

No. 843,872.

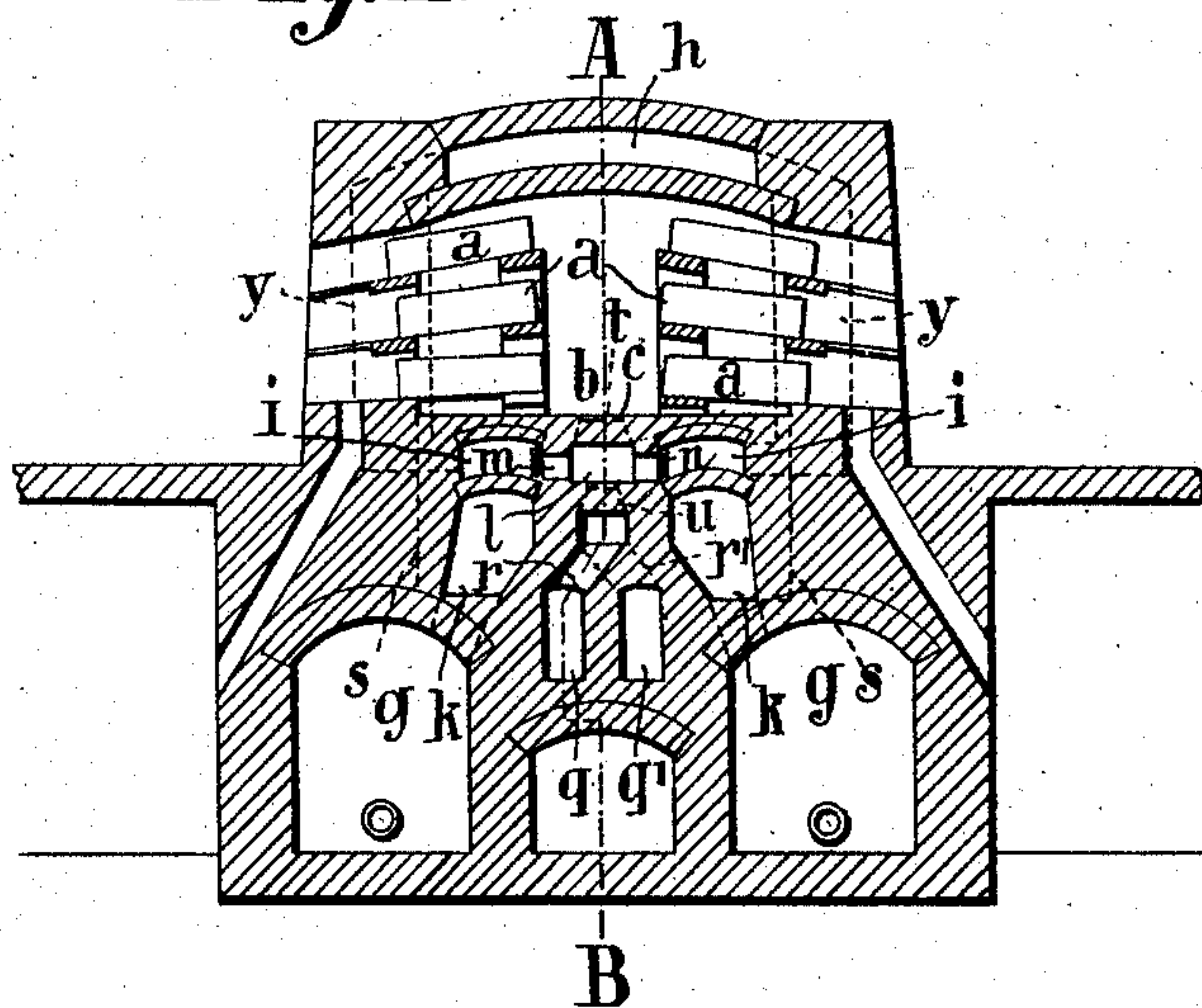
PATENTED FEB. 12, 1907.

A. DESGRAZ & P. SCHMIDT.  
FURNACE FOR OBTAINING ZINC FROM ZINC ORES.

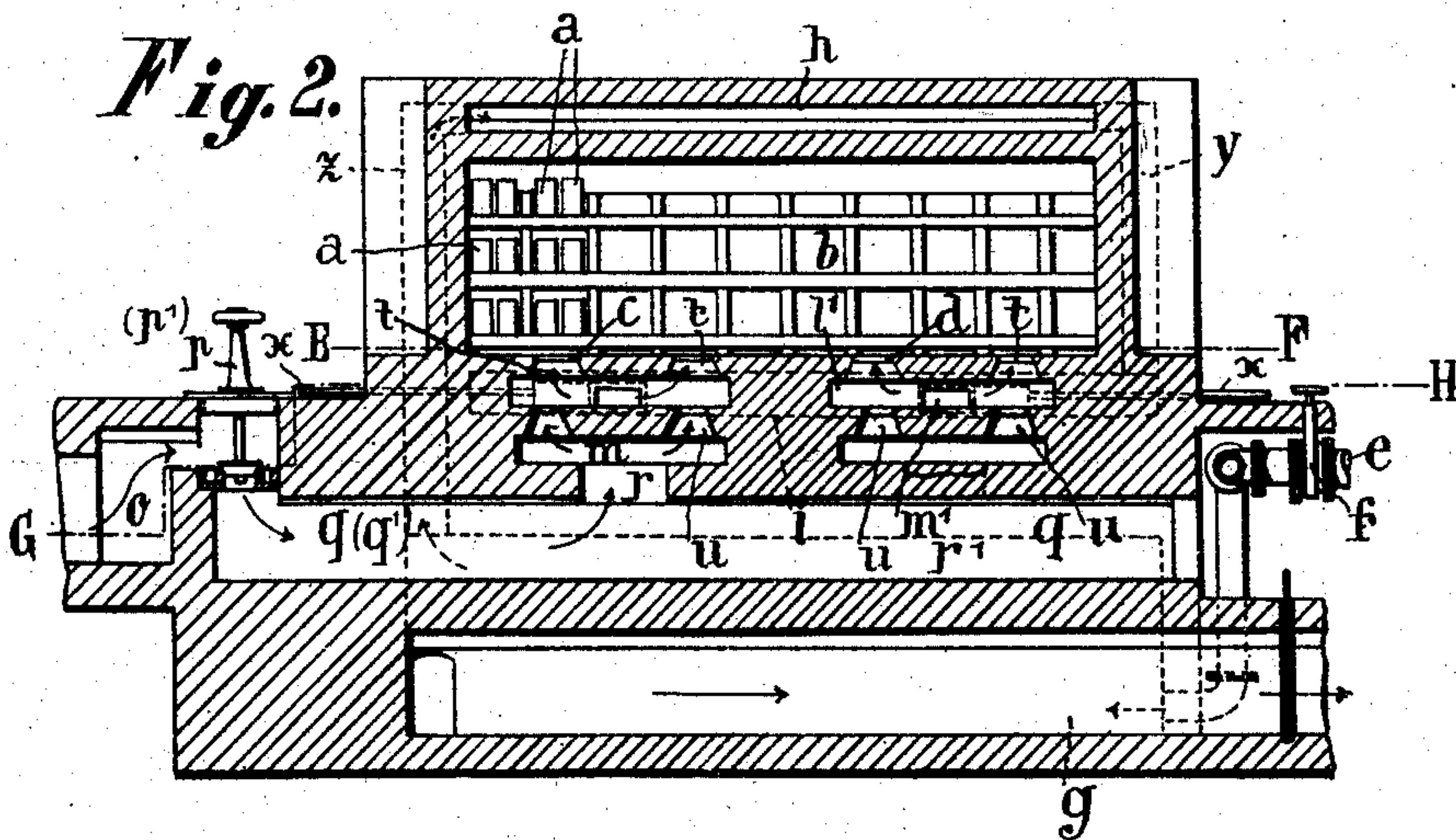
APPLICATION FILED SEPT. 13, 1906.

2 SHEETS—SHEET 1.

*Fig. 1.*



*Fig. 2.*



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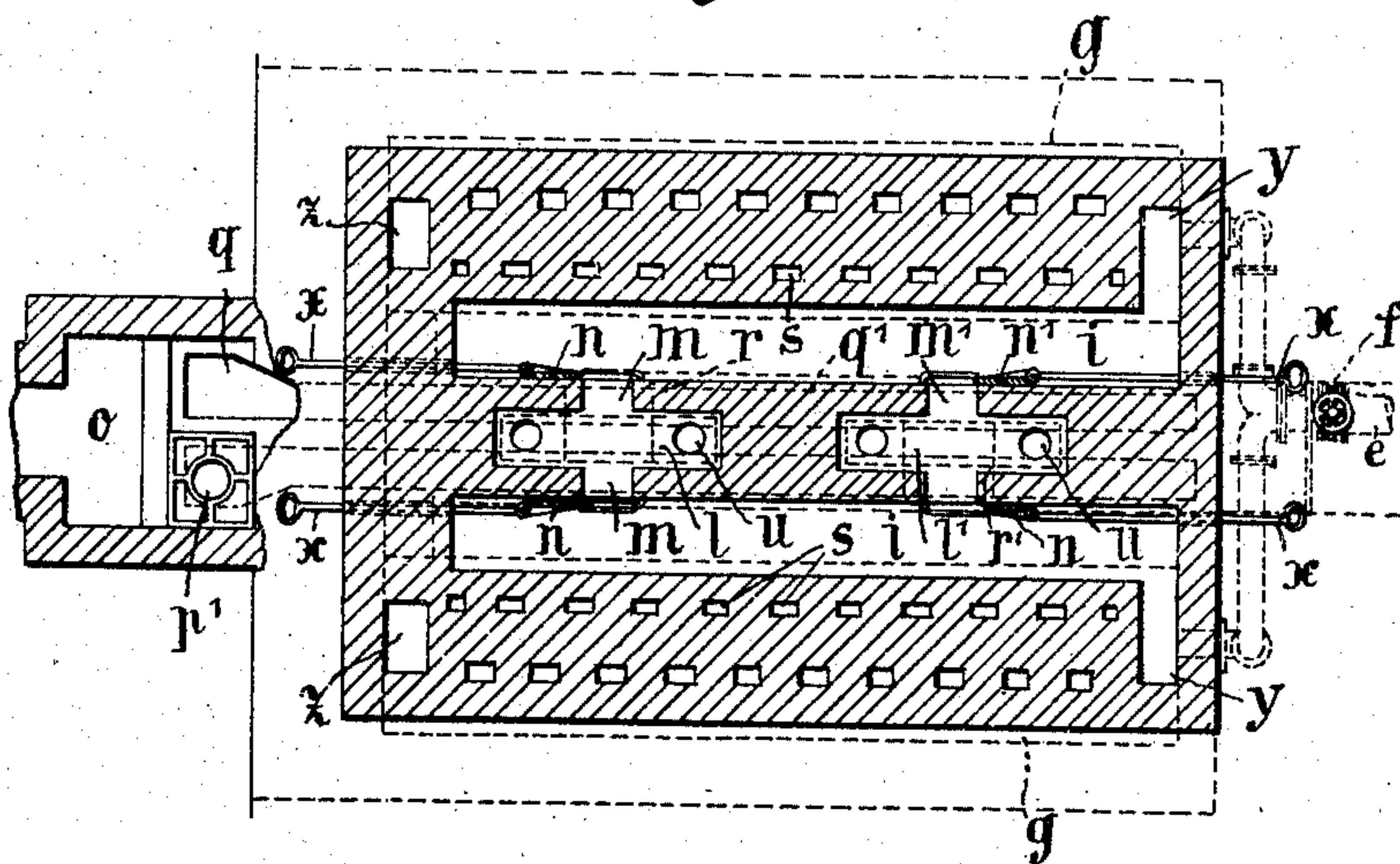
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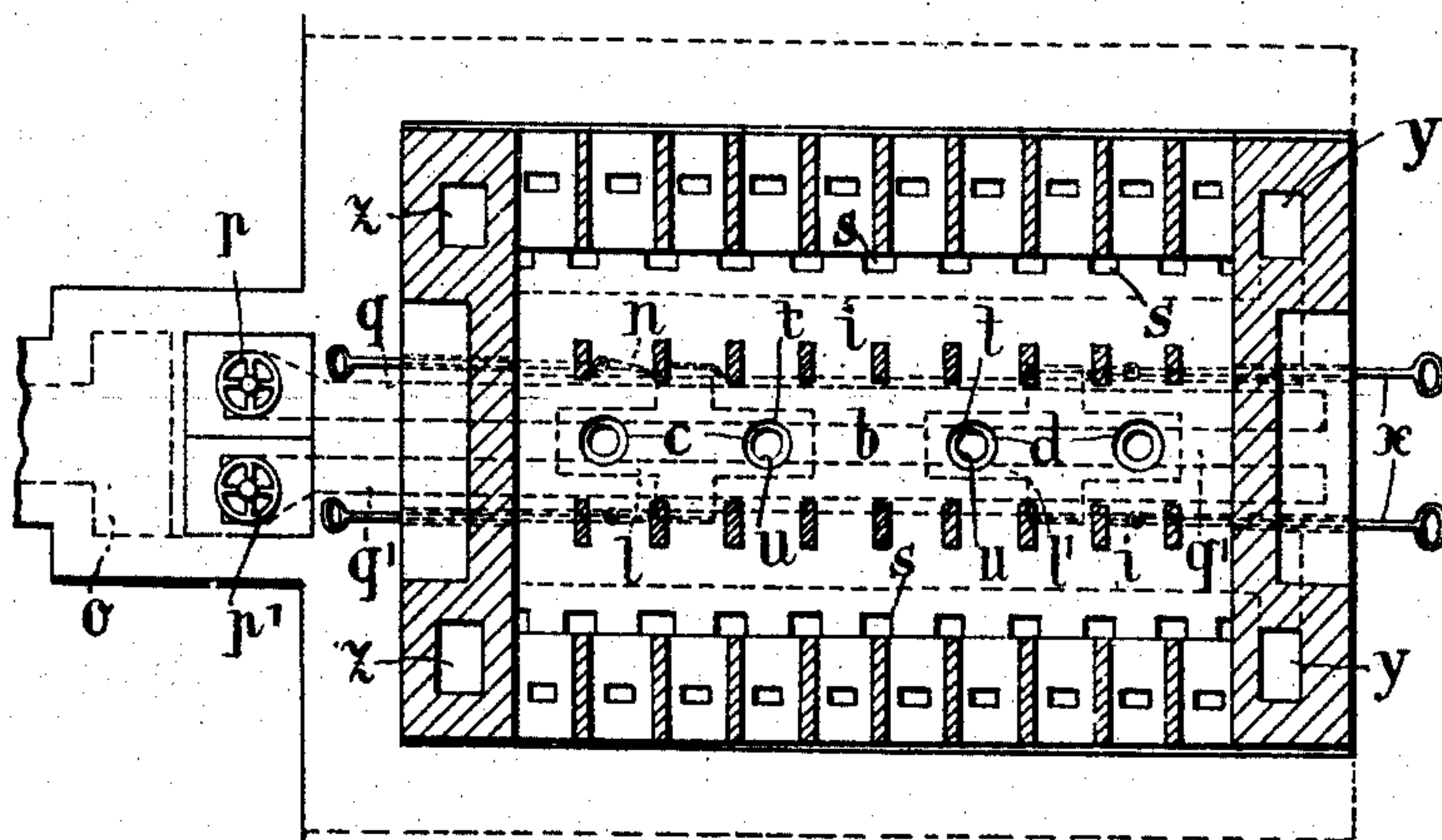
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2 SHEETS—SHEET 2.

*Fig. 3.*



*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

ADOLPHE DESGRAZ AND PAUL SCHMIDT, OF HANOVER, GERMANY.

## FURNACE FOR OBTAINING ZINC FROM ZINC ORES.

No. 843,872.

Specification of Letters Patent.

Patented Feb. 12, 1907.

Application filed September 13, 1906. Serial No. 334,466.

*To all whom it may concern:*

Be it known that we, ADOLPHE DESGRAZ and PAUL SCHMIDT, subjects or citizens of Switzerland and Germany, respectively, residing at Hanover, Germany, have invented certain new and useful Improvements in Furnaces for Obtaining Zinc from Zinc Ores, of which the following is a specification.

The process of obtaining zinc from zinc ores, as is well known, is conducted by mixing the zinc ore with the fuel required for effecting its reduction and then treating it in muffles, wherein it is heated for certain periods to various temperatures and finally just before the end of the operation the temperature is raised to a white heat. During this process the zinc is volatilized and the zinc-vapor is collected and cooled down in condensers.

The furnaces hitherto employed for carrying out this operation are subject to the serious defect that a very large amount of zinc, representing a large sum of money, together with a considerable amount of fuel are thereby wasted. These defects are principally due to the fact that the furnaces heretofore employed in the process in question did not permit of a satisfactory regulation of the temperature requisite at the various stages of the process or of a uniform distribution of heat throughout the entire interior of the furnace. During the carrying out of the process, which extends over about twenty-four hours, the temperature should not at first be allowed to rise too rapidly, as should this occur a serious loss will ensue through the escape from the condensers of uncondensed zinc fumes. As the distillation progresses the temperature is gradually increased, and just before the end of the process it is rapidly raised to white heat, and then upon the emptying of the separate muffles again almost immediately reduced to the initial temperature. By suddenly heating the residue to the maximum temperature just before the end of the operation a large part of the zinc still remaining therein is driven off. The temperature during the different stages of the operation should be absolutely uniform throughout the furnace.

In order that a furnace should operate satisfactorily for the purpose in question, it must fulfil the following requirements: 1. It must permit of the regulation of the tem-

perature in the most convenient manner throughout all the various stages of the operation—that is to say, it must be adapted to be suddenly raised from a very low to a very high temperature. 2. It must be so constructed as to expose all the muffles at any given stage of the process to an absolutely uniform temperature. When both these conditions are satisfied, there will be but little loss of zinc and but a small quantity of fuel will be required. The furnaces at present in use, however, by no means satisfy the above-mentioned conditions.

In the case of a furnace which is heated either directly by a grate or partly by gas the first condition cannot be satisfied, as the initial temperature is almost always too high and the final temperature too low, with the result that the amount of zinc lost is very great. The second condition is still less capable of being satisfied. Attempts have been made to overcome the resulting disadvantages by putting a larger charge of ore into the muffles which are subjected to the greatest heat or by placing more easily reducible material in the muffles exposed to a lower temperature and in this manner to reduce the loss of zinc. This manner of remedying the defects of the process is, however, very cumbersome and inconvenient.

Furnaces of the construction heretofore usual and heated entirely by gas, whether the direction of the flame is invariable or reversible, but imperfectly satisfy the first condition, while the second condition is not satisfied at all. A furnace in which the direction of the flame is reversed is under no circumstances suitable for the purpose in question, as one-half of the muffles must always be exposed to a lower temperature than the other half, a condition of things which is reversed whenever the direction of the flame is changed.

All the foregoing defects are obviated in a furnace constructed in accordance with the present invention, wherein there are arranged in the floor of the combustion-chamber several pairs of burners, each of which is connected with the gas-supply pipe by means of a regulating-valve to be acted on from outside, while the air introduced in a common heating-channel is fed to the said pairs of burners by means of openings, the opening of each pair of burners being regulatable from



outside. By this means there is obtained throughout the furnace a uniform temperature, which can be regulated in accordance with the requirements of the process.

5 The accompanying drawings show a furnace in accordance with this invention, Figure 1 being a vertical transverse section; Fig. 2, a longitudinal vertical section on the line A B of Fig. 1; and Figs. 3 and 4, horizontal  
10 sections, respectively, on the lines G H and E F of Fig. 2.

Throughout the entire length of the furnace, wherein the direction of the flame is invariable, there is arranged a free space *b*,  
15 wherein the flame is developed. Rows of muffles *a* are arranged on each side of the space *b*. The burners proper, *c c d d*, are arranged in the floor of the space *b* in such a manner that two of them are always connected together with respect both to the gas  
20 and to the air supply.

The burners *c* each comprise an upper part or nozzle *t* for the mixture of air and gas and a lower part or nozzle *u* for the gas. Be-  
25 tween these two parts or nozzles there is situated an intermediate chamber *l l'* for the supply of the air of combustion. According to its size a furnace is provided with two or more pairs of burners.

30 The air-supply, which enters the furnace under pressure by means of the pipe *e*, can in the first instance be regulated for all the pairs of nozzles by means of a slide *f*. After passing through the recuperators *g*, the arrangement of which is not shown in the drawings, it ascends the passages *z*, passes through the intermediate space *h* between the top  
35 arches, again descends through the passages *y*, and finally in very highly heated condition enters the passages *i*, which are arranged above the passages *k* for the exhaust-gases. The air-passages *i* are in communication with the air-chambers *l* and *l'* of the separate pairs of burners through the apertures *m m'*. The  
40 amount of air supplied from the passages *i* through the apertures *m m'* to each pair of nozzles can be separately regulated from the outside for each pair of nozzles by means of the slides *n n'*, actuated by the rods *x*.

50 The gas passes from the common supply-pipe *o* first to different regulating-valves *p p'* and thence into flues *q q'*, which are equal in number to the pairs of burners in the furnace. Each of the flues *q q'* is connected  
55 with one pair of burners by means of the passages *r r'*. By this means the amount both of air and of gas supplied to each pair of burners can be separately regulated, or, what practically comes to the same thing, it is possible so to regulate the supply as to be able  
60 always to obtain the temperature most suit-

able for any particular stage of the process and to change it in a very short time, while a uniform temperature can, moreover, always be maintained throughout the whole  
65 furnace. The conditions 1 and 2 are consequently both satisfied.

The flame is as soon as developed uniformly distributed in both directions and is drawn through the spaces between the muffles downward and thence through the apertures *s* into the two exhaust-pipes *k*. The waste gases are used for heating the recuperators *g*.

Having now particularly described and as-  
75 certain the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. A furnace for treating zinc ores having rows of muffles with a free flame-space between them, pairs of burners in the bottom of said space, gas-flues leading to a pair of burners, air-flues leading to said burners, and means for controlling the flow through all said flues.  
80 85

2. A furnace for treating zinc ores having rows of muffles with a free space between them, burners arranged in pairs in the bottom of said space, chambers below the burners each common to a pair of burners, flues  
90 supplying gas to said chambers, air-flues communicating with the said chambers, and means for controlling the flow to said chambers.

3. A furnace for treating zinc ores having rows of muffles with a free space between them, pairs of burners arranged in the bottom of said space, mixing-chambers below the burners each common to a pair of burners, gas-flues communicating with said mixing-chambers, air-chambers below the mixing-chambers provided with pairs of nozzles leading to the mixing-chambers and registering with the burners, air-flues leading to said air-chambers, and means for controlling  
100 105 the flow through the flues.

4. A furnace for treating zinc ores having rows of muffles with a free space between them, pairs of burners in the bottom of said space, chambers below the burners each common to a pair of burners, means for supplying gas and air to said chambers, and a gas cut-off for each chamber.  
110

In testimony whereof we have hereunto set our hand in presence of two subscribing  
115 witnesses.

ADOLPHE DESGRAZ.  
PAUL SCHMIDT.

Witnesses:

HENRY J. FULLER,  
LEONORE RASCH.