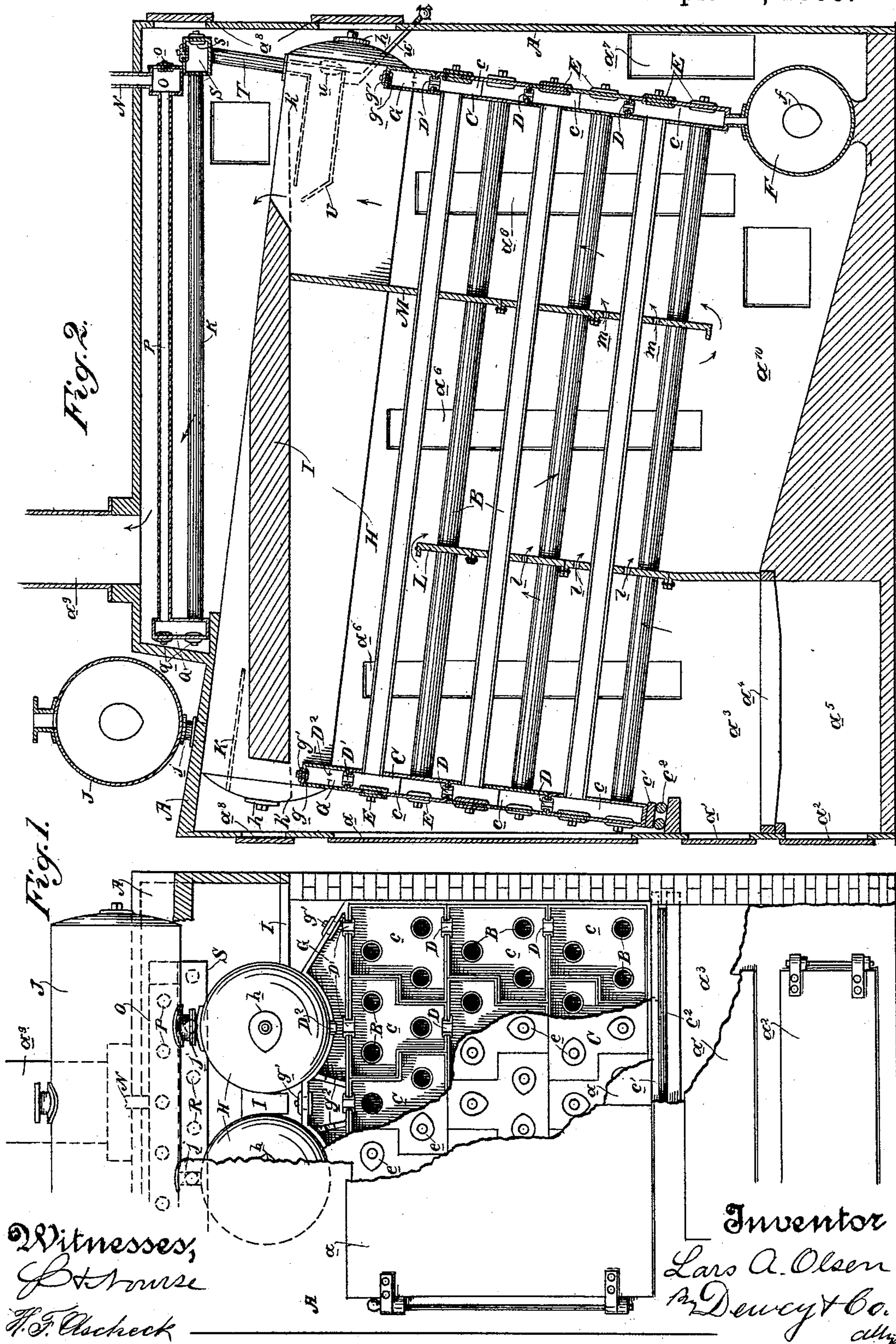


(No Model.)

L. A. OLSEN.
STEAM BOILER.

No. 495,829.

Patented Apr. 18, 1893.



UNITED STATES PATENT OFFICE.

LARS A. OLSEN, OF OAKLAND, CALIFORNIA.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 495,829, dated April 18, 1893.

Application filed September 14, 1892. Serial No. 445,891. (No model.)

To all whom it may concern:

Be it known that I, LARS A. OLSEN, a citizen of the United States, residing at Oakland, Alameda county, State of California, have invented an Improvement in Steam-Boilers; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to that class of steam boilers in which water tubes with hollow heads are located in the furnace shell and are surmounted by and communicate with suitable water and steam drums.

My invention consists in the novel construction and arrangement of the shell, the inclined water tubes therein, the hollow heads of said tubes, the inclined water drums, the steam drum and the feed water pipes, all of which together with the several details and combinations will be hereinafter fully described and specifically pointed out in the claims.

The object of my invention is to provide a boiler having a maximum capacity of steam storage, rapid in its steam generation, economical in its fuel consumption and having great strength and durability.

Referring to the accompanying drawings for a more complete explanation of my invention,—Figure 1 is a front view of my boiler, a portion of the front of the shell being broken away to show the front of the forward head, and a portion of the front wall of said head being broken away to show the interior of the head sections *c*. Fig. 2 is a vertical longitudinal section of my boiler.

A is the furnace shell, having in its front the main doors *a*, the fire-box door *a'* and the ash-pit door *a''*. In its lower portion is the fire-box *a'''* with grate bars *a''''* and underlying ash-pit *a'''''*. In its side it has a door *a''''''*; at its back a door *a'''''''*, man-holes *a''''''''*, and at its top front the smoke stack *a'''''''''*.

B are water tubes. These are located within shell *A* and incline downwardly from the front to the back. These tubes are carried at each end in sectional hollow heads *C*. Each head is formed of separate sections *c* laid upon and next to each other. Each section is a hollow box made of cast steel, or cast iron, or otherwise. Their contours may be varied, it being preferable to make the side series of an "L" shape, while the intervening ones are of a "T" shape, whereby in laying

them up, they bond together snugly to form the complete head.

Into the back wall of each section is let and expanded therein the end of one or more of the tubes *B*. I prefer to have three tubes to each section. The interiors of these sections communicate through nipples *D* which are short pipes or tubes passing through and expanded in the adjacent walls of the sections. Thus the hollow spaces of the sections, communicating through the nipples practically unite in a single hollow head through which the water from and to the tubes *B* can freely circulate.

In the outer wall of each section *c*, opposite the end of each tube *B*, is made a hand-hole *E*, covered by any suitably constructed plate *e*. Any section of the head may be removed whenever necessary, by working through the nearest hand-hole and removing its connecting nipple and attached tubes. The forward head rests its base, through the intervention of a bearing bar *c'*, upon rollers *c''* to provide for movement due to expansion and contraction. This location of the rollers at the front instead of at the back is of advantage in that the front being directly over the fire is subject to the greater movement. The back head communicates at its base with a mud drum *F*, access to which is had through a suitably covered hole *f*.

Upon top of each head is a hollow casing *G*, with which the top sections of the heads communicate through nipples *D'*, said casings having hand-holes *g* covered with plates *g'* similar to those in the heads, whereby ready access is afforded to remove the nipples. The casings are centrally stiffened by apertured braces *g''*. Supported by and between these casings *G* are the two water drums *H* which lie at the same inclination as and parallel with the tubes *B*. These drums are suitably bolted to the casings and they communicate therewith through nipples *D''*. At each end the drums have man-holes covered by plates *h* of the same character as the hand-hole covers in the heads.

The line *h'—h'* represents the water level in drum *H* and on this level the brick work separating wall *I* of the shell *A* is formed on each side of and between the drums, said wall terminating short of the back of the shell.

Across the front ends of the drums H is supported the steam drum J, which communicates with said drums H through the passages *j*.

5 Within the forward ends of drums H, and lying between the communications of said drums with the casings G below and the steam drum J above, are guard-plates K which prevent the water from the forward head and
10 casing being thrown upwardly into the steam space above, thus insuring dry steam.

Rising from the back of the fire-box and extending nearly to the top of the tube series is the first directing plate L. This consists
15 of perforated sections of plate slipped over the tubes and flanged and bolted together. The lower portion of this plate is provided with holes *l*. Depending from the top or brick-work I is the second directing plate M
20 which is similar in construction to plate L and extends to the bottom of the tubes, terminating above the space *a*¹⁰ in the base of shell A. In the lower portion of this plate are the holes *m*. The flames from the fire-
25 box rise over the first directing plate, pass under the second plate, and thence rise by the rear portions of the water drums, and by the rear end of wall I, and forwardly over them to the stack. By this course the heat is equal-
30 ized throughout the length of the tubes, and every portion thereof is fully exposed to the flames. The flames in curving over and under the plates are naturally directed away from the immediate vicinity of their lower
35 portions. To obviate the effect of this, the holes *l* and *m* are provided so that some of the heat can pass directly through and thus the tubes near the plates are fully heated.

N is the feed water connecting pipe. It
40 enters a box O from the inner wall of which issues a series of pipes P which extend forwardly in the upper portion of shell A in the path of and exposed to the flames and products of combustion on their way to the
45 stack. The forward ends of these pipes enter the box Q, from which issue rearwardly extending pipes R which enter a box S at the back. From this box extend pipes T which pass downwardly into the rear ends of the
50 water drums H. Here they enter directing chutes U which extend forwardly and carry the water into the drums at a point removed from the entrance into the rear casing G, so that no water of a low temperature can be
55 discharged directly into the rear head, to the injury of the tube connections therein. Suitable drains *u* are provided for chutes U, and in the backs of said chutes are covered hand-
60 ends of the water drums. holes *u'* accessible from the man-holes in the

In the back or outer walls of all the boxes O, Q and S, at points opposite the pipes are covered hand-holes *o*, *q* and *s* similar to those in the heads, whereby the pipe connections
65 can be easily reached. The feed water entering through pipes P and R is initially heated and is then delivered into the drums H. From

these, the circulation is through the back casing and back head, forwardly through the tubes B, and up through the front head and
70 front casing into the drums again. The steam rises through the front head and casing into the steam space above the water line in the drums and thence into the steam drum. Thus a large steam space for storage is ob-
75 tained, the heat is directed properly and economized, steam generation is rapid, and the whole boiler is strong, efficient and safe. The water space of the drums H is below the wall I and subjected to the direct flames, 80 while the steam space is above said wall.

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

1. In a steam boiler, the combination of a 85 shell having a fire-box in its lower front, a stack in its top front and a separating wall for directing the flames to the rear of the shell in their passage to the stack, a series of backwardly inclined water tubes in the shell
90 above the fire-box and below the separating wall, hollow heads at each end of and communicating with said tubes and a backwardly inclined water drum above and communicating with said hollow heads, substantially as 95 herein described.

2. In a steam boiler, the combination of a shell having a fire-box in its lower front, a stack in its top front and a separating wall for directing the flames to the rear of the
100 shell in their passage to the stack, a series of backwardly inclined water tubes in the shell above the fire-box and below the separating wall, hollow heads at each end of and communicating with said tubes and a backwardly
105 inclined water drum above and communicating with said hollow heads, said drum having its rear lower portion below and its forward upper portion above the separating wall in the shell, substantially as herein described. 110

3. In a steam boiler, the combination of a shell having a fire-box in its lower front, a stack in its top front and a separating wall for directing the flames to the rear of the
115 shell in their passage to the stack, a series of backwardly inclined water tubes in the shell above the fire-box and below the separating wall, hollow heads at each end of and communicating with said tubes and a backwardly
120 inclined water drum above and communicating with said hollow heads, said drum having its rear lower portion below and its forward upper portion above the separating wall in the shell, and a steam drum above and communicating with the forward top portion of
125 said water drum, substantially as herein described.

4. In a steam boiler, the combination of a shell having a fire-box in its lower front, a stack in its top front and a separating wall
130 for directing the flames to the rear of the shell in their passage to the stack, a series of backwardly inclined water tubes in the shell above the fire-box and below the separating

wall, hollow heads at each end of and communicating with said tubes and a backwardly inclined water drum above and communicating with said hollow heads, said drum having
 5 its rear lower portion below and its forward upper portion above the separating wall in the shell, a steam drum above and communicating with the forward top portion of said water drum, and a guard-plate in the forward
 10 end of said water drum between its communications with the forward head and the steam drum, substantially as herein described.

5. In a steam boiler, the combination of a shell having a fire-box in its lower front portion, a stack in its upper front portion and a separating wall for directing the flames to the rear of the shell in their passage to the stack, a series of backwardly inclined water tubes in the shell above the fire-box and below the
 20 separating wall, hollow heads at each end of and communicating with said tubes, a backwardly inclined water drum above and communicating with said hollow heads, said drum having its rear lower portion below and its forward upper portion above the separating wall
 25 in the shell, and a series of directing plates in said shell about the tubes having passages alternately above and below, to direct the flames in a tortuous course throughout the length of
 30 the tubes, substantially as herein described.

6. In a steam boiler, the combination of the shell, the backwardly inclined water tubes therein, the hollow heads consisting of separate hollow sections receiving the tubes in their

inner walls and having the communicating
 nipples, the hollow casings G on top of said
 heads and having the nipples communicating
 therewith, the inclined water drums supported
 on said casings and communicating therewith
 and the steam drum supported above and
 40 communicating with the forward ends of the water drums, substantially as herein described.

7. In a steam boiler, the combination of the shell with its separating wall, the inclined water tubes and hollow heads below said wall, the inclined water drums partly above and partly below said wall, the feed water pipes in the shell above the water drums, the boxes with which said pipes communicate and the
 50 pipes connecting the final box with the rear ends of the water drums, substantially as herein described.

8. In a steam boiler, the combination of the shell, the water tubes therein with their hollow heads, the water drums above and communicating with said heads, the feed water pipes passing back and forth in the shell above the drums, the directing chutes in the rear ends of the drums and the pipes connecting the feed water pipes with said chutes,
 60 substantially as herein described.

In witness whereof I have hereunto set my hand.

LARS A. OLSEN.

Witnesses:

S. H. NOURSE,

J. A. BAYLESS.