TABLE 8.—PROPER SPEEDS AND FEEDS FOR TURRET LATHES

Speeds and feeds are altered by type and condition of machine, type of steel used, method of mounting, lubricant used for cutting, material cut, method of holding.

Material	Surface Feet per Minute						Feeds			
	H. S. S.‡		J Stellite		Carbide		Ram-Type Machine		Saddle-Type Machine	
	Rough	Finish	Rough	Finish	Rough	Finish	Rough	Finish	Rough	Finish
Cast iron	50 to 60	80 to 110	90 to 120	130 to 160	180 to 200	350 to 400	0.016 to 0.025	0.032 to 0.060	0.032 to 0.060	0.032 to 0.125
Semisteel, hard	40 to 50	65 to 90	75 to 100	100 to 130	140 to 160	250 to 300	0.016 to 0.025	0.032 to 0.060	0.032 to 0.060	0.032 to 0.125
Malleable iron*	80 to 100	110 to 130	120 to 140	150 to 200	250 to 300	400 to 500	0.016 to 0.025	0.032 to 0.060	0.032 to 0.060	0.032 to 0.060
Steel casting (0.35 carbon)*	45 to 60	70 to 90	70 to 80	90 to 130	150 to 180	200 to 250	0.010 to 0.020	0.018 to 0.030	0.018 to 0.045	
Brass (commercial 85-5-5)	200 to 300	200 to 300			600 to 1000	600 to 1000	Maximum Feed of Machine			
Bronze (80-10-10)*	110 to 150	150 to 180			600 to 1000	1000 to 1000				
Aluminum†	400 to 700	Fine Feeds to Produce Good Finish			800 to 1000		0.016 to 0.030	0.010 to 0.016	0.016 to 0.050	0.010 to 0.030
S.A.E. 1020 (coarse feed)	60 to 80	60 to 80			300 to 600	0.020 to 0.030	0.024 to 0.044			
(fine feed)	100 to 120	100 to 120			450 to 600	0.007 to 0.020	0.010 to 0.030			
S.A.E. 1035	75 to 90	90 to 120			250 to 450	0.020 to 0.030	0.020 to 0.044			
S.A.E.-X-1315	175 to 200	175 to 200			400 to 500	0.010 to 0.015	0.010 to 0.015			
S.A.E. 1050	60 to 80	100			200 to 300	0.012 to 0.020	0.025 to 0.090	0.015 to 0.045		
S.A.E. 2315	90 to 110	90 to 110			300 to 500	0.012 to 0.020	0.025 to 0.090	0.015 to 0.045		
S.A.E. 3150	50 to 60	70 to 90			200 to 300	0.012 to 0.020	0.025 to 0.090	0.015 to 0.045		
Stainless steel (selenium content)	100 to 120	100 to 120			240 to 300	0.010 to 0.015	0.010 to 0.015	0.010 to 0.015		

* Water-soluble oil lubricant. † Kerosene lubricant. ‡ Cobalt 18-4-1.

GENERAL MACHINING OF NONFERROUS METALS AND OTHER MATERIALS

The growing use of such nonferrous alloys as aluminum, magnesium, and monel metal and of the various plastics, frequently grouped under the head of bakelite, makes it seem advisable to group the suggestions from various sources, as to tools and methods of machining these, under one heading. This seems to be more convenient than to divide the information among the sections dealing with the various operations to be performed.

Tools for High-Nickel Alloys

Correct combinations of tooling, speeds, feeds, and cutting compounds give satisfactory results in machining such materials as monel, nickel, and Inconel. Monel contains approximately two-thirds nickel and one-third copper. Inconel is approximately 78 per cent nickel, 14 per cent chromium, 6 per cent iron, 2 per cent other elements.

Tungsten high-speed steels of the 18-4-1 type, with 0.70 to 0.75 per cent carbon content, are most satisfactory for general machining. Tools should be of 58 to 60 Rockwell C hardness for machining operations where cutting is intermittent and the tool is subjected to impact and for heavy roughing. For light smooth lathe turning and for automatic machining, tools with 61 to 63 Rockwell C hardnesses are best. For light cuts and high-speed machining, the super high-speed steels, containing cobalt and molybdenum, give best results.

Because of high heat generated in machining high-nickel alloys, carbon tool steels are not satisfactory. Stellite, tungsten, carbide, and tantalum carbide, properly used, are best. Grind with a slightly larger true rake angle than for mild steel. Figures 14, 15, and 16 show tools for various operations on high-nickel alloys.

In machining the harder alloys, Inconel, and K monel, the clearance angle should be kept at a minimum. On heavy, rough machining, it is best to grind a land about $\frac{1}{32}$ inch wide at the cutting edge.

Rough turning, rough planing, and shaping may be done dry, but it is essential to use a cutting oil for all other cutting operations. This increases the machining speed from 25 to 50 per cent, and results in a smoother finish.

Sulphurized oils give best results. Any tarnish is readily removed by soaking the work for 20 to 30 minutes in a cold 10 per cent solution of sodium cyanide.

All lubricants should be thoroughly removed from the machined pieces if they are to be subjected to high temperatures either during subsequent fabrication or in service.

Automatic Screw Machine Work.[1]

In Table 9 are recommended speeds and feeds for automatic screw machine turning on R monel.

[1] W. F. Burchfield, Research Department, International Nickel Company.