No. 661,499.

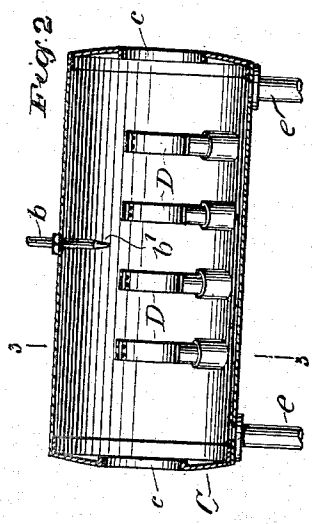
Patented Nov. 13, 1900.

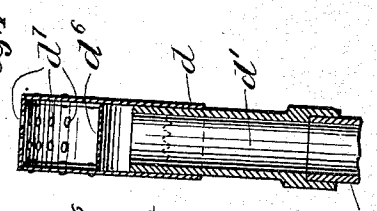
M. CORYELL.

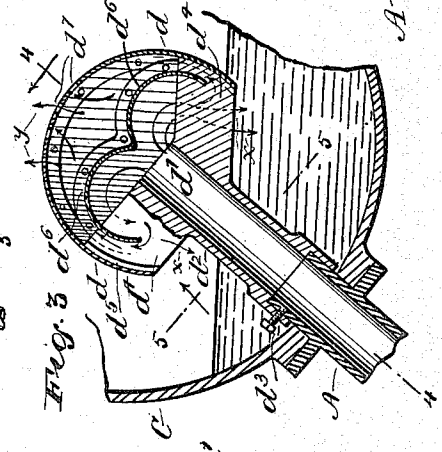
BOILER.

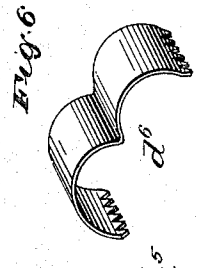
(No Model.)

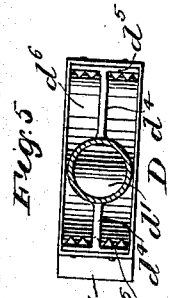
(Application filed Apr. 24, 1900.)











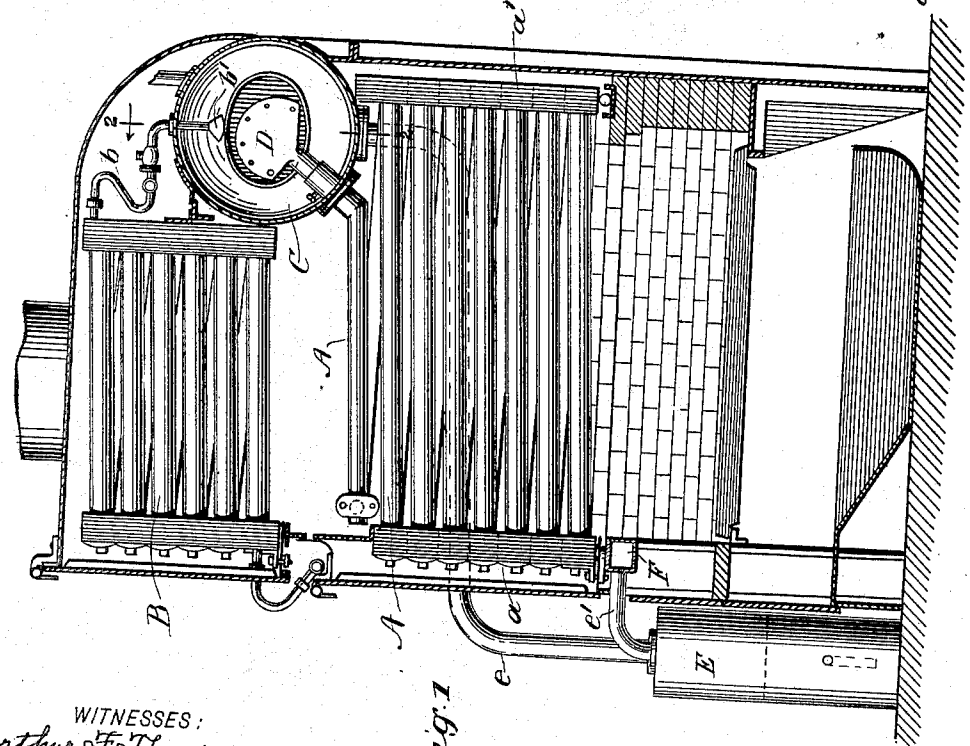


Fig. 1

WITNESSES:

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UNITED STATES PATENT OFFICE.

MIERS CORYELL, OF NEW YORK, N. Y.

BOILER.

SPECIFICATION forming part of Letters Patent No. 661,499, dated November 13, 1900.

Application filed April 24, 1900. Serial No. 14,083. (No model.)

To all whom it may concern:

Be it known that I, MIERS CORYELL, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to water-tube boilers of that type described in my United States Letters Patent No. 633,337, dated September 19, 1899, in which the tubes are arranged in sets or elements, each one of which comprises a series of direct and return tubes arranged in pairs and connected with front and rear headers, so as to form a single continuous independent circulatory conduit directly from the feed-water collector to the steam-drum.

The object of my invention is to simplify the construction and reduce the expense and labor of maintenance, inspection, and repairs, to secure an increased efficiency in the operation of the boiler, and to dispense with the necessity of an automatic feed-water regulator therefor.

To this end my invention consists in the arrangement, construction, and combination of parts and elements herein shown and described, and specifically pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of my improved boiler. Fig. 2 is a longitudinal vertical section of the steam-drum on the line 2 2, Fig. 1. Fig. 3 is an enlarged sectional view showing the construction of my improved separators. Fig. 4 is a sectional view of a separator on the line 4 4, Fig. 3. Fig. 5 is a sectional view thereof on the line 5 5, Fig. 3; and Fig. 6 is a view of the deflector-plate forming part of said separator without the flanges shown in Fig. 3.

Similar reference characters are employed to designate corresponding parts in all the views.

The steam-generating tubes A extend in pairs back and forth across the combustion-chamber, being connected with the front and rear headers a a', which are constructed in accordance with my said Letters Patent No. 633,337. The feed-water heater B, which preferably embodies the same construction, is arranged at the front of the boiler above the tubes A. The steam-drum C is connected directly with the feed-water heater by the pipe b and is placed above the rear header of the generating-tubes and immediately behind the rear header of the feed-water heater, so as to fill the space between them, thereby forcing all the gaseous products of combustion forward, so that the tubes of the feed-water heater will lie directly in their path. The pipe b, connecting the feed-water heater and steam-drum, enters the steam-drum, and its end is provided with a nozzle b', by which the feed-water is sprayed into the drum, thus avoiding shock and also securing a more rapid heating and better distribution of the water. As stated, the steam-generating tubes A are connected directly with the steam-drum C. In the construction which I have illustrated the ends of the tubes project into the drum, and their inner ends are provided with caps or hoods D, which form separators to deflect toward the bottom of the drum any entrained water that may be carried in with the steam, while permitting the steam to pass freely into the upper part of the drum. These separators consist of a parallel-sided semicircular shell d, having its lower portion open, while the sides and upper portions are closed, except for the steam-apertures, which are formed in its upper periphery. Preferably this shell is constructed of sheet metal and is supported by a spider d', comprising a tubular section d^2, arranged to form a continuation of the steam-generating tube, over the end of which it fits and to which it is detachably secured by the fastening device d^3. The spider also comprises the radial arms d^4, which carry at their outer ends flanges d^5, to which the shell is secured by rivets or otherwise. Immediately above the end of the tube d^2 a curved plate d^6 is secured. This plate may be formed with side flanges riveted to the side walls of the inclosing shell, as shown in Fig. 3, or it may be constructed without the flanges, as shown in Fig. 6, and secured by suitable lugs or supports on the sides of the shell. In the construction illustrated the ends of the plate d^6 are serrated to facilitate the drainage therefrom of the deflected water, and the arms d^4,

or the ends of the plate, are slotted to permit the plate to lie relatively close to the end of the tube d^2. The upper portion of the periphery of the shell d is provided with a series of apertures d^7. I have shown four of these separators—that is, a boiler containing four elements—but it will of course be understood that the number of elements in the boiler will usually be greater than this and that the number of separators employed will depend upon the number of elements in the boiler. In operation the steam and entrained water, if any, entering through the tube A will impinge against the plate d^6 and will be thrown back in a reverse direction. The water will fall into the lower portion of the drum, as shown by the arrows x, but the steam will pass around the ends of the plate and upward between the ends of the plate and the sides of the shell d and will find an exit through the apertures d^7 in the periphery of the shell, as shown by the arrows y. By constructing the separators D integrally with the tubular sections which form continuations of the steam-generating tubes and by detachably connecting the separators with said tubes they can readily be disconnected and removed through the hand-holes c whenever desired for inspection, cleaning, or repairs.

The operation of the boiler embodying my improvements is as follows: The feed-water is by the feed-pump forced into the steam-drum C, passing through the feed-water heater and the connecting-pipe b. Thence the water passes into the sediment-chamber E through the pipe e, from which through the pipe e' it enters the feed-water collector F, with which the steam-generating tubes of each element in the boiler communicate. The water then enters the tubes A, where it is vaporized, and by which the vaporization is carried to the steam-drum.

By arranging the steam-drum immediately behind the feed-water heater and over the rear end of the steam-generating tubes a water-wall is provided for the combustion-chamber at that point which deflects the products of combustion and concentrates their heating efficiency directly upon the feed-water heater, thereby insuring a high temperature for the feed-water when it enters the steam-drum. By this arrangement I am also enabled to operate the boiler with the normal water-level well up in the steam-drum, as shown in Fig. 3. This would not be possible if the drum were located at the forward end of the boiler out of the path of the products of combustion, because in such case the high temperature which the water had when it entered the steam-drum would be rapidly lost by radiation, causing a decided diminution of efficiency. The ability to operate the boiler with this high-water level is a decided advantage, in that much greater latitude can be allowed in the feeding of the boiler, since the level may fall considerably without endangering the tubes. I am thereby enabled to dispense with an automatic boiler-feeder, which has been found necessary in boilers of this type, in which the normal water-level is below the line of the steam-drum.

It will of course be understood that I do not intend to limit my invention to the precise details of construction which I have illustrated and described, since numerous modifications may be made therein without departing from the spirit of my invention.

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

1. In a sectional water-tube boiler, the combination of a steam-drum, a series of tubular steam-generating elements, each forming an independent circulatory conduit between a feed-water collector and the steam-drum, a separator carried by the end of each tube within the steam-drum and detachable connections between each tube and its separator, substantially as shown and described.

2. In a sectional water-tube boiler, the combination of a series of tubular steam-generating elements, each forming an independent circulatory conduit between a feed-water collector and the steam-drum, a series of shorter tubes above the steam-generating elements forming a feed-water heater and a steam-drum located above the ends of the steam-generating tubes and adjacent to the ends of the feed-water-heating tubes so as to form in the space between the two sets of tubes a water-wall by which the gaseous products of combustion are deflected between the tubes of the feed-water heater, substantially as shown and described.

3. A separator for water-tube steam-boilers consisting of a curved deflector-plate, a support for said plate and detachable connections between said support and the end of the steam-generating tube, substantially as shown and described.

4. A separator for water-tube boilers consisting of a shell provided with separate steam and water outlets, a plate within said shell for deflecting the entering steam and water and detachable connections between said shell and the steam-generating tubes, substantially as shown and described.

5. In a sectional water-tube boiler, the combination of a steam-drum, a series of tubular steam-generating elements, each forming an independent circulatory conduit between a feed-water collector and the steam-drum and each connected with the steam-drum below its water-line, and a separator carried by the end of each tube in the steam-space of the steam-drum above the water-line, substantially as shown and described.

MIERS CORYELL.

Witnesses:
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JOHN S. ABERCROMBIE.