No. 814,238. PATENTED MAR. 6, 1906.

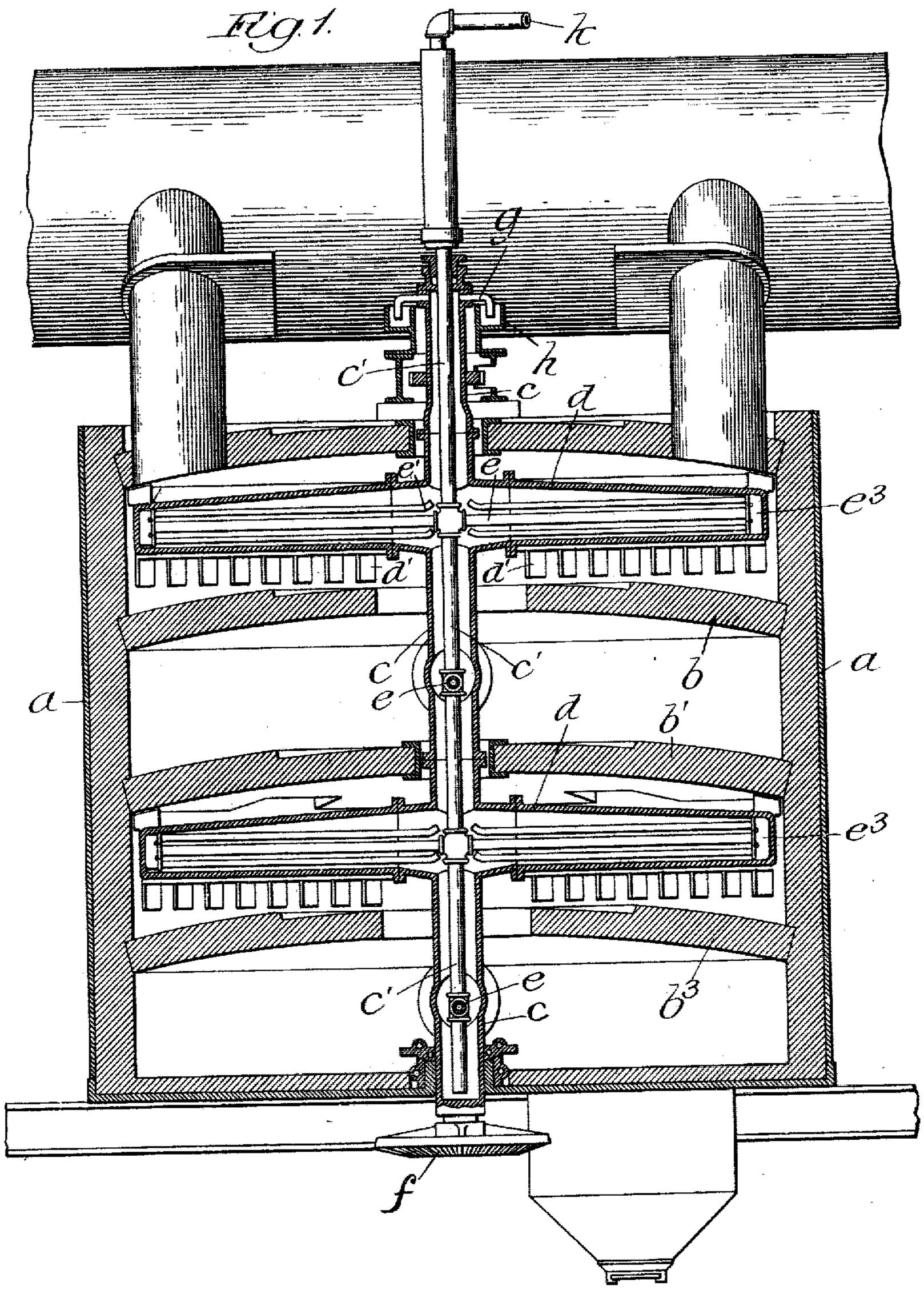
T. F. SHERIDAN.

ROASTING FURNACE.

APPLICATION FILED NOV. 20, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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John Enders.

Inventor:
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2 SHEETS—SHEET 2.

Fig. 2.

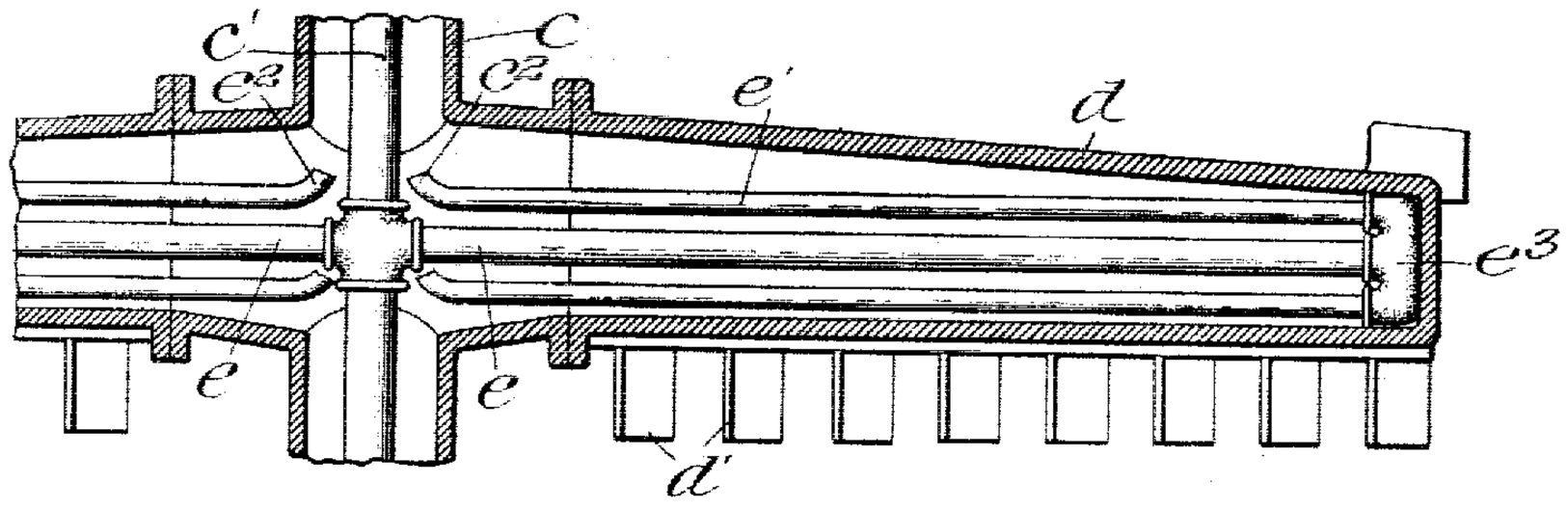


Fig. 3

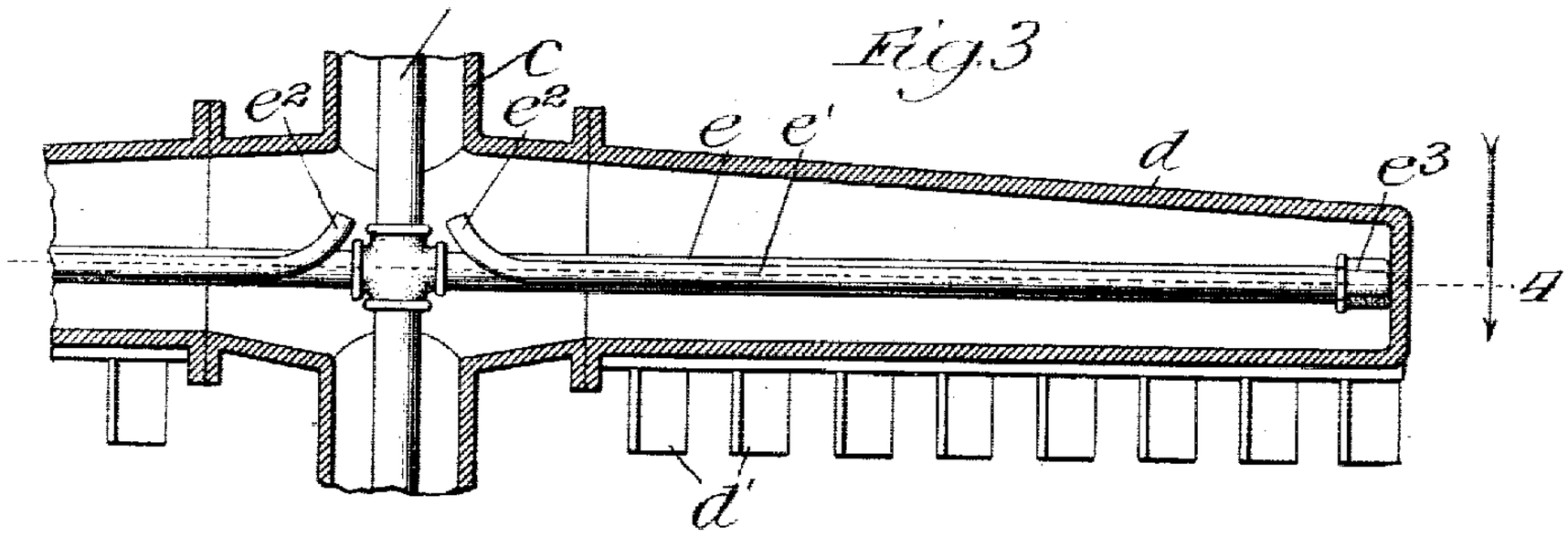
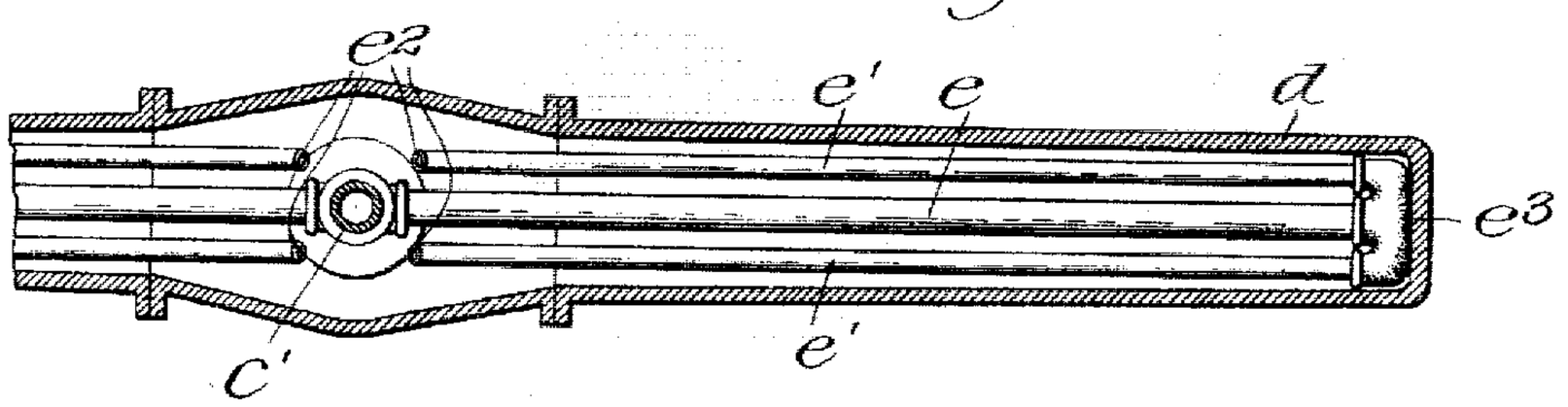


Fig. 4.



Witnesses:
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Inventor:
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THOMAS F. SHERIDAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO ALLIS-CHALMERS COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF NEW JERSEY.

ROASTING-FURNACE.

No. 814,238. Specification of Letters Patent. Patented March 6, 1906.

Application filed November 20, 1905. Serial No. 288,321.

To all whom it may concern:

Be it known that I, THOMAS F. SHERIDAN, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Roasting-Furnaces, of which the following is a specification.

My invention relates to roasting-furnaces of the type in which the ore under treatment is stirred or agitated by the action of hollow stirring or rake arms which are supplied with water for the purpose of keeping them relatively cool, and has for its object to provide an improved means for cooling the rake-arms and keeping them at a uniform temperature with the use of a minimum quantity of water, and consequently at a minimum expense.

The invention consists in the devices set forth in the accompanying specification and described in the claims.

In the drawings, Figure 1 is a sectional elevation of a roasting-furnace containing my improvements; Fig. 2, an enlarged sectional detail showing one of the rake-arms; Fig. 3, a view similar to Fig. 2, showing a modification; and Fig. 4, a sectional plan view of the parts shown in Fig. 3.

In the drawings, *a* represents the shell of a well-known type of roasting-furnace. This furnace is provided with hearths *b b' b*^{3}. An upright hollow shaft *c*, carrying hollow rake-arms *d*, communicating with the exterior of said shaft, is mounted in the furnace and has at its lower end a suitable gear *f*, whereby it may be rotated in the well-known manner. Within this hollow shaft is a supply-pipe *c'*, connected by a pipe *k* with any suitable source of water-supply. Connected to this supply-pipe and communicating therewith is a series of branch pipes *e*, which extend into the interior of each of the hollow rake-arms to the outer end thereof, where they are connected to a head *e*^{3}. To this head are also connected return-pipes *e'*, which extend from the head to the interior of the hollow shaft, where they are provided with a terminal opening. As shown in Fig. 1, the head is arranged vertically. Consequently the return-pipes are arranged in a similar manner above and below the branch pipe *e*. The upper return-pipes are upturned at their inner end, as shown, for a purpose presently to be described. At its upper end the hollow shaft is provided with discharge-pipes *g*, discharging into a trough *h*, from which the water may be conveyed by any suitable means to its point of discharge. The furnace, with its hearths, hollow shaft, and the supply-pipe therein, forms no part of my invention, which concerns itself with the means for maintaining the rake-arms at a uniform comparatively low temperature.

In operation the ore is fed to the upper hearth, where it is subjected to the action of heat and stirred by the rotating rake-arms and discharged thereby through a central opening to the next lower hearth. A similar series of rake-arms is provided on this hearth, though I have not shown them, which discharge the ore through a marginal opening to the third hearth. This is well known, however, and needs no particular description. Water is supplied to the supply-pipe through its connection *k* with a source of supply, and this water fills the interior of the hollow shaft and the hollow arms when the furnace is in operation. Owing to the great heat which is maintained in these furnaces, the shaft and the rake-arms, with the water therein, would soon become overheated, unless some means to prevent this is provided. Consequently I maintain a circulation of cold water in the supply-pipe and the branch and return pipes. The cold water flowing through the supply-pipe and the branch pipes is returned through the return-pipes to the terminal openings of the return-pipes, which, as above stated, are within the hollow shaft. During its circulation the water in the pipes becomes heated. Consequently it is at higher temperature at the discharge-point than the incoming supply. It has therefore a tendency to rise to the discharge-pipes *g*, whence it is conveyed away.

It will be observed that the cold water in the supply, branch, and return pipes does not come in contact with the water in the rake-arms—that is, there is no mingling of hot and cold water in these arms, but the water in the arms is maintained at a uniform comparatively low temperature by reason of its contact throughout the length of the rake-arms with the cooled pipes.

In the former constructions of which I am aware the branch pipes in the rake-arms conveyed the cooled water from the supply-pipe

to a point adjacent the outer end of the hollow arms, where the branch pipe is provided with a terminal opening. In such a construction it will be recognized that in order to maintain a circulation of cold water in the hollow rake-arms it is necessary to supply a sufficient amount of cold water to displace the body of heated water therein. It will also be seen that when the cold water is supplied to the outer end of the hollow rake-arms such rake-arms will be cooled to a greater degree at this point—that is, they will not be cooled to a uniform extent. By carrying the cold water through a series of pipes out of contact with the water in the hollow arms I am enabled to cool the water in the arms to a uniform extent. It is not necessary in my construction to provide a sufficient amount of cold water to displace the heated water in the hollow arms. All that is necessary is to supply a sufficient quantity of cold water to maintain the body of water in the hollow arms at the desired temperature. It will thus be seen that the water in the hollow arms will be changed slowly, since it is not displaced by any body of incoming water, but only by the circulation caused by its tendency to rise when heated. I am thus enabled to keep the rake-arms at the desired temperature with a minimum amount of cold water at low temperature and at a minimum expense.

In Figs. 3 and 4 I have shown the return-pipes arranged horizontally instead of vertically, which may be readily done by arranging the head e^3 in a horizontal position, as will be understood. The ends of the return-pipes within the hollow shaft are upturned, as before stated. This is to assist the water in its circulation. The water being heated at this point to a somewhat greater degree than at other points in its course its tendency is to rise to the point of discharge. The water, therefore, is discharged from the upturned ends in the direction which it would naturally take.

I claim—

1. In a roasting-furnace, a hollow upright shaft, hollow horizontally-arranged rake-arms connected thereto and communicating with the interior of the shaft, and means for filling the shaft and arms with water and for circulating a cooling medium through the arms out of contact with the water therein.

2. In a roasting-furnace, a hollow upright shaft, horizontally-arranged hollow rake-arms attached thereto and communicating with the interior thereof, a supply-pipe in the shaft, branch pipes in the hollow arms communicating with the supply-pipe, said branch pipes having terminal openings within the hollow shaft.

3. In a roasting-furnace, a hollow shaft, hollow rake-arms connected thereto and communicating therewith, a supply-pipe in such shaft, pipes connected with the supply-pipe extending to the outer end of the hollow rake-arms and provided with return branches having terminal openings within the hollow shaft.

THOMAS F. SHERIDAN.

Witnesses:

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