BED, PAN & LEGS

Front sump cover		A-59022
Rear sump cover		A-59023
Bed		L-94819
Pan		A-95157
Leg (right)		A-95187
Leg (left)		A-95188
Stop rod plunger		B-31995
Screw plug		B-32063
Strainer		A-34325
Bedway stud	(20)	B-34331
Stop rod screw		B-35350
Oil gage cover		B-36350
Oil gage glass		B-36358
Oil gage gasket		B-38359
Gasket	(4)	B-47848
Pan plate		A-56089
Gasket		B-58655
Gasket cap		B-59026
Front sump gasket		A-59027
Rear sump gasket		A-59028
Gasket		B-59029
Bedway stud	(2)	B-62379
Gasket		B-62853
Gasket		B-62854
Coolant pump brkt.		A-95295
Bedway nut	(22)	B-85475
Stud		B-95019
Knob		B-95020
Spacer		A-95216
Stop rod		A-95217
Rack		A-95222
Bedway	(2)	A-95144
Splash guard		A-95296
Side splash guard		A-95297
Strainer knob		788
Spring		1551
Vicker oil filter		B-71003
For machine with hand C.C.		
Stop rod brkt.		A-95219
Spacer		B-95221
For machine with air C.C.		
Stop rod brkt.		A-95218
Plug		B-95220
Gits oiler	(2)	502-G

COMMON

HEAD

Housing - (8338)		A-84628 A-84629
Brake housing		A-66250
Clutch gear		A-34309
For'd clutch gear		A-34310
High clutch gear		A-84280
Low clutch gear		A-84285
Cover	(2)	B-84632
Steel clutch disc	(28)	B-34127
Bronze clutch disc	(32)	B-34128
Clutch spacer	(2)	B-34352
Idler gear stud		B-34353
Adjustment nut		B-34356
Adjustment nut		B-34357
Gear shift lever shaft		B-34358
Gear shift lever shaft		B-34359
Hi-lo clutch washer		B-84291
Hi-lo clutch washer		B-34377
Tooth clutch gear plate		B-34381
Idler gear spacer		B-34383
Bearing spacer		B-34386
Bearing spacer		B-34387
Bearing spacer	(2)	B-34388
Clutch shaft washer		B-34389
Spacer & oil retainer		B-34531
Motor shaft brg. sp.		B-34532
H & L clutch shaft washer		B-34798
Clutch finger	(4)	B-39183
Chambered locknut		B-39258
Clutch plunger spool	(2)	B-40640
Motor shaft gear		B-73730
Tooth clutch fork		B-41111
Intermediate shaft		A-41149
Three gear cluster		A-84282
39T gear		B-84295
34T gear		A-84281
29T gear		A-84284
45T gear		B-84293
25T gear		B-84294
Detent plug	(5)	B-42281
Adjustment nut		B-42616
Lever spring	(2)	B-42667
Gasket	(2)	B-95732
Hi-lo clutch plunger		A-43840
Spray head	(3)	B-45696
Gear shift fork		B-84296
Reverse clutch shaft		A-47804
Clutch plunger		A-47807
Brake piston		B-47817
Sleeve		B-47820
Outer brake disc	(5)	B-47822
Handle	(2)	B-92351
Lever	(2)	B-95189
Lever block	(2)	B-95190
Spray pipe		B-47842
Idler gear		B-50589
Idler spacer		B-50591
Locknut		B-55247
Hi & lo clutch shaft		A-84286
Clutch brkt. gasket		A-61411
Brake disc cup		B-66249

HEAD

COMMON

Gasket		B-66251
Motor shaft spacer		B-67242
Motor shaft spacer		B-67243
Motor shaft spacer		B-84290
Motor shaft gear		B-67245
Inner brake disc	(4)	B-67844
Locknut		B-83041
Adj. nut		B-84289
156 Truarc-snap ring		5100-
MRC ball bearing-09 int. fit		5209K
MRC ball bearing " "	(3)	5210K
MRC ball bearing " "		5211K
MRC ball bearing	(2)	205SG
MRC ball bearing	(4)	207S
MRC ball bearing	(3)	208S
MRC ball bearing		208SZ
MRC ball bearing		308S

2 in. CAP. SPINDLE-PARTS

Spindle gear spacer	B-34603
Rear bearing closer	B-34605
Bearing spacer	B-34607
Front bearing closer	A-47851
Balancing ring	B-59612
Spindle	A-37284
Spindle adj. nut	B-34606
Oil thrower	B-35088
Driving button	B-37291
Driving button scr.	B-37292
Gear nut	A-54658
Timken roller brg #3 precision	593,592A
Timken roller brg #3 precision	581,572

118-1505 SPD. RANGE

Tooth clutch gear	A-84283
Tooth clutch pinion	B-84292
Small spin. gear	B-84297
Large spin. gear	B-84298

143-1820 SPD. RANGE

Tooth clutch gear	A-85326
Tooth clutch pinion	B-85332
Small spin. gear	B-85328
Large spin. gear	B-85334

HEAD END BRACKET

End cover		B-34411	Bearing block		A-95199
Top cover		B-34412	33-32T gear		A-95200
Gear stud		B-34420	66T gear		A-95201
Bearing spacer	(2)	B-34422	Drg. closer		B-95202
Spindle gear		B-34620	Filler block		B-95203
35T gear		B-34621	MRC bearing	(4)	202-S
40T gear		B-34622	MRC bearing	(2)	204-S
45T gear		B-34623	MRC bearing		5302-SB
Spacer		B-34642	Victoprene seal		60449
Feed shaft		B-95521			
Oil gage cover		B-36350	Mach. with hand oper. C.C.		
Oil gage glass		B-36358	H.E.B.		L-95204
Oil gage gasket		B-38359	Gear stud	(2)	B-34624
Cover gasket		A-38457			
Feed shaft extension		B-95522	Mach. with air oper. C.C.		
Spacer		B-67013	H.E.B.		L-95205
Oil seal guard		B-67014	Gear stud	(2)	B-70364

CLUTCH LEVER BRACKET

Clutch lever	(2)	B-47823
Clutch lever brkt.		A-61376
Clutch brkt. cover		A-61377
Spring		B-31760
Oil pump gear stud		B-34369
Oil gage cover		B-41415
Oil gage glass		B-41720
Lever pin		B-44288
Reverse clutch fork	(2)	B-47824
Clutch lever shaft		B-47825
Spacer	(2)	B-47826
Clutch fork collar	(2)	B-47827
Pin	(2)	B-47828
Lever lock pin		B-47833
Plunger		B-47834
Spring		B-47843
Clutch brkt. cov. gask.		B-47846
Button		B-48062
Valve body gasket		B-49263
Plate stand		B-50870
Clutch lever shifter		A-56359
Handle	(2)	B-92351
Shaft		B-56360
Lever		A-56361
Brake valve const.		A-59519
Valve body		A-59521
Valve stem		B-59523
Oil gage gasket		B-60018
Oil gage gasket		B-60317
Oil pump gear		B-60724
Oil pump pinion		B-60725
Plug		B-62160
Plug	(2)	B-64870
Pump pinion bushing		B-63954
Adjustment screw		B-67460
Relief valve		B-67839
Lever notice plate		B-72812
Lever		A-95192
Lever block		B-95193
Lever		A-95195
Lever block		B-95196
Linear "O" ring		11-110
Linear "O" ring		11-111
Dieco spring		M-111A

TURRET SLIDE & SADDLE

Turret clamp		A-74321	Lever roller	B-34177
Turret cover		B-42668	Lever washer	B-34178
Hex turret		A-57941	Lock bolt spring	B-34179
Slide		L-74319	Pawl pivot	B-34184
Saddle		L-94816	Pawl stop pin	B-34185
Tumbler		A-62940	Spacer	B-72326
Lockbolt lever		B-62938	Locating pin	(2) B-65368
Pawl		B-62939	Binder bolt	(6) B-39857
Spring retainer		B-70942	Locating ring	A-41138
Tumbler seat		B-71971	Chip guard	B-41820
Stop scr. carrier		B-70536	Chip guard support	B-41825
Stop scr. carrier nut		B-12004	Guard	B-74327
Knock out spring		B-31760	Steel way screw	(12) B-42367
Knock out rod plug		B-80810	Bevel gear	B-43630
Ratchet		B-75553	Lever washer	B-63347
Turret bevel gear		B-34166	Lockbolt bushing	(6) B-47906
Clamp stud		B-74296	Oil plug	B-58855
Washer		B-74302	Taper gib	B-59747
Set screw block		B-74303	Taper gib	B-59748
Clamp ring locator	(2)	B-77660	Straight gib	B-59749
Jam nut		B-80811	Left front gib	B-63016
Release trip		B-74323	Pawl spring	B-39246
Clamp release		B-74324	Binder hub	B-92239
Lock bolt sleeve		B-70941	Binder handle	B-92325
Link		B-74325	Bindle handle	B-92351
Lever pin		B-65416	Saddle way-rear	A-59751

TURRET SLIDE & SADDLE

Saddle way-front		B-59752
Rack		A-59753
Slide cap-front		B-59754
Slide clamp cap		B-59755
Slide cap-rear		A-74322
Slide cap-front		A-59757
Saddle cap-front		A-59758
Saddle cap-rear		A-59759
Block		B-59760
Ind. stop shaft		B-59764
Stop rod		B-59765
Stop shaft collar		B-59766
Clamp nut		B-59767
Tumbler screw		B-59768
Stop screw	(6)	B-59769
Knock out rod		B-95169
Clamp stud		B-95170
Bevel gear nut		B-59773
Gib screw	(2)	B-60136
Saddle way-front		A-60721
Stop		B-62194
Lock bolt		B-62326
Spacer		B-95739
Latch pivot		B-63543
Latch		B-63544
Ratchet pin	(3)	B-64964
Lockbolt centers		A-65243

Shoe	(3)	2359
Brass shoe	(6)	2261
Brass shoe		2253
For T.S. & S.-W/O-S.A.		
Pinion shaft		A-34540
Pinion shaft washer		B-34541
Turnstile sleeve		B-34542
Slide cap-front		B-66587
Slide cap-front		B-66588
Slide cap-rear		A-78004
With Bijur lubricator		
Brkt.		B-73928
Front cover		A-81026
Bijur lubricator		LBK-2036
Eaton snap ring		309
Linear-o-ring	(5)	11-110
Linear-o-ring		11-010
Timken brg. cone #3 precision		#387
Gits-oiler		#502
Gits-oiler		#503
For T.S. & S.-W/O-S.A.		
Gits-oiler	(5)	#501
Gits-oiler	(2)	#504

SADDLE APRON

Apron		L-94827
Apron cover		A-94828
Left side cover		A-94829
Feed lever		A-94830
Turnstile sleeve		A-94831
Right side cover		A-94832
Dial		A-95129
Worm gear		B-65296
Lever		B-65802
Lever		B-65803
Triple cluster gear		A-65808
Cam		A-69916
Cam shaft		A-94994
Front gasket		A-95122
Left side gasket		A-95123
Right side gasket		A-95124
Hollow shaft		A-95125
Shaft	(2)	A-95126
Clutch bolt		A-95127
Pinion shaft		A-95128
Spring		B-31917
Pin	(2)	B-39805
Spring	(3)	B-52222
Spacer	(2)	B-62521
Clutch bolt nut		B-65293
Dbl. cluster gear		B-65306
Dbl. cluster gear		B-65307
Dbl. cluster gear		B-65308
Worm		B-65311
Spacer	(2)	B-65322
Dial marker		B-65334
Sleeve		B-65340
Screw		B-65341
Shift pin	(2)	B-65342
Bushing	(2)	B-65386
Lever screw		B-65817
Fd. lever plunger		B-65822
Tooth clutch		B-65824
Tooth clutch		B-65828
Gear		B-65829
Rear cover		B-65834
Rear gasket		B-65836
Lever guard		B-67045
Fd. lever cam		B-67046
Clutch plug	(3)	B-69183
Bushing		B-73036

SADDLE APRON

Handle	(5)	B-92351
Knob	(3)	B-93655
Lever stop		B-95006
Cam spacer		B-95009
Fd. lever stud		B-95019
Knob		B-95020
Retainer		B-95024
Spring	(4)	B-95025
Spacer		B-95026
Pin	(2)	B-95027
Gasket		B-95130
Feed dial		B-95131
Dial feed plate		B-95132
Detent plate		B-95133
Spacer		B-95134
Brg. spacer		B-95135
Spacer	(2)	B-95136
Brg. spacer	(2)	B-95137
Lg. fd. lever rod		B-95138
Seal retainer		B-95139
Turnstile hub		B-95140
Turnstile handle	(5)	B-95141

O-rings

PRP 568-008	(2)	
PRP 568-010		
PRP 568-012	(2)	
PRP 568-113		
PRP 568-115	(2)	
PRP 568-210		
PRP 568-213		

Victoprene seal (2)
#60388

J.M. #9846
Hat gasket

Gits #302
Oil cap

Tru-arc snap rings
5100-78 (2)
5100-137
5100-250

Arrow breather
vent ASP-3BV

Bijur KIC-C-2367
lube pump, 1 in. stroke

Bijur B-5734 sight-gauge

MRC bearings

R-4	(2)	
104-KS	(2)	
107-KS		
204-S	(2)	
207-S		

Aetna bearings (2) E-7

Jergens #26908 plunger

Drill jig bushing (2) GA-92
5/16 hole

Brass shoe 1049

CROSS SLIDE & CARRIAGE

Cross slide gib		B-34391
Dial		B-42854
Carriage taper gib		B-61693
Compensating nut		B-62363
Binder handle		B-68690
Carriage		L-94817
Cross slide		A-94818
Clip	(6)	B-31937
Gib screw	(2)	B-34399
Gib stud		B-37754
Gib nut		B-40580
Rear carriage cap		B-42168
Rear cap gib		B-42171
Wiper	(2)	B-47907
Wiper cover	(2)	B-47908
Clamp	(2)	B-62365
Feed screw gear		B-62366
Brg. spacer	(2)	B-62367
Brg. spacer		B-62368
Wiper cover (right)		B-62805
Wiper	(2)	B-62806
Wiper cover (left)		B-63151
Stop		B-63545
Tee bolt		B-66118
Handle stud		B-68691
Handwheel		A-95159
Feed screw		A-95160
Front carriage cap		A-95161
Trip dog		B-95162
Trip pin		B-95163
Feed screw nut		B-95164

Experimental

Adaptor		B-95165
Handle hub		B-95166
Handle		B-92351

Reid tool SKA-13
Knurled knob assembly

Brass shoe	(2)	2252
Brass shoe		2281
NRC bearing	(2)	7303

CARRIAGE APRON

Carriage apron		L-94820
Apron cover		L-94821
Right side cover		A-94822
Left side cover		A-94823
Cr. fd. lever		A-94824
Long. fd. lever		A-94825
Gear shift lever		A-94826
Carriage dial		A-95040
Worm gear		B-65296
Knockout spring		B-31760
Fd. lever spring	(2)	B-31917
Rev. detent spring		B-31918
Clutch spring		B-34684
Stud		B-37754
Pin	(2)	B-39805
Adj. nut		B-40580
Spring		B-46766
Spring	(6)	B-52222
Spring		B-59673
Spacer	(2)	B-62521
Triple cluster gear		A-65259
Tooth clutch gear		A-65260
Gear shifter stud		B-65275
Tooth clutch		B-65286
Bushing		B-65287
Tooth clutch gear		B-65289
Clutch bolt nut	(2)	B-65293
Spacer	(2)	B-65295
Tooth clutch		B-65297
Fd. lever plunger	(2)	B-65302
Dbl. cluster gear		B-65306
Dbl. cluster gear		B-65307
Dbl. cluster gear		B-65308
Idler gear		B-65310
Worm		B-65311
40T gear		B-65312
Bunting bushing		B-65318
Bunting bushing		B-65319
Spacer	(6)	B-65322
Dial marker		B-65334
Gib		B-95855
Bushing		B-65339
Sleeve		B-65340
Screw		B-65341
Shift pin		B-65342
Brg. spacer		B-65352
Bushing		B-65386
Bushing		B-65387
Bushing		B-65388
Lever guard	(2)	B-67045
Fd. lever cam	(2)	B-67046
Clutch plug	(6)	B-69183
Stop screw	(6)	A-69817
Spacer		B-70631

CARRIAGE APRON

Stop screw roll		A-71323
Bushing	(2)	B-73036
Pin		B-81534
Handle		B-92351
Knob	(3)	B-93655
Front gasket		A-94991
Left side gasket		A-94992
Right side gasket		A-94993
Cam shaft		A-94994
Gear shift cam		A-94995
Hollow shaft		A-94996
Shaft	(3)	A-94997
Handwheel		A-94998
Pinion shaft		A-94999
Clutch bolt	(2)	A-95000
Lever		B-95001
Detentholder		B-95002
Shifter block		B-95003
Shifter rod		B-95004
K.C. rod plug (15/16)	(2)	B-95005
Lever stop	(2)	B-95006
C.S. knockout rod		B-95007
Detent plate		B-95008
Cam spacer		B-95009
Feed dial		B-95010
Dial feed plate		B-95011
Idler gear stud		B-95012
Sleeve		B-95013
Brg. spacer	(3)	B-95014
25T gear		B-95015
Spacer		B-95016
Fd. disengage pin		B-95017
K.O. rod plug (1-1/16)		B-95018
Fd. lever stud	(2)	B-95019
Knob	(2)	B-95020
Washer		B-95021
Pinion shaft gear		B-95022
Handwheel shaft		B-95023
Retainer	(2)	B-95024
Spring	(8)	B-95025
Spacer	(2)	B-95026
Pin	(4)	B-95027
Cr. fd. lever rod		B-95028
Rev. gear shaft rod		B-95065
Plug		B-95066
Victoprene seals		
#60096		
#60388		
#60454		
McCord-McKim gasket		507-F
Bijur B-5734 sight gauge		

CARRIAGE APRON

Bijur KIC-C-2367		
Lube pump, 1 in. stroke		
Tru-arc snap rings		
5008-137		
5100-78	(3)	
5100-137		
5100-250		
O-rings		
PRP 568-008	(4)	
PRP 568-010	(2)	
PRP 568-113		
PRP 568-115	(4)	
PRP 568-210		
PRP 568-213		
PRP 568-214		
PRP 568-218		
MRC bearings		
202-S	(2)	
204-S	(3)	
207-S		
104-KS	(3)	
107-KS		
R-4	(2)	
Aetna bearings	(3)	E-7
Torrington		
NTC-1427 Brg.		
TRC-1427 Plate	(2)	
Drill jig bushing	(4)	GA-92
Steel ball (5/16 D.)		
Steel ball (3/8 D.)		
Jergens #26908 plunger		
Brass shoe		1049
Brass shoe		2246
Brass shoe		2281
Brass shoe	(6)	2289

AIR OPER. COL. CHUCK

Wedge shoe	(2)	B-31983
Switch box		A-65672
Yoke bracket		A-72071
Finger	(2)	A-70711
Spindle guard pin		B-32580
Spring	(2)	B-34684
Finger pivot pin	(2)	B-36830
Finger holder frict.		B-44274
Detent		B-46705
Detent plug		B-46706
Detent spring		B-46707
Switch bushing	(2)	B-52246
Switch plunger	(2)	B-56194
Finger roller	(2)	B-62784
Finger roller pin	(2)	B-62785
Yoke pin		A-65677
Link pin		B-65679
Cover		B-65681
Dog	(2)	B-65682
Switch pin	(2)	B-65683
Guard cover		B-67758
Spindle guard		A-70378
Pin		B-77796
Cylinder adapter		A-72069
Cylinder adapter		A-72070
Link		B-72072
Spacer-mach. without		A-72037
Yoke pin-mach. without		A-72074
Oil-rite style dosf.		114
Micro-switch	(2)	BZ-2RS
Air valve		B-88686
Valve mtg. plate		A-95845
Spd. cont. plug	(2)	B-88698
Logan - Model 401		B-87942
R.F.L. unit		
5 in. bore-2-1/16 in stroke		90436
Logan air cylinder		B-95662

1-1/2 in. Only

Collet hood guard		B-37595
Yoke		A-67755
Collet hood		A-37594
Collet		B-34547
Collet pads		B-35135
Plunger		B-37596
Wedge shoe stud	(2)	B-62792
Wedge		B-67759
Finger adj. ring		B-67760
Abutment sleeve		B-67761
Finger holder		A-67762

2 in. Only

Collet hood guard		A-37287
Yoke		A-70361
Collet hood		A-37289
Collet pads		A-36758
Collet		A-42589
Wedge		B-62790
Finger adj. ring		B-69765
Abutment sleeve		B-69766
Finger holder		A-69767
Plunger		B-70362
Wedge shoe stud	(2)	B-70363
Abutment sleeve ext.		B-83823

AUTO CHUCK

Guard cap hinge		B-12890
Lever		A-34428
Yoke		A-34608
Yoke bracket (mach. w/o HEB)		B-34777
Spindle guard cap		B-35089
Hood guard support		B-35104
Collet hood guard		A-37287
Crank lever		B-40489
Yoke bracket		A-67973
Sleeve		A-46864
Wedge shoe	(2)	B-62004
Collet hood		A-37289
Finger	(2)	B-38091
Hood guard pin		B-32580
Abuttment sleeve		B-33563
Wedge		B-33564
Pivot link pin	(2)	B-31970
Wedge shoe stud	(2)	B-34446
Finger roller	(2)	B-34447
Finger roller pin	(2)	B-34448
Pin wrench		B-34523
Finger pivot pin	(2)	B-34618
Rear spindle guard		A-35108
Rear spindle guard		A-36440
Collet pads		A-36758
Plunger		B-37288
Pivot link pin		B-40496
Shaft		A-40504
Link		B-42021
Collet		A-42589
Finger holder		A-44256
Finger holder friction		B-44274
False jaw screw	(4)	#1453
Gits oiler		#502-G

REVOLVING HEAD BAR HAND FEED

Sliding head		A-36383
Rear stand		A-36748
Front stand		A-36749
Stand head		A-62831
Lever		B-36751
Link lever		B-40490
Ratchet pusher		B-42018
Revolving head		A-83716
Link pin	(4)	B-31970
Chuck jaws		B-36017
Chuck screw		B-36018
Front bearing closer		B-36026
Rear bearing closer		B-36027
Chuck plate		B-36028
Bearing spacer		B-36030
Latch		B-36384
Chuck guard		A-36385

Lever pin		B-36752
Stand head washer		B-36805
Support tube		B-37566
Link pin		B-40496
Link		A-42019
Stud		B-42020
Bars	(2)	B-42023
Ratchet		B-42025
Link		B-42026
Drip trough		A-36894
Spring		B-43666
Center plug		B-83717
Latch handle		292
Knob		788
Shoe		882
Spring		1530
MRC bearing	(2)	214-SF
Gits oiler		502-G

LIPE BAR FEED (SPL.)

SL - (12 ft.) lipe bar feed unit	#225	Ext'd. piston	A-85163
		Piston const.	A-85298
Bushing	B-85297	Support arm	A-84536
Tube	B-85296	Arm extension	A-84537

SQUARE TURRET

Binder lever		B-42144
Base		A-58493
Lockbolt lever		B-63351
Lockbolt cam		B-63352
Lockbolt bushing	(4)	B-32046
Lockbolt spring		B-32049
Screw plug		B-32055
Lockbolt		B-34234
Lockbolt sleeve		B-34235
Bottom plate		B-34243
Binder lever collar		B-34248
Spring plunger		B-34249
Lever shaft		B-42145
Lever bushing		B-42146
Lever collar		B-42147
Lever collar		B-42148
Bakelite ball		B-42149
Indexing plate		B-43646
Center stud		B-43648
Center bushing		B-51196
Center sleeve		B-51197
Square turret		A-56325
Pivot screw		B-58482
Tumbler plunger		B-58483
Tumbler		A-61146
Tee nut	(2)	B-63945
Spring		B-73527
Spring	(2)	2075
Gits/oiler	(2)	B-95803

MOTOR DRIVE

Louis Allis 256T

Motor bracket	A-86291	Motor brkt. gasket	A-95734
Motor housing	A-67731	Key	B-86292

COOLANT PUMP & PIPING

Gusher coolant pump		B-91226
Model 6P3-long		
Manifold		A-95329
Ball valve	(2)	B-94875
Flodar fitting	(2)	
BA-1000-12-8		
American flexible		1/2 x 12
Coolant line with male coupling & open nozzle		1/2 x 16

Std. pipe	(3)	1/2 x 12
Std. pipe		1/2 x 8
Std. pipe		1/2 x 6
Std. pipe		1/2 x 2
Swing joint	(4)	1/2
Street ell	(2)	1/2
Hyd. tubing		3/4 O.D.

S.C.A.

Bracket	A-71286	Stop lever	B-71298
Lg. fd. lever	A-71859	Knock out adjustment	B-71299
Lever (#4 UTL only)	B-71288	Bushing	B-71301
Leader	A-71289	Knock out rod	B-71302
Lever (#6 UTL only)	B-80822	Lever catch	B-71303
Lever (#3 UTL only)	B-95148	Detent	B-71304
Leader nut	B-32079	Knock out rod plunger	B-71305
Spring	B-48061	Lever rod	B-95810
Leader bushing	B-71290	Lever pivot	B-71307
Follower	B-71291	Pinion shaft	B-71858
Follower rack	A-71292	Kickout plun. spring	B-52312
Closer	B-71293	Cover	B-71319
Disengage block	B-71294	Spring	B-56121
Pin	B-71306	Knob	B-95020
Kickout plunger	B-71297	Gits oiler	#2201

CROSS SLIDE TAPER ATTACH.

Base		A-34811	Swivel slide		A-34816
Tool slide taper gib		B-34813	Swivel plate		B-34817
Swivel slide taper gib		B-34814	Tool slide stud		B-34821
Yoke		B-34819	Swivel stud		B-34822
Tool slide		A-63199	Bracket		B-47841
Gib screw	(2)	B-34399	Tee nut	(2)	B-63945
Follower		B-34815	Stud	(2)	B-88881

10 in. AIR POWER CHUCK (S-P)

Adapter	A-91730	S-P 10 in. 2-jaw chuck	Model K2	
Mtg. plate	A-95345	S-P 10 in. 3-jaw chuck	Model K2	
Draw rod	A-99483	S-P 10 in. cylinder	Model RM	
Cylinder guard	A-99484	S-P Soft blank top jaw	10-K-325 (1 set)	
Mounting plate	A-98946	Logan RFL unit	Model 401	B-87942
		Valvair speed control plug	(2)	B-88698
		Numatics 4-way valve		B-95900

CHUCK GUARD

Knob	B-84088	Guard	A-95850
Hood	A-95849	Housing	A-84629

10 in. AIR POWER CHUCK (CUSHMAN)

Adapter	A-91730	Cushman chuck #20-672-10-A08	
Mtg. plate	A-95845	Cushman cylinder #10-752-10-000	
Draw rod	A-98944	Cushman H.S. top jaws 24-11055	(1 set)
Guard	A-98945	Logan RFL Unit	B-87942
Mounting plate	A-98946	Valvair speed control plug	B-88698
		Numatics 4-way valve	B-95900

8 in. SMW POWER CHUCK

Mounting plate		A-97160	Logan R-F-L Unit		B-87942
Chuck adapter	(2)	A-99076	Valvair speed plug		B-88697
Stand off bracket	(2)	A-99077	Numatics 4-way valve		B-97159
Chuck guard		A-99078	SMW chuck-adapter-jaw		B-97161
Knob		B-84088	Bracket	(2)	B-99079

INCH/METRIC DIAL

Jergens Conversion				
Dial Unit No. 65103	A-97149	Nut (No. 6 UTL)		B-97152
Increment Ring 0/333	B-97150	Adapter		B-97153
Handwheel	A-97151	Clip	(6)	B-97306
Nut (No. 3 UTL)	B-98565	McMaster Delrin Fluted-Head Finger	(6)	B-97330

USING THE CONVERSION DIAL

1. Inch measurement

   With the inch engraving on the selector ring to the top, the engraved dial will now revolve at the same speed as the lead screw.

2. Millimetre measurement

   The conversion dial can be changed from inch to metric by turning the selector ring slowly 180° in a clockwise direction until it can be felt clicking into the detent position. This will show the mm engraving at the top. The engraved dial will now revolve at a higher speed than the leadscrew spindle, 2.54 to 1.

3. Reversion to inch measurements

   The selector ring is returned to the detent position in a counter-clockwise direction. A small arrow engraved beside the inch and mm engraving shows the direction of rotation in each case.

4. Zero set

   The engraved dial can be set at zero or any other position on the dial by unscrewing the thumb screw, moving it to the required position and then re-tightening the thumb screw.

ADJ. SPINDLE BACK STOP

Adj. stop	A-96999	Adapter	B-97001
Guard	A-97000	Sleeve	B-97002

TURRET LEADING ATTACHMENT

Follower bracket		A-99435
Follower bracket cover		A-99436
Leader		A-94437
Splined shaft		A-99438
Spacer		A-99439
Cover		B-99440
Gits oiler		502
Gear housing		L-97769
Lever bracket		A-97771
Lever		A-97772
Spacer		A-97773
Right side cover		A-97774
Bearing closer		B-97775
Knock out rod plug		B-31750
Spring		B-31917
Spring		B-52222
Follower		A-71511
Feed screw gear		B-71513
Bearing closer	(2)	B-71514
Washer	(2)	B-71515
Bushing	(2)	B-71518
Washer	(2)	B-71520
Spacer		B-71521
30T gear		B-71522
Splined shaft		B-71523
20T gear		B-71525
Coupling		B-71526
Closer		B-71528
Spring retainer		B-71530
12T gear		B-71531
Collar		B-71532
Cover		B-71534
Feed lever plunger		B-71536
Eccentric pin		B-71539
42T gear		B-71540
36T gear		B-71541
Rack		B-71542
Roller	(2)	B-71543
Cover		B-71545
Cam		A-71547
Bushing		B-73454
Spring		B-79065
Shear pin		B-83937
Feed lever stud		B-95019
Knob		B-95020
Seal spacer		B-97779
Shift rod		B-97780
32T gear	(2)	B-97781
8T pinion		B-97782
Long. feed lever rod		B-97783
Gear stud	(2)	B-97784
Closer gasket		B-97785
Cover gasket		A-97786
Apron gasket	(2)	A-97787
Washer	(2)	1721
Garlock seal 92 x 7518	(3)	B-95748

3 UTL LOT 3669 378 ONLY

CONTENTS

This instruction manual is for—

Customer _____

_____

_____

Machine _____

Serial No. _____

Lot No. _____

Date Mfg. _____

Note: When ordering tooling, repair parts or requesting information please refer to the above machine, serial number and lot number.

UNIVERSAL TURRET LATHE

INSTALLATION—SECTION 1

The Bardons & Oliver Universal Turret Lathe was designed and built to produce accurate work over a long period under conditions of hard usage. In order that the inherent accuracy be retained, extreme care must be given to the installation of the machine. Thorough inspection of the machine should be made at regular intervals, the frequency depending on the type of work handled and the accuracy desired.

IMPORTANT

Do not attempt to run the machine until all of the following instructions for Unpacking, Installing, Lubrication, Electrical Connections, Leveling, and Safety have been carefully and completely followed.

UNPACKING

Turret Lathes for domestic customers are shipped in individual crates: those for foreign customers are shipped in individual boxes. While the machine is being unpacked, particular care should be taken not to mar the finish or damage the working parts.

Whenever possible, tools, chucks, and fixtures are attached directly to the machine. Wrenches and other items which cannot be attached, together with a data envelope, will be found in a separate box fastened to the platform or skids.

Contained in the data envelope are the instruction manual, electrical diagram, parts catalogue, and packing list. Be sure this data is preserved and delivered to the proper departments.

Check and account for each item on the packing list before disposing of any crating or boxing material.

FOUNDATIONS

The machine is mounted on heavy wooden skids to prevent bed warpage in shipping. Locate the machine approximately in its final position before removing the skids. In removing the skids care must be taken to prevent undue twisting which might cause permanent distortion of the bed.

If possible, the legs should rest on a concrete foundation. A wooden floor lacks rigidity and its surface swells or shrinks according to climatic conditions.

To maintain accuracy, place steel bearing plates under each leg, as shown on the outline drawing of the machine.

These plates should be grouted in concrete flush with the floor. If it is impossible to set these plates in or on concrete, they may be bolted down to a wooden floor. Here it is advisable to use plates affording a much larger bearing area on the floor. Drill and tap for the hold down screws after the bearing plates are firmly fastened to the floor.

On machines equipped with an air collet chuck and bar feed unit, assemble the bar feed unit according to the foundation drawing in the manual and place the unit in its approximate position with respect to the machine. The bar feed unit should be located on bearing plates the same thickness as used under the machine.

Connect the two air lines to the collet chuck cylinder underneath the end of the spindle. Each hose is suitably marked.

ELECTRICAL CONNECTIONS

The machine is shipped from the factory with all electrical equipment wired. It is only necessary to connect the main power lines to the terminals on the disconnect switch in the upper right hand corner of the electric control cabinet. When the headstock oil reservoir is filled as outlined in the "LUBRICATION" instruction, close the disconnect switch and press the "START" button located on the push button control panel. If the power lines have been connected to give the proper rotation of the motors the spindle will rotate in a counter clockwise direction with the start lever in forward.

LEVELING

CAUTION—Before leveling, allow the machine to reach normal operating temperature.

To start machine, read operating instructions first.

The accuracy originally built into the machine will be lost unless the machine is properly leveled. To maintain this accuracy the level of the machine should be checked at least twice a year.

To level, raise the machine by turning the leveling screws so that a 1/8 inch thickness gage may be slipped between the bottom of each leg and the bearing plate. Use a precision level about fifteen inches long. Starting at the head end, place the level lengthwise on the bed ways, and level by turning the adjusting screws. Then place the level across the bed ways and level. Repeat the two operations at the tail end of the machine. After leveling at each end, repeat the leveling process until all readings are equal. After proper alignment, bolt down the legs and recheck the level.

If extremely accurate work is to be done on the machine, the leveling can be further checked by chucking a round bar and taking a turning cut with the carriage or hexagon turret. Any remaining misalignment will be indicated by the amount of taper in the turned diameter. This can be corrected by slight adjustment of the leveling screws.

On machines equipped with the air collet chuck and bar feed unit, this unit should be bolted to the floor only after it is leveled and aligned with the spindle. To level and align the unit (Figure 1), do as follows: Place the unit in approximately the proper position with respect to the machine, and make necessary electrical and air connections. Insert a test bar (equal to the maximum capacity of the collet) through the revolving scroll chuck and just through the collet. The bar should be straight, of a uniform diameter and about 12 feet long. Close the collet. Place a parallel between the support bars and the test bar. Using a 2 inch parallel, raise the second stand until the test bar is level. Check alignment of support bars by placing level lengthwise on top of the bars and then crosswise on the bars adjacent to the parallel. Adjust by leveling the second stand. Level the first stand lengthwise and at right angle to the support bars. Using the test bar as a guide, align the stands with the center line of the spindle. Recheck level of test bar and support bars. As a check of alignment, the test bar should be concentric with the hole in the abutment sleeve. Recheck the levels throughout the bar feed unit.

To insure proper installation of the bar feed unit, tighten the chuck until it grips the test bar. Loosen the chuck just enough so that it can be moved back and forth over the test bar. It must slide freely over the whole length. After lining up and leveling the bar feed stands, bolt them securely to the floor.

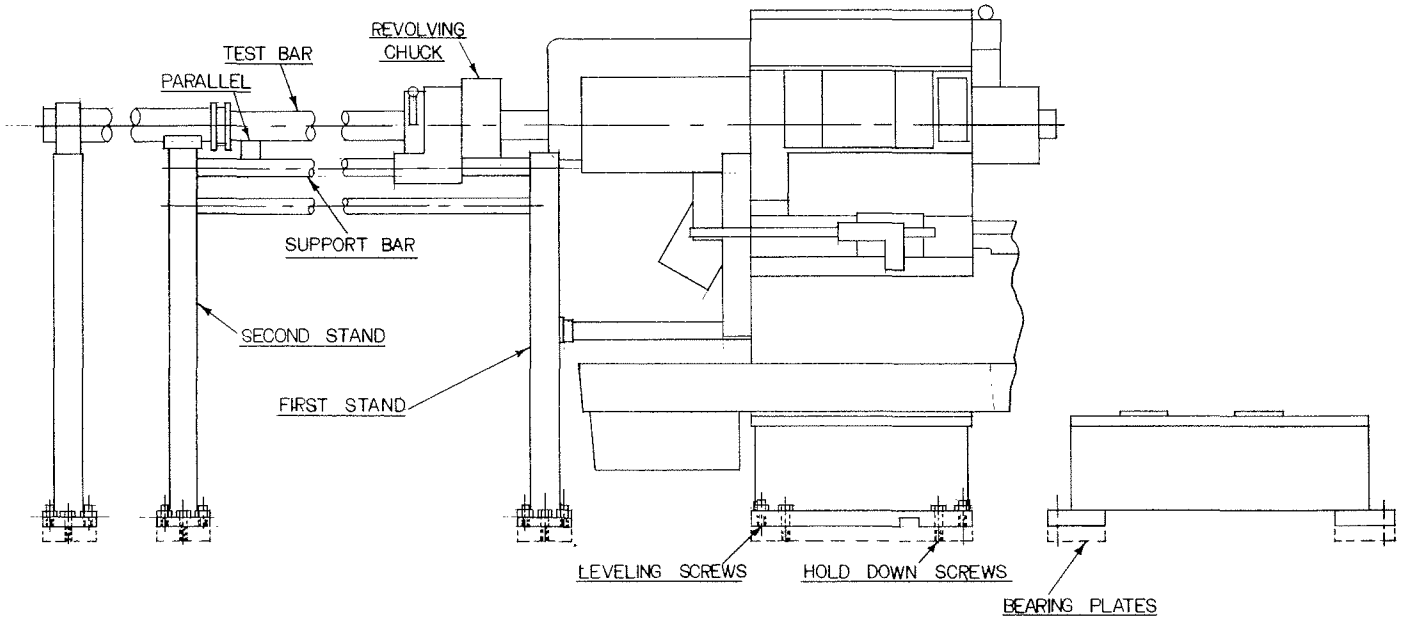


FIG. 1

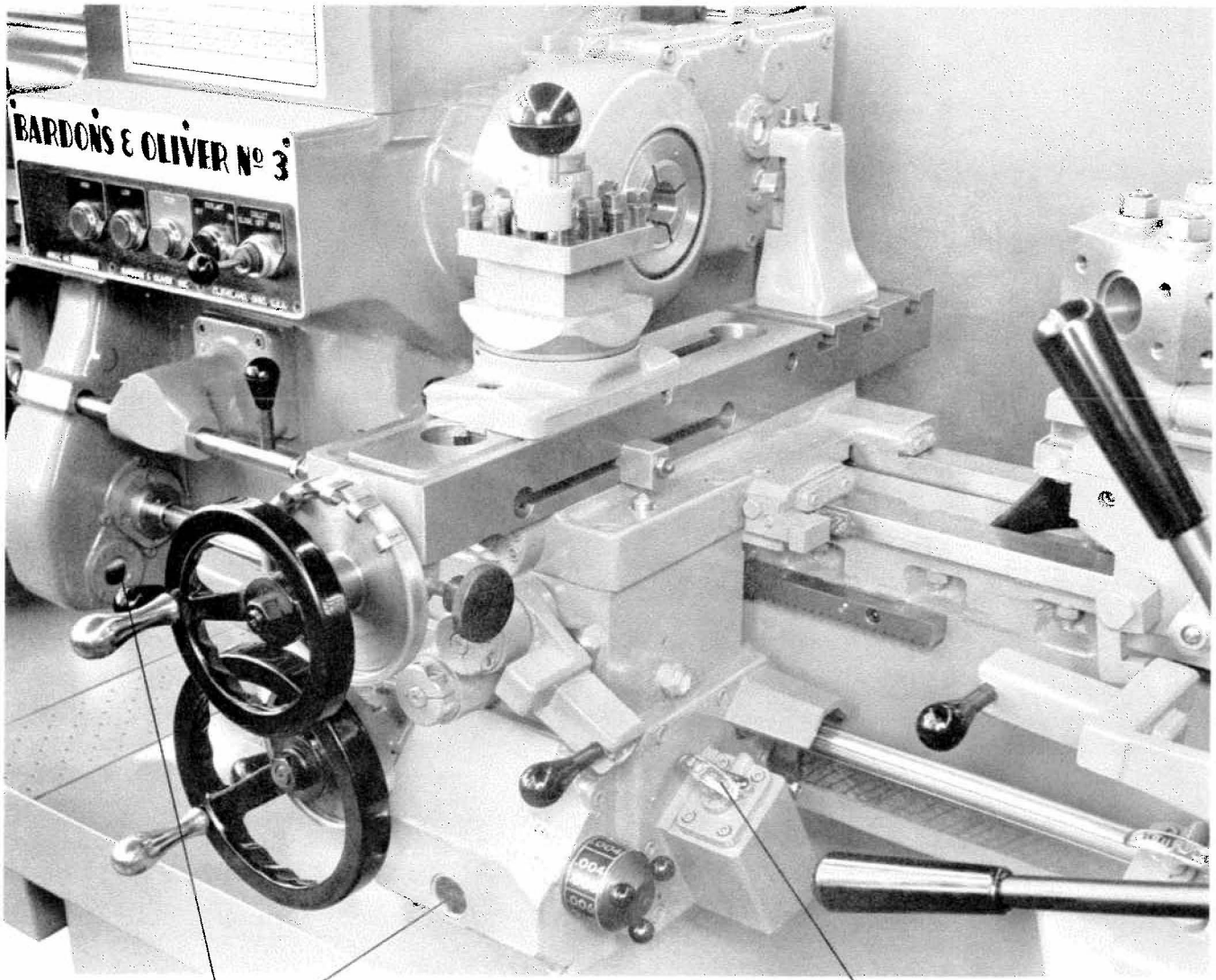
LUBRICATION

The headstock is fully enclosed and spray lubricated. With the main drive motor on circulating oil should be visible in the sight gauge directly below the forward-reverse lever near the spindle face.

The aprons and head end bracket are splash lubricated. The plunger pumps on the aprons lubricate the bearing surfaces of the turret slide, the cross slide, carriage, feed screw, and nut, as well as bearing surfaces in each apron not reached by the splash system. Since the plunger pumps take oil from the aprons, it may be necessary to add oil to the aprons more often than to the headstock or head end bracket.

The apron oil reservoirs are filled to the proper level before shipment. Fill the headstock and check the aprons and head end bracket. Make sure that the oil level in each reservoir is at approximately the center of the gage glass. Check the oil levels before starting the machine, as the level drops somewhat after the machine is started. Raising the oil level above the center line on the gage will cause oil leakage at various points and excessive oxidation or gumming of the oil.

The instructions on the lubrication chart (Figure 2) must be followed. If the machine is operated on a multi shift basis, the headstock and aprons should be drained, flushed and refilled two or three times as often as called for on the chart.



Site Gage

Apron
Plunger Pump

LUBRICATION CHART

INSTRUCTIONS

Before Starting	—	Fill all oil reservoirs to the center line on the gages. Fill oil cups. Depress apron pump plungers 3 or 4 times.
Every 4 hours	—	Fill oil cups. Depress apron pump plungers 3 or 4 times.
Every 3 months	—	Drain apron and head end bracket oil reservoirs. Flush with solvent type flushing oil. Refill reservoirs.
Every 6 months	—	Drain headstock oil reservoirs. Flush thoroughly with solvent type flushing oil. *Clean oil filter on inside of reservoir cover.* Refill headstock.

OIL SPECIFICATIONS

Headstock and Head End Bracket	—	High grade mineral oil, Mobil DTE 25 or equivalent.
Aprons	—	Mobilgear #626
Oil Cups	—	Mobil Vactra oil #2

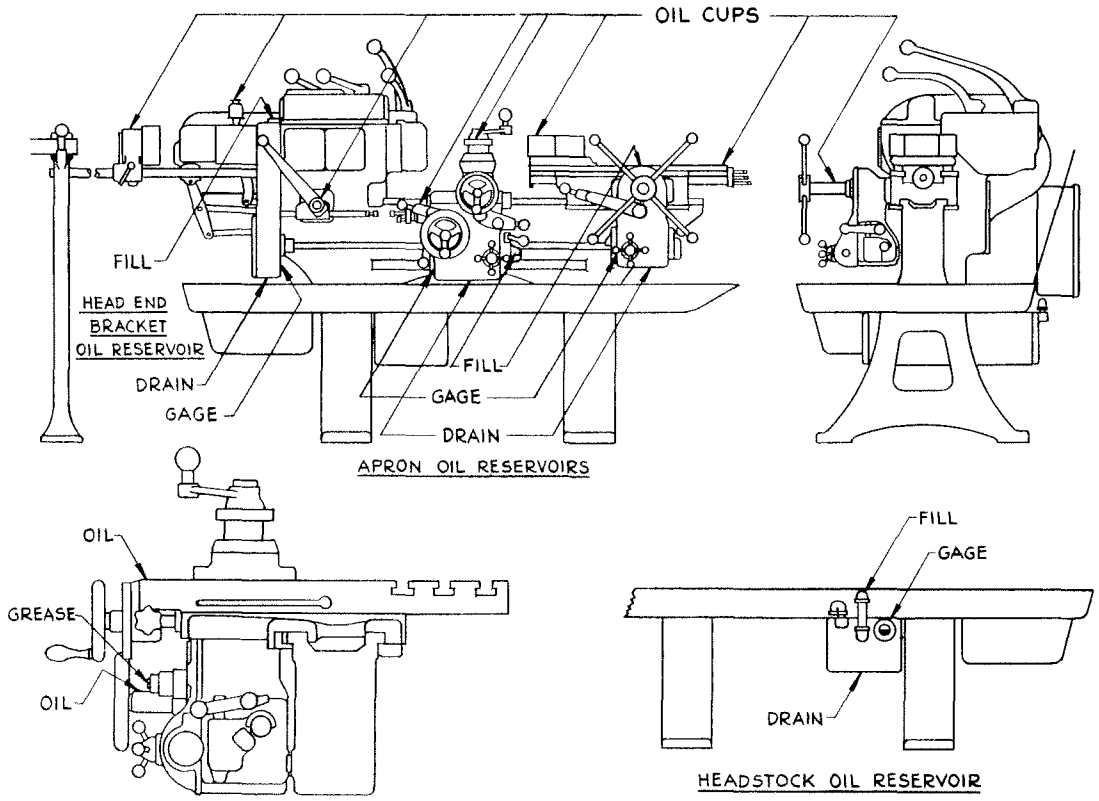


FIG. 2

NOTE: Mobil Products are listed above to indicate the proper type of lubricant. Many manufacturers of high quality lubricants have equivalents, and it is recommended that you consult the company which has best served your past needs.

SECTION 2

Safety First

Before you turn on the machine—

- Protect your eyes. Wear safety glasses.
- Wear appropriate clothing—No long sleeves, neckties, or jewelry.
- Make sure floor is clean and free of obstructions in work area. Clean up chips, oil spills, and remove parts or tote boxes to a safe area.
- Before turning on power, put the spindle in neutral.
- Make sure work part and tooling are securely fastened in proper holders or fixtures.
- When main power is on and before spindle is rotated check that hydraulic and air pressure gages show proper operating pressure.

HEADSTOCK OPERATION

The No. 3 Universal Turret Lathe has a 24 speed (with 2 speed motor) headstock. Speeds are easily selected by positioning three levers as indicated on the chart attached to the front of the headstock (Figure 3).

The high-low lever "B" allows spindle speed changes without slowing the spindle. When the position of levers "A" or "C" is changed, the forward-reverse clutch must be disengaged, and the spindle must be allowed to slow almost to a stop. The forward reverse lever when in the neutral position automatically applies the spindle brake. Between the forward and neutral positions there is a coasting zone which greatly facilitates gear shifting. An automatic lever lock prevents unintentional starting of the machine.

The high-low motor buttons start the main drive motor. Either of these buttons may be pressed with the spindle running allowing an instantaneous shift from high to low motor.

A selector switch turns on and off the separate motor driven coolant pump.

If the machine is equipped with an air operated collet mechanism the switch closest to the operator opens and closes the collet.

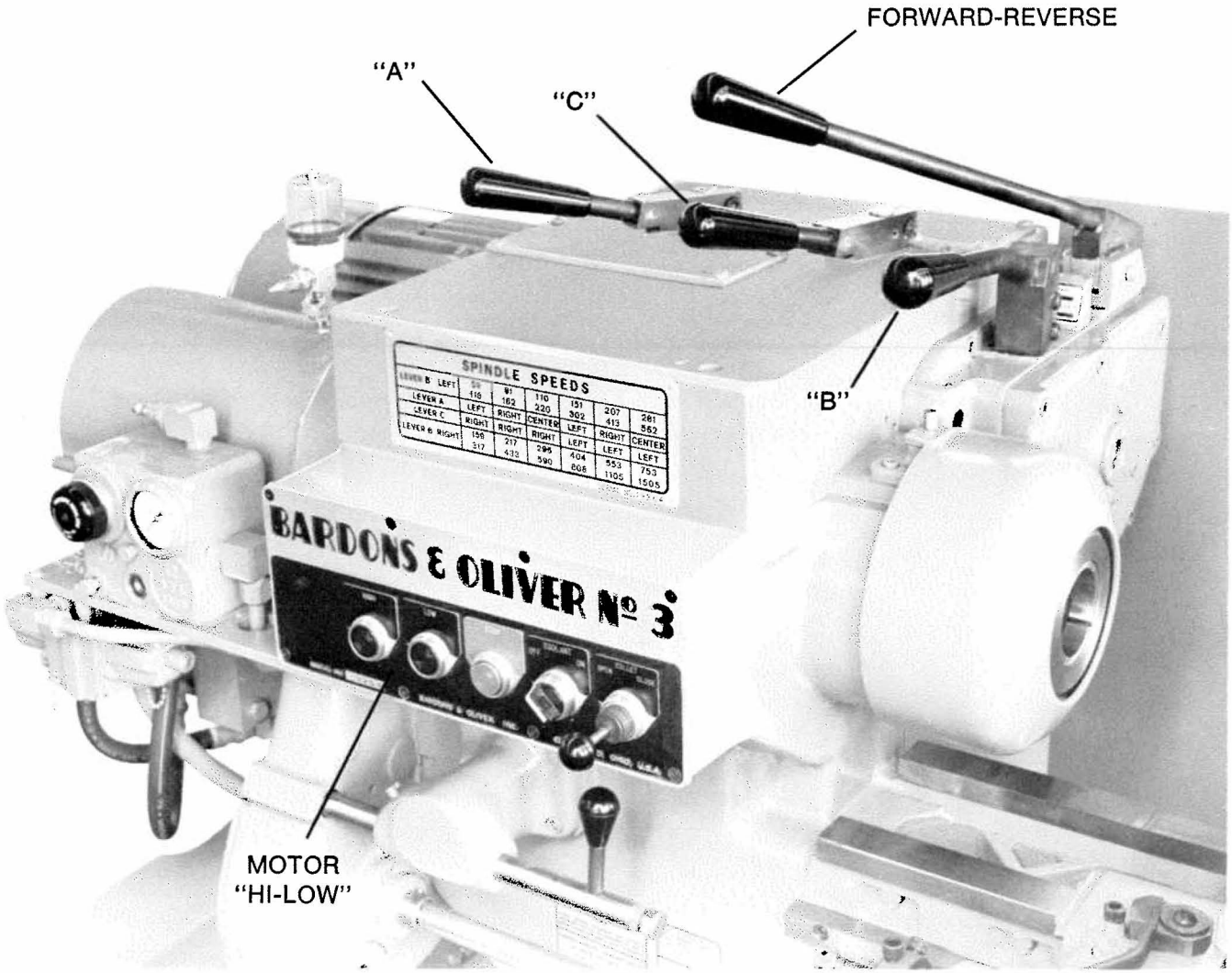


FIG. 3

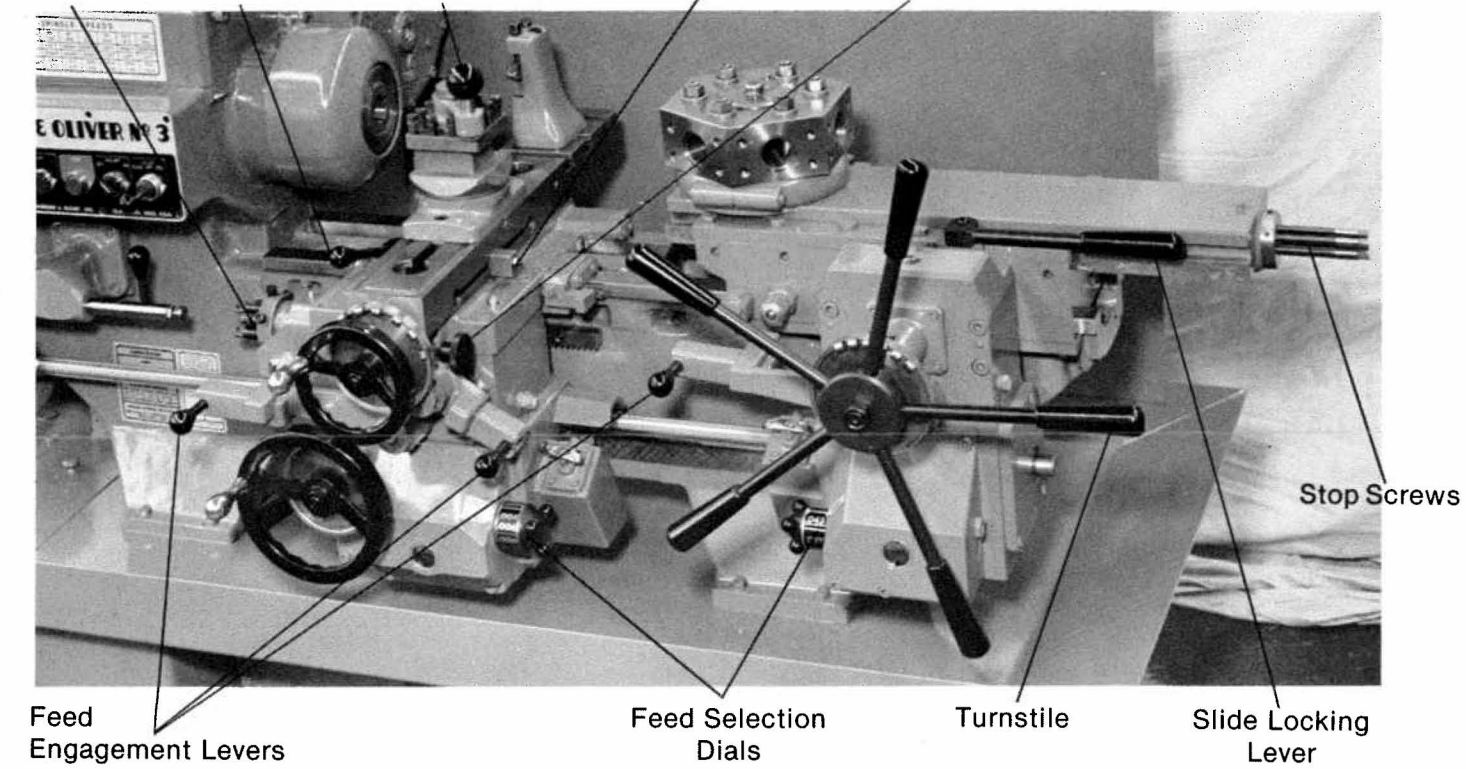
CARRIAGE AND CROSS SLIDE OPERATION

The carriage and the cross slide can be adjusted manually by turning the hand wheels. Power feeds are engaged by lifting the new "easy action" levers and are disengaged by the same levers or by adjustable stop screws or dogs. Positive tooth clutches in each apron assure easy engagement and long life.

Feed selections in each apron are made by means of a single dial and are easily read on large rotating drums.

The carriage locking lever can be used to lock the carriage into position for facing, grooving or cut-off. The cross slide lock can be used to lock the cross slide in position.

The six position stop screw roll may be set to disengage the feed on longitudinal cuts.



SLIDE AND HEXAGON TURRET OPERATION

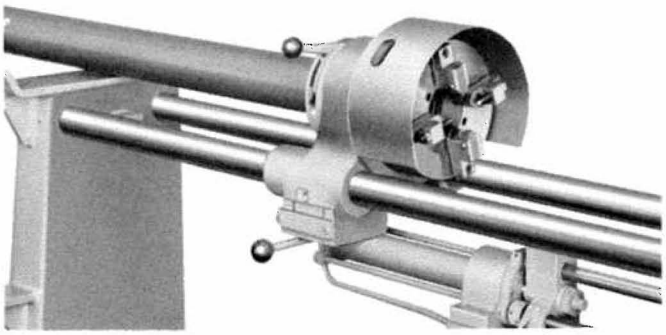
The turnstile handles advance, retract and index the hexagon turret.

Power feed is engaged by lifting the new "easy action" lever and may be disengaged by the same lever or by a stop screw.

Stop screws are set by adjusting the screw in the bottom position on the roll which corresponds to the working face of the hexagon turret.

AIR OPERATED COLLET CHUCK AND BAR FEED

The air operated collet chuck and bar feed are shown below. Controls for the unit are located on the machine control panel on the front of the headstock. See Figure 3.



The operating lever controls the action of the collet separate, or controls the collet and bar feed together.

Bars to be fed into the machine are held in a revolving scroll chuck.

To insert a new bar position the chuck to the right. Swing the support tube forward and insert the bar. Pass the bar through the chuck and just through the collet. Close the collet. Move the chuck all the way to the left. Close the chuck jaws until they grip the bar securely.

As the bar is used, the chuck will advance to the right. When the chuck has reached the end of its travel, loosen jaws and move to left with collet closed. Close chuck jaws as above.

COLLET CHUCK

To change collet pads, remove the pad screws from the master collet. These can be reached through holes in the collet hood. (Figure 4) To avoid runout of stock, clean the master collet and pads carefully before putting in the new pads.

The grip of the collet is adjusted at the rear of the spindle by use of the spanner wrench for which holes are provided in the end of the abutment sleeve. (Figure 4) The finger holder should at all times abut tightly against the end of the spindle. The collet grip should be adjusted so that the finger rollers snap into the groove in the wedge when the collet is closed.

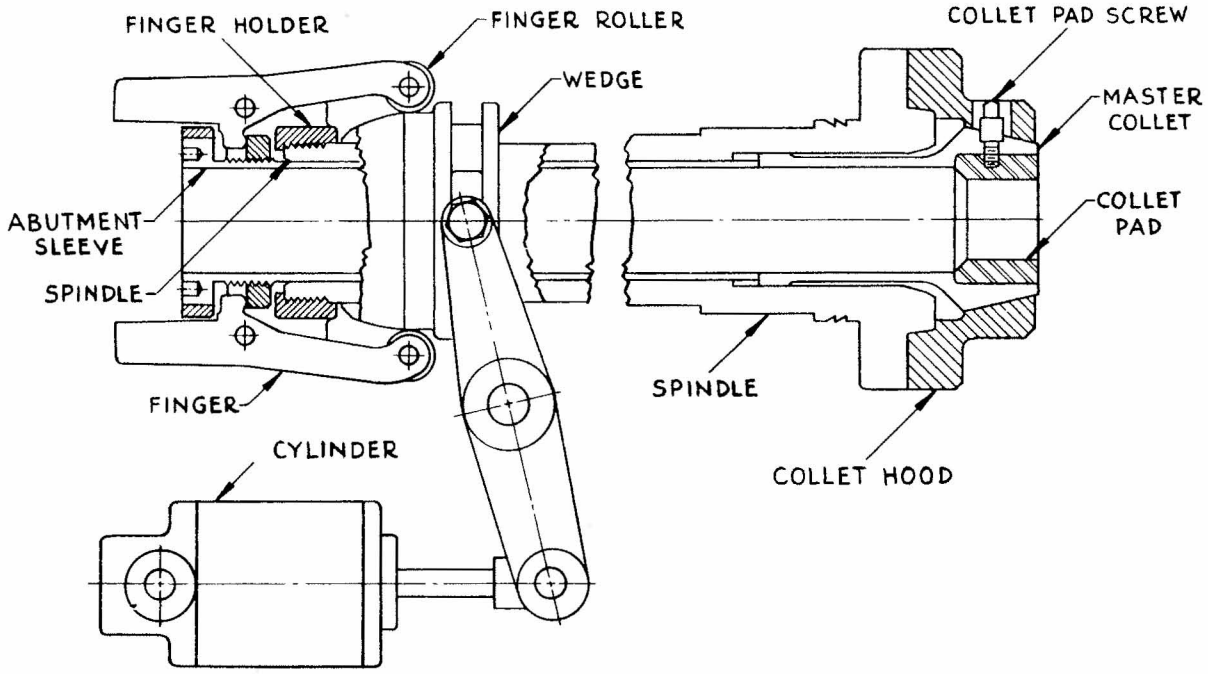


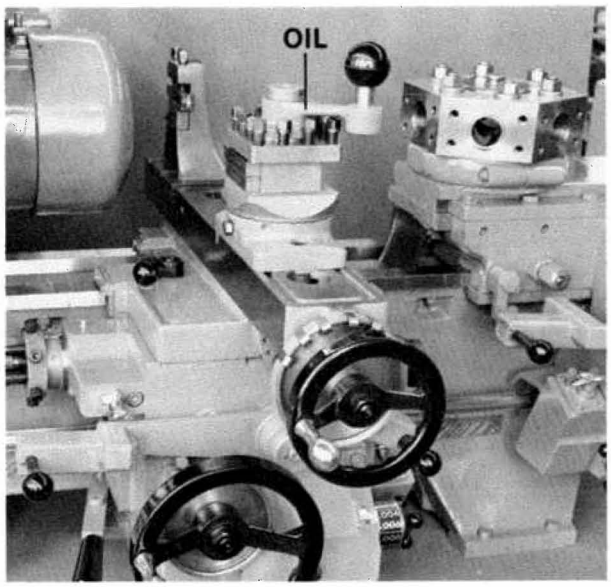
FIG. 4

SQUARE TURRET

The Bardons & Oliver Square Turret features rugged construction and accuracy, assuring repetitive indexing within a few ten thousandths of an inch. A protective skirt around the bottom of the turret effectively keeps chips from the bearing surfaces. Daily maintenance of the square turret consists of oiling at the point indicated.

Rotate the **Turret Index Lever** counter clockwise to index the square turret.

Four cutters can be held in the square turret and each cutter indexed to the cutting position in sequence, according to the job requirements.

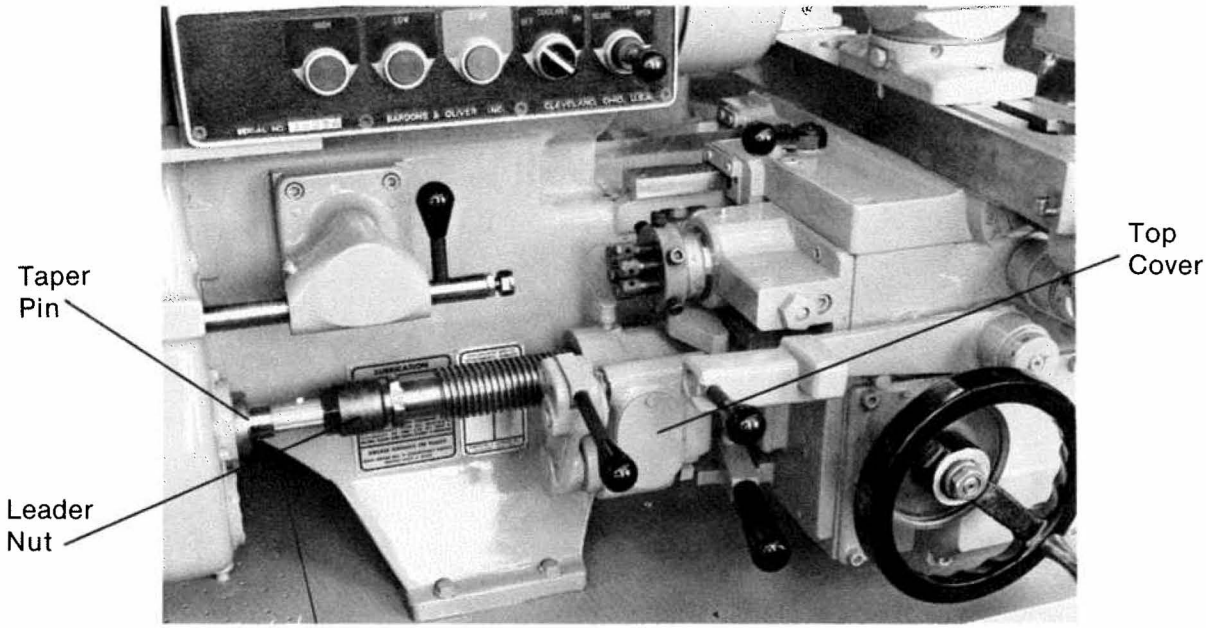


COOLANT SYSTEM

An impeller type pump with integral motor drive is mounted directly over the coolant sump, and is controlled by an independent push button switch mounted on the control panel at the front of the headstock.

The coolant sump, located at the head end of the machine, is divided into two compartments by a baffle. Metal particles settle in the first compartment, and thus the pump located in the second compartment is protected. The sump should be cleaned frequently.

CARRIAGE THREAD CHASING ATTACHMENT

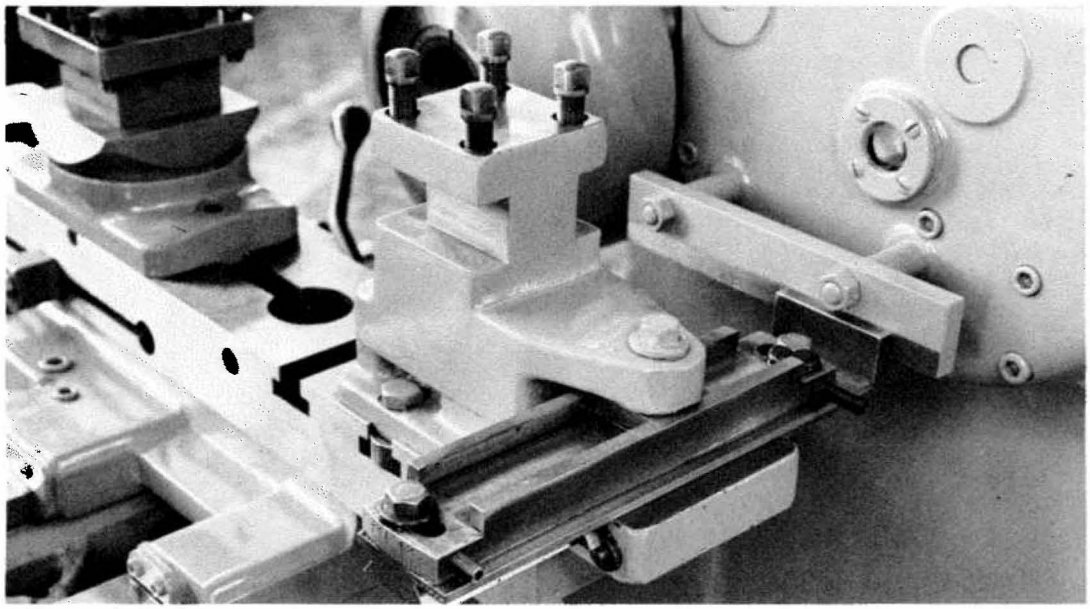


The carriage thread chasing attachment, bolted to the carriage apron and driven by the feed shaft, is simply designed and easy to operate. Lifting the engagement lever meshes the follower with the leader. The quick acting automatic knockout controlled by the carriage stop screws facilitates threading close to a shoulder or blind hole.

When changing leaders disconnect the feed shaft driving coupling by removing taper pin, see above. Slide the shaft to the right to allow for removal of leader. When tightening leader nut use one wrench on the leader and one on the nut to avoid shearing the pin in the coupling.

To change the follower, remove the top cover on the chasing attachment bracket. After the new follower is inserted, it may be adjusted to the leader by the screw located at the bottom of the chasing attachment.

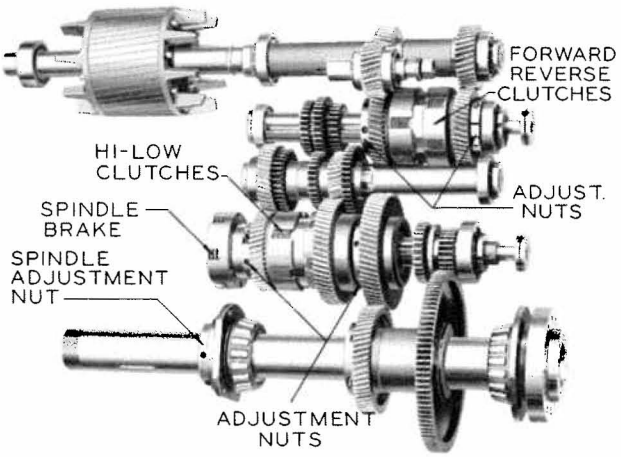
CROSS SLIDE TAPER ATTACHMENT



The cross slide taper attachment is mounted on the rear of the cross slide in place of the rear tool post. The lower member of the taper guide carries a yoke which engages a guide plate held by two studs on the head lever bracket.

SECTION 3
HEADSTOCK ADJUSTMENTS

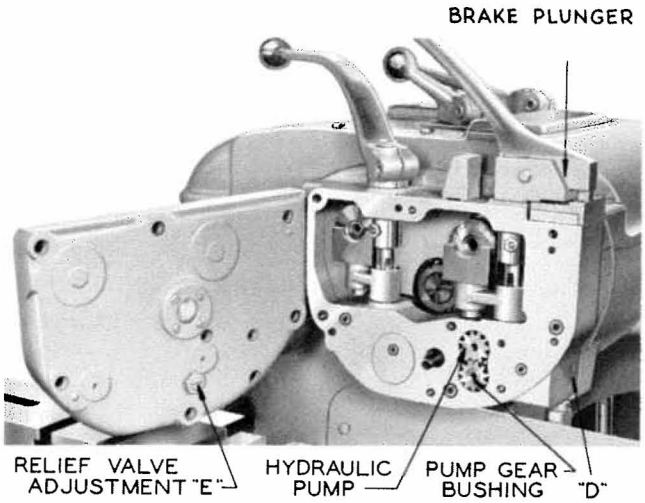
1. There are two double multiple disc clutches, one to obtain forward and reverse spindle rotation and one to provide quick high-low speed changes (Below).



The clutches have split adjusting nuts at each end which may be easily reached by removing the small covers on the top of the headstock. These clutches should not require adjustment more often than once or twice a year. When adjusting the clutches, keep trying the clutch levers in each direction while turning each nut a little at a time. After the right "feel" has been obtained in each clutch, be sure to tighten the locking screws in the split nuts before replacing the covers.

2. The spindle is mounted in two single row precision tapered roller bearings. A split adjustment nut, located on the rear end of the spindle outside the headstock, may be easily reached with a pin wrench after removing the small plate on the top of the head end bracket. In adjusting, all end play should be eliminated but no preloading should be introduced.

3. The headstock hydraulic system provides oil to operate the spindle brake and to spray lubricate



all moving parts in the headstock. The hydraulic pump is located in the clutch lever bracket directly in back of the spindle and supplies 50 to 60 lbs pressure to operate the spindle brake.

If the breaking action is slow, insert a pressure gage in place of the pipe plug fitting "D" on the back of the clutch lever bracket. The brake will not operate properly at a pressure below 50 lbs. (See Above)

The pressure may be regulated by adjusting the relief valve at point "E". If oil pressure is still too low, check for the following conditions.

1. Not enough oil in the headstock oil reservoir.
2. Clogged oil filter, located on the inside of the headstock oil reservoir cover.
3. Worn pump gear bushing which allows air to enter the hydraulic system.

If the pressure is correct and the breaking action is still slow, the brake should be disassembled, cleaned, and wire brushed. However, it should not be necessary to do this until the machine has been in use several years.

CARRIAGE AND SADDLE APRON ADJUSTMENTS

Each feed lever contains a safety spring which allows the tooth clutches to slip only under conditions which would be injurious to the machine.

Since the feed engagement clutches are of the positive multi-tooth type, it is not necessary to adjust them to prevent slippage. The clutch teeth should be fully meshed when the feed lever plunger is engaged.

TURRET AND SLIDE ADJUSTMENTS

The hexagon turret revolves on and is located centrally by a large diameter tapered roller bearing. A double bevel circumference clamp ring tightens the turret against the slide and preloads the bearing for accurate centering and vertical alignment.

The turret slide travels on hardened and ground replaceable alloy steel ways in the saddle. It is guided between double, hardened, ground and lapped alloy steel gibs on each side, and held by sturdy hardened and ground steel top caps.

To move the saddle on the bedways, loosen the eight screws beneath the lower saddle caps. Do not loosen the adjustment screws on the back side of the saddle. A latch is provided for attaching to the cross slide carriage for easy movement of the saddle along the bedways.

A neoprene apron is attached to the front end of the slide just below the turret to keep chips and dirt out of the indexing mechanism. However, the slide should be occasionally removed so that the saddle may be thoroughly cleaned. To remove the slide, place a board across the bedways beneath the front of the slide, remove the saddle caps and raise the rear end of the slide until the front end rests on the board.

The front top cap consists of three separate pieces, the middle portion serving as a slide clamp. The binder handle has a serrated hole for easy positioning.

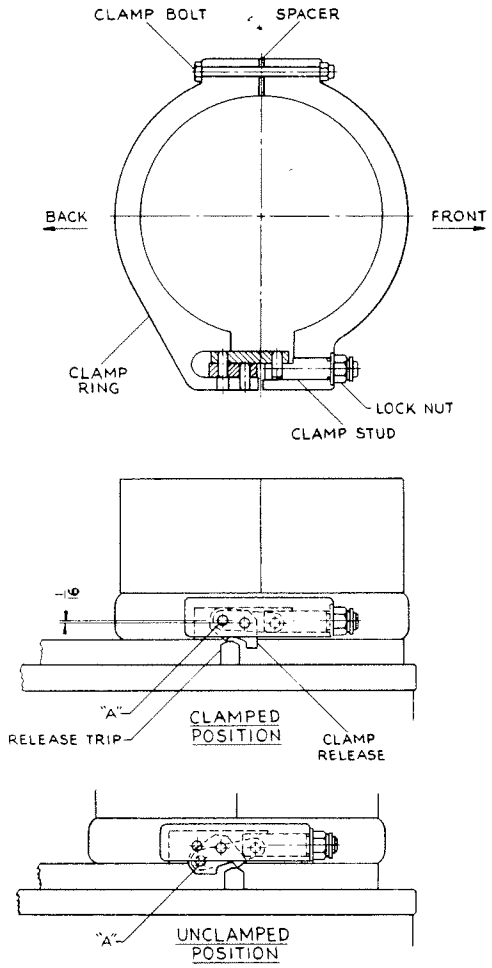


FIG. 5

1. The clamping action of the turret clamp ring is controlled by a toggle arrangement (Figure 5). The clamp bolt should fit freely in both halves of the clamp ring and its nut should be adjusted so that when the turret is in the clamped position, a .005" to .010" feeler can be inserted between a section of the clamp ring and the spacer.

The height of the trip release should be such that pin "A" lines up with the hole in the back section of the clamp ring (Figure 5) when the turret is in the clamped position. This locates the clamp release 1/16" over center and keeps the clamp ring from releasing. After some period of time the clamp release may become worn. To align pin "A" with the clamp ring hole, raise the threaded, four sided trip release the required amount.

The lock nut on the clamp stud should be tightened until sufficient clamping action results. As the turret slide is moved back and forth by rotating the turnstile and the clamp release rides over the release trip, a slight drag, but no binding should be felt.

To check the clamping action, index the turret half way and then bring the slide forward. In this position the clamp ring is closed, but the lock bolt is not engaged in the turret. Raise two of the turret binder bolts about two inches above the top of the turret. Place a bar between them and try to turn the turret.

2. If, after adjusting the clamp ring, the turret is still inaccurate, proceed as follows: move the slide to the rear, thus opening the clamp ring and indexing the turret. Bring the slide forward about half an inch. Insert a 2 inch bar in one of the turret holes. While applying pressure on the bar back and forth with one hand, place one finger of the other hand so it rests against both the turret and the back of the clamp ring. If movement is felt at this point between the turret and clamp ring, the outer race of the tapered bearing is set too low in the slide. Then place finger against the turret and front of the clamp ring and apply pressure as above. If movement is felt at the front of the turret the lock bolt and lock bolt bushings are worn.

Bring the slide forward until the leading edge protrudes about one inch from the saddle. Locate an indicator on the top surface of the turret. Tap the front of the clamp ring. If the indicator reading drops, either the outer race of the tapered bearing is set too high in the slide, or the flat bearing between turret and slide has become excessively worn.

The conditions outlined here should not occur for several years, even under hard usage. Correcting these troubles will entail one or more of the following operations:—relocating the tapered bearing outer race, rescraping the bearing surfaces of the turret and slide, replacing the lock bolt sleeve and bushings, and rescraping the clamp ring. Because of the skill and experience necessary to properly perform these operations, we suggest that you contact the factory Service Department before proceeding.

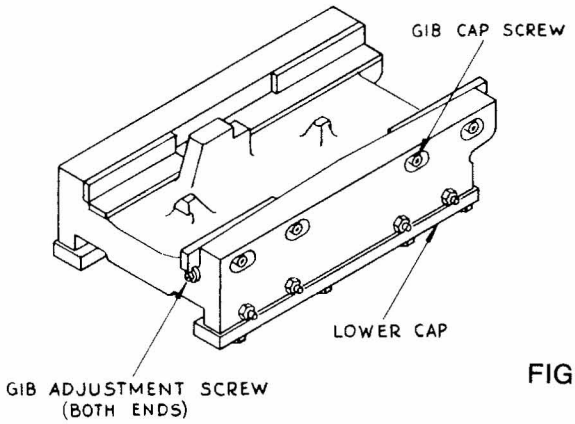


FIG. 6

(VIEW OF SADDLE LOOKING FROM REAR OF THE MACHINE)

3. After the machine has been in operation a few months it may be necessary to adjust the slide gibs. (Figure 6) The front gibs are not adjustable. There are two adjustable rear gibs. Loosen the cap screws for each gib on the back face of the saddle. The gib adjustment screws are set into each end of the saddle.

CROSS SLIDE AND CARRIAGE

Pairs of adjustable tapered gibs are provided at the outside of the front bedway, the bottom of the rear bedway and the lower or third bedway. One long tapered gib provides adjustment for the cross slide.

The cross feed screw is mounted in two opposed radial thrust ball bearings which are slightly preloaded and do not require adjustment. An adjustable double bronze nut, located in the front face of the carriage, is provided so that backlash can be eliminated from the feed screw.

A binder handle is provided for clamping the carriage to the bedways. The handle has a serrated hole for easy positioning.

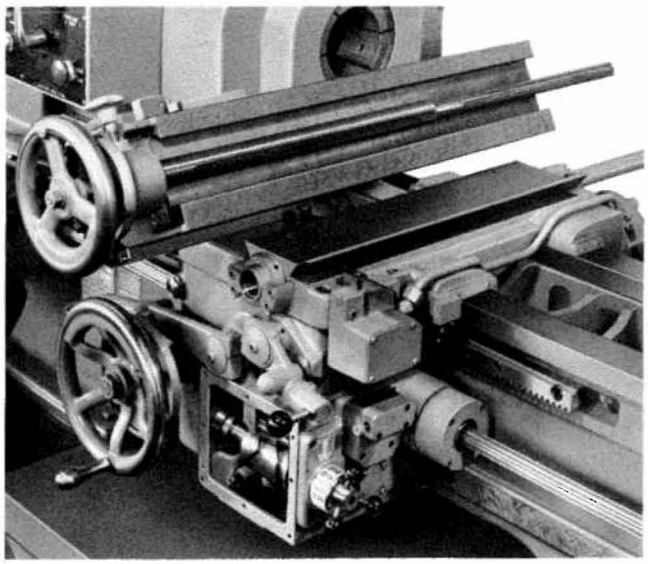


FIG. 7

CROSS SLIDE AND CARRIAGE ADJUSTMENTS

1. After the machine has been run for a few weeks check the adjustment of the gibs. Check these adjustments about twice a year thereafter. To adjust, back off the gibs between the apron and lower bedway. Tighten the gibs between the carriage and the front bedway until the carriage just begins to bind when the handwheel is turned. Then back the gibs off slightly and make sure there is equal tension on each gib screw. After releasing the set screws on the back face of the carriage, adjust the rear gibs in the same manner as indicated for the front gibs. Adjust the gibs between the apron and lower front way last. Tighten the cross slide gib until the slide just begins to bind. Then, back the gib off slightly. Make sure all gibs are held securely in the adjusted positions.

2. To eliminate backlash between the cross slide screw and nut, loosen the locking screws holding the bronze adjustment nut. (Figure 7) Turn the adjustment nut until the backlash is eliminated, and then retighten the locking screws.

SQUARE TURRET

The Bardons & Oliver Square Turret features rugged construction and accuracy, assuring repetitive indexing within a few ten thousandths of an inch. A protective skirt around the bottom of the turret effectively keeps chips from the bearing surfaces. Daily maintenance of the square turret consists of oiling at the point indicated on the figure.

When the indexing lever (1) is in the extreme clockwise position as shown in the figure, the lockbolt (2) is seated in the turret bushing (3) and the turret is clamped to the base. Tapered pins position the lockbolt cam (4) and stud collar (5) on the center stud (6) in the proper timed relationship. The indexing sequence is as follows:—The indexing lever is moved counter-clockwise. The turret is unclamped. The hardened pin (7) in the indexing lever engages the stud collar, causing the center stud to move with the indexing lever. The lockbolt cam engages the tumbler (8), depressing the lockbolt lever (9), which in turn disengages the lockbolt. The second hardened pin (10) in the indexing lever then engages the indexing plate (11) causing the turret to turn. The lockbolt rides on a recess in the turret until the next position is reached. Moving the indexing lever clockwise returns the lockbolt cam against the lockbolt sleeve (12). The indexing lever then disengages the stud collar and moves on the double acme threads causing the turret to be clamped to the base.

To properly maintain the square turret it should be completely disassembled and cleaned at least every six months. To completely disassemble, remove the bottom plate (13), stud collar (5), indexing lever (1), turret, center stud (6), tumbler pivot screw (14), tumbler (8), lockbolt lever (9), tumbler plunger (15), screw plug (16), lockbolt spring, and lockbolt (3) in that order. Reassemble in the reverse order, taking care that each part is placed in its original position, particularly the tumbler and lockbolt lever. Double acme threads locate the indexing lever on the center stud. It is possible to assemble this unit with the lever 180 degrees from the proper position. If the tapered pin which locates the stud collar on the center stud fits flush with both sides of the collar, the lever is properly positioned. If the pin goes in only half way, remove the indexing lever and reengage it opposite to the prior point of engagement. In adjusting the tumbler plunger the set screw should be tightened just enough to keep the tumbler in the proper indexing position. Tightening the set screw too much may cause the plunger to bind and shear.

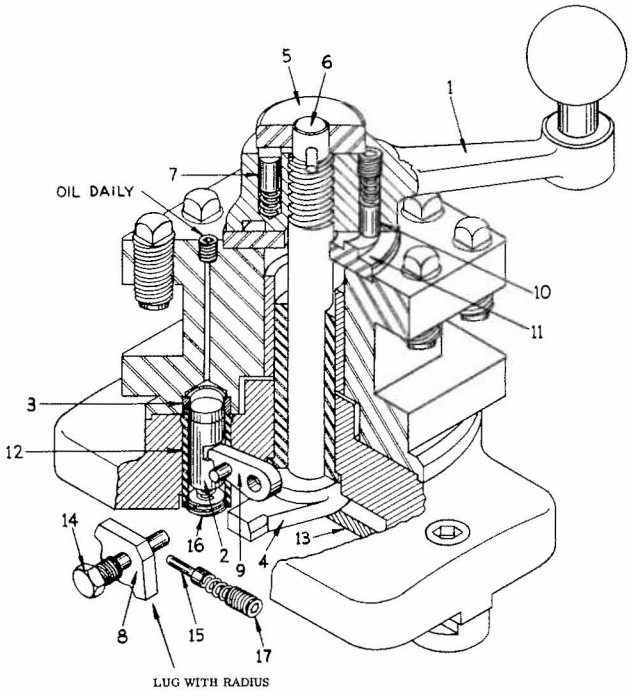


FIG. 8

DIAGNOSIS OF IMPROPER SQUARE TURRET OPERATION

The following chart lists difficulties which may be experienced with the square turret operation, and indicates the cause and remedy for each trouble. See Figure 8.

TROUBLE	CAUSE	REMEDY
Turret remains stationary although indexing handle is turned one half revolution.	Indexing lever does not engage the indexing plate.	Remove the hardened pin in the indexing lever, clean, and on reassembly be sure the pin works freely.
Indexing lever moves only one quarter revolution and turret will not index.	Lockbolt does not disengage.	
	a) Set screw (17) holding tumbler plunger loosens.	Tighten set screw slowly until turret properly indexes.
	b) Tumbler plunger sticks.	Remove set screw, spring and plunger, clean, and be sure on reassembly that plunger works freely.
	c) Tumbler plunger broken.	Replace plunger. Plunger must work freely.
	d) Tumbler broken or excessively worn.	Replace tumbler.
	e) Lockbolt lever broken.	Replace lever.
Turret "Skips" or fails to stop at the next position on indexing.	Lockbolt spring worn.	Replace with about a quarter inch longer spring.
Repetitive indexing is inaccurate.	Lockbolt spring worn and lockbolt does not fully engage in turret.	Replace with about a one quarter inch longer spring.
	Lockbolt and lockbolt bushing excessively worn.	Recommend the square turret be sent back to the factory for rebuilding.
Turret drags or binds on indexing.	Tools in the turret held too tightly.	Tighten tools only as much as possible with wrench provided. Do not use pipe on wrench handle.
	Bottom plate does not clear the cross slide.	Remove bottom plate, clean, and file nicks which may cause loss of clearance between the bottom plate and the base bottom.

COLLET CHUCK

To change the collet pads, remove the pad screws from the master collet. These can be reached through holes in the collet hood. To avoid stock runout, clean the master collet and pads carefully before assembly.

Dirt and fine chips working into the collet and spindle recess may cause the collet to stick and not release. To avoid this condition, remove the collet hood and clean the collet and spindle recess frequently.

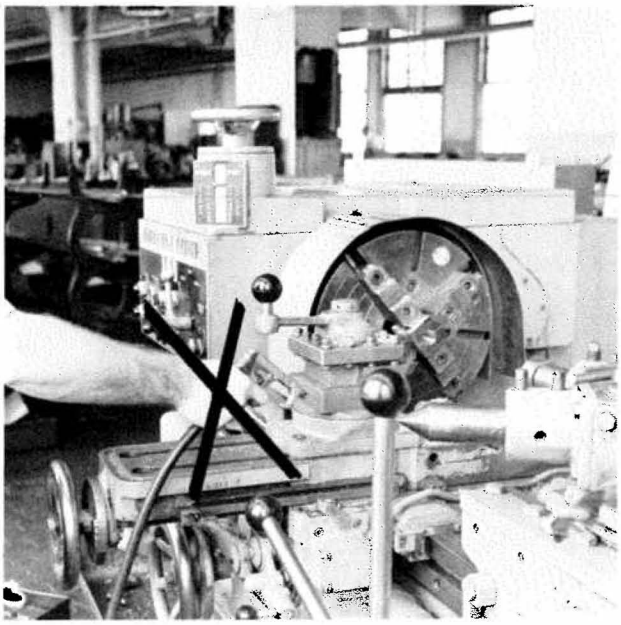
MASTER COLLET & PADS

GENERAL SAFETY

SECTION 4

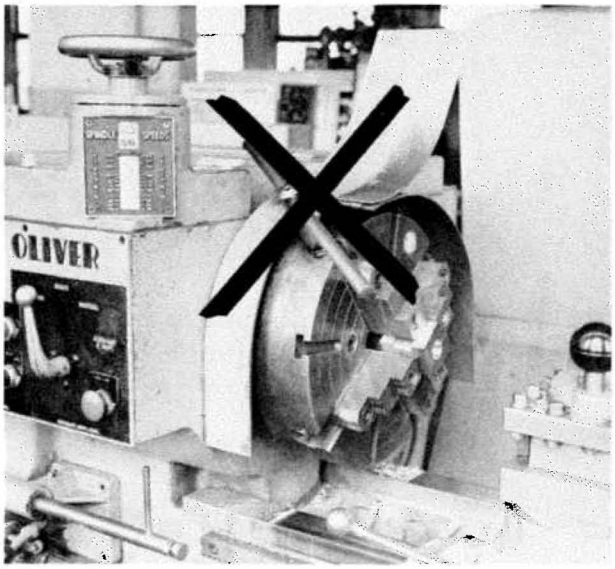
- Before you turn on machine observe all safety rules in Section 2—Operating Instructions.
- Do not leave your machine running unattended.
- Do not attempt to remove or bypass any safety device on your machine.
- Use the proper size wrenches for tool change or adjustments. Discard worn or broken tools and wrenches. A wrench that slips may cause injury.
- Do not overload machine and stall motor.
- Always stop the spindle to check finish or dimensions.
- Do not use an air hose to blow away chips. Air will force dirt into ways and bearing surfaces. Air may blow chips into your eyes.
- After taking a cut be careful not to touch hot chips or parts. Do not remove chips while the spindle is running.

Do not use an air hose to blow away chips.

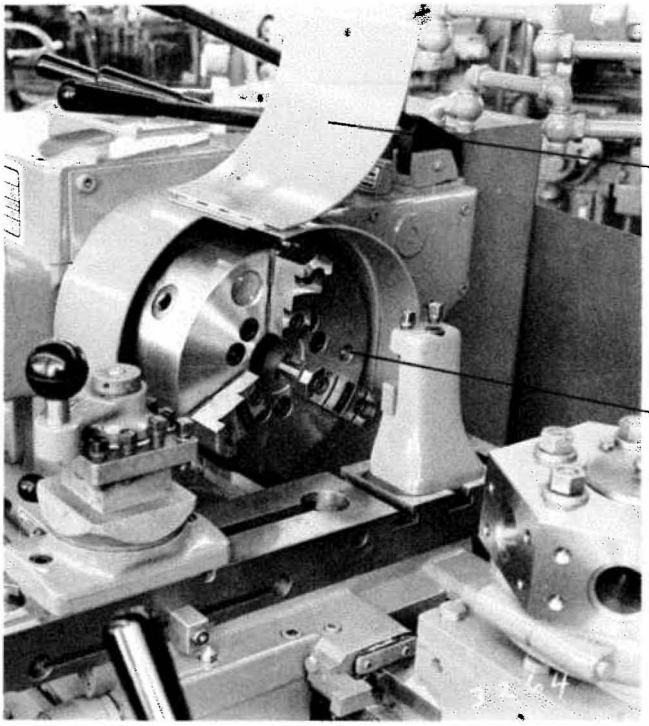


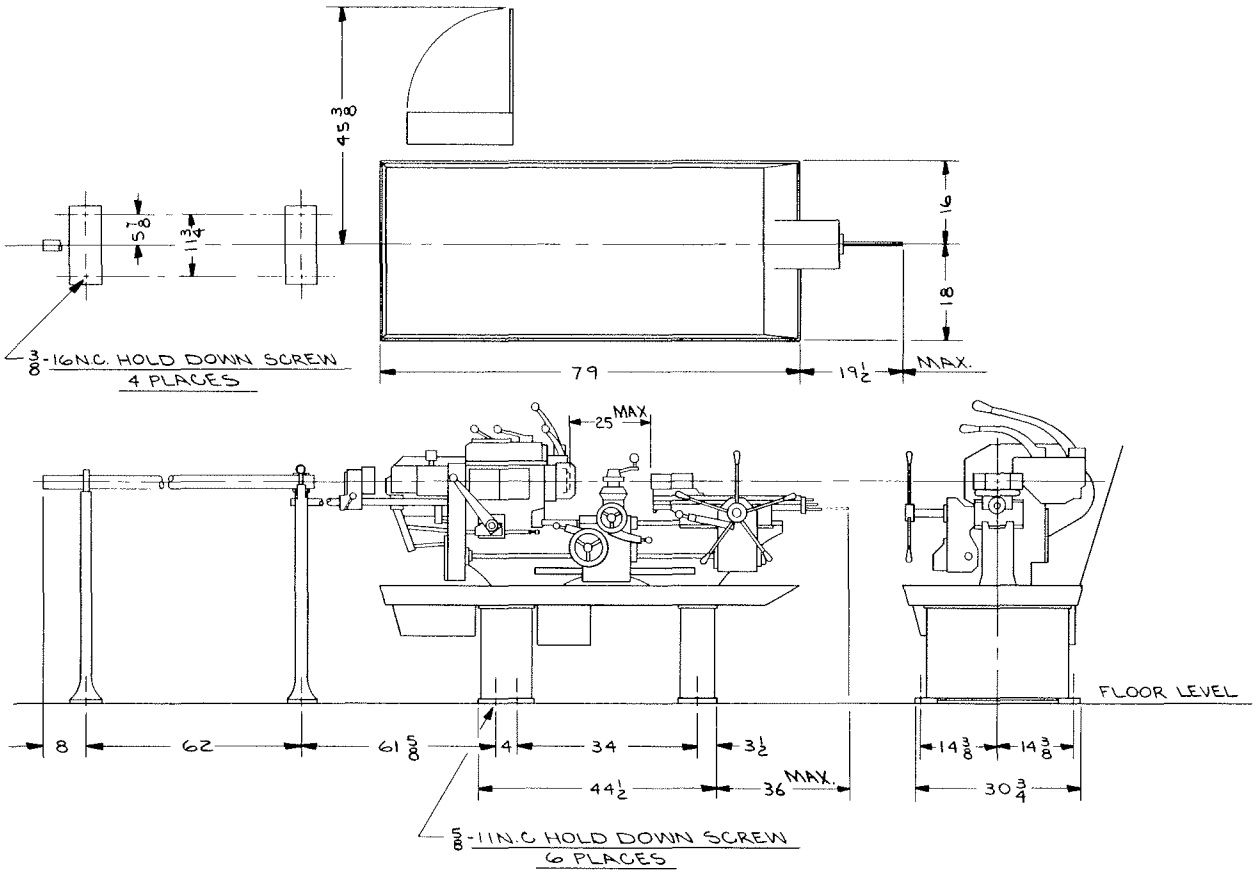
CHUCK SAFETY

- When loading or unloading parts, remove chuck wrench immediately. Do not leave the wrench in the chuck.
- Wait until the spindle comes to a complete stop before loading or unloading.
- Do not run the spindle with the chuck empty—centrifugal force may cause the jaws to come loose.
- Clean and inspect your chuck regularly—do not overload it. Know its limitations.
- Use the correct jaws for the job.
- Always use the chuck guard to direct chips and coolant down.
- Lubricate chuck as recommended.



Do not leave wrench in chuck for any reason.





Specifications

BARDONS & OLIVER No. 3
Ram Type UNIVERSAL TURRET LATHE

	2″
Swing over bedways	15½″
Swing over carriage guides	13¾″
Swing over cross slide	7⅝″
Bar capacity round	2″
Bar capacity hexagon	1¾″
Bar capacity square	1 7/16″
Hole in collet chuck plunger	2 1/16″
Chuck size medium duty steel body	8″
Spindle nose	8″-A1
Spindle hole diameter	2⅜″
Spindle speeds, number	24
Spindle speed range	59-1505 70-1820
Maximum distance end of spindle to face of turret	25″
Bed width across ways	7″
Width of bedways	1½″
Hexagon turret effective travel at one setting	10″
Hexagon turret size across flats	8¼″
Diameter of tool holes	1½″
Center of tool holes to top of slide	2⅞″
Cross slide cross travel	9″
Carriage longitudinal travel	18½″

Hexagon turret power feeds
.005, .008, .012, .018, .029, 047[1]

Cross slide power feeds
.003, .005, .008, .012, .020, .032[1]

Carriage power feeds
.005, .008, .013, .019, .031, .050[1]

OPTIONAL CARRIAGE THREAD CHASING ATTACHMENT
Pitches available—4 to 28 T.P.I.[2]
Effective length—5″

OPTIONAL CROSS SLIDE TAPER ATTACHMENT
Maximum taper—3″ per foot
Effective length—6″

Motor horsepower—10/5

Approximate shipping weight with motor—no tooling—3400 lbs.
Additional shipping weight collet chuck and bar feed—1000 lbs.

[1]Feeds may be halved with fine feed gears
[2]8 to 56 T.P.I. with fine feed gears