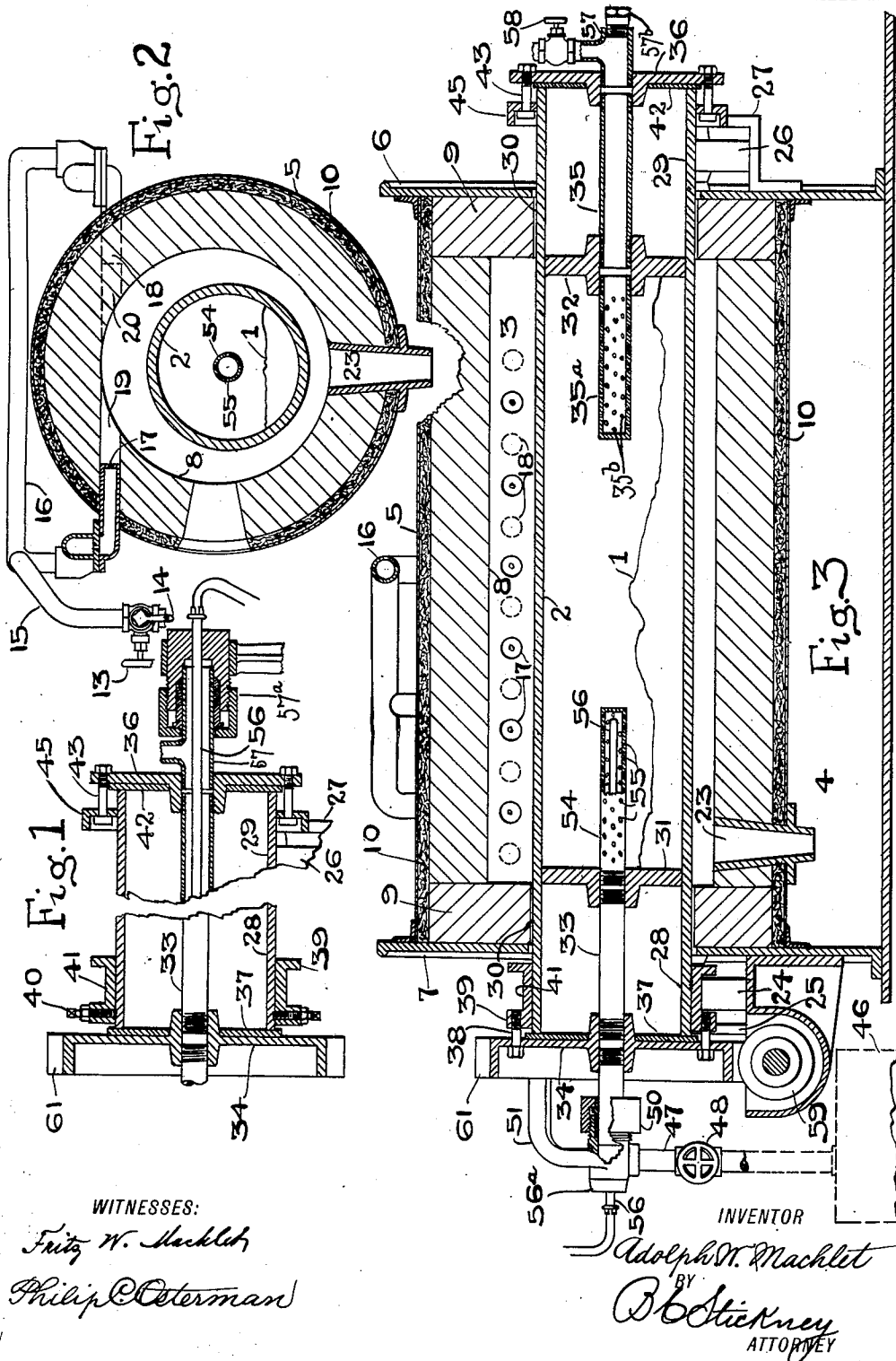


961,305.

Patented June 14, 1910.

2 SHEETS—SHEET 1.



WITNESSES:

Fritz W. Machlet
Philip C. Oeteman

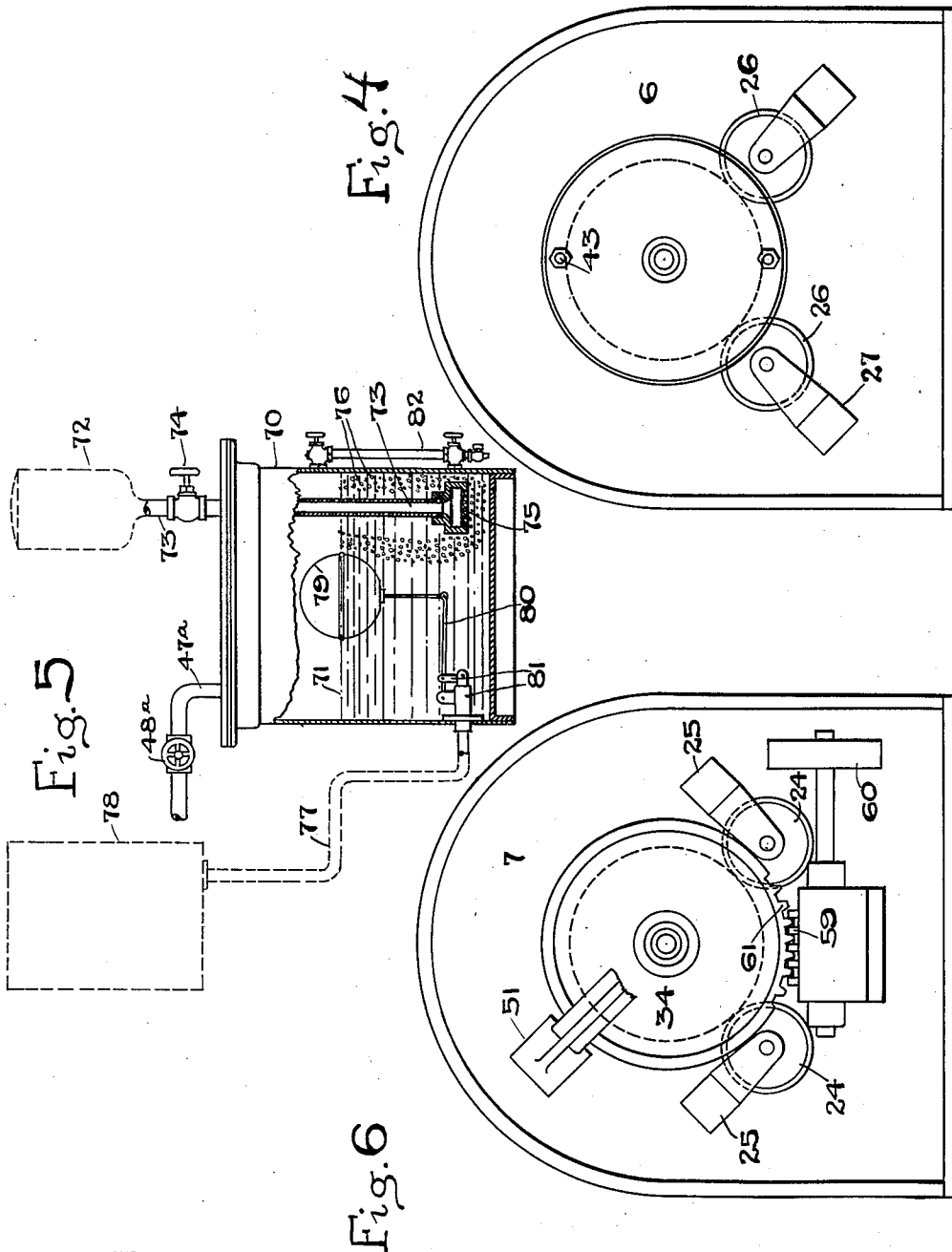
INVENTOR

Adolph W. Machlet
 BY *B. B. Stickney*
 ATTORNEY

961,305.

Patented June 14, 1910.

2 SHEETS—SHEET 2.



WITNESSES:
Fritz W. Machlet
Philip C. Osterman

INVENTOR
Adolph W. Machlet
 BY
B. C. Stickney
 ATTORNEY

UNITED STATES PATENT OFFICE.

ADOLPH W. MACHLET, OF ELIZABETH, NEW JERSEY.

ANNEALING APPARATUS.

961,305.

Specification of Letters Patent. Patented June 14, 1910.

Application filed May 25, 1906. Serial No. 318,678.

To all whom it may concern:

Be it known that I, ADOLPH W. MACHLET, a citizen of the United States, residing in Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Annealing Apparatus, of which the following is a specification.

This invention relates to annealing metal and other articles, particularly articles which have been formed of steel.

In annealing steel articles, it is important to heat them uniformly, and, particularly when the work is to be nicely done, to permit them to cool very slowly; and it is also important to prevent oxidizing of the articles. In order to secure these and other objects, I confine the articles in a retort, which is placed within a furnace heated by combustion of mixed air and fuel, sealing the retort outside of the furnace, the latter having an opening through which the retort protrudes. Before the articles are hot enough for oxidation, I displace the air from the retort by introducing gas, such for instance as ammonia, or ammonia mixed with a hydrocarbon gas, or a carbonous gas unmixed with ammonia. Other gases may be used, as for instance steam, in some cases. The retort is then heated to the proper point, and preferably rotated during the heating, so as both to heat the retort uniformly throughout, and also to agitate the articles therein so that they shall be uniformly heated; a pyrometer being employed to enable the heat of the articles to be regulated, for some fine work. The retort proper is wholly within the flame chamber of the furnace, so as to insure even heating of the articles therein. The subsequent cooling of the articles is greatly prolonged by reason of the slow radiation of heat from the thickened refractory walls of the furnace, thereby securing a more perfect annealing of the articles; it being unnecessary to remove the retort from the furnace during the cooling operation. The original body of inert gas remains confined in the furnace during the heating and cooling of the articles, no appreciable or injurious effect being produced thereby on the articles. The seal being outside of the furnace, is not injured by the heat; and the articles may be conveniently discharged when hot, if desired.

In the accompanying drawings, Figure 1 is a detail showing ends of the retort in section, together with their appurtenances. Fig. 2 is a transverse sectional view of the apparatus seen at Fig. 3. Fig. 3 is a longitudinal sectional elevation of an apparatus equipped for annealing, etc. Fig. 4 is an elevation of one end of the apparatus seen at Fig. 3. Fig. 5 shows means for charging ammonia with hydrocarbon by passing it through naphtha or other oil. Fig. 6 is an elevation of an end of the apparatus seen at Fig. 3.

The articles to be annealed, represented by an uneven line 1, are deposited in bulk within a retort 2, preferably in the form of a barrel or elongated cylinder, and mounted wholly within a flame chamber 3 of a furnace 4, the latter comprising a cylindrical or other body 5 having heads 6 and 7. The furnace is provided throughout with a refractory lining, the cylindrical portion thereof which lines the body being indicated at 8, and that portion which lines the heads of the furnace being indicated at 9; all of said lining being usually set in plaster of paris or asbestos 10. The space inclosed by said refractory lining, forms the flame chamber. Any suitable fuel may be consumed in the furnace; and it may be otherwise constructed. Preferably a mixture of hydrocarbon fuel with air is used; the supply of air and fuel being regulated by valves 13, 14. The air and fuel become mixed within the pipes 15, 16, and the mixture is admitted to burners 17, 18, inserted in horizontal openings 19, 20, formed in the opposite walls of the furnace near the top of the flame chamber. The burners point alternately in opposite directions, as seen at Fig. 2, so as to direct the flames across the top and down around both sides of the retort, and form two sets, extending along the top of the flame chamber above said retort. The gas flames are directed upon and over the retort and play down around the same and escape through an outlet 23 formed in the bottom of the furnace at the end of the retort, whereby even heating of the latter is assured. The supports of said retort are mounted upon the exterior of the furnace heads, and consist of a pair of rolls 24 carried upon brackets 25, fixed upon the left-hand head 7, and a pair of rolls 26 mounted upon brackets 27 fixed

upon the right-hand head 6. The retort consists of a section of wrought iron or soft steel tubing, which comprises the main chamber, in which the articles 1 are placed, and extensions 28 and 29 projecting from the ends of the furnace, the extension 28 revolubly mounted upon the rolls 24, and the extension 29 upon the rolls 26. Said extensions project through openings 30 formed in the refractory lining 9 and through similar openings in the heads of the furnace.

Inserted loosely in the retort are two partitions or covers 31, 32, the former rigidly connected by a central inlet pipe 33 to a cover 34, and the latter similarly connected by an outlet pipe 35, to a cover 36; the latter being movable together with the partition 32, so as to permit the retort to be charged and discharged. The cover 34, which is provided with an asbestos or other packing 37, is secured by bolts 38 to a flange or wheel 39 which is detachably secured by set screws 40, Fig. 1, and is provided with an annular recess 41, which forms a tread to run upon the rolls 24; the flanged walls of said recess serving to prevent endwise displacement of the retort.

The cover 36, which is provided with an asbestos packing 42, is secured by bolts 43 to a collar 45, which is detachably secured upon the retort. The space between the partitions or covers 31, 32, is wholly within the flame chamber of the furnace, and hence the articles in said space are uniformly heated. Ammonia or carbonous gas or steam may be supplied from a receiver or generator shown diagrammatically at 46, Fig. 3, connected to the retort by means of a pipe 47, provided with a valve 48. A gland is shown at 50 to accommodate the rotation of the retort, since the pipe 47 remains stationary. A yoke 51 is fixed upon the head 7 of the furnace to support the gland 50. Threaded into the cover or end 31 of the retort, is a jet or sprayer 54, having numerous apertures 55 for directing the inert gas in small jets into the retort; said sprayer being connected by the pipe 33 to the gland 50.

A pyrometer 56 is inserted through a cap 56^a provided upon the gland 50, and extends within the pipe 33 and spray 54 nearly to the inner end of the latter; so that an accurate reading of the temperature within the retort may be secured, which is a matter of importance in some cases. The pyrometer stem or element which extends through said cap and into the spray, may remain stationary during the rotation of the retort.

In operation, the covers 32 and 36 are removed, and the articles 1 placed in the retort, and said covers replaced, 36 being sealed. Then the inert gas or steam is admitted through the valve 48, to displace the air from the retort, this being done before the heating of the retort has proceeded very

far, so as to avoid oxidizing the articles. The air may escape through a pipe 57 having a valve 58, which is closed as soon as the attendant observes that nothing but the gas or steam is escaping therethrough. Then the flames at the burners 17, 18 are turned up, and the retort brought to the required heat and kept at such heat for the required length of time.

Rotation of the retort during the heating operation is effected by means of a worm 59, operated by a pulley 60, and meshing with a worm wheel 61 formed upon the cover 34; whereby the articles are gently agitated, and all portions thereof evenly heated and treated throughout the retort.

In case it is desired to anneal the articles in an atmosphere of ammonia and carbon, the apparatus seen at Fig. 5 may be employed. A tank 70 is nearly filled with naphtha 71. A tank 72 containing ammonia or other suitable inert gas under pressure is connected with the tank 70 by means of a pipe 73, the flow of ammonia being controlled by a valve 74 in said pipe. The latter extends down into the oil tank 70 and terminates near the bottom thereof in a spray 75. Bubbles of ammonia are seen at 76 rising from the spray, and during this action they take up a plenum of naphtha or carbon, filling the top of the tank 70 with gas comprising ammonia and carbon. This gas may be let through a pipe 47^a from the top of the tank 70 having a valve 48^a, and may lead to the pipe 47, Fig. 3. In order to maintain a sufficient quantity of naphtha or other suitable mineral oil in the tank 70, it may be connected by a pipe 77 to a reservoir 78 above the tank. In the latter may be placed a float 79 attached to a lever 80 controlling a valve 81, which regulates the flow of oil from the reservoir into the tank. The latter may also be provided with a gage glass 82.

At Fig. 1, the pyrometer element 56 is shown introduced through the pipe 57 at the right-hand end of the retort; a gland 57^a being provided to accommodate the rotation of the pipe, which simply serves as an exhaust for the air originally contained in the retort, as well as enabling the attendant at any time, by opening the valve 58, to ascertain the condition of the gas which is sealed in the retort during annealing. At Fig. 3, the pipe 57 is closed by a screw-plug 57^b, which may be removed during the heating of the retort, to enable the attendant to peer into the screen (or into the retort if the screen be omitted) to observe the color thereof and judge thereby of its heated condition; said plug being in line with the pipe 35. The tubular cap 35^a, Fig. 3, prevents small articles from passing from the retort into the pipe 35, and it is provided with perforations 35^b to form outlets for the gas or

air from the retort. By extending said cap into the retort, as shown, a sufficient number of holes 35^b may be formed therein, and the cap serves as a screen for the articles, which in some cases may nearly fill the retort.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. In combination, a furnace provided with a chamber in which the flames originate, said chamber having a refractory lining, a closed metallic retort mounted wholly within said lining and closely confined on all sides thereby, numerous burners for mixed air and fuel, means for accurately controlling the heat of the retort, said burners forming a set extending the entire length of the retort in such a manner as to cause the retort to be heated throughout with evenness independent of the heat of said refractory lining; and said burners and lining being constructed to direct the flames all around the retort; means being provided for filling the retort with inert gas during the heating of the retort; and means for effecting rotation of said retort.

2. In combination, a furnace having a single fire chamber provided with a refractory lining, a metallic retort within said fire chamber, means for rotating the retort, and numerous burners for mixed air and fuel; said burners being directed alternately in opposite directions and forming a series extending along said retort and placed at such intervals as to effect substantially uniform heating of the retort throughout its length, and the retort having a lid outside of the furnace and being so sustained in said fire chamber that the flames may play freely around the top, sides and bottom of the retort.

3. In combination, a furnace having a refractory lining which forms a fire chamber, a metallic retort wholly within and closely confined by said fire chamber, supporting means provided upon the exterior of said furnace for enabling said retort to rotate, the latter being removable from said supporting means, numerous burners for mixed air and fuel within said fire chamber, said retort being supported in such a manner that the flames from said burners may play freely all around and beneath said retort between the same and said refractory lining, said retort having a cylindrical extension protruding through said refractory lining and engaging said supporting means, and a lid upon said extension, the retort being removable from the furnace, and having outside of the furnace a removable cover.

4. In combination, a furnace having a flame chamber, a metallic retort wholly within said chamber, and having supporting

means extending to and revoluble upon supports which are provided upon the exterior of the furnace, said retort being removably mounted at its ends upon said supports, and having a lid at one of said ends, a set of burners for mixed air and fuel within said flame chamber, the walls of the latter co-operating with said burners to direct the flames with substantial uniformity beneath and all around said retort, and a holder for inert fluid connected to said retort.

5. In combination, a furnace for gas and air having a row of controllable burners, a chamber in which the flames originate, a retort wholly within said flame chamber, supports exterior to said furnace upon which said retort is mounted for movement, a holder for inert fluid connected to said retort so as to supply fluid thereto during the movement of the retort, and means for effecting movement of the retort.

6. In combination, a furnace, a retort mounted therein, a spray in the form of a perforated tube extending into said retort, means for supplying fluid to the retort through said spray, and a pyrometer having a part extending into said tube.

7. In combination, a furnace, a retort mounted therein for revolution, a pipe or inlet member connected to said retort and provided with a gland, and a pyrometer having a part extending through the gland and inlet member into the retort; and a protecting member for the pyrometer within the retort.

8. In combination, a furnace, a retort mounted therein and having a cover at one end, a gas-holder or supply connected to the other end of the retort, the latter having an inlet for the gas, and a pyrometer extending through said inlet into the retort and provided within the retort with protecting means.

9. In combination, a furnace, a retort mounted therein and having double covers at each of its ends, an inlet pipe connecting the double covers at one end of the retort, and a pyrometer extending through said pipe into the retort.

10. The combination with a furnace and a revoluble retort therein, of outlet and inlet screens 35^a and 54, projecting into the ends of the retort, an outlet pipe, and a screw plug 57^b closing the outlet pipe and in line with one of said screens, so as to afford a view of the interior of the heated screen when the plug is removed.

11. In combination, a retort mounted for revolution, and a pyrometer mounted upon a stationary part at the axis of revolution of the retort and extending within the retort.

12. In combination, a retort mounted for revolution, a pyrometer mounted upon a stationary part at the axis of revolution of

the retort and extending within the retort, and a protecting member for the pyrometer within the retort.

13. In combination, a furnace, a retort
5 mounted therein for revolution, a stationary pipe connected to the retort at the axis of revolution of the latter for supplying gas to the retort, a gland being provided to con-

nect said pipe to said retort, and a pyrometer supported upon a stationary part of said 10 gland and extending into the retort.

ADOLPH W. MACHLET.

Witnesses:

SAMUEL R. OGDEN,
PHILIP C. OSTERMAN.