(No Model.) 4 Sheets—Sheet 1.

W. L. LOWREY.

PORTABLE COMBUSTION APPARATUS.

No. 308,911. Patented Dec. 9, 1884.

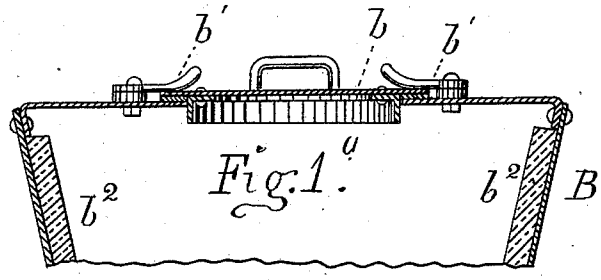


Fig. 1.

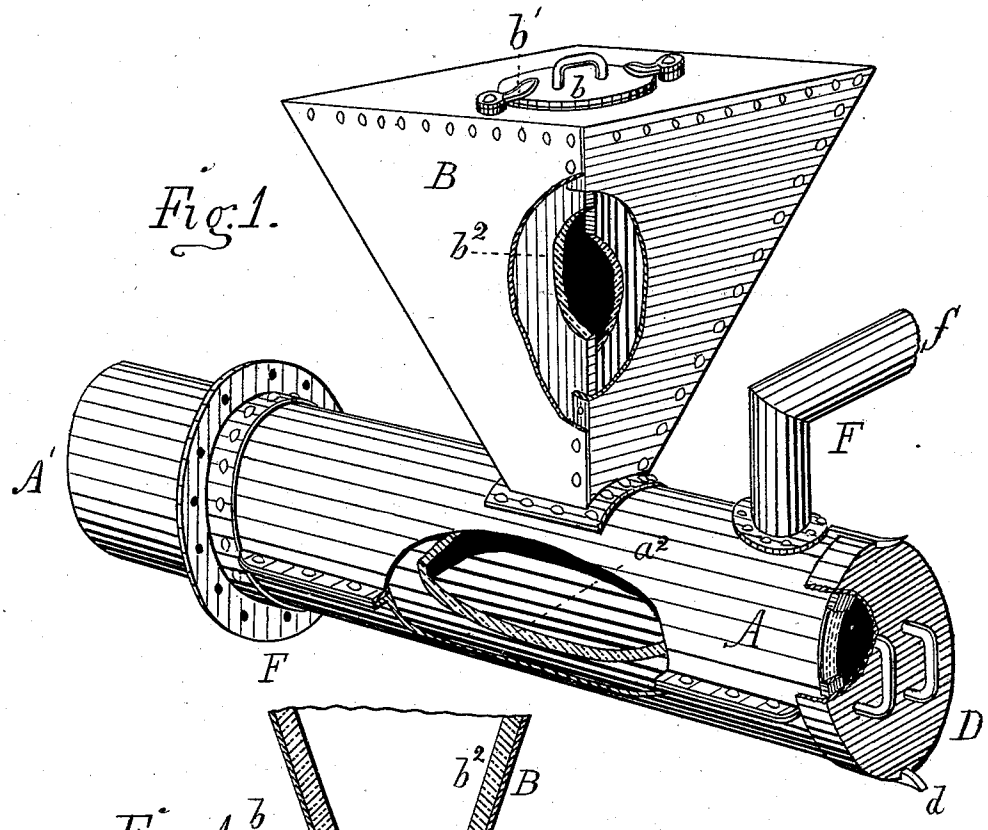


Fig. 1.

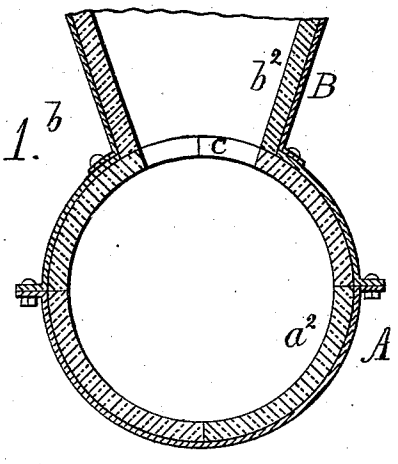


Fig. 1.

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PORTABLE COMBUSTION APPARATUS.

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Fig. 2.

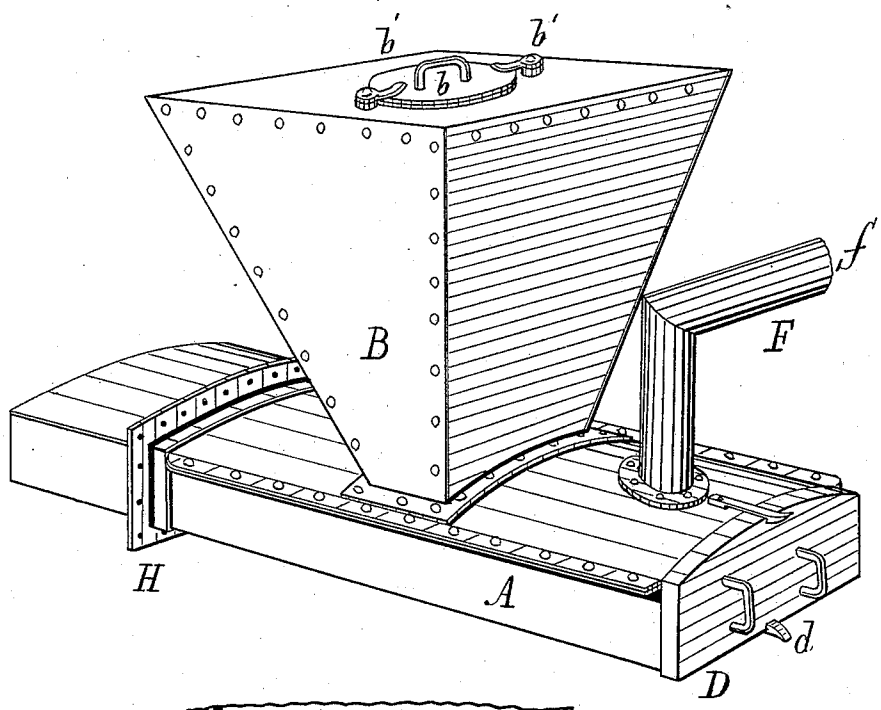
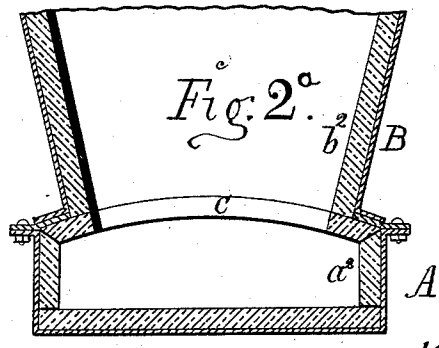


Fig. 2a.



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PORTABLE COMBUSTION APPARATUS.

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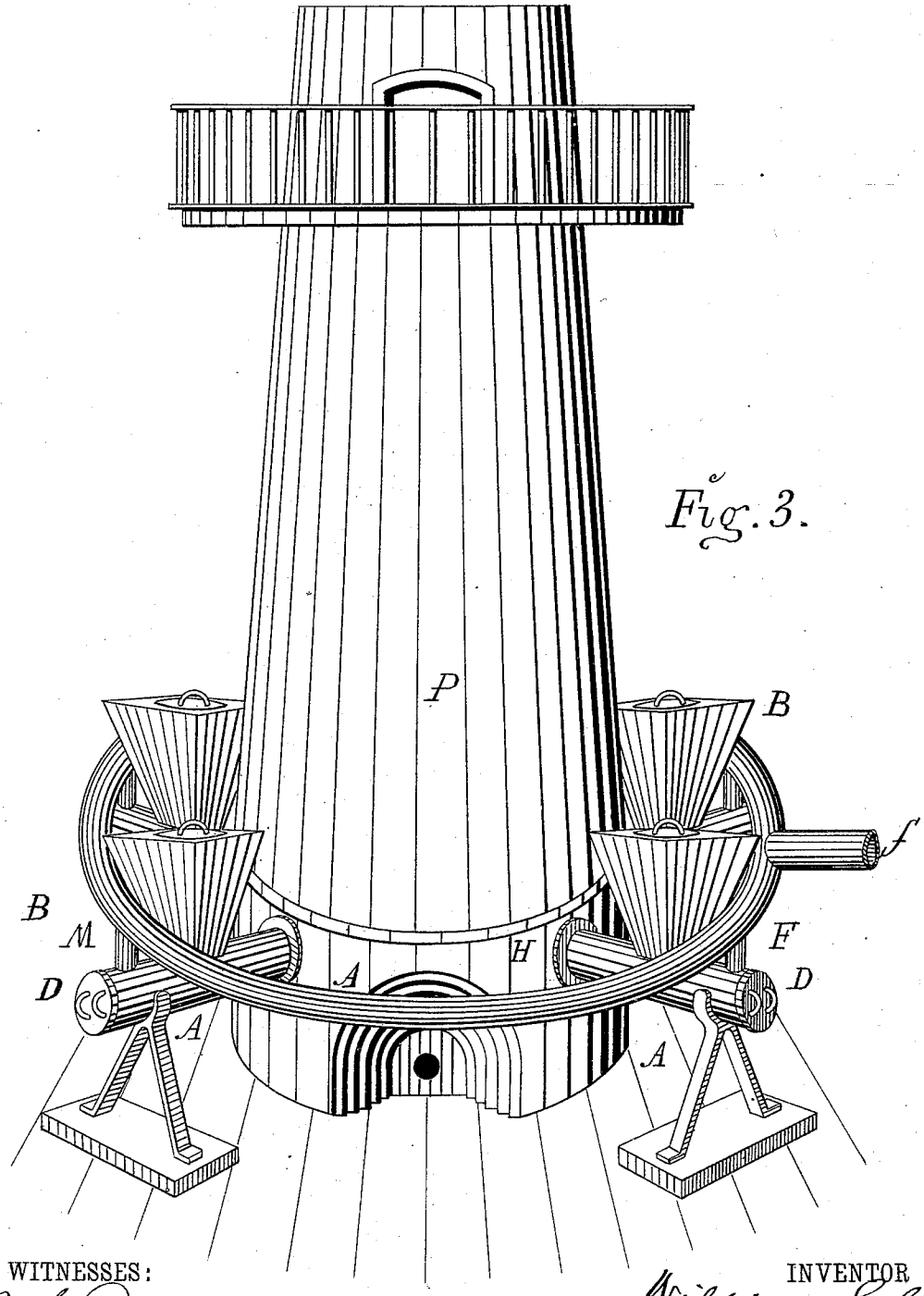


Fig. 3.

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(No Model.) 4 Sheets—Sheet 4.

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PORTABLE COMBUSTION APPARATUS.

No. 308,911. Patented Dec. 9, 1884.

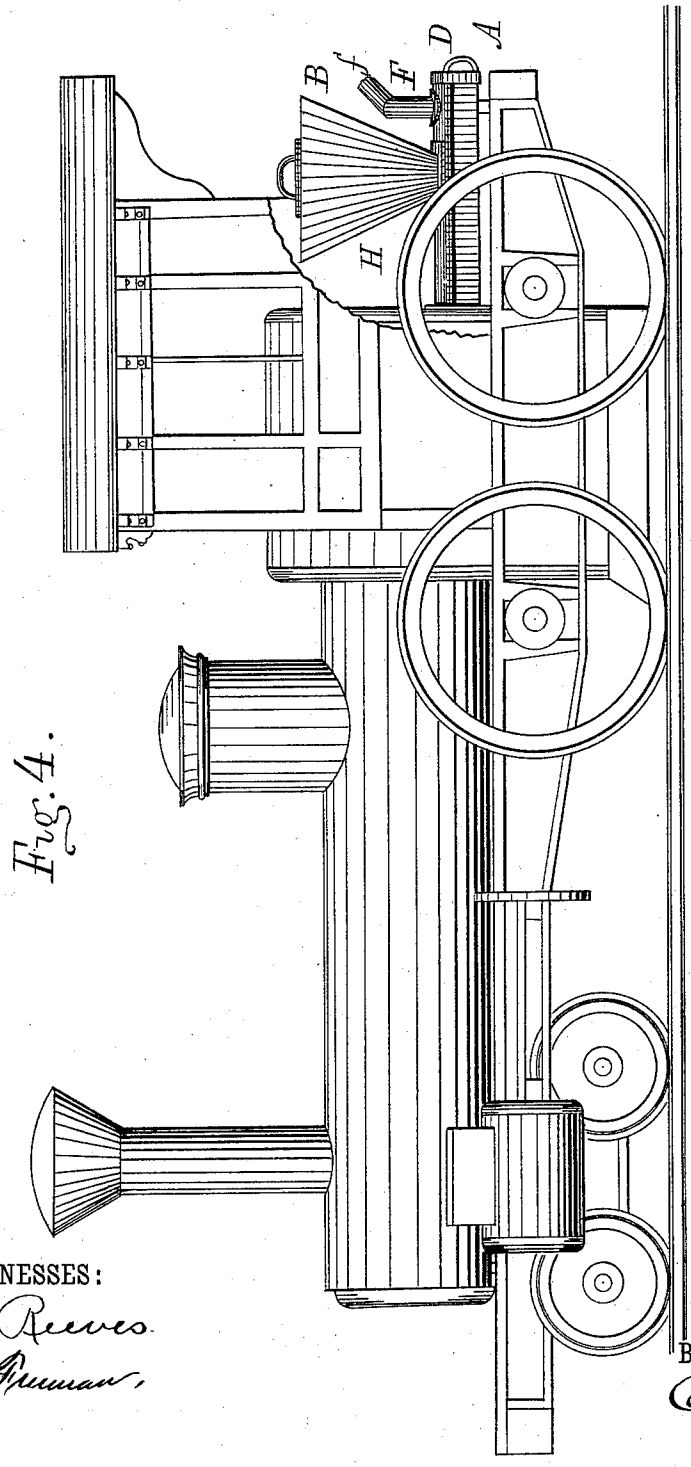


Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM L. LOWREY, OF BOSTON, MASSACHUSETTS.

PORTABLE COMBUSTION APPARATUS.

SPECIFICATION forming part of Letters Patent No. 308,911, dated December 9, 1884.

Application filed April 12, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. LOWREY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Portable Combustion Apparatuses, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to furnaces to be used in connection with steam-generators, or for other purposes; and the novelty consists in the construction and arrangement and adaptation of parts, as will be more fully hereinafter set forth, and specifically pointed out in the claims.

The essential object of the invention is, primarily, to attain a more complete combustion of fuel than is possible with contrivances now in use, and, secondly, to produce a construction of combustion-furnace which shall obviate the necessity of grates or the like, and which shall be capable of being readily and cheaply applied to boilers, locomotives, and heaters now in use.

To these ends the invention consists, essentially, in a portable furnace or attachment which may be readily applied to boilers or heating apparatuses without materially changing their form, and which shall serve to project the heat and flame directly to the point or points of such devices where it is most desirable, and where the best results can be obtained.

By my construction I avoid the use of grate-bars or equivalent supporting means, which allows the saving of a large percentage of the fuel—viz., that portion which ordinarily gravitates through the grate-bars to the ash-pan.

In actual practice only from one-fifteenth to one-tenth of the energy stored in carbon, and which is developed by its oxidation, is, as at present used, utilized in the best steam-generating apparatuses, there being with the best engines from two to three pounds of good anthracite coal per hour required to produce one horse-power of available result. The manifest cause of this large percentage of lost energy is incomplete or insufficient combustion of the fuel, due to the faulty construction and adaptation of the appliances employed. Another element of fault is that as ordinarily practiced the heat for use is taken from the mass at a point where combustion is most weak—from the top of a mass of coal instead of from the center of greatest, most active combustion.

I have demonstrated that to produce nearly perfect combustion of fuel it should be heated to white heat before air is applied or allowed to come in contact with it; that if the fuel is properly heated it matters little whether the air supplied is hot or cold before it is applied to the incandescent carbon—whether in a gaseous state or as fixed carbon; that force properly applied to form a blast of air, projected on incandescent carbon, greatly assists in the oxidation of such carbon and facilitates the giving off and projecting of heat to desired points with small loss of intensity; that heat may be drawn directly from the center of most active combustion, and its influence utilized directly, while in intensity, quantity, and quality it is most desirable, instead of leading it through a mass of fuel, which robs it of its strength and deteriorates its quality; that where all the products of combustion in a given amount of fuel are obliged to be, by their condition and surroundings, consumed or oxidated at a given point, a much larger amount of heat is developed than when burned separately, and that chemical conditions for nearly perfect combustion are best when oxidation is confined to a given point.

With these facts in view this invention, in what I consider the best means for carrying it out, consists in the mechanisms and combinations of mechanisms illustrated in the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a perspective view of my invention, partly in section, to show internal construction; Fig. 1ª, a transverse section through the combustion-chamber and a part of the magazine; Fig. 1ᵇ, a detailed section of the upper portion of the magazine and its cover. Fig. 2 is a perspective view of a different and preferred form, and Fig. 2ª a transverse section thereof. Fig. 3 is a perspective view showing my invention applied in a series to a blast-furnace, the air being supplied from a pipe common to all the com-

bustion devices in the series, and the blast or smelting furnace being connected with each, and Fig. 4 is a side elevation showing the device illustrated in Fig. 2 applied to a locomotive-engine.

To enable others skilled in the art to which the invention relates to make and use the invention, I will describe the construction and mode of operation.

Referring to the drawings, and particularly to Fig. 1, A designates a combustion-chamber, connected to and rigid with which is a magazine, B, having a removable cover, *b*, held in closed position by buttons or pivoted latches *b'*. These parts A B are formed of boiler-iron or other proper and suitable metal, and are provided with a lining of fire-proof material—as fire-clay—as seen at a^2 b^2, respectively. The throat of the magazine—that is to say, the passage *c*, which connects the interior of the chamber A with the interior of the magazine B—is contracted, as shown, in order that a minimum of resistance will operate against the gravity of the fuel in the magazine, but is sufficient to allow such of the fuel as is at any time in such throat to attain a white or nearly white heat from the consuming fuel below. The entire magazine B is preferably made in the approximate form of an inverted pyramid or cone, in order that the inclined sides may also act against the gravity of the coal or other fuel. The front end of the combustion-chamber A is provided with a removable cap, D, which when in position forms an approximately air-tight joint with said chamber A, and which is held in such position when the device is in use by spring locking means, as *d*. This cap D is thus adapted to be removed when it is desired to treat the burning coal, and to resist an air-pressure from within when in place. At a point between this cap and the junction of the magazine with the chamber A is secured the air-injecting pipe F, the interior of which connects with the interior of the said chamber at one end, and at the other end, *f*, is adapted to be coupled to a blast-inducing means. (Not shown.) The magazine being properly charged, and the fuel having been brought to an incandescent state in the chamber below and around the throat *c*, the proximity of the fuel in the said throat with such incandescent fuel will keep the fuel in the throat at a white heat, or nearly so; but the fuel at any distance above will not absorb any considerable quantity of the heat, from the fact that no draft is induced in that direction. The blast of air is directly upon the fuel in the chamber, and the combustion is confined to that part of said chamber in immediate proximity to the throat *c*. Any gases given off by the coal in the magazine are forced directly into the center of the combustion-chamber, or that point where combustion is most active, and are consumed to augment the intensity of the heat, and the gases thus distilled by this arrangement are fed to the center of combustion in proper proportions to insure their greatest benefit—a fact which does not follow if the draft is through the mass of coal, important chemical changes occurring in the different degrees of heat to which coal may be subjected.

It will be observed that the coal within the magazine is not fed with oxygen, and only the gases distilled within the magazine are forced into the fire-chamber, and that the coal is not treated with air until it has assumed an incandescent state. In this state the chemical conditions are such that upon the contact of air properly charged with oxygen very nearly complete combustion or oxidation occurs, and any slack sintering off from the surface of the fuel and any hydrocarbon products distilled or given off instantly ignite and burn in the furnace-chamber; hence there is no smoke. The intense heat thus obtained is applied directly to the points where it is to be utilized—that is to say, to the tubes of a boiler (see Fig. 4) or the interior of a smelting-furnace (see Fig. 3) through the outlet A', a flange, H, allowing the furnace to be properly secured to such boiler or other furnace in any desirable manner.

The form shown in Fig. 2 I prefer for most purposes, as it limits the gravity of the fuel, having a greater horizontal than vertical area, and thus closely defines the limits of the center of combustion. This form is shown in Fig. 4 as applied to a locomotive.

The form shown in Fig. 1 is adapted to a weaker blast of air, and an air-pipe, M, common to all the devices A, B, &c., serves as the air-injecting means, the several flanges H being secured to a general furnace, P.

Modifications in details of construction may be made without departing from the principle or sacrificing the advantages of the invention, the essential features of which have been explained, and will be readily understood in connection with the drawings.

It is essential that the mass of fuel and slag should be fed forward together in the combustion-chamber, for if its passage be obstructed or the slag be drawn back or removed at the bottom of the chamber the combustion of the carbons and hydrocarbon vapors will be incomplete.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a portable or detachable grateless furnace, the combination of a horizontal and unobstructed combustion-chamber wherein the fuel is fed forward uninterruptedly, a magazine connected therewith by a contracted throat, and a suitable air-feeding device, substantially as described.

2. A combustion-chamber having an adjustable air-tight cap and a magazine connected therewith by a contracted throat, combined with means, as F *f*, for injecting air into the interior of the chamber, and means, as H, for

securing the said chamber to a boiler or furnace now in use, as set forth.

3. The chamber A, having cap D, with locking means *d*, securing-flange H, and air-pipe F *f*, combined with the magazine B, having air-tight cover *b*, secured by arms *b'*, and having inclined sides and contracted throat *c*, as set forth.

4. In a portable or detachable grateless furnace, constructed substantially as shown, the chamber A, having fire-proof lining a^2, and the magazine B, having similar lining, b^2, combined with air-tight doors and air-injecting means, substantially as described.

5. The herein-described process of producing combustion, which consists in feeding the fuel by gravity from a magazine into a horizontal unobstructed and grateless combustion-chamber, wherein the body of the fuel is fed forward, as required, and the combustion of the fixed carbons and hydrocarbon vapors distilled therefrom takes place at or near the point where the carbons enter the chamber, at which point they are subjected to a current of air moving at right angles, whereby the air is applied to incandescent carbon, and the heat is taken from the center of most active combustion, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM L. LOWREY.

Witnesses:
E. M. MARBLE,
E. H. REEVES.