

No. 824,801.

PATENTED JULY 3, 1906.

J. H. MEISSNER.
BOILER.

APPLICATION FILED NOV. 18, 1904.

3 SHEETS—SHEET 1.

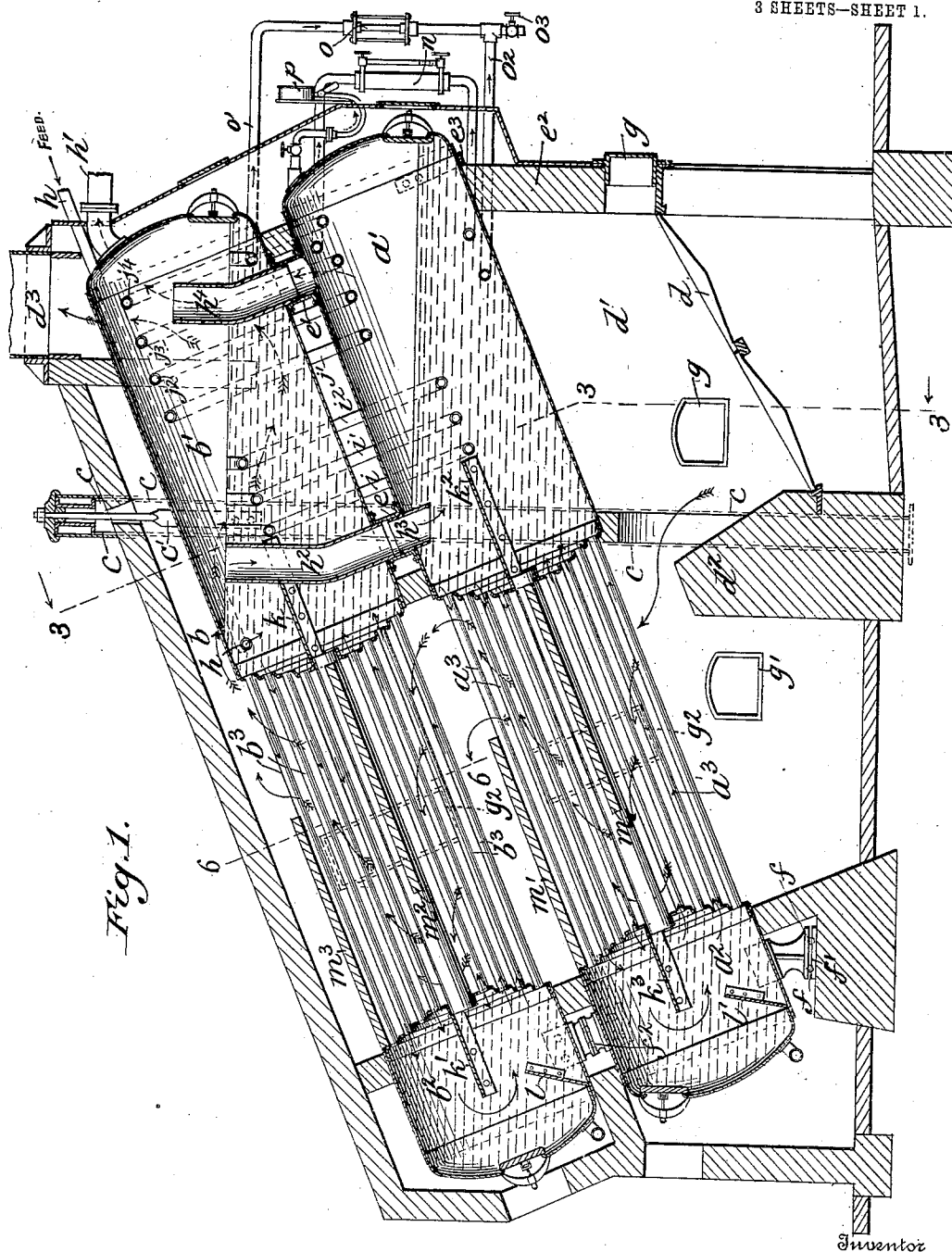


Fig. 1.

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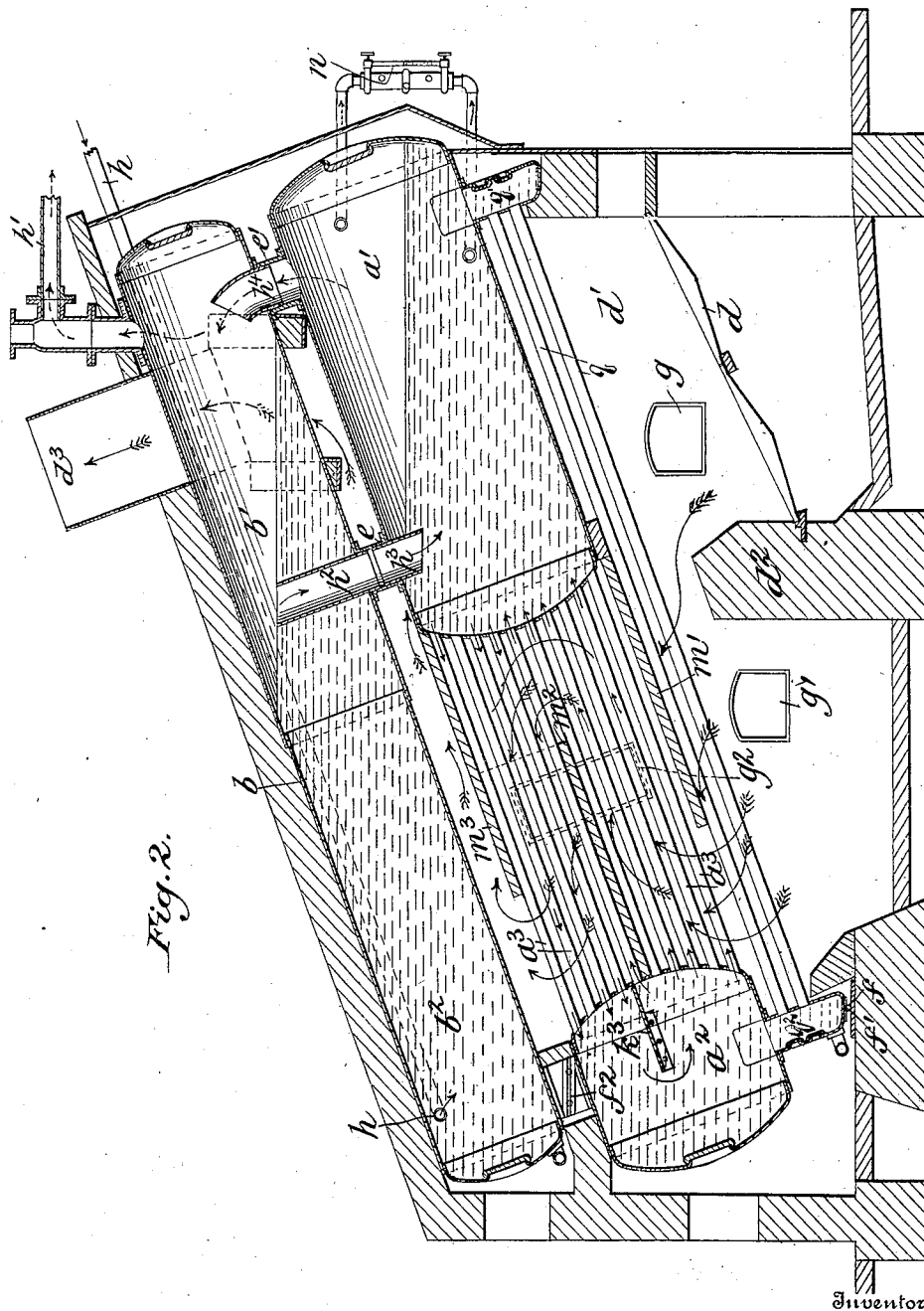


Fig. 2.

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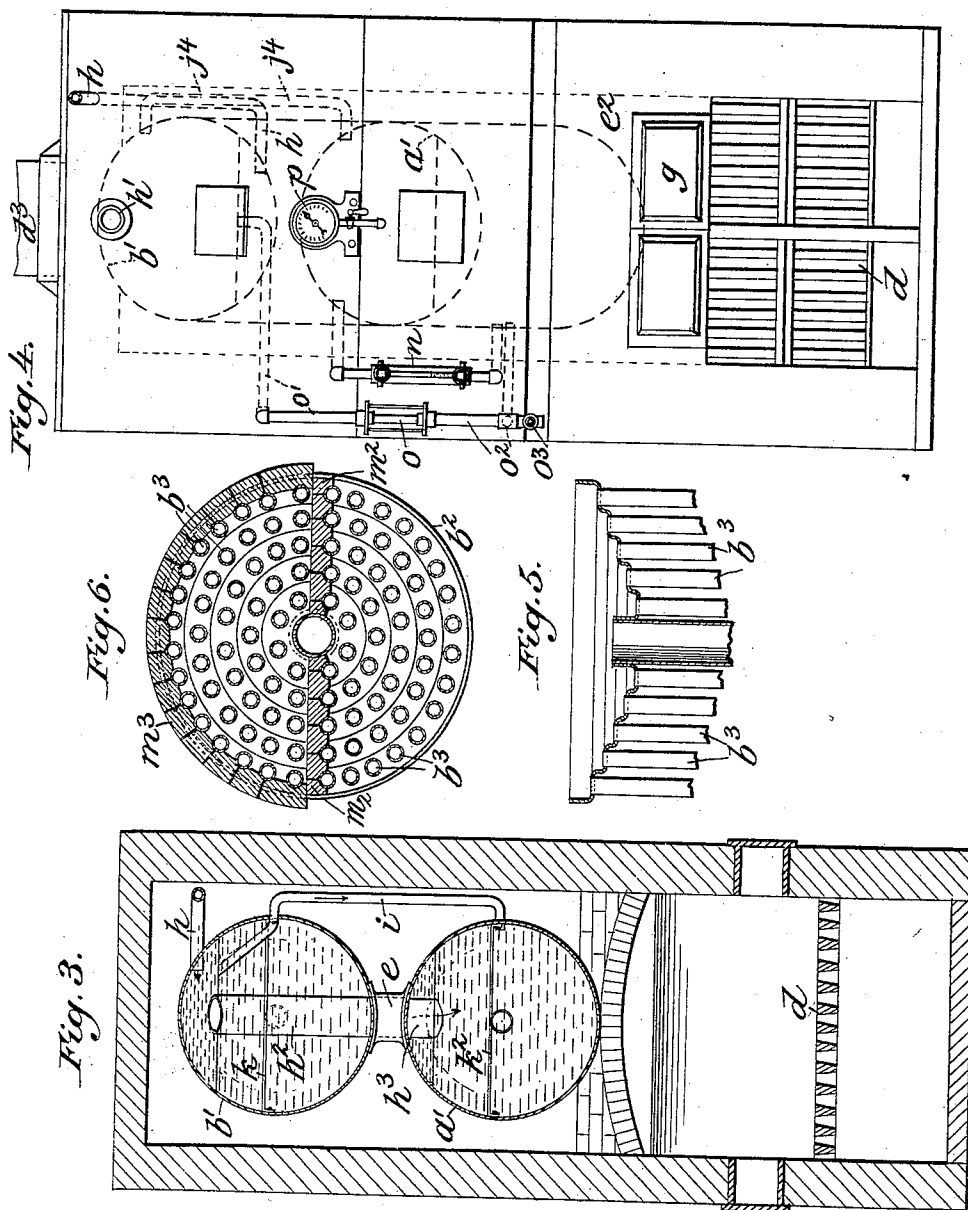
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WITNESSES:

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UNITED STATES PATENT OFFICE.

JULIUS HERMAN MEISSNER, OF PITTSBURG, PENNSYLVANIA.

BOILER.

No. 824,801.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JULIUS HERMAN MEISSNER, a citizen of the United States, residing at Pittsburg, Pennsylvania, have invented a certain new and useful Improvement in Water-Tube Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improvement in water-tube boilers, and particularly to sectional water-tube-shell boilers, the object being to provide in the one boiler a battery of sections each in a measure independent, having separate water and steam spaces, also a distinct circulation of water for each section, and yet coöperating to constitute, in effect, a single boiler possessing in the highest degree a thereby greatly-increased capacity of water and steam space and releasing-surface to convert into steam a large amount of water, with an economy in time and fuel, combined with other advantages as to ease of access for repairs, cleaning, and renewal.

The invention consists, moreover, in the form and arrangement of the several parts of the boiler, which will be hereinafter more particularly described and claimed, as illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of a preferred form of the boiler. Fig. 2 is a similar view of a modified form. Fig. 3 is a transverse section on the line 3 3 of Fig. 1. Fig. 4 is an end view of Fig. 1. Fig. 5 is a detail view of the tube-sheet, and Fig. 6 is a transverse section on the line 6 6 of Fig. 1.

My improved water-tube-shell boiler comprises a plurality of sections (in the present instance two) arranged at different levels and positions to suit conditions, whether inclined or vertical or nearly horizontal; but for obtaining the best results and effects, as will be later set forth, two independent water-tube sections are preferred, with shells in an inclined position, one section on top of the other.

The lower boiler-section *a* consists of the front shell *a'*, the rear shell *a²*, and the intermediate water-tube section *a³*. The upper boiler-section *b* is likewise composed of the front shell *b'*, the rear shell *b²*, and the intermediate water-tube portion *b³*. These boiler-sections are shown as arranged at an inclination of twenty-five to thirty degrees to the horizontal and are supported at the front by

the lower furnace-wall and framed upright channel-bars *c*, hung at about the center by links *c'* from two channel-beams from above resting on the one side of walls and channel-bars, and the lower section rests at the rear upon the ground on antifriction-rollers *c²*, all inclosed by the usual brickwork.

The Meissner patent grate or any suitable grate structure *d* is arranged directly under the lower front boiler-section, forming a combustion-chamber *d'*, whence the heated products of combustion pass over the fire-bridge *d²* in a circuitous route between and in contact with the water-tubes *a³* and *b³* to the upper portion of the heating-space over and around the upper large front shells and thence to the uptake and chimney *d³*, as indicated by the continuous feathered arrows, giving off practically all the heat to the whole boiler.

The upper and lower front shells *a'* and *b'* are strongly connected with each other by two heavy flanged necks *e* and *e'*. These are not the ordinary water-necks, but of a construction to be hereinafter more fully described. They are strongly riveted to the front shells, making firm steam and water tight connections. Thus connected the front shells *a'* and *b'* are firmly seated in a heavy half-round boiler-front *e²* in an inclined position and are further secured from slipping by a heavy band of iron *e³*, riveted to lower shell *a'*, as shown. The rear sections *a²* and *b²* are at the same inclination as the front sections *a'* and *b'* and rest in saddles suitably riveted in position. The shell *a²* rests on rollers *f* on a horizontal plate *f'*, while the upper rear shell *b²* rests on a sliding saddle *f²*, resting, with or without intermediate rollers, on one of similar pattern, which is riveted at the top of lower shell. Thus mounted the whole boiler allows each section an easy and independent expansion and contraction by the boiler-tubes. Side door *g* gives access to the furnace part, doors *g'* to lower part for dusting tubes and cleaning purposes, and upper doors *g²* for cleaning the tubes, blowing soot off, and access generally.

By referring particularly to Fig. 1 it will be seen that the boiler-section *b* is composed of front and rear shells *b'* and *b²*, with outwardly-convexed heads of a radius approximately equal to the diameter of shells. Each of them is provided with a manhole and needed covers. They all provide for easy access to inner part of the boiler. The front

shells are somewhat longer than the length of the tubes to allow easier access to clean and repair. The tubes can thus easily be withdrawn inside of the front shells, and no good tubes need be cut away to get at defective ones. Another great advantage is that in a sectional water-tube-shell boiler of this kind having separate water and steam spaces the longer shells give more releasing-surface for steam, more steam-space, and more water-space by approximately fifty per cent. than ordinary water-tube boilers. The shells should be of the same diameter front and rear to suit the tube-sheets and number of tubes to be used. The tube-sheets forming the adjacent ends of the shells are dished by being pressed while heated and in this case stepped in flat circular forms, in which are provided tube-hole spaces surrounding the center at different levels. A large tube-hole with an inward flange occupies the center of said flue-sheets, riveted on them and holding a larger center water-tube serving for a firm connection between the tube-sheets to further stay them. These tube-holes shown are in circular form and bored to suit the tubes, or they could partly be pressed out when the plate is heated and shaped under a press. The tubes are secured in the usual way by properly expanding them and rolling them in by the ordinary method. This kind of tube-sheet has a great rigidity and strength and will need no further inner bracing. The front shell b' is provided with a feed-water inlet at h , which preferably taps the shell near the tube-sheet, as shown; but the feed-water could be also introduced more or less advantageously into the lower shell of the same section, if desired. The upper section has its own steam-space, water-space, and evaporating-surface, and the steam is withdrawn through an upper dry-plate into the steam-pipe h' . An overflow-pipe h^2 of comparatively large capacity is arranged within the front shell b' , so as to maintain the level of the water therein at a height sufficient to keep submerged the upper portion of the shell, where the shell-plate meets the tube-plate, and yet to leave ample steam-space and water-surface within said shell. This overflow-pipe is of slightly less diameter than the neck e . The latter is cored and is threaded on upper and lower part, and the overflow-pipe h^2 is screwed water-tight into said upper part. The neck e has no connection otherwise with the water in the upper shell except what overflows and washes the side of the neck to keep it from becoming overheated. The heat that strikes this portion is well used up and is not of sufficiently high temperature to hurt the neck, which is further protected by brickwork from the passing furnace heat. Another short pipe h^3 , connected with the bottom of said neck, reaches into the water in the lower shell b' . It is also

screwed to the neck, as shown. Both tubes h^2 and h^3 can be withdrawn by unscrewing them in order to facilitate the cleaning of the tubes or repairing them. A steam-pipe h^4 leads through the neck e' into the upper shell a' from the steam-space of lower front shell b' . The steam-pipe is screwed into the neck in a water-tight manner similar to the overflow-pipe. The two boiler-sections a and b are practically duplicates connecting one with the other by means of the water overflow and the steam-pipes in such manner that while they have separate water-levels and steam-spaces, yet they effectively cooperate as a whole, receiving the passing heated gases from one common furnace and converting the water into steam, this water being initially heated in the upper boiler-section without the usual violent ebullition, while the lower boiler-section does the most of the work and steams more rapidly, discharging its product into the steam-space of the upper section.

As an alternative method of connecting the water and steam spaces of the upper and lower boiler-sections outside connections i i' i^2 , extending from the water-level of shell a' to below the water-level in shell b' , and j' , j^2 , and j^3 , connecting the steam-spaces, may be provided as a substitute for the large overflow h^2 h^3 and steam connections h^4 or they may be advantageously used in connection with the large pipes and pass as additional heating-surface for the water-tubes i i' i^2 and as superheating-tubes for steam-tubes j' j^2 j^3 through from outside of boilers.

Within the front and rear shells of the upper boiler-section b are arranged guide-plates k and k' , extending transversely of the shells adjacent to the sheets, while plates k^2 and k^3 are similarly arranged in the lower boiler-section. As the feed-water enters the front shell b' at h its course is directed by the deflecting-plate k downwardly through the upper tubes b^3 into the rear shells, whence it passes around the plate k' , forms an eddy caused by plate l in lower portion of lower shell, which causes the water to deposit some of its impurities, and returns to the front shell through the lower tubes, as indicated by the featherless arrows. As the returning water enters the front shell it is directed beneath the plate k to the front portion of the same and rises to the surface, a portion in the form of steam, and as the volume of water in the shell is increased by the feed to such an extent as to rise above the level of the water overflow at h^2 this heated water passes downward through the overflow-pipe into the lower boiler-section. Here it is deflected by the plate k^2 downward through the upper tubes a^3 into the rear shell, passes around the plate k^3 , comes to the lower eddy-plate l' , deposits any impurities, and passes up again to the front section through the lower tubes, as

indicated by the featherless arrows. Entering the front shell it is directed by the plate k^2 to the front portion of the shell, supplying the steam-space, as indicated by the broken arrows.

The heating-space is divided by overlapping baffle-plates m , m' , m^2 , and m^3 in such manner that the products of combustion are forced to take an indirect course, as shown by the heat-arrows, the result being that the water in the course of its passage through the tubes is at all points traveling in a direction opposite to that of the heat, whereby a very great practical advantage is obtained which will readily be appreciated by those skilled in the art.

A water-gage n of the usual construction is arranged in view of the fireman upon the front shell of the lower boiler-section. By this gage the fireman is kept correctly informed as to the stage of water in all the sections, for the reason that so long as the proper water-level is maintained in the lower section, in which the steaming is most rapid, he may be assured that the water is overflowing therein from the upper sections and that consequently the original feed-water is sufficient. The water overflow is of sufficiently large capacity to insure against stoppage from any cause and to carry off any excess of feed-water which under any circumstances may be introduced by the feed-water pipe. The one water-gage is consequently all that need to be watched by the fireman. Moreover, this gage is close to him and not as far away as with other high water-tube boilers which have at the same time a very violent movement of water in their upper drums, while in the present case the water of the upper sections will always keep comparatively quiet and is not influenced by the more violent movements in the lower sections. Water-gages or gage-cocks can also be put on the upper sections, if desired; but they are not required.

To further enable the flow of water as it takes place downward from above to be watched near the water-gage, there is placed a sight-feed o somewhat above the water-level in the lower shell and connecting two sets of water-pipes, one pipe o' leading from the water-level of the upper shell and the other pipe o^2 passing into the lower shell to a point below the normal level of the water therein in a manner similar to the large overflow-pipe h^2 h^3 . A blow-off valve o^3 is provided to clean out the glass tube when needed. The flow of water can thus readily be observed by the fireman as it takes place from above down through the glass sight-feed o into the lower pipe leading to the lower shell. The steam-gage is also arranged on the front of the lower boiler, taking its steam from the upper part of the lower steam-space, the steam-gage being also close to the fire-

man. In Fig. 2 a similar arrangement is shown, in which, however, the upper section is a cylindrical boiler, while the lower is provided with water-tubes. In this modification the feed-water is shown as introduced at the rear end of the upper section, though not necessarily so. The principle of operation is the same in both cases. In Fig. 2 in addition to the tubes a^3 additional tubes q extend beneath the lower section a and connect legs q' and q^2 , communicating, respectively, with the shells a' and a^2 , legs to have hand-holes with caps or cover outside in order to get at tubes q to clean and repair them.

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

1. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels, each section consisting of cylindrical shells connected by tubes, and an overflow-passage from the steam-space of the lower section to that of the upper section.

2. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels, each section consisting of cylindrical shells connected by tubes of a length less than the interior of one of the shells, an overflow-passage from the water-space of the upper section to the lower section and a steam-passage from the steam-space of the lower section to that of the upper section.

3. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels, each section consisting of cylindrical shells connected by tubes, means for causing the water to flow from one shell to the other through certain of the tubes and to return through other tubes, an overflow-passage from the water-space of the upper section to the lower section, and a steam-passage from the steam-space of the lower section to that of the upper section.

4. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels and inclined to the horizontal, each section comprising cylindrical shells arranged in line and having outwardly-convexed ends, the inner adjacent ends of the shells perforated to form tube-sheets and connected by water-tubes, the upper shell of each section of sufficient interior length to receive the tubes, and an overflow-passage from the water-space of the upper section to that of the lower section.

5. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels independent of each other and inclined to the horizontal, each section comprising cylindrical shells connected by water-tubes, means for causing the current of water to flow from one shell to the other through certain of the tubes and to return through other tubes, an overflow-passage from the water-space of the upper section to that of the

lower section, a passage from the steam-space of the lower section to that of the upper section, and means for causing the products of combustion to pass among the water-tubes in a direction opposite to the travel of water through the tubes.

6. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels and having independent water and steam spaces, a water overflow from the water-space of the upper to that of the lower section, and a steam-passage outside of the boiler from the steam-space of the lower to that of the upper section, the steam-passage being arranged within the path of the products of combustion.

7. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels, each section consisting of cylindrical shells having outwardly-pressed convex ends, the adjacent ends constituting pressed tube-sheets arranged in the form of stepped rings, tubes arranged in the rings and connecting the shells, an overflow-passage from the water-space of the upper section to the lower section, and a steam-passage from the steam-space of the lower section to that of the upper section.

8. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels, each section consisting of cylindrical shells connected by tubes of a length less than the interior of one of the shells, an overflow-passage from the water-space of the upper section to the lower section and a steam-passage from the steam-space of the lower section to that of the upper section, and a water-gage arranged in operative relation to the lower section.

9. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels and at an inclination to the horizontal, the sections comprising cylindrical shells having outwardly-convexed ends, the inner adjacent ends of the shells perforated to form flue or tube sheets and connected by water-tubes, one shell of each section being of sufficient interior length to accommodate the tubes, means for causing the water to flow through said tubes and the products of combustion to pass along and in contact with said tubes in opposite directions, an overflow-passage from the water-space of the upper section to that of the lower section, means of a passage from the steam-space of the lower section to that of the upper section, a water-gage arranged in operative relation to the lower section, and means affording view of the flow of the water from the upper to the lower section.

10. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels and at an inclination to the horizontal, each section comprising cylindrical shells having outwardly-convexed ends, the adja-

cent ends of the shells perforated to form tube-sheets and connected by water-tubes, the upper shell being of sufficient interior length to accommodate the tubes, guide-plates extending transversely of the shells about the medial line thereof and adjacent to the tube-sheets, overlapping baffle-plates so arranged longitudinally of and between the tubes as to direct the products of combustion along said tubes in a direction opposite to the flow of the water therein, an overflow-passage from the water-space of the upper section to that of the lower section, a passage from the steam-space of the lower section to that of the upper section, a water-gage arranged in operative relation to the lower section, and means affording a view of the flow of the water from the upper to the lower section.

11. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels and each provided with water and steam spaces, an overflow-passage from the upper water-space to that of the lower section, a passage from the steam-space of the lower section to that of the upper section, means affording a view of the flow of water between the sections, and a steam-gage arranged in operative relation to one of the sections.

12. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels and at an inclination to the horizontal, each section comprising cylindrical shells having outwardly-convexed ends, the adjacent ends of the shells perforated to form tube-sheets and connected by water-tubes, the upper shell being of sufficient interior length to accommodate the tubes, means for causing the water to flow through said tubes and the products of combustion to pass along and in contact with said tubes in opposite directions, an overflow-passage from the water-space of the upper section to that of the lower section, a passage from the steam-space of the lower section to that of the upper section, a water-gage arranged in operative relation to the lower section, and a steam-gage in communication with the steam-space of the lower section, the water-gage, sight-feed and steam-gage arranged contiguous to each other on the lower portion of the boiler-casing.

13. In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels, the sections having independent water and steam spaces and connected by separated supporting-necks, a water overflow from the upper section through one neck to the lower section, and a steam-passage through the other neck from the lower to the upper section.

14. In a sectional water-tube-shell boiler, a plurality of sections arranged at an incline one above the other and connected by hollow supporting-necks, each section having a wa-

ter and steam space, a water-overflow pipe from the lower portion of the upper section through one neck to the lower portion of the lower section, and a steam-passage through the other neck from the upper portion of the lower section to the upper portion of the upper section.

15 In a sectional water-tube-shell boiler, a plurality of sections arranged at different levels, each section consisting of cylindrical shells connected by tubes of a length less than the interior of one of the shells, hollow necks connecting the longer shell of one section with the longer shell of the other section, an overflow-passage from the water-

space of the upper section to that of the lower section through one neck and a steam-passage from the steam-space of the lower section to that of the upper section through the other neck, said passages being formed by pipes removably secured in the respective necks.

In testimony whereof I affix my signature to this specification in the presence of two witnesses.

JULIUS HERMAN MEISSNER.

Witnesses:

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M. C. MASSIE.