in a straight line against the opposed adjacent sides of each pair of tubes to spread the tubes of each pair in a straight line apart, and means for actuating the active members.

3. In a tool of the character described, in

combination, a body or main portion, adapted to be located in a group of oppositely opposed pairs of boiler tubes, active members carried thereby and adapted to move in outwardly directions in line with each pair of opposed tubes, a handling device pivotally connected to the body, whereby the tool may be set in line with the handling device for admission to a group of tubes through a straight-away passage between adjacent rows of tubes with the axis of the connection parallel with the tubes and then turned at an angle to the handling device on said axis, whose position remains unchanged longitudinally to the tubes, to set the tool in operative position among the group of tubes, and means for moving the active members against the tubes to force them apart.

4. A tool of the character described, comprising a substantially rectangular flat body, tube spreading members fitted to move vertically in the body and extend beyond its upper and lower sides, tube spreading members fitted in the body to move in horizontal directions and project from the flat faces of the body, and means for moving all of the tube spreading members outwardly from the body.

5. A tool of the character described, comprising a substantially rectangular flat body, tube spreading members fitted to move vertically in the body and extend beyond its upper and lower sides, the upper and lower members being arranged and movable in line with one another, tube spreading members alternately arranged in line and fitted in the body to move in horizontal directions and project from the flat faces of the body, and means for moving all of the tube spreading members outwardly from the body.

6. A tool of the character described, comprising a substantially rectangular flat body, tube spreading members fitted to move vertically in the body and extend beyond its upper and lower sides, the upper and lower members being arranged and movable in line with one another, tube spreading members alternately arranged in line and fitted in the body to move in horizontal directions and project from the flat faces of the body, shoes connected to the tube spreading members having concave faces to fit the sides of the tubes to be spread, and means for moving all of the tube spreading members outwardly from the body.

7. In a tool of the character described, in combination, a body or main portion, active members carried thereby and adapted to move in outwardly directions, a hollow handling device pivotally connected to the body, whereby the tool may be set in line with the handling device for admission to a group of tubes through a straight-away passage between adjacent rows of tubes with the axis of the connection parallel with the tubes and then turned on said axis, whose position remains unchanged, to set the tool in operative position among the group of tubes, a pump connected to the handling device for supplying a fluid to the body of the tool to act on and force out the active members.

8. A tool of the character described, comprising a body or main portion adapted to be located in a group of oppositely opposed pairs of boiler tubes, active members fitted to move in the body to act in opposite directions in a straight line against the opposed adjacent sides of each pair of tubes to spread the tubes of each pair in a straight line apart, means for controlling and limiting the out movement of the active members, and means for actuating the active members.

9. In a tool of the character described, in combination, a body or main portion, adapted to be located in a group of oppositely opposed pairs of boiler tubes, active members carried thereby and adapted to move in outwardly directions in line with each pair of opposed tubes, a hollow handling device pivotally connected to the body, whereby the tool may be set in line with the handling device for admission to a group of tubes through a straight-away passage between adjacent rows of tubes with the connection parallel with the tubes and then turned on said axis, whose position remains unchanged, to set the tool in operative position among the group of tubes, a pump connected to the handling device for supplying a fluid to the body of the tool to act on and force out the active members.

10. A tool of the character described, comprising a substantially rectangular flat body, tube spreading members fitted to move vertically in the body and extend beyond its upper and lower sides, the upper and lower members being arranged and movable in line with one another, tube spreading members alternately arranged in line and fitted in the body to move in horizontal directions and project from the flat faces of the body, a pump, and pipe connection between the pump and the body of the tool, whereby fluid under pressure supplied by the pump acts on the tube spreading members to force them outwardly from the body.

11. A tool of the character described, comprising a substantially rectangular flat body, tube spreading members fitted to move vertically in the body and extend beyond its upper and lower sides, the upper and lower members being arranged and movable in line with one another, tube spreading members alternately arranged in line and fitted in the body to move in horizontal directions and project from the flat faces of the body, shoes connected to the tube spreading

members having concave faces to fit the sides of the tubes to be spread, a hollow handling device pivotally connected to the body, and a pump connected to the handling device for supplying fluid under pressure to the body of the tool to act on and force out the active members.

12. In a tool of the character described, in combination, a substantially rectangular flat body provided with vertical and horizontally arranged cylinder bores, a piston fitted to slide in each of the cylinder bores and provided with a packing at its inner end, means for preventing rotation of each piston and limiting its outward movement, a source of supply of a fluid under pressure, and a pipe connection between the body of the tool and the source of fluid supply.

13. In a tool of the character described, in combination, a substantially rectangular flat body provided with vertical and horizontally arranged cylinder bores, a piston fitted to slide in each of the cylinder bores and provided with a packing at its inner end, means for preventing rotation of each piston and limiting its outward movement, a hollow lug at one end of the body, a sleeve provided with a hollow handle and fitted to rotate on the hollow lug, and a source of supply of a fluid under pressure connected to the hollow handle.

14. In a tool of the character described, in combination, a substantially rectangular flat body provided with vertical and horizontally arranged cylinder bores, a piston fitted to slide in each of the cylinder bores and having a longitudinal groove or slot, and a guide pin seated in the body and extending into the groove of each piston, concave shoes on the outer ends of the pistons, and a pump for forcing a fluid to the body to act on the pistons.

15. In a tool of the character described, in combination, a substantially rectangular flat body, pistons fitted in the upper and under sides and arranged to slide on vertical lines with one another, pistons horizontally arranged between the upper and lower vertical pistons, the alternate ones extending from the two side faces of the body, a hollow handling device pivotally connected to the body, a pump for forcing a fluid through the handling device to the body to act on the inner ends of the pistons, and shoes with concave faces adapted to seat against boiler tubes secured to the outer ends of the pistons.

In testimony whereof, I have hereunto subscribed my name, this 13th day of July, 1908.

JOSEPH F. DUGETT.

Witnesses:

M. TURNER,

J. C. MCKIBBIN.