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DRAWING FERROUS WIRE AND OTHER
METAL-WORKING PROCESSES

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This invention relates to the mechanical working of metals by operations involving plastic deformation of the metal, e. g. by drawing, rolling and similar operations, and is especially applicable to the drawing of ferrous wire from rod or wire.

The common practice in producing ferrous wire is first to clean the rod or wire chemically and then wash it, sully-coat it with a wet-formed coating of hydrated ferric-ferrous oxide, treat it with lime and dry it in an oven. The rod or wire is then reduced in diameter by being power-drawn through one or more dies until it is of the desired diameter, strength and length. The progress of the rod or wire through the drawing die or dies is assisted by lubrication in the form of standard drawing compounds such as soap, greases and oils. The chosen lubricant is contained in a box or tank through which the rod or wire must pass before entering the first drawing die; further lubrication may similarly be applied to the wire immediately prior to its passage through each subsequent drawing die.

An improvement upon the above method is to replace the sully-coating by the application of a fine crystalline phosphate coating, passivated if desired by a treatment with a solution containing hexavalent chromium, as first described in Singer's British Patent No. 455,077. Rod or wire which has been subjected to this treatment may, without further treatment, be passed through the lubricating boxes and drawing dies. By the use of this improved method a greatly increased life of the drawing dies is obtained. However, objectionable fumes are generated as the wire is drawn through the dies, and further if the phosphate-coated wire is exposed for an appreciable period of time to a damp atmosphere before the drawing operation takes place it becomes partially corroded and in a condition, therefore, which may cause damage to the dies and to the wire in the process of wire-drawing.

An object of this invention is to facilitate the drawing of ferrous wire.

Another object is to improve metal-working processes in which the metal is coated with a phosphate.

A further object of the invention is a wire-drawing process by means of which wire having an improved surface is produced.

A still further object is to eliminate the defects set forth above.

We have found that these objects can be attained by applying to a phosphate-coated material a coating of one or more of the following com-

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pounds, namely the oxides, hydroxides and carbonates of the alkaline earth metals and borax. By the alkaline earth metals we mean calcium, strontium and barium. We prefer to use lime, particularly that obtained commercially as slaked lime, and the coating may be applied by passing the material through a bath containing an aqueous suspension of the lime, e. g. a 10% suspension, or by dusting the lime onto the wet metal which is to be drawn or otherwise worked.

By means of the invention the life of the dies is prolonged. As an example steel wire of high tensile strength and 0.122 inch diameter was given a phosphate coating by treatment with a solution of zinc phosphate containing an oxidising accelerator. The actual steps consisted in pickling the wire in cold hydrochloric acid, rinsing it in cold water, forming the phosphate coating, rinsing the wire again in cold water and drying it in an oven. The wire was then continuously drawn through 9 dies down to 0.037 inch diameter, passing through a dry soap box prior to passing through each die. It was found that the maximum amount of wire which could be drawn before the dies needed reconditioning was 3 tons. Identical wire was then given a phosphate coating in the same way but before being dried in the oven was dipped in a 10% aqueous suspension of slaked lime. This wire was then drawn in the same way and exactly 9 tons of drawn wire were produced before the dies needed reconditioning.

The finished metal has a bright and smooth surface and further operations such as electroplating, lacquering and hot dipping can be carried out more satisfactorily than hitherto because of the better surface condition of the base metal and the greater ease with which the phosphate coating can be removed. If a coloured product is desired the phosphate coating can be dyed before the application of the lime or other coating and the finished product will then be found to retain the colour. In general it is found that by means of the invention an increased amount of the phosphate coating is retained during the drawing operation. Further the resistance of the drawn wire to atmospheric corrosion is increased.

We claim:

1. In the method of producing ferrous wire by drawing a ferrous metal wherein the metal has a coating of crystalline phosphate of the type formed by the interaction of the metal surface with an acidic phosphate the improvement which comprises coating said phosphate coating by immersing the phosphate coated metal in an aque-

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ous suspension of lime, drying said lime coating, and subjecting said metal to drawing.

2. In the method of working ferrous metals by operations involving plastic deformation of the metal wherein the metal has a coating of crystalline phosphate of the type formed by the interaction of the metal surface with an acidic phosphate the improvement which comprises facilitating the working by forming on the said phosphate coating a dry coating of at least one compound selected from the group consisting of oxides and hydroxides of the alkaline earth metals.

3. The method according to claim 2 in which the compound selected is lime.

4. The method according to claim 2 in which the coating is formed by immersing the phosphate coated metal in an aqueous suspension of lime and thereafter drying the coating.

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