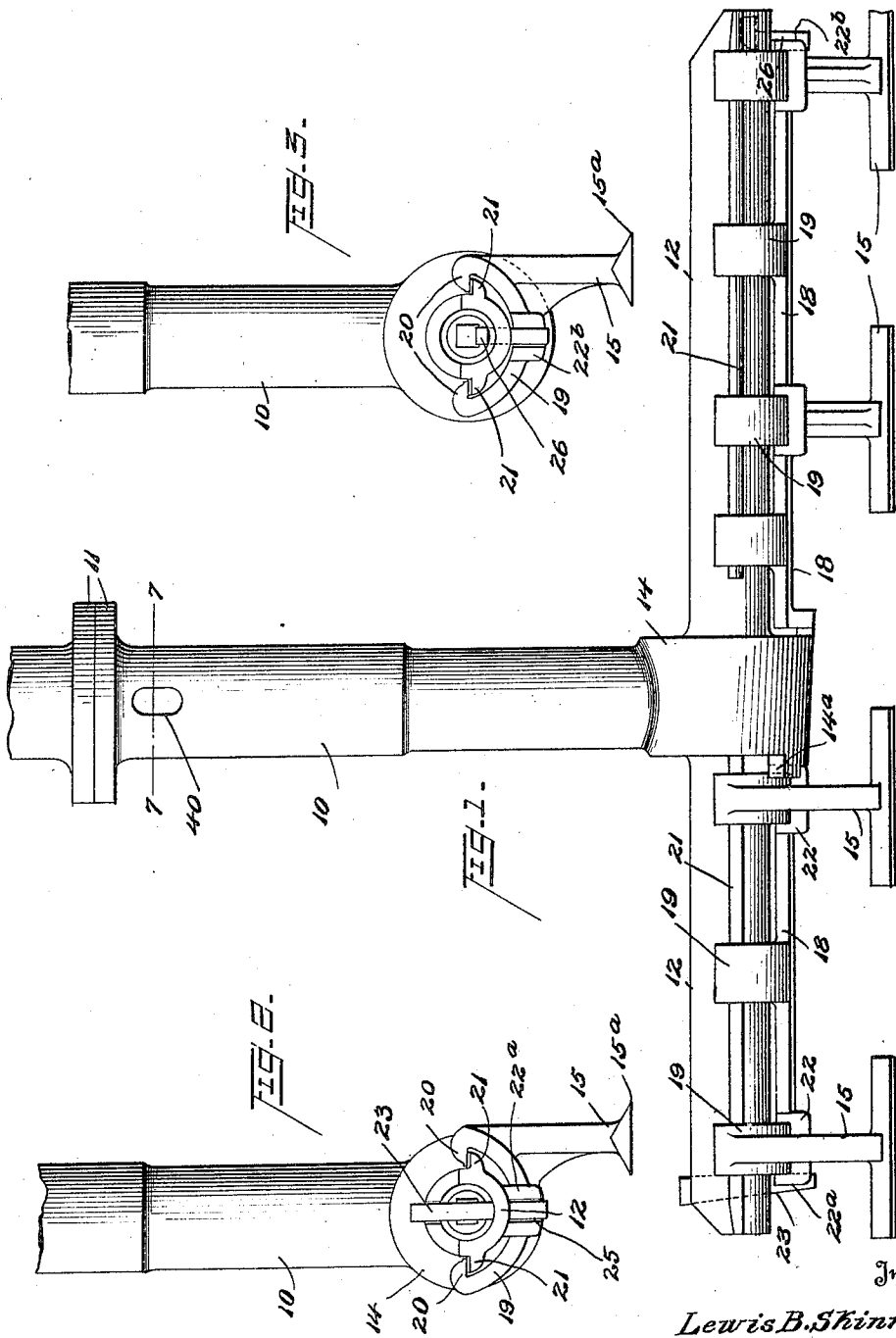


1,404,902.

L. B. SKINNER.
MECHANICAL RABBLE DEVICE.
APPLICATION FILED SEPT. 2, 1920.

Patented Jan. 31, 1922.
2 SHEETS—SHEET 1.



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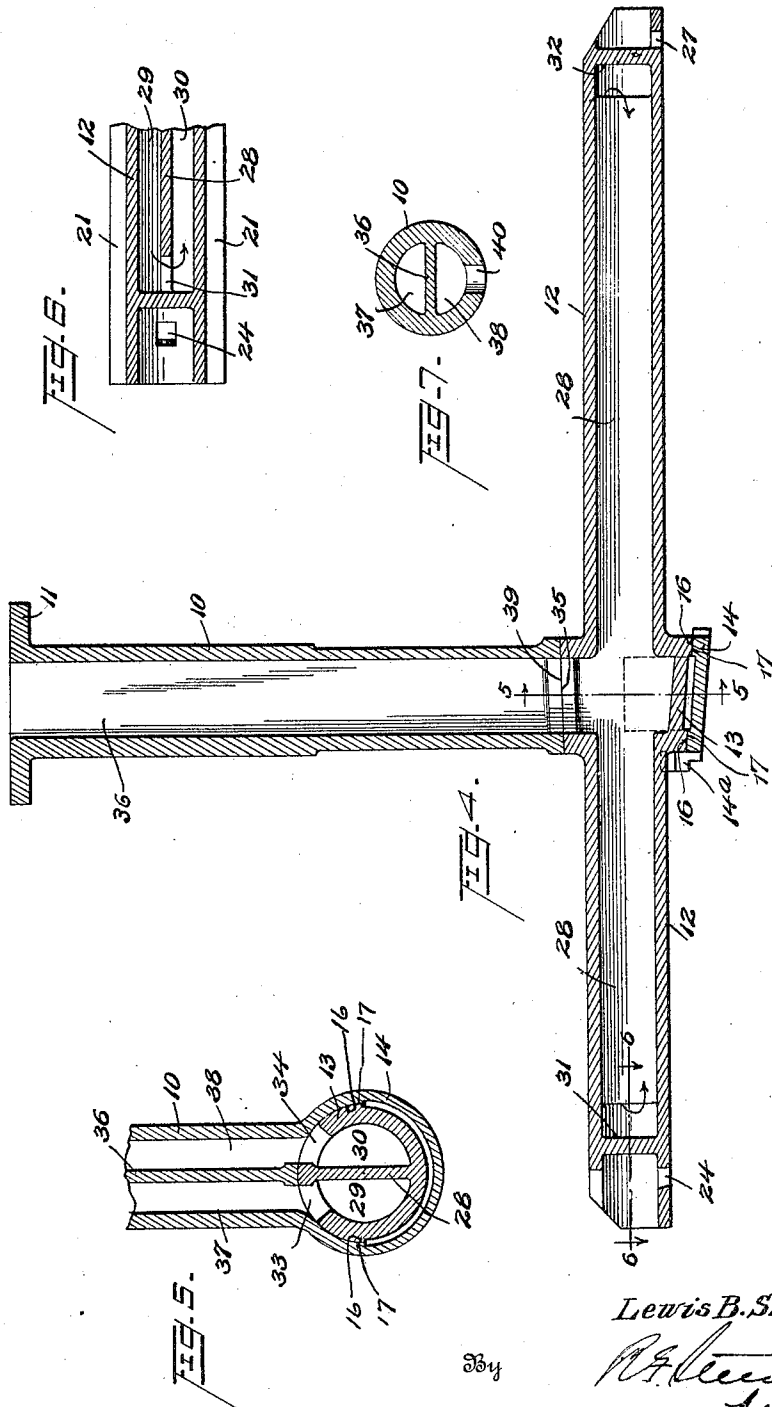
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UNITED STATES PATENT OFFICE.

LEWIS BAILEY SKINNER, OF DENVER, COLORADO.

MECHANICAL RABBLE DEVICE.

1,404,902.

Specification of Letters Patent.

Patented Jan. 31, 1922.

Application filed September 2, 1920. Serial No. 407,702.

To all whom it may concern:

Be it known that I, LEWIS B. SKINNER, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Mechanical Rabble Devices; 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.

This invention relates to mechanical rabble devices for use in roasting and calcining furnaces generally wherein heated material is stirred and advanced along a hearth.

The invention has to do especially with rabble mechanism wherein a revoluble upright shaft carries one or more transverse arms mounted at right angles to the shaft and adapted to support a plurality of rabble teeth (also termed rakes, shoes or plows), each arm comprising portions extending in diametrically opposite directions from said shaft, and both these oppositely extending portions being adapted and arranged to support the rabble teeth above referred to. Rabble mechanism of this design has certain practical advantages, among which may be mentioned the fact that, where the rabbling of viscous or sticky material is involved, the rabble teeth may be spaced apart along the supporting double arm sufficiently to largely prevent the viscous material from "bridging across," without lessening the effectiveness of the rabbling performed or reducing the hearth area swept by a single rabble arm carrying the same number of teeth close together.

The present improvements relate to a double arm rabble structure of the general character described in which said oppositely extending arm portions are combined in an integral unit of sturdy, rugged construction of particularly advantageous design, which can be assembled with the upright supporting shaft, or removed therefrom, easily, expeditiously, and with a minimum interruption to normal furnace operation.

Notwithstanding what has been accomplished in the way of providing rabble apparatus that will stand up under the severe conditions of heat and corrosion to which such apparatus is subjected in service, more or less rapid deterioration of the rabble parts exposed to mechanical wear and corrosive influences in the furnace is inevitable;

so that fairly frequent repair and replacement must be expected and provided for in actual practice. This is particularly true of the rabble teeth themselves, since the conditions of service to which they are subjected are especially severe and cause relatively rapid destruction of the metal castings commonly employed for these members. Removal and replacement of the rabble teeth and arms necessitates stopping or checking furnace operation for a period of time whose length depends upon the facility and expedition with which the required changes can be made. While the changes are being made, the furnace doors have to be open to afford access to the rabbles. This subjects the workmen to heat and obnoxious gases; and it also dilutes and thus lowers the value of the furnace gases by admitting "false air" into the furnace. It is important, therefore, to reduce to a minimum the time required to remove and replace defective rabble parts.

Accordingly it is a general object of this invention to provide improved double arm rabble apparatus characterized by features of construction enabling the double arm as a unit to be assembled with or removed from its upright actuating shaft easily and expeditiously, the arrangement being such that, in assembling the parts, the arm is practically self-positioning on the shaft by a simple thrust movement and is readily locked against movement either longitudinally or about its own axis, the locking means or a part thereof being most desirably also operative to act as retaining means for the teeth carried by the rabble arm on one side of the actuating shaft.

Another object is to embody the foregoing and other desirable characteristics in a rabble mechanism having provision for internal cooling, while at the same time attaining simplicity and ruggedness in a construction relatively free from liability to get out of order.

With the foregoing objects in view, as well as others which will become apparent hereinafter, the invention comprises the features, details of construction, and combinations of parts, which will first be described in connection with a typical practical embodiment illustrated in the accompanying drawings and will then be more particularly pointed out.

Generally described, apparatus construct-

ed in accordance with the principles of the invention comprises an upright revoluble shaft transversely apertured to receive a rabble arm which can be thrust longitudinally through the transverse aperture of the shaft until abutment means carried by said rabble arm intermediate its ends, specifically an approximately central enlargement, most desirably of circular cross-section and having a tapered bearing surface, engages a coacting surface in the apertured portions of said shaft. Operative engagement of these surfaces denotes proper relative positioning of the parts, which may be locked in this position in any suitable manner, but most desirably by means cooperating with detachable rabble teeth subsequently strung on that portion of the double arm that was thrust through the shaft aperture to draw the arm and shaft abutment surfaces more firmly together, while also aiding to retain the detachable teeth on the rabble arm.

In the accompanying drawings, Figure 1 is a side elevation, and Figs. 2 and 3 are end views, of rabble apparatus embodying the invention;

Fig. 4 is a central vertical section of the rabble shaft and arm, the internal partitions being shown in elevation;

Figs. 5 and 6 are sections on the lines 5—5 and 6—6, respectively, of Fig. 4; and

Fig. 7 is a section on the line 7—7 of Fig. 1.

The specific embodiment of the invention illustrated in the drawings is what may be termed a T rabble arm, which I have found to offer important practical advantages when used in mechanical furnaces for making muriatic acid and salt cake, such for example as those illustrated in my prior copending applications Serial No. 359,955, filed February 19, 1920, and Serial No. 360,949, filed February 24, 1920. While this specific application of the invention is here pointed out for purposes of illustration, it is not to be inferred that the invention is limited thereto. On the contrary rabbling mechanism embodying the present invention in widely differing specific forms may be employed in ore roasting and other mechanical furnaces or kilns.

In the rabble mechanism here illustrated, 10 is the lower of two sections into which the upright rabble shaft is divided in this particular instance, the shaft sections being coupled together by suitable fastening means, such as bolts or the like (not shown), cooperating with coupling flanges 11. A one-piece rabble arm 12 is provided, at a locality intermediate its ends with a tapered boss or enlargement 13 integral therewith and of generally circular cross section, fitting snugly within a correspondingly tapered supporting socket 14 disposed transversely at the lower end of the rabble shaft. As

shown, the horizontal rabble arm projects a substantial distance in opposite directions from said socket, both projecting portions, which in this instance are of unequal length, being adapted and arranged to carry detachable rabble teeth 15. The rabble arm is mounted in position on the upright shaft by thrusting that portion of the arm on the side next the smaller end of the tapered boss 13 (at the left in Figs. 1 and 4) through the supporting socket until the cooperating surfaces of the boss and socket engage, that portion of the rabble arm being so dimensioned that it will pass freely through the socket. It will be understood that the rabble teeth are not mounted on the arm until after the latter is assembled with its shaft, since the inside diameter of the receiving socket on the rabble shaft is only large enough to permit the passage therethrough of the arm alone, or rather that portion of the arm extending from the smaller end of the tapered boss. I have found it desirable, in order to reduce the cost of manufacture and insure an air-tight seal, to only finish off the marginal portions of the boss 13 and socket 14, the metal between these portions being roughed down slightly below the surfaces of the finished portions to insure contact between the faces 16 and 17 formed on the boss 13 and socket 14, respectively, as shown in Figures 4 and 5.

Means should also be provided to prevent accidental longitudinal movement of the rabble arm in the socket. This may be accomplished in various ways within the broad scope of the invention, but the particular arrangement for this purpose shown in the drawings offers important practical advantages and is at present considered most desirable. The teeth 15 and interposed spacer 18, each provided with an attaching yoke 19 having hooks 20 fitting over longitudinal supporting ribs or ledges 21 and slidable therealong, are strung on over the end of the arm until hub 22 of the inner tooth of the series is received between a pair of locking lugs 14^a on the smaller end of the tapered socket 14 and abuts said socket. A wedge shaped key 23 is then inserted into a slot or key-way 24 provided in the rabble arm and lies in a groove 25 in the outer face 22^a of the hub of the outermost tooth of the series. When driven into place, the key bears against the end tooth (or spacer) hub and forces the series against the socket on the rabble shaft, drawing the rabble arm boss firmly into the mounting socket and holding the parts solid. The wedge, besides locking the rabble arm to the upright shaft as described, performs the additional function in this instance of holding the teeth and spacer in place on that portion of the rabble arm so that they cannot accidentally work off the end of the arm. The series of teeth

and spacers on that portion of the rabble arm on the opposite side of the shaft 10 are similarly mounted in place and may be held against dislodgment by means of an angular stop-pin 26, inserted in an aperture 27, provided in the end of the rabble arm, the outer face 22^b of the end tooth hub being grooved to receive said stop pin.

It will be observed that the teeth carried by the rabble arm on one side of the shaft 10 are in staggered or offset relation radially to those on the opposite side, so that the teeth move in different paths and are arranged to sweep over a plurality of concentric contiguous annular hearth areas making up the total circular hearth area which the rabble mechanism is designed to cover. By spacing the teeth a considerable distance apart as shown, difficulties due to semi-fused sticky material bridging across from one tooth to the next are largely eliminated. This relatively wide spacing apart of the rabble teeth is made possible by the double arm construction; and by suspending the rabble teeth off-center, as shown in Figs. 2 and 3, bridging up and down is also largely done away with. The rabble shaft 10 is rotated in such direction that in operation the tooth edges 15^a are the front or advance edges.

The rabble shaft and arm are provided interiorly with cooling passages through which a cooling medium may be circulated. The rabble arm 12 is hollow and is provided interiorly with a partition wall 28, which divides the space inside into two passages 29 and 30 communicating only near the opposite ends of the arm as shown at 31 and 32. The tapered boss 13 of the hollow rabble arm 12 is provided with openings 33 and 34 communicating with passages 29 and 30, respectively, and lying on opposite sides of the partition wall 28, the upper edge 35 of which is therefore exposed in this locality. The hollow interior of rabble shaft 10 is divided by the partition wall 36 to form two independent passages 37 and 38. When the tapered boss 13 of the hollow rabble arm is properly positioned in the receiving socket 14 of the rabble shaft, the lower edge 39 of division wall 36 of the rabble shaft and the free upper edge 35 of wall 28 in the tapered boss abut, so that passage 37 registers with opening 33 and passage 38 registers with opening 34. Thus a cooling medium such as air for example, may enter the rabble shaft through passage 37 and after passing successively through passages 29, 31—32, and 30 of the rabble arm, flows into passage 38 of the rabble shaft and may be discharged thence through opening 40.

It will be seen that the described construction makes it possible to assemble the double arm rabble member with its shaft by a direct straight thrust movement which is

automatically stopped at the proper point necessary to ensure correct alinement and relative positioning of the several parts; and that the assemblage can be held together rigidly by simple locking means. Removal of the rabble arm is also readily effected by driving out the key 23, sliding off the rabble teeth and spacer, and then driving the arm boss out of the shaft socket by sledging on the end of the arm.

What I claim is:

1. Rabbling apparatus comprising, in combination, a rabble shaft provided with a transversely disposed socket, a one-piece rabble arm having an integral enlargement intermediate its ends fitting said socket snugly and dividing said arm into two portions, both of which are adapted to carry rabble teeth, and one of which is adapted to be passed through said socket until said enlargement abuts said shaft, and means for locking the rabble arm in this position.

2. Rabbling apparatus comprising, in combination, a rabble shaft, a rabble arm detachably mounted in said shaft and projecting transversely through the shaft, the oppositely projecting portions of said rabble arm being adapted to carry teeth, means integral with the arm to prevent relative movement in one direction of the rabble shaft and arm, and removable means carried by the rabble arm to prevent relative movement of the rabble shaft and arm in the other direction.

3. Rabbling apparatus comprising, in combination, a rabble shaft, a one-piece rabble arm detachably mounted on said shaft and projecting transversely through the shaft, the oppositely projecting portions of said rabble arm being adapted to carry teeth, and means for clamping teeth on said rabble arm, said means also locking the rabble arm against movement on said rabble shaft.

4. Rabbling apparatus comprising, in combination, a rabble shaft provided with a transversely disposed tapered socket, a rabble arm having a tapered boss fitting in said socket, teeth carried by said rabble arm, means for securing said teeth on said rabble arm, said means also locking said rabble arm in said socket.

5. Rabbling apparatus comprising, in combination, a rabble shaft provided with a transversely disposed tapered socket, a rabble arm passing through said socket and having a tapered boss engaging said tapered socket, the rabble arm extending in opposite directions from said rabble shaft, teeth supported by said arm on opposite sides of said boss, and means carried by the rabble arm to force teeth against the rabble shaft and thereby to maintain the rabble arm in said socket.

6. Rabbling apparatus comprising, in combination, a rabble shaft provided with a

transversely disposed socket, a rabble arm having an approximately central enlargement, said rabble arm being adapted to be passed through said socket until said enlargement engages said socket to limit further movement of the rabble arm in that direction, teeth supported by said rabble arm on opposite sides of said enlargement, and means on the section of the rabble arm passed through said socket for forcing the teeth on said section against said rabble shaft to maintain the rabble arm in the socket.

7. Rabbling apparatus comprising, in combination, a rabble shaft provided with a transversely disposed tapered socket, a rabble arm having a tapered boss, said arm being adapted to be passed through said socket until said boss engages said socket, teeth supported on said rabble arm, the end of said rabble arm being slotted, and a wedge in the slot forcing said teeth against said rabble shaft to maintain the rabble arm in said socket.

8. Rabbling apparatus comprising, in combination, a rabble shaft, a rabble arm removably mounted on said shaft and projecting transversely therethrough, means integral with the arm to prevent longitudinal movement of the arm in one direction in respect to the shaft, removable means carried by the rabble arm to prevent longitudinal movement of the rabble arm in the other direction with respect to the rabble shaft, and means to prevent torsional movement of the rabble arm in respect to the rabble shaft.

9. Rabbling apparatus comprising, in combination, a hollow shaft divided by a vertical partition into two passages, a transverse rabble arm removably mounted on said shaft and having two passages formed by a partition extending to points adjacent each end of the rabble arm, said rabble arm having portions supporting teeth extending on opposite sides of said shaft

and being provided with openings intermediate said portions communicating respectively with the passages in said arm, and means carried by the rabble arm for locking said arm to the shaft with the partition of the rabble arm in line with the partition of the shaft and abutting therewith, whereby said openings register with the respective shaft passages.

10. Rabbling apparatus comprising, in combination, a hollow shaft provided with a transversely disposed tapered socket and divided by a vertical partition into two passages opening into said socket, a rabble arm passing through said socket and having a centrally disposed tapered boss engaging said tapered socket, said rabble arm having two passages formed by a vertically disposed partition extending to points adjacent each end of the rabble arm, the tapered boss on said rabble arm being provided with central openings communicating respectively with the passages in said arm, and means carried by the rabble arm for locking said tapered boss in said tapered socket with the vertical partition of the rabble arm in line with the vertical partition of the shaft and abutting therewith, whereby said central openings register with the respective shaft passages.

11. Rabbling apparatus comprising, in combination, a rabble shaft having a transverse aperture providing a mounting socket, a unitary rabble arm having a centrally disposed enlargement formed to be seated snugly and solidly within said socket by a direct thrust movement of said arm parallel to the axis of said socket, said enlargement dividing the arm into two portions both adapted and arranged to support rabble teeth, and means preventing dislodgment of said arm from said socket.

In testimony whereof I hereunto affix my signature.

LEWIS BAILEY SKINNER.