

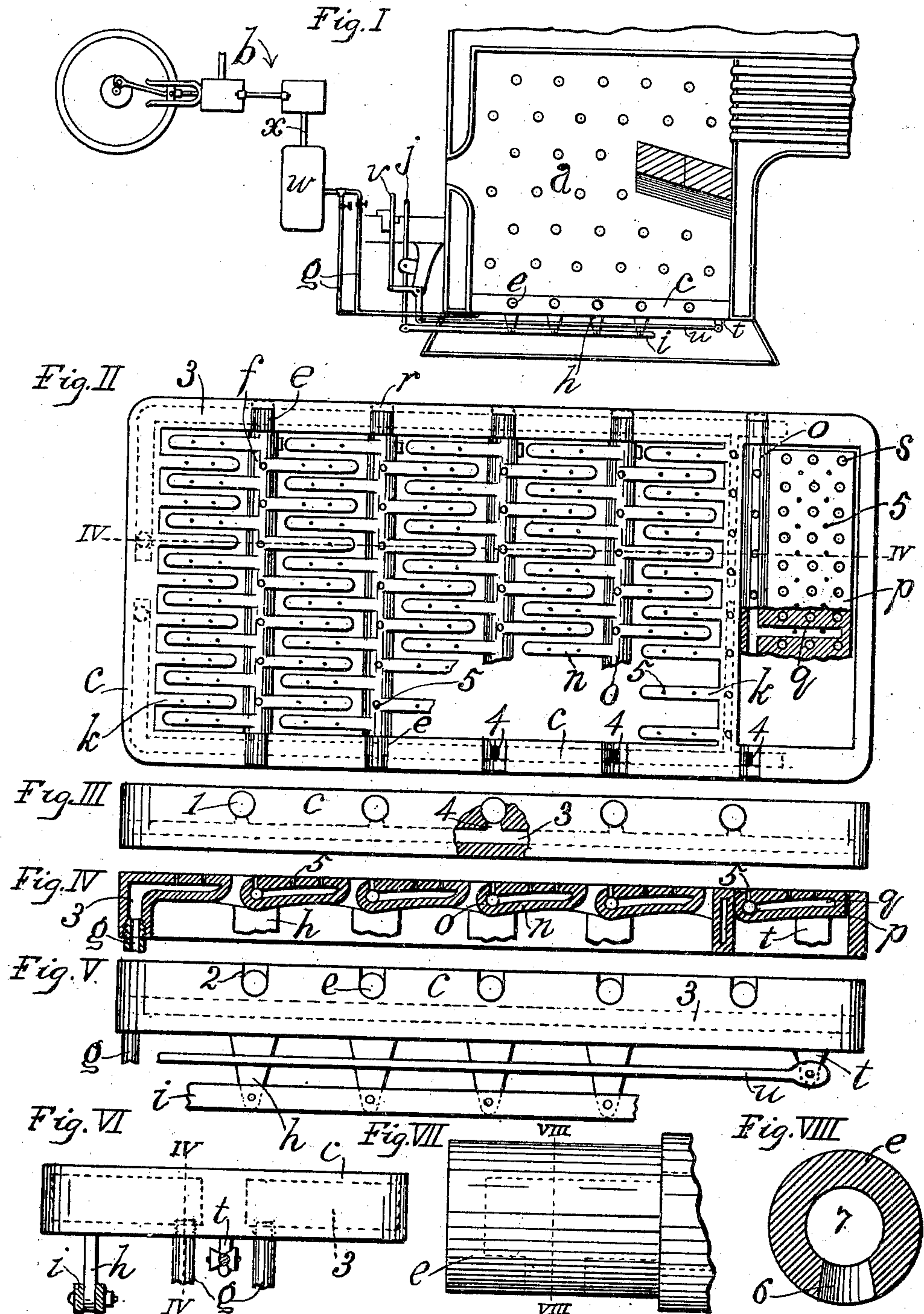
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Patented Sept. 23, 1902.

W. N. BEST.  
PERFECT COMBUSTION FURNACE.

(Application filed May 27, 1901.)

(No Model.)



Witnesses  
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# UNITED STATES PATENT OFFICE.

WILLIAM NEWTON BEST, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF TWO-THIRDS TO JOHN H. BEST AND EZRA BEST, OF QUINCY, ILLINOIS.

## PERFECT-COMBUSTION FURNACE.

SPECIFICATION forming part of Letters Patent No. 709,571, dated September 23, 1902.

Application filed May 27, 1901. Serial No. 62,158. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM NEWTON BEST, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Perfect-Combustion Furnace, of which the following is a specification.

The object of this invention is to provide a furnace adapted for burning coal or other fuel with the greatest effectiveness.

Another object of the invention is to provide against liability of destruction or injury to the grate frame and bars from overheating.

The accompanying drawings illustrate this invention.

Figure I is a view of a furnace embodying the invention as applied for a locomotive and tender. Fig. II is a plan of the grate-frame and grates of this newly-invented furnace. Parts are broken away to expose the outlets from the hollow frame to supply air to the hollow grates. Fig. III is a side elevation of the grate-frame viewed from the left side—that is to say, the upper side—of Fig. II. The frame is broken to expose the interior air-passage or hollow chamber of the frame. Fig. IV is a section on line IV IV, Fig. III. Fig. V is a side elevation of the grate-frame with grates. Fragments of the shaker-rods are also shown. Fig. VI is an end view of the grate-frame, showing air-pipes to supply air to the hollow chamber of the frame. Fig. VII is an enlarged detail of the journal of any one of the grates. Fig. VIII is a section on line VIII VIII, Fig. VII.

*a* in a general way indicates the furnace fire-box.

*b* indicates the air-compressor of the furnace.

*c* indicates a hollow grate-frame furnished with bearings 1 2 for the journals *e* at the ends of the grates *f*.

3 indicates the hollow chamber of the grate-frame.

4 indicates holes or passages leading from the hollow chamber of the grate-frame into the bearings 1 2, respectively, of said frame.

The grate-bars *f* are hollow and furnished with perforations 5, which are sufficiently numerous and of suitable size and appropriately arranged to supply to the furnace the

atmospheric air necessary to supply the oxygen for the combustion of the fuel to be used.

6 indicates openings or holes in the grates *f* and adapted to register with the openings or holes 4 of the bearings to allow air to pass from the chambers 3 of the grate-frame into the chambers 7 of the grates to issue from said grates through the perforations 5. The holes 6, leading into the grates, are preferably in the under side of journals *e* of the grates *f*, and preferably the journals rest on the bearings, as shown in the drawings, and when compressed air is supplied to the frame through pipes *g* the appropriate quantity of air will be forced into the furnace through the numerous perforations of the grates and will pass upward through the mass of combustibles (not shown) in the furnace, thus distributing to said mass the oxygen at the places where combustion should take place. In this way a uniform and practically complete combustion can be produced through the entire furnace and the production of smoke be entirely avoided.

The pressure of the air supplied to the grate will be regulated by any suitable means within the required limits and as necessity demands.

*h* indicates arms extending down from the grates to be acted upon by suitable means, such as the rod *i*, operated by a lever *j*.

*k* indicates stationary hollow grate-fingers which project from the frame and the hollow chambers of which are connected with the chamber or air-passage 3 of the frame.

*n* indicates the hollow grate-fingers mounted on the grate-shaft *o*, the ends of which form the journals *e*.

*p* indicates the drop-grate, which has air-passages *q* leading from the hollow shaft *o*. Perforations 5 are provided opening from the chambers *q* of the drop-grate.

In practical operation the coal or other available fuel will be applied in the furnace and ignited and the air-pressure appropriately maintained. The perforations 5 of the grates and fingers preferably open upward, so that the air is positively applied to liven the fuel mass (not shown) and supply the requisite oxygen for combustion thoroughly distributed to the places where required. The air which enters the grate-bars under pressure expands



to issue therefrom, and thereby removes the heat from the grate-bars and enters the furnace in a heated condition to facilitate the combustion, at the same time protecting the  
 5 grates from injury from overheating, and the air by lifting up the fuel mass prevents the clogging of the grates by clinkers.

The operation of the shaker-grates to shake out the ashes does not interfere with the supply of air, the holes in the bearings and journals being so arranged that they register at the positions which the grates assume during the shaking. The hollow drop-grate is at the front end of the furnace, onto which the in-  
 15 combustible elements of the fuel can be raked and from which they can be dropped into the ash-pan in the customary manner.

Preferably the bearings 1 on the left side of the case of the locomotive-furnace are circular bearings, and the journals *e* on the left side of the grates are accurately fitted therein, respectively, and the bearings 2 on the right side of the case are open at the top to allow the journals *e* on that side of the grates to be readily let down into and withdrawn up from such bearings, so that the grates can be readily put into and withdrawn from the support or frame *c*. The frame *c* is cut away at the inner edge above the bearings 1, so that  
 30 only a narrow bar *r* extends over the outer end of the journals or pivots *e*, thus being sufficient to hold the journals in place on that side. The arms *h*, which extend down from the grates, respectively, for operation by the shaker-rod *i*, are located at the same side of the grate-frame with the journal-retaining bars *r*, so that the action of the shaker bar or rod *i* will not throw the journals out of their bearings. The drop-grate *p* is furnished with  
 40 perforations *s* and has a downwardly-projecting arm *t*, operated by a connecting-rod *u*, which is controlled by a lever *v* in the cap. The frame or support *c* is furnished on its opposite sides with independent air trunks or mains 3, and these air trunks or mains are respectively supplied with air through the pipes *g*, which both connect through intermediate connections with the air-compressor *b*.

*w* indicates a storage-tank connected with  
 50 the air-compressor by a pipe *x*. The air-pressure in the air trunks or mains 3 on the opposite sides of the frames is thus equalized, and a practically uniform discharge of air throughout the bottom of the furnace is thus  
 55 secured. When the grates are shaken, the air-jets from the outlet 5 will permeate the mass of combustibles in different directions, thus helping to stir up the mass and promote combustion.

60 The discharge of air through the holes 5 in the drop-grate keeps the mass of combustibles lively upon the drop-grate, and when the drop-bar is operated to dump the refuse such refuse slides off readily.

65 The size of the outlets 5 from the air-passages 3 will be determined by the requirements of any particular case within the judg-

ment of the constructor. The detachable hollow grates *f* can be independently removed at any time for renewal in case of  
 70 breakage or other injury.

The air-compressor condenses the air, so that a large amount of oxygen is contained in a small compass, and this condensed air takes up the heat from the frame and the  
 75 grates and keeps them cool, and the heat thus taken from the furnace through the frame and grates is returned to the furnace in the condensed air, which is thereby adapted to produce more ready, rapid, and complete  
 80 combustion in the furnace.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a furnace, the combination of a hollow grate-frame with bearings therein and air-  
 85 outlets opening from the chamber of the grate-frame into said bearings; and hollow perforated grates furnished with journals which turn in said bearings and having perforations in the journals to register with the perfora-  
 90 tions in the bearings; means for supplying compressed air to the hollow grate-frame to supply said grates with air; and means for partially rotating the grates on their journals.

2. A furnace comprising a hollow grate-  
 95 frame furnished with bearings and holes leading from the hollow chamber to the bearings; hollow perforated removable shaker-grates having journals which turn in said bearings and furnished at their ends respectively with  
 100 holes to register with the holes in said bearings, said holes leading into the hollow chambers of the grates, respectively, to furnish air to the hollow grates.

3. A furnace comprising a support furnished  
 105 with an air-passage; grates pivoted in said support and respectively furnished with a main air-trunk and with fingers; said trunk and fingers being hollow and perforated to conduct air from said main trunk into the  
 110 furnace; a drop-grate furnished with perforations therethrough and pivoted in the support and also furnished with air-passages and with outlets opening from said air-passages; means for shaking the grates; and means for  
 115 operating the drop-grate.

4. In a furnace, a grate-support furnished on its opposite sides, respectively, with independent air-passages and with journal-bear-  
 120 ings; openings being provided in said bearings to communicate with the air-passages of their sides respectively; hollow grates mounted in the bearings and furnished with openings to register with the openings of the bearings, respectively, said grates being perfo-  
 125 rated to form outlets for the air.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Los Angeles, California, this 20th day of May, 1901.

WILLIAM NEWTON BEST.

Witnesses:

JAMES R. TOWNSEND,  
 JULIA TOWNSEND.