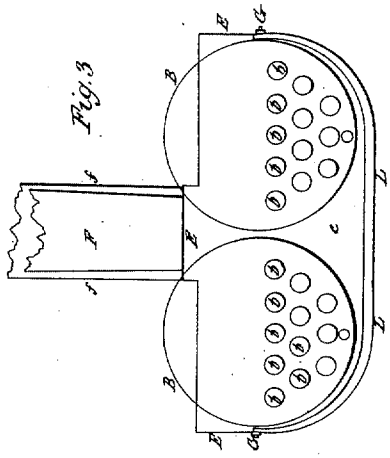
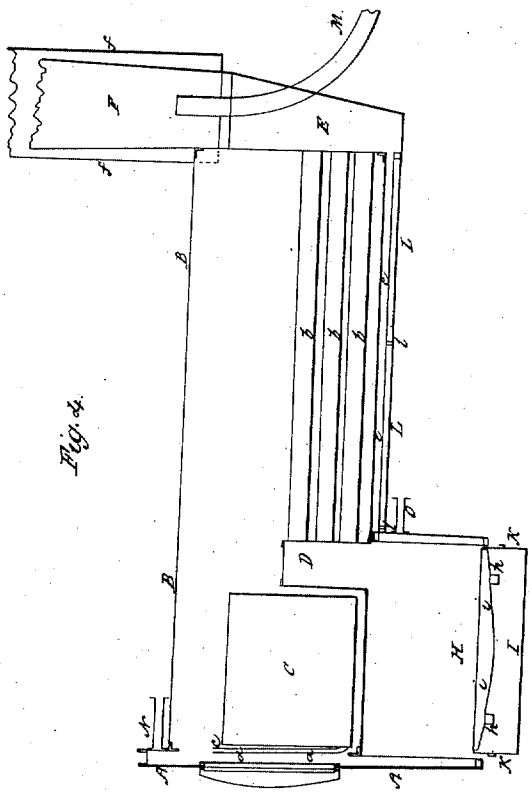
7570X

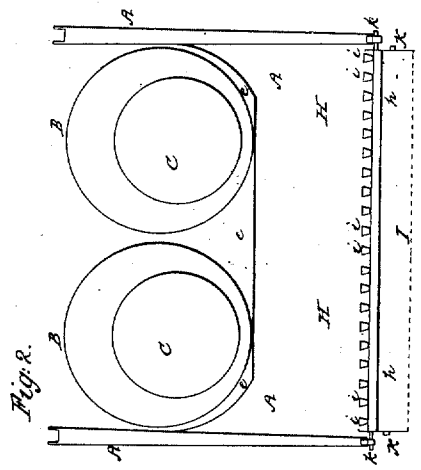
S. H. Long,

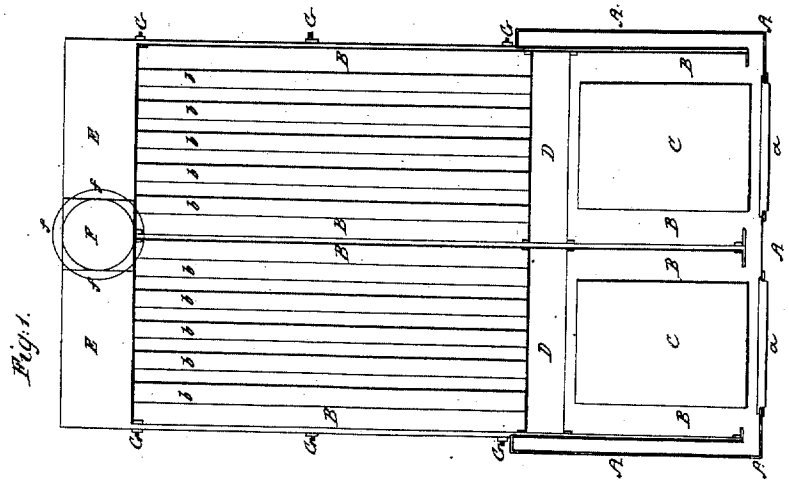
Steam-Boiler Fire-Tube.

Patented May 6, 1833.









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

Stephen H. Long U.S. Army 7570X

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 Stephen H Long of his improvement in the construction of Boilers or Steam Generators and of Wheels for Locomotive Steam Engines

To all to whom these presents shall come. Be it known that I Stephen H Long of the United States Army have invented certain new and useful improvements in the construction of Boilers or Steam Generators and of Wheels for the Pennsylvania Locomotive and other Locomotive Steam engines and that the following is a full and exact description of my said improvement. In addition to my improvement in the construction of Boilers as specified in the first item of my Letters patent under date of December 28th 1832. I claim the following improvements in the construction of Boilers and other apparatus appended to them as new and useful, to wit, 1st The introduction of flues or tubes passing longitudinally through that portion of each cylindrical boiler situated in rear of the fire place. And to admit of this arrangement the lower half of each boiler is intersected by a niche recess or notch of any convenient width & length (say from four to eight inches) and rising from the lower part or side of the boiler to a line or plane passing horizontally through the boiler at or a little below its centre. The sides of this niche or recess will of course be nearly semi circular and should be parallel to each other. The rear end of the fire place being perforated with holes in which the tubes or flues are inserted. And that towards the front of the fire place being of similar form but destitute of perforations for the reception of flues. The space above and between the sides of the niche forms a plane surface constituting a portion of the boiler. Hence that portion of the boiler situated immediately above the

7570X

fire place are a definite of flues while those back of the fire place are supplied with a greater or less number of flues according to the size of the Cylinders of which the steam generator or boiler is composed which flues are contained in a segment of each cylinder occupying the lower half of the same. That portion of each cylinder situated immediately above the fire place a smaller cylinder of sheet iron tin or copper serving as a steam chamber may be inserted the cylinder may be of a size as large as can be admitted through the steam holes into that portion of the cylindrical boiler between the fire and the space in which there are no flues or tubes

The object of the small cylinder is not only to enlarge the steam room but to exclude from the boiler a considerable portion of water which would otherwise be required. A free communication between the interior of each small cylinder and the upper part of the boiler in which it is situated is afforded by means of a tube rising from the bottom of the former and opening into the top or steam room of the latter. David Dalbo claims as a new and useful improvement in the construction of boilers for locomotive engines the introduction of a fire box adapted to two or more cylindrical boilers to be constructed and applied in the following manner viz. The front side and back of the box are of the usual construction so far as relates to those portions of the same that are situated below the cylindrical boilers. The back sides nearly or quite to the bottoms of these boilers

The sides may rise to any convenient height not lower than a line in plane passing through the centres of the same. The front may rise three to five inches or more above the tops of the cylindrical Boilers. This as well as the other sides of the fire Box is constructed of two plates or sheets of iron of suitable thickness confined at suitable intervals asunder by means of stay bolts and other customary fastenings. The interior sheet or plate of the front is perforated with circular openings corresponding to each cylindrical boiler of a diameter about two inches less than that of the interior of the boiler. This plate is attached to the front ends of

all the cylindrical boilers by means of rivets or a row of stay bolts passing through the plate and through a flange about one inch wide turned inwardly at the front end of each boiler and made continuous part round the interior circumference of the boiler. These combined and effectually caulked in the usual manner. The plate forms a steam tight junction with the boilers. The exterior plate of the front is also perforated with openings after the manner of main holes in front of each boiler and corresponding to them respectively.

Thus arranged the front of the fire box will serve not only as a steam generator but as a conduit through which the water is to be conveyed into the cylindrical boilers in a manner to keep them equally supplied and will at the same time subserve the purposes of a steam dry leading from the cylindrical boilers but from the fire box to the main steam pipe through which the steam is conducted to the working cylinders. The front of the fire box is also perforated as usual by one or more fire holes of suitable dimensions.

In reference to the arrangements of the several parts of the boiler or steam generator as above contemplated it should be remarked that the chimney is situated at the centre back end of the cylindrical boilers or at the end farthest from the fire place. also that the water to supply the boilers is conveyed from the force pump through a tube which enters the back of the fire box a little below the cylindrical boilers —

3d I also claim as a new and useful improvement in the construction of boilers for the purposes already mentioned, the application of an apron situated in front of the fire box beneath the cylindrical boilers and about one inch from them which apron may if required horizontally beneath the boilers and the space or spaces between them and may run either in a concave or an oblique right line or plane from beneath the bottom of each exterior boiler to a horizontal plane passing through the centres of the cylindrical boilers. The margins of the apron may be attached to the underside of the boilers or also to the back of the fire box by means of screw bolts or otherwise.

7570 X

The space between the boiler and the apron is intended as a flue through which a portion of the heated air &c is conveyed from the fire place to the chimney

The construction of the apron may be as follows. Two or more ribs of bar iron about one inch square are formed by bending them into a shape corresponding to a transverse section of the apron These ribs are to be disposed in such a manner that one of them may occupy a position immediately back of the fire box and another a position directly below the rear or back end of the boiler the residue should more than two be required occupying positions intermediate to those above designated all the ribs being parallel to each other and having their ends attached to the outsides of the boiler on the lines of contact between them and the margins of the apron — Upon these ribs both externally and internally thin sheets of iron are fastened by means of rivets passing through the ribs and the sheets. The space or spaces between the sheets which spaces are of a thickness or depth equal to that of the ribs is filled with a lining or envelope of pounded charcoal and clay cementing of about three parts of the former to one of the latter or with some other suitable non-conductor of heat. The flue between the boiler & the apron as also the tubular flues within the cylindrical boiler all open into a smoke box situated at the back end of the boiler from which they conduct together with waste steam from the working cylinders and from the safety valve &c specified mentioned by through a chimney rising from the top of the smoke box. The chimney is formed of two parts one of which is firmly attached to the smoke box and rises about eight feet above it and the other includes the former being of larger diameter and of such a construction as admits of its being moved upward and downward on the part first mentioned. The inner part of the chimney is furnished with appropriate apparatus and fastenings by means of which it may be readily elevated or depressed at the pleasure of the person in attendance according as he may find it expedient in passing under bridges or through

Journals. or for the purpose of increasing the draft through the fire places. Mr. S. moreover claims as a new and useful improvement in the construction of boilers for steam engines the discovery and application of a grate adapted to the use of Anthracite Coal. The construction of the grate is as follows viz. The grate bars are included in a square or rectangular and moveable frame of sheet iron about one fourth of an inch thick and of such dimensions as otherwise that it may enter freely into the lower part of the fire box hereafter described. The sides of the frame may be about five inches in depth of which about two inches are made to enter the fire box. The grate bars are suspended within the frame on bearers of iron extending quite across the frame and resting on two of its opposite sides. The position of the bearers with respect to the grate bars is rectangular beneath them and at a distance about six inches of their ends. The bearers are of a square or rectangular form supporting the grate bars upon one of their sides respectively. One of both of the bearers is furnished with a journal at each end passing through the sides of the grate frame by means of which an oscillating movement may be communicated to one or both of the bearers by means of a lever or crank applied to some part of the bearer either exteriorly or interiorly of the frame as may be found most convenient. By means of the oscillations of one or both bearers a vibratory motion is communicated to the grate bars which motion is rendered alternate between all the contiguous bars in consequence of the convex of the bearer on its upper or bearing side being alternately truncated immediately beneath each grate bar.

The ends or journals of one of the bearers protrude through and beyond the sides of the grate frame far enough to enter steps or supports attached to the lower part of the sides of the fire box in which steps the bearer is allowed to traverse and serves as an axle for the grate. By this means one side or end of the grate (together with the ash pan which is attached to the lower edge of the grate frame) may be let down at pleasure for the purpose of discharging at once the contents of the fire place. and again elevated for the reception of a new

7570X

stages of flow. This operation is facilitated by the aid of Lacey rods and pivots appropriately adjusted for the purpose.

J. H. Johnson claims as a new and useful improvement in the construction of wheels for Locomotive steam engines, the application of hubs of cast iron in connexion with wooden wheels each hub being formed of two similar portions or segments of a circular form and of suitable diameter and thickness, adapted to each other by means of a socket in one of the segments fitted for the reception of an annular tenon projecting from the inner side of the other segment through both of the angle plates transversely of the hub or in the direction of its axis. On the exterior segments of the hub and outward by thereof is a ring or box incorporated with the hub and surrounding the axle. This box is intersected by two slots or mortises diametrically opposite to each other made for the reception of a key which passes through the axle and tenon as a bench for to confine the wheel to the axle. Both segments of the hub may be furnished with the box and slots just described if deemed advisable.

The interior portions of the hub in addition to the socket and annular tenon before mentioned consist of an additional box surrounding the axle and receiving the span in each segment. Between the socket or tenon and the additional box or boxes there of a number of radiating partitions equal to the number of spokes in the wheel, which box and partitions are also incorporated with the constituent portions of each segment. The partitions extending from the box outwardly to the circumference of the hub. The segments thus formed and firmly connected by means of screw bolts in such a manner that the radiating partitions may come well and contact as nearly as possible with each other constitute the hub or nave of the wheel. The openings or spaces between the partitions is nearly as practicable for the spokes, and the same bolt by which the segments are bound together passing through these partitions is also through the spokes. The spokes and felloes of the wheel are constructed in the usual manner of wooden wheels except in respect as relates to the adjustment of the former to the hub. The tire or binding

of the wheel consists of three principal circular concentric bands or hoops of wrought or malleable iron of the following description viz 1st The flat or tyre hoop encircling the outward or flange side of the wheel rim and extending at least half the distance across it. The exterior surface of this hoop presents a cylindrical or slightly taper form. The inner hoop is attached to the felloe by nails or screw bolts with conical heads the latter being inserted in holes of a corresponding shape made in the hoop for their reception and the body of the nail or bolt being driven into or through the felloe. 2nd The sloped hoop is formed of a bar of wrought iron or steel whose transverse section is a square or parallelogram the least dimension or side of which exceeds the thickness of the flat hoop by at least one quarter of an inch or by a difference corresponding to the difference in lengths of the two rails of the rail way or portions of the road when the most abrupt curves or curves of the least radius occur. The width of the sloped hoop should not exceed that of the flat hoop and is such as to occupy that portion of the periphery of the wheel uncovered by the flat hoop. Note 1st The flat hoop is first driven upon the rim from the face or outside of the wheel after which the sloped hoop is driven from the opposite side of the wheel into close contact with the flat hoop.

Note If these hoops having been applied to the wheel their exterior surfaces are turned by turning or otherwise into the shape best adapted to the curvatures of the road the flat hoop being made cylindrical or nearly so and the sloped hoop being turned in a manner tapering transversely of the wheel a gentle curve rising gradually from the surface of the flat hoop and becoming more abrupt as it approaches the wheel flange — Note 2nd The flat and sloped hoops together constitute the entire wheel tread which instead of the two portions or parts specified mentioned may be formed of a single band or tyre of wrought iron moulded into the same or similar shape with sloped hole exterior surface as that presented by both portions combined.

3rd The flange hoop is also of wrought iron about four inches in depth and about 3/4 — inch in thickness. This part is of a similar

7570X

like form and is applied as usual to the interior of each side of the wheel in such a manner that the exterior periphery may be bored about one inch beyond the depth of the flanged tire or the inside beyond the flat tire or cylindrical part of the wheel — The flanged tire is forced into close contact with the flat tire or with the corresponding tire when a single band is used or substituted for the flat and flanged tires) and with the fellies of the wheel by means of screw bolts passing through the flanges and the fellies at a suitable distance from and within the other parts of the tire. To the wheel constructed in the manner above described I give the name of the bifurcate band wheel when the tire of the wheel consists of three parts and of the double banded wheel when the tire consists of two parts only as explained in Note 2. — The improvements described in this specification and especially claimed as new and useful are. 1st The application of two or more horizontal cylindrical boilers to Locomotive Steam engines with flues leading through a portion of each and at the same time one or more flues leading in the same direction exclusively of the boilers exclusively between them and the ashpan. 2nd The use of two or more horizontal cylindrical boilers with tubular flues in connexion with the fire Box. 3rd The introduction and use of steam chambers disposed in such a manner as to enlarge the steam room within the boilers while they serve to reduce the quantity of water necessarily contained in the boilers — 4th The construction of a grate with one or more oscillating bearers. the bellies to promote the combustion of Anthracite Coal or Coke — 5th a new method of causing a Grate to bearers in an axle by means of which the fire place may be speedily discharged of its contents.

6th The construction and application of a moveable or slip chimney or a new flue. and 7th a new method of constructing wheels for locomotive ~~&~~ steam engines. all of which improvements are exemplified in the drawings hereunto annexed and hereinafter described and further illustrated by the following explanations and references

Explanations of the Drawings

Fig 1. A horizontal section of the steam Generator or a plane

passing near the axes or centres of the Cylindrical Boilers.

Fig 2. A Transverse vertical section of the Steam Generator passing through the fire place grate cylindrical steam chamber &c.

Fig 3 A Transverse vertical section of the steam generator in rear of the fire place and between the fire box and the smoke box

Fig 4. A vertical section longitudinally of the Steam generator and near the axis or centre of one of the Cylindrical Boilers

References to the drawings and models.

A.—The fire box communicating freely with the Cylindrical boilers

a. man holes or openings through the front of the fire box and communicating with the interior of the Cylindrical Boilers

B.— The cylindrical boilers containing tubular flues, in rear of the fire places and cylindrical steam chambers within the fire box.

b. The tubular flues.

C. The steam chambers communicating with the upper part of the boilers by means of the tube c (in fig 4)

D. Notches in the cylindrical boilers affording a communication between the fire places and the tubular flues

E. The annular box at the back end of the boilers - e the flue beneath the boilers

F. The standing part of the chimney attached to the smoke box

f. the slip or movable part of the chimney

G. Screw Bolts passing through the ribs of the apron and confining the same to the boilers

H. The fire places and Grates

h. the bearers upon which the grate bars i - and one at both of, which may be oscillatory on journals as at k

I. The ash Pans

K. The sides of the grate frames

Le. The apron with its ribs as at L.

M. The waste steam pipe entering vertically into the chimney.

N. The Steam pipes leading from the Boilers to the working cylinders.

7570X

C. The duplex propeller arranged under the hull
P. The whole with its appropriate fixtures

In testimony that the above is a true specification of my said improvements as above described I have hereunto set my hand and seal this 21st day of February A.D. 1838.

Witnesses
Sarah B. Wolfe
I. Badger

Stephen H. Long.

3804 mDs

(Dr in portfolio)