This invention relates to slab heating furnaces. In processing metal such as silicon iron alloys and different grades and types of stainless steel into strip form, it is common practice in working the metal from ingot into hot rolled coil bands to subject the metal in the form of slabs of from 2" to 10" in thickness to an intermediate heating at temperatures of 2050° F. to 2400° F. to insure an adequate temperature in such slab to permit the completion of the hot rolling thereof to a gauge of from .049" to .250" before the temperature of such hot rolled coil band is reduced to a temperature below about 1000° F. Slab heating furnaces of standard construction having skid rails therein for receiving the slabs and supporting the slabs as they are pushed through the furnace have been used extensively in the past for effecting such intermediate high temperature heating of the slab.

In commercial practice, it is found that the slabs of metal as they are pushed through the slab heating furnace are so heated that the metal of the slab often becomes relatively soft and the surfaces of the slab become "sticky." When this occurs, the metal of the heated slab tends to and often does stick to the standard skid rails in the slab heating furnace with the result that the slabs, which normally about one another as they are pushed through the furnace, tend to overlap one another and to create a "pile-up" in the furnace which is difficult to untangle. This is a common difficulty which has been and is being experienced by all users of the pusher type of slab heating furnaces and, prior to the present invention, no one has provided a satisfactory and inexpensive universal solution to the problem.

An object of the present invention is to provide a slab heating furnace having lubricated skid rails therein for insuring proper programmed movement of slabs of metal therethrough.

Another object of this invention is to provide a slab heating furnace having substantially parallel skid rails therein which carry a substantially dry lubricating means disposed in spaced relation lengthwise thereof to minimize galling and gouging of the heated slabs and to facilitate movement of slabs therealong.

Other objects of this invention will become apparent from the following description when taken in conjunction with the accompanying drawing in which:

FIGURE 1 is a view in perspective and generally a portion of one of the skid rails of the furnace of FIG. 1 which illustrates features of this invention.

Referring to FIG. 1, this invention is illustrated by reference to a slab heating furnace shown generally at 10. The furnace 10 is provided with a base 12 formed in part of a hearth 14, a top 16, sides 18, and ends 20 and 22 formed of refractory material, the end 20 being provided with an entry port 24 and the end 22 being provided with an exit port 26. A downwardly projecting wall 21 of refractory material divides the furnace into an entry rail zone and an exit zone. In this embodiment, the sides 18 are provided with a plurality of burner ports 28 through which burners 29 project, although it will be appreciated that the burners 29 may be disposed to be fired lengthwise of the furnace instead of crosswise thereof. As is common practice, a plurality of skid rails 30, only two of which are illustrated, are disposed in substantially parallel relation to one another and in alignment with the entry port 24 for receiving slabs 32 which are to be heated. The skid rails 30 are mounted on spaced horizontal hollow pipes 34 which are normally formed of carbon steel, the ends of which are supported through the walls 18, the pipes 34 usually being supported midway of their length as by means of a vertical support member 36. In admitting the slabs 32 through the entry port 24 to the skid rails in the heating zone, the slabs follow one another and are pushed in predetermined timing through the furnace 10 along the skid rails 30 as determined by practice depending upon the time necessary for developing the desired temperature in such slabs. The pusher equipment is not illustrated as such is well known in the art.

The hearth 14 in the soaking zone of the furnace is provided with a plurality of substantially parallel skid rails 38, only two of which are illustrated, disposed in substantial alignment with the skid rails 30 for receiving and conveying the slabs 32 to the exit port 26 where the slabs are delivered to rollers 40 to be conveyed to the hot rolling stands. Usually, the skid rails 30 are formed of plain carbon steel as they are normally cooled as will be described hereinafter; whereas, the skid rails 38 are usually solid rails formed of Type 309 stainless steel, it being found that the latter adequately withstands the temperatures encountered in the soaking zone of the furnace.

Referring to FIG. 2, the skid rail 30 of plain carbon steel is illustrated as a bar which is welded onto and along the upper edge of the pipe 42 which is part of the horizontal pipe 34. The pipes 42 and 34 are connected to a source (not shown) of coolant such as water for the purpose of cooling the rails 30 and for enabling them to withstand the temperatures developed in the furnace.

In accordance with this invention, the skid rails 30 are provided with a plurality of aligned openings 44 which are disposed in predetermined spaced relation lengthwise of the rails 30 for receiving plugs 46 of substantially dry lubricating medium. In practice, the openings 44 comprise ¾" diameter round holes drilled vertically in the rail 30, such openings being disposed from 3" to 5" from one another lengthwise of the rail 30. The plugs 46 are preferably formed of graphite machined to make a tight fit and to completely fill the openings 44 so that the upper end of each such plug is flush with the upper slab engaging surface of the skid rail 30.

When the skid rails 30 are provided with the spaced lubricating means as previously described, it is found that the slabs 32 are adequately lubricated as they are pushed lengthwise of the parallel skid rails to prevent sticking or piling-up of the slabs in the furnace 10. It will be appreciated that through long continued use some wear of the surface of the skid rails 30 is encountered and it is to be noted that if such surface is worn the plugs 46 also become worn with the result that a surface of the plug 46 is always available for the purpose of lubricating the slabs 32 as they are moved lengthwise of the skid rails 30 in the furnace. Thus, permanent lubrication is provided for the skid rails 30 so that the lubrication will last for the lifetime of the skid rails.

While this invention has been described with reference to round openings 44 and round plugs 46 of the lubricating medium, it will, of course, be appreciated that the openings 44 may have any predetermined shape and size so long as the plug 46 is of a complementary shape and size to completely fill the opening 44. Further, it will be appreciated that the spacing between the plugs 46 may be
3 varied somewhat from the spacing of 3" to 5" referred to hereinbefore, although from a practical viewpoint it would be inefficient to space the plugs 46 closer than the minimum of 3" stated hereinbefore as the additional lubrication is found to be unnecessary. The upper limit of 5" given hereinbefore for the spacing between the plugs 46 is a good working spacing as it is found that if the spacing is lengthened greatly thereover that inadequate lubrication is provided for the heated slabs and some sticking may result.

This invention has made it possible to effect the slab heating without encountering detrimental galling or gouging of the heated slabs or any sticking or pile-ups of the slabs in the slab heating furnace with the result that production is greatly increased and improved alloy slab quality is obtained since the heat developed therein is in accordance with a programmed schedule and the slabs are not subjected to undue heat as by reason of pile-up in the furnace. It is apparent that the invention can be readily reproduced by anyone skilled in the art.

I claim:

1. In a slab heating furnace, the combination comprising, a plurality of spaced skid rails disposed in substantially parallel relation to extend substantially horizontally through at least a part of the furnace and having an upper slab engaging surface for receiving and supporting a slab during movement thereof through the furnace, and lubricating means carried by each of said skid rails and disposed in spaced relation lengthwise thereof with an exposed lubricating surface in the plane of said upper slab engaging surface to provide lubrication for said slab as the slab moves along said skid rails.

2. In a slab heating furnace, the combination comprising, a plurality of spaced skid rails disposed in substantially parallel relation to extend substantially horizontally through at least a part of the furnace and having an upper slab engaging surface for receiving and supporting a slab during movement thereof through the furnace, and lubricating means carried by each of said skid rails and disposed in spaced relation lengthwise thereof with an exposed lubricating surface in the plane of said upper slab engaging surface to provide lubrication for said slab as the slab moves along said skid rails.

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