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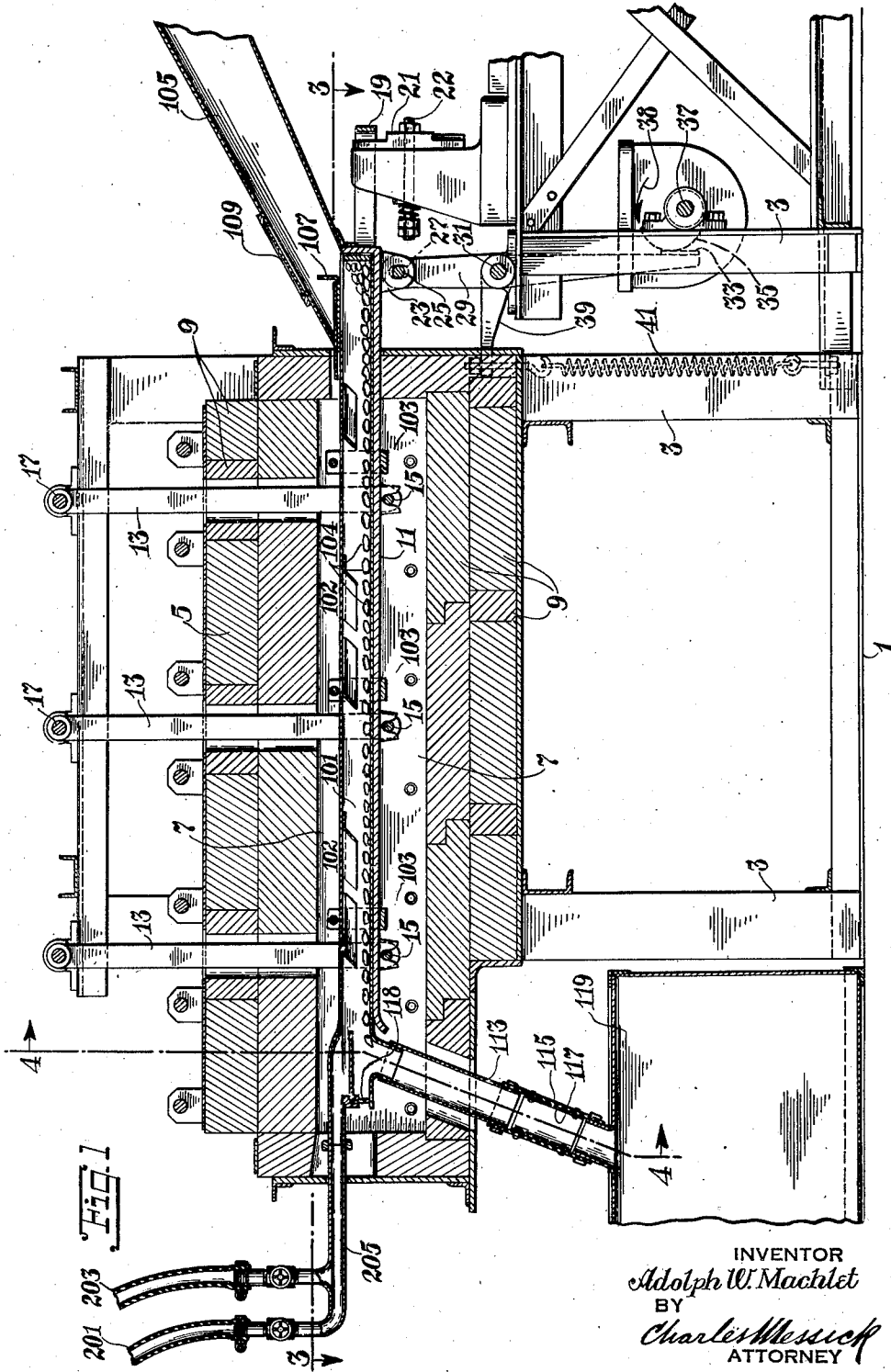
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CONTINUOUS HEAT TREATING MACHINE

Filed Nov. 21, 1931

2 Sheets-Sheet 1



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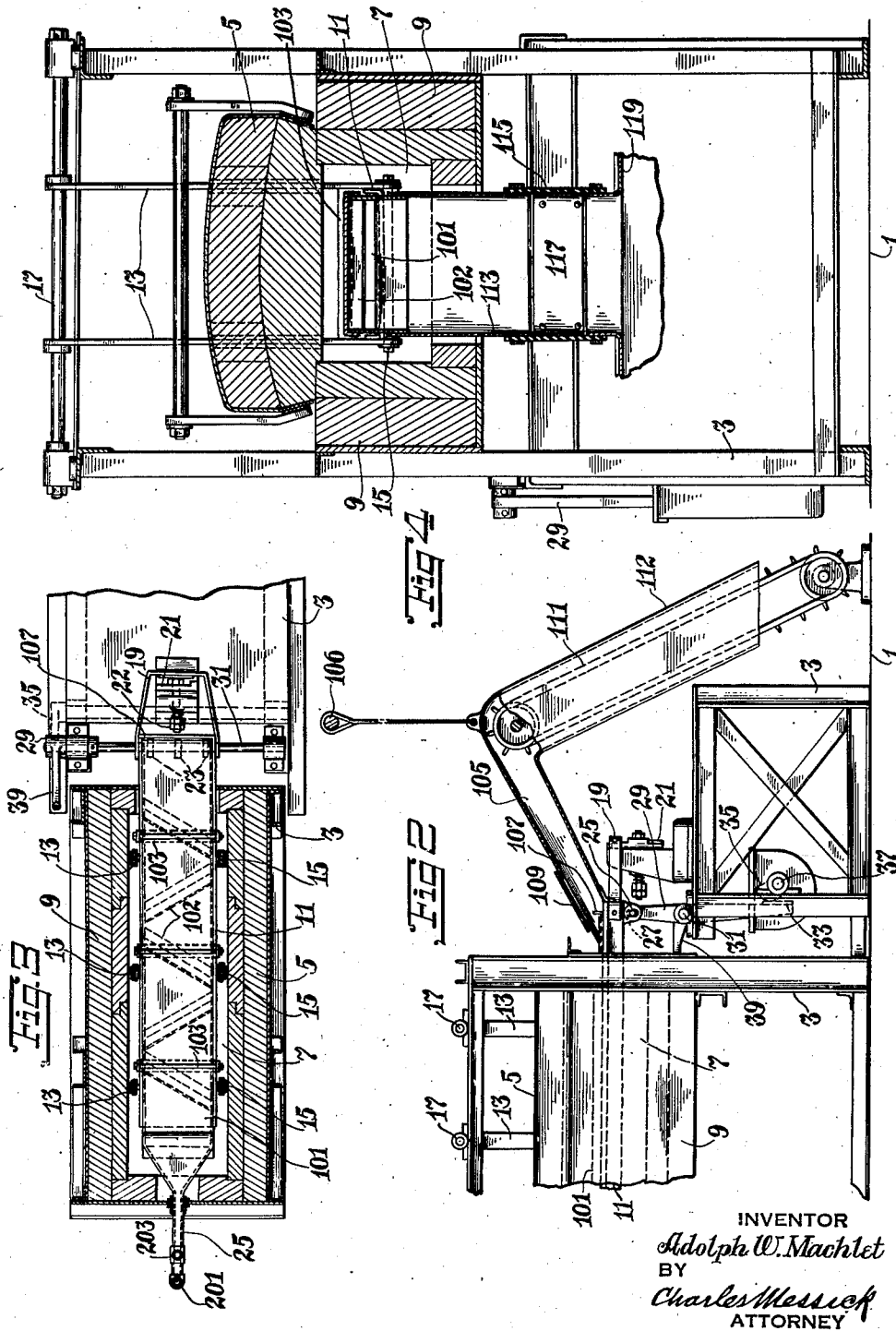
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UNITED STATES PATENT OFFICE

2,021,072

CONTINUOUS HEAT TREATING MACHINE

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Application November 21, 1931, Serial No. 576,468

11 Claims. (Cl. 266—5)

This invention pertains to machines and methods for processing articles while subjected to heat in closed retorts in the presence of treating materials.

One object of the invention is to provide an improved heat treating machine designed for a continuous cycle of operations including heating, treating and discharging the treated work.

Another object is to provide improved constructional arrangements and/or mechanical devices for such a machine.

Another object is to provide improved combinations of instrumentalities in such a machine.

Another object is to provide an enclosed oscillating retort designed to receive work at one end, pass the work through itself and discharge the work at the other end.

Another object is to provide means to prevent loss of treating material from such an enclosed oscillating conveyor.

Another object is to exclude air and other unwanted gases so as to produce the best possible product.

Another object is to agitate the work during its passage so as to expose all its surfaces, with substantial uniformity, to the treating material.

Other objects may be explained in the following detailed description of one form of the invention and may be pointed out in the appended claims.

Referring to the accompanying drawings:—

Fig. 1 is a longitudinal elevation, partly in vertical section of the body and left hand end of my improved continuous heat treating machine.

Fig. 2 is a similar elevation of the right hand end of the device of Fig. 1. However, in Fig. 2 the fragment of the body which is shown appears in full whereas it is in section in Fig. 1.

Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 1.

Fig. 4 is a substantially vertical section taken on the line 4—4 of Fig. 1.

The numeral 1 indicates a floor upon which is mounted a conventional frame 3, supporting a furnace 5, provided with a hot chamber 7, which may be heated by any approved means. Chamber 7 is surrounded by brick insulation 9, secured in place in a conventional manner, and is of much greater length than height or breadth. Chamber 7 contains a conventional oscillating refractory-metal, trough-like shelf 11 suspended by links 13 depending from the upper part of frame 3.

As shown best in Fig. 1, pivot pins 15 and 17 in co-operation with links 13 permit shelf 11 to os-

cillate a short distance both to the right and to the left from the indicated position.

Shelf 11 projects through an opening at the right hand end of chamber 7 and is provided, at the extension, with an iron strap 19 which, in the indicated position, is shown as loosely looped around an adjustable bumper 21, of conventional type.

Shelf 11 is also provided with lugs 23 having a hole which contains a pivot pin 25. Pin 25 passes loosely through an oval hole 27 in the upper end of a rocker arm 29. The central portion of rocker arm 29 is pivoted at a shaft 31 journaled at frame 3.

Rocker arm 29 extends down from shaft 31 and terminates in a striking plate 33. In the position of Fig. 1 plate 33 engages a cam 35 which is tightly mounted on a shaft 37. Cam 35 and shaft 37 are designed to be rotated in the direction of arrow 38 by power, from any suitable source, not shown.

Upon shaft 31 there is tightly secured a lever arm 39, at the end of which is attached a tension spring 41, designed to transmit torque through shaft 31 and rocker arm 29 to striking plate 33 and force it into contact with cam 35.

Thus member 11 moves from the position of Fig. 1, to the right as shaft 37 is rotated 90°. At 90° member 35 disengages member 33. As soon as the disengagement occurs spring 41, acting through members 39, 29, 25, etc., moves member 11 to the left until the movement is abruptly halted by member 19 striking against member 21.

Member 11 carries a duct-like retort of sheet metal 101, which will be subsequently described in detail. Retort 101 is rigidly but detachably secured to member 11 by strap clamps 103. When member 19 strikes member 21, any work, for instance, the iron objects 104 which are shown as loosely resting in retort 101, slip, because of their momentum, a short distance to the left until brought to rest by friction with the bottom of member 101.

Upon a 180° further rotation of shaft 37, that is to say 270° beyond the position shown in Fig. 1, members 33 and 35 again engage. Members 11, 101 and 104 are then again gradually moved to the right and the cycle is repeated.

Bumper 21 is rotatably mounted on a spring-maintained bolt 22, so that it may be adjusted by the operator to vary the unrestrained movement of members 29, 25, 11, 101, etc., as above described, thus varying the violence of the bumps between members 19 and 21 and controlling the average speed at which the work 104 travels to the left.

The net result of the above described movement is that the work 104 moves slowly toward the left by a succession of short steps. The mechanism may be termed an oscillating or reciprocating conveyor mechanism to distinguish it from the many well-known types of belt conveyors.

Referring to the right of Fig. 2, a chute 105, movably suspended at 106, is shown as attached to member 11. A continuous stream of work may be loaded into the retort 101 from chute 105. Retort 101 is provided with a sliding door 107, and chute 105 is provided with a sliding inspection door 109. Doors 107 and 109 are at a convenient height for an operator standing on floor 1. Chute 105 is loaded from a belt conveyor 111, shown in Fig. 2, which is completely enclosed at 112 to a level considerably below the bottom of retort 101, so that treating gases which, because they are usually of lower specific gravity than air, will thus be prevented from leaking out of the retort 101. Door 107 is designed to completely close the right hand end of retort 101 when required, for instance, if the chute 105 is not in use. In such an event the work may be fed in through door 107 by hand.

The left hand end of retort 101 is provided with a down spout 113 having a flexible portion 115 preferably provided with a suitable heat-resisting lining 117. A sliding door 118 at the left hand end of retort 101 is provided to permit the cleaning out of the retort 101 when required. The lower end of down spout 113 is shown as discharging into a closed tank or box 119 where the work may be gradually accumulated after passing through retort 101. Tank 119 may contain oil or water if it is desired to immediately quench or chill the work after it has passed through retort 101 as above described.

It may be observed that both the bottom of down spout 113 and housing 112 are below retort 101 so that we have in effect a bell-like closure or hood for the treating gases, which will prevent their wastage.

The treating materials may be either in the form of solids, powder, liquid or gas, but treating materials in gaseous form are generally used, and the fittings at the left of retort 101 are particularly arranged for the introduction of gaseous treating materials into retort 101.

The method of treating work, usually small ferrous articles, in the above described apparatus, which is especially adapted for operation in combination with said apparatus, consists of combined nitrogenizing and carburizing at a retort temperature of 1300° to 1600° Fahrenheit. Suitable treating materials include any hydrocarbon gas, which may enter through a pipe 201, and ammonia gas, which may enter through a pipe 203. Pipes 201 and 203 communicate through a pipe 205 with the left hand end of retort 101.

Retort 101 is stiffened at its upper portion by diagonal braces 102, and these braces also act as baffles for the even distribution of the treating gases as they flow toward the right through the retort 101.

With the above described combination of apparatus and method, small ferrous articles can be hardened sufficiently for most practical purposes, at very low cost, in about five minutes of actual processing in the retort 101. The articles are discharged from the retort 101, ready for use as soon as they cool off.

The apparatus and method above described is

particularly designed to perform the same type of hardening of ferrous articles which is now usually effected in cyaniding furnaces and to accomplish this work without the danger to the health of the operator such as is always present when cyanide is used.

Such a surface need not be very thick and by combining the carburizing and nitrogenizing treating materials as above described a coating of adequate hardness and which requires no tempering as does a carburized case, may be produced as a continuous operation by the above described apparatus and method.

I do not limit myself to the exact construction or method shown and described above, which 15 may be modified in accordance with progress of the art and the scope of my invention will be pointed out in the following claims.

I claim:—

1. A heat processing machine including an oscillatory retort designed to confine treating material when in a gaseous state, closed at top, bottom and sides, mounted in a substantially horizontal plane so as to prevent thermo siphon draft and loss of such gas, means to jar the retort in one direction of its length and permit it to return the distance jarred more gradually so as to advance work contained in the retort a step at a time and means to close at least one end of the retort to cooperate with the horizontal mounting in minimizing the loss of the treating material while in the gaseous state.

2. A heat processing machine including an oscillatory retort designed to confine treating material when in a gaseous state, closed at top, bottom and sides, mounted in a substantially horizontal plane so as to prevent thermo siphon draft and loss of such gas, means to jar the retort in one direction of its length and permit it to return the distance jarred more gradually so as to advance work contained in the retort a step at a time and means to close both ends of the retort to cooperate with the horizontal mounting in minimizing the loss of the treating material while in the gaseous state.

3. A heat processing machine including an oscillatory retort designed to confine treating material when in a gaseous state, closed at top, bottom and sides, mounted in a substantially horizontal plane so as to prevent thermo siphon draft and loss of such gas, means to jar the retort in one direction of its length and permit it to return the distance jarred more gradually so as to advance work contained in the retort a step at a time, a spout at one end of the retort and closure means at the lower end thereof designed to be closed while the machine is operating to cooperate with the horizontal mounting in minimizing the loss of the treating material while in the gaseous state.

4. A heat processing machine including an oscillatory retort designed to confine treating material when in a gaseous state, closed at top, bottom and sides, mounted in a substantially horizontal plane so as to prevent thermo siphon draft and loss of such gas, means to jar the retort in one direction of its length and permit it to return the distance jarred more gradually so as to advance work contained in the retort a step at a time and work feeding means to close one end of the retort including elevating means and a feeding chute means closed to free air above the level of the retort bottom to cooperate with the horizontal mounting in minimizing the

loss of the treating material while in the gaseous state.

5 5. A heat processing machine including an oscillatory retort designed to confine treating material when in a gaseous state, closed at top, bottom and sides, mounted in a substantially horizontal plane and of great length as compared to height, of a ratio substantially more than 4 to 1, said height being not only relatively but actually
10 small, so as to prevent thermo siphon draft and loss of such gas, and means to jar the retort in one direction of its length and permit it to return the distance jarred more gradually so as to advance work contained in the retort a step at a time.

15 6. A heat processing machine including an oscillatory ductlike retort provided with a chute at one end, a tubular projection from substantially the junction of the retort and chute, and a flexible tubular means connected to the other end of the projection for the introduction of treating material into the retort while it is in vibration and without wastage of treating material when in a gaseous state.

20 7. A heat processing machine including an oscillatory ductlike retort provided with a chute at one end, a flexible extension for the chute and a substantially air and gas-tight stationary receptacle at the bottom of the chute, whereby
25 treating material while in a gaseous state may be conserved and the retort be substantially unconstrained so that it may vibrate freely.

30 8. A heat processing machine including an oscillatory ductlike retort, a mounting therefor to support same in a substantially horizontal position so as to avoid the formation of a thermosiphon draft therein, provided with a chute at one end, a tubular projection from substantially the junction of the retort and chute, and a flexible tubular means connected to the other end of the projection for the introduction of treating material into the retort while it is in vibration and without wastage of treating material when in a gaseous state.

9. A heat processing machine including an oscillatory ductlike retort, a mounting therefor to support same in a substantially horizontal position so as to avoid the formation of a thermosiphon draft therein, provided with a chute at one end, a flexible extension for the chute and a substantially air and gas-tight stationary receptacle at the bottom of the chute, whereby
5 treating material while in a gaseous state may be conserved and the retort be substantially unconstrained so that it may vibrate freely.

10. A heat processing machine including an oscillatory ductlike retort provided with a chute at one end, a flexible extension for the chute and a substantially air and gas-tight stationary receptacle at the bottom of the chute, whereby
15 treating material while in a gaseous state may be conserved and the retort be substantially unconstrained so that it may vibrate freely, a tubular projection from substantially the junction of the retort and chute and a flexible tubular means connected to the other end of the projection for the introduction of treating material while the retort is in vibration and without wastage of treating material when in a gaseous state.

11. A heat processing machine including an oscillatory ductlike retort, a mounting therefor to support same in a substantially horizontal position so as to avoid the formation of a thermosiphon draft therein, a flexible extension for the chute and a substantially air and gas-tight stationary receptacle at the bottom of the chute, whereby treating material while in a gaseous state may be conserved and the retort be substantially unconstrained so that it may vibrate
25 freely, a tubular projection from substantially the junction of the retort and chute and a flexible tubular means connected to the other end of the projection for the introduction of treating material while the retort is in vibration and without wastage of treating material when in a gaseous state.

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