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R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1794.

Microscopic Examination of Eighteen Samples of Austenitic Manganese Steel.

(Copy No. 6.)

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Microscopic Examination of Eighteen Samples of Austenitic Manganese Steel.

Origin of Material and Object of Investigation:

Continuing an investigation of austenitic manganese steel samples requested by the Sorel Steel Foundries Limited, Sorel, Quebec, a third lot, of eighteen (18) samples, was received from this company on January 20, 1945. The numbers used to designate the samples in this report were stamped on each sample when received.

As stated in previous reports,* the Sorel Steel Foundries requested only a microscopic examination of these samples and photomicrographs of those which have a normal austenitic microstructure; no further investigation of the mechanical properties was required.

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* Microscopic examinations of two previous lots in connection with the same investigation were reported upon as follows:

Lot No. 1, Samples Nos. 36 to 50 inclusive, in O.D.M.L. Report of Investigation No. 1778, dated January 17, 1945.

Lot No. 2, Samples Nos. 51-70, 72 and 73, in O.D.M.L. Report of Investigation No. 1784, dated January 27, 1945.

Microscopic Examination:

Specimens for microscopic examination were cut from each sample and, when suitably polished and etched, were examined at magnifications of 100 to 1000 diameters. Examination at the higher magnification was considered necessary to detect marginal cases of carbide precipitation at the grain boundaries.

Photomicrographs of all specimens with a normal austenitic microstructure were taken at the conventional magnification of 100 diameters (see Figures 1 to 13). It should be noted from these photomicrographs that Specimens Nos. 78 and 80 have numerous small black particles at the grain boundaries. These appear to be sulphide inclusions. The influence of these inclusions on the mechanical properties of the casting is not known, but their location at the austenitic grain boundaries is very likely undesirable.

The following specimens have a normal austenitic microstructure: Nos. 8, 10, 15, 16, 71, 74, 75, 76, 77, 78, 79, 80 and 81.

The remaining specimens, Nos. 12, 14, 22, 82 and 83, do not have a normal austenitic microstructure. Particles of free carbides are present, particularly at the grain boundaries. Figure 14, a photomicrograph at X500 magnification, shows a typical particle of free carbide at an austenitic grain boundary in Specimen No. 14.

Summary:

Samples Nos. 8, 10, 15, 16, 71, 74, 75, 76, 77, 78, 79, 80 and 81 have a normal austenitic microstructure.

Samples Nos. 12, 14, 22, 82 and 83 do not have a normal austenitic microstructure.

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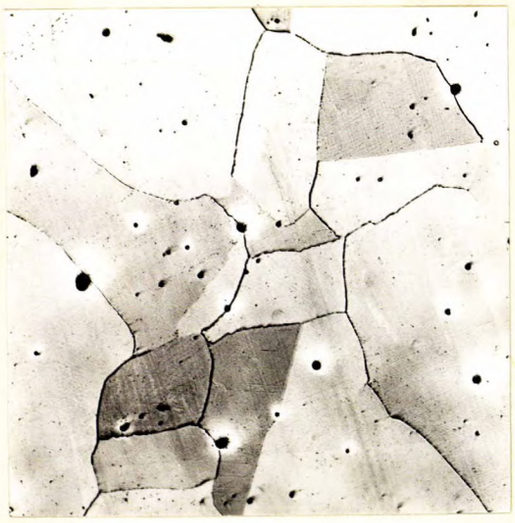
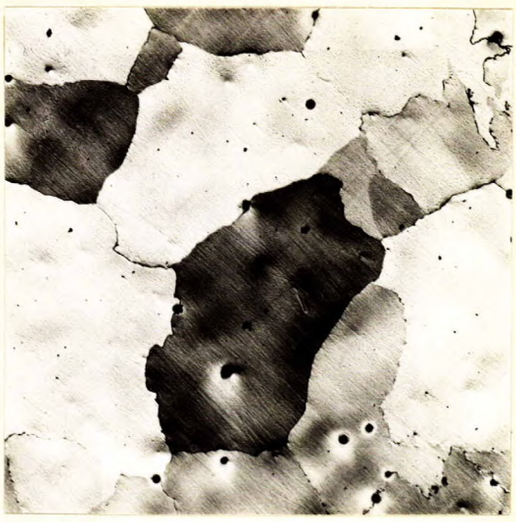
Figure 1.



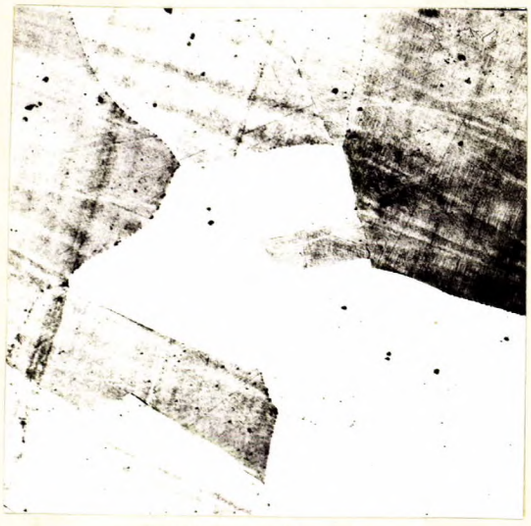
SAMPLE NO. 8.

Figure 2.



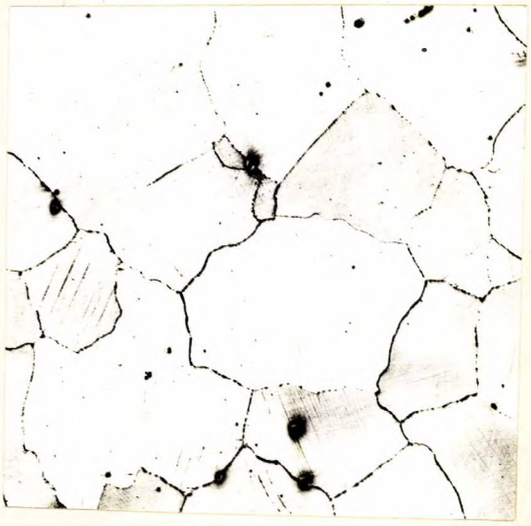
SAMPLE NO. 10.

Figure 3.



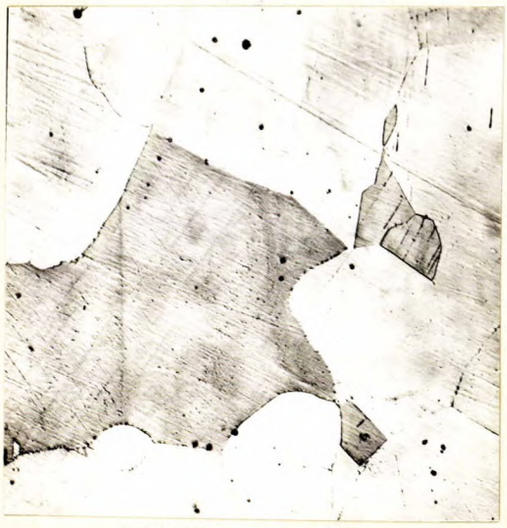
SAMPLE NO. 15.

Figure 4.



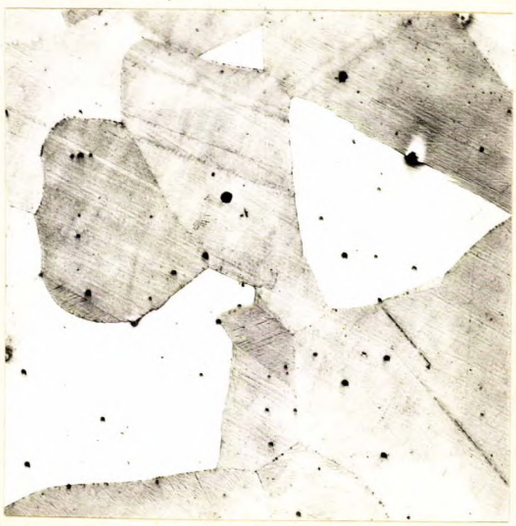
SAMPLE NO. 16.

Figure 5.



SAMPLE NO. 71.

Figure 6.



SAMPLE NO. 74.

All of above photomicrographs at X100,
etched in 2 per cent nital.

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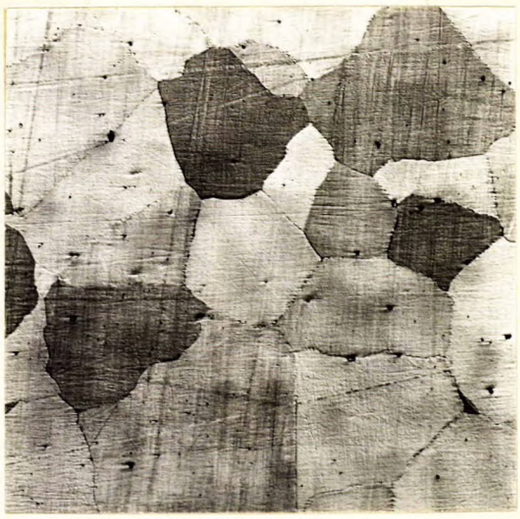
Figure 7.

SAMPLE NO. 75.

Figure 8.



SAMPLE NO. 76.

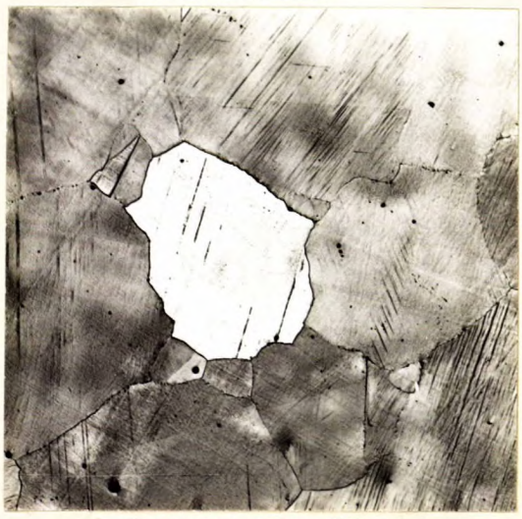
Figure 9.

SAMPLE NO. 77.

Figure 10.

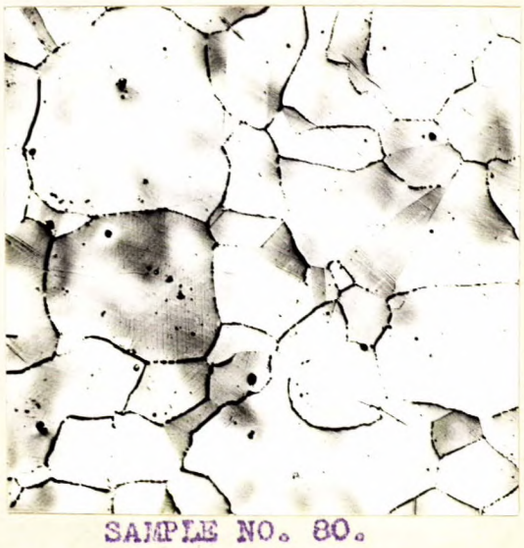
SAMPLE NO. 78.

Figure 11.



SAMPLE NO. 79.

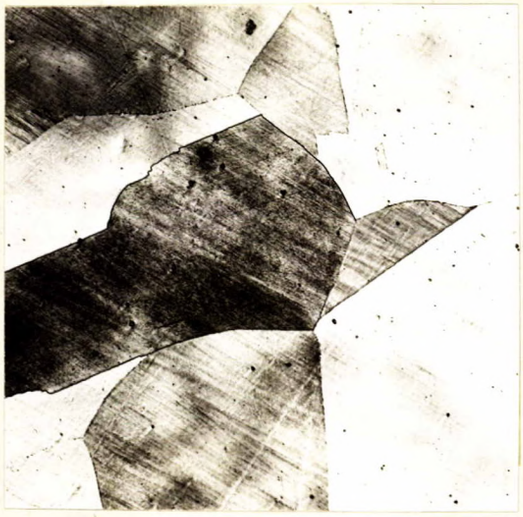
Figure 12.



SAMPLE NO. 80.

All of above photomicrographs at X100,
etched in 2 per cent nital.

Figure 13.



X100, etched in 2 per cent nital.

SAMPLE NO. 8.

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Figure 14.

X500, etched in 2 per cent nital.

SAMPLE NO. 22.

Note particle of free carbide (light-coloured particle) at grain boundary.

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