TOOL STEEL.

At a meeting of the New York Railroad Club held on Friday evening, November 17, 1911, W. B. Sullivan, Carpenter Steel Company, Philadelphia, read an interesting paper on "Tool Steel." The author pointed out the necessity of accurate control of the temperature at which steels of different carbon content are forged and annealed in order to secure uniform and satisfactory results from the tools. Steel containing 0.90 per cent. carbon remains unchanged in structure until heated to about 1,360 deg. Fahr. As the the temperaure of the furnace is increased beyond this point the ferrite and pearlite suddenly begin to decompose. The reaction is completed at a temperature of about 1,460 deg. Fahr., which is called the critical point. The ferrite and pearlite change to martensite. By quenching at this point the martensitic condition of the grain structure will be preserved and the steel will be hard and brittle. If the steel be again heated to a still higher temperature the martensite in turn will be decomposed and the original ferrite and pearlite condition will be restored. If the steel is annealed at a temperature where martensite is formed it will contain a portion of the hardening element. By a judicious application of heat it is possible to obtain almost any desired combination of ferrite, pearlite and martensite. Tools when properly handled should be heated first to the proper temperature or critical point, and then quenched. Heating above this point tends to produce decarbonization. If a tool is heated too hot and then allowed to cool slowly before quenching it will have a grain structure developed by the higher temperature which is not corrected by allowing the tool to cool before quenching. Tools should not be allowed to soak too long even at the proper temperature, as this tends to produce decarbonization on the surface.

The hardness of a piece of steel properly treated is governed by the size, character of steel, temperature of bath and character of bath. In general, for small sections lower temperatures should be used than for large pieces. The degree of hardness depends on the rapidity with which the heat is extracted from the steel. A bath of high temperature will produce less hardness. A piece of steel quenched in water will be harder than one quenched in oil. Tests made by the Carpenter Steel Company showed that, compared with water on a basis of unity, No. 1 mineral oil had a tempering quality of 0.241; cottonseed oil, 0.161; fish oil, 0.149.

The author included an outline of the proper grades and tempers of carbon tool steel for various uses. Temper No. 1 contains 0.70 to 0.80 per cent. carbon; No. 2, 0.80 to 0.90 per cent. carbon; No. 3, 0.90 to 1 per cent. carbon; No. 4, 1 to 1.15 per cent. carbon; No. 5, 1.15 to 1.25 per cent. carbon. Grade A is the highest grade steel, selling for about 16 cents per pound. Grade B sells for 13 cents per pound, and Grade C for 10 cents per pound. Grade D is ordinary tool steel selling for about 7 cents per pound. The following outline shows the proper selection of temper and grade and the proper heat treatment:—

Temper No. 1	Grade	
Crowbars	D	Should not be heated over 1,800 deg. Fahr. for forging. Hardens at 1,485 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Pinchbars	D	
Pick Points	D	
Wrenches	D	
Sledges	C	
Hammers	C	
Rivet Sets	B	

Temper No. 2.		
Smith Tools	C	Should not be heated over 1,800 deg. Fahr. for forging. Hardens at 1,480 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Track Tools	C	
Boilermakers' Tools	C	

Temper No. 3.		
Cold Chisels	C	Should not be heated over 1,750 deg. Fahr. for forging. Hardens at 1,465 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Hot Chisels	C	
Rock Drills	C	
Shear Blades	B	
Punching Tools	B	

Temper No. 4.		
Machine Drills	B	Should not be heated over 1,700 deg. Fahr. for forging. Hardens at 1,460 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Counter Bores	B	
Milling Cutters	B	
General Machine Shop Tools	B	
Carbon Lathe Tools	A	
Taps	A	
Dies	A	
Reamers	A	

Temper No. 5.		
Brass Tools	A	Should not be heated over 1,700 deg. Fahr. for forging. Hardens at 1,455 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Finishing Tools	A	
Small Machine Shop Tools	A	

MINOR MINERALS OF ONTARIO

Numerous mineral substances were produced in Ontario during 1910 and gave rise to many industries of local importance, employing in the aggregate much labor and capital. Most of them are non-metalliferous in character.

Calcium carbide, used in producing acetylene gas for lighting purposes, and made by the fusion of carbon and lime in the electric furnace, is turned out by two companies, the Willson Carbide Company at Merritton, and the Ottawa Carbide Company at Ottawa. Together, these companies produced and shipped 3,072 tons, valued at $184,323. They employed 56 men and paid out $37,630 in wages. The production in 1909 was 2,349 tons.

For a number of years the production of corundum has been carried on by the Manufacturers Corundum Company, formerly the Canada Corundum Company, at Craigmont, and the Ashland Emery and Corundum Company at Burgess Mines. The Ashland Company's mines and works were leased by the Manufacturers Company, 1st August, 1910, and consequently passed into the hands of that company, which is at the present time the sole producer of corundum. The quantity taken out and shipped from both mines in 1910 was 1,870 tons of grain corundum, valued at $171,944, or about 4.59 cents per pound. There were 201 men employed at the mines and works, receiving in wages the sum of $100,945.

The production of feldspar went up from 11,001 tons in 1909 to 16,374 tons in 1910, the latter quantity having a value of $47,518. The labor of 107 employees was required, the amount of wages paid being $32,901. The Kingston Feldspar and Mining Company, of Kingston, and the McDonald Feldspar Company, of Toronto, were the chief producers.