No. 734,626. PATENTED JULY 28, 1903.

C. SMITH.

APPARATUS FOR SAVING FUEL.

APPLICATION FILED JULY 2, 1900. RENEWED DEC. 30, 1902.

NO MODEL.

Fig. 1

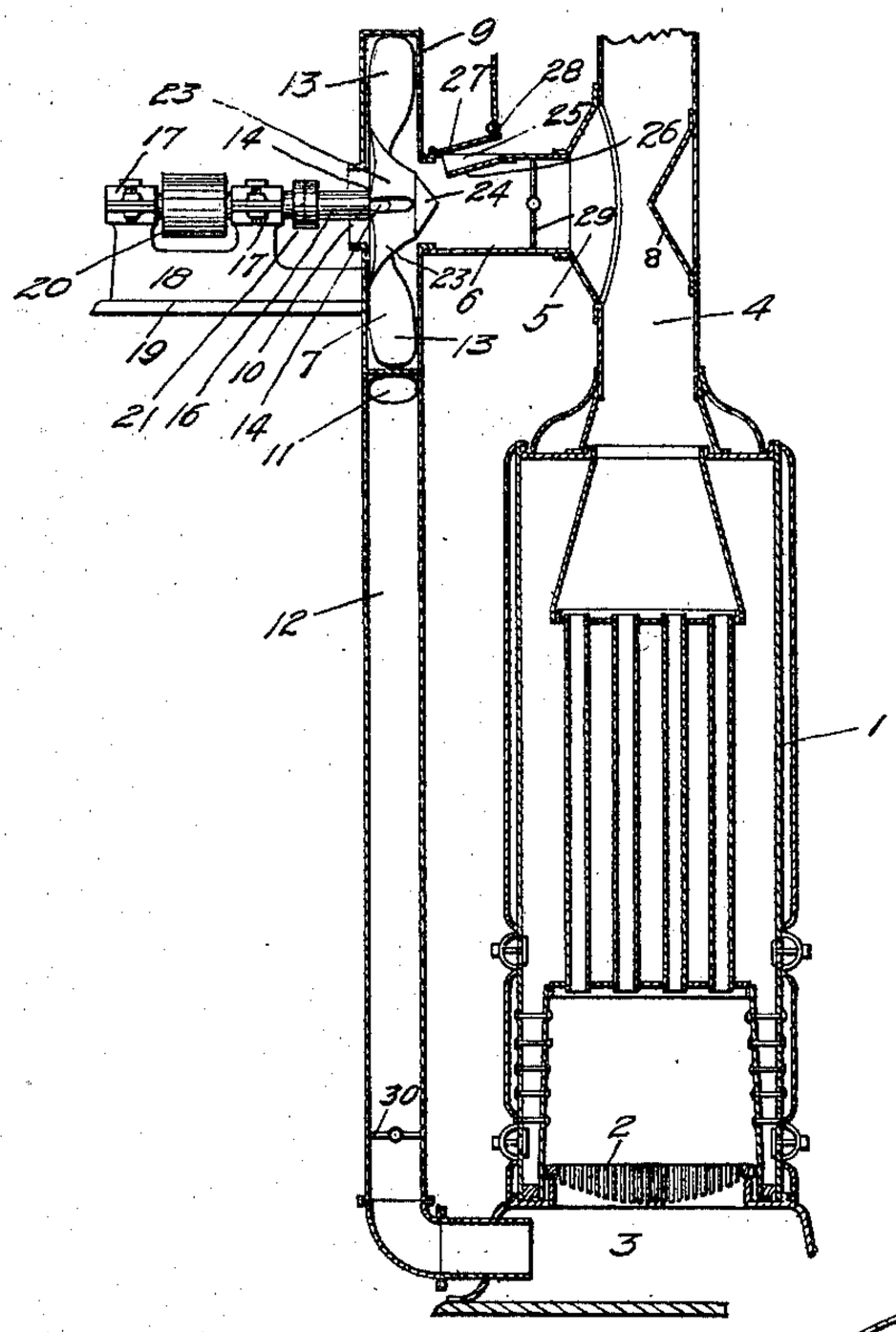


Fig. 3

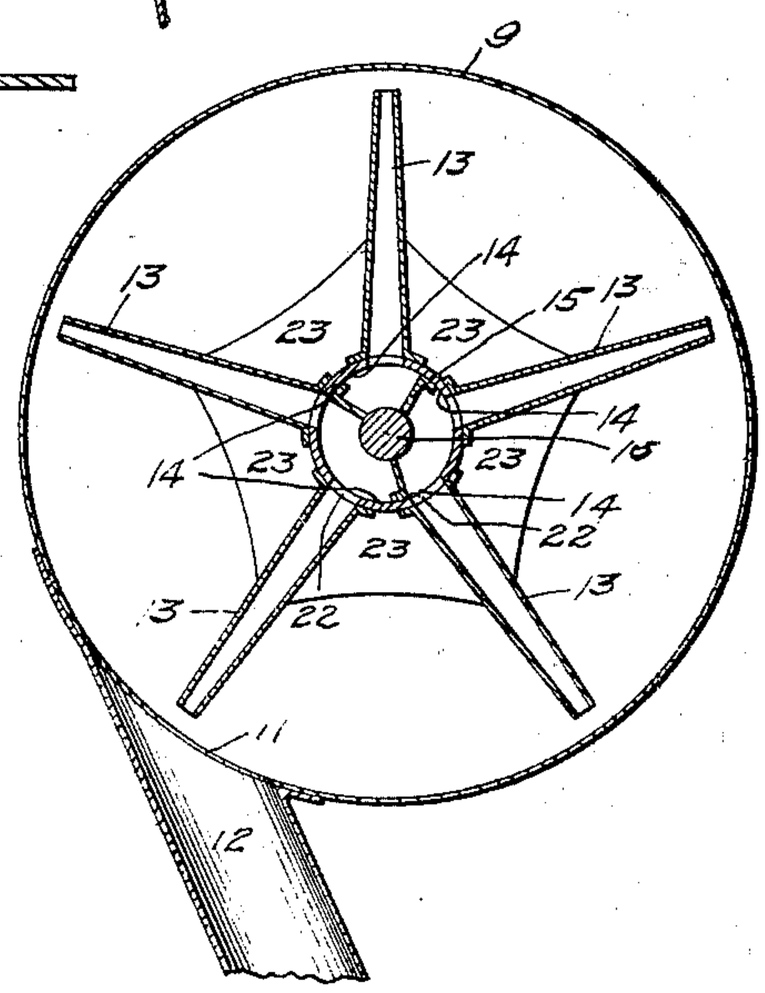
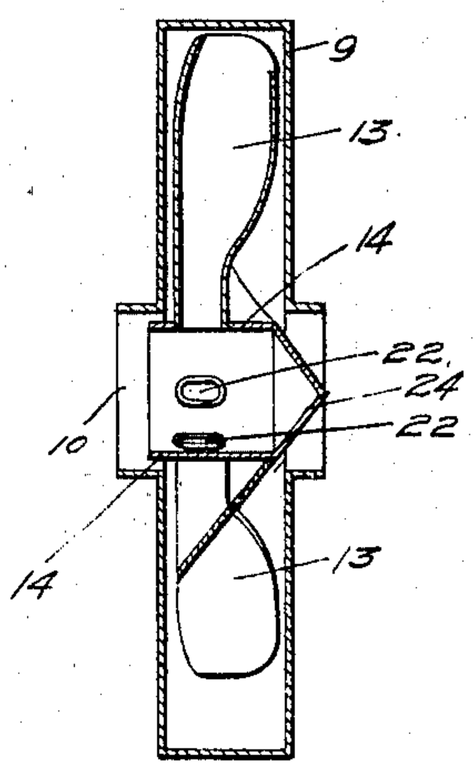


Fig. 2



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No. 734,626. Patented July 28, 1903.

UNITED STATES PATENT OFFICE.

CYRUS SMITH, OF IRWIN, PENNSYLVANIA.

APPARATUS FOR SAVING FUEL.

SPECIFICATION forming part of Letters Patent No. 734,626, dated July 28, 1903.

Application filed July 2, 1900. Renewed December 30, 1902. Serial No. 137,207. (No model.)

To all whom it may concern:

Be it known that I, CYRUS SMITH, a resident of Irwin, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Saving Fuel; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to an attachment for steam-boiler and other furnaces whereby the carbonic-acid gas and solid waste products of combustion are returned to the fire and more perfect combustion of the fuel secured and the efficiency of the furnace greatly increased.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of a steam-boiler furnace with my attachment applied. Fig. 2 is a longitudinal section through the fan-casing and fan, and Fig. 3 is a transverse section of the same.

I have illustrated my invention in connection with a vertical boiler 1, although any other type of boiler might be used. The boiler is provided with the usual furnace-grate 2, below which is the ash-pit 3, said ash-pit being provided with the usual doors, (not shown,) through which the ashes are removed and which supply the draft for the furnace. The furnace is further provided with a stack 4, which in the present instance has an enlarged portion 5, formed by a funnel-shaped device attached to one side of the stack, said chamber 5 communicating with a pipe 6, which leads to the fan 7. In the stack 4 opposite the pipe 6 is a conical deflector 8, the object of which is to direct the solid and heavy waste products of combustion toward the pipe 6.

The fan 7 is provided with a casing 9, which is or may be of the usual construction, said casing having an opening 10 on one side and being connected at the other side with the pipe 6. Said casing at its lower side has an opening 11, communicating with the pipe 12, which extends down and leads into the ash-pit 3, as shown in Fig. 1. The fan comprises five or other suitable number of radial arms 13, secured to a hollow hub or sleeve 14, said hub or sleeve being bolted or otherwise suitably secured to a spider 15, secured to the inner end of the shaft 16. This shaft is mounted in suitable bearings 17 on the frame 18, secured to the platform 19, which is suitably supported in proper relation to the boiler and stack. The shaft 16 is provided with a pulley 20, whereby the shaft may be driven from any suitable source of power, either the engine itself or a separate source. The shaft is furthermore provided with a water-cooling box 21, which prevents the heat being communicated from the fan to the journal-boxes 17.

Each of the wings 13 is made hollow, as shown in Figs. 2 and 3, the inner ends of the wings being flanged and suitably bolted or otherwise secured to the sleeve or hub 14, the latter being provided with openings 22, communicating with the interior of the wings. The wings are cut away at their inner front edges, as shown in Figs. 1 and 2, so that the base is substantially one-half the width of the upper ends thereof, and the opening at the inner end of said wings is somewhat smaller than the opening at the outer end thereof, thereby permitting a free flow of air through said wings. Between the wings are crescent-shaped deflector-plates 23, which are attached at their outer edges to the rear edges of the wings and project forward in a downwardly-inclined direction and are connected to the cone 24, secured to the front end of the sleeve or hub 14. The cone 24, together with the deflector-plates 23 and the cut-away portion at the base or inner front edges of the wings, provides for the free entrance of the waste products of combustion into the fan-casing and directs the same in the proper course to be drawn therein and discharged into the pipe 12.

On the upper side of the pipe 6 is provided a suitable opening 25, the bottom wall 26 of which slopes downward and leads toward the opening to the fan-casing. A suitable cover or door 27 is hung at one edge to the pipe 6 and is provided with a ring 28, to which may be attached a cord or similar device for holding said door or valve open to any desired degree. The pipe 6 is provided with a damper or other suitable valve 29 and the pipe 12 with a similar valve 30.

The operation of the device is as follows: The furnace may be started by natural draft, the dampers 29 and 30 being closed meanwhile to prevent back draft. After sufficient steam is generated to drive the fan 7 the damper 29 is opened wide and the damper 30 opened as wide as may be desired, the amount of opening of the damper 30 regulating the amount of draft secured through the fan. The fan is then set in motion, and as the carbonic-acid gas, carbon, and other waste products of combustion are ponderable quantities they are drawn into the fan-casing and discharged through the pipe 12 into the ash-pit 3 and directed into the fire, the door leading to the ash-pit being meantime closed. The fan not only draws in the solid and heavy waste products of combustion through the pipe 6, but also draws in air through the opening 10, which passes through the hollow hub 14 and the hollow wings 13. This air not only serves to keep the shaft 16 cool, but also aids in combustion in that it is mixed with the waste products of combustion and becomes heated thereby, thus acting as a hot blast for the fire. A further supply of air is drawn through the opening 25 in the pipe 6, the quantity whereof can be regulated by the door or valve 27.

It will be observed that the stack 4 is not provided with a damper, so that the natural draft is unobstructed, the fan serving merely to draw the more heavy waste products of combustion from the stack and return them to the furnace. The combustion of the fuel therefore is much more perfect than with the ordinary style of furnace, and at the same time the draft of the furnace is in no manner obstructed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a device of the class specified, the combination with the furnace, ash-pit and unobstructed stack, of a fan, and casing therefor, pipes leading from the same to the stack and ash-pit, respectively, and means in the stack for deflecting the solid and heavy waste products of combustion into the pipe leading to the fan.

2. In a device of the class specified, the combination with the furnace, ash-pit and unobstructed stack, of a fan and casing therefor, pipes leading from the same to the stack and ash-pit respectively, and a stationary conical deflector in the stack opposite the pipe leading to the fan.

3. In a device of the character specified, the combination with the furnace, unobstructed stack and ash-pit, of a fan and casing therefor, pipes leading from the same to the stack and ash-pit respectively, said fan being provided with hollow wings communicating at their inner ends with the atmosphere and a valved opening in the pipe leading from the stack to the fan.

4. In a device of the character specified, the combination with the furnace, unobstructed stack and ash-pit, of a fan-casing, pipes leading from the same to the stack and ash-pit respectively, said casing being provided with an opening opposite the pipe leading to the stack, a valved opening in the pipe leading from the stack to the fan-casing, a fan in said casing and arranged to draw the products of combustion from the stack and having a hollow hub communicating with the opening in the casing and hollow wings communicating with the hollow hub and deflector-plates between the wings and sloping toward the pipe leading to the stack.

5. In a device of the character specified, the combination with the furnace, unobstructed stack and ash-pit, of a fan and casing therefor, pipes leading from the same to the stack and ash-pit respectively, said fan being provided with hollow wings having narrow bases communicating with the atmosphere and broad outer ends, deflector-plates between the wings and sloping toward the pipe leading to the stack and a valved opening in the pipe leading from the stack to the fan.

In testimony whereof I, the said CYRUS SMITH, have hereunto set my hand.

CYRUS SMITH.

Witnesses:
D. M. THORNE,
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