Kinds of ore. Magnetites, hematites, brown-ores, carbonates, and bog-ores have been successfully mined as iron-ores in Pennsylvania. These, although of widely different origin, occur within well-defined districts or areas. The longest dimensions of some of these areas are approximately parallel.

Occurrence. Magnetite occurs at Durham, Vera Cruz, Rittenhouse Gap, Boyertown, Fritz Island, Cornwall, Dillsburg and at other places southwestward to near Fairfield, Adams County. In the main these ores represent a replacement of limestones adjacent to igneous intrusions, but the ores of the first three localities may have had a very different origin.

Limonitic ores occur southeast of the magnetite belt in or near the limestones of Lancaster County, and southwestward through York (City) and Conewago. Part of the limonite belt in the limestone belt extends from Easton through Bethlehem; Allentown, Alburtis, Muhlenberg, Lebanon, Hummelstown, Carlisle, Shippensburg, Chambersburg and Waynesboro. These ores apparently represent concentrations of iron originally deposited in overlying sedimentary rocks.

Hematites occur in detached areas in the South Mountains and in narrow but very continuous outcrops in the Clinton and Oriskany formations, extending from Orbisonia and Fort Littleton northeastward to Selinsgrove and Lewisburg. These latter ores, following the folding of the rocks, extend in zigzag lines throughout the Juniata region.

Forming another belt to the northwest, extending from New Enterprise through Henrietta and Williamsburg to State College, is another limestone valley with its accompanying ores. At State College this
limestone forms two large branches extending northeasterly, one to Mackeyville, the other to Woodward.

In the southwestern portion of the State and occurring as nodules in beds of shale in the coal measures or as a thin bed just on top of the Vanport or "ferriferous" limestone are ores called variously " siderite," "spathic iron ore," "clay ironstone," "argillaceous iron ore," etc. On the outcrop of this bed the action of weathering has converted this carbonate ore into a brown ore, or limonite.

In the northwestern part of the State, particularly in the Allegheny Valley, occur locally important bog-iron ores.

First Forge. Beginning with the Pool Forge in 1766, numerous "forges" were built in Pennsylvania. Charcoal was used for fuel. Successful operations were then established where ore, timber and water power existed together. Later, changes in processes, fuel and coke supplies, eliminated all smelters, (or as now called "blast furnaces") except those in commercially strategic localities.

Condition of industry. No one doubts but that the present stagnation is merely temporary, and that with a stabilization of conditions in general must come a stabilization of production in which the iron and steel industries are very basic factors. The opening, by American corporations, of foreign ore deposits totalling billions of tons, indicates that the large producers have no fear of lack of future opportunities.

Is any iron ore left in Pennsylvania? The Survey believes there is. The early iron founders took the ore most easily available, unconsciously following a definite economic law. Large modern plants demand large deposits; but "merchant ore" is still salable in small quantities. Large deposits and tonnages with long hauls fostered economical methods. The Lake Superior ores would not be what they are if mining methods had not progressed. Pennsylvania ore, if mined, must compete in price and quality with outside ores. For various reasons the magnetites seem to offer the best field for developments of the immediate future. These will therefore be the first of the iron ores to be investigated. The other types will similarly be taken up in the order of their merit.

Published reports. The First and Second Pennsylvania Geological Surveys and the Commission Survey published reports on the iron resources of the State, which, while helpful at the time, are now out-of-date because of the advances of commerce and science; also they have been out of print for many years. More recently the United States Geological Survey has published various bulletins relating to certain restricted localities in Pennsylvania. All of these reports are available in many of the public libraries throughout the State. In addition to the foregoing, articles have appeared from time to time in the technical press relating to the many phases of Pennsylvania resources.

The lists given below name the principal reports written on the iron ores of Pennsylvania.

- 2 -
The following reports published by the Second Pennsylvania Survey can be obtained only from second-hand book dealers or consulted in libraries:

Iron Ore Belts, York and Adams counties C
Magnetic and Micaeous Ore Belts of York, Adams, C
Cumberland and Franklin counties C2
Geology of Lancaster County C3
Iron industry of Chester County C4
Brown Hematite Ore Ranges of Lehigh County D1
Brown Hematite Deposits of the Siluro-Cambrian D2
Limestones of Lehigh County
Limestone Belt and Iron ore mines of Lehigh and Northampton counties D3; Vol. I.
Magnetic Iron ore mines of Berks County D3, Vol. II.
Fossil Iron Ore Beds of Middle Pennsylvania F
Iron ores of Cumberland Valley M3
Iron Furnaces of Bedford County T2
Iron industry of Center County T4
Iron ores; genesis of T4
Iron ores, mining methods
Cornwall ore mines Ann. Rep. 1885

The following publications of the U. S. Geological Survey can be obtained from the Supt. of Documents, Government Printing Office, Washington, D. C., at the prices named. (Send only Money Orders):

Economic geology of the Kittanning and Rural Valley quadrangles
Butts, Chas. U.S.G.S., Bulletin No. 279 50 cents
Brown Iron Ore near Dillsburg, York County, Pa., Harder, E.C. U.S.G.S. Bull. No. 430 pp. 250-255 60 cents
Magnetite Deposits of Cornwall type in Pennsylvania, Spencer, A.C. U.S.G.S. Bull. No. 359; 1908 $1.30

Since the foregoing was written a great deal of information has been collected by field work conducted by the present Pennsylvania Geological Survey. In process of publication is a preliminary volume on iron ores and methods of their formation. Owing to circumstances beyond our control the date at which this will be ready for distribution is indefinite. The interested public are urged to correspond with the State Geologist for information concerning specific localities, deposits, or minerals.

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