Patented Apr. 28, 1925. 1,535,317

UNITED STATES PATENT OFFICE.

IRVIN JOHN KOEHNLINE, OF BRIDGEPORT, OHIO, AND SAMUEL PEACOCK, OF WHEELING, WEST VIRGINIA.

PROCESS OF ANNEALING STEEL SHEETS.

No Drawing. Application filed January 6, 1925. Serial No. 882.

To all whom it may concern:

Be it known that we, IRVIN JOHN KOEHNLINE, a citizen of the United States, residing at Bridgeport, in the county of Belmont and State of Ohio, and SAMUEL PEACOCK, a citizen of the United States, residing at Wheeling, in the county of Ohio and State of West Virginia, have invented certain new and useful Improvements in Processes of Annealing Steel Sheets; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a process of annealing high grade steel sheets in packs, and has for its object to provide a procedure which will be more efficient in practice than those heretofore proposed.

With this and other objects in view, the invention consists in the novel combination of steps hereinafter disclosed and particularly pointed out in the claims.

In order that this invention may be the more fully understood, it is said:—

In annealing thin sheets of steel packed in piles of say two feet or more in height, as is ordinarily done, it is found practically impossible to heat the sheets to the temperature necessary to eliminate strain hardening, because at such temperature the steel sheets persistently stick together. That is to say, it is not practicable in such annealing procedure to reach the transformation temperature, which is approximately 800° C., at which alpha iron changes to gamma iron, because at such temperatures the sheets develop a form of crystals that readily interlock or interengage with each other to such an extent that they can be later separated only with great difficulty; and this separation further not only imposes excessive costs on the process, but it also in a large degree so mars or deforms the surfaces of the sheet steel, that it is materially lessened in value.

In order to avoid these objections in practice, the steel sheets are of necessity not raised to 800° C., or to any temperature so nearly approaching the same as will cause sticking. They therefore are usually under-annealed, or are annealed to a degree less than that desired to remove working strains. The result of this under-annealing is to cause the sheets to be more or less unsuitable for a number of treatments, such for example, for the purposes of drawing, enameling, tinning, galvanizing, etc., but nevertheless such steel must be thus employed because its complete annealing to a degree sufficient to eliminate all stresses and strains present would mean a waste of say 50 per cent of the sheets due to the above mentioned inherent difficulties of separating the individual sheets. In other words, a complete annealing of the sheets would result in the sheets so sticking together that practically a solid mass would result. In addition to this, lack of control of the physical properties of the sheets due to the enforced omission to heat the steel sheets to the proper degree to completely anneal the same, the steel is also found to contain very decided corrosion zones, probably due to differences in texture due to partial or incomplete annealing.

According to this invention, on the other hand, it has been found that if these steel sheets are given a thin coating of calcium or magnesium hydroxide mixed in a suitable vehicle, such as water, these objections may be overcome as will now be disclosed. That is to say, the thin sheets before annealing are coated with calcium or magnesium hydroxide by any suitable means, such as by spraying the same with the above mentioned mixture, or dipping the sheets in tanks containing such a mixture, whereupon the sheets may be piled in such a manner as to prevent too much draining of the coating mixture therefrom and so that the films of alkali earth hydroxide will remain more or less intact and form a positive layer between each separate sheet.

It is preferred to make the mixture of an alkali earth hydroxide of about the consistency of cream, or of a paint, and also to apply said mixture to the sheets immediately after the pickling action in acid and thus make it serve the double purpose of neutralizing the acid present and of preventing the sticking of the sheets during the annealing process. By this means, it is found that the individual sheets can be so effectually separated from each other as to prevent metallic contact and therefore prevent the sticking together during the annealing process even though the annealing is carried well beyond

the temperature of 800° C. and all the stresses and strains present completely removed.

It is, however, important that the moisture contained in the hydroxide, or otherwise present in the pack, be removed at a comparatively low temperature prior to annealing, for otherwise the steam formed would be rapidly expelled and during such expulsion the continuity of the separating hydroxide layers may be broken. After this drying action, the sheets are passed through the annealing chambers and the temperature regulated to any desired degree necessary to remove the stresses and strains present, whereupon it is found that mild steel sheets very low in silicon and phosphorus may be completely annealed, as a commercial procedure and by the ordinary box annealing procedure.

What is claimed is:

1. The process of annealing thin steel sheets at relatively high temperatures while preventing said sheets from sticking together which consists in coating the surfaces of said sheets with separating layers of an alkali earth hydroxide, and subjecting the coated sheets to an annealing temperature above 800° C.

2. The process of eliminating all the stresses and strains present in pack rolled annealed steel sheets which consists in coating the surfaces of said sheets with separating layers of alkali earth hydroxide and subjecting the coating sheets to an annealing temperature above 800° C.

In testimony whereof we affix our signatures.

IRVIN JOHN KOEHNLINE.
SAMUEL PEACOCK.