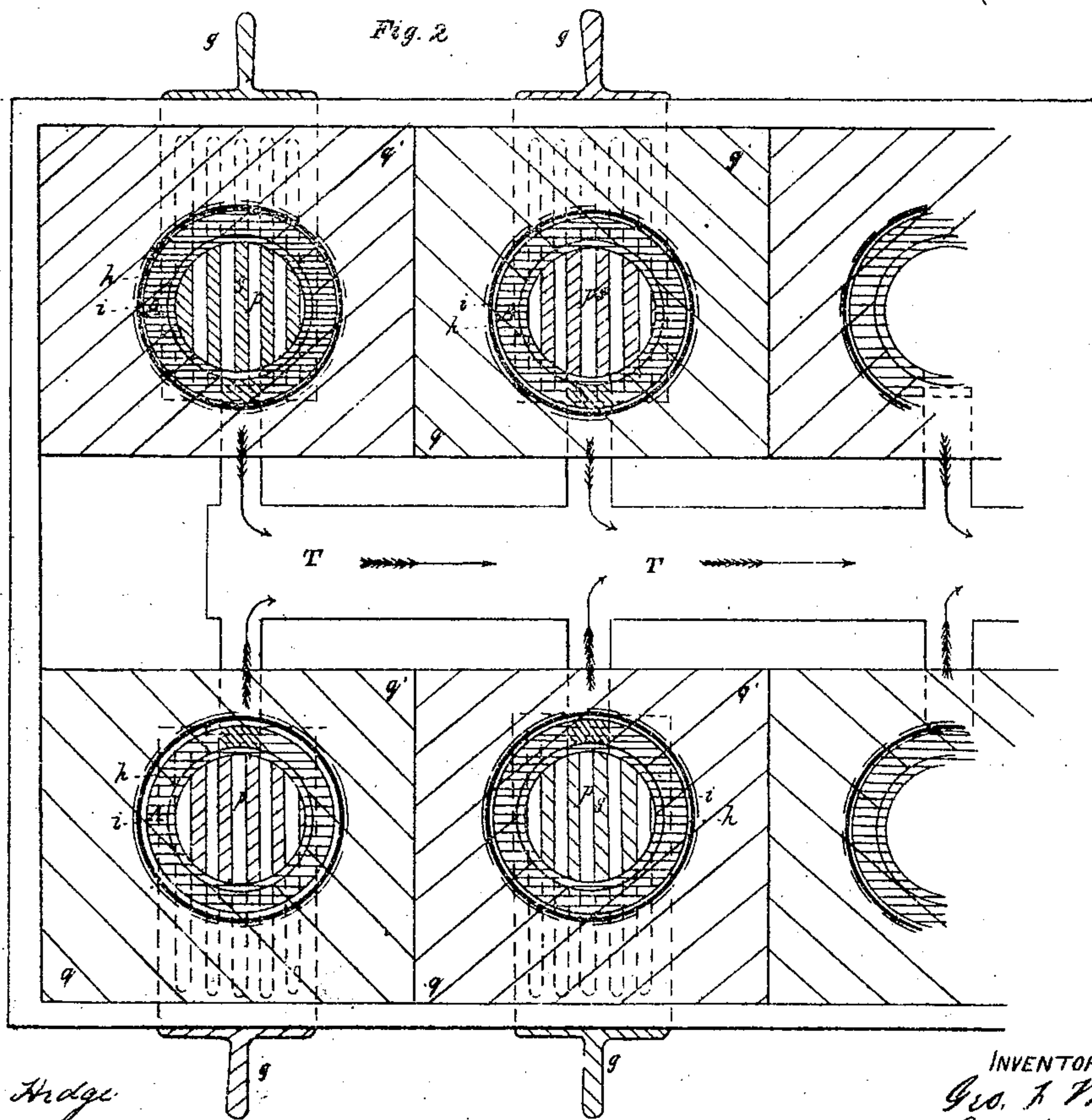
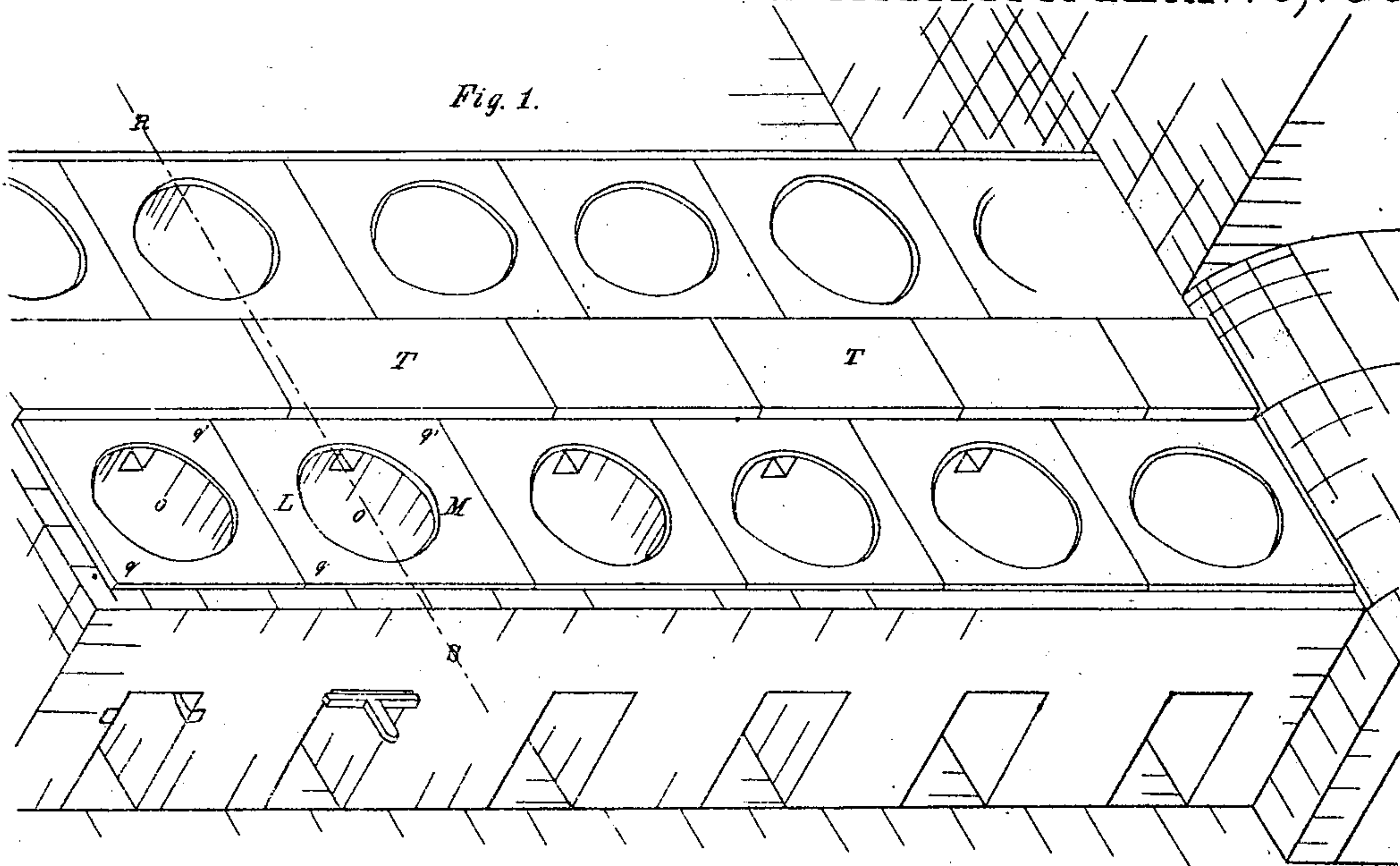


Wilson & Horsford.

Concentrating Acid Phosphate of Lime.
N^o 75339 Patented Mar. 10, 1868.



WITNESSES.
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INVENTORS.
Geo. F. Wilson
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Fig. 3.

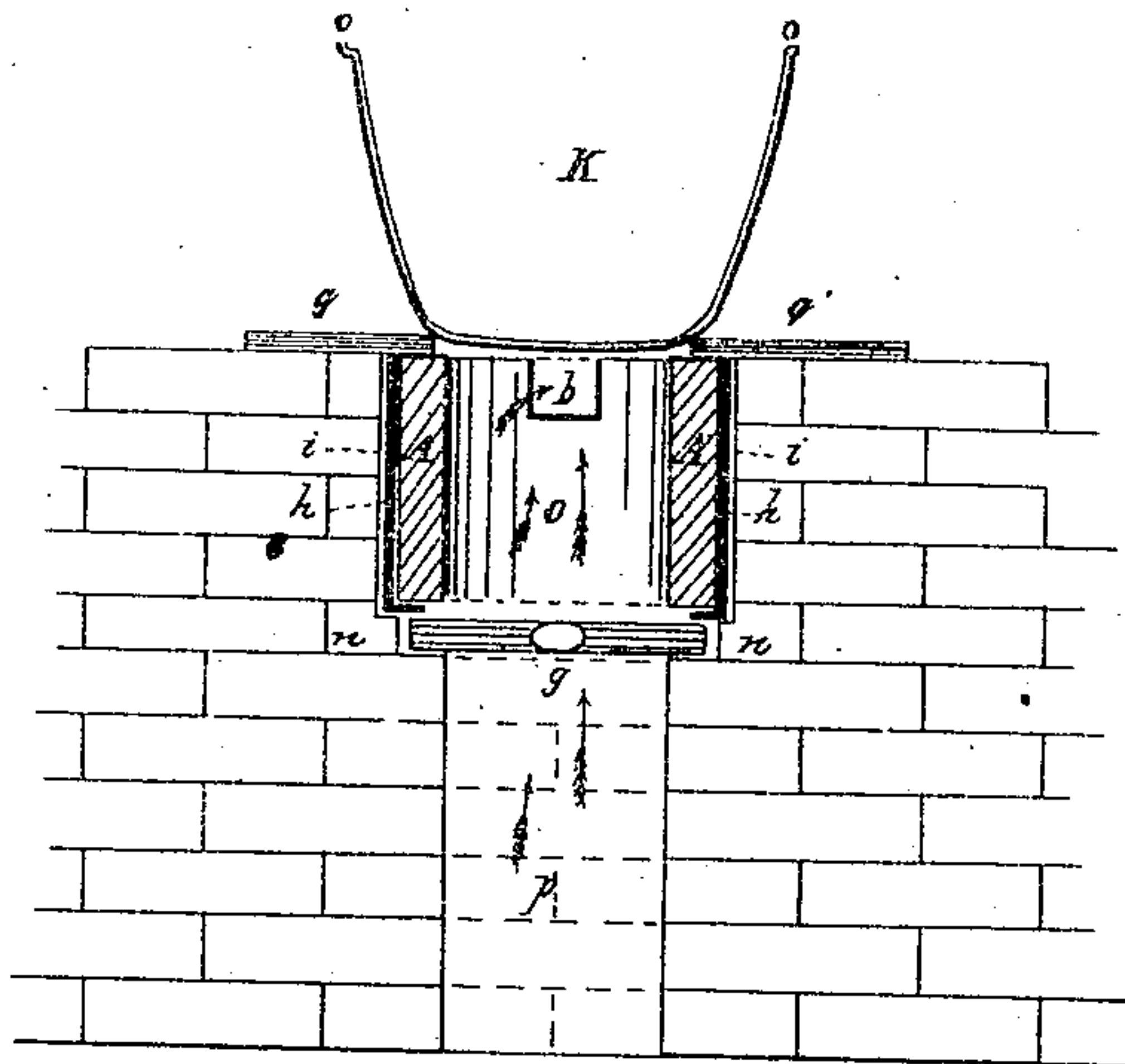
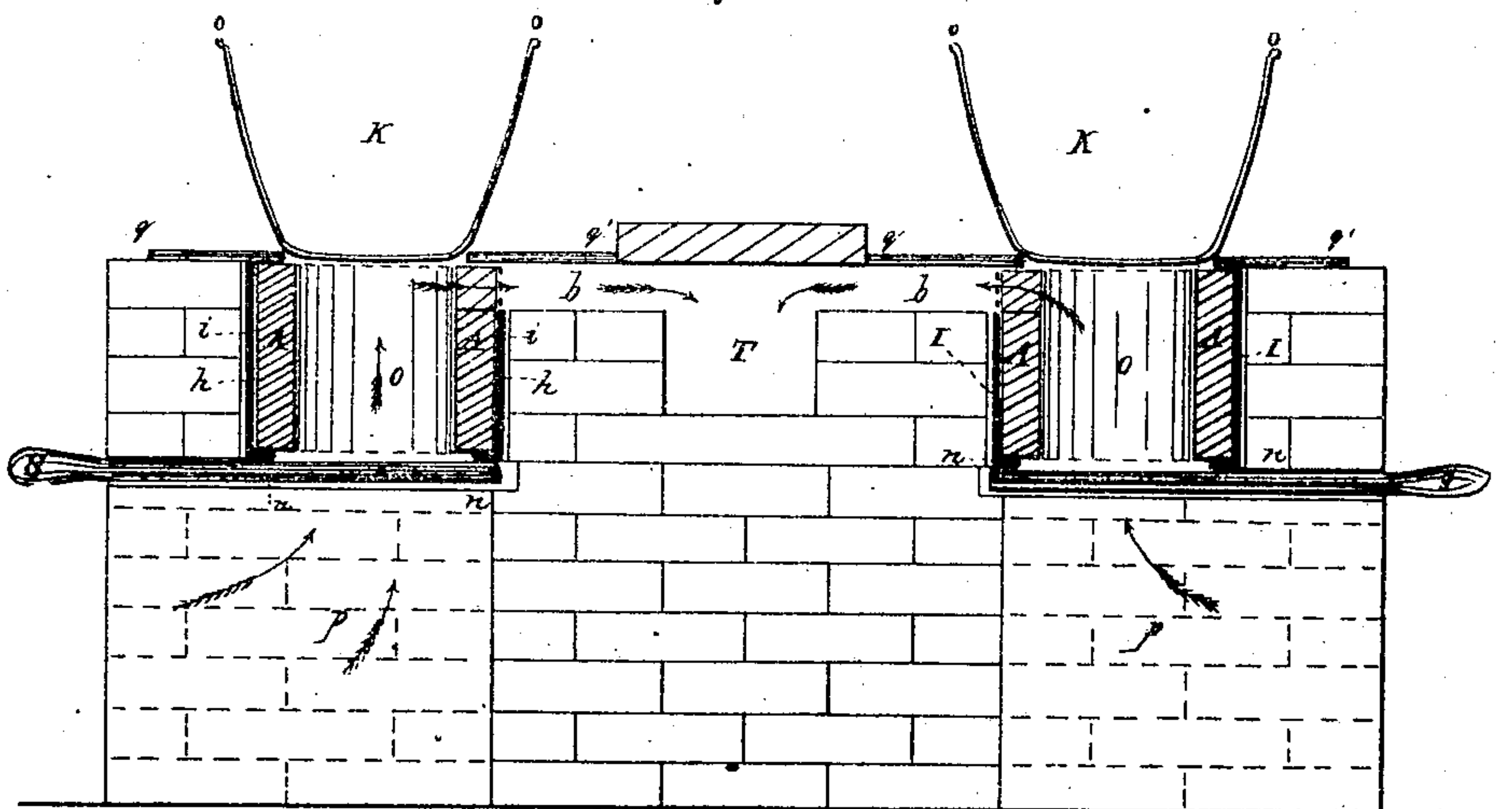


Fig. 4.



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United States Patent Office.

GEORGE F. WILSON, OF EAST PROVIDENCE, RHODE ISLAND, AND EBEN
NORTON HORSFORD, OF CAMBRIDGE, MASSACHUSETTS.

Letters Patent No. 75,339, dated March 10, 1868.

IMPROVEMENT IN APPARATUS FOR CONCENTRATING ACID PHOSPHATE OF LIME.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that we, GEORGE F. WILSON, of East Providence, in the county of Providence, and State of Rhode Island, and EBEN NORTON HORSFORD, of Cambridge, in the county of Middlesex, and State of Massachusetts, have invented a new and improved Mode of Concentrating the Solution of Acid Phosphate of Lime; and we hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The object of this our invention is to facilitate the economical and careful concentration of soluble acid phosphate of lime, and its conversion, by the addition, from time to time, of neutral phosphate of lime, to an acid of the requisite strength and qualities for domestic and other uses in the arts, as described in Horsford's patents.

In order to conduct this process on a large scale, it is essential that, as evaporation proceeds, fresh quantities of liquor be added. It is necessary to stir the liquor from time to time, as the neutral phosphate of lime or ground white bones are added, both to prevent adhesion to the bottom of the evaporating-vessel, and to facilitate the escape of carbonic-acid gas, which is contained in small quantity in the burned bones. This evolution of carbonic-acid gas is sometimes so rapid that, taken in connection with the ebullition, if not carefully watched, liquor would be thrown out and lost. To prevent this loss, and also to prevent the adhesion of the acid to the bottom of the evaporating-vessel, and generally to keep in the power of the operator the entire control of the process, so as to produce a superior article, our experiments have demonstrated the necessity of conducting the concentration in small iron kettles lined with porcelain, and the further necessity of having an independent fire under each separate kettle, so that the fire may be regulated or instantly withdrawn, according to the condition of the liquor in each individual kettle. To accomplish these ends, we have invented the system of boiler-furnaces, of which—

Figure 1 presents a perspective view,

Figure 2 a plan, and

Figure 3 and Figure 4 vertical sections, respectively, through L M and R S of fig. 1.

The fire-pot *o*, over which the porcelain-lined kettle *k* is supported, is a short cast-iron hollow cylinder or tube, *i i*, (fig. 4,) with a flange, *n n*, projecting inward, for the support of the fire-brick lining A A. We employ also a short thick fire-brick tube, having the shape of the fire-pot, and used in lieu of the encasing iron tube. The bottom of the fire-pot is a movable grate, with a handle, *g*, so as to be instantly withdrawn, and the fire dropped into the ash-pit below, if necessary. A passage-way or flue, *b*, at the top of the fire-pot *o*, fig. 3 and fig. 4, gives special communication from each fire-pot into and through the common flue T to the chimney, shown in fig. 2. The fire-pot is surmounted by a cast-iron plate, *q q'*, having a hole to receive the kettle *k* for evaporation. *p* is the ash-pit; *g*, the handle of the movable grate. T, fig. 2 and fig. 4, is the common flue, communicating on the one hand with the fire-pot flues, and on the other with the chimney.

In practical operation, one man attends a bench of twelve kettles. The liquor is taken from a tub or kiln, marked to hold, between two levels, one near the top, and the other near the bottom, one hundred and twenty gallons by actual measure. The kettles are filled at the commencement to two-thirds their capacity, covered with wooden covers, and placed over the fires. As soon as boiling commences, the covers are removed. The liquor is added as evaporation proceeds, and with the ground white burned bones, the latter in calculated proportion, varying inversely with the specific gravity of the liquor. If the heat becomes too great, the kettle may be lifted from its place, and supported farther from the fire upon slender iron bars introduced under the sides, while a draught over the top of the fire, instead of through it, reduces the heat. The fire is renewed by lifting each kettle from its seat and adding fresh coal. When the liquor has been concentrated to a certain definite point, it is necessary that no further concentration should take place. At this point the fire under the individual kettle may be dropped into the ash-pit below, and the concentration stopped. At this stage it requires to be stirred a short time to accomplish certain necessary chemical changes as it cools. To this end it is removed from the fire-pot.

The arrangement above detailed makes it possible for one operator to attend a bench of twelve kettles, and

preserve the individuality of each kettle in the time and heat required for the concentration and finishing-process due to each kettle.

The fire-pot, whether constructed of an iron cylinder lined with fire-brick, as shown in fig. 4, or of a fire-brick tube only, must be surrounded with a space for air; otherwise the heat of the fire will break the furnace, and require constant repairs. The space is shown in the drawings.

We claim, and desire to secure by Letters Patent of the United States—

1. The new and improved method or process of concentrating the acid phosphate-of-lime liquor by means of the apparatus constructed and arranged substantially as and for the purposes above described.
2. We claim also the use of metallic evaporating-kettles lined with porcelain, for concentrating the solution of acid phosphate of lime, in the manufacture of Horsford's pulverulent phosphoric acid.
3. We claim the improved fire-pot, substantially as described, that is to say, consisting of fire-brick, lining a short metallic tube, or a short continuous fire-brick tube, with a surrounding air-space, in connection with the use of the porcelain-lined kettle, for concentrating acid phosphate-of-lime liquor.
4. The movable grate, in combination with the fire-pot and porcelain-lined kettle, substantially as and for the purpose above described.
5. The arrangement of the series or bench of single kettles above described, having a separate fire for each, in the manner and for the purpose set forth.

GEO. F. WILSON,
E. N. HORSFORD.

Witnesses:

WILLIAM HEDGE,
W. H. MCGRENER.