No. 687,408. Patented Nov. 26, 1901.

J. T. SCOTT & C. G. HIGHTOWER.

TUBE FLARER.

(Application filed Dec. 21, 1899.)

(No Model.) 2 Sheets—Sheet 1.

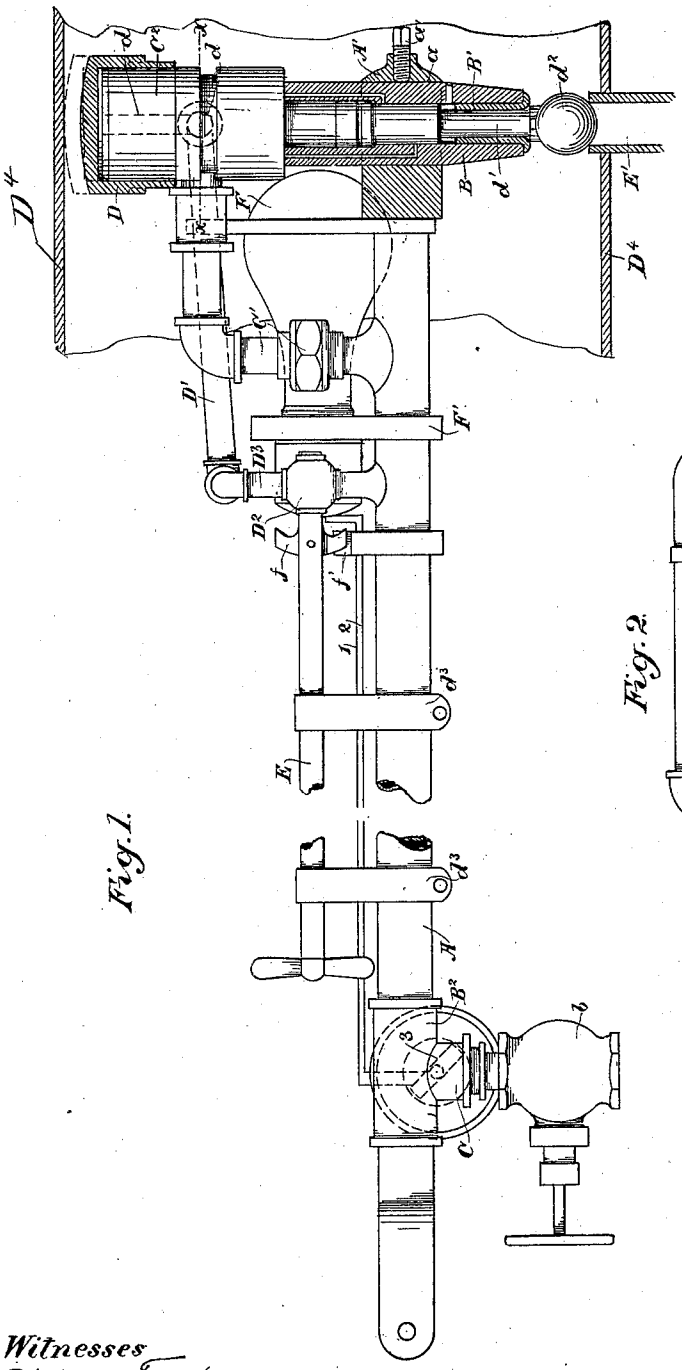


Fig. 1.

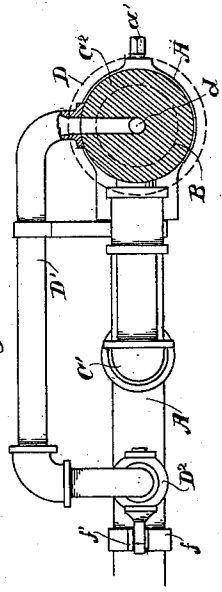


Fig. 2.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 3.

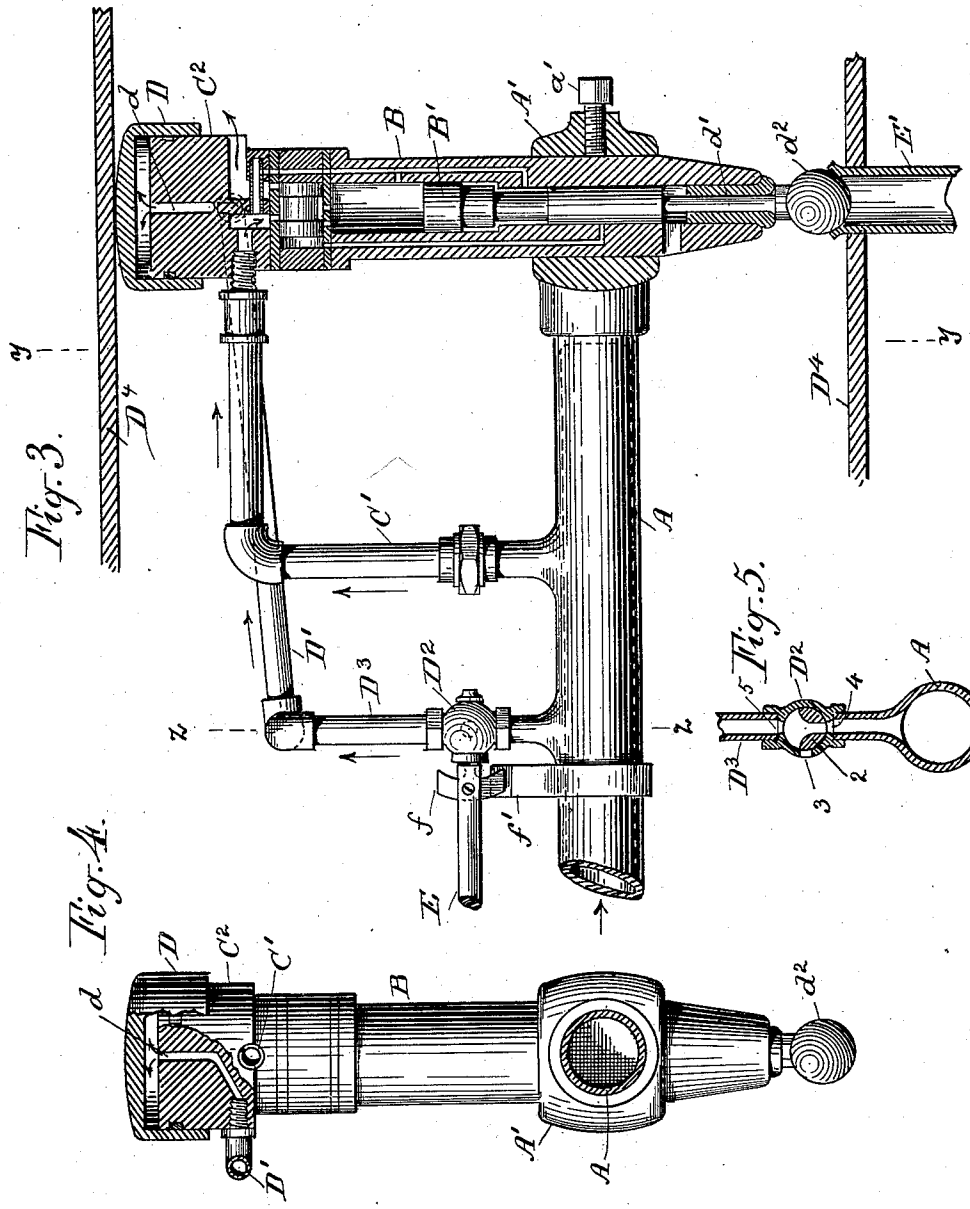


Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN T. SCOTT AND CHARLES G. HIGHTOWER, OF SAN FRANCISCO, CALIFORNIA.

TUBE-FLARER.

SPECIFICATION forming part of Letters Patent No. 687,408, dated November 26, 1901.

Application filed December 21, 1899. Serial No. 741,149. (No model.)

To all whom it may concern:

Be it known that we, JOHN T. SCOTT and CHARLES G. HIGHTOWER, citizens of the United States, residing in the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Tube-Flarers; and we do hereby declare the following to be a full, clear, and exact description of the same.

The invention relates to a certain new and useful tool for flaring the ends of tubes in the manufacture of water-tube boilers, and more especially that class of tube-boilers known as "Thornycroft" boilers used in connection with steam vessels; and it consists in the arrangement of parts and details of construction, as will be hereinafter fully set forth in the drawings and described and pointed out in the specification.

Heretofore owing to the large diameter of the water-cylinders into which the tubes are inserted it has been customary for the workman or flarer to work directly within the cylinder or boiler and flare the end of the tubes by means of a pneumatic hammer or tool carried by hand, the operation of flaring in such case being carried on in a manner similar to riveting from the inside. However, recently certain water-tube boilers have been ordered for use in connection with war vessels designed for this country wherein, owing to the space allotted for utilization of the tube-boilers, cylinders having a diameter sufficient to enable workmen entering therein cannot be employed or made use of, the diameter of the ones to be used in the construction of the tube-boilers being reduced to about seven or eight inches. Inasmuch as the end of the tubes must be flared from the inside of the cylinders in order to make an absolute tight joint it is obvious that a tool or flarer had to be provided not only adapted for flaring the tubes from the inside of the boiler-cylinders, but also capable of being operated from the outside of the cylinder, and which would perform the work of flaring equally as well as the flaring done by a workman located directly within the cylinder.

The object of our invention consists in providing a tool by means of which the end of the tube may be flared within cylinders of small diameter or such within which a workman cannot operate, and with this end in view the invention, broadly stated, may be said to consist of a tool for work within small size cylinders provided with means by which it may be operated from the outside of the cylinder and with means for automatically adjusting or setting the flarer to the diameter of the cylinder and adjusting the same to the work as the operation of flaring the end of the tube progresses.

To comprehend the invention, reference should be had to the accompanying sheet of drawings, wherein—

Figure 1 is a side view in elevation, partly in section, showing the tool within one of the boiler-cylinders. Fig. 2 is a sectional top plan view taken on line x x, Fig. 1. Fig. 3 is an enlarged broken view of the features illustrated in Fig. 1 of the drawings, the casing, pneumatic hammer, and expansible or slide shell being in section. Fig. 4 is a vertical sectional view taken on line y y of Fig. 3, the slide-shell being partly broken away and the head upon which the shell works being in part section; and Fig. 5 is a broken vertical front view on line z z, Fig. 3.

In the drawings the letter A is used to indicate the handle of the tool, which in the present case consists of a hollow metallic tube, to the outer end of which is secured the head A′. This head is formed with a vertical opening a, through which is fitted the shell or casing B of a pneumatic hammer, the same being held in place by set-screw a'. Within this shell or casing works the hammer B′, which hammer is actuated by compressed air, as is usual with pneumatic hammers. To the opposite end of the handle A is attached coupling or connection B^2, with which communicate the air-supply pipe C, leading from a suitable compressor. Said coupling is provided with a valve b for controlling the flow of air into the handle A, by means of which the same is conveyed to the hammer. Communication is established between the hammer and the hollow handle where the handle is utilized as the air-pipe by means of the branch connection C′. The hammer-casing when secured to head A′ rests upon or fits

against or is provided with a head C^2, which head is fitted within the slide shell or cap D. Head C^2 is attached to pipe connection D', leading from air pipe or handle A, which conveys air from said pipe or handle to port *d*, cut through the head C^2. By means of this port a portion of the air is conveyed from air-pipe back of the head or between said head and the cap or shell D. The pressure of the air thus forced between the head and cap or shell, which fits snugly upon the head, forces the shell or cap outward, or expands the same, so to speak, so as to bear firmly against the opposite side of the cylinder or boiler D^4 to that upon which the flaring cone is operating. By means of a valve D^2, carrying a three-way plug 2, Fig. 5 of the drawings, fitted within coupling D^3 of the pipe connection D', the admission of air from air pipe or handle A back of the head C^2 is controlled. This valve is operated by the valve-rod E, which rod is held in supports d^3, depending from handle A. When the valve is turned so that its plug assumes the position illustrated by Fig. 5 of the drawings, communication is established between pipe A and coupling D^3 through ports 4 5, the outlet-port 3 being closed.

Within open end of the hammer-casing B is loosely fitted stem *d'* of cone or ball d^2. This cone or ball d^2 serves to gradually flare end of tube E', projecting into cylinder or boiler D^4, as the stem *d'* is acted upon by the pneumatic hammer B'. The size or shape of flaring cone or ball d^2 is dependent upon that of the tube being flared.

While we have described and illustrated the handle A as being a hollow one and serving as a conduit for air, still this is not essential, and we are well aware that the handle may be a solid one and that the flexible air-pipe C may lead directly to the pneumatic hammer and be supported by the handle.

To the valve-rod E is attached a lug *f*, which engages stop *f'* in order to limit rotation of valve-rod in opening or closing valve D^2.

In flaring tubes the tool is inserted within the cylinder, the combined height of the shell D, head C^2, hammer-casing, and flaring cone or ball being approximately equal the interior diameter of the cylinder or boiler and the cone or ball placed in line with the tube to be flared. The operator then opens the valve *b*, so as to admit air under pressure through branch connection C' to the hammer, and opens valve D^2 to admit air to shell D behind head C^2, and the hammer acting upon the stem *d'* with a rapid reciprocatory motion drives the cone or ball d^2, carried by the stem, against the inner edge of the projecting end of the tube E' and gradually flares the end of said tube. After the air has been admitted to operate the pneumatic hammer the valve D^2 is turned so that the three-way plug thereof will open communication between the supply-pipe and coupling D^3 and permit the air under pressure to flow through pipe D' to port *d* in head C^2, so as to force the shell D outwardly. As the end of the tube is flared the cone or ball gradually moves upward therein, being forced or held upward by the expansion or extending of shell D. This shell or cap is moved off of head C^2 by the pressure of air entering back of said piston-head. As the shell rests upon the wall of the cylinder or boiler at a point opposite the tube being flared, it acts as a support for the inner end of the entire tool and as a means for holding the flaring cone or ball against the tube being flared. This is necessary, for as the flare increases the diameter of the tube the cone or ball enters therein a greater distance with each stroke of the hammer. The stroke of the hammer, so to speak, increases with the flaring of the tube, and means must be provided to compensate for this in order to impart a uniform stroke to the hammer and blow to the flaring cone or ball. This we do by automatically raising the hammer in proportion to the flare of the tube, so as to hold the flaring cone or ball against the work, it being accomplished by actuating the support under air-pressure so as to bear firmly against the wall of the cylinder or boiler and maintain the flaring ball or cone firmly pressed into the end of the tube. It will be apparent that as the pressure of air between the shell and piston-head is a constant one of necessity the parts give, move apart, or expand in accordance with flaring of the tube.

Owing to the length of the cylinder or boiler within which the work is conducted it is essential that light be had therein in order to see to work by. This may be accomplished in any suitable manner; but we prefer to attach to the head end of the tool an incandescent lamp F, which is held in place by bracket F'. From this lamp run the wires 1 2, which connect with a switch 3. We prefer this manner of supporting the light, as it insures the light being at all times in line with the work.

After a tube has been flared the distance from flaring ball or cone and base of shell D will be greater than the interior diameter of the cylinder. Hence it is necessary to contract the parts in order to remove the cone or ball from within the flared end of the tube. This is accomplished by cutting off the supply of air which actuates the pneumatic hammer and then turning valve D^2 so as to rotate the three-way plug 2 to cut off communication with the air-supply pipe and open communication between ports 3 and 5, port 3 being the outlet for the retained air. When the supply or flow of air from supply-pipe has been cut off, the weight of the pneumatic hammer will be sufficient to expel the air retained back of head C^2 and cause the same to move downward within shell D. The air expelled by this movement of the head flows backward through port *d*, pipe D', and connection D^3 and escapes through outlet-port 3.

By the herein-described tool we are enabled to flare tubes and have successfully flared

hundreds within cylinders or boilers of exceedingly small diameter.

Having thus described our invention, what we claim as new, and desire to secure protection in by Letters Patent, is—

1. In a flaring-tool for water-boiler tubes, the combination with the handle carrying a head, of a pneumatic hammer carried by said head, a flaring cone or ball actuated by the hammer, means for supplying air under pressure to the pneumatic hammer, an expanding shell, and means for supplying air under pressure to said shell so as to expand the same as the flaring progresses.

2. In a flaring-tool for water-boiler tubes, the combination with the handle of a pneumatic hammer carried thereby, a sliding or expanding shell for supporting the hammer end of the tool, a piston-head interposed between the hammer and expanding shell, means for supplying air under pressure to actuate the pneumatic hammer and actuate the expanding shell, and of devices for cutting off the air-supply.

3. In a tool of the described character, the combination with the pneumatic hammer, of an air-actuated expanding support by means of which the hammer is held up to its work, and of means for supplying air under pressure to the hammer and to the expanding support.

4. In a tool of the described character, the combination with the pneumatic hammer, of an expanding support for the hammer, and of means for automatically actuating said support as the operation of flaring progresses.

5. In a tool of the described character, the combination with the hollow handle, of a head having a port *d* carried thereby, a pneumatic hammer carried by said head, connection between the hollow handle and a source of air-supply, pipe connection between said handle and the pneumatic hammer, an expanding support adjacent to the end of the port *d*, valved pipe connection leading from the handle and communicating with said port, and of a valve-rod for operating the valved connection, said rod being supported by the handle.

6. In a flaring-tool for water-boiler tubes, the combination with the handle, of a pneumatic hammer carried thereby, an air-actuated expanding support for the hammer, means for supplying air under pressure to actuate the hammer and to actuate the expanding support, and devices for controlling the supply of air.

In witness whereof we have hereunto set our hands.

JOHN T. SCOTT.
CHARLES G. HIGHTOWER.

Witnesses:
JAS. C. H. FERGUSON,
A. C. LEWIS.