A. P. GERALD.

TOOL FOR SPREADING BOILER TUBES.

APPLICATION FILED APR. 6, 1909.

1,014,459.

Patented Jan. 9, 1912.

2 SHEETS—SHEET 1.

Fig. 1

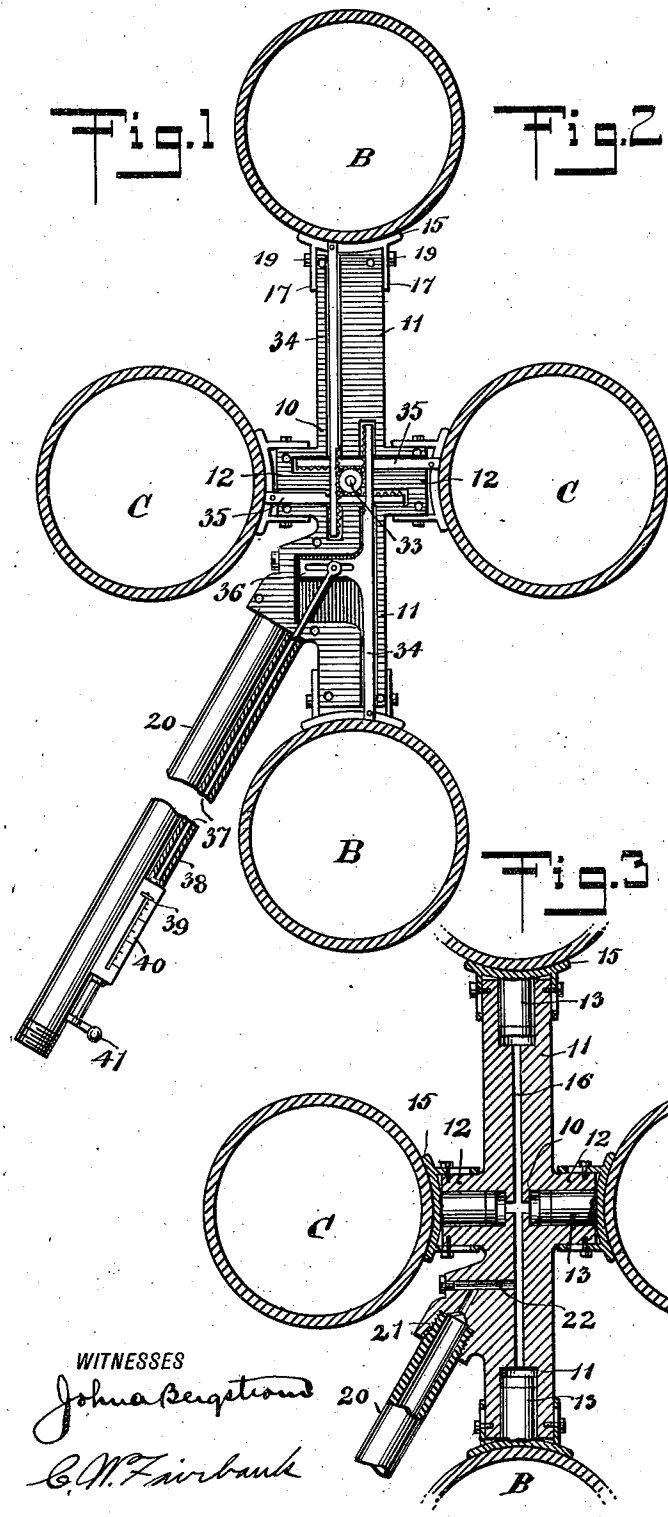

Fig. 2

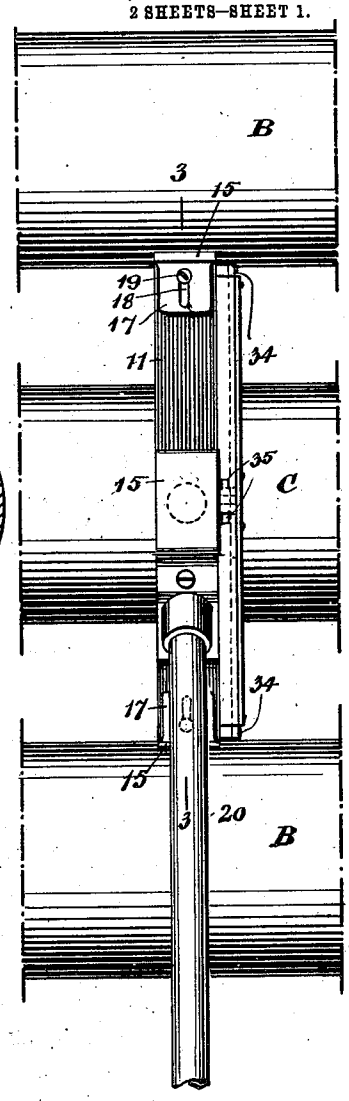

Fig. 3

WITNESSES

Johna Bergstrom

C. M. Fairbank

INVENTOR

August P. Gerald

BY Munn & Co

ATTORNEYS

A. P. GERALD.

TOOL FOR SPREADING BOILER TUBES.

APPLICATION FILED APR. 6, 1909.

1,014,459.

Patented Jan. 9, 1912.

2 SHEETS—SHEET 2.

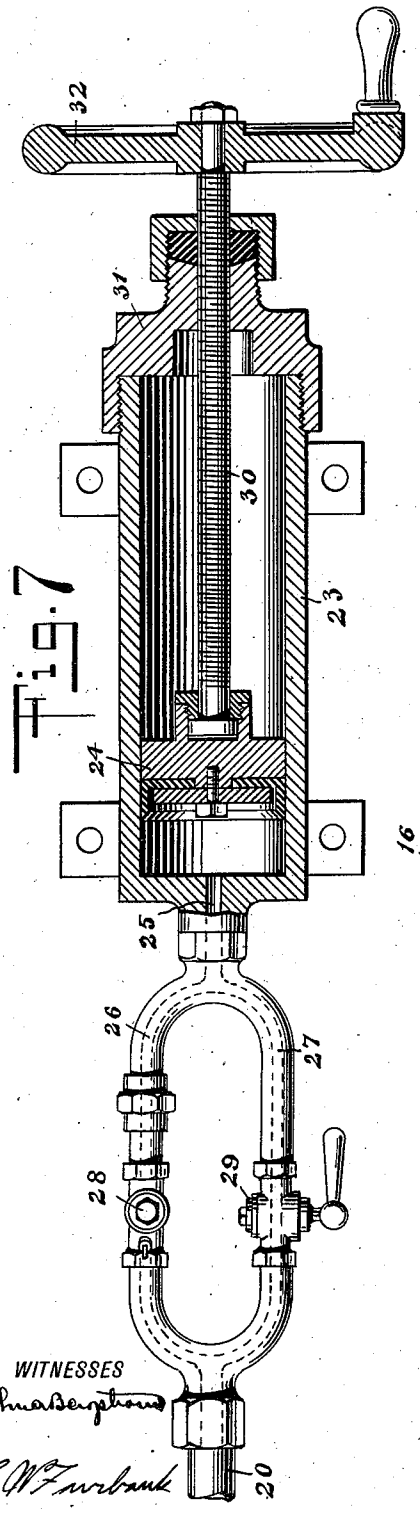

Fig. 7

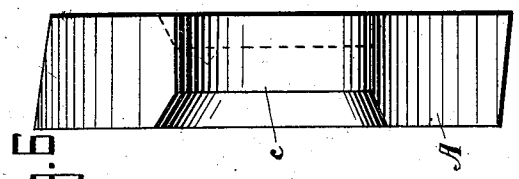

Fig. 6

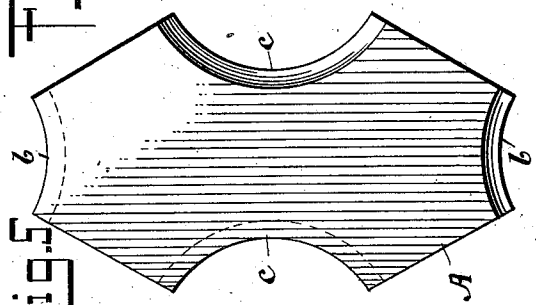

Fig. 5

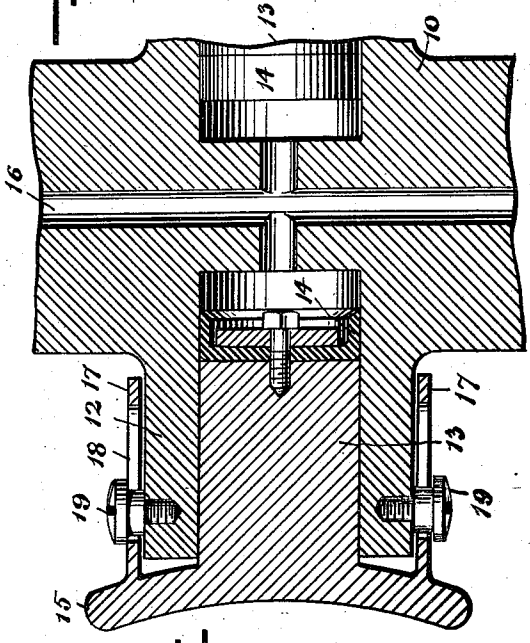

Fig. 4

WITNESSES

John A. Bergstrom

C. W. Fairbank

INVENTOR

August P. Gerald

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

AUGUST P. GERALD, OF JERSEY CITY, NEW JERSEY.

TOOL FOR SPREADING BOILER-TUBES.

1,014,459. Specification of Letters Patent. Patented Jan. 9, 1912.

Application filed April 6, 1909. Serial No. 488,159.

To all whom it may concern:

Be it known that I, AUGUST P. GERALD, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented a new and Improved Tool for Spreading Boiler-Tubes, of which the following is a full, clear, and exact description.

In certain types of water tube boilers, it is customary to space the tubes apart intermediate their ends by fire brick of a special design and adapted to engage with two tubes in substantially the same vertical plane and with two tubes in substantially a horizontal plane. These fire brick constitute protecting walls or facings for the baffle plates, and it is desirable that they form a substantially continuous wall. After the boiler has been built or been used for some time, it often becomes necessary to replace certain of these brick without dissembling the boiler. For this purpose tools have been designed which operate to spread apart the tubes, so as to facilitate the insertion and proper placing of the brick. Tools of this character include active members carried by a handle and movable relatively to each other for engagement with the tubes. The handle facilitates the proper placing of the active members and may also serve to facilitate the movement of said members in respect to each other.

The main object of my invention is to so construct the tool that the active members move in opposite directions in a straight line against opposed adjacent faces of each pair of tubes, to spread the tubes apart in a straight line.

A further object of my invention is to operate these active members by fluid pressure and utilize the handle as the means for delivering the fluid to the pistons constituting the active members.

A further object of my invention is to provide indicating means at or adjacent the outer end of the handle to show the operator the exact position of the active members.

Further objects of my invention are to provide means for locking the active members in their outermost or operative position, and to positively withdraw them to their inner or inoperative position, when it is desired to remove the tool.

Other distinguishing features entering into the construction of my improved tool will appear from the fuller description hereinafter given.

The invention will be described in detail with respect to its distinguishing structural and functional characteristics in connection with what I believe to be a preferred construction, as illustrated in the drawings, and the applicability of specific distinctive features to other purposes or to other constructions will be kept in view as far as possible, and in the claims I shall endeavor to clearly point out the particular features which distinguish my invention from previously existing constructions, to the best of my ability in the light of my knowledge and belief.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is a side elevation of a tool constructed in accordance with my invention, the casing of a portion of the indicating means being removed; Fig. 2 is an edge view of my improved tool; Fig. 3 is a section on the line 3—3 of Fig. 2; Fig. 4 is a longitudinal section through one of the active members and on an enlarged scale; Figs. 5 and 6 are face and edge views, respectively, of a brick to be inserted after the spreading of the tubes; and Fig. 7 is a longitudinal section through a fluid-forcing means constituting a part of my improved tool.

Tools of the class to which my invention relates are employed for placing in position fire brick A of substantially the general form shown in Figs. 5 and 6. Each of these brick has recessed *b*, *b* in the upper and lower ends to engage with two tubes B, B in the same vertical plane and provided with recesses *c*, *c* upon opposite sides to engage with tubes C, C arranged in substantially the same horizontal plane and upon opposite sides of the vertical plane of the tubes B, B. Unless some special tool be provided for spreading these tubes apart prior to the insertion of the brick, it is necessary that the recesses in the sides and ends of the brick be beveled or cut away as illustrated in the drawings. This beveling or cutting away of the brick in the sides and ends adjacent the recesses, permits the brick to be turned and forced into position, but

is entirely unnecessary if the tubes be spread apart to a slight extent prior to the insertion of the brick.

The specific form of my improved tool illustrated in the accompanying drawings, includes a body 10 having upwardly and downwardly-extending branches 11, 11, in alinement with each other, and outwardly-extending branches 12, 12 in alinement with each other and at substantially right angles to the branches 11, 11. All of the branches lie in the same plane, so that the body of the tool with its branches is comparatively thin and may be moved through the diagonal passages of the tube to get the tool into operative position. Each branch at its outer end is provided with a chamber constituting a cylinder and in axial alinement with the corresponding branch. Within each cylinder is a piston 13 provided with a suitable packing 14 at its inner end and having its outer end extending beyond the end of the corresponding branch of the body and presenting a dished or concave shoe or face plate 15. The shoe or plate is adapted to substantially fit the curvature of the exterior of a boiler tube, and together with the piston constitutes an active member.

Within the body and communicating with all of the branches is a passage or conduit 16, through which a fluid may be delivered to each and all of the cylinders in the rear of each and all of the pistons. For limiting the movement of the active members and normally preventing their removal from their corresponding cylinders, each shoe or face plate is provided with two flanges 17, 17 in engagement with the outer surface of the corresponding branch, and these flanges have sliding engagement with the sides of the branch during the reciprocating movement of the pistons. Each branch is provided with a slot 18 therein for receiving a set screw 19 carried by the branch. The slots extend lengthwise of the flanges and the length of each slot limits the reciprocating movement of its corresponding piston.

For placing the body of the tool in position and controlling and adjusting it, I provide a handle 20 preferably in the form of a tube, and having threaded engagement with a boss 21 on the body. This handle also serves as a conduit for delivering fluid to the passage 16 and the several cylinders. A branch passage 22 connects the main passage 16 with the end of the conduit 20, and at the outer end of the handle I provide means for forcing a fluid through the handle to the passage 16 to cause the members to move into engagement with the tubes of the boiler and spread them apart. I also so construct this means that it may be operated to withdraw the liquid through the handle and thus draw the pistons back into their retracted position. The fluid-forcing means is preferably that illustrated in Fig. 7, in which there is employed a cylinder 23 having a piston 24 movable longitudinally thereof and having a port 25 connected to the lower end of the handle by two branch pipes 26 and 27, arranged in parallelism. One of these branches 26 is provided with a check valve 28 opening toward the handle, so that liquid flowing from the cylinder 23 to the handle may readily pass this check valve but will be prevented from returning. In the branch 27 I provide a turning plug 29 which may be opened or closed as occasion may demand. Connected to the piston is a piston rod 30, rotatable in respect thereto and having threaded engagement with the cylinder head 31 opposite to the port 25. The piston rod is provided with a hand wheel 32 at its outer end and by means of which said piston rod may be rotated to advance the piston in the cylinder.

In spreading the tubes, the turning plug 29 is closed and the piston is advanced to force the fluid from the cylinder 23 through the handle to the several active members, to force the latter outwardly into operative position. When the tubes have been spread to the desired extent, they are held by the active members and the confined body of fluid. The fluid is positively prevented from returning to the cylinder 23, even though the piston in the latter be retracted, for the check valve opens in only one direction. When it is desired to withdraw the active members, the turning plug 29 is opened and the piston 24 is retracted to positively draw fluid out of the handle and body of the tool and to thus suck the active members back into their retracted position.

In order to ascertain the exact position of the several active members and thus to enable the operator to note when sufficient fluid has been forced in to accomplish the desired work, I provide an indicator adjacent the outer end of the handle and operatively connected to the several active members. Preferably, I employ a pinion 33 mounted on a stud disposed in a central position on one side of the body. A pair of rack bars 34, 34 extend lengthwise of the two branches 11, 11 and are connected to the two active members at the outer ends of these branches. The two rack bars 34, 34 engage with opposite sides of the pinion and lie in the same plane, so that a movement of one active member insures a corresponding movement of the active member upon the opposite branch of the body. Two other rack bars 35, 35 have engagement with opposite sides of the pinion 33 and extend outwardly along the branches 12, 12 to the active members carried by the latter. These rack bars lie in the same plane and in a plane parallel to that occu-

pied by the rack bars 34. All four rack bars have engagement with the same pinion 33 and all have engagement with their corresponding active members, so that any movement whatsoever of one active member must be accompanied by a corresponding movement of each of the other active members. One of the rack bars 34 is provided with an outwardly-extending bracket 36 adjacent the boss 21 on the body and is also provided with a slot extending longitudinally thereof. A rod 37 extends lengthwise of the handle 20 and has one end secured within the slot of the bracket 36. As the handle 20 is at an acute angle to the general direction of the two branches 11, 11, and as the rack bars 34, 34 move lengthwise of the branches 11, 11, it is evident that a movement of the rack bars 34 and the bracket 36 will cause a longitudinal movement of the rod 37 and a movement of the inner end of said rod along the slot of the bracket. This rod 37 may move within a small tube carried by the handle at one side thereof, and at its lower end it may have a pointer 39 movable along a stationary scale 40 calibrated to indicate the exact extent of movement of the active members. By noting the position of the pointer 39 on the scale 40, the operator may, at any time, ascertain the exact extent to which the active members have been moved and whether or not the spreading has been carried to a sufficient extent to permit the insertion of the brick A. It will be noted that the rack bars 34 and 35 and the pinion 33 insure the simultaneous movement of all of the pistons, so that in case one boiler tube is more easily bent than another, all of the strain will not be applied to the weaker tube but all of the tubes will be bent to equal extents. These rack bars and the pinion may be utilized independently of the rod 37 and serve merely to insure the simultaneous movement of the active members, and without serving to indicate the position of the active members.

At the outer end of the rod 37 may be provided a handle 41, by means of which the rod 37 may be moved lengthwise and all of the active members given a corresponding movement. This is particularly desirable in case any one of the active members becomes wedged or cannot be returned to its inactive position by the suction created in withdrawing the fluid through the handle 20. By means of the handle 41, all of the active members may be positively and mechanically drawn back upon the escape of the fluid in their respective cylinders. It is evident that the rod 37, the rack bars and the pinion may be made of larger size and be utilized as the main means for operating the active members.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A tool of the character described, comprising a body portion provided with vertically and horizontally-arranged cylinder bores, all having their axes lying in the same vertical plane, a piston fitted to slide in each of said cylinder bores and having its outer face adapted to engage with a boiler tube, means for delivering fluid under pressure to each of said cylinder bores, and means connecting all of said pistons to insure their simultaneous movement.

2. A tool of the character described, comprising a body portion having a plurality of cylinder bores, a piston fitted to slide in each of said bores and having its outer end adapted for engagement with a boiler tube, a tube connected to said body for delivering fluid under pressure to each of said cylinder bores, and means connected to each of said pistons for positively returning each piston upon the escape of the fluid from the cylinder bores.

3. A tool of the character described, comprising a body portion having a plurality of cylinder bores, a piston fitted to slide in each of said bores and having its outer end adapted for engagement with a boiler tube, a tube connected to said body for delivering fluid under pressure to each of said cylinder bores, and means connected to each of said pistons for positively returning each piston upon the escape of the fluid from the cylinder bores, said means also serving as an indicator to show the position of the several pistons in their cylinders.

4. A tool of the character described, comprising the combination of a body, tube-spreading members carried thereby and movable relatively to said body, a tube connected to said body and through which a fluid under pressure may be delivered to the interior of said body, to move said tube-spreading members into operative position, a force pump, and two conduits connecting said force pump and said tube, one of said conduits including a check valve opening toward said tube and the other of said conduits including a manually-operated turning plug.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUST P. GERALD.

Witnesses:
CLAIR W. FAIRBANK,
PHILIP D. ROLLHAUS.