7372X

3 Sheets-Sheet 1.

S. H. Long,

Locomotive.

Patented Jan. 17, 1833.

Fig. 3.

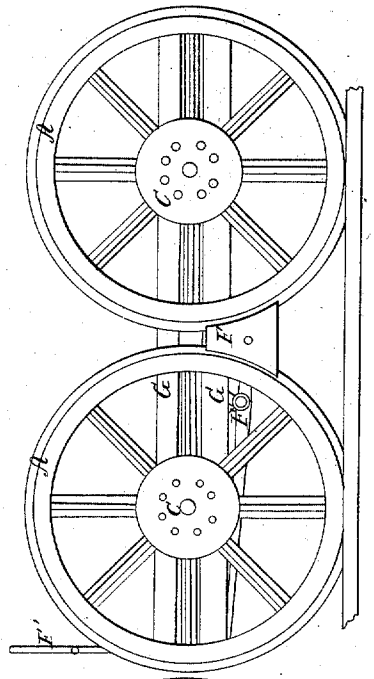


Fig. 2.

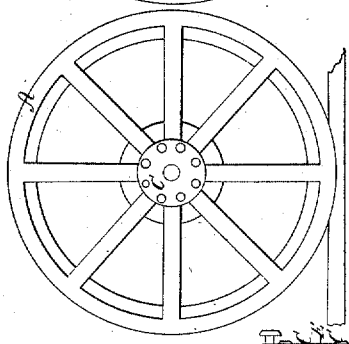
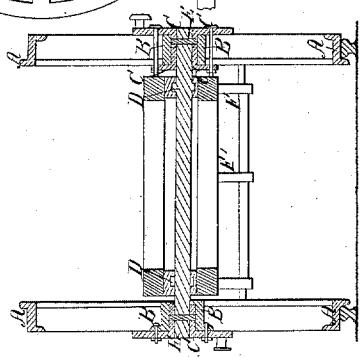


Fig. 1.



AM. PHOTO-LITHO. CO. N.Y. (OSBORNE'S PROCESS.)

3 Sheets-Sheet 2.

7372X

S. H. Long,

Locomotive.

Patented Jan. 17, 1833.

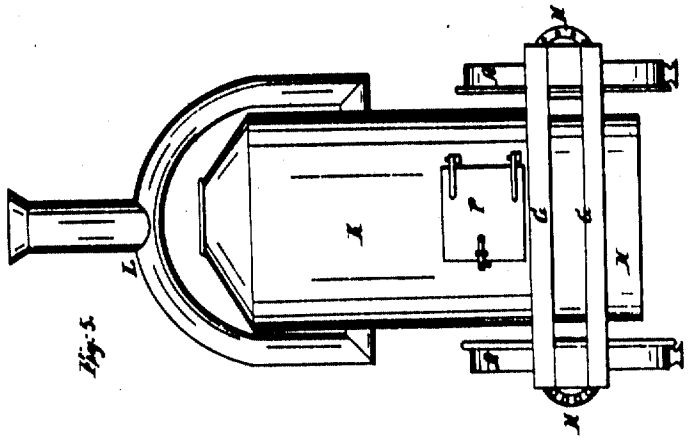


Fig. 5.

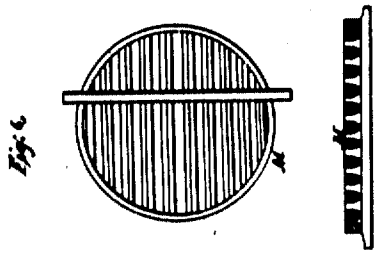


Fig. 6.

Fig. 4.

A.M. PHOTO-LITHO. CO. N.Y. (ORIGINAL PROCESS)

No Printed Specification Available

7372X

3 Sheets-Sheet 3.

S. H. Long,

Locomotive.

Patented Jan. 17, 1833.

Fig. 8.

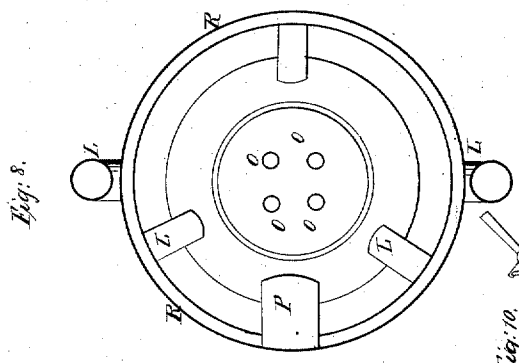


Fig. 10.

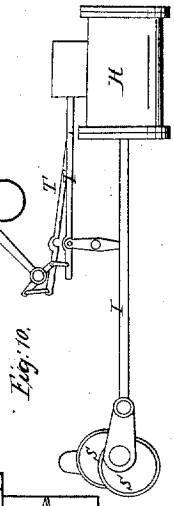


Fig. 7.

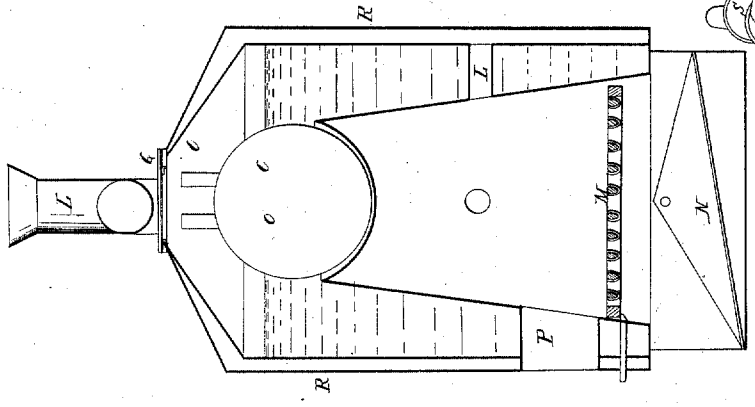
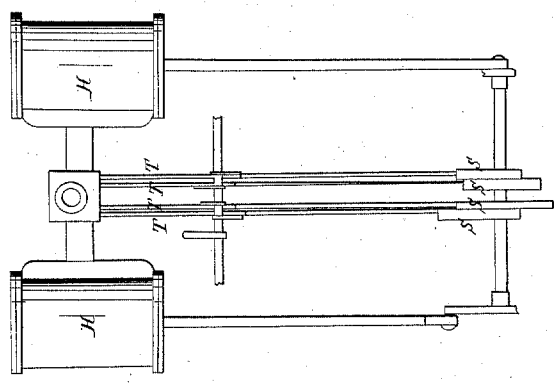


Fig. 9.



AM. PHOTO-LITHO. CO. N.Y. (OSBORNE'S PROCESS)

Ar. 12

Jan 17 1833

291

7372X

S. A. 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. A. Long himself of his improvement in the Locomotive Steam Engine & other Rail Road Carriages

The improvements here contemplated have for their object greater economy and efficiency in the construction and use of Rail Road Carriages generally and especially of Carriages propelled by Steam on Rail Roads greater simplicity & certainty in the conformation & arrangement of this moving power & more direct & effective application of such Steam power than has hitherto been attained in the construction of Machinery for similar purposes

These improvements consist in the invention of new Machinery and parts of Machinery never before used in any way known to the applicant of new modifications of machinery and parts of machinery before known but now for the first time introduced in the construction of Rail Road Carriages and Locomotive Steam Engines and a combination of machinery & parts of machinery whether before known or unknown here never before used combinedly in Rail Road Carriages or Locomotive Steam Engines All which improvements are designated in this instrument in describing the "Improved Locomotive" a name adopted to designate the whole invention modification and combination

What I claim as my improvement & desire particularly & specifically to have secured to me by these Letters Patent is the Machinery as used — The Pennsylvania Locomotive as described in the following order viz. First the Wheels are constructed of cast iron in a manner of any convenient dimensions and containing such number of spokes as may be deemed desirable — The rim of the wheel is furnished with

7372X

two flanges viz. one as usual projecting outward from the head or bearing surface of the Wheel and serving as a guide to keep the wheel upon the axle & the other believed to be new as respects all carriage Wheels projecting inward on the opposite side of the nave & from its [illegible] and serving as a guide to the [illegible] of the nave & at the same time to the spokes with both of which it is mortised — The hub of the wheel is of a tubular form of nearly the same thickness through as may be & that thickness being the same as nearly as may be with that of the other parts of the Wheel. The equality and correspondence in which respect is believed also to be new as respects all carriage Wheels and of a diameter large enough to receive boxes for the reception of the axles — The hub may be furnished with one or more flanges as may be deemed advisable viz. with one flange projecting inward from its tubular periphery on the outside of the hub — And with another projecting outward and inward on the inside of the Wheel. The combination of these flanges is believed by the applicant to be new.

In case of the hub being constructed without flanges two boxes will be required for each hub viz a box entering the hub on the outside and a similar box entering it from the inside of the Wheel. Both of which boxes are to be furnished with flanges projecting beyond the exterior periphery of the hub & serving for the reception of screw bolts which pass between the spokes of the Wheel and firmly connect the flanges together. This application of flanges to Boxes of carriage Wheels is believed by the applicant to be entirely new — In case the hub is furnished with flanges the size of the former may be enlarged at pleasure. Both flanges must be perforated for the reception of a box entering from the outside of the Wheel and penetrating thro' the interior flange which last in its projection beyond the periphery of the hub will serve for the reception of screw bolts which in this modification will firmly connect the flange of the box to the flange of the hub — In this case the flange of the

box may be extended in a manner to subserve the purposes of a coank which application of it, if made will as the applicant believes be entirely new — Flanges as difference may be added to the spokes if required. This mode of constructing wheels for Rail Road Cars is such that a degree of uniformity in the thickness of every part of the wheel may be successfully maintained — whereby the strains or stress usually left upon wheels either in the unequal crystalization and cooling of the metal or in the ordinary mode of binding & wedging of the hubs when cast in segments may be readily obviated without impairing the strength of the wheel or rendering its construction more expensive — Second the axles and their adjustments are of a character differing from those of ordinary Rail Road Cars, and are believed to be new as regards Carriages & machinery in the following particulars

The axles are of a uniform size or nearly so throughout their entire length. no journals necks or shoulders or other irregularities being necessary in this construction. They are form by connecting to the wheels by means of linch pins of a suitable size passing thro' their extremities and thro' those parts of the wood or boxes that are inserted within the hubs so that the hubs effectually prevent the linch pins from dropping out of their places (The usual wedge pins may be added at the pleasure of the constructor) Instead of journals or necks turning in steps or bearings in the usual manner bands or rings are substituted with or without washers on either or on both sides of the band which together with the washers when applied are placed within a groove or cavity in the steps or bearings which not only serves as a receptacle for the band and washer but also as a reservoir for grease or oil for lubricating the axle

The ring or band is firmly attached to the axle by means of two or three pins or taps of suitable size passing thro' its periphery & penetrating the axle to the depth of about one quarter of an inch & in a direction towards the centre of the ring — The exterior box

as of the wheels when applied to Locomotive Engines are supplied with flanges prolonged in such a manner as to subserve the purpose of cranks. or a substitute for cranks may be found at the option of the artizan in applying a receptacle for the crank axle to one or more of the spokes as hereinbefore specified — Third. Brakes or conveys may be applied to the wheels in the following manner. Between the foremost and hindmost Wheels on either or both sides of the four wheel cars may be placed a brake of a triangular form or of the form of a wedge truncated at its point with sides longitudinally concave which is made to act on the peripheries of the two collateral wheels either by being thrust upwards inwards or downwards like its concave sides come into contact with the peripheries or rims of the wheels on which they are intended respectively to operate — The position of the Brake or Brakes may be either a little or below a horizontally thro' the centres of the Wheels working or thrusting upward. in the latter case and downward in the former — The brake may be made to perform its office by means of a lever or levers at the option of the constructor This mode of employing brakes or conveys is believed to be entirely new — Fourth. The boiler is of a cylindrical form standing on end and terminated at its upper extremity by the frustum of a direct cone. the summit of the frustrum affording an area sufficient for the manhole thro' which the boiler may be entered at its top — The inside of the boiler presents also the frustrum of a direct cone the interior of which serves as a fire place. This form of construction of the boiler is new and was invented by me but was published in the Franklin Journal in 1827. — The frustrum in this case instead of being terminated at the top by a plane area contains a basin of a hemispherical shape & proceeding its concavity towards the fire place — The diameter of the fire place at the base of the frustrum is three to four inches less than that of the extreme part of the boiler and at the summit of the frustrum therefore more than that of its base

inches

Within the basin above mentioned are placed four quadrantal vessels which combine constitute a hemispherical steam chamber within the basin of a diameter three to four inches less than that of the basin or of the top of the frustrum on which the basin is situate. Each vessel is furnished with a tube or opening rising considerably above the extreme height of the sides of the boiler & communicating with the steam chamber at the top & within the conical head of the boiler. The whole of this arrangement of quadrantal chamber is believed to be entirely new. The boiler is perforated by circular openings leading from the fire place thro' the sides of the boiler. The longest side of these openings which is about ten inches in diameter serves as a fire door for the admission of fuel to the fire place and at the same time as a flue in conjunction with the other openings to convey the heated air smoke &c from the fire place. The boiler is surrounded by a double casing of sheet iron serving as a flue to conduct the heated air &c from the flues first before mentioned around the exterior of the boiler. The heated air is conveyed thro' the casing of the boiler by means of two other flues passing outward from opposite sides of the Boiler and thence upward on the outside of the casing to the top of the boiler where they unite and pass upward in a single flue or chimney. Near the point at which the two flues last mentioned pass from the boiler casing are tubular conical joints by means of which the flues and chimney may be thrown into a vertical or oblique position as occasion may require either to increase the draught thereof. The fire place is to pass under a bridge or thro' a tunnel when used in a carriage. This method of construction of flues or chimneys by means of the tubular conical joints is believed to be entirely new. The fire grate is within the conical frustrum of the boiler at its base extremity and is constructed of wrought iron plate about one fourth of an inch thick. The grate bars are attached to a wrought iron ring of about the same thickness. The bars and the ring have nearly a uniform depth of about four inches. The bars are formed of plate of a width about

7372 X

double the depth of the grate. The plate being folded longitudinally in such a manner as to form two projections about half an inch thick on their lower part & one inch & half inch thick on their uppermost edges and having a vacant space of a triangular form in the body of each bar. This cavity is filled with fine clay or other suitable non-conductors of heat. This method of constructing grates is believed to be new.

The grate is made to traverse on a bolt or rod situate beneath the grate, passing transversely across the bars and occupying a position about one third part of the diameter of the grate either from its front or rear or the side most remote from the ash. The grate is sustained by a bolt passing under that side & capable of being withdrawn at pleasure when ever it becomes necessary to discharge the fuel from the fire place.

The withdrawing of the bolt being succeeded by a correspondence of that part of the grate which was sustained by it & the consequent turning of the grate upon its axle which precipitates the fuel from the fire place. The ash pit is provided with an inclined flooring or apron of sheet iron the front & rear of which may be respectively elevated or depressed at pleasure not only for the purpose of regulating the draught into the fire place but to prevent its becoming overcharged with ashes cinders &c. the inclination serving to facilitate the discharge of any substances that may fall from the grate — either or both of the bolts by which the apron is sustained may be withdrawn whenever it becomes necessary to discharge the contents of the fire place and the apron entirely removed from the ash pit. This arrangement is believed to be new —

Fifth. The working or steam Cylinders of which there are two are placed horizontally within the body of the carriage & communicate their actions directly to the axle parallel to the sides of the carriage frame. They are elevated about four inches above the centre of the carriage wheels they receive the steam from the boiler through a single steam chest which is furnished with two slide valves viz. one for each cylinder. The movements of which are regulated in a manner to cut off or intercept the steam in its passage into each cylinder at about one half the stroke of the piston — The application of two horizontal Cylinders & their crank

[illegible]

4th The Steam Thro' a single Steam chest are believed to be new.

5th The apparatus by which the brakes are moved consists of a compound Cam & two Cam rods operating in such a manner that the wheels of the carriage may be made to revolve in either direction at pleasure by steering two of the Cam Rods into gear & the other two out of gear. The compound Cam is attached to one of the carriage axles and consists of four simple Cams combined in such a manner as to contribute to the operation above mentioned. which is effected by arranging the respective working parts of each Cam about ninety degrees in advance of the corresponding parts of the Cam that operates in conjunction with it and by a similar arrangement in relation to the reverse Cams. The Cam rods are thrown into gear and out of gear by means of a compound crank & wrist together with a vertical lever connecting the Cam rods respectively with the compound cranks. which wrist and crank being turned to one extreme of their range brings into action one pair of the rods & relieves the other pair and vice versa when the crank and wrist are turned to the opposite extreme & when they are turned to a point midway of their range both pairs of rods are thrown out of gear & the steam valves are entirely disengaged from them & may be moved by hand as occasion may require — This mode of adjustment of the Cams and Cam rods is believed to be entirely new —

6th North — The carriage frame consists of four chuck pieces viz. Two on each side of the carriage one above & the other below the axles connected by transoms or cross timbers which serve not only to connect the chuck pieces. but to sustain the Cylinder. boiler. bell cranks & other parts of the machinery — The frame is suitably braced and stiffened by the footplate on which the boiler rests by the timbers supporting the bed of the Cylinders & by diagonal stays of iron contributing to produce stiffness not only in the horizontal but in the vertical dimension of the frame. or body of the carriage — The entire carriage and machinery except the boiler & axles & the parts immediately connected with the latter are sustained on springs by means of small iron stirrups attached to the lower spring pieces or chucks and depending from the extremities of the springs. The connexion of the wheels & axles with the carriage frame is a

direction longitudinal of the latter is effected by means of two iron bars attached about midway between the upper & lower strong pieces one on each side of the carriage & connected with the brass bearings or steps in which the axles turn. The checks transoms &c are constructed of oak or ash averaging about four inches square. The bolts rods &c by which they are connected are about three fourths of an inch in diameter. The relative disposition of the connecting bars the axles & the steam Cylinders together with their several adjustments are believed to be new. Eighth. The safety valve is constructed in conformity to a formula devised and recommended by Charles Wm Cresswell Esq of Philadelphia & I claim as my invention the application and mode of construction of the apparatus by which the principle is applied. It has for its object the prevention of a counter current of steam from acting upon the depressed surface of the valve and thus contributing to press the valve downward in a manner to prevent the salutary operation of this important appendage of the steam engine. My manner of applying this principle to Locomotive and other steam engines is as follows viz. A valve chamber of a circular form & of a size sufficiently large to contain the valve and its seat & to admit the free passage of steam on all sides of the valve is made of cast iron or brass & attached either to the boiler or to a steam tube leading from it. On one side of the chamber is an aperture leading from it at a point about equal in height to that of the valve seat, which last is elevated two & a half inches above the bottom of the chamber & occupies the summit of a cylindrical tube rising to that elevation within the chamber. The valve chamber is furnished with a cap or bonnet carefully adjusted to its top and perforated for the reception of the valve which is of a cylindrical form having a diameter equal to that of the aperture in the valve seat. The bonnet is furnished with a stuffing Box and follower by means of which the valve may be made to press steam tight or nearly so thro' the cap of the chamber. The valve is also perforated from its top longitudinally to within about half an inch of the part resting on the valve seat for the reception of a small iron

Rod or stem which serves to communicate the action of the weight to the valve — The diameter of this perforation is somewhat greater than that of the stem in order to prevent the latter from impinging against the sides of the valve & thereby causing friction in the movements of the latter. the valve has also a stem extending downwards thro' the valve seat and entering a guide situated at the bottom of the tube on which the valve rests. as is usual in reference to ordinary safety valves. by means of this arrangement the waste steam instead of passing upwards by the sides & pressing upon the upper surface of the valve is made to enter the chamber by raising the valve and afterwards to pass out at the aperture in the side of the chamber. Situated as before mentioned at or below the valve seat — Fifthly — In accordance with a principle devised and successfully tested by Messrs J & P Mitchell & Co of the said Ships which recognizes the utility and advantage of injecting a current of steam into ignited Anthracite coal as a means of promoting combustion increasing inflamation & consequently of diffusing more effectually the heat generated from anthracite and perhaps other coal — I have adopted a plan of introducing a current of steam which is discharged from the cylinder or from the safety valve immediately beneath the furnace of the boiler of Locomotive & other steam engines & shown in fig 5 the application of this principle to Locomotive Engines This object I effect in the following manner viz. the portion of steam tube leading from the cylinder communicates not only with the escape or waste pipe but with a pipe leading directly to the furnace. the pipe last mentioned being furnished with a cock to regulate the quantity of Steam to be injected into the furnace.

Between the cock & the furnace the steam may be conveyed thro' any number of tubes that may be deemed advisable & injected into the furnace thro' an equal or greater number of apertures.

The steam tube leading from the safety valve has also similar communication with the escape pipe & the tube leading from the furnaces — (Note.) The Messrs Mitchells have granted to the petitioner the privilege of applying the principles discovered

7372X

by them as recognized in the Eighth and ninth articles of the foregoing specification to the Locomotive and other steam engines

Tenth. A water tank of the capacity of about three hundred gallons attached to the Locomotive between the cylinder and Rear wheels.

Witnesses

Irving Taylor
Geo. McClellan
A. F. Pond

J. F. B. Long.

4000 Wds