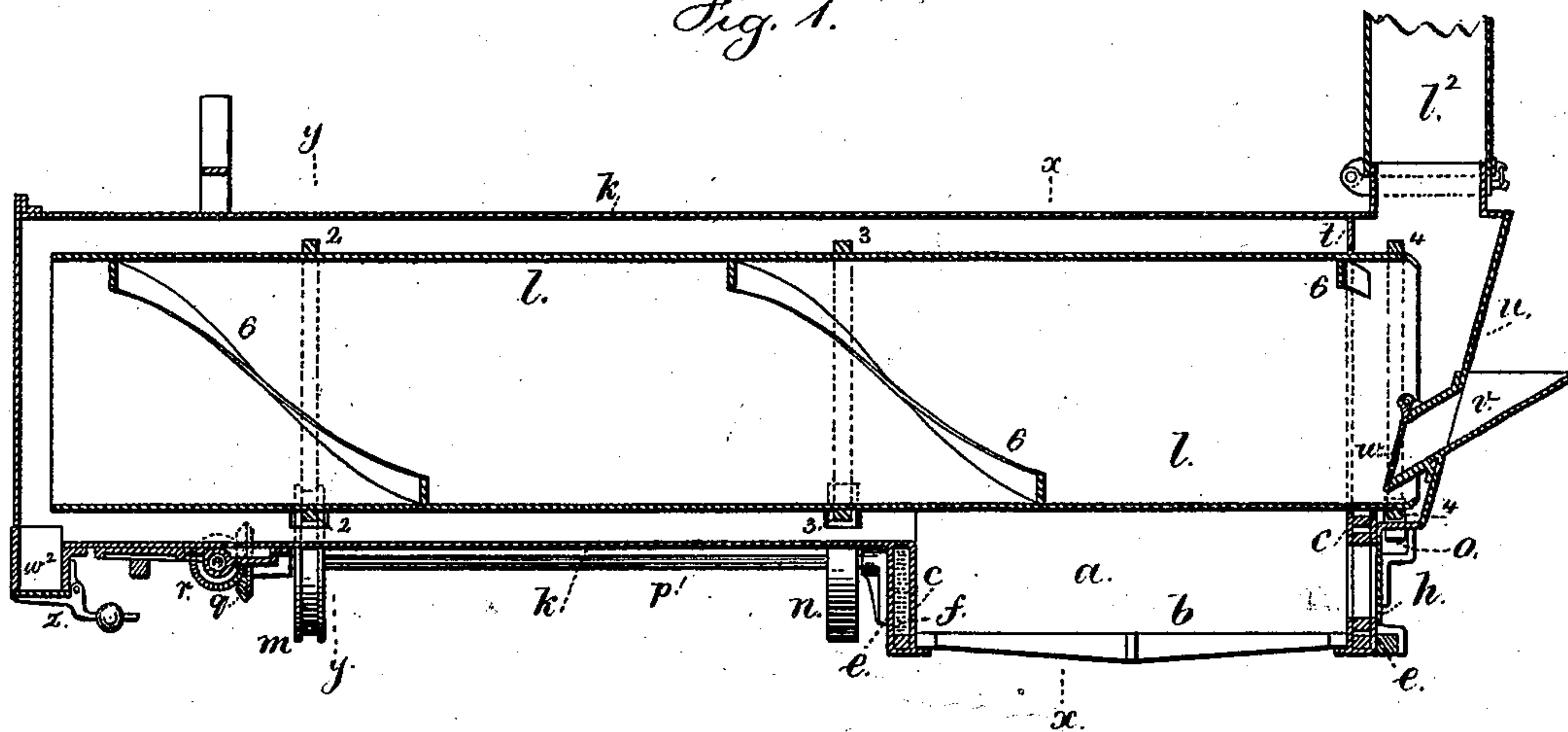
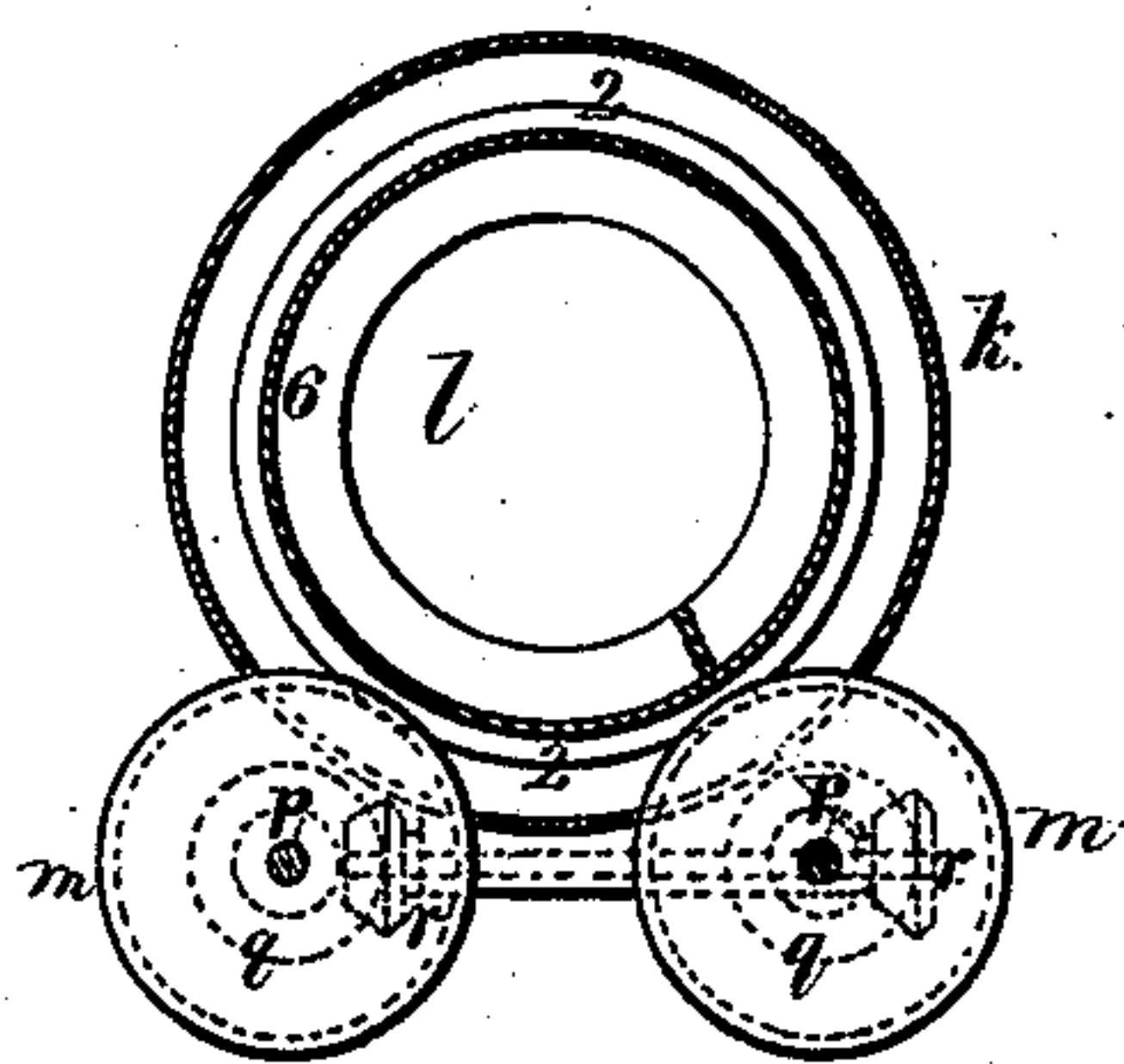


W. MORGAN.  
Apparatus for Drying and Heating Gravel, &c.  
No. 210,139.                      Patented Nov. 19, 1878.

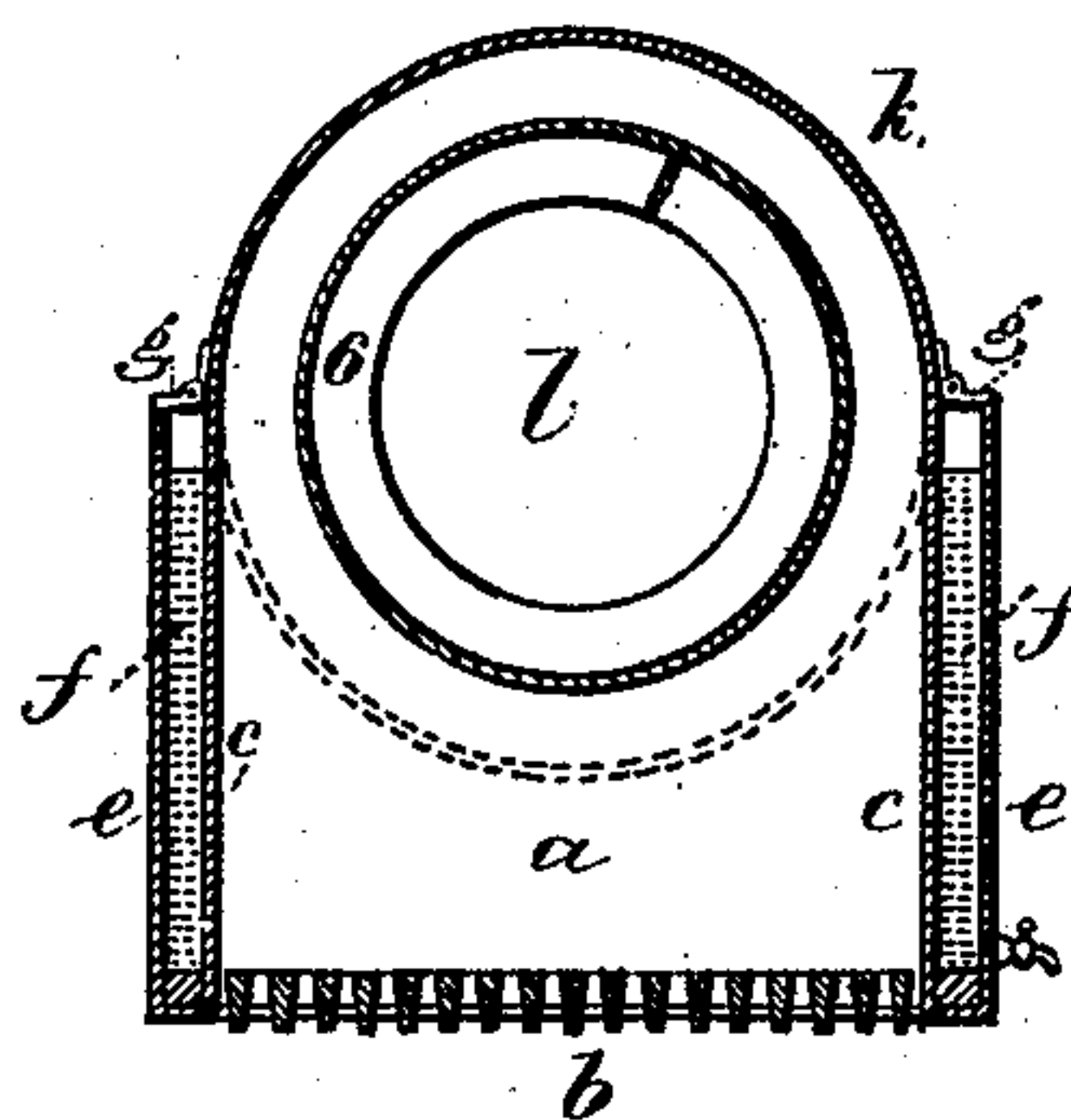
*Fig. 1.*



*Fig. 3.*



*Fig. 2.*



*Witnesses*

*Chas. H. Smith  
Geo. C. Pinckney*

*Inventor*

*William Morgan  
per Lemuel W. Perrell  
att'y*



# UNITED STATES PATENT OFFICE.

WILLIAM MORGAN, OF NEW YORK, ASSIGNOR TO HIMSELF, JOHN P. CRANFORD, AND NATHAN B. ABBOTT, OF BROOKLYN, N. Y.

## IMPROVEMENT IN APPARATUS FOR DRYING AND HEATING GRAVEL, &c.

Specification forming part of Letters Patent No. **210,139**, dated November 19, 1878; application filed March 1, 1878.

*To all whom it may concern:*

Be it known that I, WILLIAM MORGAN, of the city and State of New York, have invented an Improvement in Apparatus for Drying and Heating Gravel, &c., of which the following is a specification:

Furnaces have been made for drying the gravel employed for composition-pavements, and revolving cylinders sustained by central shafts have also been used in such driers, and the furnace has been lined with fire-brick. These gravel-driers have to be moved from place to place, and the fire-brick lining makes them very heavy, and often in the transportation, or by careless use of the poker or of the introduction of the wood fuel, the fire-brick become misplaced or broken, and the exposed metal portions of the furnace are burned out.

Agricultural boilers have been made with a water-jacket to the furnace, and driers for grain and ores have been made of a revolving cylinder with an internal screw-flange, and through which heated gases have passed to a chimney.

My drier is portable. A water-jacket is made use of to prevent the furnace burning out. There is a cylinder over the fire that is supported upon rollers, one set of which is outside the front of the furnace, and there is a partition through which the drying-cylinder projects, and a casing at the base of the chimney for the products of combustion. The supply-hopper opens through this casing, and is provided with a weighted inlet-valve, and the gravel is discharged at the back end of the cylinder through a hopper with a weighted valve.

In the drawing, Figure 1 is a longitudinal section of the drying apparatus complete. Fig. 2 is a cross-section through the furnace at the line *x x*, and Fig. 3 is a cross-section at the line *y y*.

The furnace is made as a fire-chamber, *a*, with grate-bars *b*, and an inner shell, *c*, and outer shell, *e*, connected together at the bottom, so as to form a water-space, *f*. There are hinged covers *g* at the upper parts of the water-space to allow the steam to escape, and also to provide for the introduction of water as required from time to time, and there is a

plug or cock at the lower portion to allow the water to be run off. The opening for the fire-door *h* is through the front portion of the water-space.

From the furnace portion of the drier there extends to the rear a cylindrical casing, *k*, within which is the drying-cylinder *l*. This cylinder *l* has not any shaft, but it is supported upon the pairs of rollers *m m*, *n n*, *o o*, and it is preferable to connect the rollers *m* and *n* by shafts *p* running longitudinally of the apparatus, and having bevel-gears *q* driven by the cross-shaft, and gears *r*, that are revolved by hand, or by horse-power or otherwise, so as to keep the cylinder *l* in constant motion. There are annular flanges or rings 2 3 4 upon the cylinder *l*, adapted to rest upon the respective pairs of supporting-rollers, and it is preferable to employ flanges upon the rollers *m* at each side of the ring 2, to prevent end motion to the cylinder *l*, and the bearings for the rollers *o* should be outside the front water-space of the furnace, so as not to be exposed to much heat.

The products of combustion from the furnace and the heated air and gases pass along beneath and around the drying-cylinder between the same and the casing *k*, and they return through the cylinder *l*, and escape at the front end, and go off by the chimney *l*<sup>2</sup>.

The partition at *t* prevents the products of combustion passing directly to the chimney, and the cylinder *l*, extending entirely across the fire-space, allows the casing and partition *t* to surround the same sufficiently close to prevent the loss of heat.

Through the casing *u* is a hopper, *v*, with a swinging door, *w*, at its lower end, that opens by the pressure of the material thrown into the hopper, and the sand or gravel escapes into the drying-cylinder *l* and passes toward the back or delivery end.

It is preferable to use a screw-shaped flange, 6, around the inside of the cylinder *l*, to regulate the speed with which the material passes through the drier; and I remark that it is preferable to construct the supports or wheels of this portable drier so that the rear end will be the lowest, to facilitate the passage of the sand or gravel to the delivery end.

The receptacle  $w^2$  at the back end is provided with a weighted valve,  $z$ , that opens to allow the gravel to discharge, but at other times remains closed to exclude the atmosphere.

The chimney or smoke-flue  $l^2$  is, by preference, hinged, so that it may be laid down upon the boiler when not in use.

I claim as my invention—

1. In combination with the portable furnace for drying gravel and the surrounding shell  $e$  thereof, the revolving drying-cylinder  $l$ , supporting-rollers  $m m$ ,  $n n$ , and  $o o$ , the rollers  $o$  being supported in bearings outside the front water-space of the furnace and the cas-

ing  $u$  at the base of the chimney  $l^2$ , and surrounding the forward end of the cylinder  $l$ , substantially as set forth.

2. The revolving drying-cylinder  $l$ , surrounding casing  $k$ , partition  $t$ , and casing  $u$ , in combination with the hoppers  $v$  and  $w^2$  and swinging doors or valves  $w$  and  $z$ , substantially as set forth.

Signed by me this 23d day of February, A. D. 1878.

WILLIAM MORGAN.

Witnesses:

GEO. T. PINCKNEY,  
CHAS. H. SMITH.