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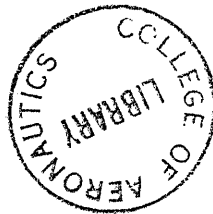
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CoA Memo M and P No. 13

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THE COLLEGE OF AERONAUTICS

DEPARTMENT OF PRODUCTION AND INDUSTRIAL ADMINISTRATION



Test Report No. PLB0/5

Comparative wear tests of PERPRO tools grade N35/RD80  
against Sanvik SLP machining EN 9

S U M M A R Y

Tools of grade N35/RD80 and SLP were tested at 600 fpm cutting speed, 0.010 in/rev. feed and 0.10 in. depth of cut to 0.030 in. flank-wear. The results showed that the grade SLP gave a tool life between six and seven times greater than grade N35/RD80 together with less crater wear.

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### Test conditions

The following cutting conditions were used during the tests:

Work material:	EN 9
Cutting speed:	600 fpm
Depth of cut:	0.10 in.
Feed:	0.010 in/rev.

and the tools used were:

N35/RD80 NT111	S1P NT107
N35/RD80 NT113	S1P NT110
N35/RD80 NT123	

### Test results

The wear of the tools was measured as in figure 1 and the results are given in Tables 1 - 6.

Figure 2 illustrating the growth of the flankwear shows that grade S1P had a tool life of between six and seven times that of grade N35/RD80.

Figures 3 and 4 show the Tallysurf readings of the crater wear of the two grades corresponding to flankwear of 0.010, 0.020 and 0.030 in. The figures indicate that for the same flankwear grade S1P had markedly less crater wear than did grade N35/RD80.

Figures 6 - 9 shows photographs of the flank and crater wear of the tools during the tests.

The cutting speed of 600 fpm appeared to be too high for the N35/RD80; two tips failed due to collapse of the nose before reaching 0.030 in. flankwear and the tool life was about a quarter of that at 500 fpm. (See report No. PLB0/4). For comparison, one tip of S1P was tested at 500 fpm and the results are shown graphically in figure 5.

### Conclusions

The results showed that for the cutting conditions investigated grade S1P gave a tool life of between six and seven times that of grade N35/RD80, and that grade S1P had a higher resistance to crater wear.

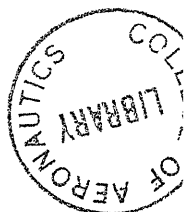


Table 1

Material: EN 9  
Tool: NT113 N35/RD80  
Feed: 0.010 in/rev.

Date: 31/10/63  
Cutting speed: 600 fpm  
Depth of cut: 0.10 in.

TIME MIN.	FLANKWEAR - in.			HARDNESS vhn	REMARKS
	Fa	Fb	Fc		
3	.009	.0125	.0085	260	
5	.010	.0125	.010	289	New bar
7	.013	.016	.016		
9	.015	.019	.020		
10	.015	.0215	.021		
12	.017	.0255	.025		
14	.115		.026	260	New bar - nose failure

Table 2

Material: EN 9  
Tool: NT111 N35/RD80  
Feed: 0.010 in/rev.

Date: 1/11/63  
Cutting speed: 600 fpm  
Depth of cut: 0.10 in.

TIME MIN.	FLANKWEAR - in.			HARDNESS vhn	REMARKS
	Fa	Fb	Fc		
3	.0105	.0105	.009	260	
6	.017	.017	.014		
9	.025	.028	.029		
12	.030	.033	.036		



Table 3

Material EN 9 Date: 11/11/63  
Tool: NT123 N35/RD80-edge 1 Cutting speed: 600 fpm  
Feed: 0.010 in/rev. Depth of cut: 0.10 in.

TIME MIN.	FLANKWEAR			HARDNESS vhn	REMARKS
	Fa	Fb	Fc		
10	.016	.018	.020	260	
12	.016	.021	.024		
14	.019	.021	.024		Nose failure

Table 4

Material: EN 9 Date: 12/11/63  
Tool: NT123 N35/RD80-edge 2 Cutting speed: 600 fpm  
Feed: 0.010 in/rev. Depth of cut: 0.10 in.

TIME MIN.	FLANKWEAR - in.			HARDNESS vhn	REMARKS
	Fa	Fb	Fc		
6	.0225	.032	.015	260	
9	.0225	.019	.028		
10	.0225	.019	.029		



Table 5

Material: EN 9  
Tool: NT107 SLP  
Feed: 0.010 in/rev.

Date: 31/10/63  
Cutting speed: 600 fpm  
Depth of cut: 0.10 in.

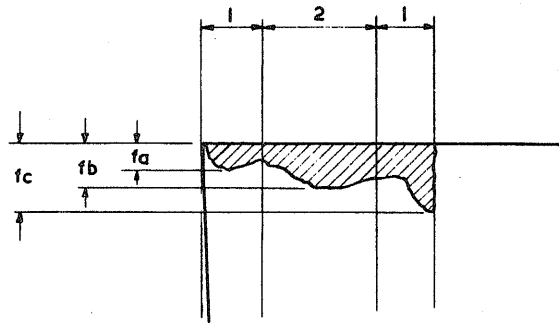
TIME MIN.	FLANKWEAR - in.			HARDNESS vhn	REMARKS
	Fa	Fb	Fc		
6	.0025	.0025	.005	260	
12	.005	.005	.008		
18	.006	.006	.0105		
24	.0075	.0085	.0125	289	New bar
30	.008	.009	.0135		
36	.0105	.011	.0185		
42	.012	.013	.0195		
48	.013	.014	.0195		
54	.0155	.016	.027	260	New bar
60	.016	.017	.0315		

Table 6

Material: EN 9  
Tool: NT110 S1P  
Feed: 0.010 in/rev.

Date: 31/10/63  
Cutting speed: 600 fpm  
Depth of cut: 0.10 in.

TIME MIN.	FLANKWEAR - in.			HARDNESS vhn	REMARKS
	Fa	Fb	Fc		
6	.0035	.006	.0035	260	
12	.006	.008	.0065		
18	.007	.009	.009		
24	.008	.013	.011		
30	.0095	.0135	.014		New bar
36	.012	.015	.017		
42	.013	.015	.018	289	
48	.013	.0165	.019		
54	.0145	.0165	.022		
60	.0155	.019	.026		
66	.016	.0205	.027		
72	.0175	.0245	.029		
78	.018	.0245	.032		



FLANKWEAR MEASUREMENT

FIG. 1

EN9, 600 fpm, 0.010 IN/REV, 0.10 IN DEPTH

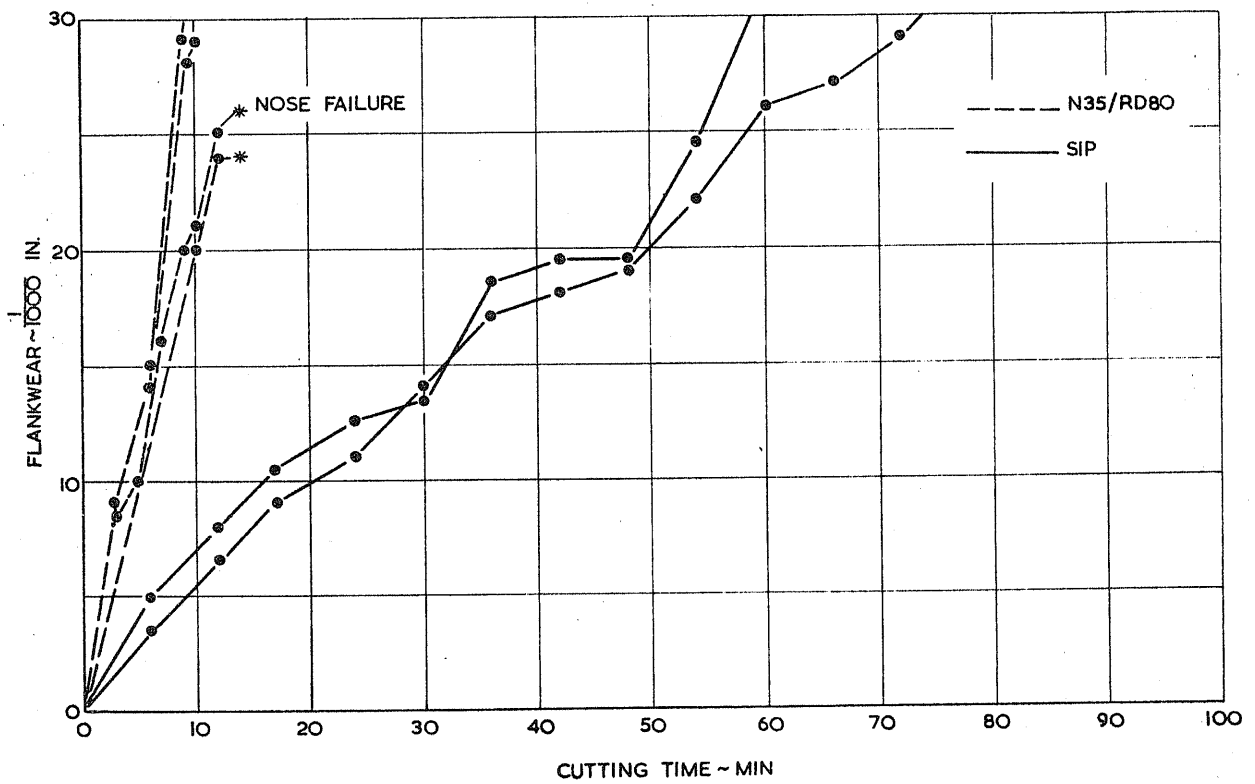
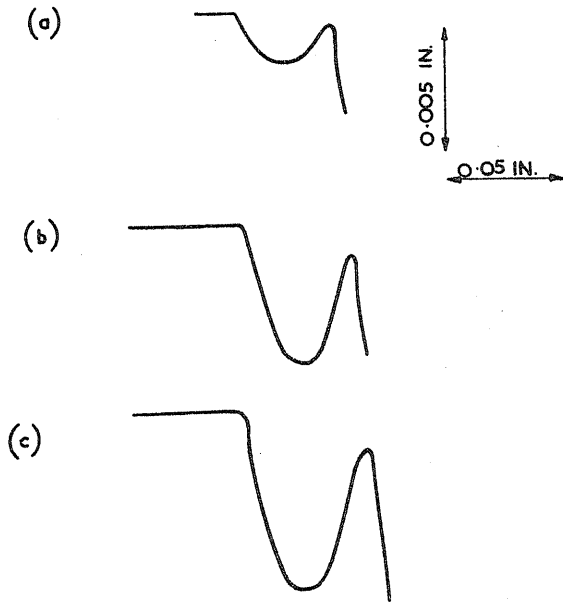
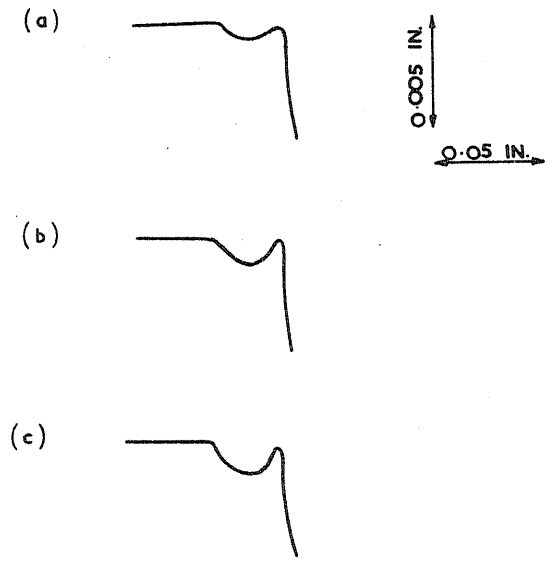


FIG. 2



GROWTH OF CRATER WEAR OF GRADE N35/RD80  
CORRESPONDING TO  
(a) 0.010 IN FLANKWEAR  
(b) 0.020 IN FLANKWEAR  
(c) 0.030 IN FLANKWEAR

FIG. 3



GROWTH OF CRATER WEAR OF GRADE SIP  
CORRESPONDING TO  
(a) 0.010 IN FLANKWEAR  
(b) 0.020 IN FLANKWEAR  
(c) 0.030 IN FLANKWEAR

FIG. 4

EN9, 500 fpm, 0.010 IN./REV., 0.10 IN DEPTH

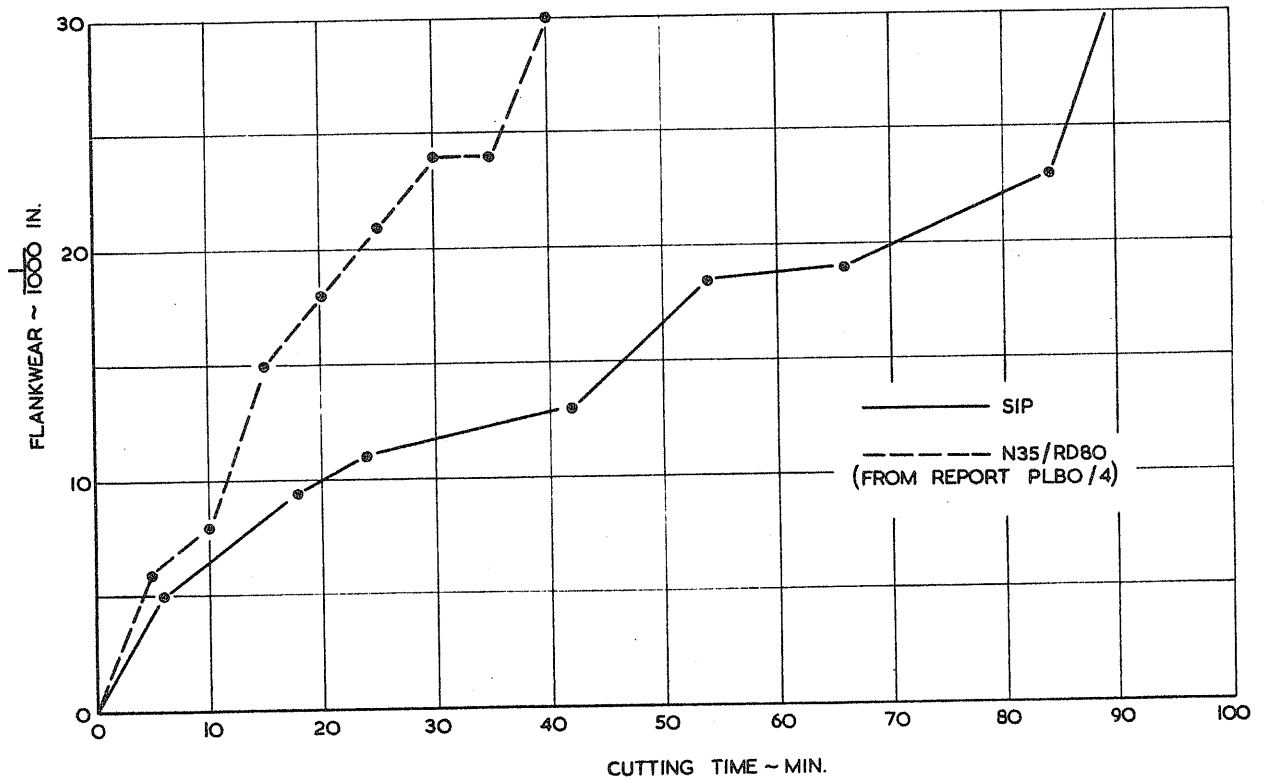
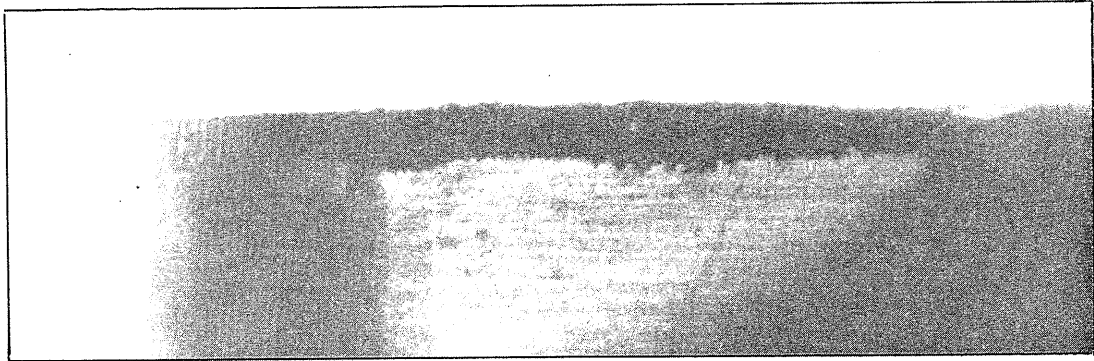
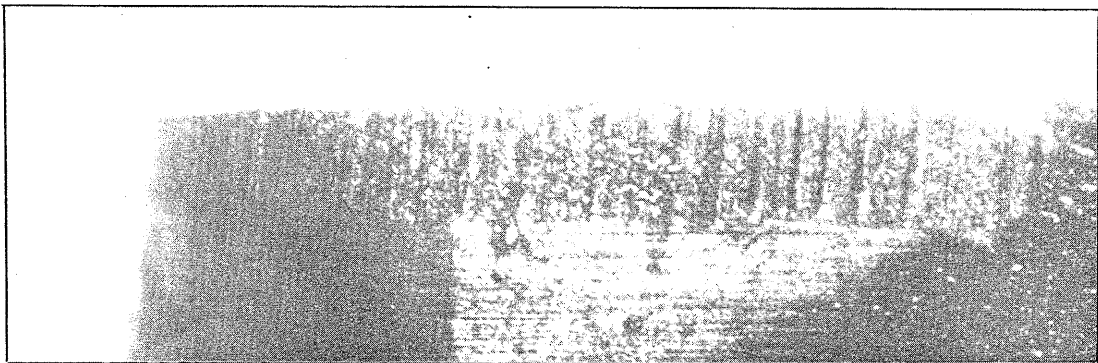


FIG. 5

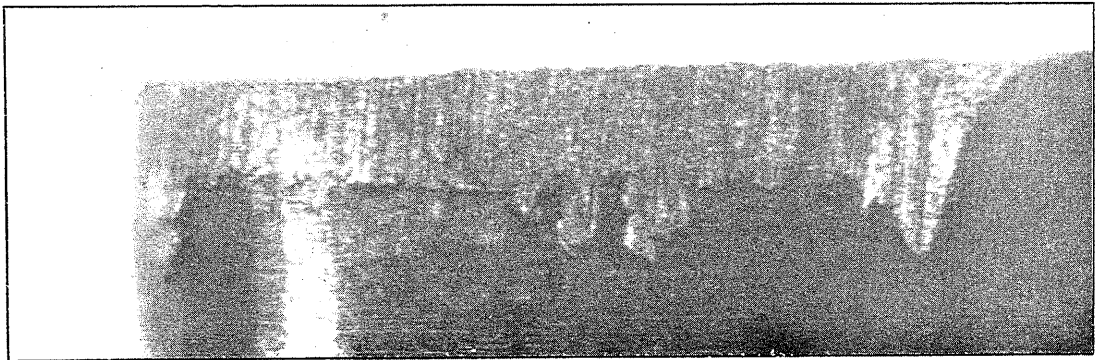




A



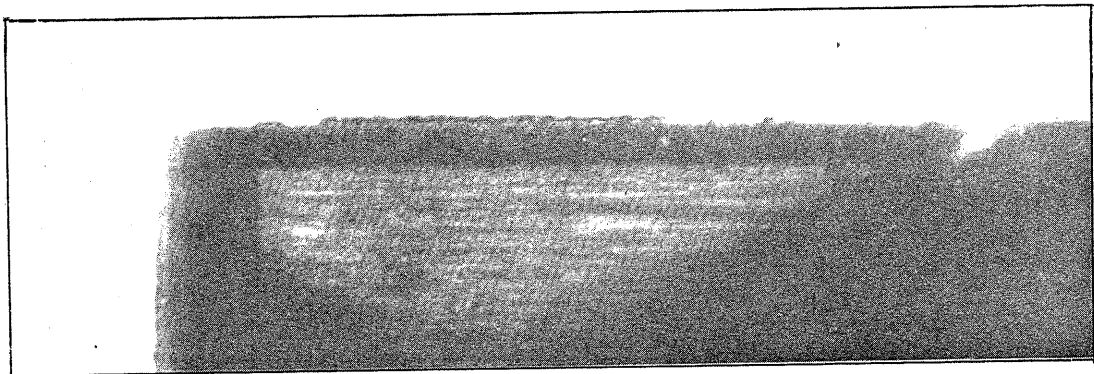
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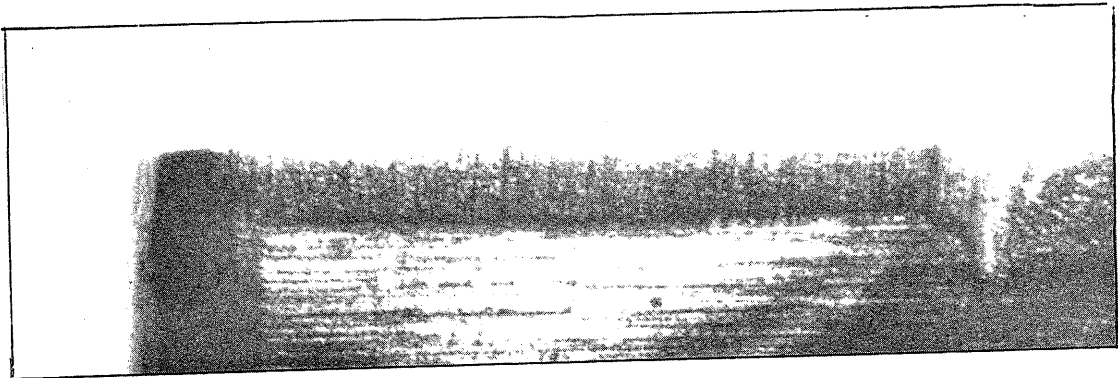
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Fig. 6. Flankwear Grade N35/RD80  
A 0.010 in Wear  
B 0.020 in Wear  
C 0.030 in Wear

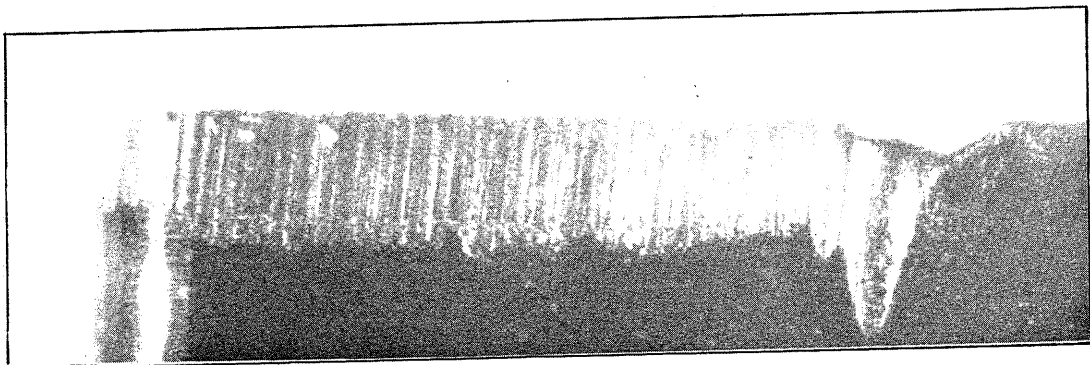




A



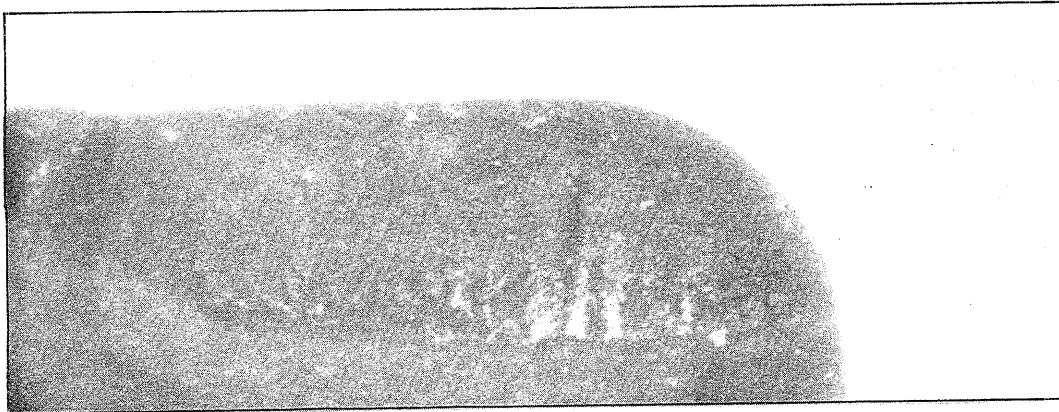
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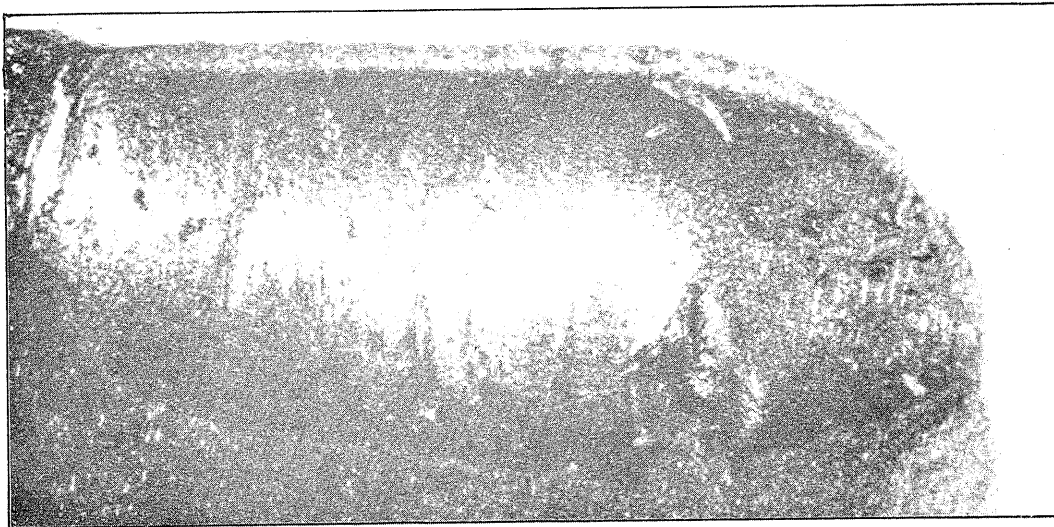
C

Fig. 7 Flankwear Grade SLP

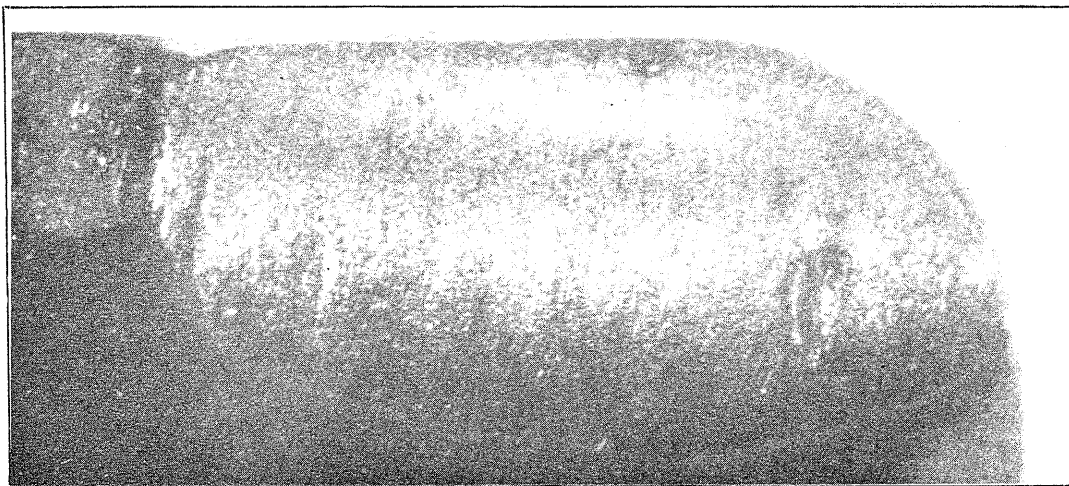
- A 0.010 in Wear
- B 0.020 in Wear
- C 0.020 in Wear



A



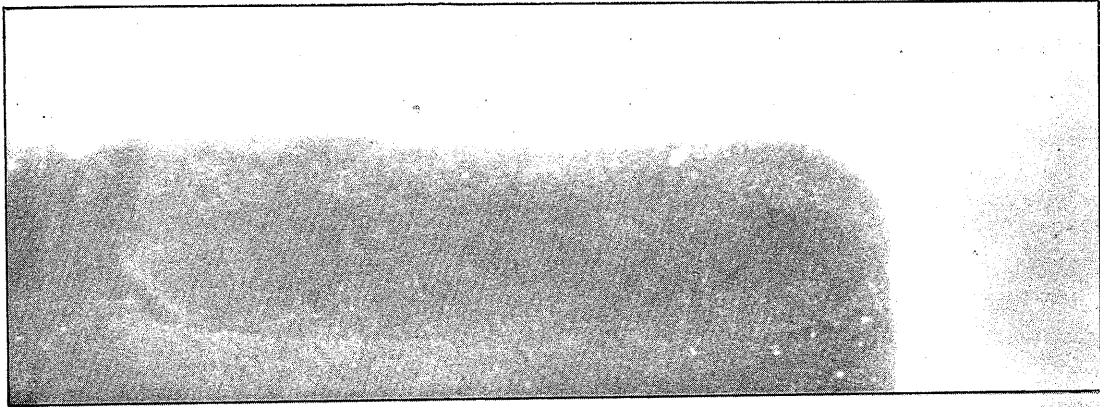
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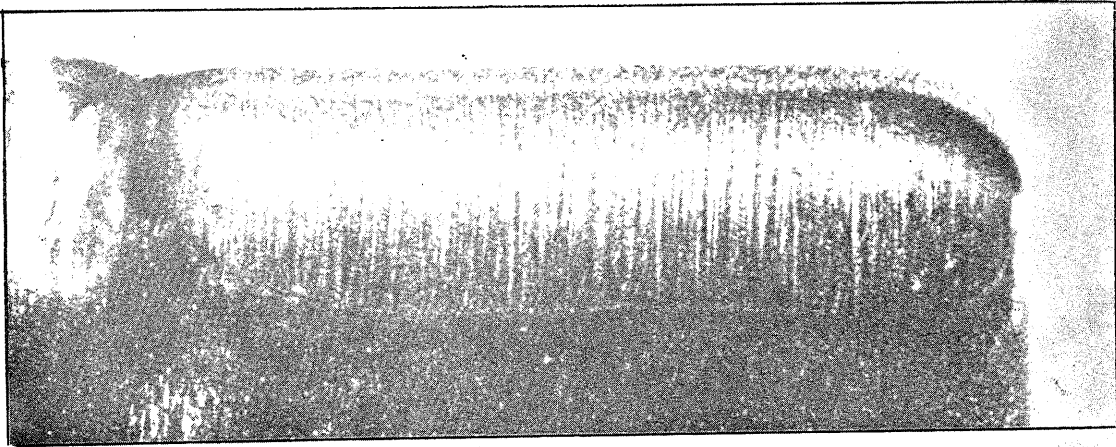
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Fig. 8. Crater Wear Grade N.35/RD.80  
Corresponding to: A 0.010 in Flankwear  
B 0.020 in Flankwear  
C 0.030 in Flankwear

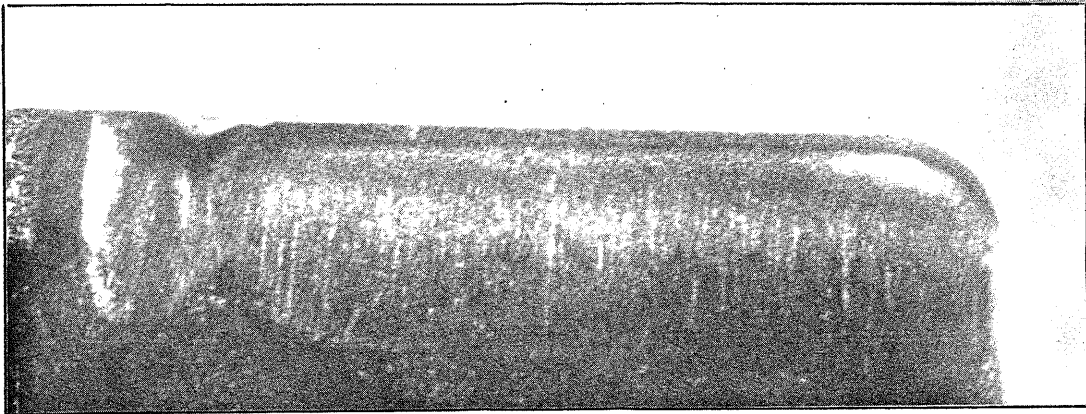




A



B



C

Fig. 9. Crater Wear Grade SLP  
Corresponding to: A 0.010 in Flankwear  
B 0.020 in Flankwear  
C 0.030 in Flankwear