

W. E. KELLY.
HEADER FOR STEAM BOILERS.

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UNITED STATES PATENT OFFICE.

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HEADER FOR STEAM-BOILERS.

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To all whom it may concern:

Be it known that, WILLIAM E. KELLY, of New Brunswick, in the county of Middlesex and State of New Jersey, have invented a certain new and useful Improvement in Headers for Steam-Boilers, of which the following is a specification.

My improvement relates particularly to the headers of that type of steam-boilers which consists, essentially, of a number of circulating-tubes arranged in rows superposed one row above another, and connected at the ends with headers which are superposed in tiers and are made to intercommunicate vertically and to communicate with a drum arranged above them and the circulating-tubes.

I will describe a header embodying my improvement, and then point out the novel features in claims.

In the accompanying drawings, Figure 1 is a front view of a header embodying my improvement. Fig. 2 is a vertical section of the same, taken about midway between the front and back and looking toward the front. Fig. 3 is a vertical transverse section taken at the plane of the dotted line $y y$, Fig. 1. Fig. 4 is a horizontal section taken at the plane of the dotted line $x x$, Fig. 1. Fig. 5 shows a number of headers embodying my improvement fitted together.

Similar letters of reference designate corresponding parts in all the figures.

A designates a header embodying my improvement. It is shown as provided with four openings $a' a^2 a^3 a^4$, and as having a partition A' extending in a horizontal direction between the two upper openings and the two lower openings. It will be seen that the sides of this header are not continuously vertical from top to bottom, but that the lower part of the header is out of line with the upper part in a vertical direction. In the present instance it will be seen that each side is composed of an upper section 1, an inclined portion 2, and a lower vertical portion 3, the inclined portion 2 being rounded where it joins the vertical portions 1 3. I have, however, indicated by dotted lines 4 in Fig. 1 that the vertical side portions 1 3 may be connected by a straight inclined portion. The header may be said to have inclined sides in either

case, for it will not have the whole of either of its sides in one vertical plane.

The header, constructed as described, is particularly adapted for a boiler of the type previously mentioned, having the superposed rows of circulating-tubes staggered, or, in other words, arranged so that alternate rows of tubes will be in line and intermediate rows of tubes will be opposite the spaces between the others. In the back of the header are holes a^5 for the circulating-tubes of the boiler.

Reference to Fig. 1 will make it clear that the holes a^5 of the upper row are opposite the spaces between the holes a^5 of the lower row. Opposite to each of the tube-holes a^5 of the upper row the opening a^2 in the front of the header is located, and it will be seen that this is an oblong opening and of sufficient dimensions to afford free access to the said tube-holes a^5 . Opposite the other tube-hole a^5 of the upper row the opening a' in the front of the header is located, and this is large enough to afford free access to this tube-hole. Opposite the two tube-holes a^5 , which are in the lower row, and nearest to the tube-hole a^5 , which is opposite the said opening a' , is an oblong opening a^3 . This is like the oblong opening a^2 , and it affords free access to the tube-holes opposite to which it is arranged. The remaining tube-hole a^5 of the lower row has an opening a^4 in the front of the header located opposite to it. The opening a^4 affords free access to this tube-hole. It will be seen that the openings $a' a^4$ are obliquely opposite to each other, and that they are represented as severally ellipsoidal in shape. It will also be apparent that the oblong openings $a^2 a^3$ are obliquely opposite to each other.

It will be seen that the header is provided with a partition A^2 , extending between the top and bottom. This partition is not vertical, but is in the main inclined. It extends from front to back of the header, just as the partition A' does. The upper portion of the partition A^2 extends between the openings $a' a^2$, and the lower portion between the openings $a^3 a^4$.

The partition A' divides the header into an upper compartment A^3 and a lower compartment A^4 , which for all practical purposes are distinct.

The top and bottom of the header are provided with holes A^6 , adapted to receive nipples for connecting the header with another header above and below. These nipples may be extended into the holes a^6 .

It will be observed that the partition A' is provided with holes a^7 opposite the holes a^6 . Owing to this the upper and lower compartments $A^3 A^4$ of a header intercommunicate vertically in the same way that contiguous headers intercommunicate through the nipples which are fitted in the holes a^6 .

It will be observed that I have shown the partition A^2 as provided with holes a^8 . These holes afford provision for circulation of water through the compartments of the header laterally from end to end of the header.

It will be noted that the partition A^2 , being inclined in conjunction with the inclined sides of the header, forms the header into two substantially triangular compartments, one of which has its base or longer side downward and the other of which is inverted, having the base or longer side uppermost. Each of these substantially triangular compartments, it will be observed, embraces one of the oblong openings which extends opposite to the tube-holes a^5 and one of the small openings.

The partitions $A' A^2$ greatly strengthen and stay the header, and, owing to their curved or irregular lines of direction, they will not occasion injury to the header during the contraction or expansion. Two triangular headers, conforming in shape and arrangement to the triangular compartments of the header might be used instead of the header I have described.

The oblong openings $a^2 a^3$ are fitted with similarly-shaped covers a^9 . The small openings $a' a^4$ are fitted with similarly-shaped covers a^{10} . The covers $a^9 a^{10}$ are secured in place by bolts a^{11} , having at one end heads a^{12} and at the other end nuts a^{13} . The heads of the bolts that belong to the covers a^{10} of the small openings engage with plates a^{14} , located inside the header; and the heads a^{12} of the bolts belonging to the covers a^9 of the oblong openings engage with the plates $a^{15} a^{16}$.

The plates a^{14} are of a shape corresponding to the covers a^{10} and the openings $a' a^4$. As these plates a^{14} and the openings $a' a^4$ are ellipsoidal, the plates a^{14} may be easily slipped into the headers through these holes and turned around to bear against the back edges of the openings. As shown, the front edges of the plates a^{14} are rabbeted to fit the back edges of the openings.

The plates $a^{15} a^{16}$, when fitted together in pairs, conform to the shape of the openings $a^2 a^3$ and covers a^9 . It will be seen that they are rabbeted at the edges to fit the back edges of the openings $a^2 a^3$, and that they are straight at their meeting ends and rabbeted to overlap. Perhaps this may be best understood by reference to Fig. 4. They have a firm bearing against the back edges of the openings a^2

a^3 . The plates $a^{14} a^{15} a^{16}$ are provided with pockets for the engagement of the heads a^{12} of the securing-bolts. I have illustrated in Fig. 2 that a single plate a^{17} may be substituted for a pair of plates $a^{15} a^{16}$. When such a plate is used, it will conform to the shape of the openings $a^2 a^3$, and will have pockets like the plates $a^{14} a^{15} a^{16}$ for the engagement of the bolt-heads. It is obvious that instead of an oblong opening a^2 or a^3 , extending opposite to tube-holes a^5 , two single openings, like the openings $a' a^4$, might be used with plates and covers like those applied to the small openings $a' a^4$.

I will now describe the pockets of the plates a^{14} , a^{15} , a^{16} , and a^{17} . I will premise that the heads a^{12} of the bolts are T-heads. In other words, they are no wider in one direction than the diameter of the bolt, but have a projection beyond the bolt only at two opposite points. The pockets have openings 6 at the front of the plates, as may best be understood by reference to Fig. 1. These openings are of a size to permit the easy entrance of the bolt-heads, being approximately the same shape as the bolt-heads and but slightly larger than the same. At one end the openings 6 are preferably rounded. Rearward of the openings 6 each pocket has cavities 7 8. The cavity 8 is at right angles to the length of the opening 6. By inserting a bolt-head through the opening 6 and then rotating it in such direction that one end of the bolt-head will enter the cavity 8 the other end of the bolt-head will swing around within the cavity 7 until the bolt-head occupies a position at right angles to the length of the opening 6. Then one end of the bolt-head will be fully inserted in the cavity 8. The cavities 7 and 8 of each pocket extend into one another behind the opening 6, as may perhaps be best understood by reference to Fig. 2, where the rear portion of a plate a^{14} has been removed. The advantage of this construction of the pocket is that when a bolt is fully inserted it cannot be rotated or turned upon its own axis, but can only be swung around the edge or corner 9 of the cavity 8. This is very important, because when the cover to which the bolt belongs is fitted in its place it will prevent any swinging of the bolt upon the corner 9 of the cavity 8, and, indeed, will preclude any swinging movement of the bolt, except one upon the axis of the bolt. As the pocket will prevent the axial movement of the bolt, and the cover will prevent any other swinging movement or any lateral movement of the bolt, it is manifest that the bolt cannot be disengaged from the pocket until after the cover shall have been removed. The advantage of this is that the nuts a^{13} may be screwed and unscrewed without imparting any lateral, rotary, or swinging movement to the bolts. As these pockets do not extend through to the back of the plates a^{14} to a^{17} , no leakage can occur through said plates around the bolts. Inasmuch as the plates fit snugly against the in-

ner side of the front of the header no serious escape of steam or water would be liable to occur even if a cover should become detached. Indeed the pressure behind the plates would
 5 hold them tightly in their places, and this would tend to obviate leakage past them.

A header made according to my invention, with a horizontally-extending portion dividing it into an upper and a lower compartment,
 10 has all the advantages of two superposed box or tube like headers. It is adapted to resist a great pressure of steam. Many advantages result from it. Notably, a header composed of two compartments will obviate the joints,
 15 which are necessary where two superposed box-like or tube-like headers are made to intercommunicate, and, besides, this there is a saving of metal due to the fact that less thickness of metal will be required for the partition
 20 than for the top and bottom of contiguous box-like or tube-like headers.

The oblong or elongated openings in the front which I have described are very advantageous. They afford free access to all
 25 parts of the interior of the header. They are particularly advantageous, in that they afford a long swing to the lever usually employed in operating the mandrel of a tube-expander. This is important for the nipping of contiguous
 30 headers. For these reasons I prefer the arrangement of openings $a' a^2 a^3 a^4$ which I have represented, and which involves the location of two oblong or elongated openings $a^2 a^3$ obliquely opposite each other, and two
 35 other small openings obliquely opposite to each other and adjacent to the elongated openings.

In Fig. 5 I have shown the manner in which a number of my headers fit together. Here
 40 I have also illustrated that I may employ, in conjunction with them, side headers A^5 , having straight outer sides, but inner sides conforming to the inclined sides of the adjacent headers A. At the left I have shown a side
 45 header extending continuously from top to bottom; but at the right I have shown two side headers superposed one above the other. I have shown the side headers as adapted for groups of three circulating-tubes. They have
 50 horizontally-extending partitions a^{18} .

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A header having two horizontal rows of holes for tubes with a partition extending
 55 horizontally between the holes for the two rows of tubes, substantially as specified.

2. A header having a substantially triangular space within it and provided with holes for two horizontal rows of tubes, and having
 60 a partition extending horizontally between the holes for the two rows of tubes, substantially as specified.

3. A header having two substantially triangular spaces within it and provided with
 65 holes for two horizontal rows of tubes, substantially as specified.

4. A header having two substantially tri-

angular spaces within it and provided with holes for two horizontal rows of tubes, and having a partition extending horizontally be-
 70 tween the holes for the two rows of tubes, substantially as specified.

5. A header having a substantially triangular space within it and provided with holes for two horizontal rows of tubes, and having
 75 at the front of said substantially triangular space a small ellipsoidal opening opposite one tube and a large oblong opening opposite two tubes in a row, said openings being fitted with removable covers, substantially as speci-
 80 fied.

6. A header having two substantially triangular spaces within it and provided at the back with openings for two horizontal rows of tubes and provided in the front with two
 85 oblong or elongated openings obliquely opposite each other and two small openings obliquely opposite each other, and one above one of the elongated openings and the other below the other elongated opening, substan-
 90 tially as specified.

7. A header having inclined sides, holes in the back for two horizontal rows of tubes, a partition extending horizontally between the
 95 holes for the two rows of tubes, oblong or elongated openings in the front, arranged obliquely opposite one another, and small openings obliquely opposite to one another, substantially as specified.

8. A header having parallel top and bottom
 100 and parallel inclined sides and provided with a partition extending horizontally between the top and bottom, and said partition being provided with openings through it at intervals, substantially as specified.
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9. A header having parallel top and bottom and parallel inclined sides, a partition extending horizontally through it, and elongated
 110 openings arranged obliquely opposite to each other in the front and two small openings arranged obliquely opposite to each other in the front, substantially as specified.

10. The combination, with a header having an opening in the front, of a plate fitted to the rear of said opening and provided with a
 115 pocket consisting of an opening, as 6, a cavity 7 at right angles to and at one end of the opening 6, a cavity 8, extending the full length of the opening 6, a bolt fitted in said pocket, and a cover through which said bolt passes,
 120 substantially as specified.

11. The combination, with a header having an opening in the front, of two plates overlapping each other and provided with pockets,
 125 bolts engaging with the pockets, and a cover through which the bolts pass, substantially as specified.

12. A header having a substantially triangular space within it and provided with holes for two horizontal rows of tubes and a hori-
 130 zontal partition between the rows of tubes, and having at the front of said substantially triangular space a small opening opposite one tube and a large opening opposite two tubes

in a row, and removable covers for said openings, substantially as specified.

13. In combination with a header having an opening in the front, a plate fitted to the rear of said opening and provided with a pocket comprising a main opening, a cavity at right angles thereto, providing a corner 9 and another cavity at the opposite side of the

opening, a bolt fitted in said pocket, and a cover through which the bolt passes, substantially as specified.

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Witnesses:

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EDWARD F. REINECK.