

No. 654,060.

Patented July 17, 1900.

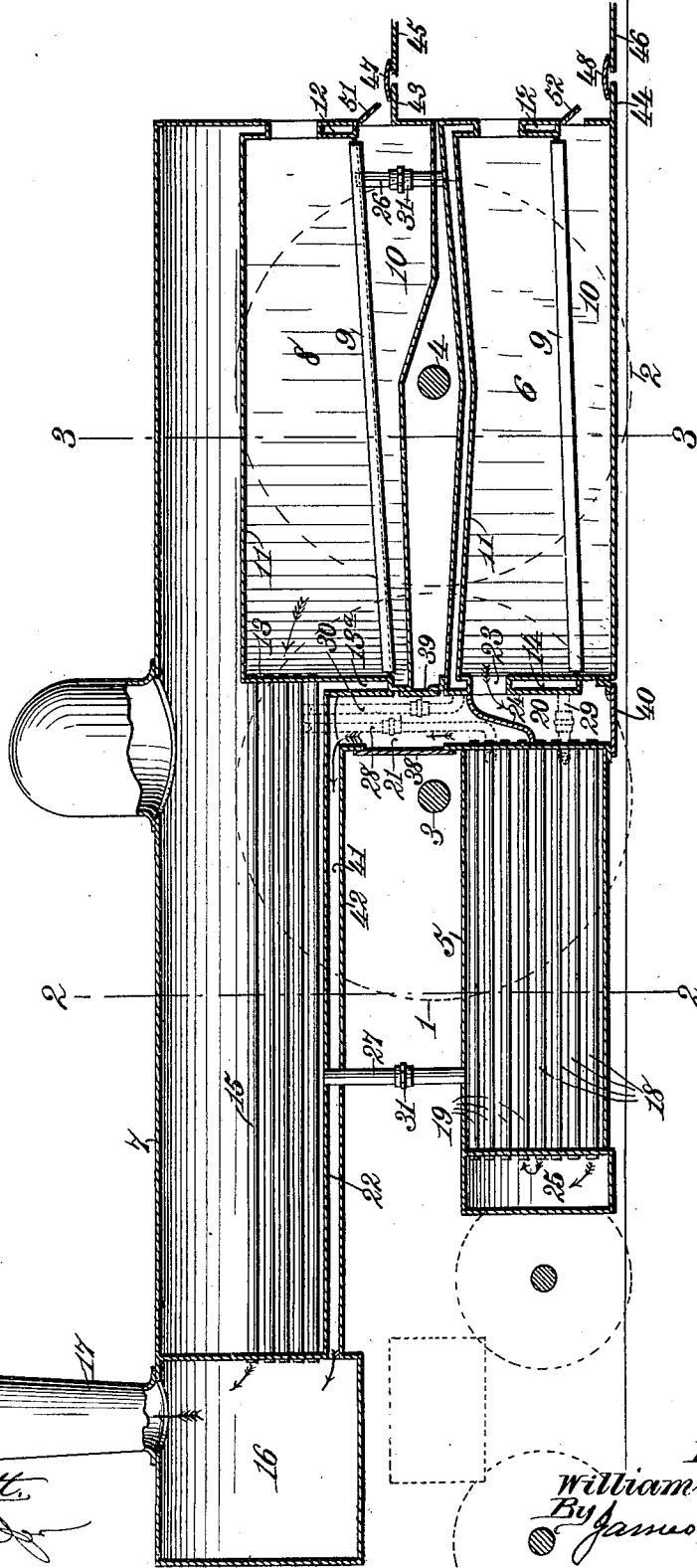
W. W. GREGG.  
LOCOMOTIVE.

(Application filed Nov. 24, 1899.)

(No Model.)

2 Sheets—Sheet 1.

*Fig. 1.*



Witnesses.  
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2 Sheets—Sheet 2.

Fig. 2.

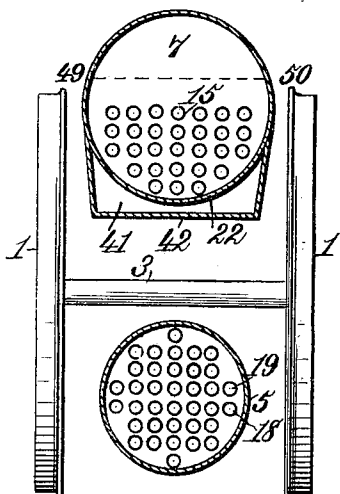


Fig. 3.

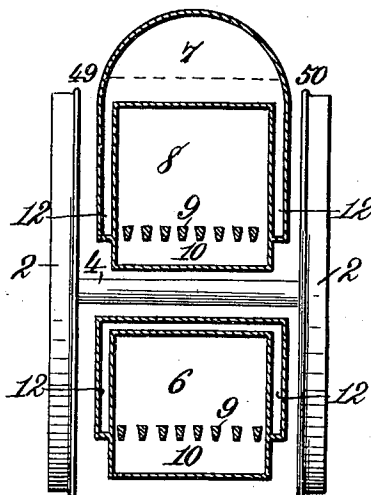
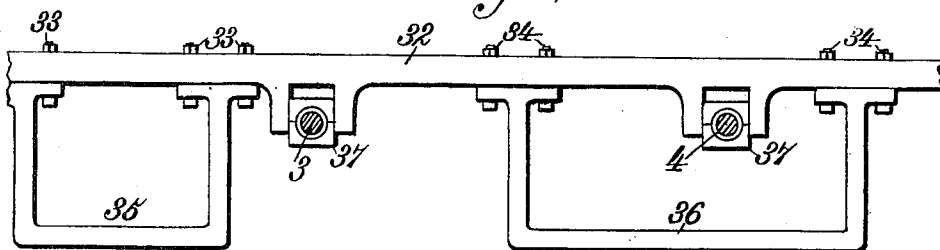


Fig. 4.



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# UNITED STATES PATENT OFFICE.

WILLIAM W. GREGG, OF ELMIRA, NEW YORK.

## LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 654,060, dated July 17, 1900.

Application filed November 24, 1899. Serial No. 738,206. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM W. GREGG, a citizen of the United States, residing at Elmira, in the county of Chemung and State of New York, have invented new and useful Improvements in Locomotives, of which the following is a specification.

This invention relates to locomotives, and has for its object to provide a locomotive with separate and distinct grates placed in whole or in part one above the other, said grates being arranged in separate fire-boxes and combined with two boilers also placed in whole or in part one above the other, the upper fire-box communicating with the upper boiler and the lower fire-box communicating with the lower boiler, the smoke and products of combustion after passing through the respective boilers escaping finally into a common chamber or smoke-box and from thence out through the smoke-stack.

It also has for its object to employ in connection with such an arrangement and combination of duplex boilers and fire-boxes two pairs of coupled driving-wheels of the well-known "American" type, said wheels being of very large diameter, the axle of the rear drivers being arranged between the upper and lower fire-boxes and the axle of the forward drivers being arranged between the upper and lower boilers, the lower boiler and lower fire-box being detachable from one another and separately removable from the upper boiler and upper fire-box and from the frame carrying said upper boiler and upper fire-box, thus permitting the front and rear drivers, with their axles, to be separately removed from the frame when the lower boiler and lower fire-box, respectively, are removed. By means of such an arrangement the lower boiler and lower fire-box may be separately removed for cleaning or repairs, each pair of drivers may be separately removed for repairs or returning, very large drivers may be employed, permitting high sustained speeds, the entire weight of the locomotive is carried on four drivers and a forward truck, the center of gravity is comparatively low, thus assuring safety, and, finally, very large total grate areas and heating-surfaces are obtained, giving great coal consumption and consequent power.

To these ends my invention consists in the features and in the arrangement and combination of parts hereinafter described, and particularly pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a longitudinal sectional view of a sufficient portion of a locomotive to illustrate my invention. Fig. 2 is a transverse sectional view on the line 2 2 of Fig. 1. Fig. 3 is a similar view on the line 3 3 of Fig. 1, and Fig. 4 is a detail view illustrating one means for detachably connecting the lower boiler and lower fire-box frames to the main locomotive-frame.

Referring to the drawings, the numerals 1 and 2 indicate, respectively, the front and rear driving-wheels, and 3 and 4 their axles, constructed in the usual manner, except that the drivers are made of much greater diameter than usual.

The numeral 5 indicates the lower boiler, and 6 the lower fire-box, while the numerals 7 and 8, respectively, indicate the upper boiler and upper fire-box. Both fire-boxes are made as long as practicable and as wide as the space between the opposite drivers will permit. As shown, the axle 3 of the forward drivers is arranged between the upper and lower boilers, and the axle 4 of the rear drivers is arranged between the upper and lower fire-boxes. Each fire-box as usual comprises a grate 9, below which is arranged an ash-pit 10, forming the bottom of the fire-box, a crown-sheet 11 forming the top, water-legs 12 forming the sides and rear end of the fire-box, and in the upper fire-box a flue-sheet 13 and a water-leg 13<sup>a</sup> and in the lower fire-box a water-leg 14, forming the front ends of the fire-boxes.

The upper boiler 7 is provided with a number of fire-tubes 15, which extend through the flue-sheet 13 at one end and into the smoke-box 16 at the other end, from which smoke-box leads the smoke-stack 17. As shown, the tubes 15 are arranged in the lower portion of the boiler 7. The heat, flames, and products of combustion pass from the fire-box 8 through the tubes 15 and out into the smoke-box 16.

The lower boiler 5 is provided with fire-

tubes 18 and 19, which are arranged in the boiler, from bottom to top thereof, and bolted or otherwise detachably fastened to the rear end of the boiler 5 and to the front end of the fire-box 6 is a combustion box or chamber 20, which at its upper end is bolted or otherwise detachably fastened to a smoke and heat flue or passage 21, said flue or passage at its upper end being bolted or otherwise detachably fastened to the front end of the upper fire-box 8 and to the outside sheathing 42 of the smoke and heat flue or passage 41, which passage 41 is formed by the shell 22 of the upper boiler 7 and by plates or a sheathing 42, attached to the lower portion of said upper boiler 7, said passage opening at its forward end, as shown, into the smoke-box 16. An outlet 23 is formed in the upper portion of the front end of the lower fire-box, and arranged in the combustion-chamber 20 in front of said outlet is a downwardly-inclined deflector 24, which at its lower end separates the lower tubes 18 from the upper tubes 19. The said deflector 24 is bolted or otherwise detachably fastened to the lower fire-box 6 and to the lower boiler 5. A smoke or combustion chamber 25 connects the forward ends of the tubes 18 and 19. The smoke, flames, and products of combustion pass from the fire-box 6 through the outlet 23 and are deflected downward by the deflector 24 into the tubes 18, through which they pass into the smoke or combustion chamber 25, and from the latter they return through the return-tubes 19 into the combustion-chamber 20 above the deflector 24, thence upward through the passage 21 alongside of the front end of the upper fire-box, thence into and through the passage 41, beneath the upper boiler 7 into the smoke-box 16, where they mingle with the smoke and gases from the upper boiler, and finally pass off through the smoke-stack 17. The water-legs on both sides of the upper and lower fire-boxes are connected by the pipe 26, while the water-spaces in the two boilers are in similar manner connected by the single pipe 27 and on both sides by the pipes 28. The water-leg 14 in the front end of the lower fire-box is connected on each side with the lower boiler by the pipe 29 and with the upper boiler by the pipe 30. By the arrangement of pipe connections referred to a free circulation of water and steam is maintained between the water-legs and water-spaces of the two fire-boxes, between the two boilers, between the lower boiler and the water-legs of the lower fire-box, and between the water-legs and water-spaces of the lower fire-box and the upper boiler. Each of the pipes referred to is made in sections detachably united by couplings 31 or by bolted connections of ordinary or any suitable construction, whereby the upper fire-box and upper boiler may be disconnected from the lower fire-box and lower boiler and the lower fire-box and lower boiler may be disconnected from one another

when it is desired to remove the lower fire-box and lower boiler or either of them.

The disposition, number, and size of the pipe connections referred to and as shown in Fig. 1 may be altered or changed as desired.

The upper boiler and upper fire-box may be attached to the locomotive-frame in the usual or in any suitable manner; but the lower boiler and the lower fire-box are removably attached to the frame in such manner as will permit of their being easily detached and removed, either both together or each separately by itself. In Fig. 4 I have illustrated one method of thus connecting the lower boiler and lower fire-box to the locomotive-frame, wherein the numeral 32 indicates the main portion of the frame to which the upper boiler and upper fire-box may be attached in the usual or in any suitable manner. To the under side of the main frame 32 are firmly but detachably bolted by bolts 33 and 34 pendent hangers 35 and 36, respectively, to which are securely fastened the lower boiler and lower fire-box. The axles 3 and 4 of the forward and rear drivers are removably fitted in axle boxes or bearings 37 beneath the main frame 32. To remove the lower boiler, the detachable plate 38, forming the front of the smoke flue or passage 21, is unbolted and removed, the side plates of said passage 21, which are similar to the plate 38 and are similarly arranged, but not shown, are unbolted and removed, the pipes 27 and 28 are uncoupled or unbolted, the deflector 24 is unfastened and removed, the pipe 29 is uncoupled, the detachable bottom 40 of the combustion-chamber 20 is unbolted from the lower boiler 5 and lower fire-box 6 and removed, the sides of said combustion-chamber 20, which are similar to the bottom 40 and are similarly arranged, but not shown, are unbolted and removed, and finally the bolts 33 are unbolted and withdrawn, thus entirely detaching and disconnecting the lower boiler and lower fire-box, all the detachments and removals necessary to the removal of the lower boiler, as just specified, excepting that of the pipes 27 and 28 and that of the bolts 33, are effected, and in addition thereto the pipes 30 and 26 are uncoupled or unbolted, the detachable plate 39 forming the back of the passage 21 is unbolted and removed, and, finally, the bolts 34 are unbolted and withdrawn, thus entirely detaching and disconnecting the lower fire-box. Each pipe before mentioned and shown in Fig. 1, excepting pipe 27, which is placed in the middle longitudinally of the upper and lower boilers, has a corresponding pipe (not shown) on the opposite side of the locomotive. When the lower boiler is detached and removed, the main drivers and axle may be removed from the frame in the usual manner and similarly the rear drivers and axle may be removed from the frame when the lower fire-box is detached and removed. Thus each pair of drivers and its

axle may be removed for repairs and for returning in order to correct irregularities incident to the usual wear of the faces of the wheels.

5 As shown, the bottoms of the smoke or combustion chambers 20 and 25 are depressed slightly below the bottom of the lower boiler 5 in order that the accumulation of cinders and sparks in said chambers may not block  
10 or clog the flues in the lower boiler. The bottom of the smoke-box 16 is also depressed below the passage 41 in order that the accumulation of cinders and sparks in the smoke-box may not block or clog said passage or the  
15 flues of the upper boiler 7.

The numerals 43 and 44 indicate projecting shelves or platforms which are attached to the upper and lower fire-boxes, respectively, while 45 and 46 indicate corresponding shelves  
20 or platforms projecting from the tender, which, together with the usual aprons 47 and 48, form platforms from which the fire-boxes are fired. The tender (not shown) is of the usual style, but modified sufficiently at its forward  
25 end to admit of the use of the aforesaid two separate platforms 45 and 46, one above the other, from which the fire-boxes 6 and 8 may be conveniently fired and attended to.

At the rear ends of the upper and lower  
30 ash-pits 10, which are otherwise inclosed, are openings for the admission of air from without to the under sides of the upper and lower grates 9, and in said openings are fitted doors  
35 51 and 52, which may be independently opened and closed and adjusted at any desired angle in order to regulate the admission of air to the fire-boxes. By such an arrangement of independent and adjustable  
40 draft-doors the drafts of the upper and lower fire-boxes may be so regulated that each will receive its proportionate amount of air for supporting the proper combustion of the fuel, and, further, whenever one furnace for any  
45 reason requires more than its normal share of the total draft such extra draft may be supplied by closing the draft-door of the other furnace, the draft-door of the furnace to be affected remaining open, thus causing practically the entire force of the partial vacuum  
50 created by the exhaust or blower to be applied to the furnace needing it. By means of such draft-doors the two furnaces are rendered practically independent of one another.

The water-line is denoted by the numerals  
55 49 and 50.

Having described my invention, what I claim is—

1. In a locomotive, the combination with  
60 two separate fire-boxes disposed one above the other, of two separate boilers also disposed one above the other, the upper fire-box communicating with the upper boiler and the lower fire-box with the lower boiler, substantially as described.

65 2. In a locomotive, the combination with two separate fire-boxes disposed one above the other, of two separate boilers also dis-

posed one above the other, the combustion-chambers of the fire-boxes having no communication one with the other, the upper fire-  
70 box communicating with the upper boiler and the lower fire-box with the lower boiler, and a smoke-chamber disposed at the forward end of the locomotive and arranged to receive the smoke and gases from the respective fire-  
75 boxes after they have passed through the boilers and before they enter the stack, substantially as described.

3. In a locomotive, the combination with two separate fire-boxes arranged one above  
80 the other, of two separate boilers also arranged one above the other, the upper fire-box communicating with the upper boiler and the lower fire-box with the lower boiler, said lower fire-box and boiler being removable,  
85 substantially as described.

4. In a locomotive, the combination with two separate fire-boxes arranged one above  
90 the other, of two separate boilers also arranged one above the other, the upper fire-box communicating with the upper boiler and the lower fire-box with the lower boiler, said lower fire-box and boiler being independently  
removable, substantially as described.

5. In a locomotive, the combination with  
95 two fire-boxes and two boilers respectively arranged one above the other, the upper fire-box communicating with the upper boiler and the lower fire-box with the lower boiler, of front and rear drivers the axles of which are  
100 respectively arranged between the boilers and fire-boxes, the lower boiler and fire-box being removable to permit the removal of the front and rear drivers and their axles, substantially  
105 as described.

6. In a locomotive, the combination with two fire-boxes and two boilers respectively ar-  
110 ranged one above the other, the upper fire-box communicating with the upper boiler and the lower fire-box with the lower boiler, the lower fire-box and boiler being removable, of pipe connections detachably connecting the water-spaces of the lower fire-box to the water-spaces of the upper fire-box and the lower  
115 boiler to the upper boiler, substantially as described.

7. In a locomotive, the combination with two fire-boxes and two boilers respectively ar-  
120 ranged one above the other, the upper fire-box communicating with the upper boiler and the lower fire-box with the lower boiler, the lower fire-box and boiler being removable, of pipe connections detachably connecting the water-spaces of the lower fire-box to the water-spaces of the upper fire-box and the lower  
125 boiler to the upper boiler, and the water-spaces of the lower fire-box to both boilers, substantially as described.

8. In a locomotive, the combination with two fire-boxes and two boilers respectively ar-  
130 ranged one above the other and the lower fire-box and boiler being removable, the upper boiler being provided with straightway tubes communicating directly with the upper fire-

box, and the lower boiler being provided with straightway and return tubes, of a detachable combustion-chamber interposed between the lower fire-box and boiler and communicating at its upper end with a detachable upwardly-extending flue, a smoke-box, a passage extending along the lower outside portion of the upper boiler and connecting said vertical flue and smoke-box, a detachable deflector disposed in the combustion-chamber and operating to direct the gases and products of combustion from the lower fire-box into the straightway tubes in the lower boiler, and a combustion-chamber connecting the straightway and return tubes in the lower boiler, substantially as described.

9. In a locomotive, the combination with two boilers and two fire-boxes respectively arranged one above the other, the lower fire-box and boiler being removable, of two platforms disposed one above the other at the rear of the fire-boxes, two corresponding fir-

ing-platforms disposed one above the other, and aprons connecting said platforms, substantially as described.

10. In a locomotive, the combination with two fire-boxes and two boilers respectively arranged one above the other and the lower fire-box and boiler being removable, of two separate inclosed ash-pits, one to each of said fire-boxes, each ash-pit being provided with a draft-door through which air is admitted to the fire-box, said draft-doors being independently adjustable at any desired angle so as to regulate the admission of air to said fire-boxes, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM W. GREGG.

Witnesses:

ROSCIUS MORSE, Jr.,  
J. H. BURGESS.