To all whom it may concern:

Be it known that I, WILLIAM H. ALLEN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Process for Rust-Proofing Metal, of which the following is a specification.

This invention relates to the rust-proofing of iron and steel, and its object is to provide a bath for the metal which will cause the surface of the metal to be changed uniformly and without blemishes into insoluble basic phosphate which is substantially unaffected upon exposure to moist air.

This invention is carried out by immersing the metal in a hot acid solution of a salt of manganese, preferably prepared by dissolving manganese phosphate in phosphoric acid. The manganese salt may be prepared by dissolving sulfate or chlorid of manganese in water and then adding an equivalent amount of sodium phosphate. The precipitate is then washed until practically free from sulfates and chlorides, and may then be dried if desired.

The manganese phosphate is then dissolved in phosphoric acid to saturation and the solution is diluted to an acidity of about one-tenth of one per cent. The liquid is brought up to nearly the boiling point and the metal articles to be treated are then immersed. A very small amount of the iron will go into solution and some hydrogen will be set free, but after about one half hour, this action will be very slight. The metal remains in the hot solution for from one to three hours, or until all action ceases and the surface of the metal is changed to basic phosphates which cannot be penetrated by the acid of the bath. The metal articles are then removed, dried, and oiled or otherwise treated as desired.

Fresh pieces of iron placed in the bath will be acted upon at once until the bath is exhausted. This process has a great advantage over that employing manganese dioxid, for the solution is clear and can be adjusted as to strength at the beginning to suit the different classes of articles to be acted upon, and being clear, there will substantially be no deposits on the articles in the bath. The bath remains a solution of manganese phosphate until the introduction of iron or steel upset the equilibrium of the solution by some of the iron or steel being dissolved.

In this case, as when iron filings in phosphoric acid are used, ferrous phosphate is formed in the bath. This absorbs oxygen from the air which causes the ferrous phosphate to change to ferric phosphate, which is not so soluble and deposits in the form of a white precipitate.

I claim:
1. The process of rendering articles of iron and steel rust-proof, which consists in immersing the same in a phosphoric acid solution of a manganese phosphate.
2. The process of rendering articles of iron and steel rust-proof, which consists in immersing the same in a solution of phosphoric acid in which manganese phosphate has been dissolved to saturation.
3. The process of rendering articles of iron and steel rust-proof, which consists in immersing the same in a solution of phosphoric acid in which manganese phosphate has been dissolved to saturation, until hydrogen ceases to be evolved by the chemical action in the bath.

In testimony whereof I have signed this specification.

WILLIAM H. ALLEN.