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O T T A W A October 26, 1945.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1952.

Investigation of the Cause of Leaking in a Boiler Casting.

(Copy No. 6.)

Bureau of Mines
Division of Metallic
Minerals

Physical Metallurgy
Research Laboratories

CANADA
DEPARTMENT
of
MINES AND RESOURCES
Mines and Geology Branch

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Origin of Request and Object of Investigation:

On October 10, 1945, Mr. H. Louette, foundry superintendent, Warden King Limited, 2104 Bennett Avenue, Maisonneuve, Montreal, Quebec, submitted two sections of grey iron castings. One was representative of a sound boiler section; the other was taken from the spot where a boiler casting had leaked on the pressure test.

Mr. Louette requested that the cause of the leak be determined, if possible.

METHOD OF INVESTIGATION:

Sections of the two samples were prepared for microscopic examination. A section at the point where the casting leaked was examined carefully under the microscope. Drillings were taken for chemical analysis.

Microscopic Examination:

Figure 1.

X100, unetched.

GOOD CASTING.

Figure 2.

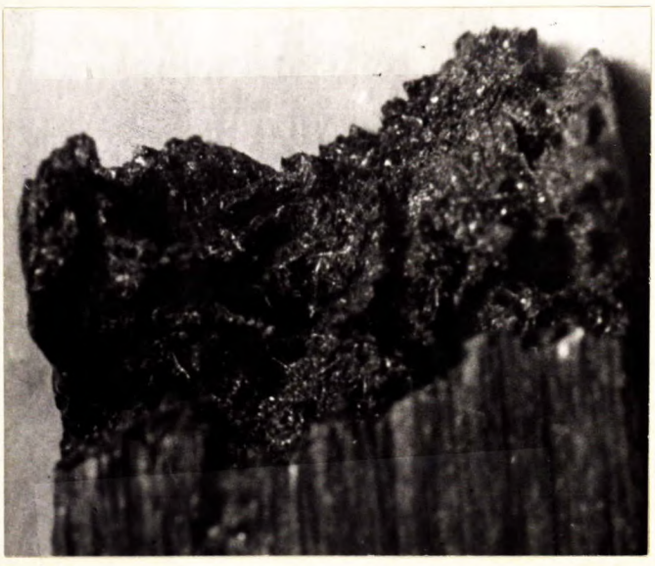
X100, unetched.

LEAKY CASTING.

The graphite flake size and distribution are practically the same in both castings. The structures revealed by etching are also similar.

Macroscopic Examination:

Figure 3.



LEAKY AREA IN CASTING.
(Magnified 10 diameters).

(Macroscopic Examination, cont'd) -

Figure 3 shows a dendritic pattern in the leaky area of the casting. This means that metal was drained away from this area when the iron was partly solidified.

Chemical Analysis:

	Leaky Casting	Good Casting
	- Per Cent -	
Carbon -	2.99	3.05
Combined carbon -	0.60	0.60
Silicon -	2.34	2.38
Manganese -	0.58	0.62
Sulphur -	0.114	0.106
Phosphorus -	0.49	0.49
Nickel -	None.	None.
Chromium -	None.	None.

Conclusions:

1. The quality of metal is practically the same in both of the castings examined.

2. The formation of the leaky area was as follows; First the mould was filled with metal. Solidification started with the usual 'pine-tree' crystals growing from the outside of the casting surface towards the centre. When the crystals were partly formed, the remaining fluid metal was drained away from the "leaky" area. The pine-tree crystals can be seen in Figure 3.

3. In view of the limited evidence at hand it is tentatively concluded that the cause of the shrinkage cavity may be either

(a) inherent physical design of the casting, or

(b) Break-through of metal into the parting line of the mould or elsewhere, allowing metal to leak out of that particular part of the mould after it is poured.

4. If the cause is due to 3(b), there will be fins on the casting, or some part of it will be oversize.

5. If leaks cannot be traced to 3(b), it may be

(Conclusions, cont'd) -

assumed that the physical design has features that are undesirable from the foundry view-point. If this is the case, some change of section size at the leaky area may be necessary.

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