CoA Memo M and P No. 20

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THE COLLEGE OF AERONAUTICS

DEPARTMENT OF PRODUCTION AND INDUSTRIAL ADMINISTRATION

TEST REPORT NO. PLBO/8

Comparison of PERPRO tools grade N5 and N10 against grade N5D and N10D

S U M M A R Y

Tools of grade N5, N5D, N10 and N10D were tested to 0.030 in. flankwear when machining EN 9 at a cutting speed of 500 f.p.m. with 0.010 in/rev. feed and 0.10 in. depth of cut. The results showed that there was no significant difference in tool life between the normal grades and the 'D' grades.

Test conditions

The following test conditions were used during the tests:-

Work material:	EN 9
Cutting speed:	500 f.p.m.
Depth of cut:	0.10 in.
Feed:	0.010 in/rev.

and the tools used were:-

N5 NT129	N5D NT135	N10 NT141	N10D NT147
N5 NT130	N5D NT136	N10 NT142	N10D NT148

Test results

The flankwear of the tools was measured, as in figure 1, at intervals of six minutes cutting time and the results are given in Tables 1 - 8.

Figures 2 and 3 show the growth of the flankwear of the N5 and N10 grade respectively. Figure 4 shows the Tallysurf record of the crater wear of the four grades at the end of the tests.

From the figures it can be seen that the N5 grades gave a tool life of about 40 min. and that three of the tips failed at the nose as the flankwear was approaching 0.030 in. There was no significant difference between the performance of N5 and N5D.

The N10 grades gave a tool life of about 70 min. and there was no significant difference between N10 and N10D.

Figures 5 - 12 show photographs of the flank and crater wear of the tools during the tests.

Conclusions

The results showed that for the cutting conditions investigated there was no significant difference in performance between N5 and N5D nor between N10 and N10D.

Table 1

Tool:	NT 129	Cutting speed:	500 fpm
Work material:	EN 9	Depth of cut:	0.10 in.
Feed:	0.010 in/rev.	Date:	11/12/63

TIME min.	FLANK WEAR Fa	Fb	Fc	DEFORM-ATION	HARDNESS vhn	REMARKS
6	.0075	.007	.0085	.0005	274	
12	.009	.009	.0095	.001		
18	.009	.0115	.014	.001	274	new bar
24	.011	.0125	.017	.001		
30	.012	.013	.019	.0015		
36	.0155	.0165	.026	.002	256	new bar
42	.017	.0185	.026	.002		
48	.088	.019	.0265	.002		nose failure

Table 2

Tool:	NT130	Cutting speed:	500 fpm
Work material:	EN 9	Depth of cut:	0.10 in.
Feed:	0.010 in/rev.	Date:	11/12/63

TIME min.	FLANK WEAR Fa	Fb	Fc	DEFORM-ATION	HARDNESS vhn	REMARKS
6	.006	.006	.0075	-	274	
12	.010	.010	.0135	.001		
18	.010	.011	.0165	.001	274	new bar
24	.0125	.014	.017	.001		
30	.013	.0145	.021	.0015		
36	.016	.016	.028	.0015	256	new bar
42	.0235	.C19	.0295	.002		
48	.060	.023	.035	.002		nose failure

Table 3

Tool:	NT135	Cutting speed:	500 fpm
Work material:	EN 9	Depth of cut:	0.10 in.
Feed:	0.010 in/rev.	Date:	11/12/63

TIME min.	FLANK WEAR Fa	Fb	Fc	DEFORM-ATION	HARDNESS vhn	REMARKS
6	.006	.006	.009	-	274	
12	.009	.009	.015	.0005		
18	.011	.012	.015	.001	274	new bar
24	.011	.012	.0165	.001		
30	.0125	.0145	.0185	.0015		
36	.015	.0235	.025	.0015	256	new bar
42	.117	.0265	.0265	.002		nose failure

Table 4

Tool:	NT136	Cutting speed:	500 fpm
Work material:	EN 9	Depth of cut:	0.10 in.
Feed:	0.010 in/rev.	Date:	11/12/63

TIME min.	FLANK WEAR Fa	Fb	Fc	DEFORM-ATION	HARDNESS vhn	REMARKS
6	.005	.005	.0085		274	
12	.010	.010	.016			
18	.010	.011	.020	.001	274	new bar
24	.011	.013	.020	.001		
30	.0125	.014	.022	.0015		
36	.016	.0175	.028	.002	256	new bar
42	.018	.021	.0385	.0025		nose failure

Table 5

Tool:	NT141	Cutting speed:	500 fpm
Work material:	EN 9	Depth of cut:	0.10 in.
Feed:	0.010 in/rev.	Date:	11/12/63

TIME min.	FLANK WEAR Fa	Fb	Fc	DEFORM-ATION	HARDNESS vhn	REMARKS
6	.005	.0045	.007	.001	274	
12	.006	.006	.008	.001		
18	.006	.006	.0085	.001	274	new bar
24	.007	.007	.010	.001		
30	.0075	.0075	.012	.0015		
36	.0095	.010	.017	.0015	256	new bar
42	.0115	.0115	.0195	.0015		
48	.012	.0125	.022	.0015		
54	.014	.014	.025	.002		
60	.015	.0165	.028	.002		
66	.015	.0165	.028	.002		
72	.015	.0165	.030	.0025		
78	.019	.019	.035	.003		

Table 6

Tool:	NT142	Cutting speed:	500 fpm
Work material:	EN 9	Depth of cut:	0.10 in.
Feed:	0.010 in/rev.	Date:	11/12/63

TIME min.	FLANK WEAR Fa	Fb	Fc	DEFORM-ATION	HARDNESS vhn	REMARKS
6	.004	.004	.005		274	
12	.006	.006	.007			
18	.006	.006	.009	.0005	274	new bar
24	.006	.006	.012	.0005		
30	.0085	.0085	.014	.001	256	new bar
36	.0095	.0095	.018	.001		
42	.012	.012	.020	.0015		
48	.013	.013	.0255	.0015		
54	.013	.0155	.026	.002		
60	.0135	.0155	.029	.002		
66	.0155	.020	.034	.0025		

Table 7

Tool: NT147 Cutting speed: 500 fpm
Work material: EN 9 Depth of cut: 0.10 in.
Feed: 0.010 in/rev. Date: 11/12/63

TIME min.	FLANK WEAR Fa	Fb	Fc	DEFORM-ATION	HARDNESS vhn	REMARKS
6	.005	.004	.0065		274	
12	.0055	.0055	.0065			
18	.006	.007	.0095	.0005	274	new bar
24	.006	.007	.0105	.0005		
30	.009	.009	.015	.001	256	new bar
36	.011	.0105	.0185	.001		
42	.011	.012	.020	.0015		
48	.011	.012	.0205	.002		
54	.015	.0125	.024	.002		
60	.013	.0135	.026	.002		
66	.013	.015	.026	.002		
72	.014	.016	.0285	.002		
78	.015	.016	.0285	.002		
84	.015	.016	.030	.002		
90	.0155	.0185	.032	.002		

Table 8

Tool: NT148 Cutting speed: 500 fpm
Work material: EN 9 Depth of cut: 0.10 in.
Feed: 0.010 in/rev. Date: 11/12/63

TIME min.	FLANK WEAR Fa	Fb	Fc	DEFORM-ATION	HARDNESS vhn	REMARKS
6	.004	.004	.0045		274	
12	.0055	.005	.007			
18	.007	.007	.010	.0005	274	new bar
24	.007	.007	.011	.0005		
30	.009	.009	.0155	.0005	256	new bar
36	.011	.010	.0185	.001		
42	.013	.011	.0195	.0015		
48	.013	.012	.0215	.002		
54	.014	.0125	.0225	.002		
60	.016	.0135	.0255	.002		
66	.016	.015	.026	.002		
72	.0165	.016	.029	.002		
78	.0165	.0165	.030	.002		
84	.017	.0165	.0305	.002		
90	.018	.0175	.0315	.002		

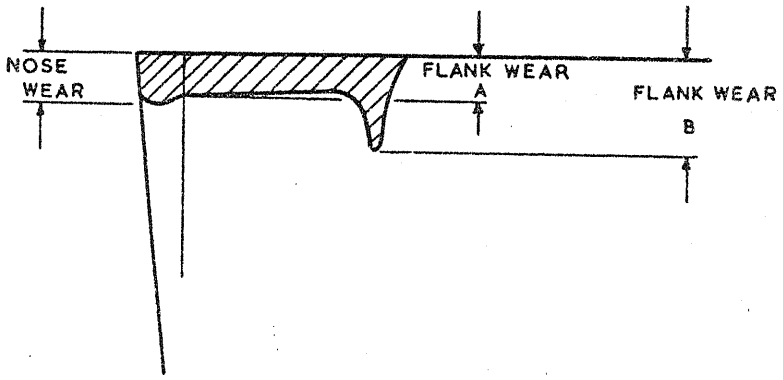


FIG. 1. TOOL WEAR MEASUREMENT.

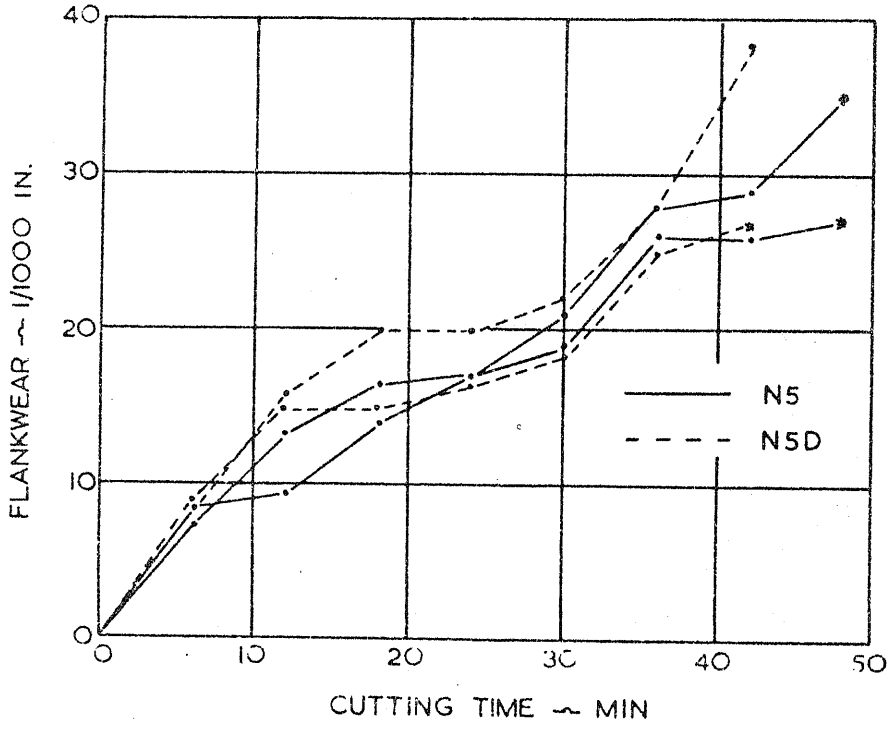


FIG. 2

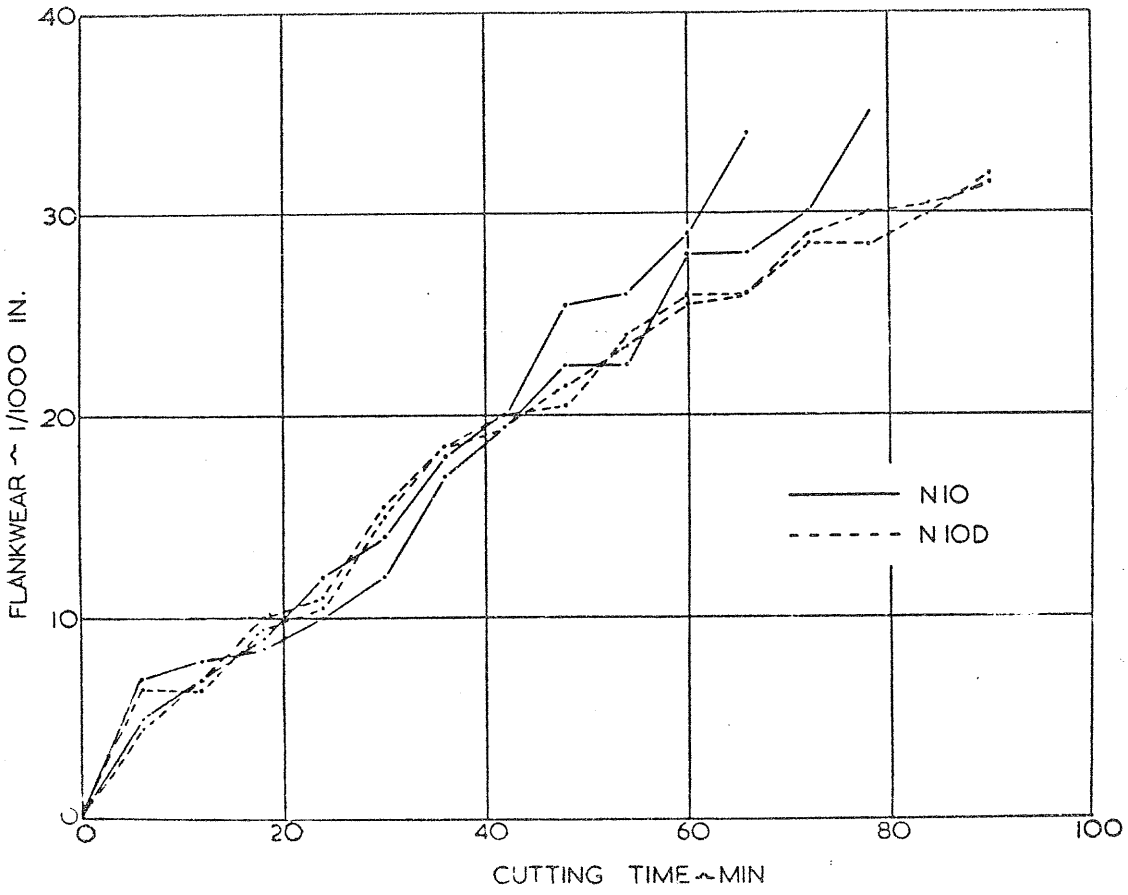


FIG. 3.

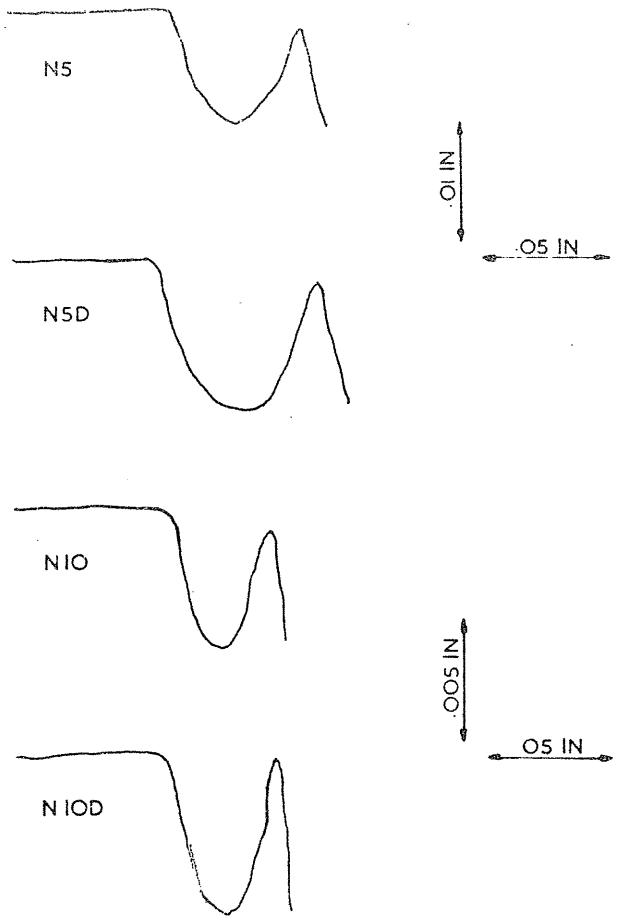


FIG. 4. CRATER WEAR OF GRADES N5, N5D, N10, AND N10D AT .030 IN. FLANKWEAR

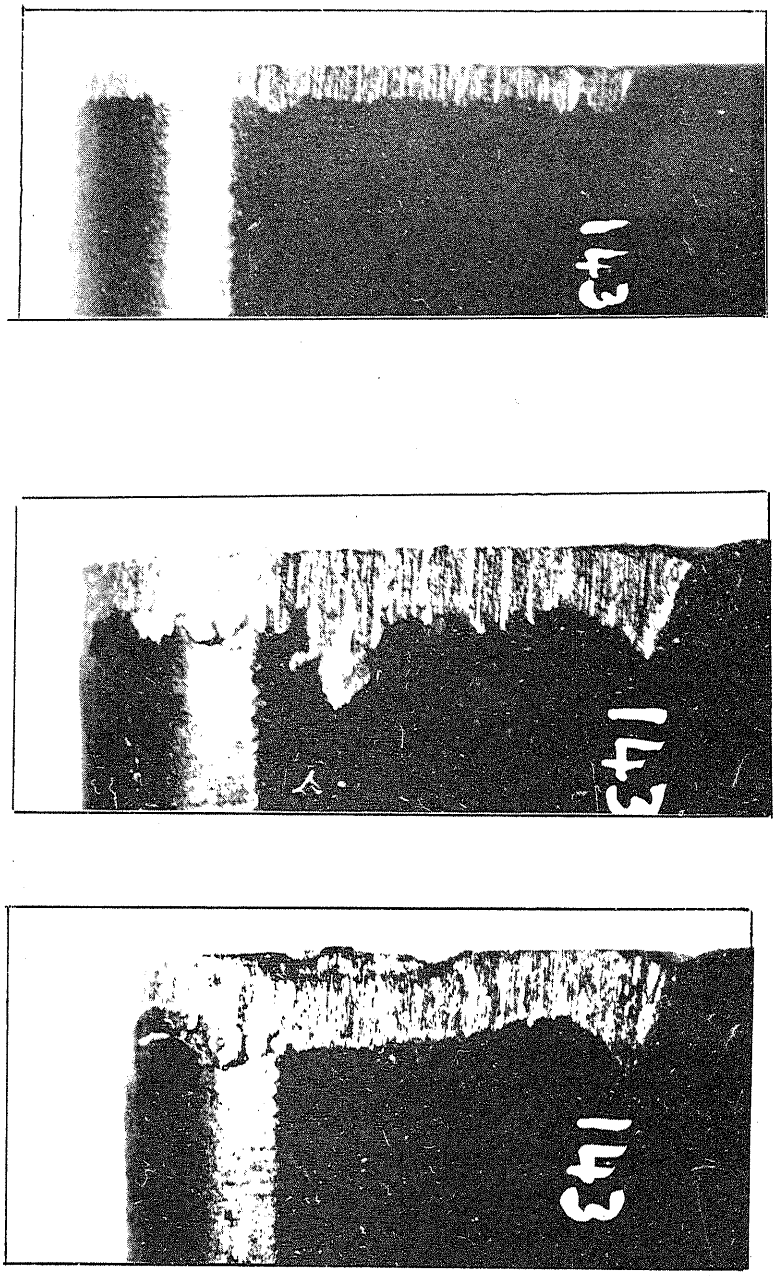


Fig. 5 Flankwear grade .10
A .010 in wear
B .020 in wear
C .030 in wear

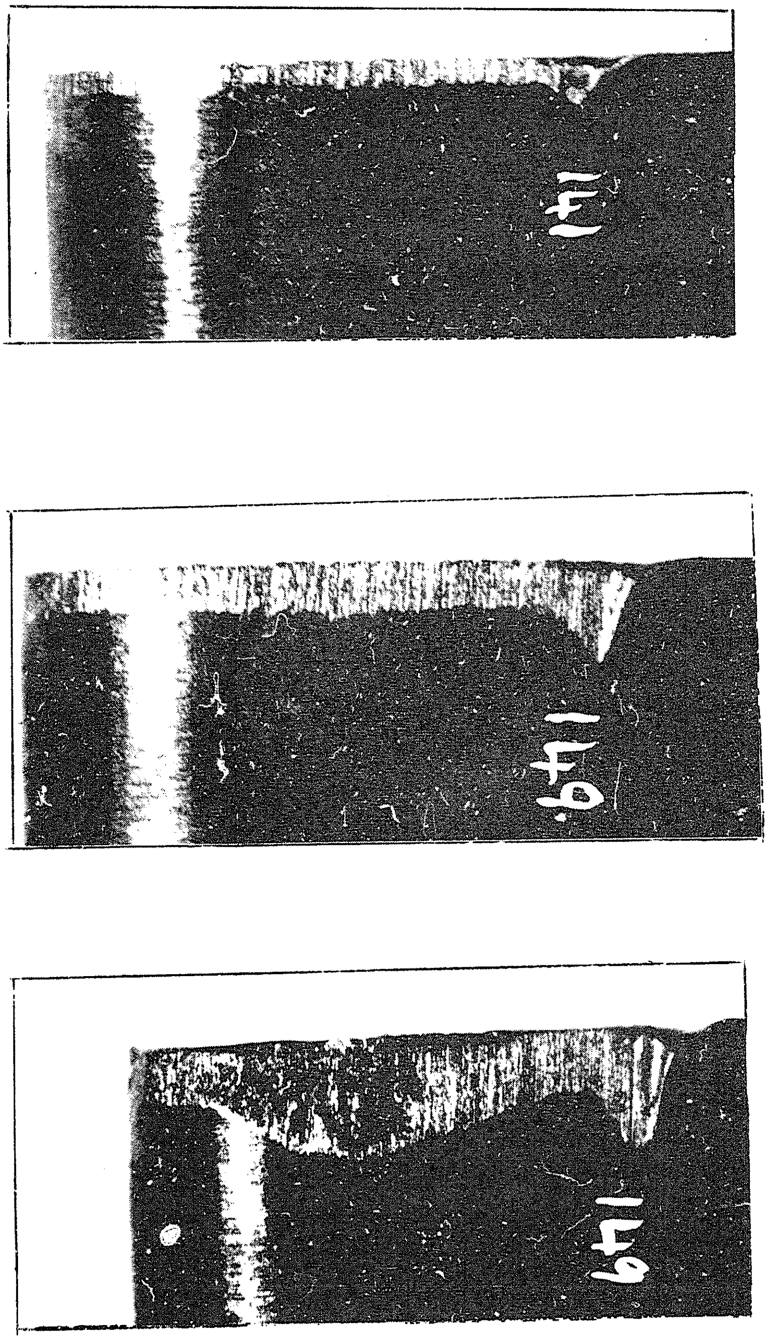
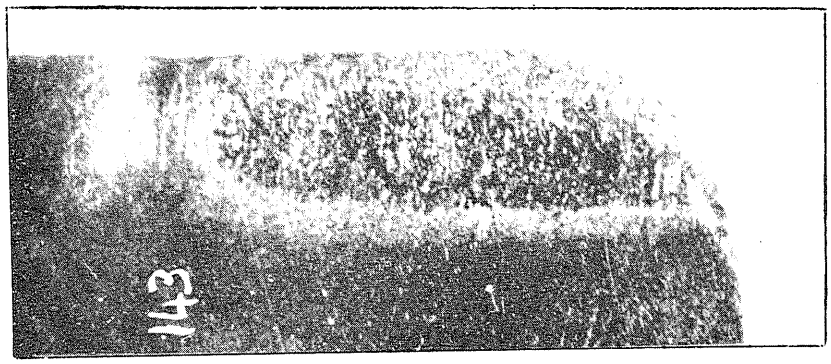


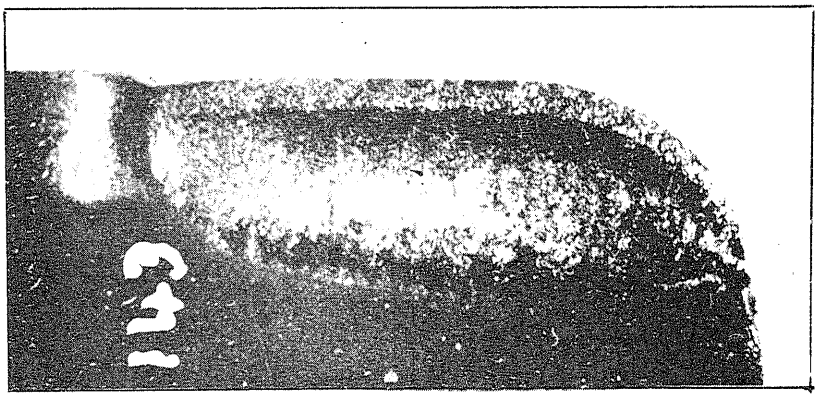
Fig. 6. Flankwear grade [illegible]

A .010 in wear

B .020 in wear

C .030 in wear





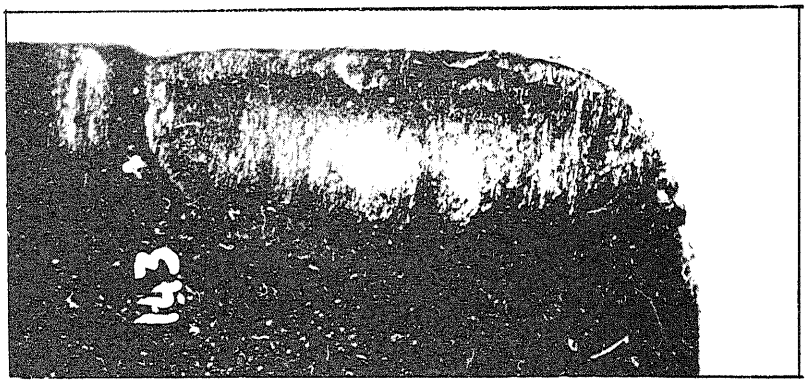
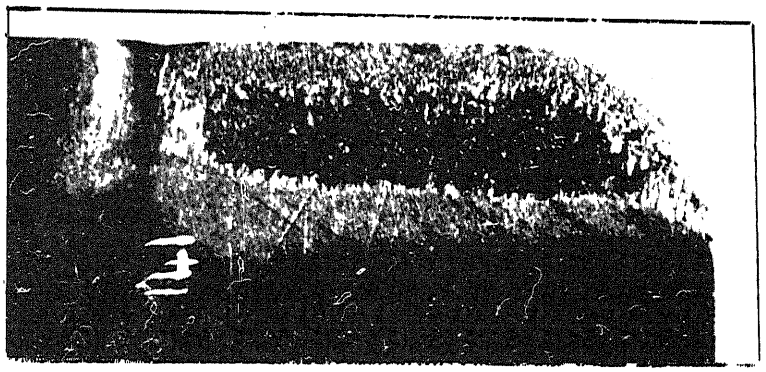
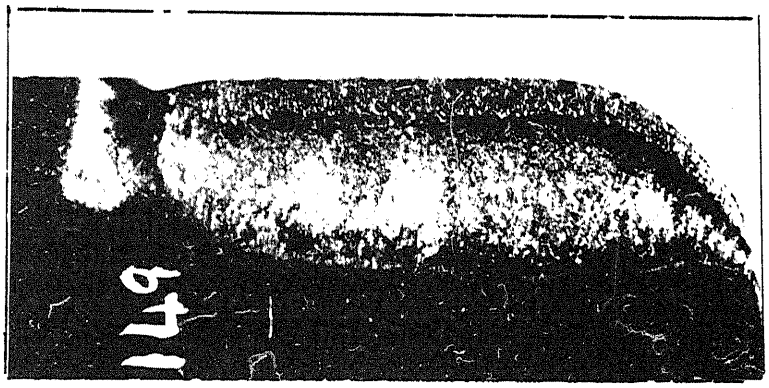


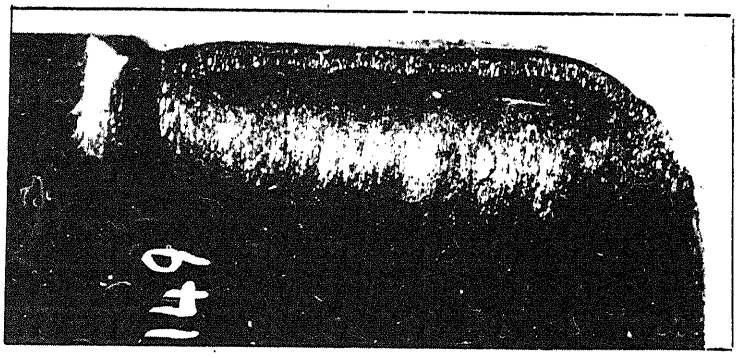
Fig. 7. Center warp grade K.10
Corresponding to .010 in Clearance
.020 in Clearance
.030 in Clearance



A

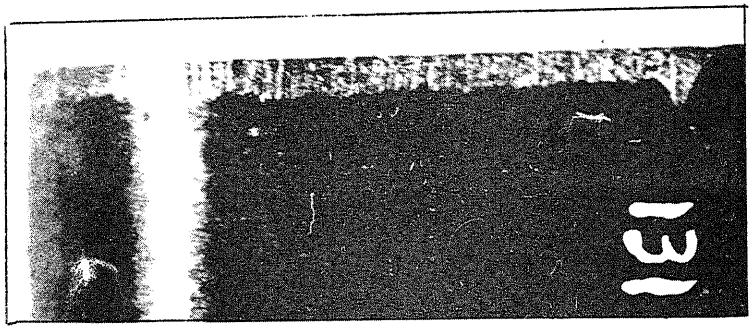


B

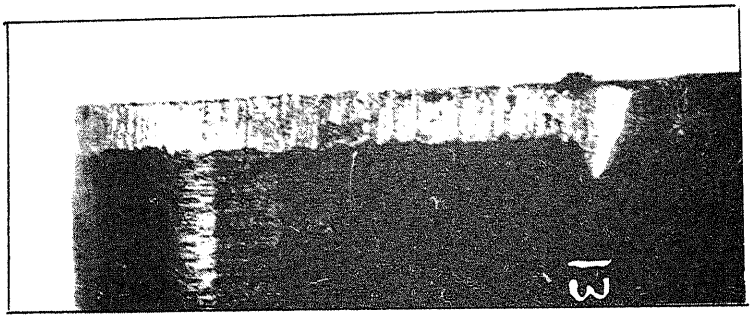


C

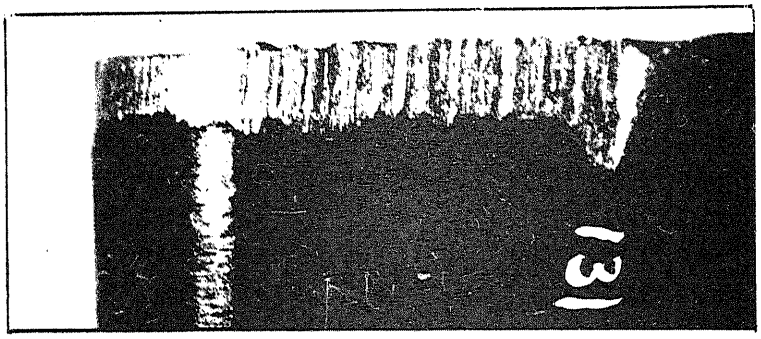
Fig. 8 Crater wear grade K.10D
Corresponding to A .010 in flankwear
B .020 in flankwear
C .030 in flankwear



A

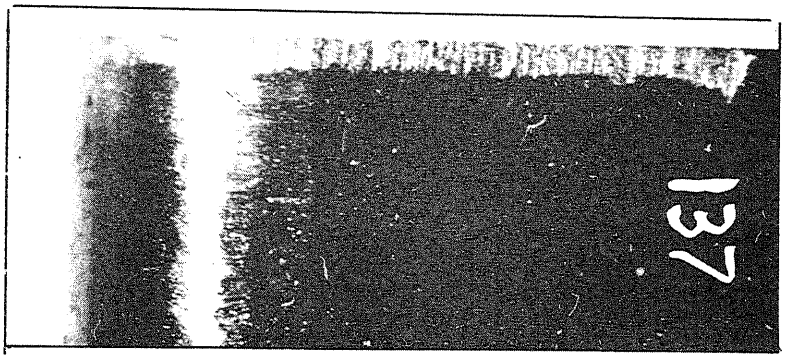


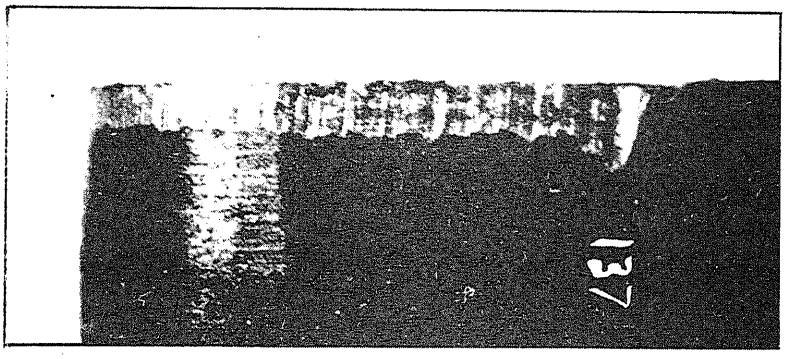
B



C

Fig. 9 Flankwear grade 1.5
A .010 in wear
B .020 in wear
C .030 in wear





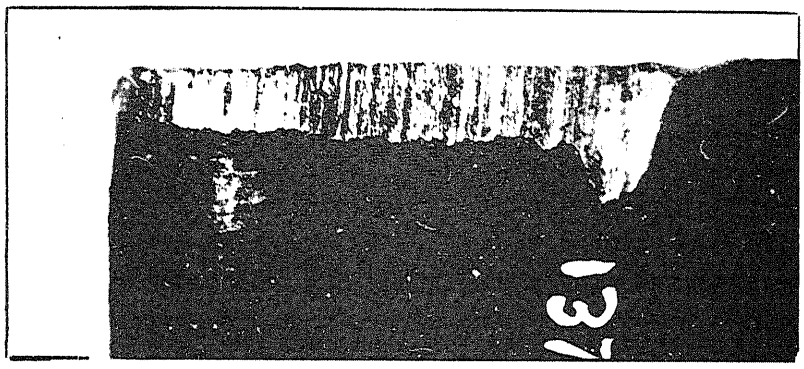
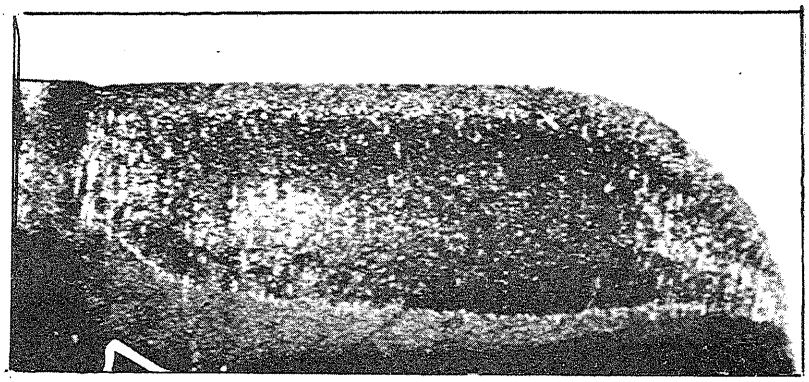
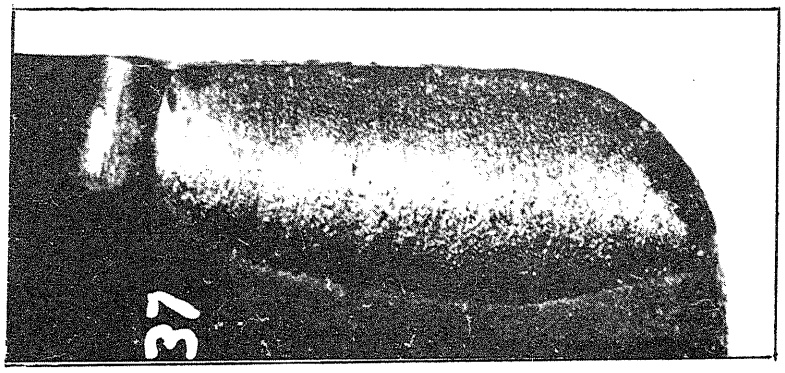


Fig. 10. Flankwear grade U.5D
A .010 in wear
B .020 in wear
C .030 in wear



A



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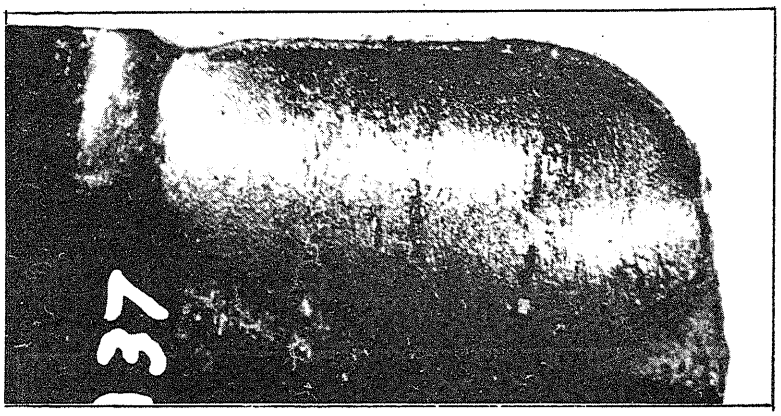
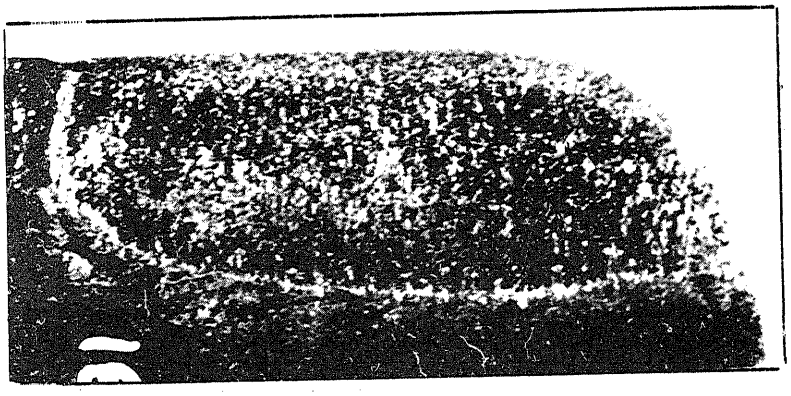
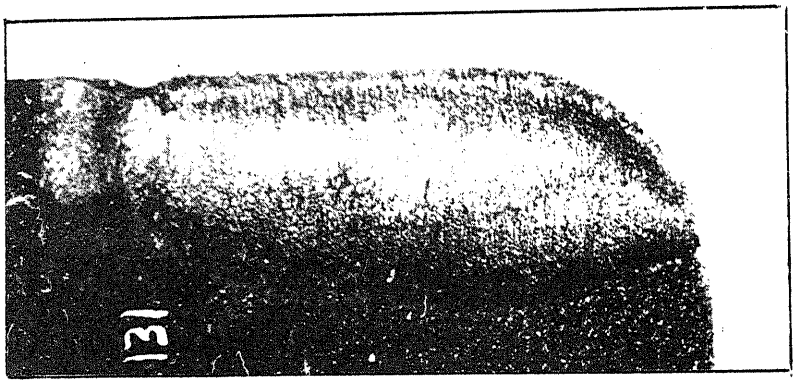


C

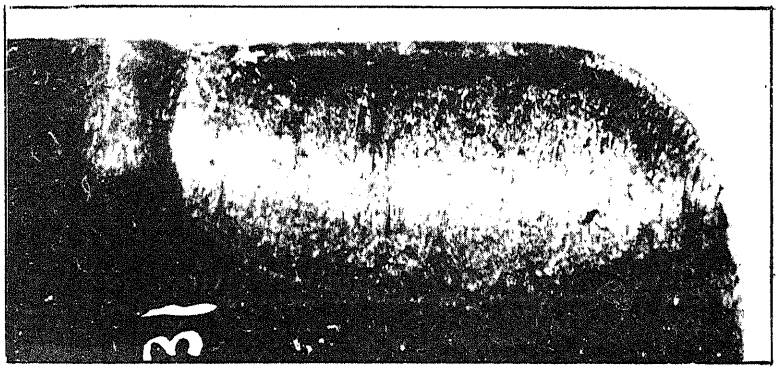
Fig. 11 Crater wear grade 7.5D
Corresponding to A .010 in flankwear
B .020 in flankwear
C .030 in flankwear



A



B



C

Fig. 12. Crater wear grade M.5
Corresponding to A .010 in flankwear
B .020 in flankwear
C .030 in flankwear