(No Model.)

D. C. KELLAM.

Smoke Consumer.

No. 238,917. Patented March 15, 1881.

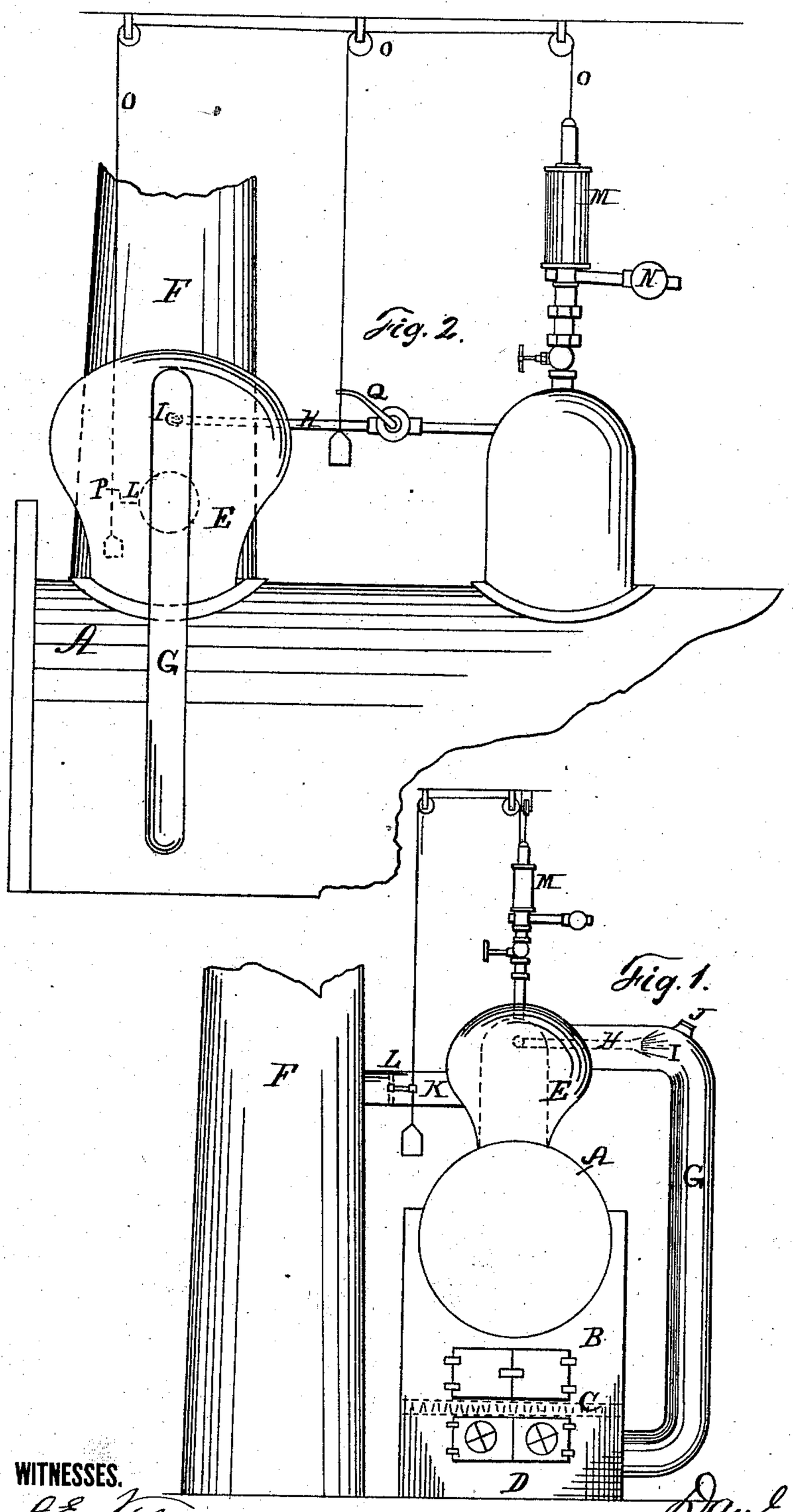

Fig. 2.

Fig. 1.

WITNESSES.

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SMOKE-CONSUMER.

SPECIFICATION forming part of Letters Patent No. 238,917, dated March 15, 1881.

Application filed December 14, 1880. (No model.)

To all whom it may concern:

Be it known that I, DANIEL C. KELLAM, of Detroit, county of Wayne, State of Michigan, have invented a new and useful Improvement in Smoke-Consumers; and I do hereby declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

My invention consists, essentially, in combining with a steam-boiler furnace a dome or drum into which the products of combustion pass before entering the smoke-flue, and providing the said drum with a return-flue leading from the drum or dome back to and discharging into the ash-pit beneath the grate-bars, which ash-pit is made close, and providing, also, a steam-jet within the said return-flue, so that when steam is on, this steam-jet, operating in the return-flue, will cause the products of combustion to be driven around into the ash-pit and passed again through the grate and incandescent fuel, thereby burning the smoke, the steam-jet furnishing the necessary oxygen to supply combustion; secondly, in combination with the apparatus above described, a damper-regulating device which shall operate to open and close the damper when it is desired to increase or decrease the pressure of the steam, said damper-regulator mechanism adapted at the same time to operate a valve which shall turn on or turn off the steam at the steam-jet.

In the drawings, Figure 1 is a view, in cross-section and elevation, of a steam-boiler and its furnace provided with my smoke-consuming apparatus. Fig. 2 is a side view of the same.

I would at the outset have it clearly understood that in the drawings is simply represented one of many arrangements that may be adopted for the purpose of demonstrating my invention; but that I do not limit myself to any particular construction or arrangement of the parts, so that there is retained in combination an apparatus composed of the elements illustrated in the drawings and described in the specification.

Heretofore in smoke-consuming apparatus it has been the aim generally to introduce oxygen to the products of combustion in the combustion-chamber above the incandescent fuel, and rely upon the heat within the furnace to produce with the oxygen thus supplied a perfect combustion of the smoke. So, also, a fan driven by other machinery has been employed to deflect the products of combustion from the smoke-chamber into the return-flue, and pass them back beneath and up through the grate. In this latter mechanism, however, it has been necessary to run the fan by some external engine, thus necessitating the engine to run at all times when the smoke-consuming apparatus was in operation.

It is the object of this invention to produce a device which shall operate either at will or automatically without the intervention of any external driving machinery.

To this end, A represents a steam-boiler. This boiler may be either a direct-draft boiler or a return-flue boiler. That represented in the drawings is of the latter class.

B is the combustion-chamber of the furnace; C, its grate; D, its ash-pit.

E is a dome or chamber into which the products of combustion pass after they have expended their heat upon the boiler and before entering the smoke-flue or chimney F. From this dome E a return flue, G, descends and discharges into the ash-pit beneath the grate-bars, which ash-pit is made close, so as to leave no opening through which the smoke can pass except up through the grate-bars, though there may be provided in the ash-pit doors the usual dampers or air-registers by which air can be admitted when the furnace is operated by natural draft, as would be the case always before steam has been raised.

H is a steam-pipe leading from the boiler and passing into the return-flue G, so as to deliver a spray or jet of steam at I.

J is an air-inlet governed by a suitable register, which may be employed in case it is desired to supply more oxygen than is furnished by the steam-jet itself.

K is a smoke-flue leading from the drum into the chimney, which smoke-flue may be governed by a damper, L.

The operation of this part of the mechanism will now be explained.

When the fire is started in the furnace the

air-register in the ash-pit is opened, as, also, the damper L. The fire is thus operated by direct draft until steam has been generated, and up to this time whatever smoke has been formed will pass upward and out of the chimney. As soon as steam is generated the damper L may be partially closed, and steam turned on through the steam-pipe H, which, delivering its jet at I, will, by the partial vacuum, draw the smoke forward and force it down through the return-flue into the chamber or ash-pit, and pass the products again up through the grate-bars and incandescent fuel, thus burning out the carbon, the damper L being so regulated as to take off the excess of gaseous matter into the smoke-stack. By this process, however, the smoke will generally be thoroughly consumed, so that no smoke will issue from the chimney.

I will now describe the mechanism whereby the device is made to operate automatically.

M is a damper-regulator of any desired character, governed by a lever and weight, N, or by other suitable mechanism, so as to operate at any given pressure of steam. This damper-regulator, through suitable connections, O, is united with the lever P which actuates the damper L, and is also connected with the lever Q which actuates the valve in the steam-pipe H. Now, when the steam-pressure reaches the limit fixed by the damper-regulator, the plunger connected with the damper-regulator rises, and, drawing upon the cord O, closes the steam-valve and opens the damper L, so that the fire will burn thereafter by direct draft until the steam-pressure has been reduced below the fixed limit by the regulator, at which time the plunger, by descending, will close the damper L, and turn on the steam-jet in the steam-pipe H, causing the return of the products of combustion back through the grate and furnace. In this way it will be seen that the smoke-consuming apparatus is caused to operate at all times when the heat of the furnace is at such a degree as not to consume the smoke, but is automatically thrown out of operation and the direct draft employed whenever the heat of the furnace is of such a degree as to consume the smoke without the aid of the smoke-consumer; and the damper-regulator is so arranged as to control the fire and hold the steam at uniform pressure.

What I claim is—

1. In a smoke-consuming apparatus, the combination, with a steam-boiler furnace, a smoke chamber or dome, a return-flue leading to the ash-pit and provided with an air-inlet, J, of a steam-jet discharging into the return-flue, whereby the products of combustion are drawn back to the grate-bars and take up oxygen supplied by the auxiliary air-inlet, substantially as described.

2. The combination, with the smoke chamber or dome and the chimney, of a connecting smoke-flue governed by a damper, and return-flue leading from the dome to the ash-pit, a steam-jet governed by a valve, and a damper-regulating device, whereby the steam-valve and smoke-damper are governed automatically, substantially as and for the purposes described.

3. The combination, with the smoke-dome provided with a steam-jet governed by a steam-valve, of an automatic regulator connected with the steam-valve, whereby steam is cut off from the jet when the pressure in the generator exceeds a fixed limit, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

DANIEL C. KELLAM.

Witnesses:

WM. M. PORTER,

S. E. THOMAS.