2 Sheets-Sheet 1.

A. B. Latta,

Sectional Steam Boiler.

No. 12,682. Patented Apr. 10, 1855.

Fig. 2.

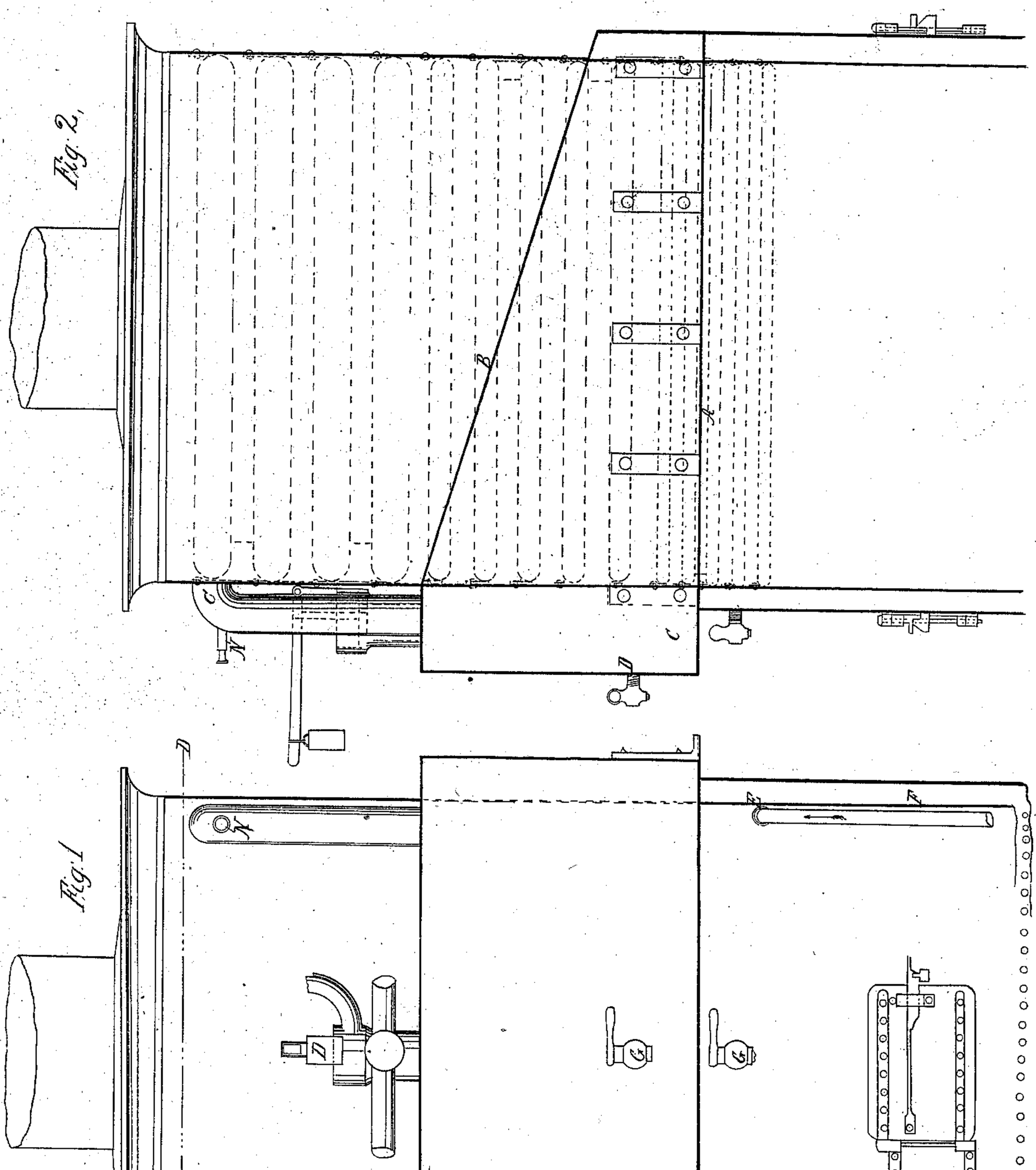
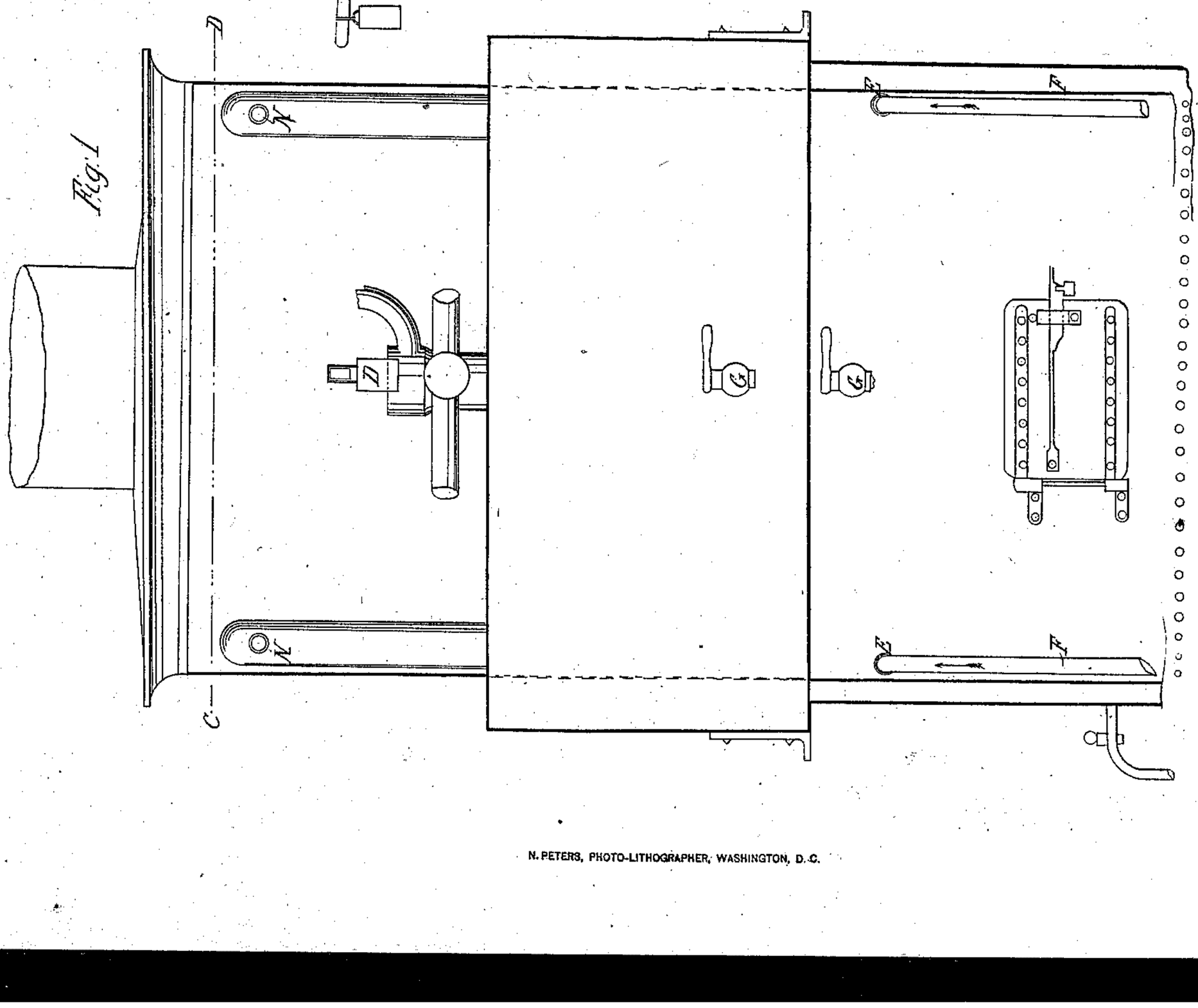


Fig. 1.



2 Sheets-Sheet 2.

A. B. Latta,

Sectional Steam Boiler.

No. 12,682. Patented Apr. 10, 1855.

Fig. 4.

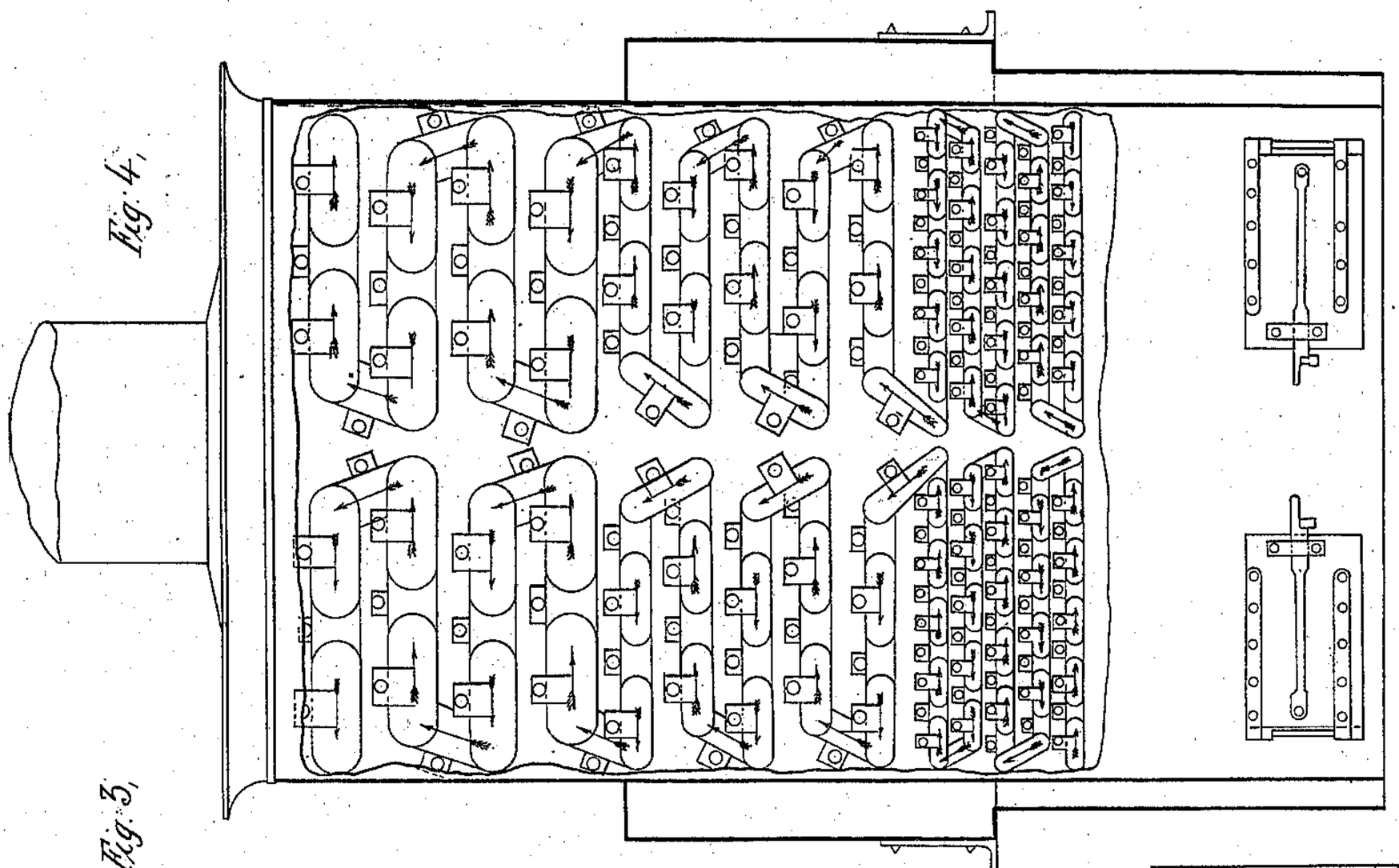


Fig. 3.

UNITED STATES PATENT OFFICE.

ALEXANDER B. LATTA, OF CINCINNATI, OHIO.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **12,682**, dated April 10, 1855.

To all whom it may concern:

Be it known that I, ALEXANDER B. LATTA, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement which I denominate an Instantaneous Tubular Steam-Generator, which is described as follows, reference being had to the annexed drawings of the same, making part of this specification.

Figure 3 is ground plan, A A A A representing the coil or continuous pipe, showing the manner in which it is formed. The U-bands or crooked pipes B B at each end are cast of malleable iron. The straight pipe is wrought-iron, similar to gas-tubes. It will be seen there is two separate coils in this plan. The ends C C turn down and connect immediately with the upper part of the water-jacket, which is the steam-chamber. P is the safety-valve. E is the box or water-jacket, which will be described hereinafter. F F are the lower ends of the coil coming through the water-jacket and connecting with the pumps of the pumping-engine G G, which are made in the form of a force-pump. These pumps receive their water from an open vessel H, which vessel is supplied with water from the reservoir for that purpose. The pipe and cock I, over the vessel, are used to regulate the quantity of water as it goes into the pumps. These pumps are worked by the oscillating cylinder J, which is geared to a large cog-wheel K, in which is inserted a wrist or crank pin L, which connects with the lever M, which passes through the pump's plunger, being attached to a stationary point below it and gives motion to said plungers or pistons of pumps G G, by which means said pumps are operated. The lever M is so arranged as to disconnect with the engine at pleasure, and to enable the engineer to work the pumps by hand, which object will hereinafter be described. No peculiar kind of pumping-engine is necessary to supply this boiler; but it is necessary to have the pumps so arranged as to take their water from an open vessel, so as to enable the engineer to see the water as it is going in. Any arrangement that would give motion to some mechanical device that would enable the engineer to determine the quantity as well as the fact that the water was going in would answer. Just where the coil turns into the water-jacket or steam-chamber there are gage-cocks N N inserted, by which the engineer ascertains whether or not the water is all converted into steam. These are located at the turn in the coil, so as to catch the water if any should pass. The U-bands B B have a projection on the top side, through which there is a bolt passed and screwed into the water-jacket. By this means the coil is secured in its place, each separately. This is important to secure the coil, so as not to allow it to move, at the same time to have such fastenings as will not burn off from excessive heat. The projection, being on the top side, is protected from the fire, and being cast to the bands it cannot get any hotter than the coil itself.

Fig. 4 represents a view of the back side of the boiler, showing the fire-box with the water-jacket broken off, so as the end of the coil may be seen, showing the ends of the U-bands as they are alternately connected. It will be seen that these coils are divided all the way up the center. This I sometimes do when there is a large quantity of steam to be generated in one boiler. It is done for the purpose of shortening the length of coil, which is desirable to such diversity of turns through which the steam has to pass, which makes the friction very great. These coils are increased inside as they ascend. This is nothing new, as it has been done before. Any of the usual modes of forming coils will answer a good purpose if combined with a water-jacket. In operating on this principle, as has been shown, I find the best way of forming coils is to commence with one coil in the bottom, and after ascending some little distance then divide into two, then ascend a little farther, and then subdivide into four, and so on, keep subdividing, using the same size of pipe all the way. The pipe should be no larger than will admit the quantity of water desired to be generated. By this means the coil at the bottom or nearest the fire is kept full of water. It will be seen by this dividing principle that the greatest increase of capacity, the shortest distance, the smallest pipe, and the least friction is arrived at. These are all very desirable in this kind of boilers; but not confining myself to any peculiar form of coil I proceed to describe the other parts of the boiler.

Fig. 2 is a side elevation of the external or water jacket. The recess at A is where it

rests on the frame-work. The sloping line B inside is where the outer sheet comes into the inner one, or where the steam-chamber stops. The inside sheet runs up to the top in the fire-engine. The weight is some object, for this reason: the steam-chamber is stopped before it reaches the top. The front side C is wider between from A up. This is done to make steam-room. The water in this water-jacket is carried up to the gage-cock D. This jacket is a part and portion of this boiler, as it generates steam to some extent, but it is not of any avail in the fire-engine until the engine has been working some little time. I therefore use sufficient coil to generate steam enough without relying on the water-jacket, because it is not available for the first twenty minutes. The water-jacket is stay-bolted in the usual way of securing flat surfaces.

Fig. 1 is a front view of water-jacket, external, showing the coil coming out at the top, turning down into steam-chamber. Near the top are the gage-cocks N N, of which has been spoken. In the center are the safety-valves D, out of which the steam escapes when an excess is generated. Down below the steam-chamber are two circles or holes. E E are two tubes sufficiently large to allow the coil F F to pass through the water-jacket, which tubes are made tight in and out, so as to allow the coil to pass through without having any connection with it. The smoke-pipe at the top is broken off, which is nearly a straight chimney. The round rods at the bottom represent grate-bars for the support of the fuel, which may be of any kind. It matters not what. This boiler operates without using the exhaust-steam. A draft is produced by placing the tubes sufficiently far apart to give the desired capacity to insure a draft, even in a short length of pipe or chimney, as is used in common locomotives.

For locomotives this boiler is better adapted than any known at present, and for land-carriages of every description. No man who has operated coiled boilers of any description has heretofore brought any of them into practical use. All of them have been deficient in some of the main features which are necessary to have a successful boiler. The English, who have had considerable experience with coiled boilers, seem to have been desirous of keeping the coil entirely full of water all the time. It is not possible, because the steam, as they state, generates behind the water and blows it out. This is the case, and it is impossible to operate a coil if it is full of water. Hence the necessity of having some means of regulating the water as it goes in, which means must be so arranged as to be under the control of the engineer; also, the gage-cocks N N at or near the top of the coil are to enable him to determine when a sufficient quantity is going in and when there is a deficiency. These gage-cocks at the top of the coil might be inserted in two or three places along up the coil at various points. The gage-cocks in the water-jackets G G might be used to determine when an excess is coming over by the water rising in it. It would be equivalent to using the gages in the coil itself, but not so certain or prompt. There have been some attempts to use a coil in a water-jacket by attaching the coil at the lower end and the upper end to attach to the steam-chamber. Supposing the water would supply the coil of its own gravity, this is absurd, because it requires double the pressure to pump water into the coil as the pressure in the steam-chamber or water-jacket. This renders it impossible to operate to any advantage in this way.

The mode of operation is as follows: In the fire-engine or locomotive that in the water-jacket should be up to the cocks in front. There should be no water in the coil. The furnace being full of dry kindlings, so that it will make a quick fire, the fire is then lighted. After two or three minutes the fire burns briskly, and the connection in the pump-lever is detached. The engineer then works the hand-pump by hand and injects water into the coil, which has by this time become hot enough to generate steam. As soon as sufficient steam has been generated to fill the steam-chambers the pumping-engine is then set to work and hand labor is no longer required. The engine is then ready for service. This only requires four or five minutes. It will be readily seen that it is necessary to have some arrangement to pump by hand in order to start the engine. If the coil were full of water, it would not generate steam enough to start the doctor or pumping-engine, because steam would be generated at the bottom, or nearest the fire, which would blow all the water above it out. Then the coil would burn before the engine could be started. It is absolutely necessary to have some means to start with. The reason for starting the fire-engine without any water in the coil is that it enables me to raise steam much sooner than it would if the coil was full of water. All the coil would have to be heated, which would take some time. In the locomotive-engine this instantaneous mode of raising steam, in cases of accident a dispatch would scarcely be read before the engine would be on her way to the scene of accident. It would certainly prevent long delays. Another feature in this boiler is that by running the water short any degree of elasticity can be given the steam without increasing the pressure; or, in other words, the steam will become surcharged with caloric. My experience shows that more economy can be had by this system of generating steam than any I have ever tried. The steam fire-engine has been in use one year and has proved itself beyond a doubt a new and useful result. The above describes the means by which it has been accomplished.

I wish it understood that it is not the intention to heat the coil red-hot and then inject water. I only allow the coil to get sufficiently hot to generate steam. This course is pursued because it saves time, which is an

object in the fire-engine. It is necessary to get to work as soon as possible. If any great quantity of water were to be heated to boiling-point, it would require some length of time to raise steam. It must be remembered in operating this boiler the engineer must not leave his engine while in operation, because in case of any failure in the doctor to pump the coil might burn if the fire should continue to burn any length of time without water.

This boiler does not carry any great quantity of water on hand. This renders it peculiarly adapted to steam fire-engines, locomotives, land-carriages, &c. The water in common boilers weighs as much and in some instances more than the boiler itself. This renders it difficult to carry any great amount of power in a land-carriage on the old plan, besides the water-level is difficult to keep right. In this boiler these difficulties are eradicated entirely. In many cases for stationary purposes it may be convenient to operate coils in this way without any water-jacket by simply building the coil in brick-work, forming a furnace below, and turning the draft into a stack or chimney. This would answer a good purpose for any kind of boiling where very hot steam is required, such as boiling sugar, &c.

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

1. Combining a steam generator or boiler consisting of a coil of tube with a furnace in such a manner that the flame or products of combustion shall come in immediate contact with said coil when this coil is combined with a feed apparatus and gages, which will enable the engineer to inspect constantly the supply of water, see that it is not interrupted, test its sufficiency, and regulate it at pleasure according to the varying demands of the boiler, or close the dampers if the feed should be interrupted, substantially as described.

2. While confining the admission of water to the receiving end of a coiled-tube boiler, limiting the quantity therein and the supply thereof to the quantity demanded for immediate conversion into steam for the purpose of avoiding the weight of a large quantity of water, producing steam promptly, saving fuel, and preventing the water from being thrown out of the tube by the steam formed in the lower part thereof, substantially as described.

3. Causing the discharging end of a coiled-tube generator to communicate with and discharge itself into the water-jacket, while all other communication of said coil with said water-jacket is avoided, as described.

A. B. LATTA.

Witnesses:
W. CHIDSEY,
JOS. SERODINO.