

**NOTES FOR FORGE SHOP  
PRACTICE: A COURSE  
FOR HIGH SCHOOLS**

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Notes for Forge Shop Practice: A Course for High Schools by James Drake Littlefield

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**JAMES DRAKE LITTLEFIELD**

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# NOTES FOR FORGE SHOP PRACTICE

**A COURSE FOR HIGH SCHOOLS**

BY

**JAMES DRAKE LITTLEFIELD**

INSTRUCTOR IN FORGING: TECHNICAL  
HIGH SCHOOL :: CLEVELAND, OHIO

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#### PREFACE

The Notes on Forge Shop Practice have been especially arranged for the use of the classes in this subject at the Cleveland Technical High School. It is given publication to meet the demand or needs of such classes in all Manual Training or Technical High Schools for a series of exercises including the necessary explanatory notes and working drawings. The author acknowledges indebtedness to Mr. J. R. Lambirth of the Massachusetts Institute of Technology for the permission to use some of his original drawings in this book. The book is not to be considered a theoretical treatise on the manipulation of iron and steel, for as its title indicates, it is simply an outline course in the subject for High School pupils.

JAMES DRAKE LITTLEFIELD

Cleveland, August, 1910





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## Notes for Forge Shop Practice

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### NOTES ON IRON

**Iron.** Iron is the most important of the metallic elements, silvery white in color when pure, very tenacious, malleable and ductile. Iron was first produced in America in 1622 near the James River, Virginia. It is used in the industrial arts in four forms—*cast-iron*, *malleable iron*, *wrought iron* and *steel*, each form having its own marked physical properties, fitting it for a special purpose.

**Cast-Iron.** Cast-iron is an alloy. It is often called pig-iron because of the fact that it is molded in little bars or pigs as it runs from the furnace. The process of making this iron is that of smelting or melting the ore in a blast furnace in connection with various fluxes, particularly limestone. These furnaces are from fifty to sixty feet high and are called "blast" furnaces because the blast is forced into them. This species of iron is extremely brittle and melts at a relatively low temperature; is crystalline in construction and can only be used for such articles as may be made or cast in molds. It contains a large percentage of carbon and usually silicon, phosphorus and sulphur. The amount of carbon varies from 1.5% to 4.5%.

**Malleable Iron.** Malleable iron is cast-iron which has been toughened during the process of baking in an oven for six or eight days. This decarbonizes the cast-iron.

**Wrought Iron.** Wrought iron is the extreme of the series. It is an alloy of iron and comes the nearest to being pure, having an extremely small percentage of carbon, practically none. It is very malleable, fusing at a very high temperature; becomes pasty during a considerable range of heat; will keep in a malleable condition above a red heat, which is much below the fusing point and thus can be bent and formed into different shapes with the hammer. Iron work produced in this way is called *Wrought*