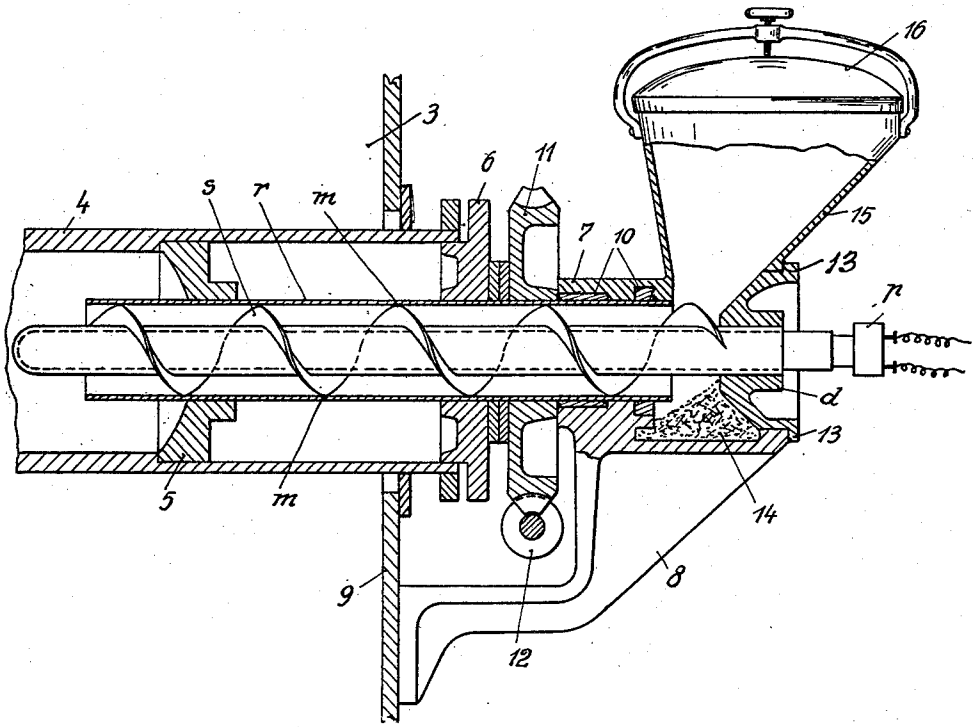
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ROTARY TEMPERING FURNACE

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FIG. 1.




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FIG. 2.

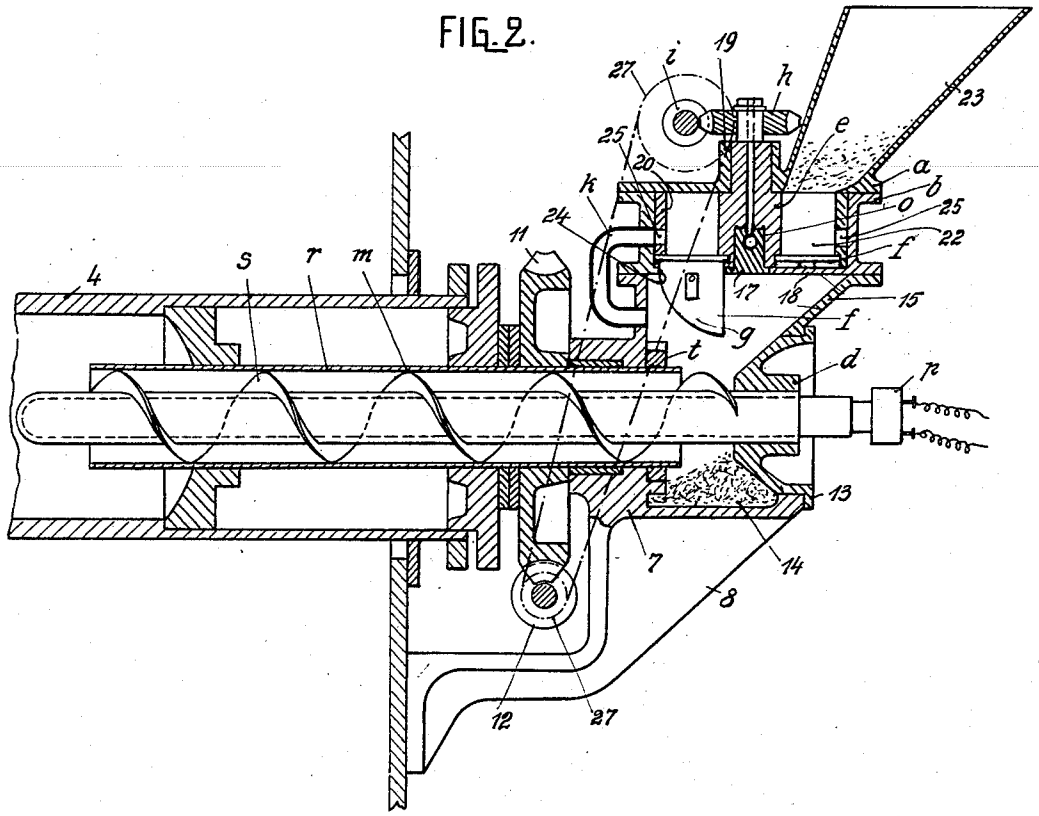
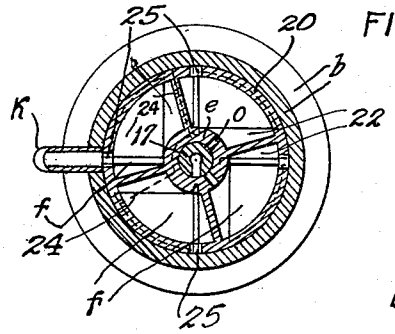



FIG. 3.




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# UNITED STATES PATENT OFFICE

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## ROTARY TEMPERING FURNACE

Application filed August 6, 1928, Serial No. 297,583, and in Germany August 12, 1927.

My invention relates to improvements in rotary tempering furnaces, and more particularly in furnaces which are provided with means for inserting and gasifying a tempering powder, the said gasified powder acting at elevated temperature and under pressure. One of the objects of the improvements is to provide a furnace of this type in which the means supplying the tempering powder are constructed so as to permit the powder to be slowly and gradually supplied to the furnace, so that the tempering gas is gradually developed, and to supply a new charge of the hardening powder in the course of the tempering operation. The said means are constructed so that the powder can be supplied without opening the furnace, and without relieving the pressure of the tempering gas confined within the furnace.

With these objects in view my invention consists in the matters to be described hereinafter and particularly pointed out in the appended claims.

For the purpose of explaining the invention two examples embodying the same have been shown in the accompanying drawings in which the same reference characters have been used in all the views to indicate corresponding parts. In said drawings,

Fig. 1, is a sectional elevation of one end of the rotary furnace and the means for supplying the tempering powder thereto.

Fig. 2, is a sectional elevation showing a modification.

Fig. 3, is a cross section on the line III—III of Fig. 2.

In the example shown in Fig. 1 the furnace comprises a heating chamber 3 having one or more pipes 4 rotatably mounted therein, the said pipes being provided with a gate for inserting and removing the objects to be tempered. Concentrically of the pipe 4 a pipe $r$ is fixed to an inner ring 5 and an outer ring 6 secured to the pipe 4, and to the inner wall of the pipe $r$ a worm $s$ is fixed by welding, the welding of the worm being preferably effected through bores $m$ made in the wall of the pipe $r$. The pipe $r$ is guided at its outer end in a cylindrical bearing block 7 made integral with a bracket 8 fixed to the front wall 9 of the furnace, packing rings 10 being provided between the bearing block 7 and the pipe $r$. To the pipe $r$ a worm gear 11 is fixed which is in mesh with a worm 12 adapted to be rotated for imparting rotary movement to the pipe 4.

Concentrically of the pipe $r$ a pyrometer tube $p$ is loosely mounted within the worm $s$, and the said tube is welded to a hub $d$ made in a lid 13 secured to the outer end of the bearing block 7. The said bearing block is formed with a chamber 14 traversed by the intake end of the worm $s$ and connected with a funnel 15 adapted to be closed by a lid 16.

In the operation of the apparatus the powder for tempering is filled into the funnel 15 and the chamber 14, whereupon the lid 16 is fixed to the funnel 15 in an air-tight manner. Now, rotary movement is imparted to the pipe 4 by means of the worm gearing 11, 12. The worm $s$ takes part in the said rotary movement, and it gradually carries the powder from the chamber 14 into the furnace, where it is vaporized by heat.

An important feature of my improved construction is that the apparatus for supplying the powder to the pipe 4 can be mounted without providing additional openings in the pipe 4, the said parts being connected with the opening provided for inserting the pyrometer tube $p$. By retarding or accelerating the rotary movement of the drum the amount of the powder supplied to the pipe 4 is regulated. Further, the pipe $r$ and the worm $s$ can be readily removed from the pipe 4 for inserting a worm $s$ having another pitch, so that the volume of powder inserted by means of the worm $s$ can be varied by providing worms of different pitches.

In Fig. 2 and Fig. 3, I have shown a modification in which additional means are provided for controlling the supply of the powder to the pipe 4. The construction of the pipes 4 and $r$, the worm $s$, the bearing block 7, the bracket 8, the worm gearing 11, 12, the pyrometer tube $p$, the lid 13 and the chamber 14 are the same as has been described with reference to Fig. 1, and the same

letters of reference have been used to indicate corresponding parts.

On the top of the funnel 15 a distributing device is provided, which consists of a cylindrical casing *b* fixed to the top of the funnel 15. Said casing *b* encloses a rotary distributing wheel *e* rotatably mounted on a trunnion 17 rising from the bottom 18 of the casing *b* and in a hub 19 of the lid *a* of the casing *b*, a worm gearing *h*, *i* being provided for imparting rotary movement to the wheel *e*. The said wheel comprises a cylinder 20 which is open at its top and bottom, and which is provided with radial partitions dividing the same into segmental chambers 22. The lid *a* is provided at one side with an intake 23 in position for successively communicating with the chambers 22. The chambers 22 are adapted to be closed at their bottoms by gates *f* hinged to the wheel *e* near one end of each chamber, and the bottom 18 is formed at the side diametrically opposite to the intake 23 with an opening 24 the area of which corresponds to and is greater than the area of the gates *f*. Upon rotation of the wheel *e* by means of the worm gearing *i*, *h*, the gate *f* passes across the opening 24 and drops downwardly by gravity, thus opening the corresponding chamber 22 to the funnel 15 and the chamber 14. To each of the gates *f* a leaf spring *g* is secured which tends to rock the gate upwardly into position for closing its chamber 22. The cylinder 20 is provided with holes 25 one for each of the chambers 22, the said holes being adapted for communication with a U-shaped pipe *k* extending through the wall of the casing *b* and leading to the funnel 15. Holes *o* are provided in the hub of wheel *e* to connect each chamber 22 with the atmosphere by indexing with the end of a channel *o'* provided in trunnion 17 and the hub of wheel *h* immediately before the chamber 22 becomes adjacent to the intake 23.

In the operation of the apparatus shown in Fig. 2 the pipe 4 is rotated by means of the worm gearing 11, 12, the powder for tempering is supplied to the intake 23, and the wheel *e* is slowly rotated. Thus measured amounts of the powder drop into the chambers 22 moving below the intake 23, the said powder being supported on the gates *f*. When a chamber which has thus received a charge of powder arrives above the hole 24 made in the bottom 18 the gate *f* drops by gravity into the position shown in Fig. 2, so that the powder is delivered into the chamber 14. As the said chamber 22 continues its movement, it engages the radial margin of said hole 24, and it is rocked thereby upwardly and into position for closing the chamber 22. After pressure has been developed within the pipe 4 by vaporization of the powder, the said pressure is transmitted to the chamber 14, and it acts from below on the gates *f* thus pressing the same into tight engagement with the wheel *e*. Thus the escape of the gas from the pipe 4 is prevented. When a chamber 22 arrives above the opening 24 made in the bottom 18, the pressure from the chamber 14 is transmitted through the pipe *k* to the chamber 22, so that the pressure above and below the gate *f* is balanced, and the gate *f* is free to drop by gravity. In order to relieve the pressure within the chamber 22 before the chamber arrives into position below the intake 23, the hole *o* in each chamber opening into the atmosphere through channel *o'* is provided. Thus, when the chamber 22 arrives below the intake 23 it contains gas of atmospheric pressure, so that there is no danger of the powder stored within the intake 23 being blown out of the said intake.

For regulating the supply of powder to the chamber 14 the velocity of the gear wheel *i*, *h* is varied, for example by providing the belt gearing for driving the worm *i* with stepped pulleys 27.

What I claim is:

1. In a rotary case hardening furnace a tube with a rotary pipe fixed concentrically therein, a feed worm enclosed by said pipe and fixed to the same, a feeding receptacle communicating with the receiving end of said pipe and said worm, means closing said receptacle and a pyrometer tube arranged within said pipe and extending coaxially to the same and to the said worm.

2. In a rotary case hardening furnace a tube with a rotary pipe fixed concentrically therein, a feed worm enclosed by said pipe and fixed to the same, a feeding receptacle communicating with the receiving end of said pipe and said worm, a cylindrical casing fixed to the top of said receptacle and having a bottom provided with a hole, a distributing wheel within said casing open at its top and bottom and divided by partitions into chambers, means for rotating said distributing wheel, an intake for successively supplying material to said chambers and hinged gates one for each of said chambers for closing the same at their bottoms.

3. In a rotary case hardening furnace a tube with a rotary pipe fixed concentrically therein, a feed worm enclosed by said pipe and fixed to the same, a feeding receptacle communicating with the receiving end of said pipe and said worm, a cylindrical casing fixed to the top of said receptacle and having a bottom provided with a hole, a distributing wheel within said casing open at its top and bottom and divided by partitions into chambers, means for rotating said distributing wheel, an intake for successively supplying material to said chambers, hinged gates one for each of said chambers for closing the same at their bottom and means for

rotating said tube, said pipe and said worm.

4. In a rotary case hardening furnace a tube with a rotary pipe fixed concentrically therein, a feed worm enclosed by said pipe and fixed to the same, a feeding receptacle communicating with the receiving end of said pipe and said worm and a pyrometer tube arranged within said tube and extending coaxially to the same and to the said worm.

5. In a rotary case hardening furnace a tube with a rotary pipe fixed concentrically therein, a feed worm enclosed by said pipe and fixed to the same, a feeding receptacle communicating with the receiving end of said pipe and said worm, a pyrometer tube arranged within said tube and extending coaxially to the same and to said worm and removable mounting means in said feeding receptacle permitting removal of said pipe, worm and pyrometer tube.

6. In a rotary case hardening furnace a tube with a rotary pipe fixed concentrically therein, a feed worm enclosed by said pipe and fixed to the same, a feeding receptacle communicating with the receiving end of said pipe and said worm, a cylindrical casing fixed to the top of said receptacle and having a bottom provided with a hole, a distributing wheel within said casing open at its top and bottom and divided by partitions into chambers, means for rotating said distributing wheel, an intake for successively supplying material to said chambers, hinged gates one for each of said chambers and pressure equalizing means connected between said feeding receptacle and each chamber as the gate of the chamber moves adjacent to said hole in the bottom of said cylindrical casing.

7. In a rotary case hardening furnace a tube with a rotary pipe fixed concentrically therein, a feed worm enclosed by said pipe and fixed to the same, a feeding receptacle communicating with the receiving end of said pipe and said worm, a cylindrical casing fixed to the top of said receptacle and having a bottom provided with a hole, a distributing wheel within said casing open at its top and bottom and divided by partitions into chambers, means for rotating said distributing wheel, an intake for successively supplying material to said chambers, hinged gates one for each of said chambers and atmospheric conduit means connected to each chamber after closing of the hinged gate and before filling with material by said intake.

In testimony whereof I have affixed my signature.

ERNST GOERIG.