

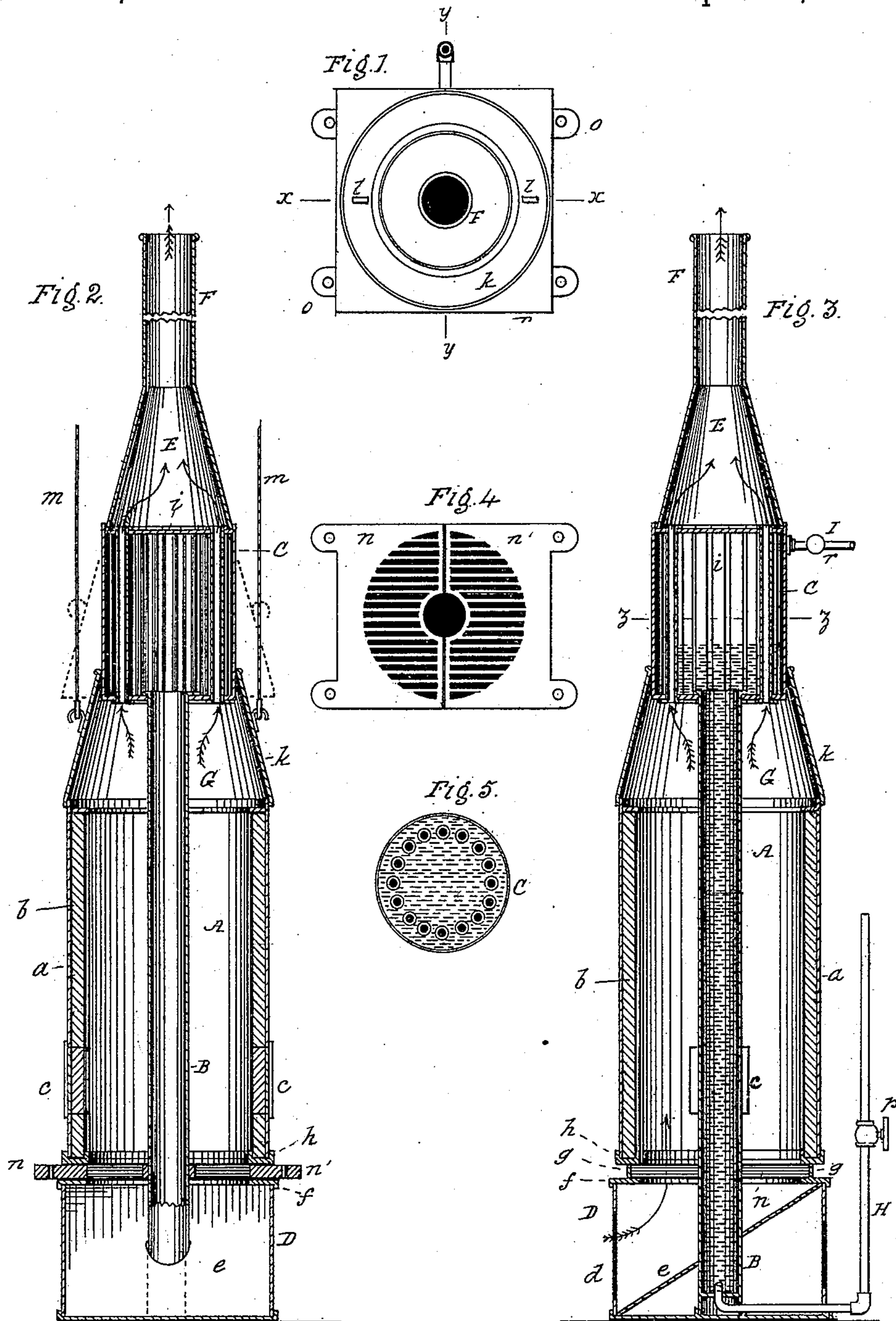
(No Model.)

C. GODFREY.

APPARATUS FOR UTILIZING WASTE HEAT OF KILNS IN GENERATING
STEAM.

No. 297,381.

Patented Apr. 22, 1884.



Witnesses:
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR UTILIZING WASTE HEAT OF KILNS IN GENERATING STEAM.

SPECIFICATION forming part of Letters Patent No. 297,381, dated April 22, 1884.

Application filed August 6, 1883. (No model.)

To all whom it may concern:

Be it known that I, CORNELIUS GODFREY, of East Williston, in the county of Queens and State of New York, have invented a new and useful Improvement in Apparatus for Utilizing Waste Heat of Kilns in Generating Steam; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form a part of this specification.

The objects of this invention are to provide improved means for utilizing the waste heat from kilns of various kinds for the purpose of generating steam to drive machinery, or for other purposes for which steam may be required, and to construct an apparatus of convenient and inexpensive form whereby such heat may be utilized for said purposes.

The primary design of my invention is to generate steam for driving, crushing, and grinding machinery in cement-works by means of the waste heat from the kiln or kilns in which the stone is burned; but it is equally applicable to any structures of a similar kind in which heat goes to waste.

The invention consists in the combination, in an apparatus for utilizing the waste heat of cement-kilns and similar structures, of a tubular steam-generator placed immediately over the kiln, an upright pipe passing through the center of the kiln and communicating with the said generator, and appliances for taking steam from said generator, and appliances for supplying water to said upright pipe, all as hereinafter particularly described; and it further consists in the novel constructions and combinations of parts, as hereinafter set forth.

In the accompanying drawings I have shown an apparatus of simple, convenient, and inexpensive construction, whereby my said invention may be carried into practice.

In the said drawings, Figure 1 represents a plan view; Fig. 2, a vertical section on the line *x x*; Fig. 3, a vertical section on the line *y y*; Fig. 4, a top view of the fire-grate, and Fig. 5, a horizontal section on the line *z z* in Fig. 3.

Similar letters of reference indicate the same parts in all the several figures.

A represents the body of the kiln in which the stone or other substance to be treated with heat is placed. The outer case, *a*, is of sheet

metal, and a lining, *b*, of fire-brick or other refractory material, is placed inside of the same.

c c are openings or doors through which the coal or other fuel is supplied when charging the kiln.

D is the base upon which the body A is supported, and which may be of metal or other suitable material. It is open at one side, as at *d*, to admit air, and is provided with an inclined plate or chute, *e*, upon which the contents of the kiln are received when the latter is discharged. An annular plate, *f*, provided with upright flanges *g*, is fitted over the top of the base D, and another annular plate, *h*, rests upon said flanges and forms the foundation or support of the body A of the kiln.

The steam-generator consists of an upright tube or pipe, B, which passes upward through the centers of the base D and body A of the kiln, and a tubular receptacle, C, which is connected with the upper end of B. This receptacle C is somewhat smaller in diameter than the interior of the kiln, and the upper portion of the same forms the steam-chamber. A number of pipes or flues, *i*, open at both ends, pass through the said receptacle C, their upper ends connecting with a conical chamber, E, which forms the base of the chimney F, and their lower ends connecting a chamber, G, directly over the top of the body A of the kiln. These pipes *i* may either be arranged in a circular row, as shown in Fig. 5, or distributed in straight rows, if preferred, their object and purpose being to conduct the heat and smoke through the receptacle C. The chamber G is formed by means of a sheet-metal jacket or hood, *k*, in the form of a frustum of a cone, the lower edge of which rests upon the top of the body A, and the upper edge of which fits snugly around the exterior surface of C, and said jacket *k* is provided with ears *l l*, to which are attached ropes or chains *m m*, (operated by any suitable power,) by which the said jacket may be lifted to the position shown by the dotted lines in Fig. 2, when the kiln is to be charged. *n* and *n'* represent the fire-grate, which is made in two sections, as shown, and provided with a central opening to allow the pipe B to pass through it, and with ears *o o*, by which it may be withdrawn, one section at a time, when the kiln is

to be discharged. This grate is made to fit in between the plates *f* and *h* and flanges *g g*.

H is a supply-pipe for supplying water to the generator, provided with a suitable valve or cock, *p*, for regulating the supply; and *I* is a steam-discharge pipe for taking the steam from the generator, provided with a suitable valve, *r*.

The arrows in the drawings indicate the direction of the draft.

By means of these constructions a convenient and effective apparatus or structure for the purpose above mentioned can be erected at a comparatively small expense; and I may state that while the waste heat is utilized the action of the kiln itself is improved, as the apparatus has a tendency to equalize the heat throughout the entire mass of stone or other material subjected to the action of heat in the same, by reason of the pipe *B* abstracting a small proportion of the heat from the center of the mass, where under ordinary circumstances it is much higher in degree than at the outer portions, and consequently a more uniform burn is obtained.

I am aware that a steam-generator has heretofore been used in connection with a kiln for utilizing the waste heat of the latter to produce steam, and I do not broadly claim as my

invention an apparatus for utilizing the waste heat of a kiln for that purpose.

What I claim as my invention is—

1. In an apparatus for utilizing the waste heat of cement-kilns and similar structures to generate steam, the combination of the tubular boiler or steam-generator *C*, the upright pipe *B*, passing through the center of the kiln, and connecting with said generator *C*, and appliances, as described, for taking steam from said generator and for supplying water to said pipe *B*, as and for the purposes set forth.

2. The combination, with a cement-kiln or similar structure, *A*, of the steam-generator *B C*, consisting of the central tube, *B*, and tubular receptacle *C*, the water-supply pipe *H*, and the steam-discharge pipe *I*, and arranged in relation to said kiln, substantially as shown and described.

3. The grate *n n'*, made in two separate sections, and provided with the ears *o o*, as described, in combination with the body *A*, plate *f*, provided with flanges *g g*, and plate *h*, as and for the purposes set forth.

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