No. 843,825. PATENTED FEB. 12, 1907.

F. KLEPETKO.

ROASTING FURNACE.

APPLICATION FILED SEPT. 6, 1904.

2 SHEETS—SHEET 1.

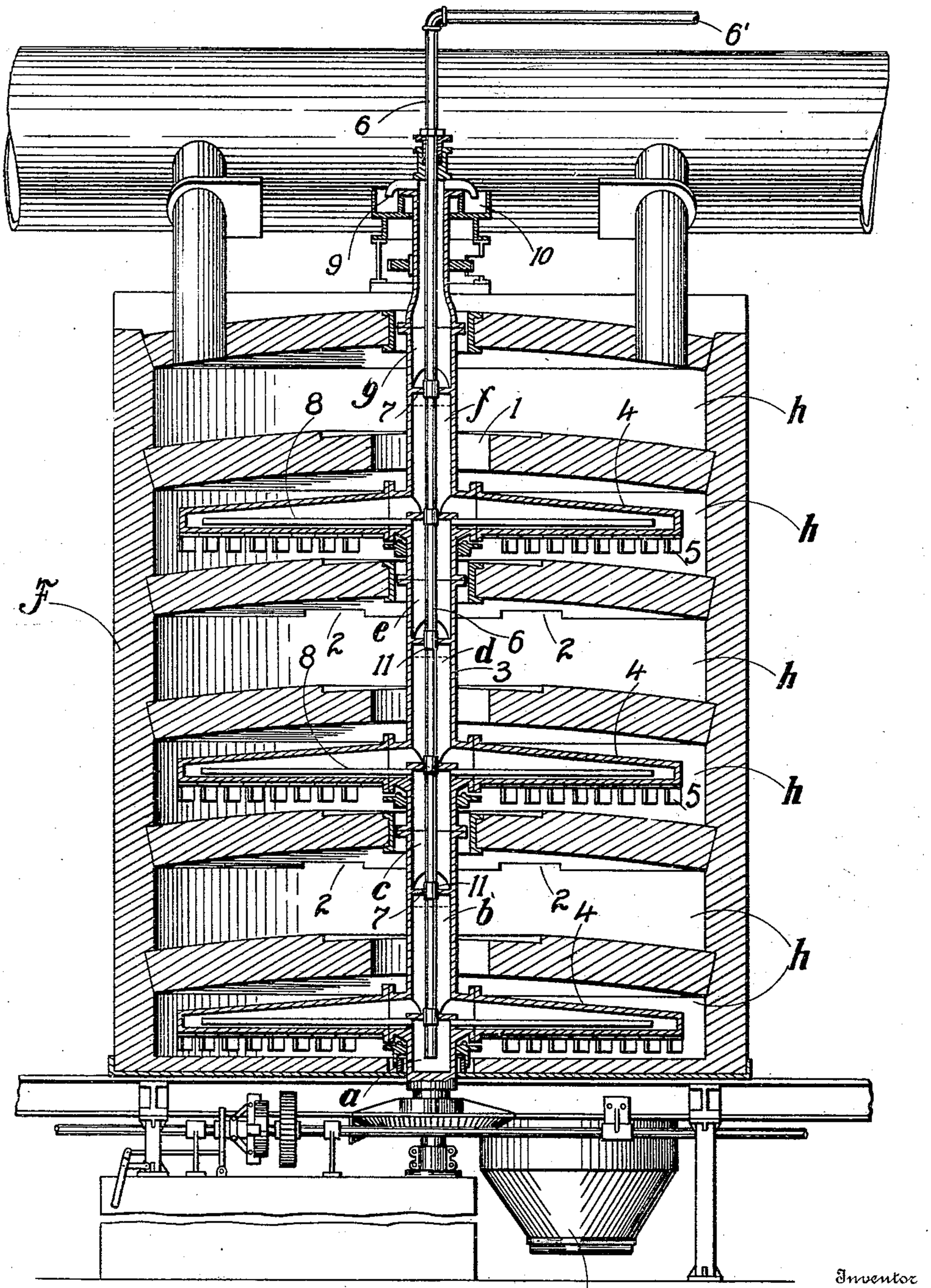

FIG. 1.

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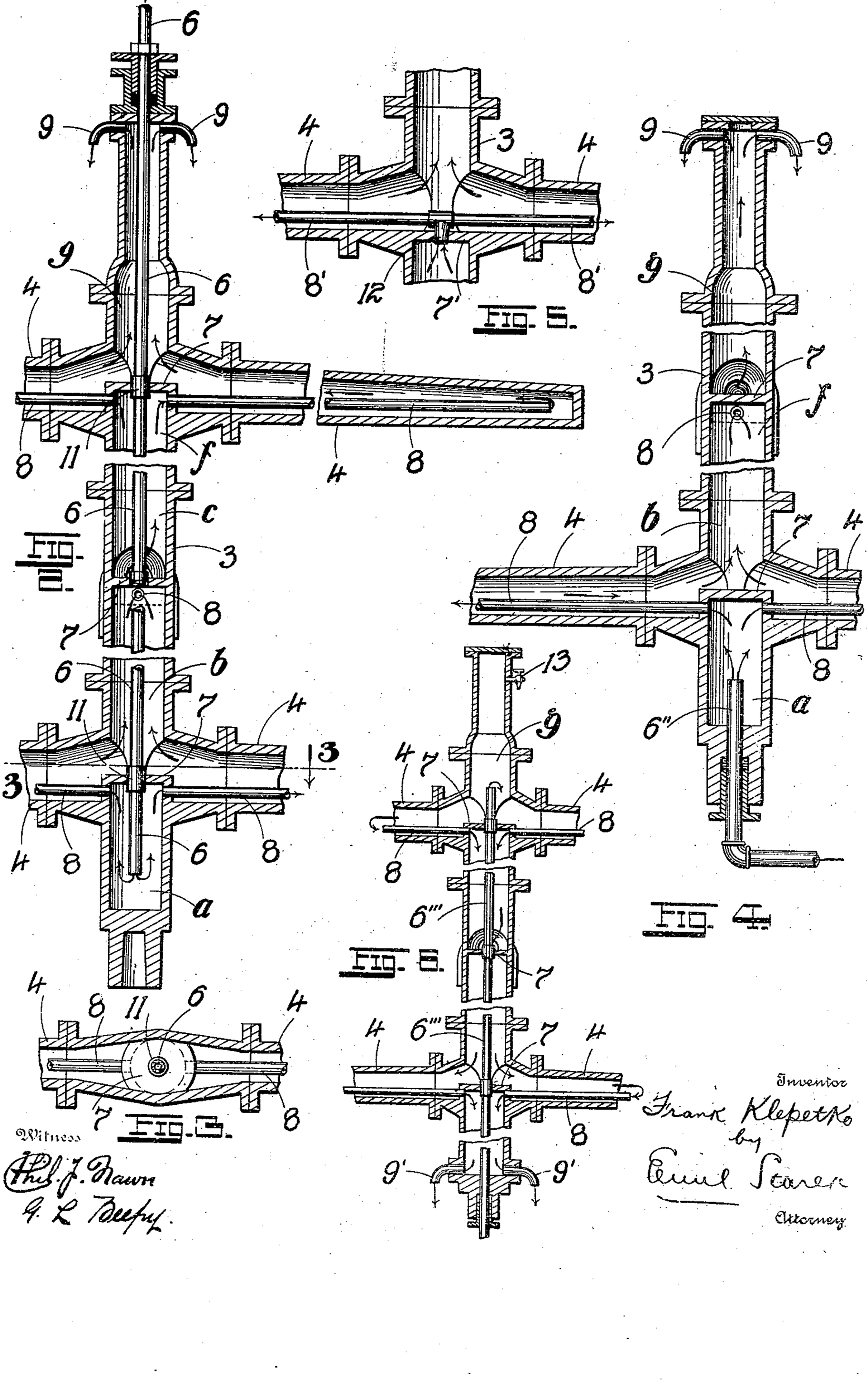

FIG. 2.

FIG. 5.

FIG. 4.

FIG. 6.

FIG. 3.

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FRANK KLEPETKO, OF NEW YORK, N. Y.

ROASTING-FURNACE.

No. 843,825. Specification of Letters Patent. Patented Feb. 12, 1907.

Application filed September 6, 1904. Serial No. 223,539.

To all whom it may concern:

Be it known that I, FRANK KLEPETKO, citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Roasting-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in roasting-furnaces; and it consists in the novel construction and arrangement of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a vertical central section of a conventional McDougall ore-roasting furnace, showing my invention applied thereto. Fig. 2 is an enlarged vertical section of the rabble shaft and arms, showing the cooling mechanism applied thereto. Fig. 3 is a cross-section on line 3 3 of Fig. 2. Fig. 4 is a modification showing the water-feed pipe entering and discharging at the bottom. Fig. 5 is a modification showing a slightly different mode of mounting the distributing-pipes, and Fig. 6 is a modification showing the water-feed pipe entering at the bottom but discharging at the top of the rabble-shaft.

The present invention is an improvement in the water-cooling features of the McDougall type of ore-roasting furnace; but it is more specially directed to overcome objections inherent in the construction shown and described in United States Letters Patent 700,339, granted to William J. Evans and myself under date of May 20, 1902.

The special object of the present improvement is to establish a more effective circulation through the hollow arms carried by the rabble-shaft, thereby utilizing to the best advantage the cooling possibilities of the circulating water or other medium.

In the patent above referred to and in other constructions which employ a series of distributing-pipes leading from the main water-feed pipe the water, taking as it does, the path of least resistance, will tend to flow through the distributing-pipes nearest the point of supply or feed end of the feed-pipe, and thus produce an uneven distribution of the cooling medium. In my present improvement the feed-pipe may be stationary, as in my Patent 733,658, dated July 14, 1903, or it may be rotatable, as in the Klepetko-Evans construction above referred to, the choice depending on the conditions which must be met. In the present improvement the water-feed pipe having no distributing-pipes attached thereto can be readily taken out through the end of the shaft by simply removing the stuffing-box when occasion for its removal arises.

The advantages of the present invention will be better apparent from a detailed description thereof, which is as follows:

Referring to the drawings, F represents the furnace, and *h* the several hearths in which the material is treated, the said material dropping from the upper hearths successively through the several hearths until it is delivered into the delivery-hopper C, the hearths being provided, respectively, with the central and marginal openings 1 2 for the passage of the material. Passing through the hearths is the rotatable hollow rabble-shaft 3, from which radiate the series of hollow rabble or stirrer arms 4, extending into the several hearths and carrying rakes 5, by which the material is successively fed from one hearth to the hearth immediately beneath it, all as fully understood in the art.

Referring again to the drawings, and more particularly to Figs. 1 to 3, inclusive, 6 represents a water-feed pipe (preferably stationary) which is located within the shaft, extending to a short distance from the closed bottom of the latter, the lower end of the said feed-pipe being open and discharging into the shaft. The shaft is divided into a series of chambers *a b c d e f g*, the chambers being separated from one another by the transversely-disposed division walls or partitions 7, occupying a plane slightly above the bottom of the adjacent rabble-arms 4, each chamber having leading therefrom the distributing conduits or pipes 8, which extend into the hollow arms 4 and discharge thereinto. Under this arrangement the water discharged into the bottom chamber *a* flows through the lower series of pipes 8 into the bottom rabble-arms, thence flowing into the second chamber *b*, and from this through the next series of distributing-pipes and their corresponding rabble-arms, and so on till the water reaches the outlet pipes or taps 9, where (at a point adjacent to the feed end of the feed-pipe) it discharges into a trough 10. As seen from the foregoing the feed-pipe 6 passes through the several partitions or division-walls 7, and in order that there shall

be no leakage at these points a connecting-nipple 11 is placed around the pipe, where it passes through the partition, said nipple being turned true and the partition drilled and reamed, making a practically water-tight joint. The pipe 6 receives its supply from an extension 6′, as shown.

From the foregoing it will be apparent that the cooling medium must take the course indicated (and shown by the arrows) and that a positive and even delivery of cool water will result throughout the entire system of rabble-arms. Each rabble-arm must receive its water from one chamber before it can deliver it to the next succeeding chamber of the shaft, and the circulation will thus be uniform and positive at all times. In this particular it will make no difference whether the feed-water is introduced through the top or bottom so long as the remaining features of construction are not materially disturbed. Thus in Fig. 4 I have shown a modification in which the water-feed pipe 6″ is introduced through the bottom of the shaft, the point of discharge into the chamber *a* being correspondingly the same as in the construction previously described.

In the forms thus far described the point of connection of the distributing pipes or conduits 8 is with the peripheral walls of the respective chambers; but I may conduct the water through the partition or division wall, as shown in the modification in Fig. 5, where the distributing-pipes 8′ are connected to a hollow tapered or screwed T 12, carried directly by the partition 7′, the latter in this case being preferably disposed in the plane of the bottom of the rabble-arm.

The feed-pipe while preferably extending through the several partitions 7 from top to bottom may extend inversely from bottom to top, as shown in the modification in Fig. 6. In that case the feed-pipe 6‴ discharges into the chamber *g* above the last partition, the water of circulation being under the circumstances forced downward, as shown by the arrows in said figure, it being understood that the static head driving the current should be sufficient to insure a sufficiently rapid circulation before any of the water is converted into steam. In this last modification provision is made to allow for the escape of accumulated air or vapor in the form of a cock 13, which can be opened just prior to the introduction of the water. The discharge-waters are allowed to escape through taps 9′ into a trough (not shown) arranged in any manner so as not to interfere with the driving mechanism for the shaft.

Where the feed-pipe is introduced into the shaft from the top, as is shown in Fig. 2, the same may be made to terminate at or in the chamber *g* without passing through the partitions dividing the several chambers. In that event the circulation of the water would be similar to that shown in Fig. 6—that is to say, it would be downward through the shaft. I do not herein illustrate such modification; but evidently it would be the inverse of that shown in Fig. 4—that is to say, the feed-pipe would terminate in the top chamber instead of the bottom chamber.

It is apparent that I may depart from the details here shown without in any wise affecting the nature or spirit of my invention. The cooling mechanism need not necessarily be restricted in its application to roasting-furnaces, but may be applied to other furnaces as well.

Having described my invention, what I claim is—

1. In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, a series of chambers distributed throughout the shaft and communicating with the hollow arms, and a feed-pipe communicating with one of the terminal chambers of the series for conveying a cooling medium thereinto, substantially as set forth.

2. In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, a series of chambers distributed throughout the shaft and communicating with the hollow arms, and a water-feed pipe extending through the several chambers and discharging its water into the same, substantially as set forth.

3. In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, a series of chambers distributed throughout the shaft and communicating with the hollow arms, and a water-feed pipe extending through the several chambers and discharging its water into the bottom chamber of the series, substantially as set forth.

4. In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, a series of chambers distributed throughout the shaft and communicating with the hollow arms, and a stationary water-feed pipe extending through the several chambers and discharging its water into the bottom chamber of the series, substantially as set forth.

5. In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, a series of chambers separated by transverse partitions, distributed

throughout the shaft, distributing-conduits leading from the respective chambers and opening into the adjacent series of hollow arms, and a feed-pipe extending through the several chambers and discharging its circulating medium into the bottom chamber of the series, substantially as set forth.

6. In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, a series of chambers distributed throughout the shaft, distributing-pipes leading from the respective chambers into the adjacent series of hollow arms and opening into the latter, and a water-feed pipe extending through the several chambers and discharging its water into the bottom chamber of the series, substantially as set forth.

7. In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, a series of chambers distributed throughout the shaft and communicating with the hollow arms, and a feed-pipe extending through the several chambers for conveying a cooling medium to one end of the shaft and allowing the same to circulate through the shaft and the hollow arms thereof, substantially as set forth.

8. In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, an inner water-feed pipe located within the shaft and discharging thereinto, a series of conduits or distributing-pipes coupled to the shaft and located within the hollow arms and communicating respectively therewith and with the shaft, the water discharged from the feed-pipe freely circulating through said conduits or pipes and through the hollow arms and shaft, substantially as set forth.

9. In a furnace having a plurality of hearths, a rotatable hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, an inner stationary water-feed pipe located within the shaft and discharging thereinto, a series of conduits or distributing-pipes coupled to the shaft and located within the hollow arms and communicating respectively therewith and with the shaft, the water discharging from the feed-pipe freely circulating through said conduits or pipes and through the hollow arms and shaft, substantially as set forth.

10. In a furnace having one or more hearths, a rotatable hollow shaft passing through the same, a series of hollow arms radiating from said shaft and extending into the several hearths, an inner water-feed pipe located within and discharging into the shaft, and conduits or distributing-pipes disconnected from the feed-pipe located within the hollow arms and conveying the water discharged into the shaft from the feed-pipe into the hollow arms, substantially as set forth.

11. In a roasting-furnace, a hollow shaft, hollow stirrer-arms on the shaft, means for circulation through the shaft and arms vertically in series, means independent of the arms providing for circulation from the shaft radially in multiple, said independent means discharging into the hollow arms, and the latter discharging their contents into the shaft, substantially as set forth.

12. In a roasting-furnace, a hollow shaft, hollow stirrer-arms on the shaft, means for circulation through the shaft and arms vertically in series, means for discharging the circulating medium into the bottom of the shaft, means independent of the arms providing for circulation from the shaft radially in multiple, said independent means discharging into the hollow arms, and the latter discharging their contents into the shaft, and means for conducting the circulating medium out of the shaft from the top thereof, substantially as set forth.

13. In a roasting-furnace, a hollow shaft, hollow stirrer-arms on the shaft, means for circulation through the shaft and arms vertically in series, means independent of the arms providing for circulation from the shaft radially outward in mulitple, and through the arms radially inward in mulitiple, and outlet means for the circulating medium at one end of the shaft, substantially as set forth.

14. In a roasting-furnace, a hollow shaft, hollow stirrer-arms on the shaft, means for circulation through the shaft and arms vertically in series, means independent of the arms providing for circulation from the shaft radially outward in multiple, and through the arms radially inward in multiple, and inlet means and outlet means for the circulating medium respectively at opposite ends of the shaft, substantially as set forth.

15. In a roasting-furnace, a hollow shaft, hollow stirrer-arms on the shaft, means for circulation through the shaft and arms vertically in series, means independent of the arms providing for circulation radially in multiple in one direction, and through the arms radially in multiple in a reverse direction, and outlet means for the circulating medium at one end of the shaft, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK KLEPETKO.

Witnesses:

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G. L. BELFRY.