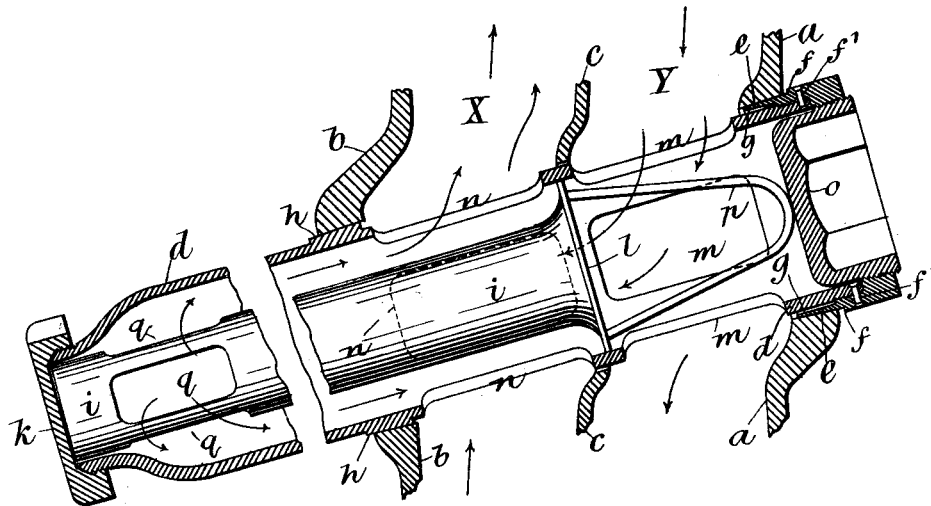


No. 675,976.

Patented June 11, 1901.

M. H. ROBINSON.  
WATER TUBE BOILER.  
(Application filed Feb. 12, 1901.)

(No Model.)



Witnesses.

Ed. Bullock  
A. M. Perkins.

Inventor.

Mark Heston Robinson,  
By his Attorneys,  
Baldwin, Davidson & Hyatt

# UNITED STATES PATENT OFFICE.

MARK HEATON ROBINSON, OF RUGBY, ENGLAND.

## WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 675,976, dated June 11, 1901.

Application filed February 12, 1901. Serial No. 47,015. (No model.)

*To all whom it may concern:*

Be it known that I, MARK HEATON ROBINSON, engineer, a subject of the King of Great Britain, residing at Overslade, Rugby, England, have invented certain new and useful Improvements in Water-Tube Boilers, of which the following is a specification.

This invention has for its object an improved construction of tubes for boilers of the type known as the "Nielausse" boiler and described in the specification to Nielausse's British Patent No. 1,052 of 1891.

In the boiler described in Nielausse's specification aforesaid each element of the boiler consists of a number of nearly-horizontal tubes attached to a header which depends from a water and steam drum. The header is divided by a transverse partition into a downcast compartment toward the front of the boiler and an upcast compartment toward the combustion-space at the back. The tubes are essentially of the construction known as "Field" tubes; but they are secured in a nearly-horizontal position instead of in a vertical one, as is customary in Field boilers, and they pass completely through the header from back to front. The water descends by the downcast compartment and passes, by means of holes in the outer tube, into the inner circulating-tube, and so into the farther end of the outer tube. It then returns by the outer tube and escapes by other holes in it to the upcast compartment and rises therein into the drum, where it delivers up the steam which is mixed with it. The outer tubes, whether consisting of one piece throughout or of two portions screwed or brazed together, are arranged to pass completely through the header from back to front, making steam-tight joints with the rear and front walls of the header by means of cones formed upon the outer tube and fitting into corresponding cones formed in the walls of the header. Openings in the sides of the tube give the necessary communication between the inside of the tube or the inside of the inner tube contained in the outer one and the compartments of the header.

According to this invention the outer tube, which is in one piece, is formed of full diameter, free from obstructions throughout, from the front end and almost to its rear end, so

that a scraper of full bore can be inserted in the tube from the front. The cone fitting with the front wall of the header is formed by the rear end of a ring, which is screwed over the end of the tube and is prevented from turning upon it by riveted pins or otherwise. The interior of the cone is cut away, so as to give considerable elasticity. The external diameter of the cone fitting with the front wall is slightly larger than the external diameter of the cone fitting with the rear wall, so that the latter may be readily withdrawn through the front of the header. The rear end of the inner tube is supported concentrically with the outer tube by a cap, by which the rear end of the outer tube is closed. The front end of the inner tube is provided with a bell-mouth, the edge of which when the inner tube is pushed home comes between the two sets of holes in the outer tube, and so prevents direct communication between the two compartments of the header. The rear end of the outer tube is coned inward to fit around the inner tube, and the inner tube is held in position endwise by a plug, which is screwed into the ring at the front end of the outer tube, bearing against a loop of stout wire extending from the mouth of the inner tube. This loop serves as a handle, by means of which the inner tube may be withdrawn. The inner tube, however, may, if desired, be rigidly connected to the screwed plug. Holes are formed through the rear portion of the inner tube to allow water to pass from it to the outer tube, and so to the upcast.

The drawing shows a transverse section of a tube made in accordance with this invention.

$a$  and  $b$  are the front and rear walls of the header, and  $c$  is a partition dividing the header into a downcast compartment Y and an upcast compartment X. On the outer tube  $d$  is a cone  $e$ , fitting with the front wall  $a$  by means of the ring  $f$ , which is screwed onto the tube and prevented from turning upon it by riveted pins  $f' f'$ . The inside of the ring  $f$  is cut away, as is shown at  $g$ , so as to give elasticity. On the tube  $d$  is another cone  $h$ , fitting with the rear wall  $b$ , and so made that it will just pass through the opening in the front wall of the header. The rear end of the tube  $d$  is bent inward to fit around

the inner tube *i* and is closed by a cap *k*, against which the inner tube abuts. The front end of the inner tube *i* is provided with a bell-mouth *l*, which when the inner tube is pushed home comes between the holes *m* and the holes *n* in the outer tube. The inner tube *i* is held in position by a plug *o*, which is screwed into the ring *f* and bears against a loop of wire *p*, projecting from the inner tube. Holes *q* are formed in the rear end of the inner tube to allow water to pass from it to the outer tube *d*. The cone *h* is formed on the tube *d* either by staving the tube so as to thicken it at that point or by expanding in a mold or die by pressure from inside.

The tube in the drawing is shown thickened throughout the whole of the part which comes within the header. It may be thickened by staving or otherwise only at the parts on which the cones are formed and at the part which comes opposite the partition in the header, or it may be of such thickness throughout as not to require thickening locally.

The direction of the flow of the water is indicated by the arrows, being from the down-cast compartment through the holes *m* into the inner tube *i* and passing out through the holes *q* into the outer tube *d* and thence through the holes *n* to the upcast compartment.

What I claim is—

1. The combination of a header having front and rear walls and an intermediate partition, an outer tube straight and of uniform internal diameter from its front end almost to its rear end extending through the header and to a distance in rear of its rear wall, two sets of openings through the outer tube, one on each side of the partition, an inner tube straight and of uniform diameter from end to end opening at its rear end into the rear end of the outer tube, a curved bell-mouth at the front end of the inner tube fitting to the interior of the outer tube between the two sets of openings and caps for closing both ends of the outer tube.

2. The combination of a header having front and rear walls and an intermediate partition, an outer tube straight and of uniform internal diameter from its front end almost to its rear end extending through the header and to a distance in rear of its rear wall, two sets of openings through the outer tube, one on each side of the partition, an inner tube straight and of uniform diameter from end to end extending from the partition to the rear end of the outer tube, a curved bell-mouth at the front end of the inner tube fitting to the interior of the outer tube between the two sets of openings, a contraction at the rear end of the outer tube fitting around the exterior of the rear portion of the inner tube, openings through the inner tube near its rear end, and caps for closing both ends of the outer tube.

3. The combination of a header having front and rear walls and an intermediate partition,

an outer tube straight and of uniform internal diameter from its front end almost to its rear end extending through the header and to a distance in rear of its rear wall, two sets of openings through the outer tube, one on each side of the partition, an inner tube straight and of uniform diameter from end to end extending from the partition to the rear end of the outer tube, a curved bell-mouth at the front end of the inner tube fitting to the interior of the outer tube between the two sets of openings, a contraction at the rear end of the outer tube fitting around the exterior of the rear portion of the inner tube, openings through the inner tube near its rear end, caps for closing both ends of the outer tube, and a loop projecting from the front end of the inner tube to rest against the cap which closes the front end of the outer tube.

4. The combination of a header having front and rear walls and an intermediate partition, a straight outer tube extending through the header and to a distance in rear of its rear wall, caps closing its ends, two sets of openings through the outer tube one on each side of the partition, a straight inner tube opening at its rear end into the rear end of the outer tube and enlarged at its front end to fit to the outer tube between the two sets of openings, a cone on the outer tube fitting a corresponding hole in the rear wall, a ring secured to the front end of the outer tube and a thin elastic cone on the rear end of the ring fitting a corresponding hole in the outer wall, the inner diameter of the cone being slightly greater than the diameter of the outer tube.

5. The combination of a header having front and rear walls and an intermediate partition, an outer tube straight and of uniform internal diameter from its front end almost to its rear end, extending through the header and to a distance in rear of its rear wall, two sets of openings through the outer tube one on each side of the partition, a cone on the outer tube fitting a corresponding hole in the rear wall, a ring secured to the front end of the outer tube, a thin elastic cone on the rear end of the ring fitting a corresponding hole in the outer wall, the inner diameter of the thin cone being slightly greater than the diameter of the outer tube, an inner tube extending from the partition to the rear end of the outer tube, a bell-mouth at the front end of the inner tube fitting to the interior of the outer tube between the two sets of openings, a contraction at the rear end of the outer tube fitting around the exterior of the rear portion of the inner tube, openings through the inner tube near its rear end, caps closing the front and rear ends of the outer tube and a projection extending from the front end of the inner tube to the cap which closes the front end of the outer tube.

MARK HEATON ROBINSON.

Witnesses:

G. F. KING,

HARRY A. WISE.