

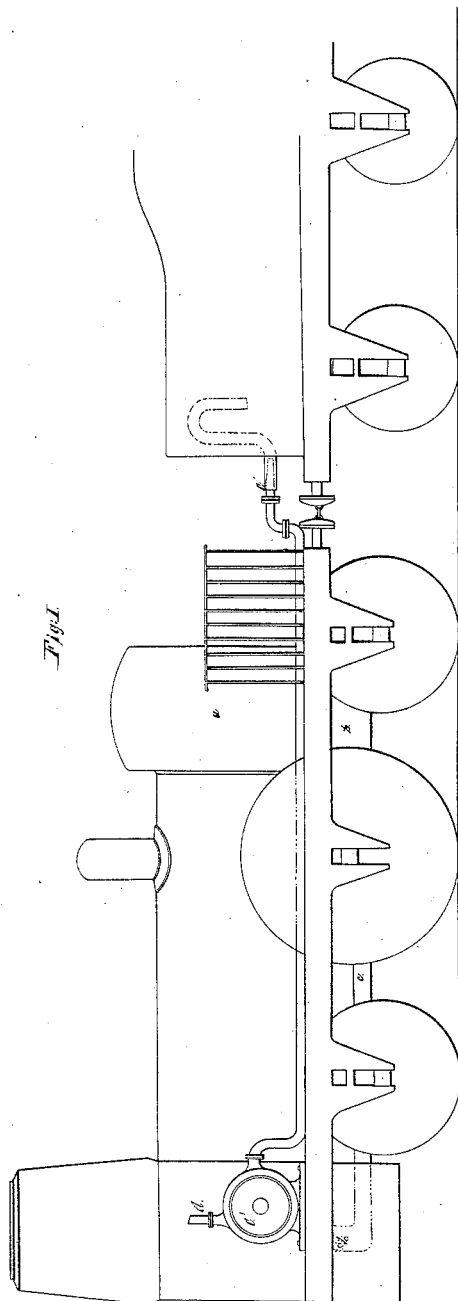
F. P. Dimmelfel,

2 Sheets-Sheet 1.

Steam-Boiler Furnace.

No 6,182.

Patented Mar. 13, 1849.

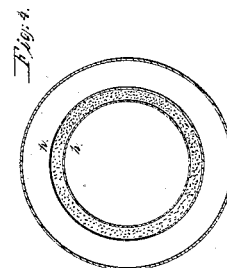
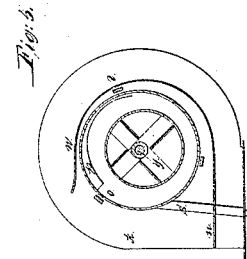
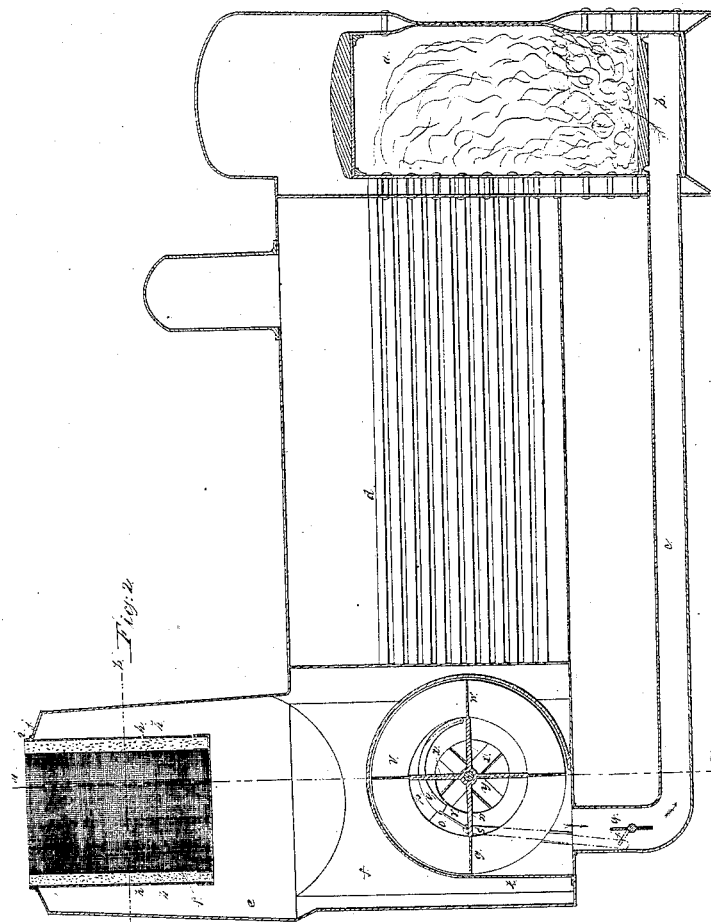
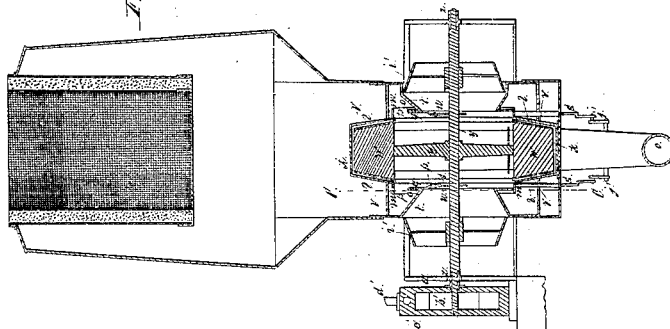


F. P. Dimpfel,
Steam-Boiler Furnace.

2 Sheets-Sheet 2.

N^o 6,182.

Patented Mar. 13, 1849.



UNITED STATES PATENT OFFICE.

FREDERICK P. DIMPFL, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN SMOKE-CONSUMING APPARATUS.

Specification forming part of Letters Patent No. 6,182, dated March 13, 1849.

To all whom it may concern:

Be it known that I, FREDERICK P. DIMPFL, of the city and county of Philadelphia, and State of Pennsylvania, have invented new and useful Improvements on the Improved Furnace for Economizing Fuel and Consuming Smoke secured to me by Letters Patent bearing date the 9th day of May, 1838, which improvements are specially applied to locomotive steam-engines, and parts of which are applicable to other purposes; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes them from all other things before known, and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a side elevation of the apparatus; Fig. 2, a longitudinal vertical section; Fig. 3, a cross vertical section taken at the line A *a* of Fig. 2; Fig. 4, a horizontal section taken at the line B *b*, and Fig. 5 another longitudinal vertical section taken at the line C *c* of Fig. 3.

The same letters indicate like parts in all the figures.

The improvements for which I now claim Letters Patent are, as stated above, based on the principle of the "improvement in furnaces for economizing fuel and consuming smoke," secured to me by Letters Patent of the date above recited.

The first of these improvements consists in operating the fan-blower of my improved apparatus by means of a steam-wheel on the shaft thereof and connected with the exhaust of the engine, that the steam-wheel may be operated by the exhaust-steam, when this is combined with the tender of a locomotive steam-engine by means of a universal joint and slide-pipe, whereby the exhaust-steam from the engine after driving the blower is discharged into the tender to heat the water preparatory to the introduction thereof into the boiler.

Of the second part of my invention: As in my improved furnace, a portion of the products of combustion are forced by the pressure in the furnace back into the fan-blower. This tends to prevent the entrance of the requisite supply of atmospheric air into the

fan-blower by the usual centrifugal action of the wings of the blower on the air. The object of this part of my invention is to overcome this difficulty, and consists in combining with the fan-blower, when used for this purpose, an auxiliary blower or blowers to force the requisite supply of atmospheric air into the main fan-blower, and thus overcome the internal pressure which otherwise tends to exclude the atmospheric air.

Of the third part of my invention: When the furnace-door is open, it will be evident that if the fan-blower is kept in action the products of combustion will be forced out of the door, and as it is a matter attended with great difficulty to stop the fan-blower whenever it becomes necessary to give access to the furnace for stoking and firing, in my Letters Patent to which I have referred above the damper in the blast-pipe is connected with the furnace-door, so that when the one is opened the other is closed, and vice versa; but this does not accomplish the desired end effectually. The aperture or apertures in the fan-blower through which the products of combustion enter the fan-blower being farther from the axis of the blower than the aperture or apertures for the introduction of atmospheric air, the closing of the blast-pipe does not entirely accomplish the desired end, for the atmospheric air that enters the fan-blower will be forced out through the aperture or apertures for the introduction of the products of combustion and be thus forced into the furnace. The object of the third part of my invention is to correct and avoid this, and consists in connecting and combining with the damper in the blast-pipe a damper or dampers which govern the aperture or apertures for the admission of the products of the combustion to the fan-blower, that when the furnace-door is opened the fan-blower may continue to rotate within its case without forcing anything out of the furnace-door.

Of the fourth part of my invention: Experiment has demonstrated to me that the pressure within the fan-blower exposes the fan-blower in its rotation to a change of pressure as its periphery passes by the aperture of the blast-pipe leading to the furnace, and as my improved blowing-wheel consists of two rings attached to and rotating with the vanes or wings this variation in the pressure causes

the rings to vibrate or buckle and the collars to bind on one side and open on the other, and consequently to increase friction and permit the gases to escape. It is important, however, to have a free passage for the currents of air and gases in the blower between the rings and the vanes or wings. To prevent the evil effects of this unequal pressure pointed out and at the same time avoid impeding the passages for the air and gases, I connect the two rings between the wings or vanes by means of metal rods, which take the strain and effectually prevent the evils pointed out. This part of my invention therefore consists in sustaining the rings of the wheel between the wings or vanes by means of brace-rods when such wheel is used for blowing and combined with an outer casing, within which it rotates, and which is provided with a blast pipe or nozzle.

Of the last part of my invention: In my original invention the gaseous products of the combustion escape through the interstices of a gravel bed or box. It is, however, difficult to obtain within a convenient space the requisite amount of surface, and when used for locomotive purposes the jars or jolts to which the locomotives are exposed have the effect to derange the pebbles or other particles of which this bed is composed. To obviate these difficulties I put the pebble-stones or balls of refractory earth, &c., in a space between two concentric vertical cylinders or prisms made of wire-gauze or perforated sheet metal or other grating which will retain them, and this I insert in the vertical chimney, so that all the gaseous products of combustion have to escape through interstices of this vessel to the inside thereof. This last part of my invention therefore consists in the peculiar construction of the box containing the gravel or other substance—that is, by making it of two concentric cylinders or prisms of wire-gauze or perforated sheet metal or other analogous grating between which the pebbles, &c., are placed when this is so combined with the chimney of a furnace as to prevent the escape of the products of the combustion, except through the meshes of the grating and the interstices of the pebbles or other substance within the concentric cylinders or prisms.

In the accompanying drawings, *a* represents a furnace of any desired construction with closed ash-pit *b*, into which the blast for the combustion is forced through a blast-pipe *c*. This furnace is provided with a flue *d*, that leads into a vertical chimney *e* of the usual construction, but provided with a smoke-box *f* of greater capacity than usual and sufficient to contain the blowing-wheel *g*. In the upper part of this chimney there is inserted two concentric cylinders of wire-gauze *h h*, closed at bottom and attached to a ring *i* at top provided with a flange which rests on a corresponding flange *j* at the upper end of the chimney, so that there will be

sufficient space between the chimney and the outer one of the perforated cylinders for the circulation of the products of combustion. The lower end of the inner cylinder is closed to prevent the escape of the products of combustion and compel them to pass through the meshes of the wire-gauze, and the upper end of the interior one is open for the escape of the gases, &c., after passing through the cylinders. The space between the two cylinders is to be filled up with small pebble-stones or balls made of clay or other earthy matter, leaving interstices between for the passage of the gaseous products of the combustion. By this means the escaping gases will be minutely subdivided and sufficiently impeded to prevent their escape, except under pressure, and therefore a constant pressure may be obtained and retained within the furnace by a blowing apparatus, and these pebbles or balls will produce the additional effect of retaining the solid particles of matter which are generally held in mechanical suspension in the gaseous products of combustion.

The case *k* of the blowing-wheel is placed in the lower part of the chimney or what corresponds with what is termed the "smoke-box" of a locomotive-boiler, so that it shall be heated by the passage of the products of combustion around it. This case is made in manner similar to my well-known fan-blower with the side rings *l l* slightly conical to correspond with the form of the blowing-wheel, and it is provided with a blast-pipe *c*, which extends to the closed ash-pipe. The rings *l l* are provided at their inner peripheries with short cylindrical flanges or collars *m*, into which corresponding flanges or collars on the rings of the blowing-wheel run, and outside of each of these there is a casing consisting of a screw-ring *n*, (see Fig. 5,) the outer part of which extends out in a horizontal tangent to the back of the smoke-box. This leaves a semicircular space around each collar for the passage of the products of combustion. Within each of the collars *m* there is a plate *o* with two apertures, one *p* in the form of a crescent and next to the periphery of the collar and governed by a damper *q*, jointed at one end to the plate and at the other by a joint-link *r* to a sliding rod *s*, so that by the sliding of this rod the damper *q* can either open or close the crescent aperture which communicates with the smoke-box by the space between the semicircular ring *n* and the collar, and a conical pipe *t*, attached to the plate *o*, so that the products of combustion in the smoke-box can pass through the crescent aperture into the case of the fan-blower when the dampers *q q* are open, but not when they are closed. The other aperture *u* in the plate *o* is circular, and is for the admission of atmospheric air to the fan-blower, so that as there is a plate like this on each side with the corresponding parts atmospheric air and a portion of the products of combustion will be admitted to the blowing-

wheel on each side—that is, when the dampers *q q* are open.

Within the casing, formed as specified, is placed the blowing-wheel *g*, which is formed of two rings *v v* in the form of flat frustums of cones connected together by radial vanes or wings *w* and then connected by arms *x* with a central shaft *y*, that extends out and has its bearings in boxes *z z* in cross-frames *a' a'*. On one end of this shaft there is a steam-wheel *b'*, consisting of radial vanes on a drum, and the whole works within a casing *c'*, to which exhaust-steam is admitted by the exhaust-pipe *d'*, these parts constituting a rotary engine which may be of any desired construction. After the steam has thus acted on the vanes of the steam-wheel it is conducted through a universal joint and slide-pipe *c''* to a tender of the usual construction, where it heats the water preparatory to feeding the boiler.

For the purpose of insuring the entrance of atmospheric air into the blowing-wheel against the pressure, which forces the products of combustion therein from the furnace, there is a wheel on each end of the shaft, and as both of these wheels are alike in every particular the description of one of them will be sufficient. It is composed of vanes radiating directly from the shaft and having their planes oblique to the axis, so that in rotating they force the air into the central opening of the blowing-wheel. These vanes are surrounded by a conical ring *i'*, the base of which is inward—that is, toward the blowing-wheel—and this runs against a reversed conical funnel *i*, so that the air that is drawn in by the obliquity of the vanes and by their centrifugal action shall have room to spread out within the ring, and then this is in turn concentrated by the reversed conical funnel *t*, that surrounds the circular aperture *p* for the admission of air to the blowing-wheel.

In the blast-pipe there is a turning or throttle damper *q'*, which governs the passage from the case of the blowing-wheel to the ash-pit, and the arbor of this damper has a crank-arm *j'* jointed to the sliding rod *s*, that operates the crescent damper *q*, so that both these dampers are opened and shut at the same time, that when the blast is shut off from the furnace the apertures through which a portion of the products of combustion enter the blowing-wheel are also closed, and the wheel may continue to turn without forcing any essential blast in the furnace, as the damper is always left open sufficient to keep the fire in a state of ignition.

I have thus described and pointed out minutely the mode of applying the principle of my improvements which I deem the best; but

I do not wish to confine myself to it, as this may be variously modified—as, for instance, any kind of steam-wheel which can be impelled by the direct action of steam may be substituted for the one described, as the object is simply to have the exhaust-steam act on the steam wheel and give the required rotation to the fan-blower as it passes on its way to the tender through the pipe, that must be provided in any well-known manner with a universal and slide-joint to admit of the vertical, lateral, and longitudinal play which takes place between a locomotive and its tender. So of the auxiliary blower or blowers, instead of making these to consist of oblique vanes and conical rings any other mode of construction may be substituted which will force the current or currents of air into the main blowing-wheel and insure their entrance, or a separate blowing wheel or wheels may be substituted with a blast-pipe leading into the main blowing-wheel; but it will be found that the mode particularly specified above is the simplest and fully efficient. Instead of the sliding bars for connecting and combining the damper in the blast-pipe with the dampers that govern the apertures that admit the products of combustion to the blowing-wheel, any other mode of connecting or combining these may be substituted therefor, as this part of my invention consists simply in effecting this connection and combination, and not in the means employed.

What I claim as my invention, and for which I now claim Letters Patent, is—

1. Combining with the blowing-wheel which forces the blast into the furnace, and which receives a portion of the products of combustion from the furnace, an auxiliary blower or blowers to insure the requisite supply of atmospheric air to the main blowing-wheel, substantially as described.

2. Connecting and combining the damper that governs the blast-pipe with the dampers that govern the apertures through which the products of combustion enter the fan-blower, for the purpose and in the manner substantially as herein described.

3. Making the case that contains the gravel or other impeding medium of a double cylinder or prism of wire-gauze or the equivalent thereof, when this is so combined with the chimney as to prevent the escape of the products of combustion, except through the interstices of the said impeding medium, substantially as described.

F. P. DIMPFEL.

Witnesses:

CH. M. KELLER,
A. P. BROWNE.