APPARATUS FOR HEATING ARTICLES

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This invention relates to apparatus for heating mechanical elements, especially of metal and more particularly to apparatus adapted to permit the heating of only parts of such articles.

In machining certain metal articles such for instance as twist drills, rock drills and similar tools, it is frequently necessary for the purpose of resharpening or other treatment temporarily to change the article by heating only parts thereof, for instance at the point which is exposed to particularly hard wear, into a condition in which it is possible to mould or shape the article. This is particularly the case when dealing with articles composed of steel.

The heating of the article must be so carried out in the cases mentioned that only a definite part of the article is brought to the high temperature at which it changes into a condition of less hardness, whilst the other zones of the article must remain below this temperature. A further example in which such heating is necessary is the machining of so-called coal cutting picks, in which it is essential to avoid heating the shaft of the pick, as otherwise, owing to the scales which form during the heating and then flame off, this shaft would no longer fit accurately in the jaw of the spindle of the cutting machine.

One object of my present invention is to provide improvements in apparatus for heating workpieces, especially those composed of metals, which will enable a definite section of the article to be heated to a high temperature while avoiding any undesired heating of the other parts of the article, and in which the zone between the section of higher temperature and the section of lower temperature of the workpiece is kept extraordinarily small.

According to my present invention I heat the article under treatment in a chamber provided with means for heating the part of the article which is inserted in the chamber, the said means functioning for instance either electrically or with gas. I provide this heating chamber with one or more openings for inserting the part of the article which is to be heated, and outside the chamber near these openings I provide means for bringing a cooling medium into contact with the part of the tool not inserted in the chamber. It is preferred in my invention to employ cold air as the cooling medium, and this is blown into a flue in the wall of the oven chamber which is open upwardly and over whose upper opening the part of the article which is to be cooled lies when the article is inserted into the heating chamber of the oven. It is also possible according to my invention to provide openings on two opposite sides of the heating chamber and to supply the cooling medium outside the chamber near each opening. This embodiment of my invention permits lengthy articles such as rods to be heated in the middle.

A further object of my invention is to provide improvements in the said apparatus for heating parts only of work-pieces which will prevent the article being heated beyond the required zone.

For this purpose according to my invention I provide in the wall of the oven chamber opposite the openings for inserting the articles to be heated, a slide formed with a forward surface running vertical to the openings for inserting the workpiece, whereby the slide can be displaced parallel to the said openings in the chamber wall so that the vertical face is at a distance from the said opening which corresponds to the length of the part of the workpiece which is to be heated. Thus the workpiece cannot be inserted further into the oven than corresponds to the temporary position of the slide.

The final object of my invention is to provide an improved method of heating the oven chamber in order substantially to avoid burning away the workpieces.

For this purpose according to my present invention I heat the oven chamber by means of a brick jet burner which I arrange in the bottom of the chamber in such a manner that the gases escaping from it do not meet the workpiece directly.

By the expression brick jet burners one generally understands gas burners of the type in which the combustion of gas and air takes place inside a refractory brick which is provided with a series of narrow flues or channels for this purpose. In these flues or channels the gas and air are practically entirely consumed, so that practically no flames emerge from the brick. In brick jet burners of this type the heat is transmitted to the workpiece on the one hand by the hot waste gases escaping from the burner channels and on the other hand by radiation of the brick which becomes heated to a very high temperature. Owing to the fact that the gas and air burn up almost flamelessly, the brick jet burner is particularly suited for heating articles composed of easily oxidising metals.

With these and other objects of my invention in view, I will now describe the nature of the present invention on the lines of the accompanying drawing in which:

Figure 1 is an end elevation of an apparatus...
constructed in accordance with the invention, one of the side walls being partly broken away and,
the line 2—2 of Figure 1.
Figure 3 illustrates a modified form of the invention.
Figure 4 illustrates the brick jet burner on a larger scale.
In the construction of the invention illustrated in Figs. 1 and 2, in a housing 1 lined with refractory brickwork and resting on a stand 2, oven chambers 3 are provided into which the articles to be heated are inserted. For inserting the articles a slot 4 is provided in the upper part of the chamber wall on whose level a series of openings 5 are provided in the housing 1, corresponding to the number of work-pieces illustrated at 6 (Fig. 1), through which the work-pieces 6 can be inserted from outside into the oven chambers.
The supporting surface for the work-piece 6 on the refractory brickwork of the lining of the housing 1 is formed of two bricks 7 and 8, the lower 7 being placed at the same time as one wall of the oven chamber 3. The bricks 7 and 8 leave between them an upwardly open flue or channel 9, at the bottom of which a perforated pipe 10 or 10a is disposed. The pipes 10 or 10a serve to introduce cold air into the flue 9, and for this purpose one of the pipes 10 or 10a is supplied with a supply pipe 13 by means of pipes 11 or 11a controlled by valves 12. The cold air introduced into the flue 9 flows past the part of the element 6 lying across the mouth of the flue and escapes through the waste gas flue 14 provided in the refractory lining to enter into a chimney 15.
As shown in Fig. 2 of the drawing the brick 8 is preferably of approximately triangular cross-section so that the surface 16 for supporting the work-piece is as narrow as possible. The narrower this supporting surface is, the smaller is the number between the part of the work-piece which is brought to high temperature and that kept at low temperature. The triangular form of the brick 8 permits a narrow surface for supporting the work-piece without thereby reducing the stability of the brick.
In the apparatus shown in the drawing the chamber 3 is heated by an ordinary brick jet burner 17 to which air and gas are supplied through the pipes 18 and 19. Fig. 4 illustrates the brick of the burner on a larger scale. The burner consists of a brick 20 of refractory ceramic material in which a series of channels 21 broadening contiguously towards the oven chamber are provided. Into each of the channels 21 a nozzle 22 projects from outside which issues from a chamber 23 to which compressed air is supplied through the pipe 24. The combustion gas is introduced into the chamber 23 through the pipe 26, the said chamber 23 being connected with the channels 21 as shown in the drawing.
In the construction of brick jet burners shown in Fig. 4 the combustion gas is sucked up by compressed air into the lower channels 21. Obviously however it is also possible to introduce the gas under high pressure and suck up the combustion air by means of the gas.
The mixture of gas and air introduced into the channels 21 of the brick 20 is burned practically completely in these channels, that is to say, without a flame emerging from the burner brick during operation. This property renders the brick jet burner particularly suitable in the present case, as by avoiding flame formation the danger of the work-piece being covered with scale is greatly diminished. The heat from the burner is transmitted to the article being heated on the one hand by the hot waste gases issuing from the burner and on the other hand by the radiation of the brick, which is heated during operation to a very high temperature, in some cases even to white heat.
As shown in Fig. 2, the burner brick is disposed in the lower part of the oven chamber in such a position that the gases issuing therefrom do not meet the work-piece directly, but are first diverted by one of the walls of the chamber. The gases escape from the oven 3 through the opening 4 into the chimney 15.
Opposite the opening 4 in the other wall 27 of the oven a sloping opening 28 is provided in which a slide 29 is disposed which has a face 30 lying vertical to the line of the opening 4 or the housing opening 5. By displacing the slide 29 the face 30 can be brought to a definite distance from the opening 4. The work-piece introduced into the oven through the openings 5 and 4 then strikes due to its weight against the face 30 of the slide 29, so that by suitably adjusting the slide 29 it is possible to prevent the work-piece 6 being inserted too far into the oven, and being heated throughout too great an area.
Fig. 3 illustrates on a larger scale a modification of the oven and opening 4 in the upper wall 27 of the oven 3 disposed in the oven wall 27 above the opening 4 as regards the means for introducing and cooling the work-piece. According to Fig. 3 I provide above the approximately triangular brick 8 a vertically adjustable slide 31, by means of which the opening 4 for introducing the work-piece into the oven wall 27 is possible and the opening 5 to insert the article 6 through the opening. The slide 31 has an extension 32 which can be secured by means of a set screw 33 to an arm of the housing of the oven.
In the modification according to Fig. 3, a channel 34 provided in the oven wall 27 above the part of the work-piece which is to be heated serves to lead off the hot waste gases from the oven.
The cold air which is introduced through the pipe 10 to be blown against the work-piece in the same manner as the construction according to Figs. 1 and 2 meets a wedge-shaped projection 35 of the slide 31 above the work-piece 6 which diverts the cold air current downward upon the upper side of the work-piece 6, as indicated by the arrow in Fig. 3. The cold air then escapes through the flue 14 into the chimney.
The modification according to Fig. 3, offers the advantage in comparison with the construction according to Figs. 1 and 2 that the heating of the work-piece is even more exact than in the other construction, since the hot gases are prevented by the slide 31 from flowing along the upper side of the work-piece, as may happen in the construction according to Fig. 2. In the latter construction the work-piece must be turned now and then while the oven is in operation, but this may be omitted in the modification according to Fig. 3, or is only necessary at much greater intervals.
The invention hereinabove set forth is embodied in a particular form, but may be variously embodied within the scope of the claims hereinafter made.
I claim:
1. Apparatus for heat treatment of a part only of an article comprising: a heat treating chamber provided with means for heating an article inserted therein, said chamber having an article
Apparatus for heat treatment of a part only of an article comprising: a heat treating chamber; an inlet opening for insertion of the part of the article to be heat treated; a channel outside the chamber near said inlet opening and adjacent the supporting point for an article in said inlet opening; cooling medium supply means in said channel; said channel being open outwardly toward the article supporting point and being broadened towards the same from the cooling medium supply means therein.

2. Apparatus for heat treatment of a part only of an article comprising: a heat treating chamber provided with means for heating an article inserted therein, said chamber having an article inlet opening for insertion of the part of the article to be heat treated; a channel outside the chamber near said inlet opening and adjacent the supporting point for an article in said inlet opening; cooling medium supply means in said channel, said channel being separated from the heat treating chamber by a wall of approximately triangular cross-section, the upper narrow end surface of which also serves as the supporting surface for the articles in the article inlet opening to the heat treating chamber.

3. Apparatus for heat treating a part only of an article comprising: a heat treating chamber; means for heating an article in said chamber; said chamber having an article inlet opening for the insertion of a part of an article to be heated; means provided outside the chamber near said opening for bringing a cooling medium into contact with the part of the article not extending into the chamber; and a slide above the article inlet opening for varying the free section of the article; said slide having a lateral projection by means of which the cooling medium moved towards the article is diverted down to the upper side of the article before being led away.

4. Apparatus for heat treating a part only of an article comprising: a heat treating chamber; a gas off-flow flue communicating therewith; means for supplying heating gas to said chamber; an article inlet opening to said chamber for insertion of a part of an article to be treated therein; and a support for an article in said opening comprising a wall of said chamber the inner surface of which is closely adjacent to and substantially in line with the gas off-flow flue, said wall tapering toward the article inlet opening and forming thereby a narrow supporting edge for articles in said inlet openings, and means for directing a cooling medium alongside the part of said wall outside the heat treating chamber and in contact with the part of the article outside the chamber and in the direction of said off-flow flue.

5. Apparatus for heat treating a part only of an article comprising: a heat treating chamber; a gas off-flow flue communicating therewith; means for supplying heating gas to said chamber; an article inlet opening to said chamber for insertion of a part of an article to be treated therein; and a support for an article in said opening comprising a wall of said chamber the inner surface of which is closely adjacent to and substantially in line with the gas off-flow flue, said wall tapering toward the article inlet opening and forming thereby a narrow supporting edge for articles in said inlet openings, and means for directing a cooling medium alongside the part of said wall outside the heat treating chamber and in the direction of said off-flow flue, said wall being adapted to rest on the articles when in the inlet openings therefor and form an inner restricted channel leading into the off-flow flue for restricting gas passing from the heating chamber to the outflow flue from flowing over the portions of the article outside the inner surface of the supporting wall therefor; and an outer cooling-medium off-flow-channel leading into the aforesaid gas out-flow channel from the means for directing a cooling medium therefor.

6. Apparatus for heat treating articles comprising: a heat-treating chamber, a brick jet burner therefor at one end thereof, a gas off-flow flue communicating with said chamber at the opposite end thereof at the top of said chamber; a wall forming the end of the chamber opposite the burner, said wall being in line with the off-flow flue and extending nearly to the top of the chamber and to said flue to provide a restricted passageway from the chamber to the flue, said outflow flue having an article inlet opening for insertion of articles to be heat treated through the aforesaid restricted passageway and said wall being tapered towards said restricted passageway to form a narrow supporting surface for articles in said article inlet opening; a cooling channel alongside the outer side of said wall below the article inlet opening; and means in said channel for directing a cooling medium through the channel, past the article inlet opening, to the gas outflow flue.