2 Sheets-Sheet 1.

G. E. Sellers,

Locomotive.

No. 7,498. Patented July 9, 1850.

Fig: 4.

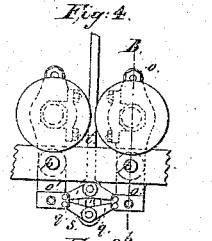
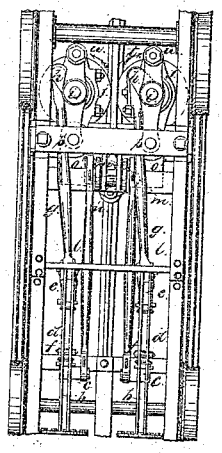


Fig: 3.



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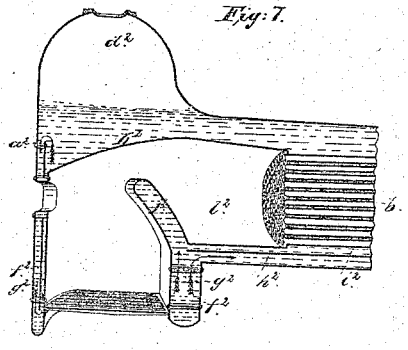
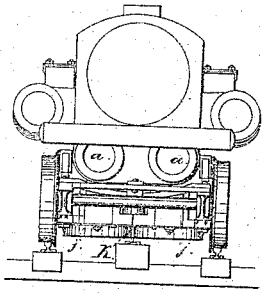


Fig: 2.



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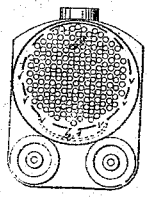
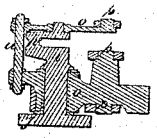


Fig: 1.

Fig: 5.



2 Sheets-Sheet 2.

G. E. Sellers,

Locomotive.

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Fig: 10.

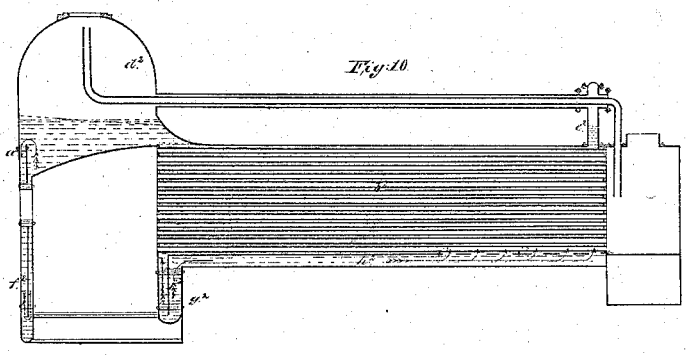


Fig: 6.

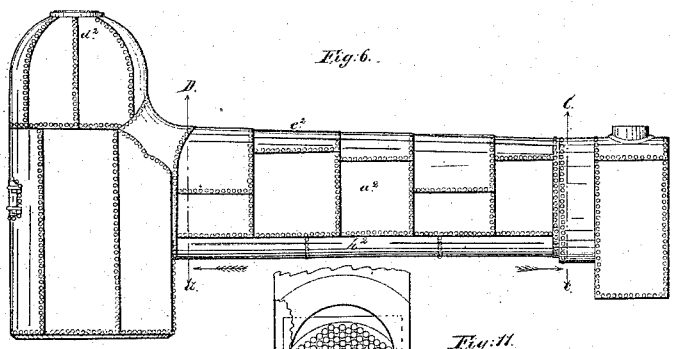


Fig: 11.

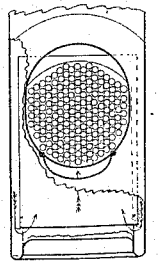
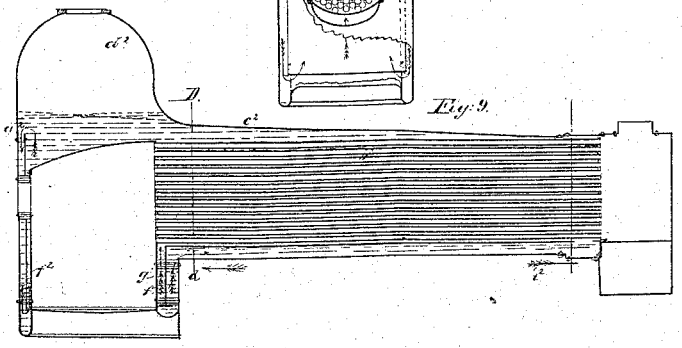


Fig: 9.



UNITED STATES PATENT OFFICE.

GEO. E. SELLERS, OF CINCINNATI, OHIO.

BOILER AND GEARING OF LOCOMOTIVE-ENGINES FOR WORKING HEAVY GRADES.

Specification of Letters Patent No. 7,498, dated July 9, 1850.

To all whom it may concern:

Be it known that I, GEORGE ESCOL SELLERS, of Cincinnati, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in Locomotive Steam-Engines and Boilers, and that the following is a full, clear, and exact description of the principle or character which distinguishes them from all other things before known and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1, is a side elevation of a locomotive on my improved plan; Fig. 2, an end view thereof; Fig. 3, a horizontal section taken at the line A, *a*, (Fig. 1); Fig. 4, a horizontal reversed section of the apparatus for gripping the central rail, and Fig. 5, a cross vertical section of the same taken at the line B, *b* (Fig. 4). Fig. 6, is a side elevation of my improved boiler separated from the engine; Fig. 7, a longitudinal vertical section of the same. Fig. 8, a cross vertical section taken at the line C, *c*, (of Fig. 6), and Figs. 9 and 10 longitudinal vertical sections of modifications of my improved boiler; Fig. 11, a cross vertical section taken at the line D, *d*, (of Figs. 6 and 9); with part of the rear plate of the fire box removed and looking in the direction of the arrow.

My improvements are especially applied to locomotives for running on heavy grades, but are also applicable to running on level roads. The first part of my invention relates to an improvement in locomotive steam engines secured to me by Letters Patent bearing date the 13th day of November, 1847, in which horizontal auxiliary driving wheels are used to grip the central rail for overcoming heavy grades, the grip of the said auxiliary wheels being affected by the draft of the train and when desired, aided by what I term a steam spring.

In my original invention the auxiliary driving wheels which are necessarily horizontal, are from the nature of the general arrangement placed at the back of the locomotive, and receive their motion from auxiliary engines through the intervention of cranks and bevel gear wheels.

My present invention consists in communicating motion from the auxiliary engines to the crank on the shafts of the auxiliary driving wheels by direct connections, such as connecting rods, when this is combined with a separate shaft on which are placed the eccentrics for operating the valve gear of the auxiliary engines, which shaft has cranks at right angles each connected with one of the auxiliary engines by a connecting rod to a cross-head at another part of the piston rod from that at which the connecting rods of the auxiliary driving wheels are attached. By these means the alternate action of the two engines on the auxiliary drivers is insured, and I am enabled to place these drivers in the middle of the locomotive, and to increase the length of the boiler, on an engine of the same length in the frame, and also to place the auxiliary cylinders below the boiler.

The second part of my invention relates to the boiler, mainly with the view to adapt it to the inclination of heavy grades, and also to the obtaining of a better circulation of the water, and a more perfect combustion with the view to economize fuel. In order to place the auxiliary driving wheels with their engines, etc., beneath the boiler and in front of the fire box, an increased length of boiler is required, which would present a serious objection unless some means are used to prevent the forward ends of the flues, or the top of the fire-box from becoming uncovered as the engine is ascending or descending a heavy grade, since it is evident that in a boiler constructed in the usual way the flue-tubes occupying a portion only of the cylindric horizontal part, and the water level being but a few inches above the tops of the flues or fire box no very great inclination of the boiler would be required to lower the water at either end to an extent sufficient to expose the tops of the flues at the forward end, or of the fire-box at the tinder end. If now the water in the boiler be made to occupy the whole of the cylindric horizontal portion of the boiler, and the dome part to such an extent or height as shall exceed the greatest elevation to which the top of the forward end of the boiler will be raised in ascending a grade; it is evident, that the variation of the water-level in ascending or descending will be confined to the longitudinal diameter of the dome, instead of extending throughout the entire length of the boiler. I therefore intend to occupy the whole of the cylindric portion of my boiler with flues arranged after the most approved method extending the fire box up-

ward within the dome part nearly as high as the top of the cylindric part, thus giving an increased fire surface both in the fire box and in the flues. The steam-chamber being thus confined to the dome will require an increase in its dimensions in order to make it of sufficient capacity.

In order to convey the steam generated in the forward end of the boiler during the ascent of a grade, into the dome, I make the top of the cylindric part sloping or inclined throughout its length at an angle exceeding that of the greatest ascent to be overcome, for, if it were made parallel with the frame of the engine the evolved steam would occupy the forward end forcing the water back into the dome, and leaving the flues unprotected.

In order to regulate the circulation of the currents of water in the boiler so as to expedite the absorption of the heat generated in the furnace, the well known circulating plates are placed in the water space around the furnace, so as to separate the upward and downward currents. These plates extend down as low as the bottom of the fire grate; the boiler itself extending some distance below thus forming a water passage or basin around the grate, and below the fire. I also make a water passage or channel under the cylindric part or body of the boiler, opening at one end into the water space at the back of the furnace, and at the other end communicating with the water in the forward end of the boiler through openings i^2 i^2, Fig. 10, made through the plate and between the shell and series of tubes at and near its forward end. The natural tendency of the water in becoming heated is to rise to the top of the boiler, and thence along to the steam dome or chamber, and this current so produced must be supplied. To prevent conflicting currents I draw this fresh supply from the water space below the fire grate along the channel under the body of the boiler.

The accompanying drawings represent a locomotive steam engine and boiler of the usual construction with my improvements added thereto.

The usual driving wheels are operated on in the usual manner, and as this makes no part of my invention the connections are not represented as they would conceal the parts which I wish most particularly to describe.

The auxiliary steam engines (a a) are placed under the smoke box instead of on the side as in my original patent and are horizontal. The piston rods (b b) from these two cylinders each take hold of a cross-head (c) so that each piston (b) carries two cross-heads, that by their connection slide together in appropriate guides, (f f). To the cross heads (c c) are joined a connecting rod (g g) which takes hold of the crank-wrists (h h) and as the two driving wheels grip a central rail (k) when the auxiliary engines receive steam, they rotate the auxiliary driving wheels by these connections and thus impel the locomotive. But as stated before it is highly important for the proper action of the engines that the cranks of the auxiliary driving wheels should work at right angles with each other that the strokes of the two engines may alternate.

For this purpose the connecting rods (l l) are joined each to one of the cross-heads (c) and also to a crank (m, m) on the ends of a horizontal shaft (n) from which motion is taken in the usual way for operating the valve gear of the two auxiliary engines, and as the two cranks (m, m,) are at right angles and on one shaft, it is evident that the two engines must alternate, and thus give an approximate regular motion to the locomotive.

The auxiliary driving wheels are placed nearly in a line with the main driving wheels, and therefore at that part of the locomotive where they will be least exposed to vibration in passing around curves, but still provision must be made for a slight vibration, and this is obtained in the following manner:

The axles (i, i,) of the auxiliary driving wheels have their bearings each in two levers (o o') that are connected with the frame by journals (p p p) so that there are two sets of these levers, one for each axle, that each set may vibrate independently of the other, or both together.

The two bottom levers (o') of the two sets of levers extend forward of the journals on which they vibrate and are there connected by means of two reversed toggle joint levers (q q) the central joint pins (r r) of which are embraced by an elongated hole or slot (s) in the end of a connecting rod (t) which passes through to the end of the locomotive carriage to form the connection to the tender or train of cars to be drawn or pushed by the locomotive. From this it follows that when the locomotive moves forward the forward end of the slot, or elongated hole (s) in the connecting rod (t) will draw on the pin (r) of the toggle-joint (q') by the force required to draw the train, and this force will cause the auxiliary drivers to grip the rail (k) to give the required traction, and when the locomotive backs the rear end of the said slot will act on the pin (r) of the other toggle (q) and produce a like result, and as the two sets of levers (o o') are connected together by the two toggles they will at the same time vibrate with the two auxiliary drivers to follow the curves and other lateral motion of the locomotive.

To insure the parallelism of the two levers (o o') forming each set they are at their

rear ends firmly bound together by rods (u, u,) or in any other appropriate manner.

The boiler (a^2) is in its general construction similar to the ordinary locomotive boiler but I extend the series or strata of flue tubes (b^2) upward near to the top thereof, and the outside shell at the top (c^2) is made with an inclination upward toward the dome (d^2) so that as the forward end of the boiler is elevated in ascending a heavy grade the steam generated in the forward part of the boiler finds its way to the dome as the water should always be kept above the level of the flue tubes.

The waterways (f^2) with the circulating plates (g^2) are connected with a water channel (h^2) at the bottom of the boiler and running to the forward end thereof so that the water which rises in the water-ways passes into this channel, and is conducted to the forward end of the boiler where it is admitted into the boiler through apertures made for that purpose. If it be desired, instead of confining this current to the lower part of the boiler, an eccentric channel as represented in Fig. 8 will serve to distribute it around the series of tubes, and it may be admitted into the boiler at any desired points by orifices cut through the plate between the shell and series of tubes as shown at v, v, v, v.

In this way a circulation of the water between the water-ways which surround the fire-chamber, and that part of the boiler the most distant from the first chamber is established which will promote the evaporation and tend therefore to economize fuel. Instead of discharging the products of combustion directly into the flue-tubes as heretofore I make a hollow fire bridge (j^2) which is a continuation of the waterways at the back of the fire-chamber so that the water shall circulate through it to prevent it from burning out. This I prefer to bend forward so that it shall contract the upper part of the fire-chamber, and it is extended up so near the roof (k^2) of the fire chamber as to form a throat for the passage of the gaseous products of combustion which so soon as they pass the bridge expand in a chamber (l^2) back of the bridge and between it and the ends of the flue tubes (b^2),

This contraction and subsequent expansion of the gaseous products of combustion effects a thorough commingling of them with the supporters of combustion and thus promotes the combustion of the combustible gases.

It will be obvious from the foregoing that the water channel at the bottom of the boiler may be variously constructed, that is, it may be within the shell of the boiler or it may be a tube outside, but the mode of construction represented in the drawings will be found the most advantageous.

The various parts of my invention may be employed separately; as, for instance, the mode of establishing a connection between the dome and the forward part of the boiler may be employed without the other improvements, and so of the mode of establishing a circulation of the water, or of the fire bridge and expansion chamber back of it; but when all my improvements are combined the best results will be attained.

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

1. The method substantially as herein described of operating the two horizontal auxiliary driving wheels of locomotive steam engines by connections with the auxiliary engines when this is combined with the connection of the piston rods of the two auxiliary engines with a crank shaft having the cranks thereon at right angles substantially as described whereby the engines are made to alternate in their action as specified.

2. I also claim the method substantially as described of establishing a connection between the dome and the forward end of the boiler, when this is combined with the extending of the flue tubes to the top of the boiler as described whereby the boiler is adapted to heavy grades as described.

3. I also claim in combination with the water ways surrounding the fire chamber, the water channel at the bottom of the boiler, as described, whereby a circulation of the water is established between the two ends of the boiler.

GEO. ESCOL SELLERS.

Witnesses:
JOHN L. WHETSTONE.
S. P. BISHOP.