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S. H. Long,

Locomotive.

Patented Dec. 28, 1832.

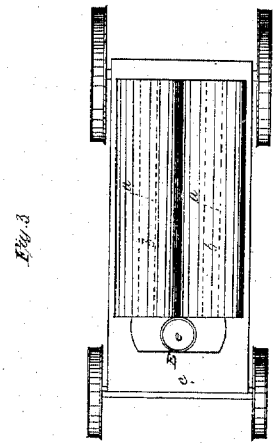


Fig. 3

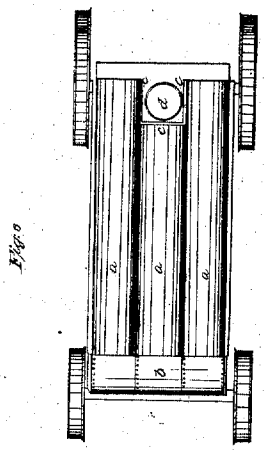


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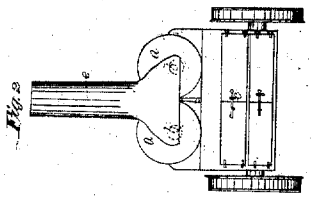


Fig. 2

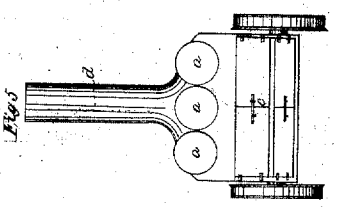


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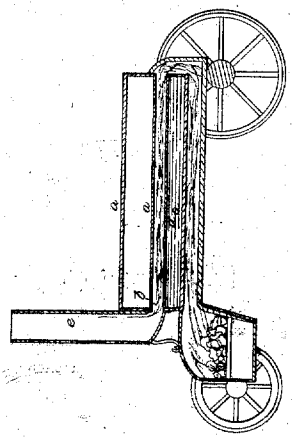


Fig. 1

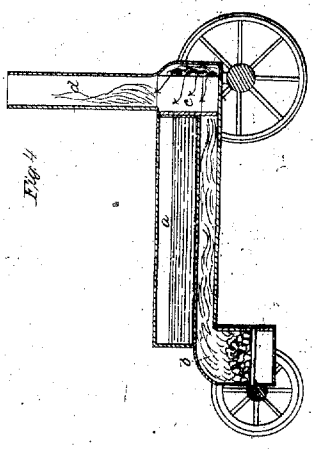
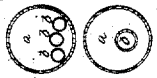


Fig. 4



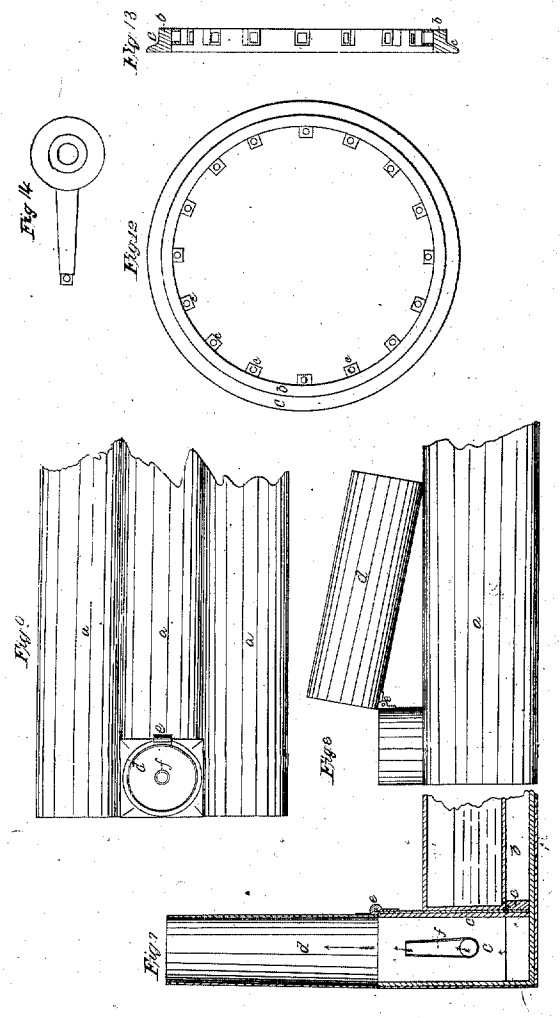
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Fig. 11

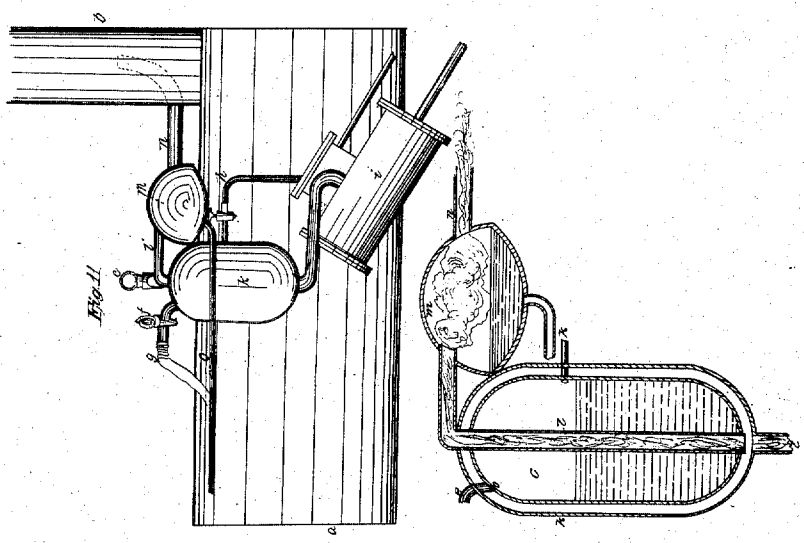
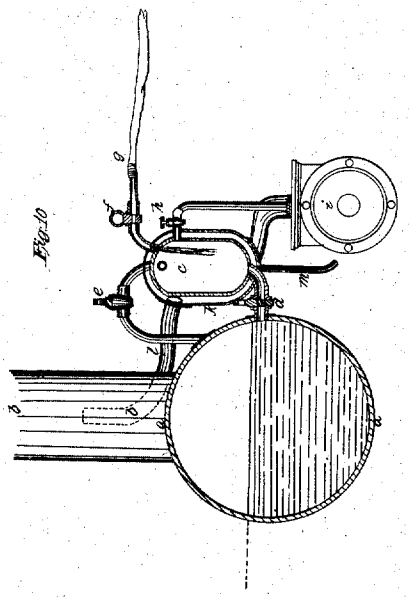


Fig. 10



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Dec 28, 1832

Stephen H. Long

Letters Patent

The Schedule referred to in these Letters Patent, and making part of the same containing a description in the words of the said S. H. Long himself of his improvement in the Locomotive Steam Engine and other Rail Road Carriages

The application and use of two parallel cylindrical boilers placed horizontally on the carriage and lengthwise thereof with one or more horizontal flues passing longitudinally through each boiler in the lower half thereof which flues must be of a size sufficient to convey the heated air, flame &c from the fire place to the chimney both of which, in this case, are situated at the same end of the boilers

The fire place is placed beneath the boilers and has its sides and front formed of sheet iron suitably lined or plated with fire brick or clay, and its rear side above a bridging of brick or such stone and opens into a broad flue of the entire width of both boilers, the sides bottom and back ends of which are constructed of sheet iron suitably braced and appropriately lined or bolted with fire brick or clay. The boilers themselves constitute the roof or upper side, not only of this broad flue but also of the fire place at the back end of the boilers: the broad flue communicates with the flues leading through the boilers. This mode of construction is believed to be entirely new in its application to Locomotive Steam Engines

In this item I claim the application of two horizontal cylindrical boilers with two or more flues in each passing longitudinally through them the fire place being exterior of the boilers & beneath them a single boiler of similar construction having five cylinders has been employed by Other Persons in the construction of a locomotive Engine and by others for other purposes

II. The application and use of two parallel cylindrical boilers placed horizontally on the carriage and lengthwise thereof with or

without flues leading through them. The latter mode being preferred when the diameter of each boiler does not exceed fifteen inches. The fire place in this case also is located at one end of the boilers & occupies a width equal severally to that of the three together. The front and ends of the fire place are formed of sheet iron appropriately braced and stiffened and lined with fire Brick or Clay as before. In rear of the fire place is a bridging of brick or Soap Stone as before mentioned above which the fire place communicates with a broad flue of appropriate depth & of a width equal to that of the fire place or to the entire width occupied by the three boilers. The sides bottom and rear of this flue are constructed of sheet iron or Copper and appropriately lined with fire brick or clay. Its roof is formed of the three boilers which have their entire under surface or those portions of their entire surface situated below a horizontal plane passing through their centres exposed to the action of the heat generated in the fire place.

The middle boiler of the three is shorter by about one foot than either of the outside boilers in order to afford a communication from the broad flue into the Chimney which rises perpendicularly from the back or rear end of the middle boiler & between the other two boilers.

A direct passage from the flue into the Chimney is intercepted by a tile of fire clay or slab of Soap Stone which compels the heated air to pass round the extremities of the tile and immediately under the back ends of the exterior boilers before it can enter the Chimney which rises immediately back of the tile. For many particulars in regard to the relative dimensions of the parts and the best mode of constructing furnaces for Steam Engines I am indebted to the liberality and intelligence of James Neal Esquire of Philadelphia. but their application and use in the construction of Locomotive Engines. I claim for myself as new and useful. In this View I claim the application of three horizontal cylindrical boilers (with or without flues leading through them) The fire place being exterior of the boilers and beneath them. Similar boilers having been previously employed by myself &

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and others for other purposes. I also claim the manner of construction specified in the item - although as I have shown I am indebted to Mr Rivet for much useful information which enabled me to regulate the dimensions of the various parts as exhibited in the Pennsylvania Locomotive

III Another mode of constructing a portable or movable chimney & its application to Locomotive Steam Engines which is as follows viz. The Chimney rises in a square form through the space provided for it as stated in the preceding item of this supplement to the height of two or three feet above the upper edge of the tube or steam chamber - last before mentioned. This portion of the chimney is sufficiently large to receive a lining or casing of fire clay to protect it against the heat and serves as a pedestal or basement for the portable or movable part of the chimney - which is round and is connected with the pedestal by means of a hinge or joint on which this part of the chimney traverses in such a manner as to admit of it being laid horizontally upon the carriage or erected perpendicularly as occasion may require in passing under Bridges through tunnels &c

Note - The waste steam of the working cylinders is conveyed by a tube or pipe into the basement of the chimney into which it is injected perpendicularly from the tube in order to increase or accelerate the draft through the fire place flue and chimney

I claim in this item the application of a portable or movable chimney differing from that described in the 4th item of my specification of June 1831. in having but a single oscillating joint instead of two lateral swivel joints as specified in that instrument

IV. 4th. An apparatus intended as a substitute for the force pumps of ordinary Engines and for the purpose of supplying the boilers of locomotive & other Steam Engines with water. which apparatus I shall designate by the appellation of the fire pump inasmuch as it is calculated to perform the functions of a supply pump without the aid of any external force except in such as it may be necessary in the starting of it. - The fire pump consists of a hollow cylinder capped at both ends and made steam tight. to be located

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in such a position that the lowest part of its cavity shall be elevated at least as high as the upper surface or greatest height of the water in the boiler to which the pump is attached. The lowest part of the pump or cylinder must communicate with the boiler at a point or points below their water surface by means of a pipe or tube of suitable size furnished with a stop cock or valve denominated the supply cock which may be opened or shut at pleasure. The uppermost part of the pump or cylinder must also communicate with the boiler at a point above their water surface by means of a tube or pipe (which may be considerably smaller than the former) furnished with a cock or valve to be called the steam cock by means of which tube and cock steam from the boiler may be conveyed into the pump at pleasure. The pump must also communicate with the water cock tank or reservoir by means of a tube pipe or hose furnished in like manner with a stop cock or valve to be called the draft cock for the purpose of opening & shutting this communication at pleasure. Moreover a small cock or valve to be called the ejection cock must be applied to the pump in some convenient position for the purpose of discharging the steam from the pump whenever there is occasion to replenish it with water. The steam thus discharged may be conveyed through a pipe to the steam chest attached to the working cylinders, and instead of being wasted may be made to contribute to the operation of the engine. The operation of the force pump is as follows viz. Let the supply cock and steam cock be shut, open the ejection cock and also the draft cock and the water will freely flow from the Reservoir (which is supposed to be higher than the Pump) into the pump. When the Pump is full of water or sufficiently so, shut the ejection and draft cocks and then open the steam cock and afterwards the supply cock and the water will flow freely from the Pump into the boiler through the supply tube its place in the pump being occupied by steam from the boiler. The operation may

be repeated at pleasure by shutting again the cocks last mentioned and opening the others — The principle on which this pump (generally) was verbally explained to me by Charles Wetherill Esqr. of Philadelphia early in the summer of 1831. The manner of construction and its application to Steam Engines and especially its use in locomotive Steam Engines I claim as new and original with myself — The feed pump may be surrounded by a casing in a cylindrical form and of such size as to admit a space of one inch or more between the casing and the pump on all sides — Into this space the waste steam from the working cylinders of the Engine may be conveyed and from which it may also be conducted into the chimney by means of suitable tubes or pipes communicating between these several parts — The water in the pump may thus be heated by the waste steam and better prepared for injection into the boilers. while the water formed in the casing from the condensation of steam may readily be conveyed to the reservoir in the manner herein after explained. In this item I claim as new and original not only the invention of the feed pump as described in this item. but also its application and use in Steam Engines generally and in connection with Steam generators as a means of supplying them with water, especially its application to locomotive Steam Engines.

V. 5th To enable to dispense with the bell cranks and other appendages necessary to their use. I have substituted a compound axle in three parts with cranks and other appropriate fixtures in connection with the working wheels of the locomotive. This arrangement is effected in part by adopting in place, wheels of different diameters and by providing suitable bearings for the support of the carriage bed, boilers, cylinders &c both exteriorly and interiorly of the wheels, the working wheels being about 4½ feet and the others about 3 feet in diameter working respectively upon to and with curvatures on a radius of 400 feet. The arrangement here alluded

to together with the leading improvements contemplated in this specification are mostly to be exemplified in the model deposited in the Patent Office —

VI. 6th. A method of heating the water within the force Pumps by means of the waste Steam and of preventing for ever the Water thus condensed from rising by intercepting its discharge and its passage from the force Pumps into the Chimney in the manner thus

This method consists in the injection of the waste Steam first into the casing by which the Pumps & Barrels are surrounded and by which a part of the Steam is applied to the upper part or side of the casing into which Steam the Steam enters through a tube rising from the lower part of the Barrels of the casing passing inwardly through the force Pumps and perforating nearly to the top of the Steam and Water within the Chimney or open air through a tube passing out of the Steam at a point about midway between its top and bottom — The Water that may have been formed by Condensation and collected in the lower part of the casing will thus be carried upward by the Steam through the vertical tube ending in the Pumps and be deposited in the Steam. Where it will be conveyed through a tube leading from the bottom of the Steam and Water into the reservoir for future use

VII. 7th. A further method of constructing wheels for Locomotive Engines and other rail way Carriages differing from that described in the first item of my Specification of June 1831. in the following particulars viz — The iron together with its flanges is cast especially from the hub and spokes and is furnished with machinery adapted to the reception of the outward extremities of the spokes and when the latter are inserted and held fast by means of dovetails or clamps embracing the ends of the spokes and confining them to the inward flanges of the iron — The spokes have a taper form diminishing towards as they recede from the hub. In all other respects the spokes and hub may be similar to those of the wheel described in my Specification of June 1831. before alluded to — The mode

of constructing Wheels for Rail Road Cars is believed to be entirely new and will be accomplished in the model intended as an illustration of these improvements.

Among the benefits resulting from this improvement are the following namely — The unyielding parts about the Nave may be made of such iron as is best calculated to facilitate the construction of the wheel without impairing its strength or durability. for example the nave may be made of fine hard metal while the spokes & Felloe which require much dressing in order to their proper adjustment may be made of iron much softer and more susceptible of being wrought with ease and dispatch. The nave may be case hardened or cast in a chill without producing an injurious strain upon the spokes & felloe of the wheel thereby impairing its efficient strength — When Naves shall have been worn out they may effectually & cheaply be renovated by cylindrizing a new iron in connection with the old spokes and felloe which from the nature of the service they have to perform are far less exposed to wear than the nave. By this means the renewing of the Wheels of Rail Road Carriages may be effected at a comparatively moderate expense.

VIII. 8th. The successful application and use of Anthracite coal as fuel for the generation of steam for the propulsion of Locomotive Engines and their trains of loaded cars continuously for more than one hour at a speed of ten or more miles per hour the weight of the entire train and load being equivalent to twenty tons the weight of the Engine and the rail road being level or at a less ascent the weight of the load being proportionably increased

Witness
E. S. G. Bowne
John Lines

Thos. H. Long

E.
Cl

2750 words