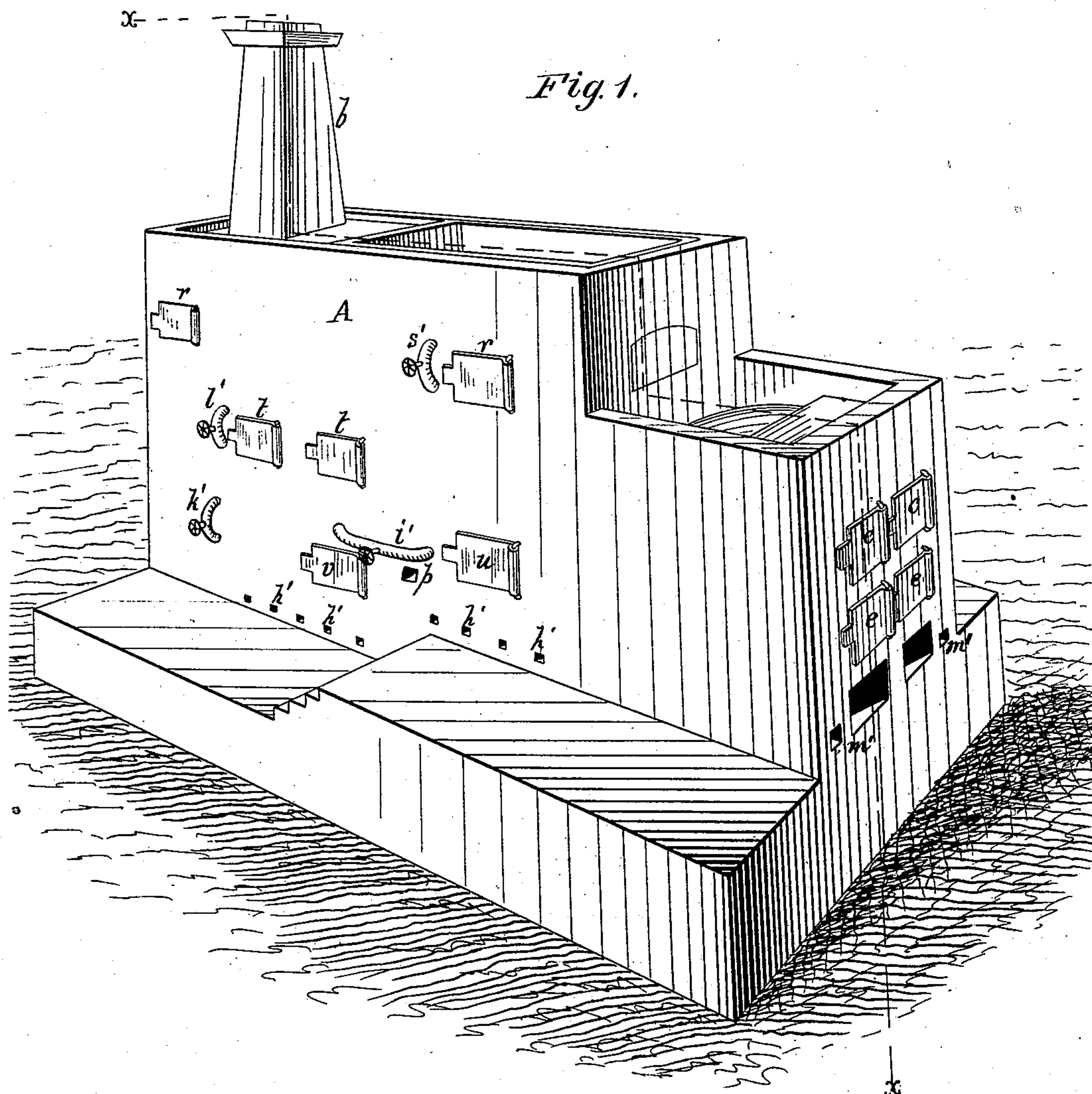


H. L. ORRMAN.  
Apparatus for Evaporating and Calcining Alkaline  
Solutions.

No. 215,659.

Patented May 20, 1879.



WITNESSES:

*Henry N. Miller*  
*C. Sedgwick*

INVENTOR:

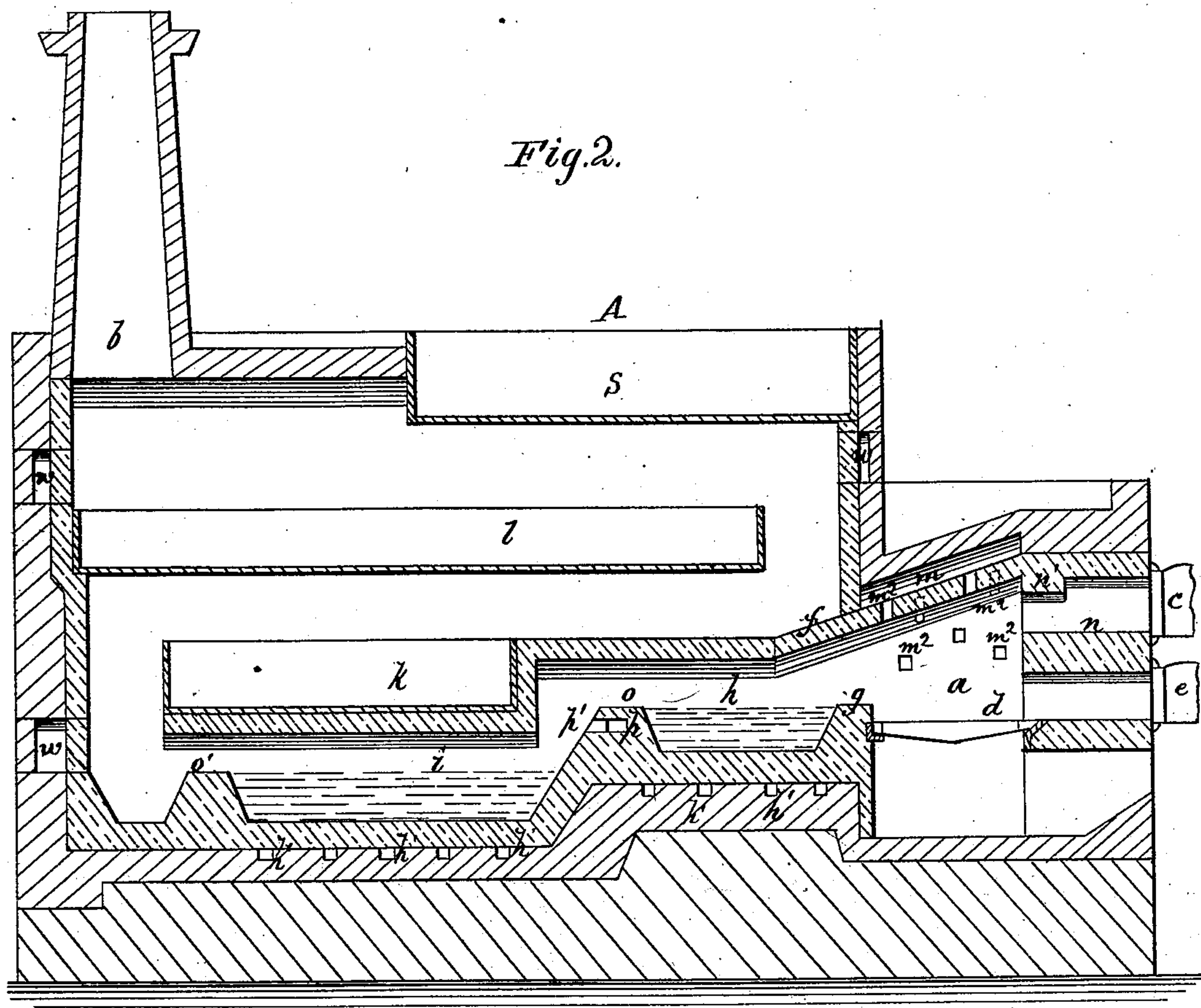
*H. L. Orman*  
BY *Mum & Co*  
ATTORNEYS.

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# UNITED STATES PATENT OFFICE.

HJALMAR L. ORRMAN, OF BERLIN FALLS, NEW HAMPSHIRE.

IMPROVEMENT IN APPARATUS FOR EVAPORATING AND CALCINING ALKALINE SOLUTIONS.

Specification forming part of Letters Patent No. **215,659**, dated May 20, 1879; application filed February 27, 1879.

*To all whom it may concern:*

Be it known that I, HJALMAR L. ORRMAN, of Berlin Falls, in the county of Coos and State of New Hampshire, have invented a new and Improved Apparatus for Evaporating and Calcining Alkaline Solutions, of which the following is a specification.

The object of my invention is to recover the caustic soda contained in the alkaline solution or waste-liquor from the chemical treatment of wood in the manufacture of wood-pulp, and to render the same ready for use again by evaporation and calcining in a recovery-furnace.

My invention consists in certain novel features of construction, whereby the successive operations are gradually and regularly performed in one furnace with facility and convenience and more economically than heretofore.

My furnace is shown in the accompanying drawings, wherein—

Figure 1 is a perspective view. Fig. 2 is a vertical longitudinal section.

Similar letters of reference indicate corresponding parts.

The furnace represented at A is built of brick, and of a size according to the capacity required. At one end is a fire-space, *a*, and at the opposite end is a chimney, *b*. *c c* are doors, through which to supply fuel to the grate *d*, and there are lower doors, *e e*, to give access to the fire for stirring.

The arch *f* over fire-space *a* is inclined downward from front to rear, to form a narrow escape-passage over the bridge-wall *g*, which passage leads over the top of the calcining-hearths *h i* and over the liquor-pans *k l* to chimney *b*. The fire-space *a* is surrounded at the top and sides by an air-space, *m*, that communicates with the outer air by openings *m*<sup>1</sup> at the front of the furnace, and with space *a* by openings *m*<sup>2</sup> in the arch *f* and side walls.

The front wall of the furnace is built deep, so that there is a shelf, *n*, behind the fire-doors, on which the coal for fuel is first laid in charging the furnace, and it is prevented from dropping down too readily upon the grate-bars by a small arch, *n'*. The calcining-hearth *h*, that is immediately behind the bridge-wall, is on a level higher than the hearth *i*, for purposes

hereinafter mentioned. The bottoms of these hearths *h i* are formed of fire-brick, and beneath each hearth are channels *h'*, that communicate with the outer air at both sides of the furnace, and permit a free circulation of air.

The object of these air-channels is to allow evaporation of the moisture absorbed by the fire-brick from the liquor contained on the hearths; otherwise when the calcining process commenced the increased heat, acting upon the moist bricks, would crack them and cause leakage when the hearths were refilled. The hearth *h* is separated from *i* by the bridge-wall *o*, and across the rear of *i* is a third bridge-wall, *o'*. These walls *g*, *o*, and *o'* retain the liquor upon the hearths. The center wall, *o*, has a passage, *p*, through from side to side of furnace A, and cross-passages *p'*, that open over hearth *i* to admit air.

Above the hearth *i* is an iron tank, *k*, and above *k* is a longer tank, *l*, both of which tanks rest in the side walls of the furnace. In the top of the furnace and open to the outer air is a third tank, *s*. A pipe, *s'*, passes from the bottom of *s* out at the side of the furnace, where it is furnished with a cock, and from thence enters the furnace over tank *l*. The tank *l* discharges to *k* by a similar pipe, *l'*, and tank *k* discharges to hearths *h i* by the pipes *i' k'*, respectively.

Above the tanks *k l* are openings through the sides of the furnace A, closed on the outside by doors *r t*, so as to permit observation of the liquor in the pans. Above tank *k* is an opening closed by door *u*, through which opening the mass on hearth *h* can be stirred and the calcined ash removed. The hearth *i* has a similar opening above it, closed by a door, *v*. The walls of the furnace are also provided with man-hole openings *w*, that will be closed when the furnace is in action, and may be opened to give access to the interior for repairs.

The operation of the furnace will be as follows: In feeding the fire the coal is supplied upon the platform *n* until the whole space behind the fire-doors is filled up. In this position the coals are subjected to heat from the fire on grate *d*, and give up their gases until converted to coke, when the fire-doors are to



be opened, the incandescent coals pushed down upon the main fire, and the space filled again with fresh coal.

The air for the combustion of the fuel can only enter from beneath the grate-bars and by the openings  $m^2$ , thus becoming heated before entering the fire-chamber, and, being supplied in sufficient quantity, causes a perfect combustion of the gases with intense heat. The heat and flame are caused, by the shape of arch  $f$ , to impinge upon the hearth  $h$  at an angle, and from thence to pass over wall  $o$  to the hearth  $i$ , and beneath and over pans  $k$   $l$  to the chimney. The waste-liquor or alkaline solution is first supplied to tank  $s$ , and by the pipes described to tanks  $l$  and  $k$ , and becomes more or less evaporated.

When the liquor in tank  $k$ , where the evaporation is most rapid, has become about as thick as sirup, it is run upon the hearths  $h$   $i$ . The contents of  $h$ , being exposed directly to the flame and heat, is quickly deprived of its remaining water, and the organic matters contained in the residuum commence to burn. The mass is to be thoroughly stirred until all the carbonaceous matters are consumed or driven off, and the soda remains in the form of a carbonate. When the process is completed the ash is removed through the door  $v$ . The hearth  $i$  being larger and subjected to

less heat, the operation will be slower. By having the two hearths, their contents are more equally exposed and the process rendered uniform. The operation is successive and continuous, each hearth or pan being filled from above when its contents are removed.

By this construction I obtain intense heat, and consequently rapidity of action, economy of fuel, with perfect combustion, durability, and cleanliness.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

In a furnace for evaporating and calcining alkaline solutions, the liquor-tanks  $s$   $l$   $k$ , the hearths  $h$   $i$ , the dividing bridge-wall  $o$ , having the air-chamber  $p$  and opening  $p'$ , and provided with air-chambers  $h'$  beneath them, and the pipes  $s'$   $l'$   $k'$ , each provided with cocks on the outside of the furnace, in combination with each other and with the fire-chamber  $a$ , surrounded on three of its sides by the space  $m$ , communicating with the openings  $m^1$   $m^2$ , substantially as and for the purpose set forth.

HJALMAR LUDV. ORRMAN.

Witnesses:

M. C. FORIST,  
E. L. FORIST.