3 Sheets—Sheet 1.

J. E. WEAVER.

EVAPORATING APPARATUS.

No. 180,441.

Patented Aug. 1, 1876.

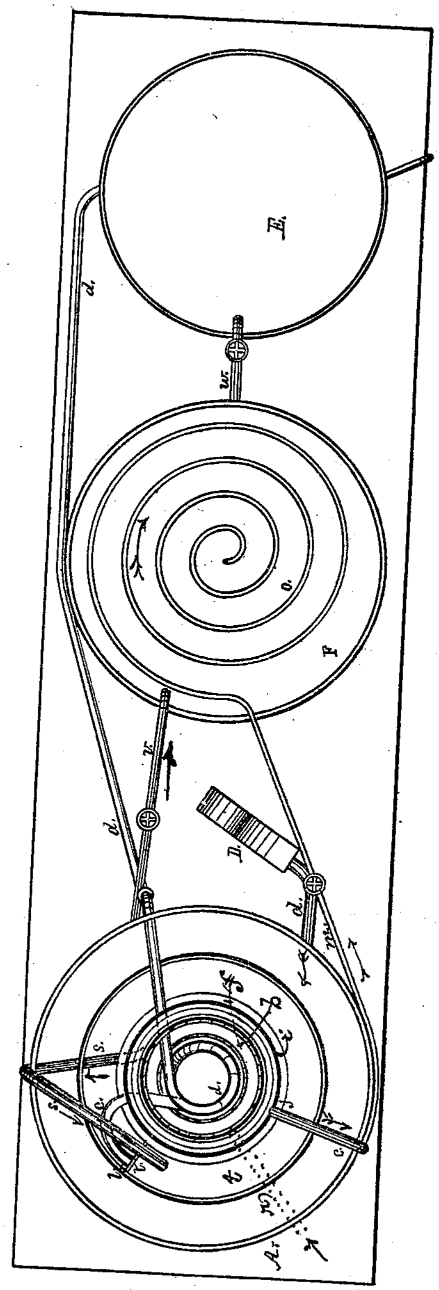

Fig: 1.

Witnesses.

James J. Johnston

A. H. Johnston

Inventor.

Jas. E. Weaver

3 Sheets—Sheet 2.

J. E. WEAVER.

EVAPORATING APPARATUS.

No. 180,441. Patented Aug. 1, 1876.

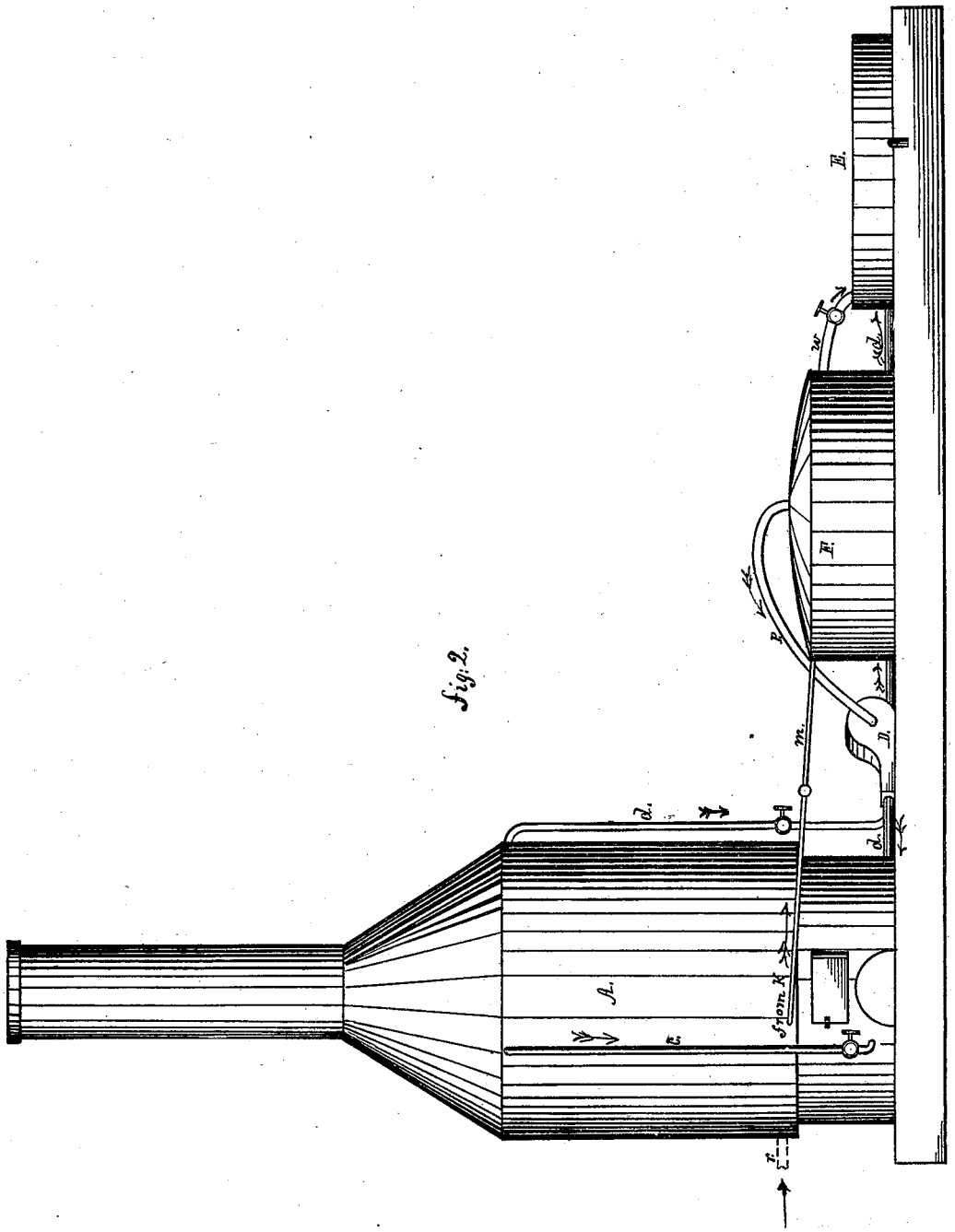

Fig. 2.

Witnesses.
James L. Johnston
A. H. Johnston

Inventor.
Jas. E. Weaver

3 Sheets—Sheet 3.

J. E. WEAVER.

EVAPORATING APPARATUS.

No. 180,441. Patented Aug. 1, 1876.

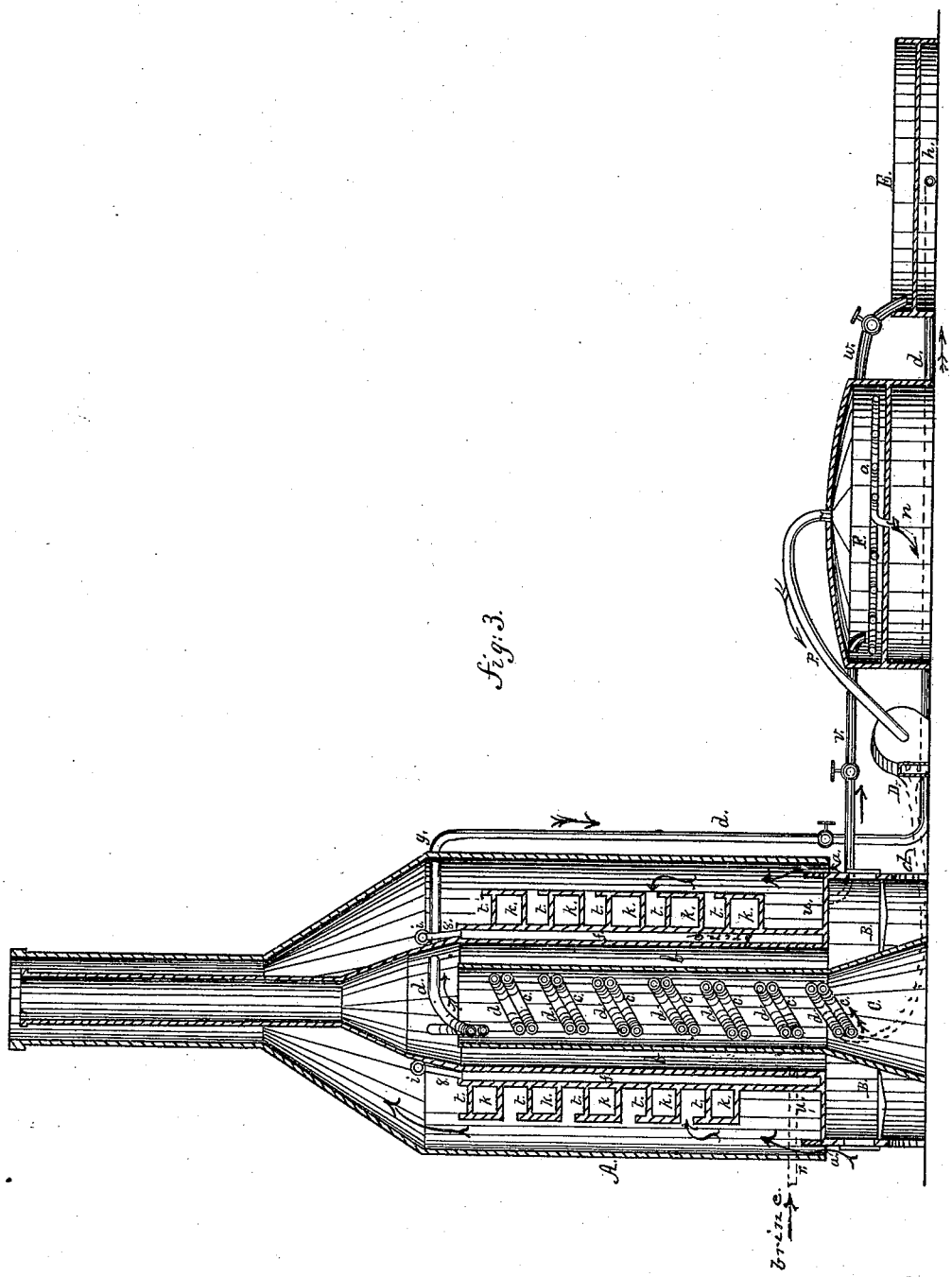

Fig. 3.

Witnesses.

James A. Johnston

W. J. Johnston

Inventor.

John E. Weaver

UNITED STATES PATENT OFFICE.

JAMES E. WEAVER, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN EVAPORATING APPARATUS.

Specification forming part of Letters Patent No. **180,441**, dated August 1, 1876; application filed January 24, 1876.

To all whom it may concern:

Be it known that I, JAMES E. WEAVER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Evaporating Liquids in the Manufacture of Salt and Sugar; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

My invention relates to an improvement in apparatus for evaporating liquids in the manufacture of salt and sugar; and consists in the peculiar construction of the furnace for heating the liquid, and the steam or vapor rising from it, said furnace being combined with a boiling-pan, suction-fan, and granulating-vat, arranged and operating with relation to each other in the manner hereinafter described.

To enable others skilled in the art to make and use my invention, I will proceed to describe more fully its construction and operation.

In the accompanying drawings, which form part of my specification, Figure 1 is a top view or plan of the apparatus. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical section of the furnace, boiling-pan, and granulating-vat.

In the accompanying drawings, A represents the outer case of the heating-furnace, having openings at *a* for the inlet of air. The heater or furnace is furnished with a series of fire-chambers, B, which communicate with a circular flue, *b*, in which flue is arranged a center chamber, C, for the spiral pipes *c* and *d*. The pipe *d* is connected with a suction-fan, D, and passes up the center chamber C in a spiral coil, passing out of the heater at *g*, then down and along to the chamber *h* of the granulating-vat E. The pipe *c* is connected to the circular steam-drum *i*, as indicated at *j* in Fig. 1, and passes out through the case A of the heater, then downward and up through the chamber C in a spiral coil, and is connected to the spiral steam-chamber *k* at *l*, the steam passing from the spiral steam-chambers *k* into the pipe *m*, which terminates in chamber *n* under the boiling-pan F, the pipe *m* forming a horizontal coil in the boiling-pan, as indicated at *o*. *t* represents a spiral channel, which is on the upper side of the spiral steam-chamber *k*. *u* represents a receiving-pan for receiving the liquid from the spiral channel *t*. To the pan *u* is attached a pipe, *v*, which communicates with the boiling-pan F, which communicates with the granulating-vat E through the medium of a pipe, *w*. *f* represents a liquid-chamber with which the steam-drum *i* is connected by a series of pipes, 8.

The operation of my improvement is as follows: Fire being made in the fire-chamber B the liquid is allowed to flow into chamber *f* by means of a pipe indicated by dotted lines *r*, where, becoming heated, it flows from the the upper part of chamber *f*, and through pipe *s* into the upper part of the spiral channel *t*, and flowing down it falls into the pan *u*, from which it is conveyed into the boiling-pan F by means of a pipe, *v*. The liquid in its passage up through the chambers *f* and down along the channel *t* into the pan *u* is heated to a very great degree, and its density increased prior to entering the boiling-pan F, from which the vapor is drawn off through pipe *p* by the suction-fan D, and forced up through the spiral pipe *d*, and down through it to the chamber *h* of the granulating-vat E. The steam rising from the liquid in the chamber *f* passes up through pipes 8 into the steam-drum *i*, from which it passes through pipe *c* down it, then up through the spiral coil into the spiral steam-chamber *k* at *l*, and passing down through it enters the pipe *m*, and passing along it and through the horizontal coil indicated at *o* enters the chamber *n* under the boiling-pan F.

It will be observed that the vapor rising from the liquid in the boiling-pan F is conveyed from it, then after passing through the pipe *d*, wherein it is highly heated, finally enters the chamber *h* for heating the liquid in the granulating-vat, and it will also be observed that the steam which rises from the liquid in the chamber *f* is conveyed through pipe *c*, and through the spiral chamber *k* entering pipe *m*, from which it flows into chamber *n* under the boiling-pan, which steam, being heated in its passage through pipe *c* and chamber *k*, is utilized for boiling the liquid

in the pan F. Thus it will be seen that nearly all the vapor, steam, and heat rising from the liquid in the operation of evaporating it is again utilized in the process of evaporating the same liquid from which it rises. The air passing in at the openings *a*, and up through the heater, facilitates the process of carrying off the vapor rising from the liquid in its passage down the spiral channel *t*.

By the construction and arrangement of the several parts hereinbefore described, the advantages are, economy of fuel, and saving of time and labor in the process of manufacturing salt or sugar.

What I claim as of my invention is—

1. In an apparatus for manufacturing salt or sugar, a heater having a series of fire-chambers communicating with one stack, around which is a liquid chamber, and a spiral channel for the liquid to flow over, and a spiral steam-chamber, and within the stack a chamber for heating the steam in its passage through coils of pipe, substantially as herein described, and for the purpose set forth.

2. The combination of a heater, constructed substantially as hereinbefore described, with the boiling-pan F, suction-fan D, and pipes *p d*, and chamber *h* of the granulating-vat, substantially as herein described, and for the purpose set forth.

3. The combination of liquid-chamber *f*, circular steam-drum *i*, with pipes *c*, spiral steam-chamber *k*, pipe *m*, and boiling-pan F, substantially as herein described, and for the purpose set forth.

4. The liquid-chamber *f*, in combination with the pipe *s*, channel *t*, pan *u*, and pipe *v*, substantially as herein described, and for the purpose set forth.

JAS. E. WEAVER.

Witnesses:
JAMES J. JOHNSTON,
A. H. JOHNSTON.