(No Model.) 2 Sheets—Sheet 1

L. WHITE, Jr., W. Y. BAKER & C. J. WATTS.

HORIZONTAL TUBULAR BOILER.

No. 458,277. Patented Aug. 25, 1891.

Fig. 1.

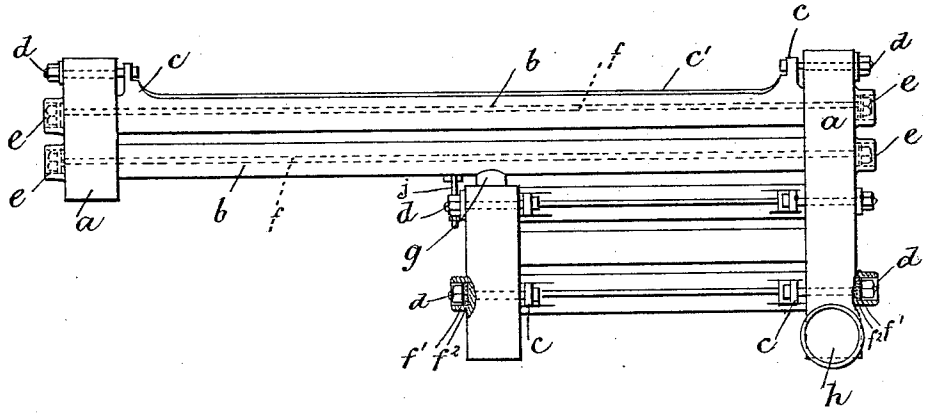


Fig. 2.

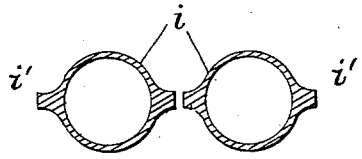


Fig. 3.

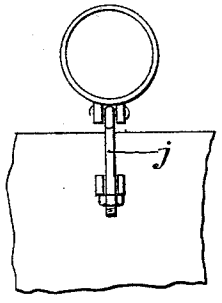
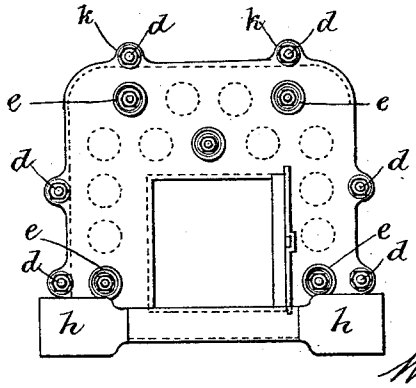


Fig. 4.



Witnesses:
David R. Smith, Jr.
E. L. Richards

Inventors:
Lynch White Jr.
William Yeats Baker,
Charles James Watts
By Richards & Q
Attorneys.

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

(No Model.) 2 Sheets—Sheet 2.

L. WHITE, Jr., W. Y. BAKER & C. J. WATTS.

HORIZONTAL TUBULAR BOILER.

No. 458,277. Patented Aug. 25, 1891.

Fig 6.

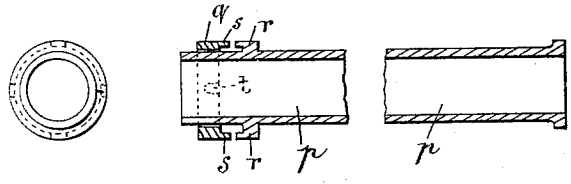


Fig 7.

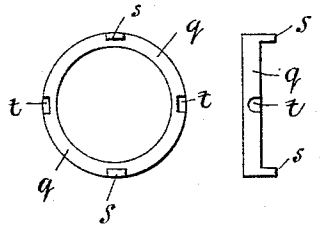
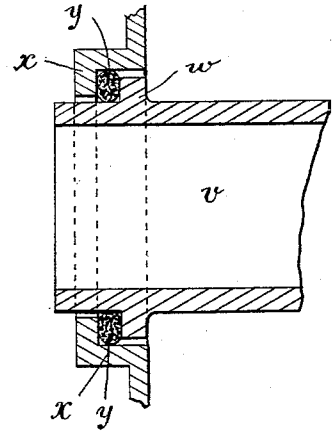


Fig 8



Fig. 5.



Witnesses:
David R. Smith, Jr.
C. L. Richards.

Inventors.
Lynch White Jr.
William Yeats Baker
Charles James Watts
By Edwards & Co.
Attorneys.

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

UNITED STATES PATENT OFFICE.

LYNCH WHITE, JR., WILLIAM YEATS BAKER, AND CHARLES JAMES WATTS, OF LONDON, ENGLAND.

HORIZONTAL TUBULAR BOILER.

SPECIFICATION forming part of Letters Patent No. 458,277, dated August 25, 1891.

Application filed March 13, 1890. Serial No. 343,713. (No model.) Patented in England June 21, 1888, No. 9,090, and November 11, 1889, No. 17,920.

To all whom it may concern:

Be it known that we, LYNCH WHITE, the younger, and WILLIAM YEATS BAKER, (trading as the Thames Bank Iron Company,) and CHARLES JAMES WATTS, engineer, residing at Upper Ground Street, Blackfriars, London, England, have invented Improvements in Horizontal Tubular Boilers, (for which we have obtained Letters Patent in Great Britain, No. 9,090, June 21, 1888, and have filed an application in the same country, No. 17,920, November 11, 1889,) of which the following is a full, clear, and exact description.

This invention relates more especially to the cast-iron tubular boilers now so much used for heating greenhouses and the like purposes, and is designed to provide for the contraction and expansion of the pipes and prevent or remedy the frequent fractures and leakages which arise from the action of the fire on the sockets of the ordinary socket-joints now employed in such boilers.

The invention consists in the parts and combinations thereof, hereinafter set forth and claimed.

We will now proceed to explain the invention with reference to the accompanying drawings, in which—

Figure 1 shows a side elevation of our improved apparatus. Fig. 2 shows the cross-section of the webbed pipes used as fire-bars. Fig. 3 is a detail drawing showing how the upper outside pipes are secured to the central casting. Fig. 4 is a front view of Fig. 1. Fig. 5 shows our improved pipe-joint. Fig. 6 shows plan and section of our special pipe which we use to replace a broken one. Fig. 7 is a detail of the ring or collar shown in Fig. 6. Fig. 8 is the wedge which is placed between the collar and the lugs *r r*.

The same letters refer to similar parts in all the views.

a a are the hollow end castings.

b are the upper pipes.

c are the lugs.

c' are the webs.

d are the bolts which pass through the lugs and secure the pipes to the hollow castings.

e are the recessed bosses formed in the castings to receive the heads of the bolts *f*.

f are the long bolts passing through the pipes *b* and connecting the end castings *f'*.

*f*² are the iron and india-rubber washers, respectively.

g is the spigot on the two outermost of the pipes *b*.

h are the return-pipes.

i are two fire-bars. *i'* are the webs on the said bars.

j is an eyebolt used, as shown, for securing the upper pipes to the central castings.

k are the lugs on the end castings.

p is our special pipe.

q is the ring or collar.

r r are lugs on the pipe *p*.

s s are the ears or projections on the ring *q*. *t t* are the recesses in the said ring.

u is the wedge which is inserted between *q* and *r*.

v is the spigot end of a pipe. *w* is the collar formed on the said pipe.

x is the recessed socket.

y is the packing.

The method we propose is to dispense with the ordinary outside socket-joint as now and hitherto used and to substitute for it a recessed joint formed by casting a fillet or collar near the end of the pipe and fitting the said collar easily into a circular recess in the end castings, this recess having a step or shoulder projecting within it, which carries a ring of elastic packing, against which the collar of the pipe presses, the spigot end of the pipe projecting beyond the collar, and thus passing the step in the recess of the socket, so as to keep the packing in its place. We thus obtain a steam-tight or water tight joint, and at the same time allow sufficient play for the expansion and contraction of the metal.

In order to prevent the destruction which would arise to ordinary packing under the great heat to which it is subjected by the action of the fire around the end of the pipe, we employ a superior description of elastic packing, composed of a good quality of india-rubber, or of india-rubber and asbestus, or of woven asbestus, or of other suitable material, according to the size of the fire, and consequently greater or less heat to which the boiler is subjected. In order to insure the se-

curity of the joints thus formed, lugs are cast on the end castings and bolts of requisite length with nuts are inserted in the said lugs, so as to compress the whole boiler firmly together.

One very important advantage secured by our improved joint is that the actual recess in which the pipes join the end castings is enveloped by the water, and is therefore entirely protected from the direct action of the fire.

We attach the hollow end castings to the pipes which lie between them by means of the short bolts *d*, as an alternative to using outside long bolts from end to end. These bolts pass through lugs *c*, cast for the purpose on the pipes *b*, and these pipes are strengthened by a web *c'*, which runs from lug to lug. If preferred, this web can be placed on the reverse side of the pipe also. The double webbed pipes *i*, which are employed as horizontal pipes or fire-bars under the fire, and which, through the space between them being diminished by the web, increase the draft, thus aiding the combustion of anthracite or other hard fuel. For this purpose the webs are placed horizontal.

Instead of external bolts we sometimes use internal long bolts *f*, Figs. 1 and 4, to fasten the end castings together. These bolts run through the water-way of some of the pipes in a central position, so as to insure an equal pressure on the surface of the rubber washers f^2, which form the joint. To receive the head and nut of these bolts we form bosses *e*, Figs. 1 and 4, with either square or round recesses. India-rubber washers are placed under the iron washers and nuts of the bolts, so as to form a water-tight joint.

At each side on the summit of the hollow bridge or central casting we form a socket with corresponding spigot *g* on the horizontal pipe directly above it, so as to connect the pipes *b* with a socket in the bridge and allow an increased flow of the heated water. This arrangement is shown in Fig. 1, as is also a pivoted bolt and nut *j*, which engages with lugs on the central casting, so as to hold the pipes *b* in place.

Our next improvement consists of the openings for return of water at lower sides of the front casting. We believe this arrangement will greatly accelerate the circulation of the water.

Our next improvement consists of a special tube *p* for replacing a broken or defective pipe. This tube is so formed that it can be inserted in the place of the old one without taking the boiler apart. It is shown in Fig. 6, and, as will be seen, it has a plain collar at one end. The other end has two fixed angular lugs *r* and a loose collar *q*. This collar has two recesses *t t*, as shown on an enlarged scale in Fig. 7, which allow it to slide back under the lugs *r*, so as to free the spigot end of the tube sufficiently to admit of it being inserted in its socket, inside which the usual india-rubber washer has been placed. When the end has been pressed in the socket sufficiently far to allow the other end to enter its socket, the collar *q* is disengaged from the lugs *r* and is turned half-round till the projecting ears *s s* are in line with the lugs *r*. Then two curved tapered wedges *u*, one of which is shown in Fig. 8, are inserted between *q* and *r*, and being driven home they tighten *q* against its india-rubber seat, and at the same time press *p* against a similar india-rubber seat in it at the other end. By this contrivance workmen in the country can readily replace a broken pipe without having to separate the boiler-castings.

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

1. The combination, with the pipes of the boiler and the flow return and front castings, of the recessed water-tight joints connecting the same and adapted to be enveloped in water, substantially as and for the purpose specified.

2. The combination, with the end castings and pipes formed with lugs, of elastic packing, bolts and nuts working in said lugs, and bolts passing lengthwise through the pipes, substantially as set forth.

3. The cast webbed pipes *b*, formed with lugs *c*, combined with the front and back castings, and the bolts *d*, passed through the said lugs and securing the same to the castings, as set forth.

4. The central casting and the sockets thereon, combined with the pipe and the corresponding spigot on the pipe directly above it, as set forth.

5. The bridge or central casting, in combination with the long bolts *f* and recessed bosses *e*, the T branch pipe *g*, and the adjustable bolt *j*, connected to bridge or central casting.

6. The adjustable tube *p*, with lugs, collar, and wedges for replacing broken pipes.

In witness whereof we have hereunto set our hands in presence of two witnesses.

LYNCH WHITE, JUNR.
WILLIAM YEATS BAKER.
CHARLES JAMES WATTS.

Witnesses:
GEO. BLACK,
97 *Newgate St., E. C.*
T. F. BARNES,
28 *Southampton Buildings, London, W. C.*