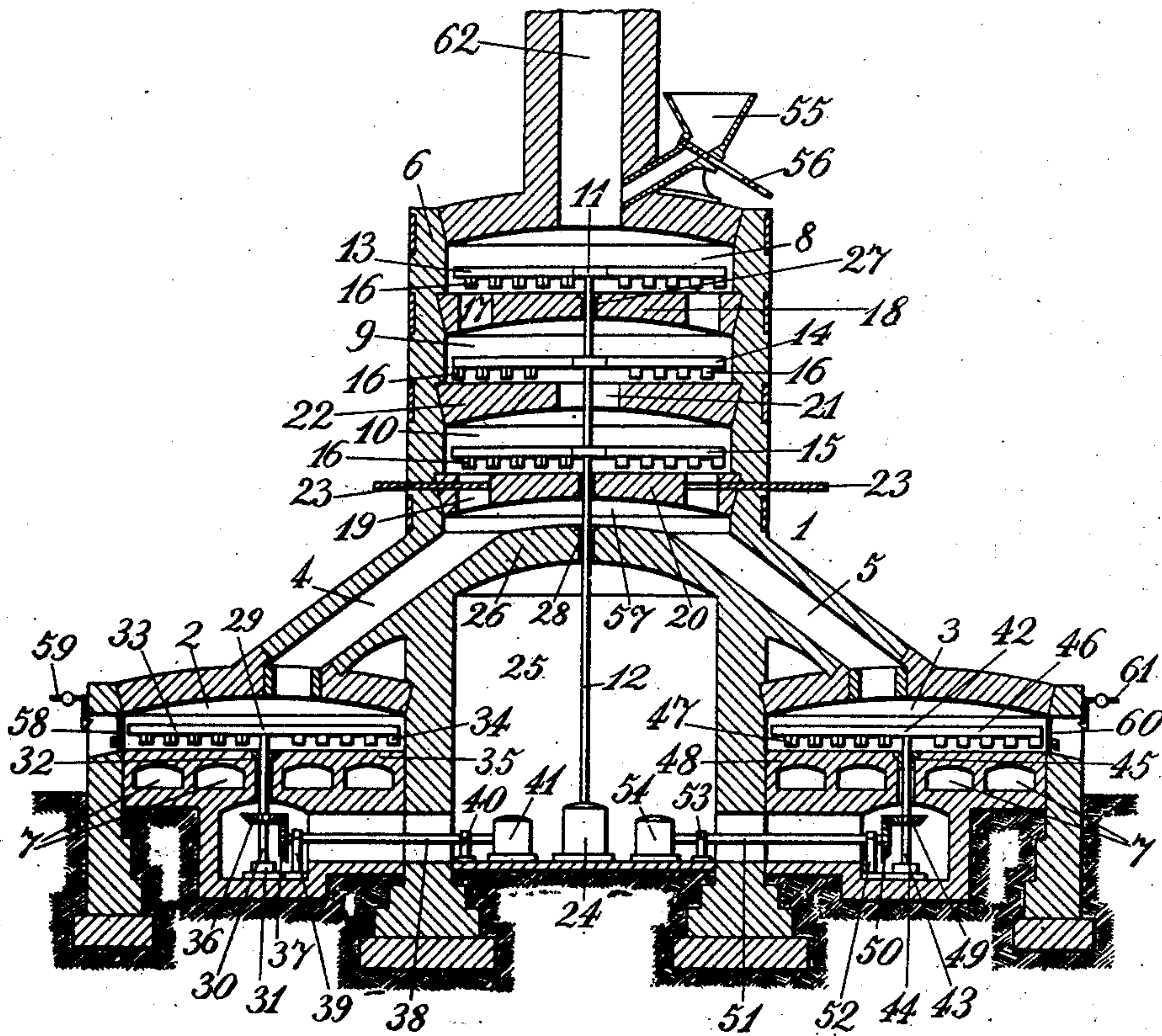


R. VON ZELEWSKI.
MECHANICAL ROASTING FURNACE.
APPLICATION FILED JUNE 15, 1908.

915,531.

Patented Mar. 16, 1909.



Witnesses:
F. G. Harder.
Rudolf Schoebel

Inventor:
Roman von Zelewski
per: Martin Schmetz
Attorney.

UNITED STATES PATENT OFFICE.

ROMAN VON ZELEWSKI, OF ENGIS, BELGIUM.

MECHANICAL ROASTING-FURNACE.

No. 915,531.

Specification of Letters Patent.

Patented March 16, 1909.

Application filed June 15, 1908. Serial No. 438,597.

To all whom it may concern:

Be it known that I, ROMAN VON ZELEWSKI, residing at Engis, in the Kingdom of Belgium, have invented certain new and useful Improvements in Mechanical Roasting-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to mechanical roasting-furnaces and particularly to that class thereof which is equipped with two devices arranged independently of each other for stirring and transporting the ore, in order to regulate the pre-roasting in the charge-chamber and the finish-roasting in the end- or discharge-chamber independently of each other. Notwithstanding the fact that this arrangement of said devices permits the transformation of existing roasting-furnaces of the older kind into roasting-furnaces, wherein the pre-roasting as well as the finish-roasting can be regulated at will, it does not suffice to carry on the pre-roasting without any interruptions.

The object of my present invention now is to construct new roasting-furnaces in such a manner, that a continuous pre-roasting of the ores can take place. To this end devices for stirring and transporting the ores are not only arranged in the charge-chamber as well as in the end- or discharge-chamber of the furnace independently of each other, but also the end- or discharge-chamber is divided into a plurality of finish-roasting-chambers arranged independently of each other. In doing so it is not only made possible to uninterruptedly operate the charge-chamber, but also to operate simultaneously therewith the finish-roasting-chambers thus formed. The advantages gained by thus transforming the end- or discharge-chamber into two or more finish-roasting-chambers consist in a considerable saving of time and in a higher working capacity of the roasting furnace. Besides this a more advantageous, uniform, and speedy pre-roasting is obtained than hitherto it has been possible, because the heating of the charge-chamber accomplished by the gases developed during the finish-roasting in the finish-roasting-chambers is never interrupted, since there is always one or more of the finish-roasting-chambers in full opera-

tion. By this arrangement it is not necessary to interrupt the heating process in the charge-chamber each time a new charge of pre-roasted ore is introduced into one or the other of the finish-roasting-chambers, as it is the case in the existing roasting-furnaces, provided with but one finish-roasting-chamber, so that by this means an additional increase of the working capacity of the roasting-furnace is secured.

In the accompanying drawing a vertical sectional view of my improved mechanical roasting-furnace is shown.

The lower part of the body 1 of my improved mechanical roasting-furnace is here divided into the two finish-roasting-chambers 2 and 3, which number might, however, be increased if so desired. These finish-roasting-chambers are connected by means of the channels 4 and 5 to the multistoried charge-chamber 6 and the floor of each of said finish-roasting-chambers is provided with a number of heating-flues 7. The charge-chamber 6 is here shown to consist of the three superimposed stories 8, 9 and 10, the number of which may of course be varied to suit any given conditions. The rotatable stirring and transporting device 11 of the charge-chamber 6 consists of the vertical shaft 12 and the three sets of rabbles 13, 14 and 15 which are equipped with the usual blades or teeth 16 which are roof-shaped on the one side and provided with oblique faces on the opposite side, for only stirring the ore when rotated in one direction and transporting the ore when rotated in the opposite direction, as customary.

To discharge the ore from the several stories of the charge-chamber 6 the oblique faces of the teeth 16 of the sets of rabbles 13 and 15 are arranged to move the ore toward the circumference of the stories 8 and 10, since the discharge openings 17 of the floor 18 and the discharge-openings 19 of the floor 20 are located in proximity of the annular wall of the charge-chamber, whereas the oblique faces of the blades or teeth 16 of the set of rabbles 14 are arranged in a direction opposite to that of the oblique faces of teeth 16 of the other two sets of rabbles, since the discharge-opening 21 of the intermediate floor 22 is located at the center of the latter. The discharge-openings 19 of the floor 20 are provided with slides 23 for a purpose to be

more fully explained later on. Rotation is imparted to the shaft 12 by means of the electro-motor 24, placed in the vault 25 beneath the charge-chamber 6. The shaft 12 is suitably journaled in the floor 18 and in the crown 26 of the vault 25 by means of the bearings 27 and 28 respectively.

In the finish-roasting-chambers 2 a stirring and transporting device 29 is arranged which consists of a vertical shaft 30, journaled in a step-bearing 31 and the bearing 32, and the set of rabbles 33 the blades or teeth 34 of which are roof-shaped on the one side and provided with oblique faces on the opposite side, as customary. Beneath the floor 35 of the finish-roasting-chamber 2 the shaft 30 of the stirring and transporting device 29 carries a bevel-wheel 36 which meshes with a similar wheel 37 secured to a horizontal shaft 38. The latter is journaled in the bearings 39 and 40 and is like the vertical shaft 12 driven by an electromotor 41. In a similar manner the finish-roasting-chamber 3 is provided with a stirring and transporting device 42, which consists of the shaft 43, journaled in the step-bearing 44 and the bearing 45, and the set of rabbles 46 the blades or teeth 47 of which are roof-shaped on the one side and provided with oblique faces on the opposite side. Below the floor 48 of this finish-roasting-chamber the shaft 43 carries a bevel-wheel 49 which meshes with a similar wheel 50 seated on the horizontal shaft 51 which is journaled in the bearings 52 and 53 and driven by the electromotor 54.

It is evident that instead of the electromotors 24, 41 and 54 other driving-means might be employed to rotate the stirring and transporting device 11 of the charge chamber 6 and the stirring and transporting devices 29 and 42 of the finish-roasting-chambers 2 and 3 independently of each other and in opposite directions, or to set them at rest at will.

The improved mechanical roasting-furnace operates as follows:—The ore to be roasted is introduced into the charge-chamber 6 through the feed-hopper 55 into the upper story 8 of the charge-chamber 6 and then distributed over the floors 18, 20 and 22, whereupon the hopper-slide 56 is closed. As at every moment at least one of the finish-roasting-chambers 2 and 3 is in full operation, the newly introduced ore is brought at once into contact with the heat and gases emanating from the operated finish-roasting-chamber. After distributing the ore the direction of motion of the rabbles 13, 14 and 15 is reversed to stir the ores until they have been sufficiently pre-roasted. Supposing now, that the finish-roasting-chamber 2 is still in operation and that the finish-roasting-chamber 3 has been put in a condition for the reception of a new charge of pre-roasted ore,

the slide 23 adjacent to the upper end of the channel 4 which until now was open will be closed and the slide 23 adjacent to the upper end of the channel 5 opened, as shown. When now the stirring and transporting device 11 is rotated to discharge the pre-roasted ore from the charge-chamber 6 it will pass through the openings 17, 21 and 19 into the channel 5 and hence into the finish-roasting-chamber 3. During this time the operation of the finish-roasting chamber 2 need not be interrupted as the heat and gases emanating therefrom can escape by way of the circular space 57 through the opening 19 used for the discharge of the pre-roasted ore into the channel 5.

As soon as the pre-roasted ore has been discharged, new ore is introduced again into the charge-chamber 6, distributed on the several floors 18, 22, 20 and pre-roasted, as described before. In the meantime the finish-roasting of the pre-roasted ore in the finish-roasting-chamber 2 has been accomplished and the ore is discharged from this chamber in the well known manner, during which time the door 58 is held open by means of a weighted latch 59. Before doing so, the slide 23 adjacent to the upper end of the channel 4 has been closed to compel on the one hand the heat and gases emanating from the finish-roasting-chamber 3 now in full operation to pass directly from the channel 5 through the opening 19 nearest to it into the charge-chamber 6, and to prevent on the other hand that any ore drops unnecessarily through the other opening 19.

As soon as the last charge of ore contained in the charge-chamber 6 has been pre-roasted to the desired degree it is discharged into the finish-roasting-chamber 2 and then the charge-chamber 6 is charged again with fresh ore. When during this time the pre-roasted ore has been finish-roasted in the finish-roasting-chamber 3 it is discharged through the door 60 held open during this operation by the weighted latch 61. The gases and other products of combustion which leave the charge-chamber 6 are led into the air by means of the chimney 62.

From the foregoing it will be seen, that by means of my improved mechanical roasting-furnace the ore can be pre-roasted to any desired degree independently of the finish-roasting-chambers 2 and 3, and the finish-roasting in the latter carried on independently of the charge-chamber 6. It is thus made possible to not only carry on the pre-roasting of the ore without interruptions, but also to regulate the pre-roasting to suit any kind of ores and without being influenced thereby in any manner by the finish-roasting operations.

Instead of the two finish-roasting-chambers shown in the accompanying drawing any number of them might be arranged as

conveniently can be grouped around the lower part of the roasting-furnace.

I claim:—

1. A mechanical roasting-furnace of the class described comprising, a furnace-body, a charge-chamber in said furnace-body for pre-roasting the ore, and a plurality of finish-roasting-chambers for finish-roasting the pre-roasted ore arranged independently of each other and communicating with said charge-chamber.

2. A mechanical roasting-furnace of the class described comprising, a furnace-body, a charge-chamber, a stirring and transporting device mounted therein, a plurality of finish-roasting-chambers arranged independently of each other and communicating with said charge-chamber, and a stirring and transporting device mounted in each of said finish-roasting-chambers.

3. A mechanical roasting-furnace of the class described comprising, a furnace-body, a charge-chamber arranged therein, a rotary stirring and transporting device mounted in said charge-chamber, means for operating said stirring and transporting device, a plurality of finish-roasting-chambers arranged upon the outside of said furnace-body and communicating with the interior of said charge-chamber, a rotary stirring and transporting device in each of said finish-roasting-chambers, and driving-means for each of said stirring and transporting devices mounted in said finish-roasting chambers.

4. A mechanical roasting-furnace of the class described comprising, a furnace-body, a multistoried charge-chamber arranged therein, a stirring and transporting device mounted in said charge-chamber and operating with a set of rabbles in each of said stories, means for rotating said stirring and transporting device in either direction and for setting it at rest at will, a plurality of finish-roasting-chambers arranged independently of each other and jointly communicating with said charge-chamber, a rotary stirring and transporting device in each of said finish-roasting-chambers, and driving means for each of said stirring and transporting devices mounted in said finish-roasting-chambers.

5. A mechanical roasting-furnace of the class described, comprising, a furnace-body, a charge-chamber, a rotary stirring and transporting device mounted therein, means for operating said stirring and transporting device, a plurality of finish-roasting-chambers arranged upon the outside of said furnace-body, channels connecting the crowns of said finish-roasting-chambers with said charge-chamber, a recessed zone of said furnace-body forming a communication between said channels below said charge-chamber, a stirring and transporting device in each of said finish-roasting-chambers, and driving-

means for each of said stirring and transporting devices mounted in said finish-roasting-chambers for rotating said stirring and transporting devices in either direction and for setting them at rest at will.

6. In a mechanical roasting-furnace of the class described, a furnace-body, a multistoried charge-chamber arranged in the upper part of said furnace-body, a plurality of floors arranged within said charge-chamber and provided with discharge-openings, slides for closing and opening the discharge-openings of the bottom-floor of said charge-chamber, a hopper for introducing the raw ore into the top-story of said charge-chamber, a rotatable stirring and transporting device mounted in said charge-chamber, means for rotating said stirring and transporting device in either direction and for setting it at rest at will, sets of rabbles carried by said stirring and transporting device and operating in the several stories of said charge-chamber, and means for leading off the products of combustion leaving said charge-chamber.

7. In a mechanical roasting-furnace of the class described a furnace-body, a charge-chamber, a plurality of finish-roasting-chambers, channels connecting said finish-roasting-chambers with said charge-chamber, a recessed zone in said furnace-body forming a communication between said channels below said charge-chamber, a floor provided with heating-flues in each of said finish-roasting-chambers, a discharge-door in each of said finish-roasting-chambers, a weighted latch for each of said discharge-doors, a rotatable stirring and transporting device mounted in each of said finish-roasting-chambers, and means for each of said stirring and transporting devices for rotating them independently of each other in either direction and for putting them at rest at will.

8. In a mechanical roasting-furnace of the class described the combination of a furnace-body with a charge-chamber, superimposed floors in said charge-chamber having discharge-openings vertically arranged in a staggered relation to each other, slides for shutting and opening the discharge openings of the bottom-floor at will, a hopper for admitting raw ore, rabbles for stirring and transporting the ore on said floors, means for rotating said rabbles simultaneously in either direction and for setting them simultaneously at rest at will, a chimney for leading off the products of combustion escaping from said charge-chamber, a plurality of finish-roasting-chambers arranged independently of each other around the base of said furnace-body, channels connecting the crowns of said finish-roasting-chambers with the slide-operated openings of the bottom-floor of said charge chamber, a recessed zone in said furnace-body forming a communica-

tion between said channels below said charge-chamber, a floor provided with heating-flues in each of said finish-roasting-chambers, a discharge-door for each of said finish-roasting-chambers, a weighted latch for each of
5 said discharge-doors, a rotatable stirring and transporting device mounted in each of said finish - roasting - chambers, and means for rotating each of said stirring and transport-
10 ing devices independently of each other in

either direction and for setting them at rest at will.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROMAN VON ZELEWSKI.

Witnesses:

H. A. JOHNSON,

A. PENDLETON CRUGER.