PARTS LIST

and

MAINTENANCE MANUAL

For

Wickman 2.5/8" 6-Spindle

Wickman 3.1/4" 6-Spindle

Bar Automatic Lathes

Your attention please !

The references at the foot of most pages show that this manual was prepared in 1988.

Unfortunately it was never completed, probably due to the compiler being made redundant as a result of the drastic reductions in manpower which the company was forced to make during that difficult time.

The 'masters' were found in the company archives in February 2005. The manual was found to be complete and ready for printing apart from Section 5: Parts Lists and General Arrangements. Only a few of the lists of parts had been done and most of the artwork was missing.

We have now completed the job although we must apologise for the fact that the end result is not as professional as we would have liked. It has been necessary to mix 'old style' pages with new ones but nevertheless this is the most comprehensive manual we have ever issued for the 2.5/8" and 3.1/4" machines and we hope that you will find it useful.

Of course, should you require any assistance in identifying part numbers etc the expertise of our engineers is always at your disposal.

Wickman Coventry Limited

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and

MAINTENANCE MANUAL

For

Wickman 2.5/8" 6-Spindle

Wickman 3.1/4" 6-Spindle

Bar Automatic Lathes

WICKMAN COVENTRY LIMITED
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PARTS LIST

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MAINTENANCE MANUAL

FOR

WICKMAN 2.5/8"-6 SPINDLE

AND

WICKMAN 3.1/4"-6 SPINDLE

BAR AUTOMATIC LATHES

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Wickman Coventry Limited operate a policy of continual improvement and we therefore reserve the right to change the specifications and illustrations with notice.

TABLE OF CONTENTS

PREFACE

This Manual provides the basic information and instructions that are necessary for the maintenance/servicing of the Wickman 2.5/8"-6 and 3.1/4"-6 Spindle Bar Automatic Lathes with Relay Logic Control Equipment.

The contents will familiarize the reader with the machine construction specifications, installation procedure, safety at work and all the relevant aspects of the machine.

The manual should be read thoroughly. It will enable the Engineer to gain the knowledge required for the correct and efficient servicing of the machine.

An Operator's Handbook is also available for the 2.5/8"-6 and the 3.1/4"-6 machines.

HEALTH AND SAFETY

Health and Safety at Work Act, 1974 - U.K. users only.

In accordance with the requirements of the Health and Safety at Work Act 1974, this manual embodies the necessary information to ensure that the machine tool can be maintained properly and with safety. It should be clearly understood that the engineer must be properly trained, have the required skills and be authorised to maintain the machine.

If it should arise that the person authorised to maintain the machine is undergoing training, he must be under the close supervision of another skilled and authorised person.

Adequate information is provided to enable the machine to be serviced and maintained in a satisfactory condition by engineers and electricians who have the necessary skills and authority. We recommend that a 'Permit to Work' system as detailed in the code of practice BS5304; 1988 entitled "Safety of Machinery", should be operated.

It is important that the various statutory regulations which are applicable, eg, 'The Protection of Eyes Regulations' are complied with.

Operating Discipline

(I) A clean, neat and well ordered machine and working area is the first essential of safety at work.

(II) All guards, cover plates, cabinet doors and the tooling area guards must be in place or closed before any production run commences.

(III) Never leave articles lying on any working surface where there is a danger that they may be dislodged by: any moving part of the machine, vibration, etc.

(IV) Never wear rings, watches, neck-ties or loose-sleeved clothing when working on the machine.

(V) Never operate the machine in excess of its rated capacity.

(VI) Know where the EMERGENCY STOP BUTTON is.

(VII) Never reach across a moving or rotating part of the machine

(VIII) Never enter the tooling area or any other working part of the machine when the machine is running on production.

(IX) When tool setting, changing tools or making adjustments, never enter the tooling area until the machine has been shut down.

(X) When carrying out maintenance work, never enter any part of the machine, either mechanical or electrical, until the machine has been shut down and the isolator on the electrical control panel is in its "off" position, disconnecting the power supply.

(XI) When working with lubrication oils and cutting oils of the soluble and straight cutting oil types, cleanliness is essential. Precautions must be taken to avoid all unnecessary contact with oil by ensuring that the machine's protective devices against coolant and oil spray are correctly closed and that protective clothing is worn. Never wear oil soaked clothes or place oily rags or tooling in the pockets of wearing apparel. Always was oil from the body as soon as possible after contamination.

The Safe Operation Of Work Holding Devices

Collet equipment and collet operating mechanisms must always be kept in first class condition, in order to ensure that the bar is securely gripped to withstand all the applied cutting forces. Tooling area guards must always be closed when the machine is in the "run" condition.

MACHINE SIZE / MODEL RANGE

WICKMAN 2.5/8"-6 SPINDLE BAR AUTOMATIC LATHE *
WICKMAN 2.5/8"-6 SPINDLE BAR AUTOMATIC LATHE WITH SPINDLE STOPPING *
WICKMAN 2.5/8"-6 SPINDLE BAR AUTOMATIC LATHE WITH DOUBLE BAR FEED *

WICKMAN 3.1/4"-6 SPINDLE BAR AUTOMATIC LATHE *

WICKMAN 1.3/4"-8 SPINDLE BAR AUTOMATIC LATHE
WICKMAN 1.3/4"-8 SPINDLE BAR AUTOMATIC LATHE WITH SPINDLE STOPPING

WICKMAN 50mm-8 SPINDLE BAR AUTOMATIC LATHE
WICKMAN 50mm-8 SPINDLE BAR AUTOMATIC LATHE WITH SPINDLE STOPPING

WICKMAN 7.1/4"-6 SPINDLE HYDRAULIC CHUCKING AUTOMATIC LATHE
WICKMAN 7.1/4"-6 SPINDLE HYDRAULIC CHUCKING AUTOMATIC LATHE WITH DOUBLE INDEXING

WICKMAN 6"-8 SPINDLE HYDRAULIC CHUCKING AUTOMATIC LATHE
WICKMAN 6"-8 SPINDLE HYDRAULIC CHUCKING AUTOMATIC LATHE WITH DOUBLE INDEXING

This Manual applies only to the Machines marked *, above.

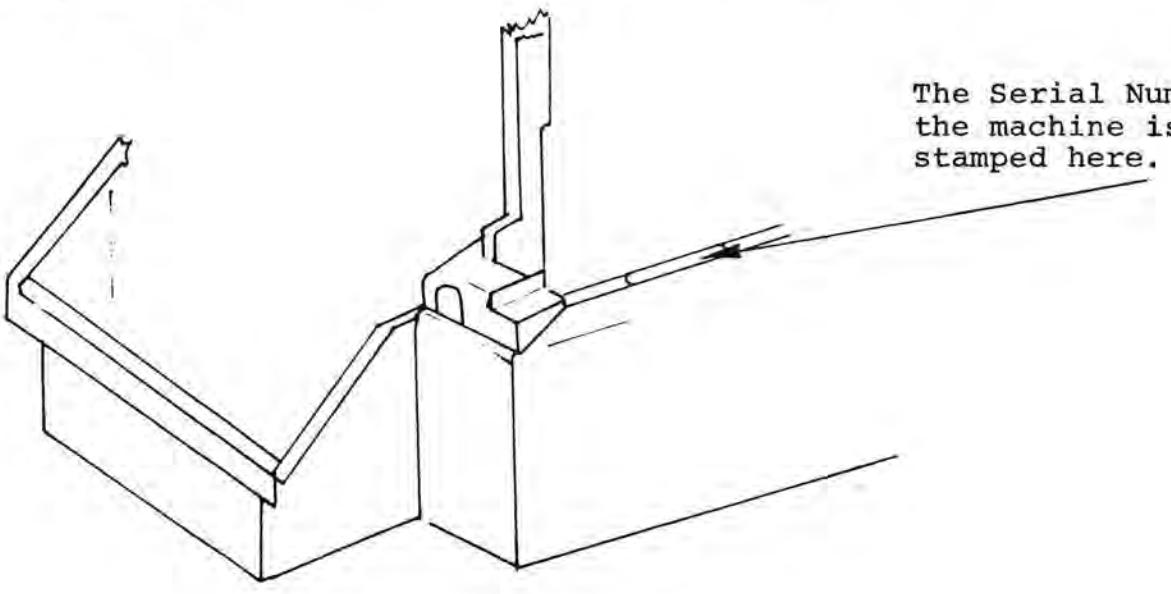
MACHINE SERIAL / INSPECTION NUMBER

In the event that queries arise with regard to the maintenance of the machine, it is important to note the following details which would need to be given to Wickman Bennett in all correspondence, ie:

Machine Inspection/Serial number, Machine size and Model.

The machine Inspection/Serial Number must always be quoted and is stamped on the machined-rim of the Tray of the machine, on the left hand side, close to the Operators position. Additionally the number is also engraved on the machine Manufacturing Plate (WSP500) which is affixed to the Main Drive Housing casting at the rear of the machine.

Reference to this number will facilitate any service that may be required.



DETAILED CONTENTS LIST

SECTION ONE - INSTALLATION

1.1 Lifting the Machine

When planning the siting of a machine consider the space required for chip removal, bar loading and servicing, i.e. centre-shaft removal. Dimensions of suitable lifting bars for use with a crane are shown on the Foundation Drawing Fig.1.1.Slings must not lie against the machine during hoisting. Examine the position of the sling with tension on the rope before the full weight of the machine is lifted.

Where a crane is not available, the machine may be moved by "wedge" truck or rollers and continuous machined surfaces are provided on the underside of the machine tray to facilitate the operation. Rollers must be longer than the machine tray width.

Careful handling of the new machine will ensure accurate alignment.

1.2 Siting and Foundations

The machine should be installed on a level and stable foundation in order to ensure accurate alignment is maintained. A concrete base is recommended. It provides the most suitable foundation because of its stability and because it is less prone to distortion when laid down in adverse soil conditions.

The actual depth of concrete base must be determined to suit the prevailing soil conditions, which must be capable of supporting the machine, its ancillary equipment, its tooling and the concrete base itself.

The soil should be consolidated with crushed rock, pebbles and stones.

With the machine in position on the factory floor, level using the jacking screws provided in the machine tray. It is recommended that steel plates be placed between the floor and the screws. Longitudinal and lateral alignment levels can be checked with a precision level on the facings provided at both ends of the machine tray and on top of the spindle drum housing, see Foundation Drawing Fig.1.1. Wedges should be placed at the positions shown.

Foundation bolt holes are also provided for use where required, bolts to be embedded in the floor approximately 5in (125mm).

Where not bolted-down, machines can be grouted or cemented by any shop approved method.

Fig.1.1 Foundation Drawing

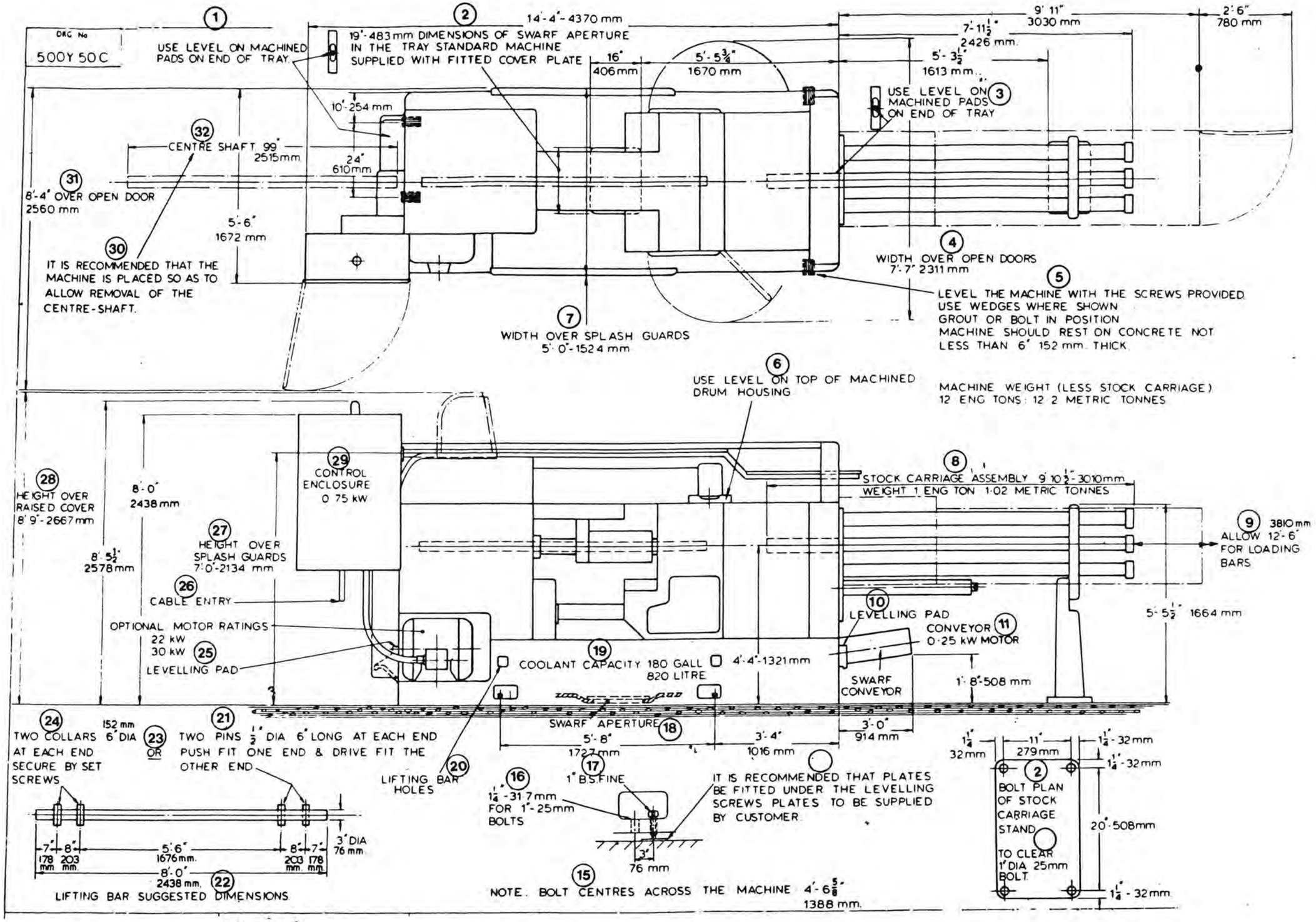


Fig. 1 .1

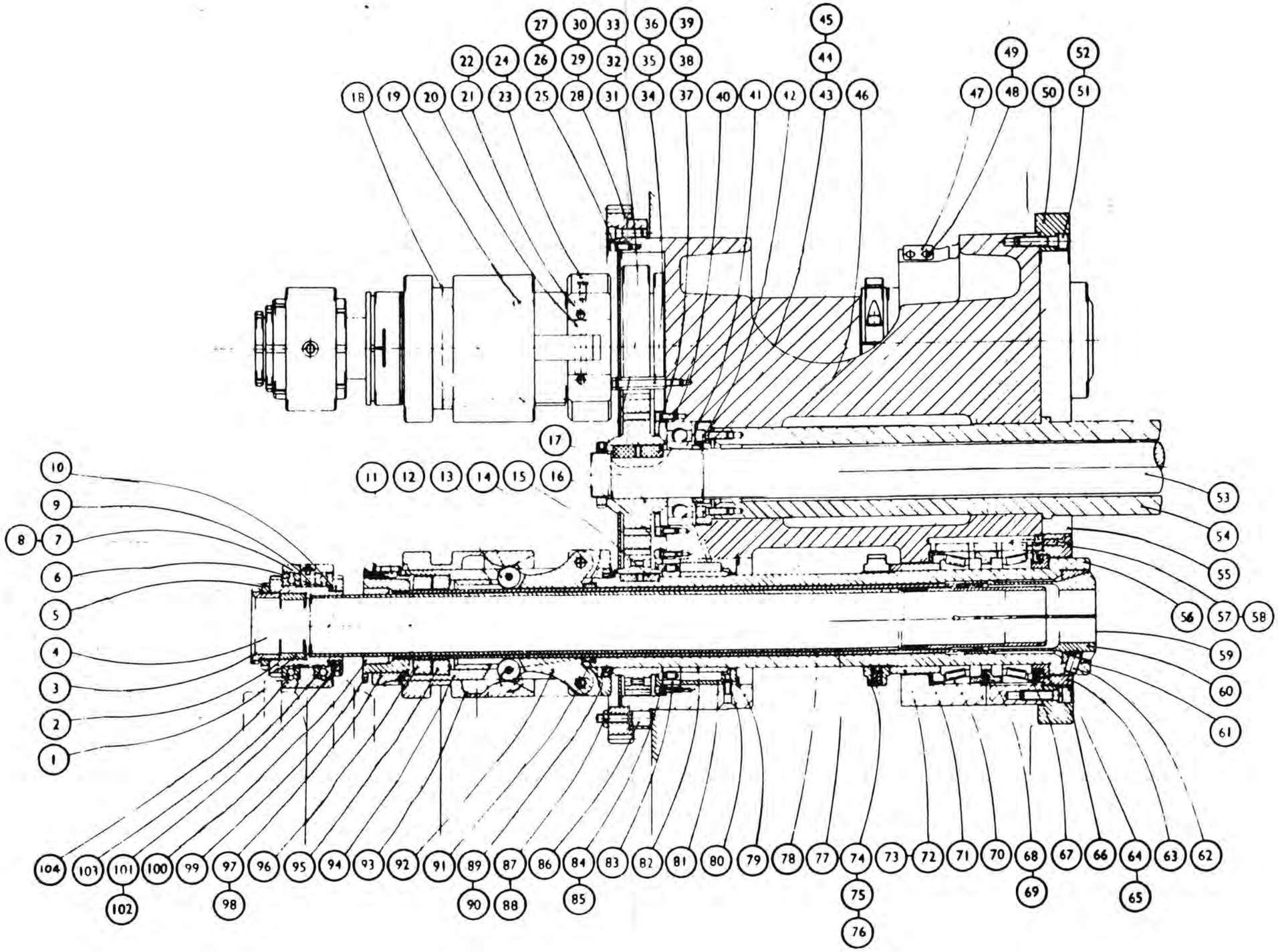


PLATE No. 1

(Drawing 501 Z 1 A)

2.1 General Description

The lubrication system has two separate parts with the two plunger pumps contained in the same unit and chain driven from the constant speed shaft. Access to the unit is through a cover on the lower face of the motor end of the main drive housing.

One side of the pump raises oil from the main drive housing sump and passes it through the lower Purolator filter to distributors which supply all points in the main drive housing. The circuit contains a pressure relief valve set at 10-15lbs/square inch (0.703-1.055kg/square cm), the excess oil being fed to the upper camshaft oil bath. The bath supplies a number of drip points, and should be kept clean of dirt and grease. A strainer box fitted to the pump intake must not be allowed to become choked. Examine twice a year and clean the sump if necessary. Check the oil level in the sump through a sight glass situated in the front of the main drive housing and fill at regular intervals.

The other side of the pump unit draws oil from the tank in the beam through the upper Purolator filter and passes it to sight feed headers for the spindles and to distributors for drum housing and cross slide feeds. The circuit contains a pressure relief valve set at 10-15 lbs/square inch (0.703-1.055 kg/square cm.) and contained in a block. When a "Flush" button in the block is pressed, the relief valve is blocked and a surge of oil is passed to the spindles and drum housing feeds. The "Flush" button should be pressed daily on machine start up.

Oil in the drum housing should be maintained to the level indicated on the rear inside face of the drum housing. Keep clean of grease and soluble coolant contamination.

A priming plug is provided on the Purolator housing for filling or for releasing air locks. Purolator handles should be turned clockwise two or three turns each day to clear the element of foreign matter. The units should be removed twice a year and the element cleaned with paraffin and a soft brush. Use a solvent on gummy deposits.

A Summary of Lubricants, fig. 2.1 specifies the I.S.O. standard for all the lubricants used on the machines.

Fill all grease nipples with grease, etc., as indicated on the charts Figs. 2.2 & 2.3. Use ball bearing grease sparingly in the spindle nose labyrinth seal nipples.

Concerning Lubrication

(a) Check all oil levels in tanks and sumps. They must not fall below the levels indicated.
(b) Frequent checks of the spindle sight-feeds are necessary; also check that the main drive oil is circulating.
(c) Turn Purolator filters daily: apply oil gun to all nipples and oil parts not served by the automatic system.

2.2 Summary of Lubricants

Wickman Oil Grade	1	2	3	4	5
Application	Light Spindle Oil	Air Line Lubrication for Cold Climates	Air Line Lubrication for Warm Climates	Centralised Lube. Air Line Lub'e Hyd. syst. Gen.Lub'e for Cold Climates	General Lubrication Centralised System for Warm Climates
B.P	Energol HL 40	Energol HL 50	Energol HL or HLP 65	Energol HLP 80	Energol HLP 100
CASTROL	Hyspin AWS 10	Hyspin AWS 22	Hyspin AWS 32	Hyspin AWS 46	Hyspin AWS 68
CENTURY	P79A	P313	PWLA	PWLB	PWLC
DUCKHAMS	Zircon 1	Zircon 3	Zircon 4	Zircon 5	Zircon 6
ESSO	Nuto H36	Nuto H40	Nuto H44	Nuto H48	Nuto H54
GULF	Harmony 34AW	Harmony 40AN	Harmony 43AW	Harmony 48AW	Harmony 54AW
MOBIL	Velocite oil No 6	Velocite oil No 10	DTE oil light or DTE 24	DTE oil med. or DTE 25	DTE oil heavy med. or DTE 26
PETROFINA	Cirkan 15	Hydran 21	Hydran 31	Hydran 31	Hydran 37
SHELL ISO VG NO	10	22	37	46	68
TEXACO	Spintex 60	Spintex 100	Rando HD.A	Rando HD.B	Rando HD.C
VAUGHAN	KSO 5L	KSO No.1	Evco Med. Hyd. or Hydrodrive HP 150	Evco Heavy Hyd. or Hydrodrive HP 200	Evco Extra Heavy Hyd.or Hydrodrive HP 300

Wickman Oil Grade	6	7	Wickman Grease Grade	1	2
Application	Reduction Units (Swarf conveyor)	Slideways		GREASES	
				Electric Motors	Spindle Nose Cap
B.P	Energol CS 300	Energol HP 20-C		Ener Grease LS3	Ener Grease LS3
CASTROL	Alpha 417	Magna BD		Spheerol AP3	Spheerol AP3
CENTURY	WLP	428AP		Lupus 3	Lupus 3
DUCKHAMS	Galrex 9	Adglide 6		Admax 13	Admax 13
ESSO	Esstic 78	Febis K73		Beacon 2/3	Beacon 2/3
GULF	Mechanism LP 85	Gulway 52 or Slidway 52		Gulfcrown No. 3	Gulfcrown No. 3
MOBIL	DTE oil BB	Vectra Oil		Mobilplex 48	Mobilplex 48
PETROFINA	Solna 58	Artac 37		Marson HTL 3	Marson HTL 3
SHELL ISO VG NO:	220	68 or 320		Alvania R2 & R3	Alvania R2 & R3
TEXACO	Regal GR & O	Way Lubricant D		Regal Starfal Premium 3	Regal Starfal Premium 3
VAUGHAN	Cosmolubric EHC	Way Lubricant		Evco BB No. 3 Grease	*Cosmolube Grease/No4 Grease

Where alternative grade references are given it is recommended that the lighter grade (lower number) is used unless oil consumption is excessive.

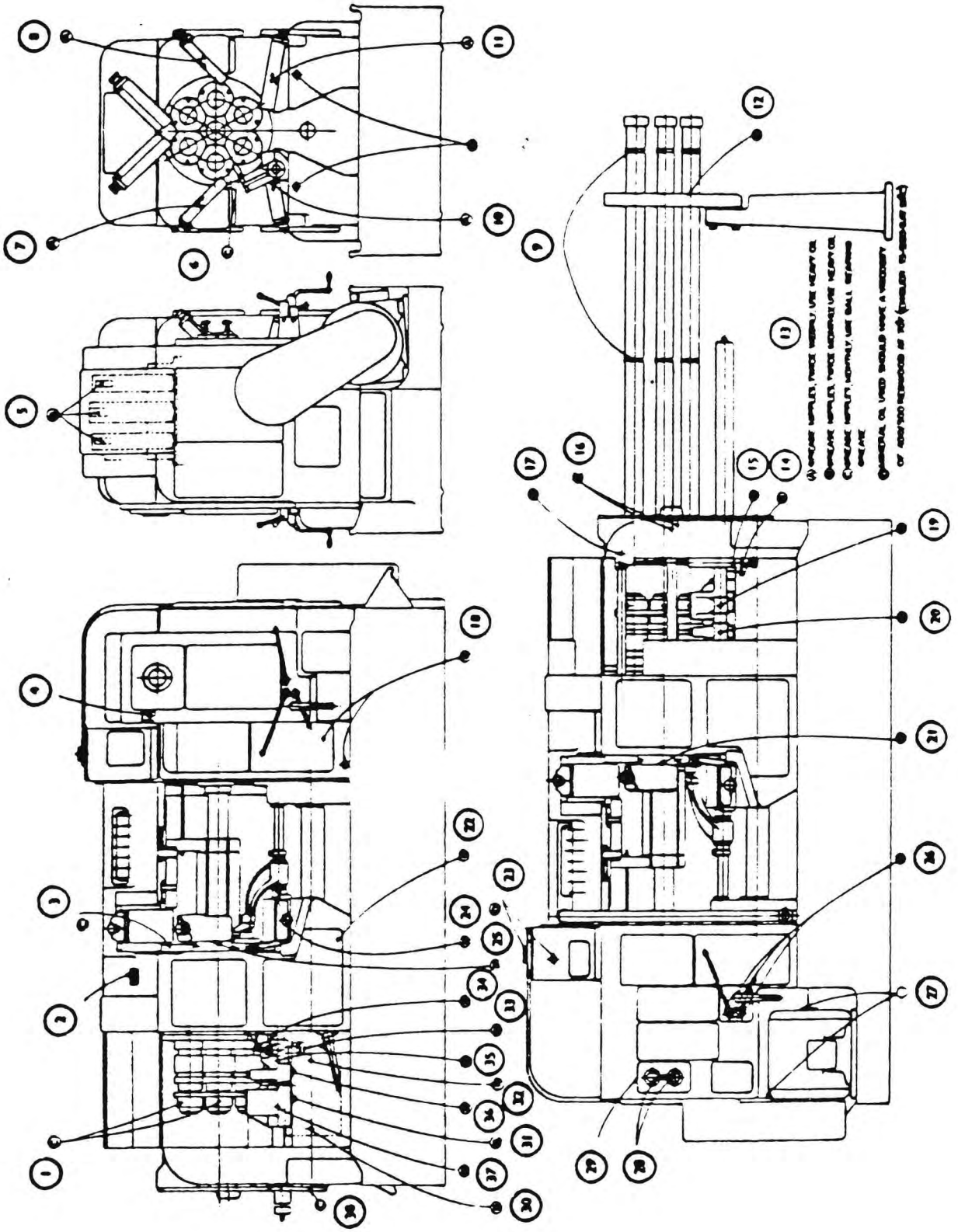
For Slideways Grade 5 is suitable for use with oil-base coolants and Grade 7 for use with water-base coolants.

REMARKS:

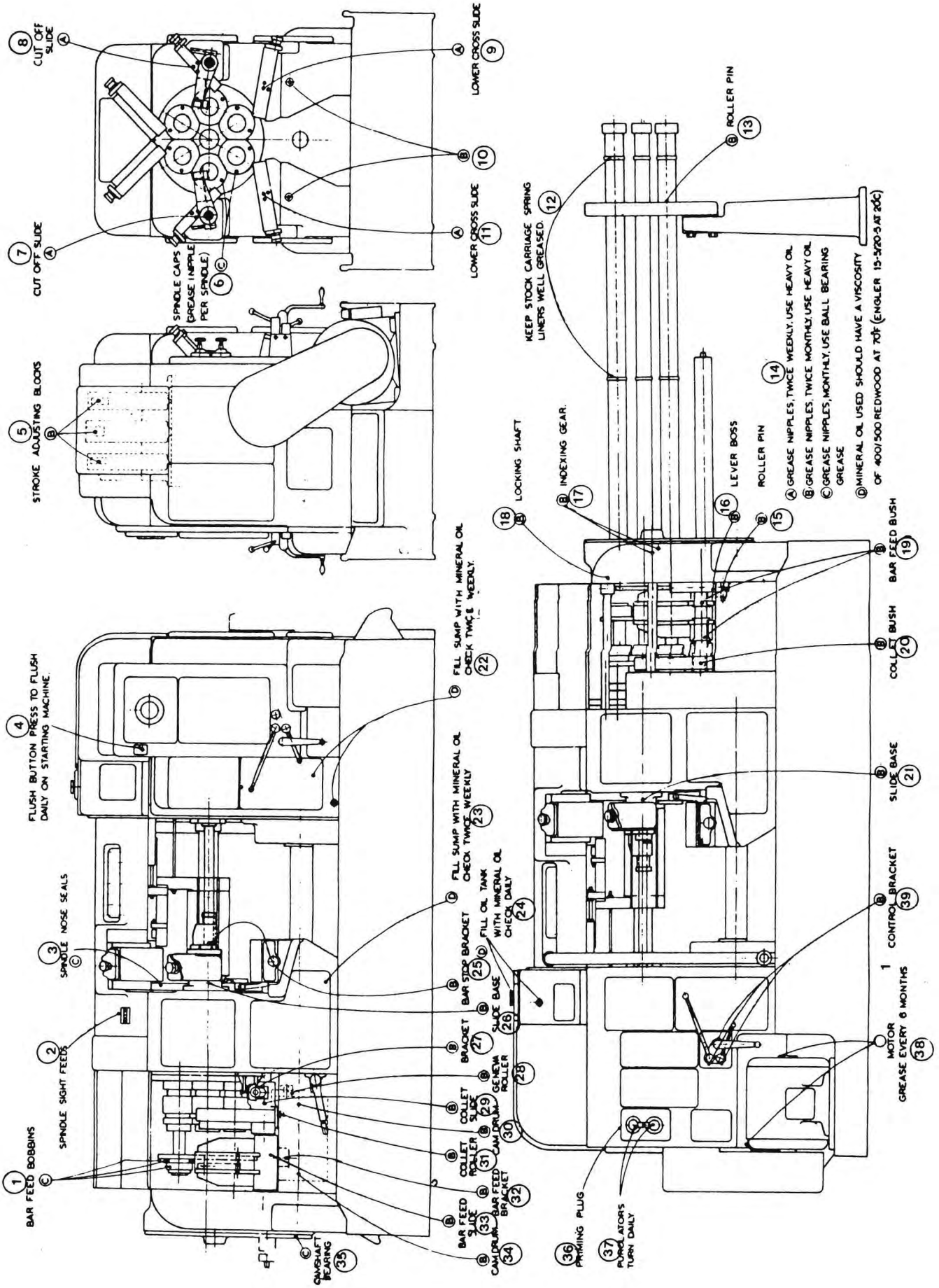
For Slideways Grade 5 is suitable for use with oil-base coolants and Grade 7 for use with water-base coolants.

* Re: Cosmolube No. 4: Use sparingly and only in nose cap seals.

2.3 Lubrication Chart 2.5/8"-6, 2.5/8"-6S and 3.1/4"-6



2.4 Lubrication Chart 2.5/8"-6 Double Bar Feed



SECTION THREE - PREVENTATIVE MAINTENANCE SCHEDULE

3.1 1000 Hour Procedures

Work Schedule to be carried out after 200, 1,000, 2,000, 3,000 hours running, at 1,000 hour intervals thereafter.

Cross Slide Felt Wipers & Aprons:	Inspect and check for damage. Remove swarf particles.
Change Gear Securing Nuts:	Check tightness.
Attachments and Tooling Equipment Securing Nuts:	Check tightness.
Chasing Attachment Drive (if fitted):	Inspect drive chain, check tension, Remove covers and check lubrication. Push back gaiter covers on universal joints and inspect.
Feed Drive - Brake Clutch: Feed - Fast Clutch: Threading: Drive Clutch:	Inspect and check adjustment (see handbook and machine plate). Check drive chain tension
Collet Operating Shoe: Bar Feed Shoe	Inspect for correct alignment and lubrication. (Renew when worn).
Six Collet Operating Sleeves:	Inspect for correct alignment and movement to avoid overheating.
Bar Feed Mechanism:	Check adjustment.
Bar Feed Mechanism Aligning Ring:	Inspect for alignment.
Cyclic System:	Inspect for leakage caused by loose connections and damaged tubing.
Upper Camshaft:	Check tightness of bolts on coupling between wormwheel and shaft.
Main Block Positive Stop:	Check for excessive pressure.
Independent Slides Positive Stop:	Check for excessive pressure.
Cross Slide Positive Stops:	Check for excessive pressure.
Drum Housing: Main Drive Housing:	Clean lubricating oil sumps.
Coolant System:	Clean tray, taps, pipes and ducts (including manifolds).
Bar Feed Tube Assemblies:	Remove and thoroughly clean. Inspect Feeders.
Collet Tubes, Collets:	Remove and thoroughly clean. Inspect Collets.

Spindle Bore and Collet Seating:	Clean. Inspect collet keys for excessive wear.
Longitudinal Slides:	Pull quadrants back, push forward to check free movement. Adjust gib strip if required.
Spindle Speed and Feed Change Gears:	Inspect lubrication.
Main Drive Housing:	All chain drives, check adjustment and sprocket alignments.
All Cams and Cam Rollers:	Inspect for excessive wear, oil, rollers and pins.
Spindle Drum:	Check end float (see handbook).

3.2 2000 Hour Procedures

Work Schedule to be carried out after 200, 2,000, 4,000 hours running, at 2,000 hour intervals thereafter.

Intake Strainer for Pump on Continuous Lubrication System:	Inspect and Clean.
Interlube Cyclic Metered Lubrication System if fitted:	Check frequency of operation.
Main Drive Belts:	Remove cover, check belt tension and inspect for excessive wear.
Handwind Interlock System:	Inspect and check (see handbook).
Bar Feed Spring:	Check setting.
Control Panel Wire Connections:	Check for tightness.
Control Panel:	Hand operate contactors and relays, ensure free action.
'PUROLATOR' Metal Edge Filter:	Remove, clean filter and case, refit.
'PUROLATOR' "Micronic" Cartridge Filter:	Remove bowl, renew cartridge.
Upper and Intermediate Cross Slides:	Strip, Clean, refit and adjust gib strip.
4th & 5th Station Longitudinal Slides:	Strip, Clean, refit and adjust gib strip.
Chasing Attachment (if fitted):	Strip, Clean, inspect for wear, refit.
Stock Carriage:	Remove springs, clean, regrease, renew as necessary.
Feed Tube: Steady Bushes:	Examine and renew if worn.
Spindles, Collet Operating Toggles:	Strip and examine for wear. (Renew in matched pairs).
Pulley Shaft:	Check for oil leak adjacent to pulley, and renew oil seal if necessary.
Spindles:	Remove collet operating sleeve, examine internal form. Check for correct movement.
Conveyor:	Remove from machine and clean thoroughly. Examine for damage, adjust and refit as necessary.
Spindle Drum:	Check indexing, measure over index. (see handbook).

Drum Locking:	Check setting (see handbook).
Drum Latch:	Check setting, inspect for excessive wear.
Interlube Cyclic Metered Lubrication if fitted:	Drain and clean reservoir.
Centre Block:	Drain and flush. Clean Strainer on guide block. Adjust gib strip if required. Do not over-tighten.
Attachments:	Strip attachment slides, clean, refit and adjust. Inspect, replace worn items. Gears, bearings, splined shafts, clutch parts etc.
Switches:	Check setting, ensure free action, inspect for mechanical damage, check securing screws.
Flexible Electrical Conduits:	Inspect for damage.
Lower Cross Slides:	Strip, clean, refit and adjust gib strip. Replace aprons and felt if worn.
Conveyor Drive Motor Bearings:	See manufacturer's Service Sheets or follow a known procedure for low power motor maintenance.
Upper Camshaft Housing:	Check oil supply to drip tray and outlets.

3.3 4000 Hour Procedures

Work Schedule to be carried out after 4,000 and 8,000 hours running, at 4,000 hour intervals thereafter.

Coolant Pump (Gear Type Only):	Strip and Clean, examine gears, shafts and gland. Renew as required. Refit.
Continuous Lubrication System:	Remove and strip pump, clean and examine for wear. Renew as required. Refit.
Main Drive Housing:	Examine lower and upper camshaft. Worm and Wormwheel. Drives for wear. Replace worn gears.
Spindle Drum, Spindle: Drive Gears:	Examine for wear. Renew if worn.
Cross Slides, Upper and Intermediate:	Replace return springs.
All Chain Drives:	Renew worn chains.
Drum Locking:	Renew Cam Roller and Pin if necessary. Examine Cam and Renew if worn.
Bar Stop Mechanism:	Strip Covers and examine cams, rollers and pins. Replace if worn.
Spindle Assembly:	Remove feed tube assemblies and examine. Replace worn bearings. Remove spindle nose caps, examine piston ring seals, replace if worn.

3.4 12000 Hour Procedures

Work Schedule to be carried out after 12,000 hours running.

Longitudinal Motion:	Examine bushes, and pins, replace as necessary.
Camshafts:	Examine for worn keys and keyways.
Cross Slide Operation:	Dismantle front and rear cam levers and renew bushes. Remove links and cross slide levers and renew bushes and pins and worn shafts.
Main Drive Housing:	Examine initial drive shafts (3). Replace if worn.
Drum Housing & Drum:	Withdraw spindle drum, examine front bearing area on drum & in housing for excessive wear and damage. (Consult Wickman Engineer). Examine drum seal, replace if worn.

4.1 Spindle Speed Drive

The initial machine drive described below covers that part of the drive from the motor to the spindles and indicates where the drive is taken off for further reduction for the feed and the fast motion drive. This is described in section 4.10. The motor, fig.4.2 is mounted on a platform pivoted on the tray and situated at the rear of the main drive housing.

The drive to a constant speed pulley shaft in the main drive housing is by vee belts. To adjust the belt tension the motor platform is raised or lowered by means of two adjusting bolts. Fig.4.2 also shows the direction of rotation of the pulleys.

The constant speed pulley shaft drives the "second" shaft through the range change gears, providing an initial high and low speed range. These gears have a neutral position to disconnect the drive for safety purposes when checking motor rotation.

The drive from the "second" shaft is transmitted by spindle speed pick off gears to the centre shaft. A list of gears is given on fig. 4.3. The centre shaft extends along the main drive housing through the hollow centre guide between the main drive and spindle drum housings and through the centre of the spindle drum to a gear on the rear face of the spindle drum.

Access to the speed pick off gears is at the motor end of the main drive housing. Gear changing is described in the Operators Handbook. Standard attachments are driven from the centre shaft to keep a direct speed relationship with the spindle. The gears and the chain wheels required are supplied fitted. The initial drive for the feed gearing is taken from the centre shaft, so that tool feed for each spindle revolution remains constant with any change of spindle speed, and the overall cycle time will vary with spindle speed changes.

Drives requiring constant speed are taken from the constant speed pulley shaft. These are the fast motion drive, coolant pump drive and the lubrication oil pump drive. All the chain drives and the position of the chain wheels can be seen on fig.4.4. All the chain drives, with the exception of the oil pump drive, are provided with jockey sprockets to tension the chains. The oil pump is mounted on a swinging bracket and chain tension is adjusted by moving this bracket. The chain drives are illustrated with directions for adjustment on fig.4.4

Do not overtighten chains. Correct adjustment should allow the middle of the longer run of any one chain to be moved sideways a minimum of 3/4in (19mm).

For layout of gearing and camshafts, see fig.4.1.

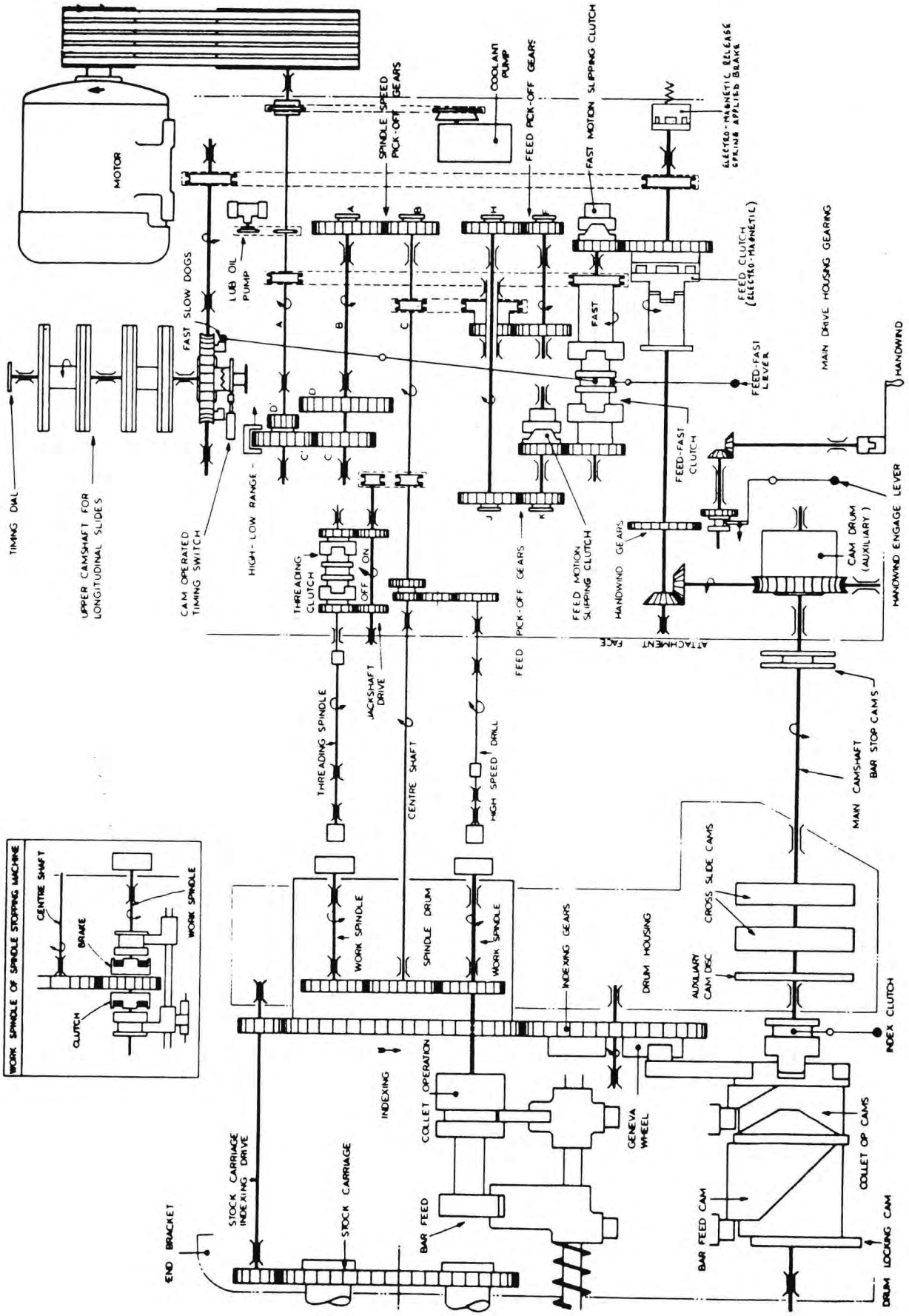

MOTOR
SPINDLE SPEED GEARS
SPINDLE PICK-OFF
COOLANT PUMP
FEED PICK-OFF GEARS
FAST MOTION SLIPPING CLUTCH
ELECTRO-MAGNETIC RELEASE SPRING APPLIED BRAKE
LUB OIL PUMP
FEED CLUTCH (ELECTRO-MAGNETIC)
FAST SLOW DOGS
FAST
MAIN DRIVE HOUSING GEARING
FEED-FAST LEVER
HANDWIND
TIMING DIAL
UPPER CAMSHAFT FOR LONGITUDINAL SLIDES
CAM OPERATED TIMING SWITCH
HIGH-LOW RANGE
THREADING CLUTCH
OFF ON
FEED-FAST CLUTCH
FEED MOTION SLIPPING CLUTCH
HANDWIND GEARS
CAM DRUM (AUXILIARY)
HANDWIND ENGAGE LEVER
ATTACHMENT FACE
FEED PICK-OFF GEARS
JACKSHAFT DRIVE
THREADING SPINDLE
CENTRE SHAFT
HIGH SPEED DRILL
MAIN CAMSHAFT BAR STOP CAMS
WORK SPINDLE OF SPINDLE STOPPING MACHINE
CENTRE SHAFT
BRAKE
WORK SPINDLE
CLUTCH
WORK SPINDLE
SPINDLE DRUM
WORK SPINDLE
INDEXING GEARS
DRUM HOUSING
CROSS SLIDE CAMS
AUXILIARY CAM DISC
INDEX CLUTCH
INDEXING
COLLET OPERATION
GENEVA WHEEL
COLLET OP CAMS
STOCK CARRIAGE INDEXING DRIVE
STOCK CARRIAGE
BAR FEED
BAR FEED CAM
END BRACKET
DRUM LOCKING CAM

Fig. 4.1

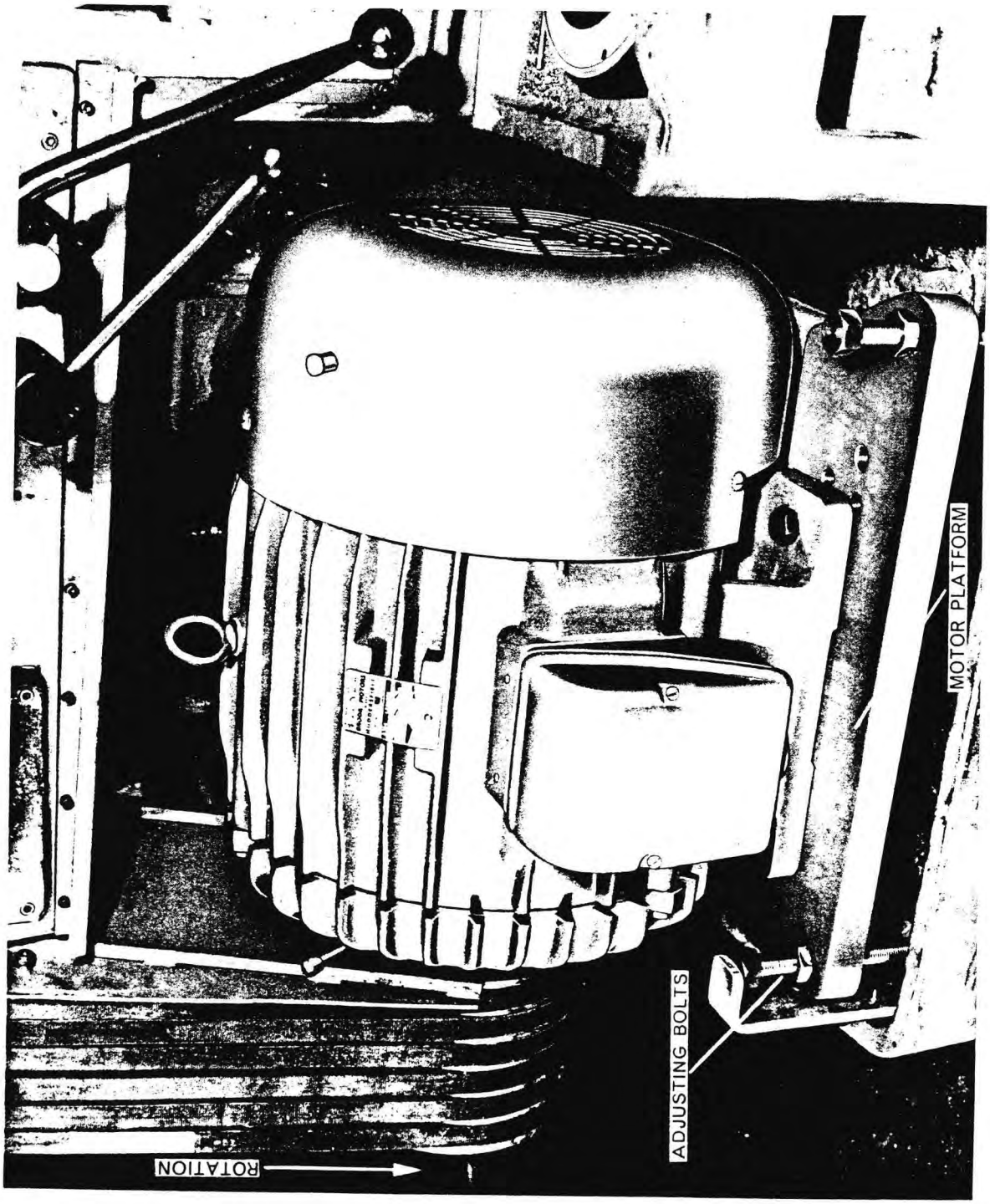


Fig. 4.2

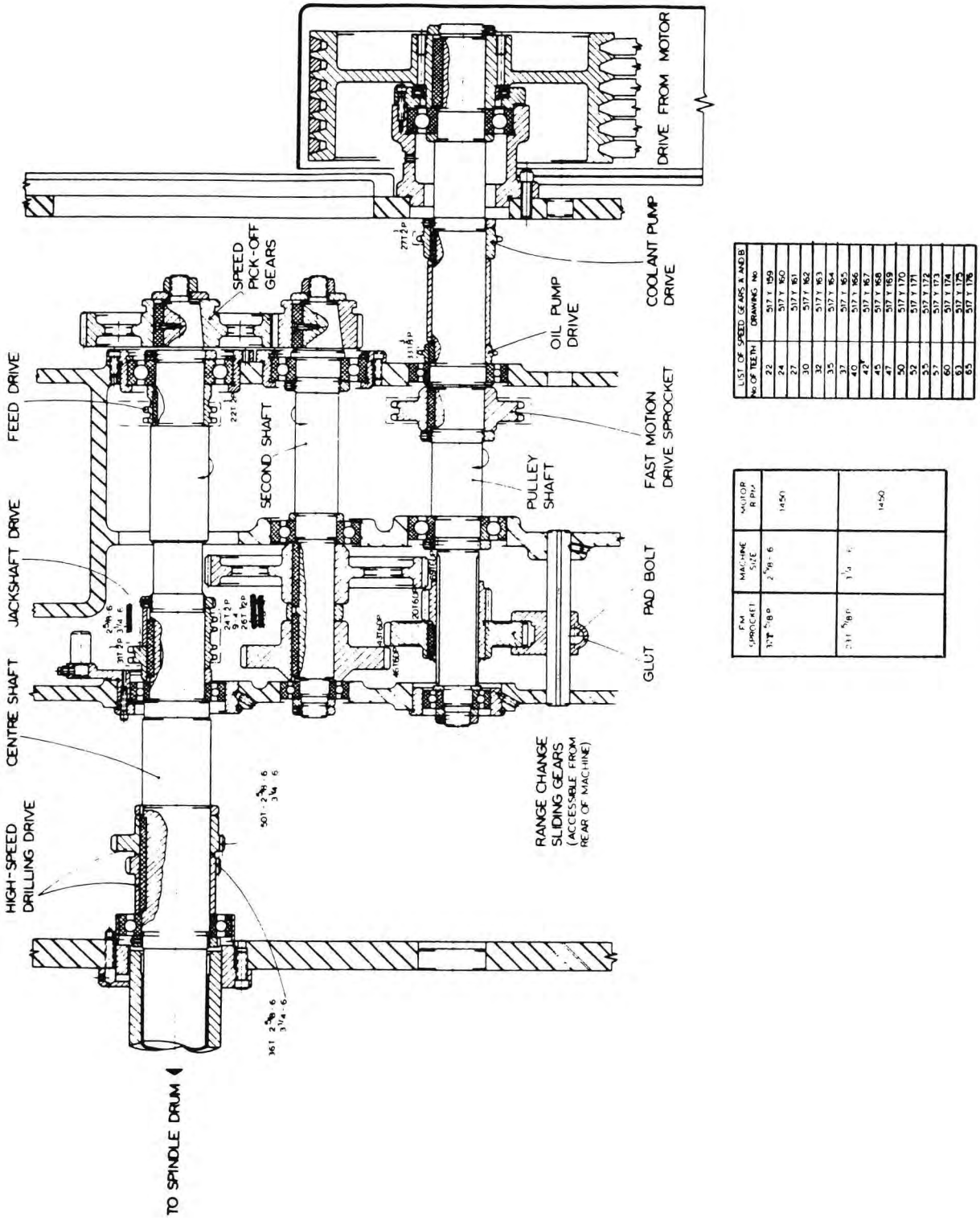

DRIVE FROM MOTOR
COOLANT PUMP DRIVE
OIL PUMP DRIVE
FAST MOTION DRIVE SPROCKET
PULLEY SHAFT
SECOND SHAFT
SPEED PICK-OFF GEARS
FEED DRIVE
JACKSHAFT DRIVE
CENTRE SHAFT
HIGH-SPEED DRILLING DRIVE
GLUT PAD BOLT
RANGE CHANGE SLIDING GEARS (ACCESSIBLE FROM REAR OF MACHINE)
TO SPINDLE DRUM
LIST OF SPEED GEARS A AND B
No OF TEETH
DRAWING No
22 517 T 159
24 517 T 160
27 517 T 161
30 517 T 162
32 517 T 163
35 517 T 164
37 517 T 165
40 517 T 166
42 517 T 167
45 517 T 168
47 517 T 169
50 517 T 170
52 517 T 171
55 517 T 172
57 517 T 173
60 517 T 174
63 517 T 175
65 517 T 176
FM SPROCKET
MACHINE SIZE
MOTOR R.P.M.
1450
1450

Fig. 4.3

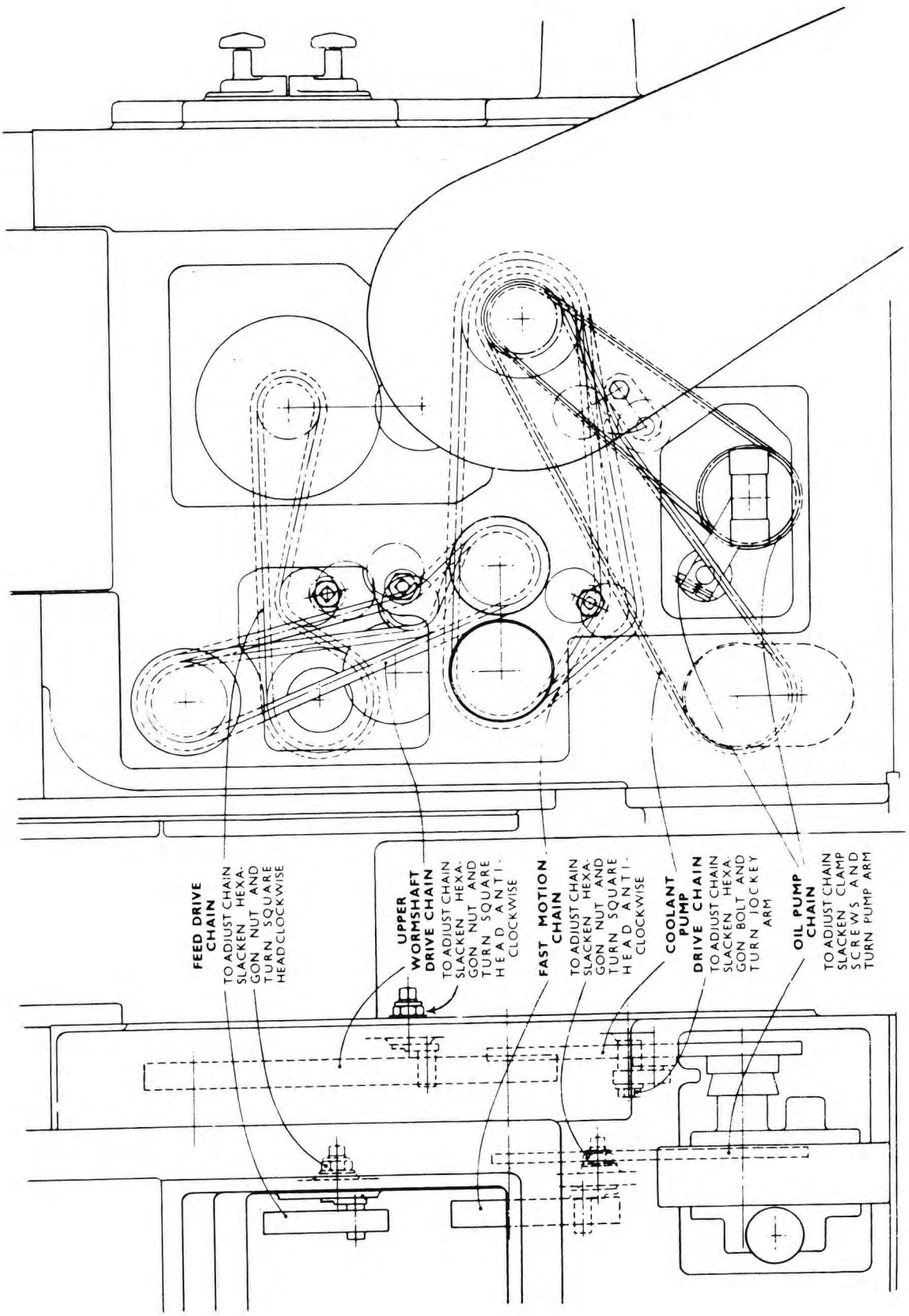

FEED DRIVE CHAIN
TO ADJUST CHAIN SLACKEN HEXAGON NUT AND TURN SQUARE HEAD CLOCKWISE
UPPER WORMSHAFT DRIVE CHAIN
TO ADJUST CHAIN SLACKEN HEXAGON NUT AND TURN SQUARE HEAD ANTI-CLOCKWISE
FAST MOTION CHAIN
TO ADJUST CHAIN SLACKEN HEXAGON NUT AND TURN SQUARE HEAD ANTI-CLOCKWISE
COOLANT PUMP DRIVE CHAIN
TO ADJUST CHAIN SLACKEN HEXAGON BOLT AND TURN JOCKEY ARM
OIL PUMP CHAIN
TO ADJUST CHAIN SLACKEN CLAMP SCREWS AND TURN PUMP ARM

Fig. 4.4

Notes

4.2 Spindle Drum

The drive from the motor was described to the point where the centre shaft passes through the hollow centre guide to the spindle drum.

Fig.4.5 illustrates this end of the centre shaft, with the spindle drive gear keyed to it and the driven gears mounted directly on each work spindle.

The spindle drum carries the work spindles and the centre guide on which the main tool block slides. This arrangement ensures consistant alignment of the work spindles with the main tool block. The end thrust of the tools upon the spindle drum is taken by the stop ring secured to the front of the spindle drum. This stop ring also carries stop screws which are adjustable dead stops for the innermost position of the cross slides, giving independent setting between each cross slide and spindle in each indexed station.

Hardened steel thrust pads are fitted in the rear flange of the spindle drum to eliminate end float and are ajusted by screws and locknuts. These should be set with no clearance between the pad and the drum housing face when drum is cold.

The drum is supported at both ends in machined diameters in the drum housing. A gear on the rear (bar feed end) of the drum, meshing directly with the Geneva gear, relays the motion of the Geneva mechanism to the drum to index the drum through 60 degrees. A further gear is taken from the drum indexing gear to drive the indexing of the stock carriage. See fig.4.1.

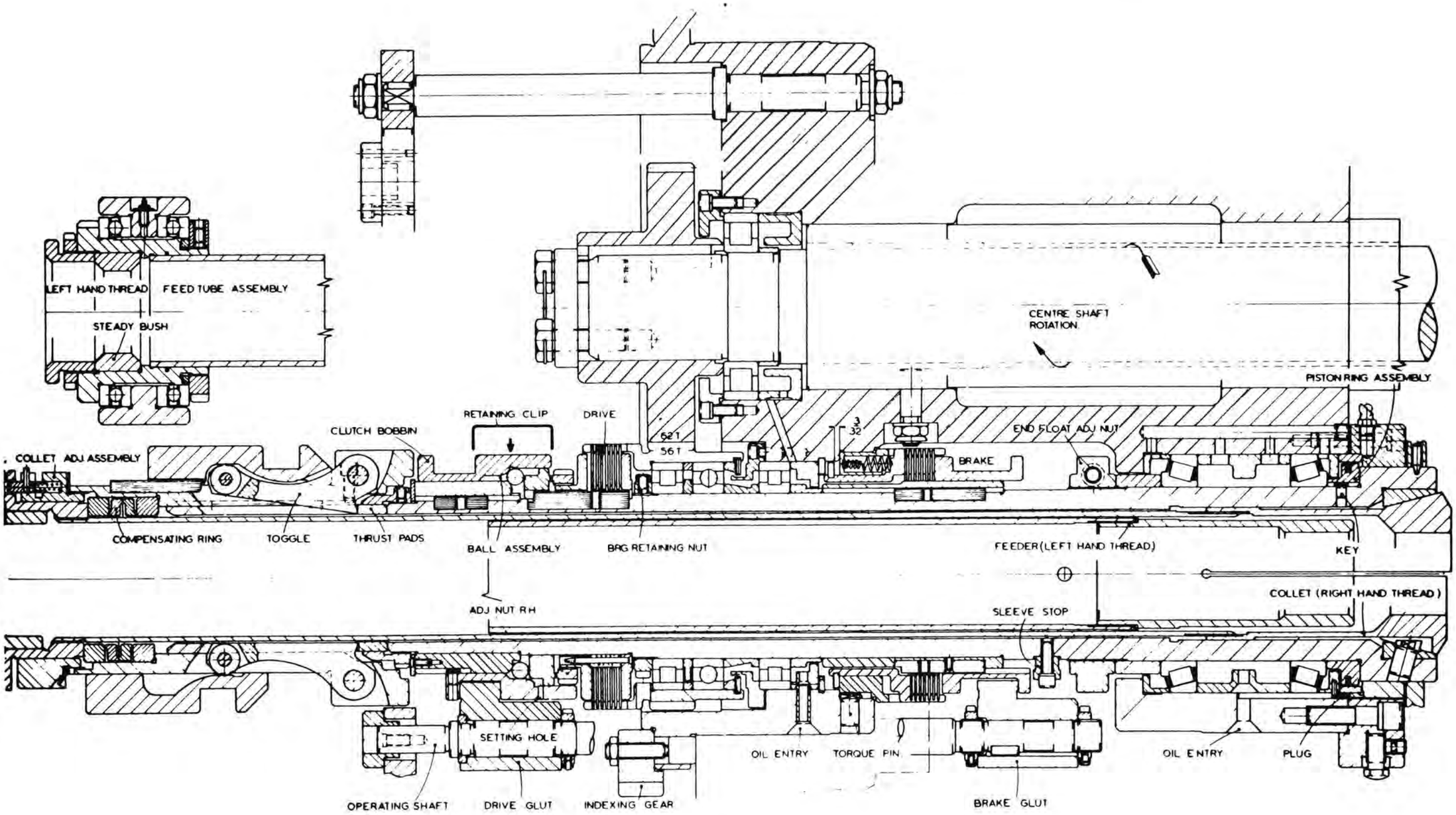

LEFT HAND THREAD
FEED TUBE ASSEMBLY
STEADY BUSH
CENTRE SHAFT ROTATION.
PISTON RING ASSEMBLY
RETAINING CLIP
DRIVE
CLUTCH BOBBIN
COLLET ADJ ASSEMBLY
621
561
3/32
BRAKE
END FLOAT ADJ NUT
COMPENSATING RING
TOGGLE
THRUST PADS
BALL ASSEMBLY
BRG RETAINING NUT
FEEDER(LEFT HAND THREAD)
KEY
COLLET (RIGHT HAND THREAD)
ADJ NUT RH
SLEEVE STOP
SETTING HOLE
OIL ENTRY
TORQUE PIN
OIL ENTRY
PLUG
OPERATING SHAFT
DRIVE GLUT
INDEXING GEAR
BRAKE GLUT

Fig. 4.5

4.3 Workspindles (2.5/8-6 and 2.5/8-6 arranged for double bar feed)

The workspindles are mounted in a pair of Timken precision taper roller bearings at the front and an extra precision parallel roller bearing at the rear, see fig.4.5. The front bearings are protected against the ingress of coolant and swarf by a piston ring seal and a labyrinth seal. A front cap covering the seals is provided with grease nipples so that the seal assembly can be filled with grease for the exclusion of foreign matter. Inspection of the seal assembly can be made by the removal of this cap and the short spacer sleeve which contains the piston ring within its seal assembly, the piston ring being lightly sprung in the bore of the sleeve. As with any piston ring assembly, careful dismantling and assembly is required and as the end cap clamps the outer race of the front bearing, end float checking of the bearings is essential after reassembly. Where fitted, remove coolant thrower rings from the spindle nose to obtain access to the end caps.

4.4 Front Bearing End Float

The Timken taper roller bearings are adjusted by a slotted lock nut accessible by removing the front upper cover on the drum housing. The slotted lock nut is split and clamped by a cap screw. The cap screw should be kept lightly clamped whilst adjusting the bearings. The following procedure is recommended when checking and adjusting:-

a) Check end float with a clock indicator (preferably a magnetic base type) mounted on the spindle drum and feeling against the spindle.

b) Check with bar gripped in the collet.

c) Use a short lever to exert pressure on the spindle, pushing the spindle the extent of the end float to obtain a reading.

d) The end float should be very gradually reduced by adjusting the locknut with short sharp taps on a wrench or a broad punch located in the slotted locknut. Remember, actual nut movement should be small, a 1/16in(1.5mm) turn on the outside of the nut will reduce the end float approximately 0.00017in(0.004mm). An end float of 0.0006 to 0.0008in(0.015 to 0.020mm) should be set for normal speeds.

e) The end float can be increased to 0.0008 to 0.0010in(0.020 to 0.025mm) for high speeds.

f) The cap screw in the slotted locknut should be tightened after each adjustment before reading the end flot and only slackened sufficiently to allow the nut to turn when adjusting.

g) After each adjustment, before reading the value of the end float, the spindles should be jogged to settle the rollers.

h) When over-adjustment reduces end float below 0.0006in(0.015mm) it is necessary, after turning the slotted locknut back, to separate the bearings a small amount by mallet blows on the rear (bar feed end) of the spindle. By this means it is possible to jolt the front bearing and the piston ring carrier away from the spindle shoulder so that mallet blows struck in the opposite direction re-seats the front bearing and piston ring carrier against the spindle shoulder. This procedure ensures that the correct end float reading is obtained and if not fully applied it may give a false reading which will increase under operating load as the bearings re-seat.

j) When adjusted satisfactorily run the machine at about 150 r.p.m. gradually increasing to the spindle speed required, observing the temperature at regular intervals on a thermometer placed in an end cap screw hole. Temperature should not exceed shop temperature, + 70 degrees F (21 degrees C) at approximately 400 r.p.m.

The following information applies if spindles and bearings are dismantled from the drum:-

a) Check that the oil feed and circulation holes are clear.

b) Assemble bearings on the spindle with the biggest bore for the adjustable bearing nearest to the locknut. This makes the end float adjustment easier.

c) Eccentric marks on the outer races to be in line and radially outwards.

d) Eccentric marks on the inner races to be in line.

e) The front bearing and piston ring carrier to be pressed hard against the spindle shoulder.

The front and rear bearings are lubricated in the 4th and 5th stations on six spindle machines by oil from a pressure header on the beam above the drum housing. Slight drip feeds mounted on the beam are provided for checking the flow. Spacing rings on the spindle assembly retain the lubricant to a suitable level and drilled passages in the drum allow internal oil flow around the front bearing assembly.

Collets are of the draw back type and are opened and closed by a toggle mechanism on the rear end of the spindles and a spring compensator is included to accommodate small variations in bar size. The collet may be removed from the spindle by releasing the spring plunger and turning the collet adjusting sleeve until the collet is screwed clear.

The tension on the collet is adjusted by means of the collet adjusting sleeve, and after fitting new collets, must always be tested by hand before running under power.

When adjusting the collet tension, extra clearance for the spanner (item No. 573X106) may be obtained by placing a spacing block (item No. 573X113) between the stop collar on the front guide rod and the bar feed slide, see fig.4.6. The spacing block should be placed into position when the bar feed slide withdraws.

On the 2.5/8-6 arranged for double bar feeding, the spacing block should be placed into position when the bar feed slide withdraws.

The feed fingers are fitted to feed tubes carrying on their outer ends the bar feed bobbins mounted on anti-friction bearings. In order to remove the feed fingers it is first necessary to slide back the stock carriage tubes. These are held in the stock carriage indexing gear by clamps which must be slackened and turned clear to release the stock carriage tubes. By turning the plate on the rear of the centre stop the feed tubes may be removed from the machine complete.

On the 2.5/8-6 standard machine and the 2.5/8-6 arranged for spindle stopping, in order to extract the feed tube in station 1 it is necessary to withdraw the bar feed shoe. The machines are fitted with a screwed knob which can be pulled down to withdraw the shoe or turned to retain it in the withdrawn position.

On the 2.5/8-6 arranged for double bar feed, in order to extract the feed tube in either station 3 or 6 it is necessary to withdraw the bar feed shoe. This is again effected in either station by pulling a screwed knob to withdraw the shoe or by turning same to retain it in the withdrawn position.

Bar steady bushes are fitted in the end of the feed tubes and are retained by a screwed sleeve and slotted locknut.

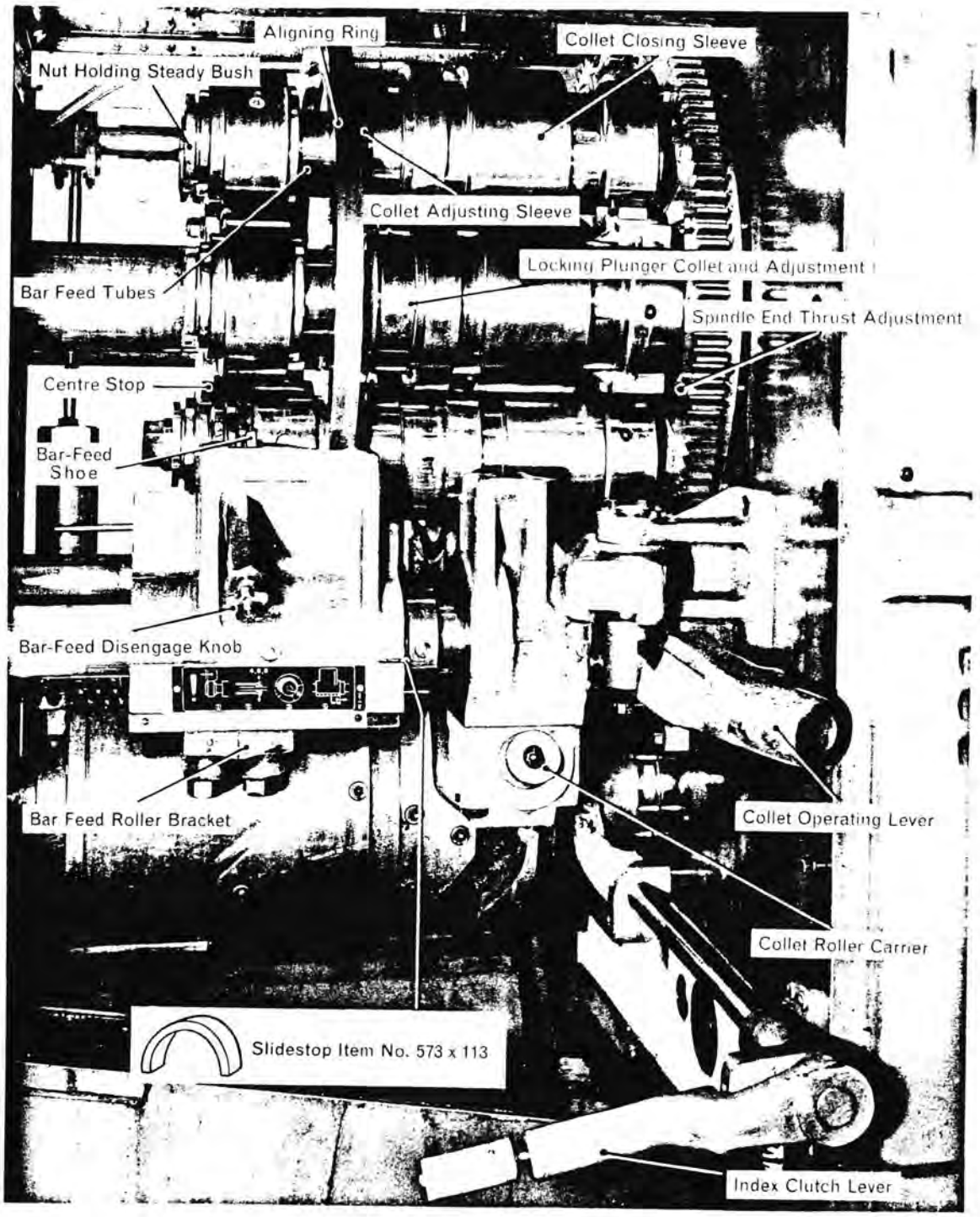

Aligning Ring
Collet Closing Sleeve
Nut Holding Steady Bush
Collet Adjusting Sleeve
Locking Plunger Collet and Adjustment
Bar Feed Tubes
Spindle End Thrust Adjustment
Centre Stop
Bar-Feed Shoe
Bar-Feed Disengage Knob
Bar Feed Roller Bracket
Collet Operating Lever
Collet Roller Carrier
Slidestop Item No. 573 x 113
Index Clutch Lever

Fig. 4.6

4.5 Work Spindles, 2.5/8-6 Spindle Stopper

The spindle stopper version of the 2.5/8-6 spindle machine enables spindles to be stopped and held in stations 2, 3, 4 and 5. All combinations of stopping and starting can be arranged between these stations.

Standard machines cannot be converted to a spindle stopper and provision must be made at an early stage of manufacture.

Fig.4.7 shows the spindle drum assembly; each spindle gear is driven from the central gear and runs loosely on ball and roller bearings when the multi-plate brake is engaged. The brake contains a series of pre-loaded cushion springs which limit and maintain the brake torque and is sufficient to brake the spindles to a standstill.

The multi-plate drive clutch on each spindle is engaged by the axial thrust imparted by a row of balls, squeezed inwards against conical and flat faces by the clutch bobbin when it is moved by the cam operated clutch glut. The clutch is adjusted by turning the slotted nut from serration to serration on its right hand thread, the serrations being maintained in engagement by a series of clutch plate separation springs. The clutch is accessible for adjustment in the 6th station and an adjustment of one serration at a time can be made by a sharp hammer blow on the clutch punch 573X155. After adjustment the clutch must be checked using the hand lever 502X251 and a spring balance reading between 50 and 70lb (22.73 and 31.8 kgs) measured at the knob end of the lever should be maintained.

The clutch gluts are operated during indexing of the spindle drum by a series of cams secured in housings at the bar feed end of the drum housing. The cams may be selected to suit varying tooling requirements and are supplied to order. A cam housing and one set of cams for stopping in the following conditions are supplied as standard:-

a) Stop in 4th, start in 5th or
b) Stop in 5th, start in 6th

When fitting new cams handwind through index to ensure that the rollers pass freely all round the cam track.

Cross slide attachments and drives for use with spindle stopping machines are usually designed for a special and limited application to suit customer's components. Fig. 4.8 shows the cams for the 2.5/8"-6S.

4.6 Dismantling (2.5/8-6S Machine)

It is recommended that spindle removal be undertaken by Wickman Bennett Service Engineers who are fully trained and highly skilled in machine reconditioning.

A brief guide to the procedure is given below:-

The drive clutch and brake clutch gluts and operating shaft should be first removed, preferably in the 6th station. Unscrew the drive clutch glut retaining nut and the end nut at the brake glut (accessible through the drum housing). Withdraw the shaft through the gluts sufficiently to remove the half collars on the drive glut end and the key in the shaft at the brake glut end. Dismantle the shaft bearing at the drive glut end and withdraw the shaft, graduallu unscrewing the remaining nuts.

Remove the feed tube, collet tube, collet adjustment assembly, collet sleeve, toggle carrier and toggles. Unscrew from the spindle the thrust pad retainer nut, remove pads and the drive clutch ball assembly. Retaining clips in the shape shown 2.1/16in,fitted over the operating sleeve will hold the ball thrust ring and retain the 33 operating balls. Drive clutch plates can then be stripped and the bearing retaining nut unscrewed. Radial access to the nut locking screw is through a hole in the spindle gear (5/32in A/Flats hexagon wrench is required).

Unscrew the brake clutch sleeve stop fitted radially to the spindle and the adjacent front bearing adjusting nut.

Dismantle the spindle nose thrower ring (where fitted) and unscrew the front cap covering the piston ring seal and carefully remove the short spacer sleeve.

The spindle may then be withdrawn, stripping the drive gear and bearings, the rear bearing spacer, brake plates and operating sleeve and the front bearing nut and spacer, leaving in the drum the rear roller bearing and spacer and the brake spring assembly. The front bearings and spacers should withdraw with the spindle.

The brake spring assembly is retained in the drum with a taper point screw and locknut and if the assembly is removed care is needed when replacing to align the keyway with the torque pin fitted in the drum bore.

The rear roller bearing is held between an end cover and a spacer located against a circlip in the drum bore. This circlip should have its deepest section over the oilway recess in the spacer.

Assemble bearings as directed for the standard machine spindle, section 4.3 page 27.

Replace the spindle and its component assemblies in the reverse order to dismantling, ensuring correct order of replacement as the spindle is fed through the bearings. Front bearing end float will need adjustment as directed in section 4.4. Other adjustments are as follows:-

Hold the glut shaft in the brake position by screw and collar in the end of the glut shaft and adjust the brake glut retaining nut to obtain 3/32in(2.38mm) compression of the brake springs.

Thrust pads to be assembled according to marks. Clutch to be in neutral when tightening the thrust pad retaining nut.

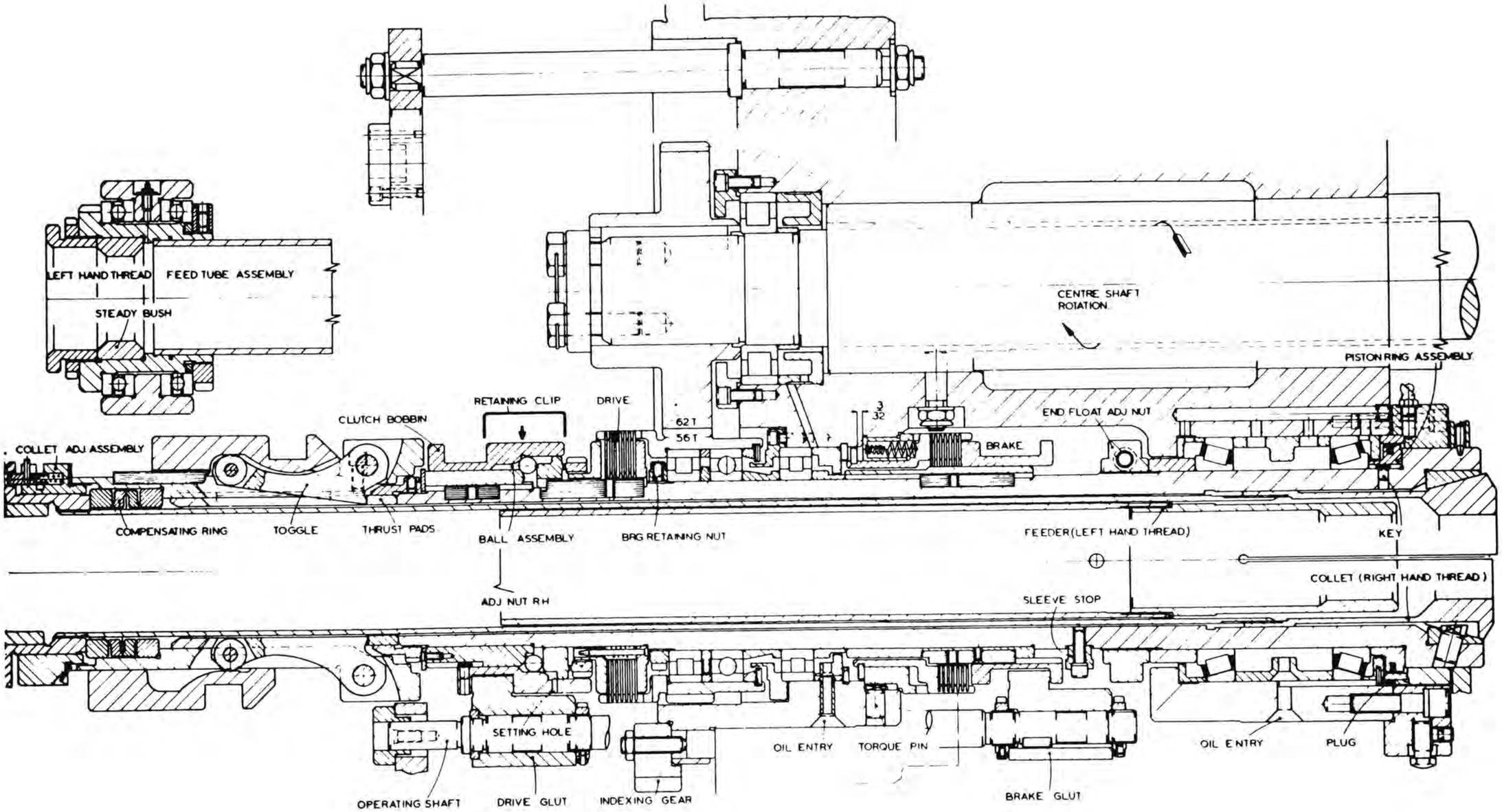
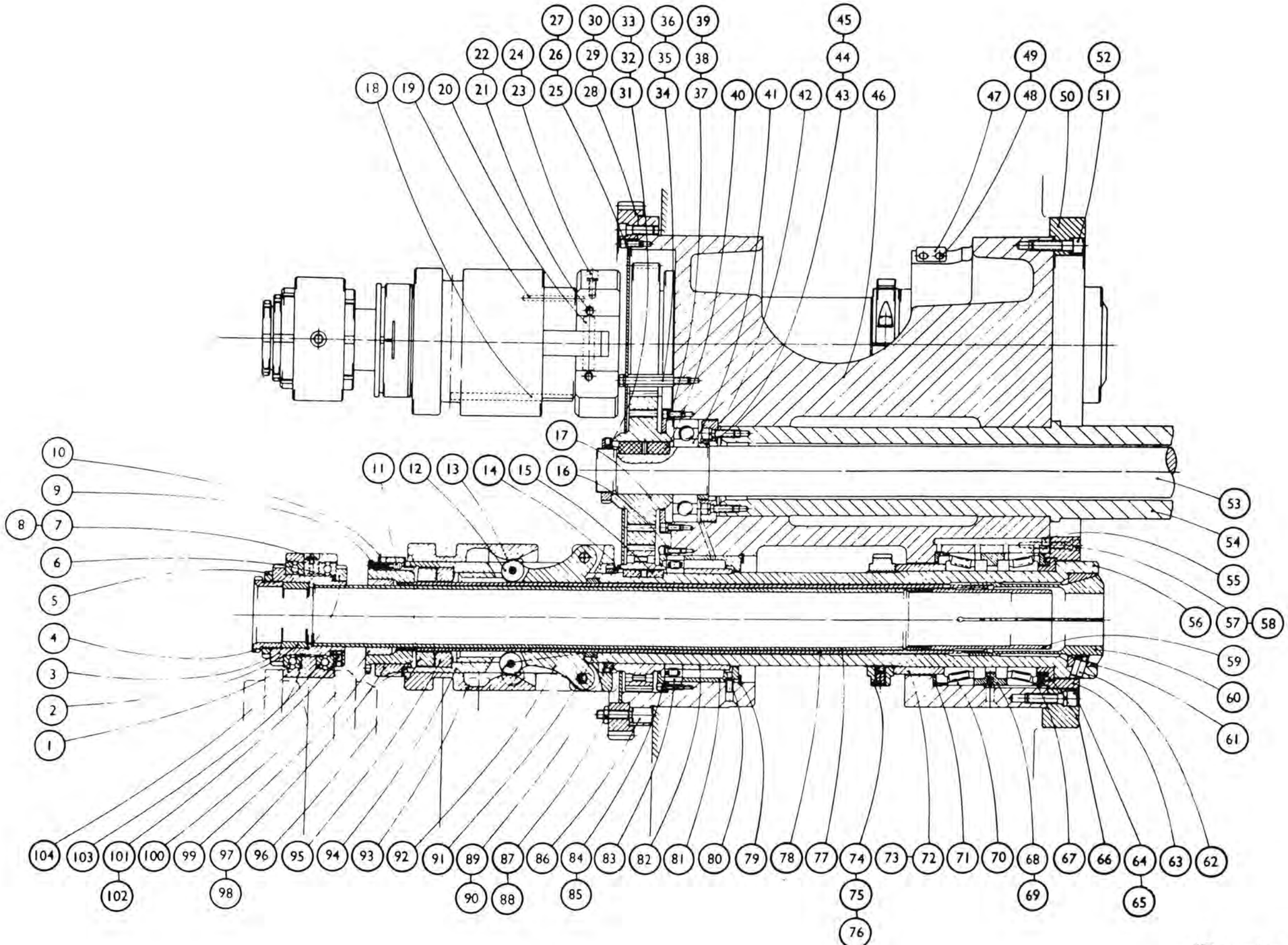

LEFT HAND THREAD
FEED TUBE ASSEMBLY
STEADY BUSH
CENTRE SHAFT ROTATION
PISTON RING ASSEMBLY
RETAINING CLIP
DRIVE
CLUTCH BOBBIN
62T
56T
3/32
END FLOAT ADJ NUT
BRAKE
COLLET ADJ ASSEMBLY
COMPENSATING RING
TOGGLE
THRUST PADS
BALL ASSEMBLY
BRG RETAINING NUT
FEEDER(LEFT HAND THREAD)
KEY
COLLET (RIGHT HAND THREAD)
ADJ NUT RH
SLEEVE STOP
SETTING HOLE
OIL ENTRY
TORQUE PIN
OIL ENTRY
PLUG
OPERATING SHAFT
DRIVE GLUT
INDEXING GEAR
BRAKE GLUT

Fig. 4.7

SPINDLES

$2\frac{5}{8}$"-6 Spindle Bar Machine



(Drawing 501 Z 1 A)

Notes

4.13 Centre Tool Block and Longitudinal Slides Operating Mechanism

The mechanism derives its motion from cams on the upper camshaft, the three slides being operated by a series of racks and levers to give each slide a constant fast approach stroke and an infinitely variable feed stroke; centre block 0 to 5in (0 to 127mm), independent longitudinal slides 0in to 5.5/8in (0 to 143mm). A sliding block with provision for three sets of pinions and slideways for racks is carried in guides on the top of the main drive housing and when cam operated, imparts the fast motion stroke to the three slides. The block is locked in its forward position and three separate quadrant levers are cam operated to provide the feed motion through the racks and pinions to the slides.

At the end of the fast motion stroke the sliding block lockbolt enters a tapered setting on the block; if the seating is not directly under the lockbolt the block will be moved and consequently double the movement on the toolslides. The setting is shown on figure 4.21.Unless dismantled or cam wear has occurred, adjustment should not normally be necessary. The adjusting procedure is as follows:-

Stop the machine at the end of the fast approach stroke with the lockbolt "IN" and remove the sheet metal covers. Dismantle the lockbolt operating lever by removing its eccentric pivot pin.

Release the spring load on the lockbolt by unscrewing the retaining cap. The spring load is approximately 60lb. (27Kgf) and the cap can be held down by an assistant if the two opposing screws are first removed.

Fit a long B.S.F. fine thread bolt or stud in the thread in the lockbolt to enable it to be pulled clear of its seating. With the lock bolt withdrawn handwind the machine backwards until the sliding block starts to retract, then carefully forwards until the block is just at the maximum forward position on the fast motion cam.

The block should then be moved with gentle blows from a mallet until a 0.003in (0.076mm) feeler can be trapped between the outer part of the cam and the roller. In this position the lockbolt should fit exactly in the tapered seating without moving the sliding block setting. In order to reset the sliding block, release the pad bolt holding the cam roller pin and turn the pin by the hexagonal end to obtain the exact seating condition. The eccentricity must be kept in the lower half as shown on fig.4.21.

After making the adjustment, the pad bolt nut must be tightened to a maximum to prevent pin movement.

Re-assemble the lockbolt operating lever and adjust its eccentric fulcrum by the squared end to just nip the lockbolt down in the seating with the roller on the inner cam. See figs. 4.19, 4.20 and 4.21.

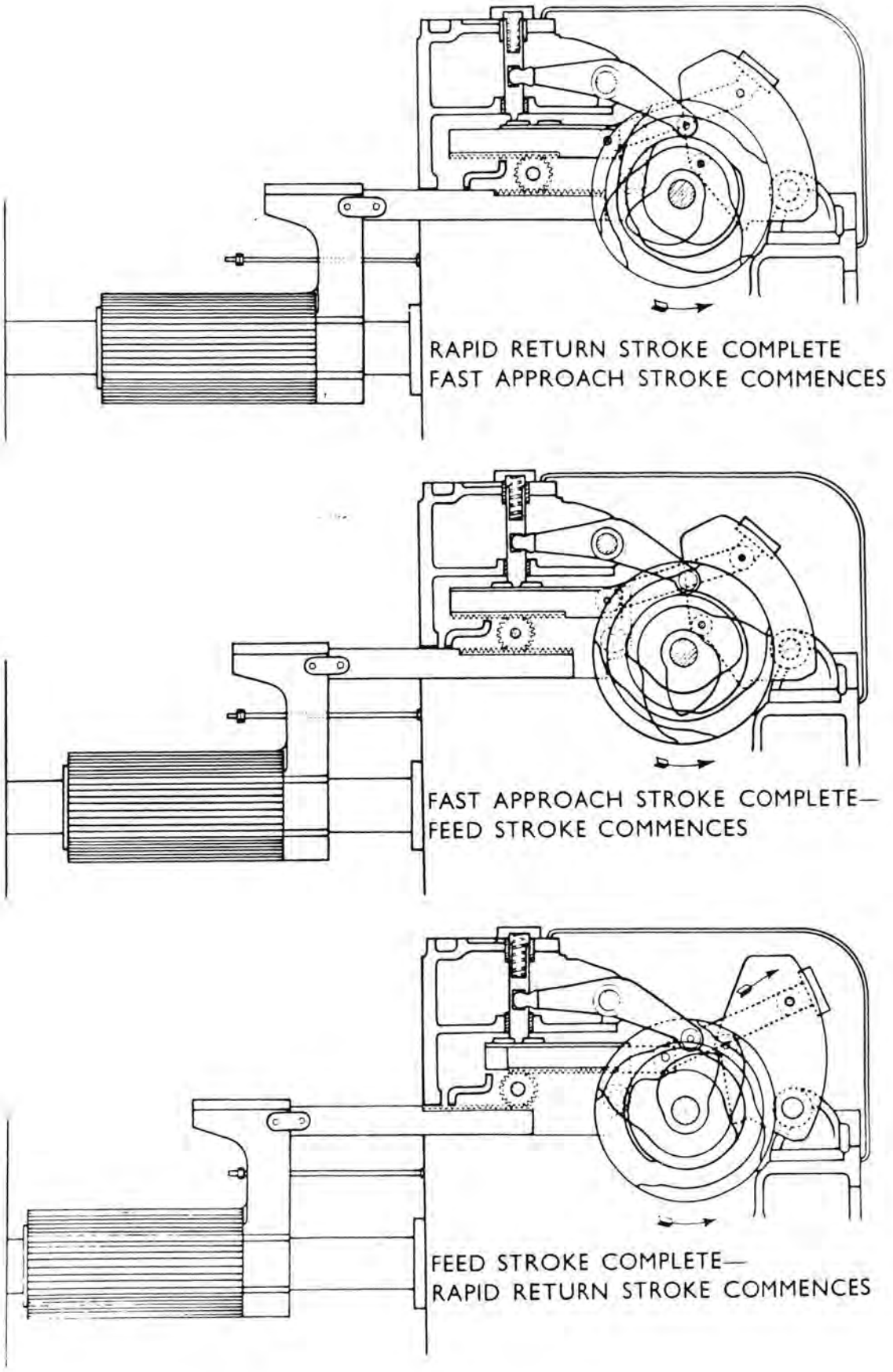

RAPID RETURN STROKE COMPLETE
FAST APPROACH STROKE COMMENCES
FAST APPROACH STROKE COMPLETE—
FEED STROKE COMMENCES
FEED STROKE COMPLETE—
RAPID RETURN STROKE COMMENCES

Fig. 19

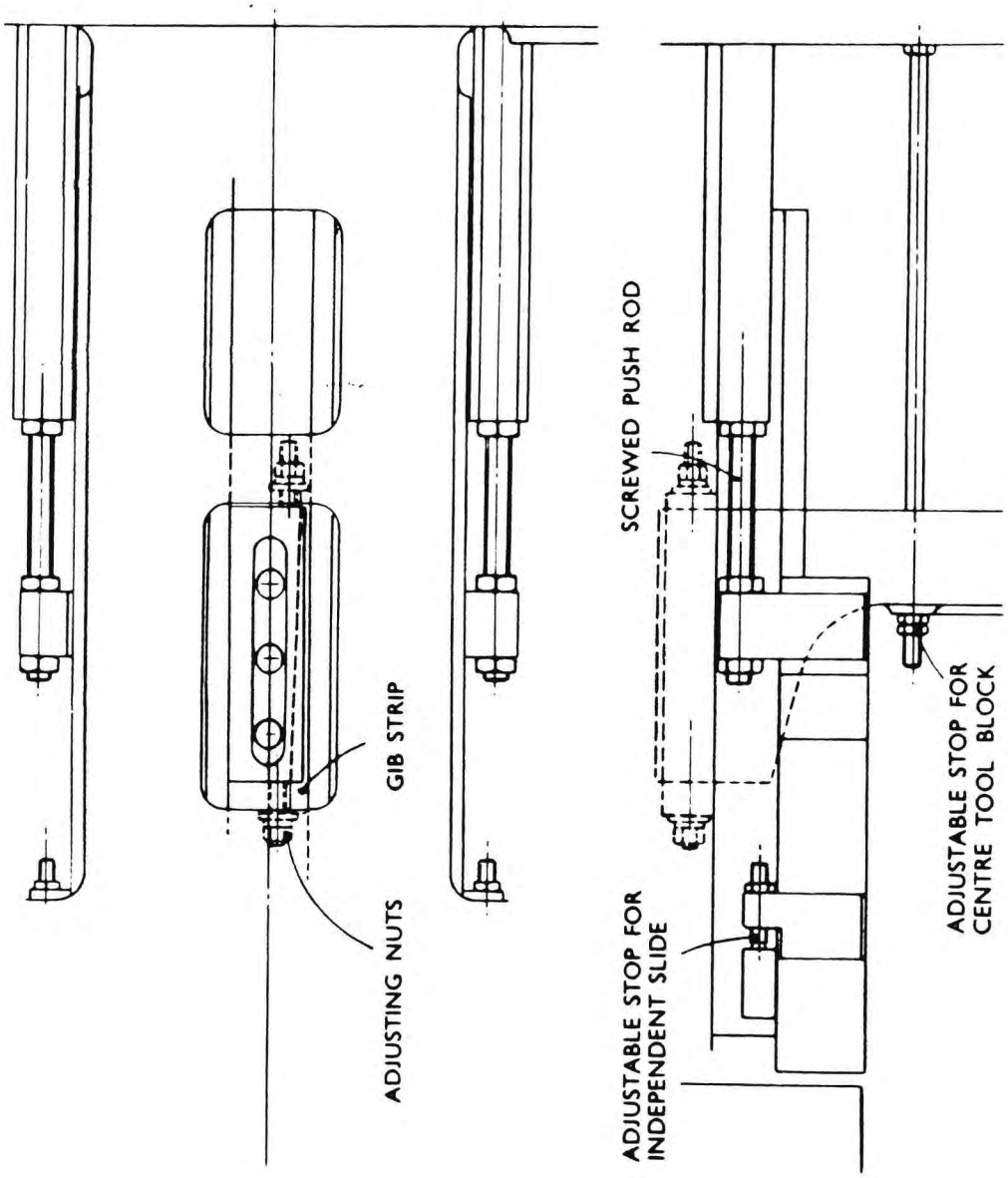

SCREWED PUSH ROD
GIB STRIP
ADJUSTING NUTS
ADJUSTABLE STOP FOR INDEPENDENT SLIDE
ADJUSTABLE STOP FOR CENTRE TOOL BLOCK

Fig. 20

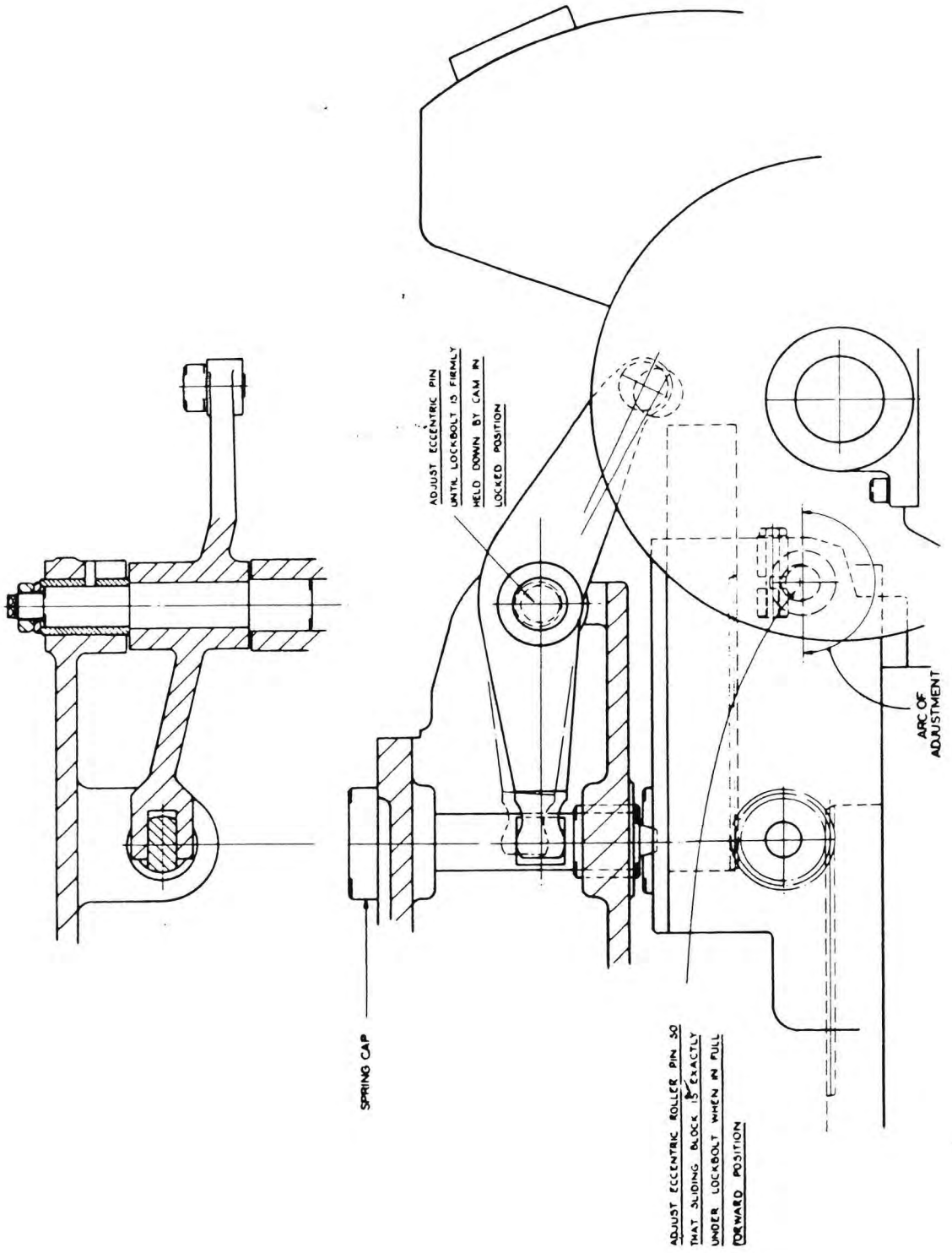

ADJUST ECCENTRIC PIN
UNTIL LOCKBOLT IS FIRMLY
HELD DOWN BY CAM IN
LOCKED POSITION
ARC OF
ADJUSTMENT
SPRING CAP
ADJUST ECCENTRIC ROLLER PIN SO
THAT SLIDING BLOCK IS EXACTLY
UNDER LOCKBOLT WHEN IN FULL
FORWARD POSITION

Fig. 21

4.14 Changing Feed Stroke

This is dealt with in the Operator's Handbook.

4.15 Changing fast motion approach stroke

Two alternative cams are available for 3.1/2in (88.9mm) and 5in(127mm) stroke. Changing involves the removal of the upper camshaft.

Auxiliary motions are available for the 3rd and 6th stations on the six spindle machines, see Operator's Handbook.

4.16 Centre block and longitudinal slides

The centre tool block, fitted with bushes and scraper rings, slides on the centre guide which indexes with the spindle drum. Torque loads are taken against guide faces in the beam by a guide block on top of the guide arm, adjustment for wear being provided by a gib strip. When adjusting the gib strip carefully check the adjustment throughout the travel as wear will tend to occur on the portion covered by short strokes. Access is through the covers on top of the beam, see fig. 4.20.

Oil is fed from drip points in the beam to a strainer on the guide block and down a pipe to the reservoir between the bushes in the centre tool block. Drain and filler plugs are provided for periodical draining and flushing out.

The centre tool block is pushed by a double link from the lower centre rack and no endwise adjustment is provided. The stop rod is provided to control length accuracy. Stop nuts should be slackened off well clear before adjusting slide strokes as the final position of the tool block is not constant for all strokes.

The faces and the tenon slots of the tool block are ground to close tolerances and standard toolholders and attachments may be fitted to any face without selection for height or centrality.

The longitudinal slides are mounted on vee guides fitted on the beam which are accurately adjusted for alignment and centrality by a tenon block secured to each end of the vee guide. Screws in the beam clamp the blocks to one side of a beam slot.

Tapered gib strips are provided and the headed screws at each end of the slide should be adjusted with the tool (573X108) supplied in the tool kit.

Each slide is pushed by a rod screwed into the pusher bar and is adjustable for position 3.1/2in(88.9mm) by means of nuts on the rod. A spacer between the nuts is slightly wider than the bracket on the slide to allow for slight misalignment of the pusher rod.

As with the centre tool block, stops should be well clear before adjusting strokes.

Notes

4.17 Cross Slide Operation Mechanism

The mechanism is situated in the drum housing and consists of a series of levers and pivoted links operating upon gear quadrants and racks to give the slides a two part motion of fast approach and withdrawal and a slow feed similar to the longitudinal slides.

The fast approach is by cam operated toggles, actuating two heavy "rocking" levers through a short arc. A cam on the main camshaft extends a toggle, swinging the front lever pivot on two stop screws in the drum housing floor. A second cam on the main camshaft imparts a similar motion to the rear rocking lever. Adjustment to the stop screws should only be required after a long period of service, fig. 4.22 illustrates and explains the adjustment.

Clamped into the tee slots on the rocking levers are adjustable link pivots with links extending to suitable levers on the cross slide operating shafts. An extension on each rocking lever carries a cam roller controlled by the feed motion cams on the main camshaft.

Figure 4.23 shows the adjustment provided for meshing the gear quadrants and racks on the lower cross slides.

All cross slides have independent feed stroke setting, adjustable by sliding the appropriate link pivot along the rocking lever tee slot to a setting indicated by a pointer on a scale. See also "Operating Adjustments" in the Operator's Handbook.

The upper cross slides have a double range of feed strokes, the "long" range being equal to twice the scale reading. The change-over is obtained by transferring the upper link pivot connection from the outer hole "B" to an inner hole "A" in the operating lever. It is necessary to remove a retaining circlip on the pivot pin and to restrain the slide spring load with a pressure on the top of the operating lever to withdraw the pin.

Changing intermediate cross slide feed stroke range

The changeover, as on the upper slides, is by transferring the link pivot from an outer hole "B" in the operating lever to an inner hole "A".

Access to the operating lever is by removing the screwed cover on the side of the drum housing.

Set the maximum stroke on the rocking lever scale and with the slides in the withdrawn position adjust the micrometer head to bring the slides to the maximum back position. A hexagon headed bolt clamps the link pivot to the operating lever, the bolt passing through the lever into the threaded pivot. Unscrew and withdraw the bolt and slide the link and pivot along a slot in the lever to the alternative hole setting. It is necessary to restrain the slide return spring with pressure on the operating lever or the end of the slide. Replace the clamp bolt and set the feed stroke and the slide position as required.

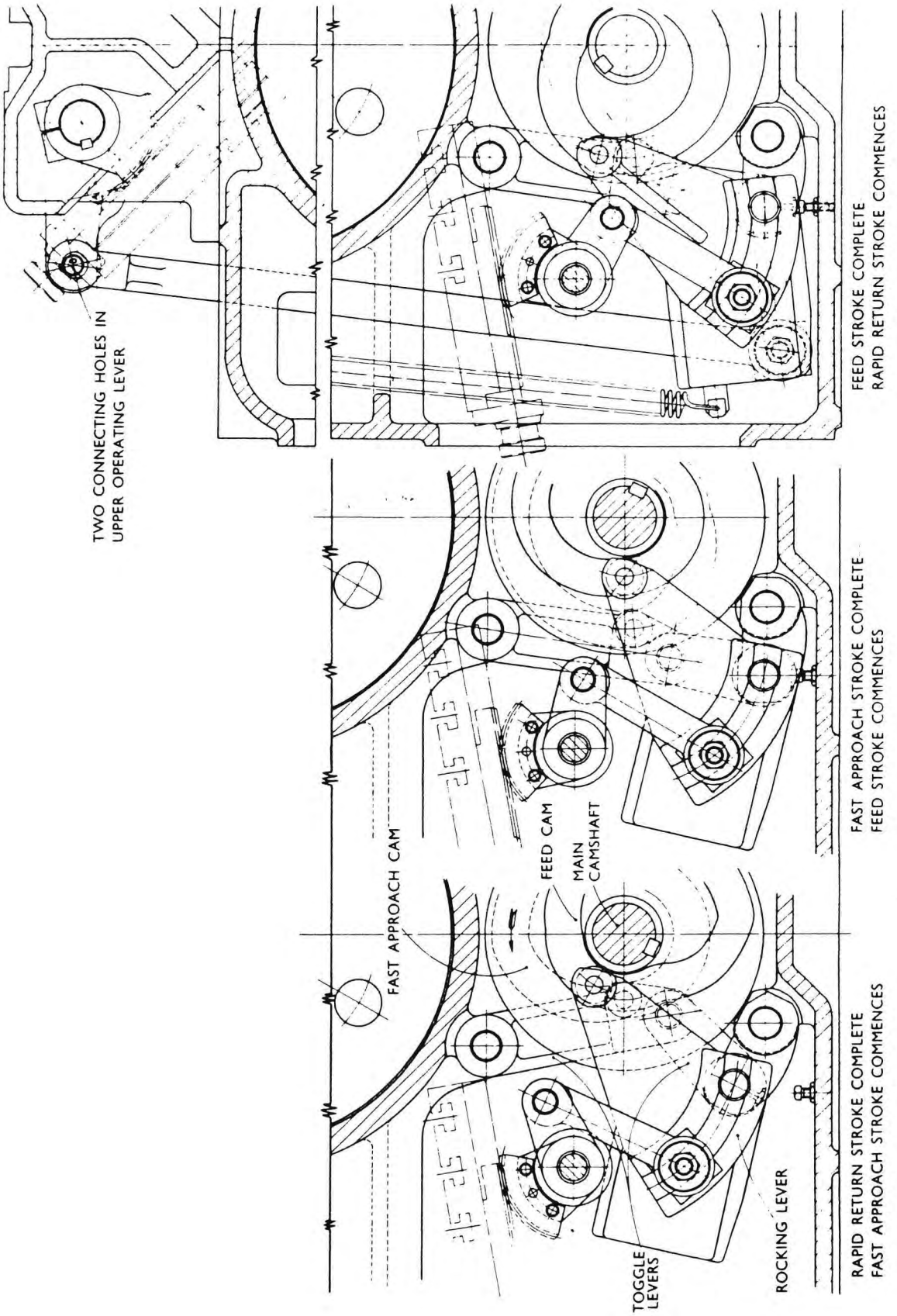

TWO CONNECTING HOLES IN UPPER OPERATING LEVER
FEED STROKE COMPLETE
RAPID RETURN STROKE COMMENCES
FAST APPROACH CAM
FEED CAM
MAIN CAMSHAFT
FAST APPROACH STROKE COMPLETE
FEED STROKE COMMENCES
TOGGLE LEVERS
ROCKING LEVER
RAPID RETURN STROKE COMPLETE
FAST APPROACH STROKE COMMENCES

Fig. 22

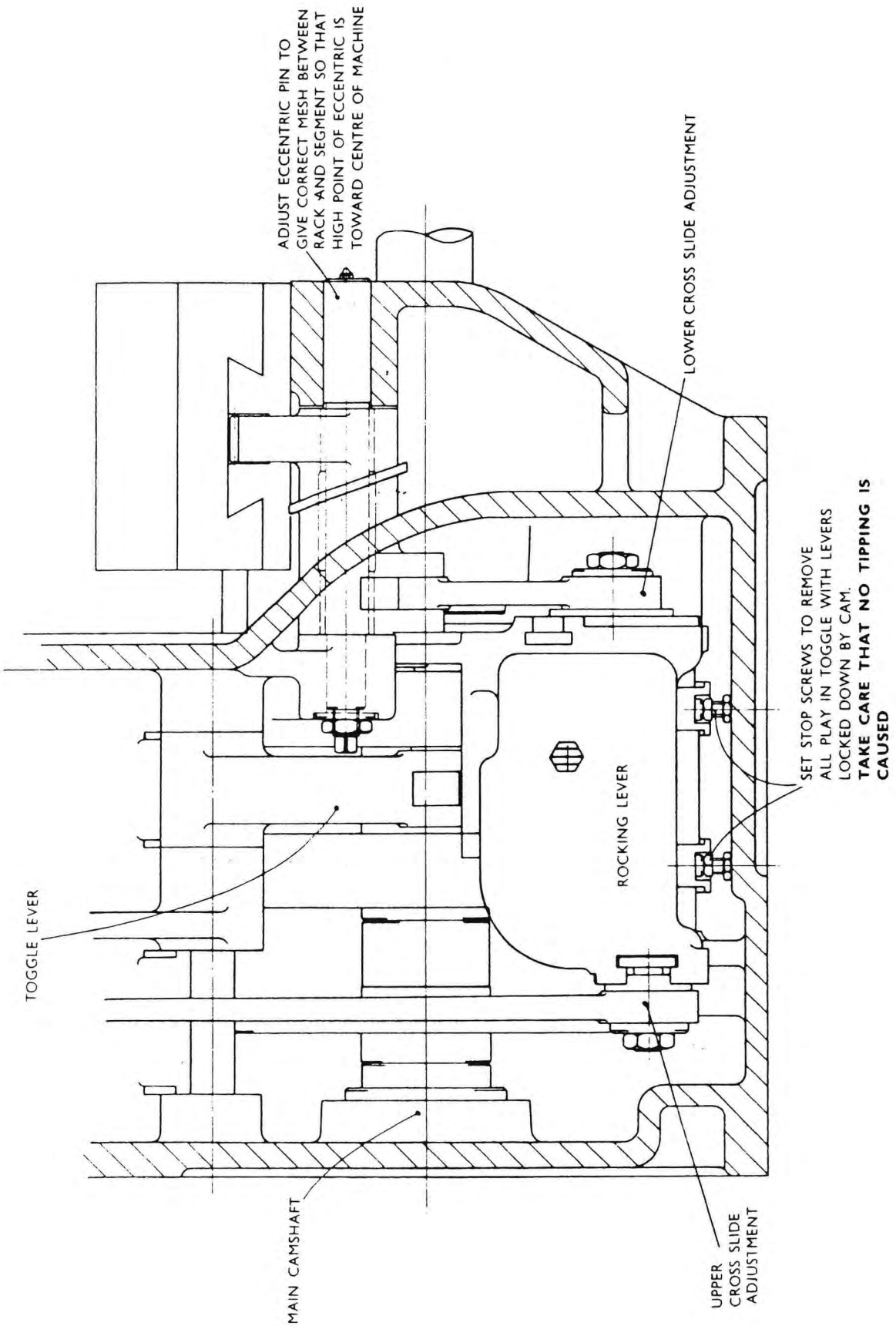

ADJUST ECCENTRIC PIN TO GIVE CORRECT MESH BETWEEN RACK AND SEGMENT SO THAT HIGH POINT OF ECCENTRIC IS TOWARD CENTRE OF MACHINE
LOWER CROSS SLIDE ADJUSTMENT
SET STOP SCREWS TO REMOVE ALL PLAY IN TOGGLE WITH LEVERS LOCKED DOWN BY CAM.
TAKE CARE THAT NO TIPPING IS CAUSED
ROCKING LEVER
TOGGLE LEVER
MAIN CAMSHAFT
UPPER CROSS SLIDE ADJUSTMENT

Fig. 23

Notes

4.18 Bar Stop and Operation on the 2.5/8"-6, 2.5/8"-6S and 3.1/4"-6

Operating adjustments are described in the "Operator's Handbook". The bar stop movement is derived from two cams on the main camshaft, operating on a lever fitted with two cam rollers. One cam and roller swings the bar stop into position and the other returns the bar stop after bar feeding. The lever is connected to an upper operating lever on the bar stop shaft by a spring box link, the bar stop shaft being carried on brackets between the housings. The mechanism is protected by a front and rear cover secured to the main drive housing attachment face. Normal operation swings the bar stop up from between the lower cross slides to the first station spindle centre, the upper operating lever contacting an adjustable stop and compresssing the spring box 1/8in (3.17m).

The bar stop can be arranged to swing over the first station slide by fitting the upper spring box pivot connection and operating lever on the opposite side of the bar stop shaft. The front cover should be removed, the adjustable stop in the support bracket released and withdrawn, and the lock-nut on the top of the spring box link unscrewed. The spring link can then be disconnected from the lever by turning the hexagon on the spring shaft at the top of the tube clockwise. This should detach the operating arm which together with the shaft, can be turned over and reconnected to the spring box. The bar stop and the bar stop arm should then be re-aligned to the spindle and the dead stop fitted in the location provided and adjusted to compress the spring box 1/8in (3.17mm). The bar stop is formed with a shaft end which is clamped in the bar stop arm. A square headed screw acts on the shaft end for fine adjustment.

Bar stop operation on the 2.5/8"-6 arranged for double bar feeding at stations 3 and 6:

Operating adjustments are described in the Operator's Handbook. The bar stop movement is derived from two cams on the main camshaft, operating on a lever fitted with two cam rollers. One cam and roller swings the two bar stops, one in station 3 and the other in staton 6, into position for bar feeding and the other returning the bar stops to their parking positions after bar feeding.

The lever is connected to two upper operating levers on the bar stop shafts with spring box links, the bar stop shafts being carried on brackets between the housings. The mechanism is protected by a front and rear cover secured to the main drive housing attachment face. The operation of the mechanism swings the bar stops and their bar stop brackets downwards over the 3rd and 6th slides to the 3rd and 6th spindle centres, the upper operating levers contacting adjustable stops and compressing the spring boxes 1/8in (3.17mm).

4.19 Feed brake Interlock and Bar Exhaustion Bar Feed Trip

See fig. 4.24.

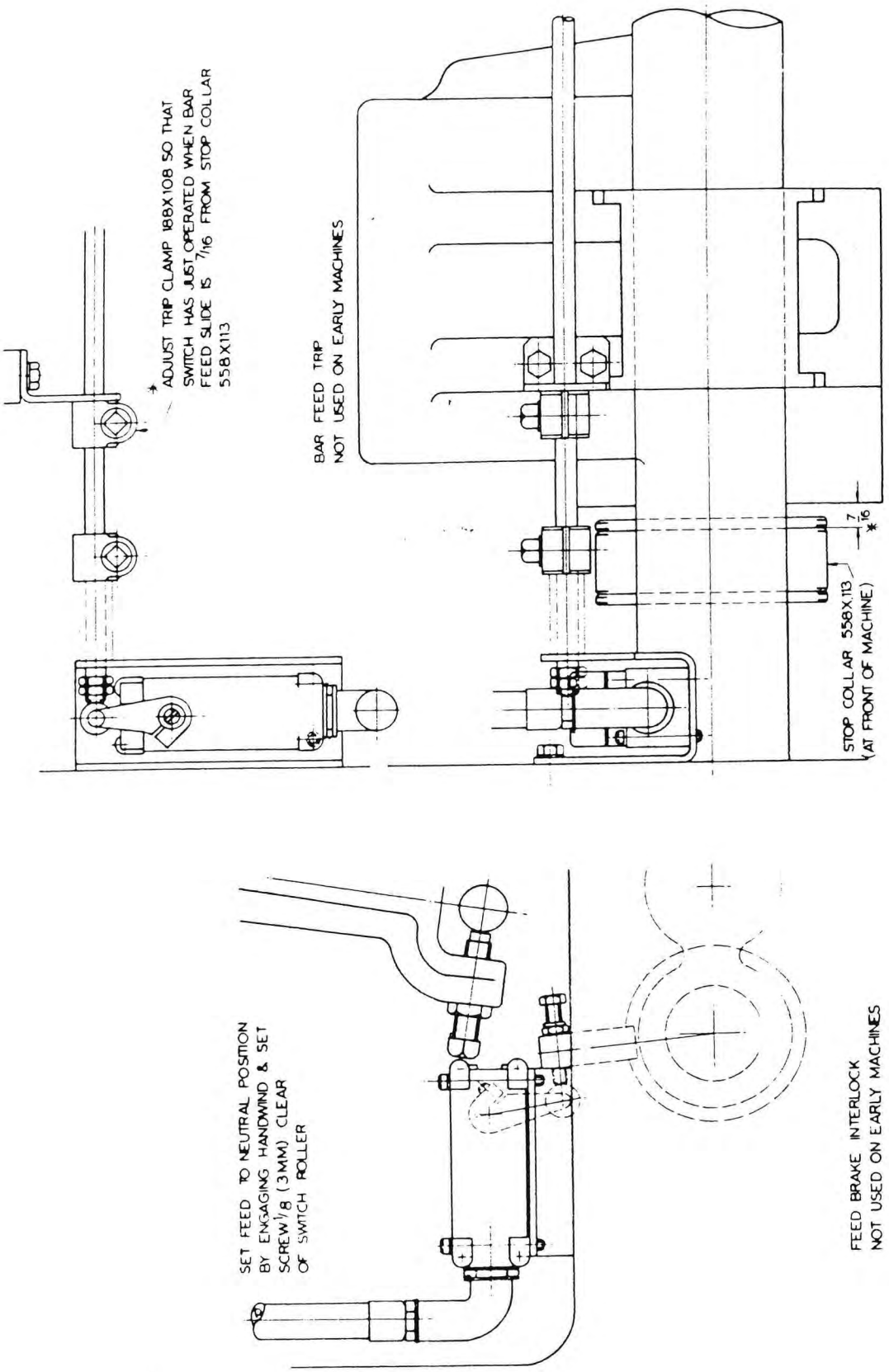

ADJUST TRIP CLAMP 188X108 SO THAT SWITCH HAS JUST OPERATED WHEN BAR FEED SLIDE IS 7/16 FROM STOP COLLAR 558X113
BAR FEED TRIP NOT USED ON EARLY MACHINES
STOP COLLAR 558X.113 (AT FRONT OF MACHINE)
7/16
SET FEED TO NEUTRAL POSITION BY ENGAGING HANDWIND & SET SCREW 1/8 (3MM) CLEAR OF SWITCH ROLLER
FEED BRAKE INTERLOCK NOT USED ON EARLY MACHINES

Fig. 24

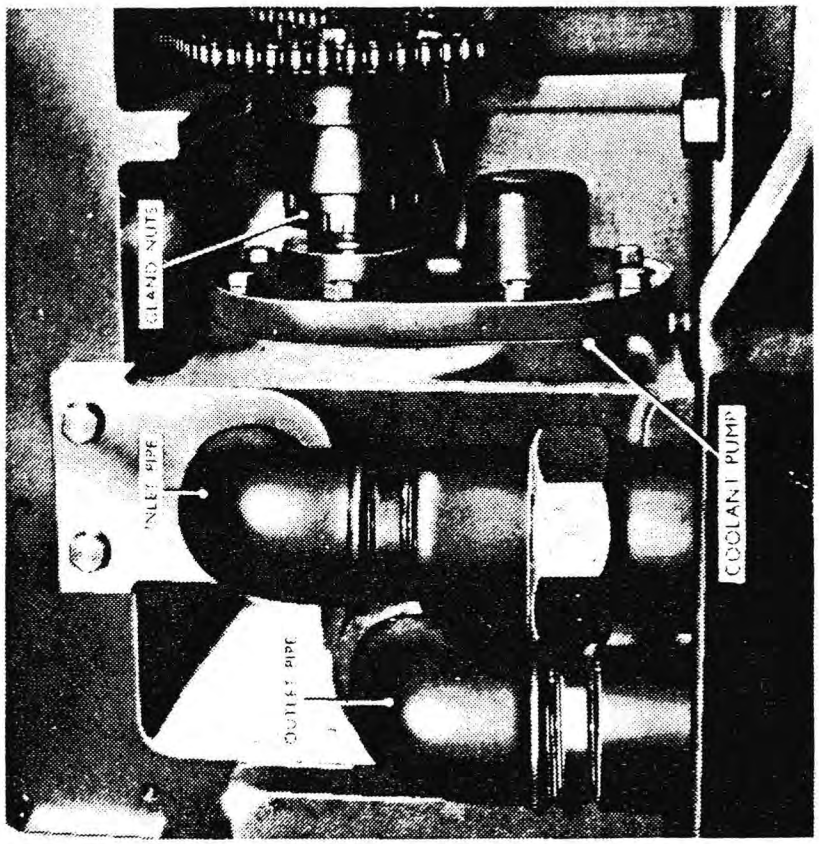
4.20 Coolant

The coolant is supplied from the machine tray by a gear pump, chain driven from the constant speed shaft. Chain adjustment is described at fig. 4.4. An adjustable gland is fitted to the driving shaft to prevent leakage and this should be adjusted as lightly as possible to prevent overheating and pump seizure. A relief valve is fitted in the pipe system to return excess coolant to the tray. Coolant taps are arranged adjacent to the lower cross slides and on headers on each side of the machine beam and additional plugged holes are provided in the headers.

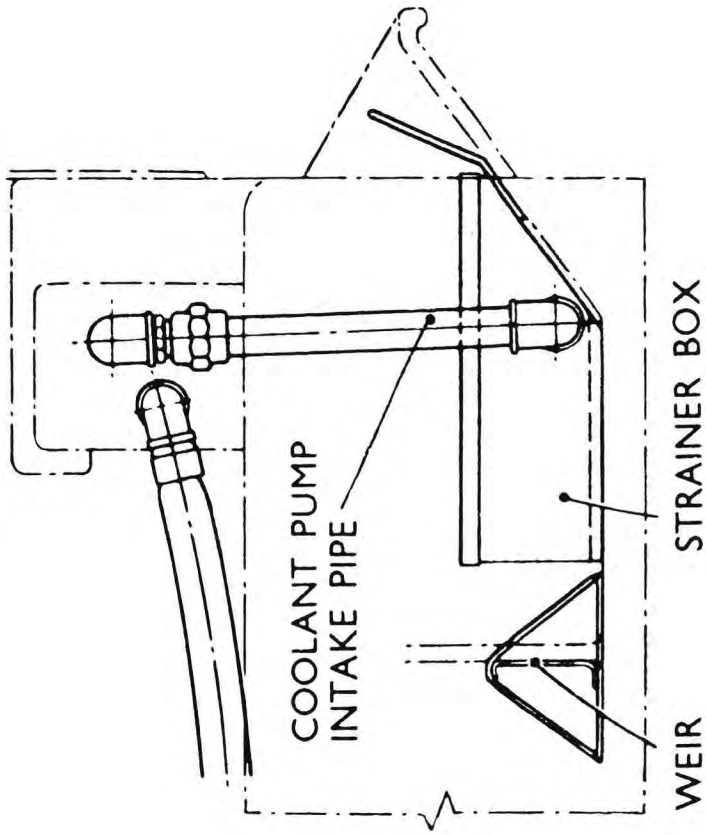
The chain drive should be removed when the machine is to be run without coolant in the machine tray.

The strainer box and weir must be in position at all times to prevent swarf entering the supply pipe. The strainer is fitted with a loose lid and should be inspected and cleaned at regular intervals, see fig. 4.25.

Machines constantly working on operations requiring oil fed cutting tools can be equipped to special order with an additional high pressure pump and a filtration system, either of the magnetic drum type or one of the centrifugal type dependent upon the material to be machined and the type of coolant to be used. For these systems, pipe work is installed to draw the supply from a strainer in the machine tray or from a separately piped supply. Filtration systems using proprietary items should be cleaned and serviced as directed by the maker's instructions.



Coolant Pump



Coolant Pump

Fig. 25

4.21 Stock Carriage

The two main parts, the stand and the tube assembly, are erected and aligned as described in the Operator's Handbook. The tube assembly has a central tube to which are secured two tube carriers to space and guide the stock tubes. The rear carrier is supported on rollers in the stock carriage stand.

At the machine end, the front carrier is gear driven during indexing by a pinion from the drum indexing mechanism and must be correctly meshed to the marks on the gears. The stock tubes are located by a by a flanged sleeve secured to each tube and clamped in pairs to the front carrier.

The tubes should be handled carefully; bent or distorted tubes will make it more difficult to slide the tubes through the carriers.

Convoluted spring linings to provide resilient support for the bar stock are not normally required, but are available in the following sizes to order:- 2.5/8"-6, 2.5/8"-6S and 2.5/8"-6DBF machines, up to including 2.5/8" diameter bar, and up to an including 1.1/2" diameter bar. Where supplied, springs should be kept well lubricated with soft grease. The 3.1/4-6 machines are fitted with steady bushes, carried in the end caps on the machine end of the stock tubes and retained by a latch fitted to the end cap. Bushes can be replaced by loosening a cap screw in the end of the cap and pivoting the latch out of a locating slot cut in the bush. The bush can then be withdrawn from the tube and a new bush fitted.

4.22 Swarf Conveyor

The swarf conveyor is fitted as an optional extra, but conduit and wiring is normally fitted to all machines, from the panel terminals to a junction box on the beam to simplify later installation. A conveyor unit supplied separately includes control buttons and contactor for panel mounting and conduit, wiring and a "Niphon" socket for installation to the machine.

The screw type conveyor is driven by a 1/4 h.p. motor and a reduction gear box, controlled by push buttons on the pendant control panel door.

A shear pin in the coupling adjacent to the motor gear box provides overload protection in addition to that provided by thermal trips in the motor starter. Spare silver steel shear pins are supplied in a container clipped to the side of the conveyor. Before replacing a shear pin, the cause of the overload should be found and removed. Holes are provided in the end of the conveyor screw so that it can be turned by hand.

Steel chutes are fitted in the tray between the housings to guide the swarf into the conveyor. When the conveyor is fitted the coolant intake pipe extends to the drum housing end of the machine, as illustrated on fig. 4.26. The main overflow of coolant is discharged into a basket under the main drive housing collecting the fine particles of swarf held in suspension in the coolant. The basket is accessible from the end of the machine and should be emptied at regular intervals.

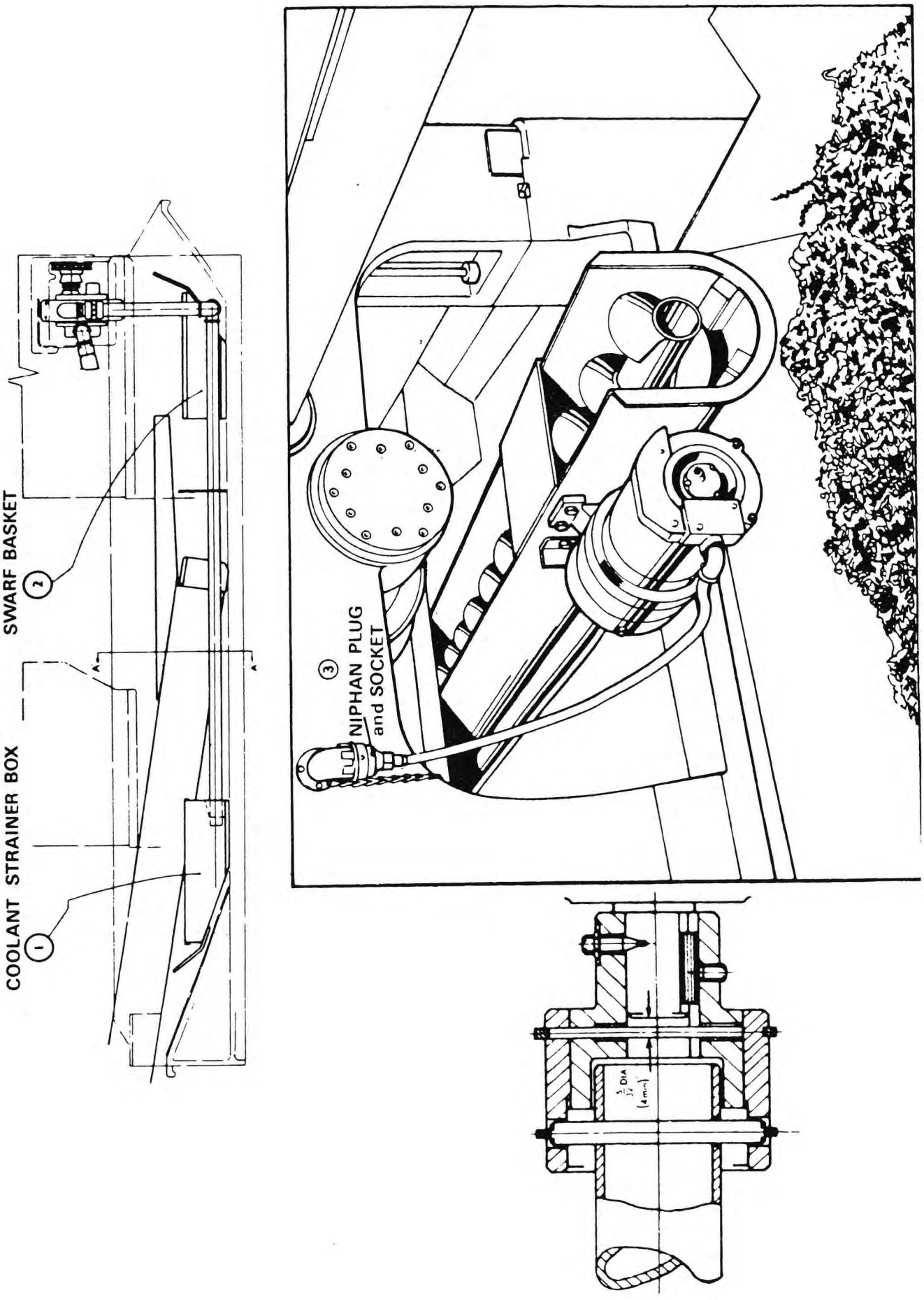

SWARF BASKET
2
COOLANT STRAINER BOX
1
3
NIPHAN PLUG
and SOCKET
3/32 DIA
(4mm)

Fig. 26

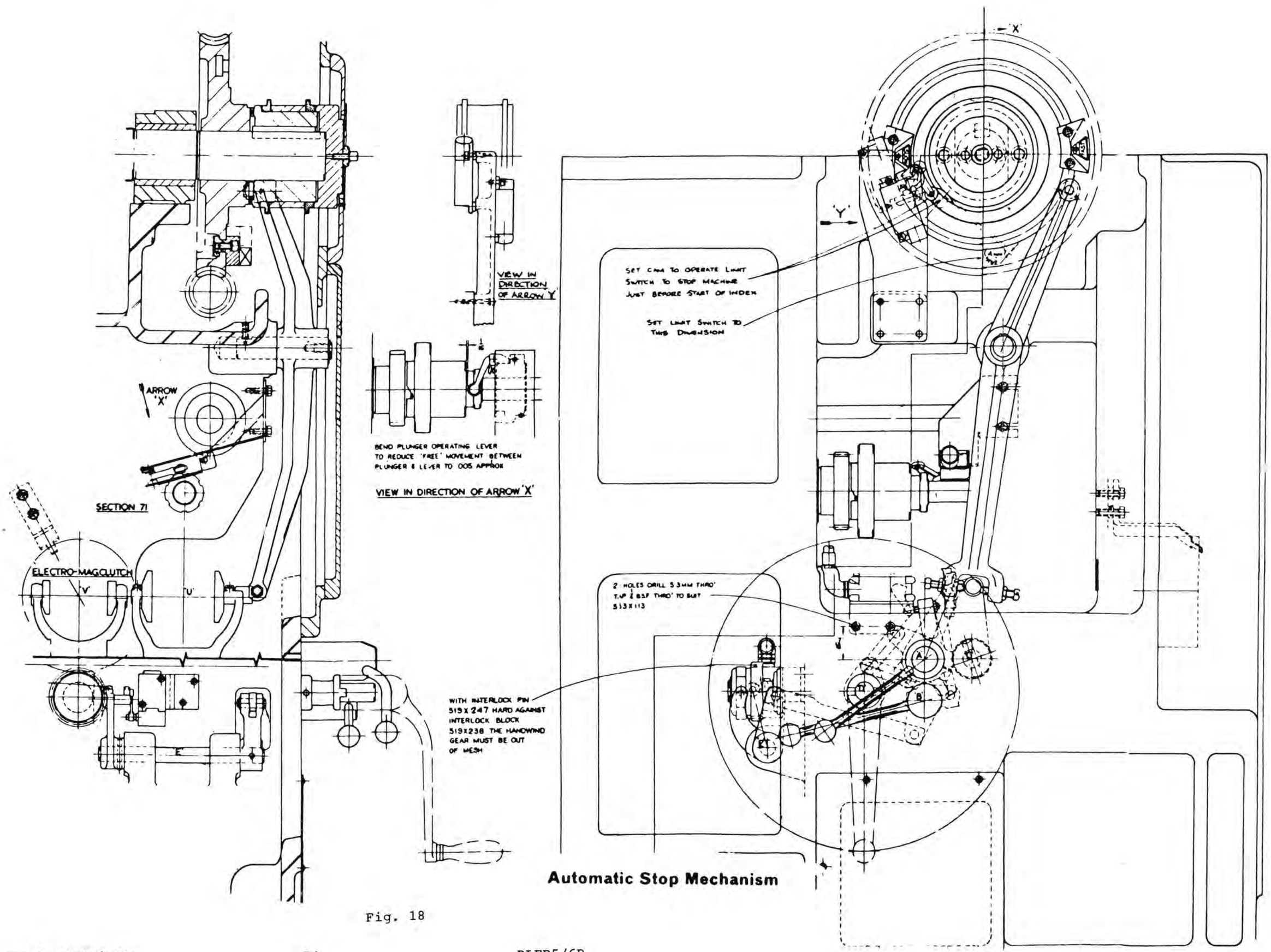
Notes

SPINDLES

2⅝"-6 SPINDLE BAR MACHINE

INDEX NO.	PART NO.	TITLE.
1	501X.135	Nut.
2	DS.129	Feed Tube Steady Bush.
3	501Y.132	Sleeve for Feed Tube.
4	501X.152	Retaining Nut.
5	501X.157	Locknut.
6	501X.133	Adjusting Washer.
7	212/04	¼" B.S.F. Autolub Grease Nipple.
8	210/1725	Indicator Washer for ¼" dia.
9	501X.129A.	Plunger.
10	125/1012	5/32" dia. Taper Pin, ¾" long.
11	501X.125	Spring for Plunger.
12	501X.107A	Roller for Toggle.
13	501X.106	Pin for Toggle Roller.
14	501Y.112A	Gear on Work Spindle.
15	501X.163	Key.
16	501X.121A.	Clamping Disc.
17	501Y.136A	Centre Driving Gear.
18	501X.158A	Key.
19	501X.128A.	Key.
20	501X.105	Pin for Toggle.
21	155/0508	5/16" B.S.F. Socket Cap Screw, ½" long.
22	154/05	Spring Washer for 5/16" Cap Screw.
23	501X.150A	Retaining Screw.
24	154/06	Spring Washer for ⅜" Cap Screw.
25	501X.140A.	Cover Plate.
26	155/0512	5/16" B.S.F. Socket Cap Screw, ¾" long.
27	154/05	Spring Washer for 5/16" Cap Screw.
28	501Y.109	Index Gear on Spindle Drum.
29	155/0724	7/16" B.S.F. Socket Cap Screw, 1½" long.
30	154/07	Spring Washer for 7/16" Cap Screw.
31	176/0506	5/16" B.S.F. Socket Set Screw, Cup Point, ⅜" long.
32	153/05	Soft Pad for ⅝" B.S.F. Set Screw.
33	150/36	Slotted Locknut 2¼" × 22 T.P.I.
34	501X.141A	Stud.
35	173/05	5/16" B.S.F. Hexagon Nut.
36	130/05	Standard 5/16" Washer.
37	501X.139A	End Cap
38	155/0512	5/16" B.S.F. Socket Cap Screw, ¾" long.
39	154/05	Spring Washer for 5/16" Cap Screw.
40	517X.181A	Key
41	257/60	Medium Ball Journal, 60 × 130 × 31 mm
42	501X.138A	Adjustable Spacer.
43	501X.137A	Binding Plate.
44	155/0620	⅜" B.S.F. Socket Cap Screw, 1¼" long.
45	154/06	Spring Washer for ⅜" Cap Screw.
46	501Z.101A	Spindle Drum.
47	501X.146A	Locator Strip.
48	155/0614	⅜" B.S.F. Socket Cap Screw, ⅞" long.
49	154/05	Spring Washer for ¼" Cap Screw.
50	501Y.134A	Drum Thrust and Stop Ring.
51	155/0832	½" B.S.F. Socket Cap Screw, 2" long.
52	154/08	Spring Washer for ½" Cap Screw.
53	517Z.128A	Centre Shaft.
54	501Y.108B	Centre Guide
55	194/1	⅛" B.S.P. Socket Pipe Plug
56	501Z.102A	Work Spindle.
57	154/06	Spring Washer for ⅜" Cap Screw.
58	155/0632	⅜" B.S.F. Socket Cap Screw, 2" long.
59	—	Feed Finger.
60	—	Collet.
61	501X.147A	Spindle Nose.
62	501X.148A	Driving Key.
63	501Y.114A	Binding Cap.
64	154/08	Spring Washer for ½" Cap Screw.
65	155/0832	½" B.S.F. Socket Cap Screw, 2" long.
66	501X.116A	Labyrinth.
67	501X.159A	Spacer.
68	501X.117B	Front Bearing Spacer.
69	124/0408	Silver Steel Pin, ¼" dia., ½" long.
70	—	A.W. 4750 Precision 3, British Timken 4.750 bore 6.5625 o.dia., 1.438 long.
71	501X.118A	Outer Spacer, Front Bearing.
72	501X.119A	Spacer.
73	501X.145A	Tab Washer.
74	501V.144B.	Binding Nut.
75	153/08	Soft Pad for ½" B.S.F. Set Screw.
76	176/0810	½" B.S.F. Socket Set Screw, Cup Point, ⅝" long.
77	501X.155	Feed Tube.
78	501X.154A.	Collet Tube.
79	102/51P.	Internal Circlip for 6¼" bore (Parallel).
80	511X.172A.	Lubricant Guide Bush.
81	501X.120C.	Rear Bearing Spacer (Outer).
82	501X.123A.	Rear Bearing Spacer (Inner).
83	278/4½ E.P.	Extra Light Roller Journal, 4½" × 6¼" × ⅞", to precision limits.
84	155/0414	¼" B.S.F. Socket Cap Screw, ⅞" long.
85	154/04	Spring Washer for ¼" Cap Screw.
86	—	Hardened Steel Roller, ¾" dia. ¾" long.
87	178/0728	7/16" B.S.F. Socket Set Screw, Half-dog, 1¾" long.
88	173/07L	7/16" B.S.F. Hexagon Locknut.
89	501X.142A	Locknut.
90	501X.143A	Tab Washer.
91	501X.113A	Pressure Plate.
92	501X.104A	Toggle.
93	501Y.111A	Toggle Operating Sleeve.
94	501Y.110A	Toggle Carrier.
95	501X.161A	Spacing Washer.
96	501X.122A	Collet Compensating Washer.
97	501Y.127A	Plunger Housing.
98	501X.165	Tab Washer.
99	501X.126A	Adjusting Sleeve.
100	501X.130A	Support Bush.
101	153/05	Soft Pad for 5/16" B.S.F. Set Screw, ⅛" long.
102	176/0506	5/16" B.S.F. Socket Set Screw, Cup Point, ⅜" long.
103	284/4	Extra Light Thrust Bearing, 4" bore, 5¼" o.d., ⅞" wide.
104	501X.131	Bearing Housing.

(Drawing No. 501 Z 1A)



Automatic Stop Mechanism

Fig. 18

Notes

4.12 Upper Camshaft

The upper camshaft is transversely mounted across the top of the main drive housing. It carries disc cams which operate the centre tool block and the longitudinal slides. Cam carriers are also fitted for cams to operate the 3rd and 6th station longitudinal motions on the six spindle machines.

The cam dogs controlling the fast motion clutch are mounted in a circular tee slot machined in the face of the worm-wheel; a timing dial is provided at the front and rear ends of the upper camshaft.

The worm-wheel drives the upper camshaft through serrations on the face of the wormwheel and a serrated plate engaging a tenon slot in the upper camshaft. By releasing the centre screw and the two outer screws this serrated plate may be disengaged from the worm-wheel. By hand winding the machine, the lower camshaft and the upper worm-wheel may be turned while the upper camshaft remains stationary, thus enabling the timing of the main camshaft and the upper camshaft to be altered or corrected as required. It is vitally important that the serrations engage properly and that the screws are fully tightened after altering the timing.

A vee groove is cut across the periphery of the cam discs and is vertically above the centre of the camshaft at 0 degree timing angle. See figs. 4.17 and 4.18.

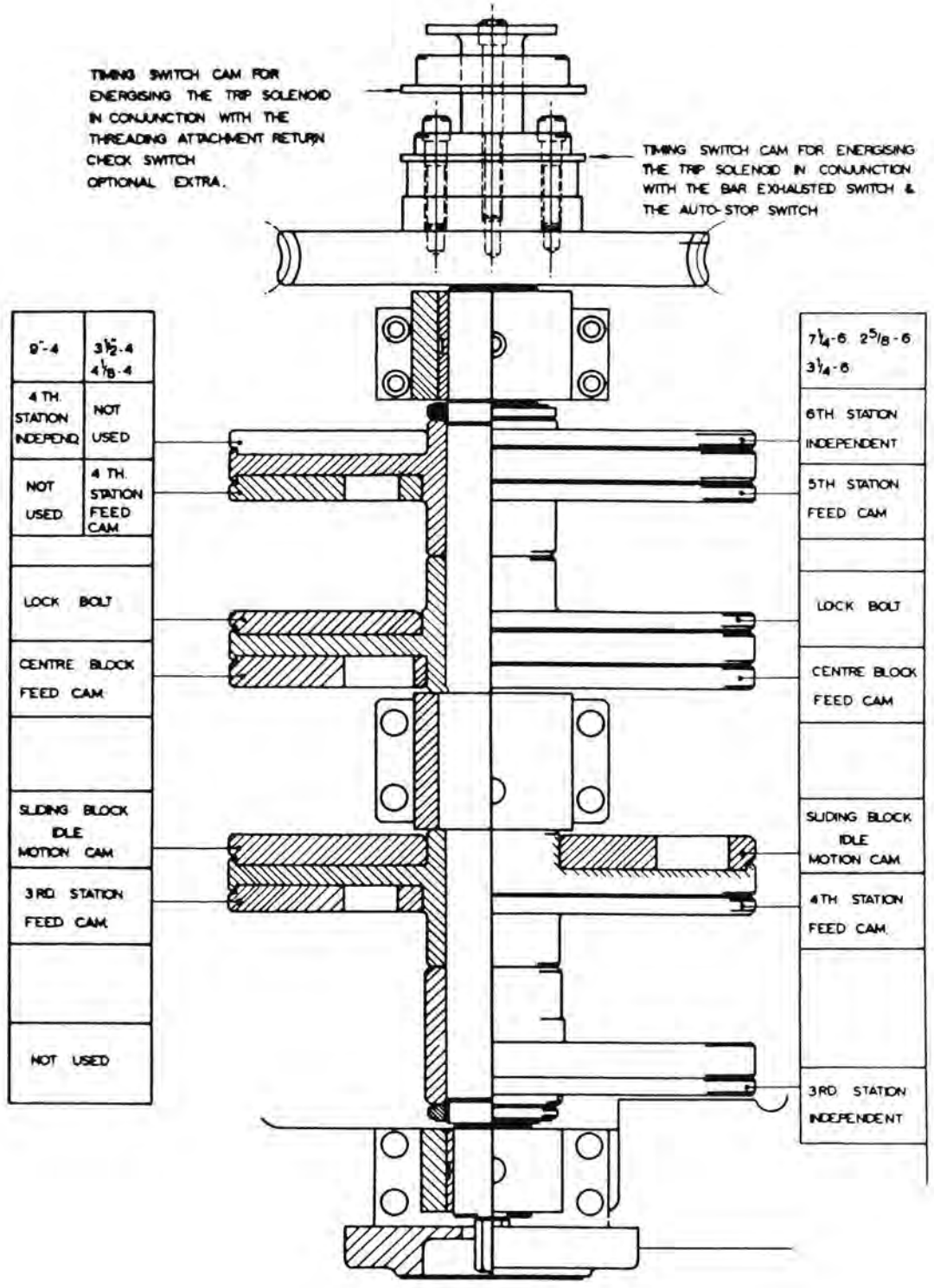
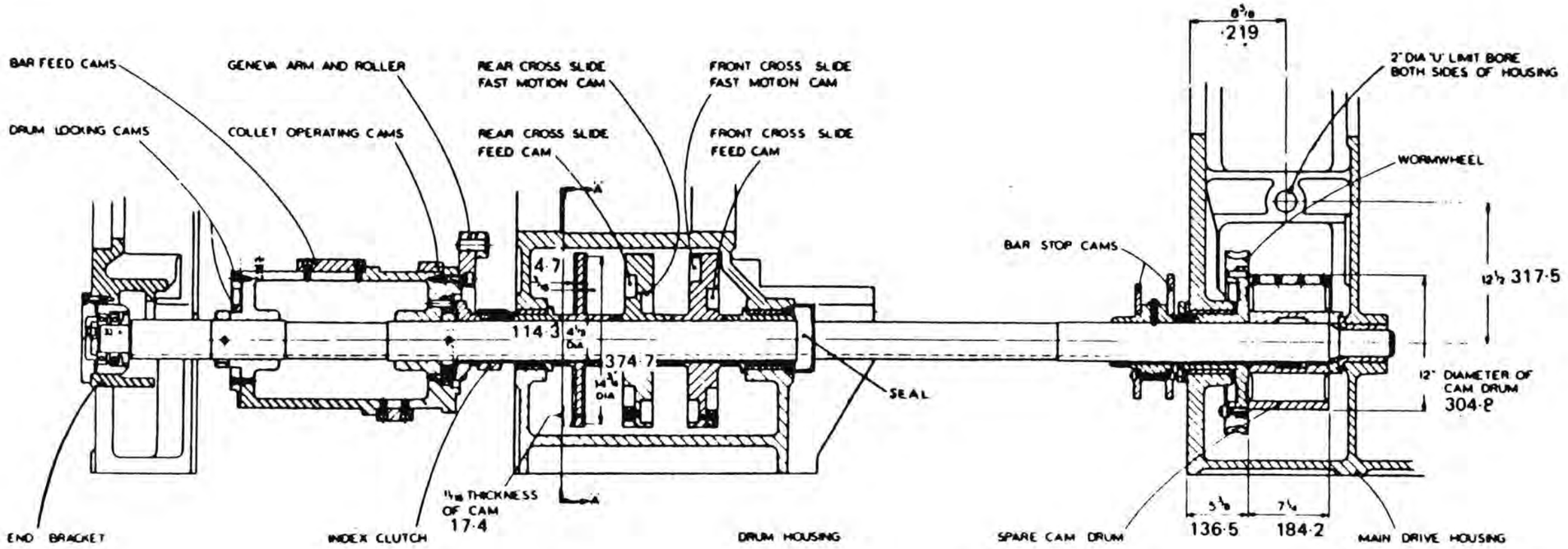

TIMING SWITCH CAM FOR ENERGISING THE TRIP SOLENOID IN CONJUNCTION WITH THE THREADING ATTACHMENT RETURN CHECK SWITCH OPTIONAL EXTRA.
TIMING SWITCH CAM FOR ENERGISING THE TRIP SOLENOID IN CONJUNCTION WITH THE BAR EXHAUSTED SWITCH & THE AUTO-STOP SWITCH
9"-4
3½"-4 4⅛-4
4 TH. STATION INDEPEND.
NOT USED
NOT USED
4 TH. STATION FEED CAM
LOCK BOLT
CENTRE BLOCK FEED CAM
SLIDING BLOCK IDLE MOTION CAM
3RD. STATION FEED CAM.
NOT USED
7¼-6 2⅝-6 3¼-6
6TH. STATION INDEPENDENT
5TH STATION FEED CAM
LOCK BOLT
CENTRE BLOCK FEED CAM
SLIDING BLOCK IDLE MOTION CAM
4TH STATION FEED CAM.
3RD. STATION INDEPENDENT

Fig. 17



2⅜-6, 3¼-6	UPPER FRONT	STN 5 SEC 503B
	REAR	STN 4 SEC 503A
3½-4, 4⅛-4	UPPER FRONT	STN 4 SEC 503B
	REAR	STN 3 SEC 503A

HOLE POSITION	RATIO OF CROSS SLIDE STROKE TO CAM MOVEMENT ADJUSTABLE FROM-
A	·975 TO 1·3
B	·487 TO ·65

RADIUS 'R' MAX 6¼ MIN 3⅛" 3⅛" CAM MOVEMENT

BEFORE M/C INSP N°

2⅜-6, 3¼-6	INTER FRONT	STN 6 SEC 503C
	INTER REAR	STN 3 SEC 503

HOLE POSITION	RATIO OF CROSS SLIDE STROKE TO CAM MOVEMENT ADJUSTABLE FROM-
A	·65 TO ·81
B	·4 TO ·55

RADIUS 'R' POSITION 'B' MAX 6¼ MIN 3⅛ (3⅛ CAM MOVEMENT) POSITION A MAX 6¼ MIN 3 13/16 (2 7/16 CAM MOVEMENT)

BEFORE M/C INSP N°

RATIO OF INTERMEDIATE CROSS SLIDE STROKE TO CAM MOVEMENT ADJUSTABLE FROM 1·0 TO 1·325

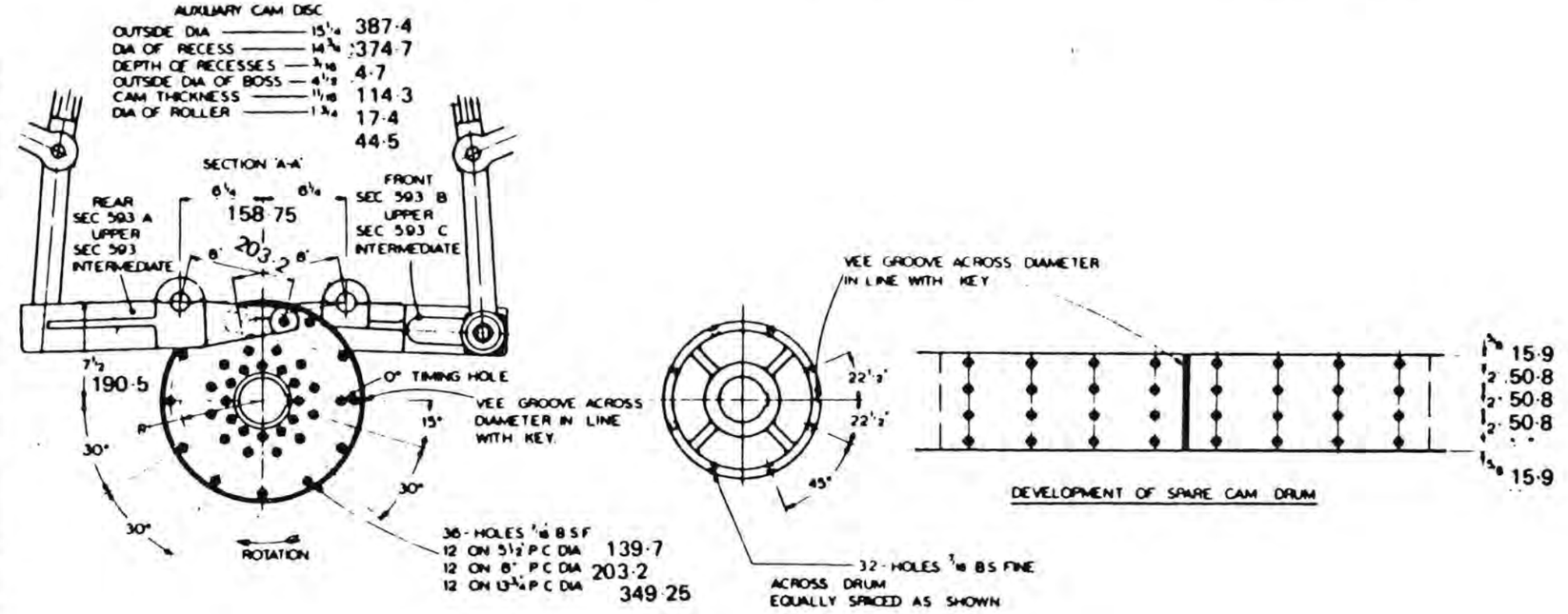
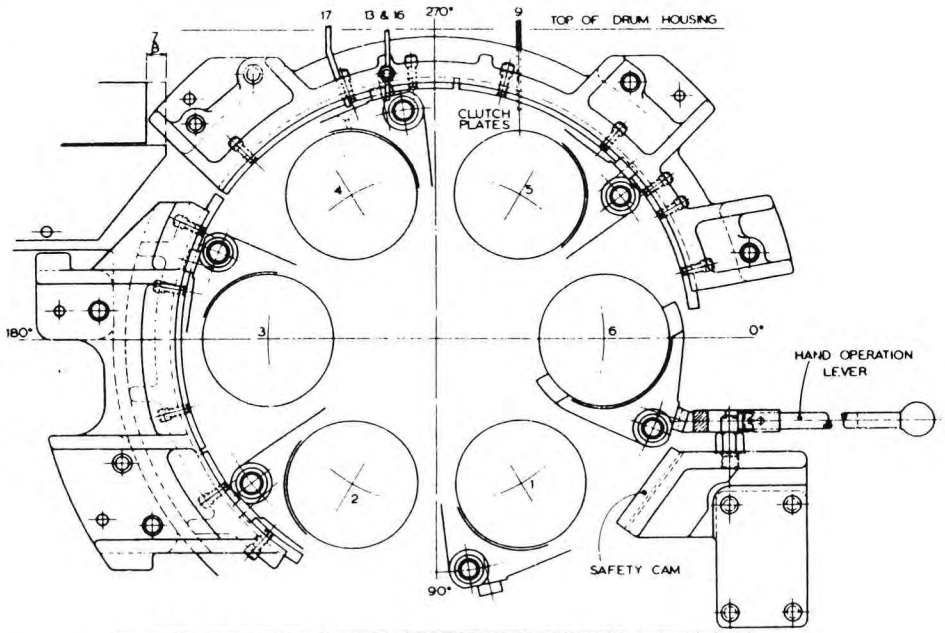


Fig. 16



SPINDLE TO STOP & REMAIN STOPPED IN STATION	CAMS REQUIRED	DEVELOPMENT LETTER	CAM CARRIER (S) REQUIRED
2	502 X 230 (2 OFF)	A	502 Y 247
3	502 X 230 (2 OFF)	C	502Y226 502Y247
4	502 X 230 (2 OFF)	B	502 Y 226
5	502 X 230 (2 OFF)	D	502 Y 226
2,3	502X230, 502X231, & 502X235	E	502 Y 226 & 502 Y 247
2,3,4	502X230, 502X231, 502X233, & 502X235	F	
2,3,4,5	502X230, 502X231, 502X233(2OFF)502X235	G	
3,4	502X230, 502X231 & 502 X 235	H	
3,4,5	502X230, 502X231, 502X233& 502X235	J	
4,5	502X230, 502X231 & 502 X 235	K	502 Y 226

CAM CARRIER 502Y226 SUPPLIED AS STANDARD.
CAM CARRIER 502Y247 SUPPLIED TO SPECIAL ORDER.

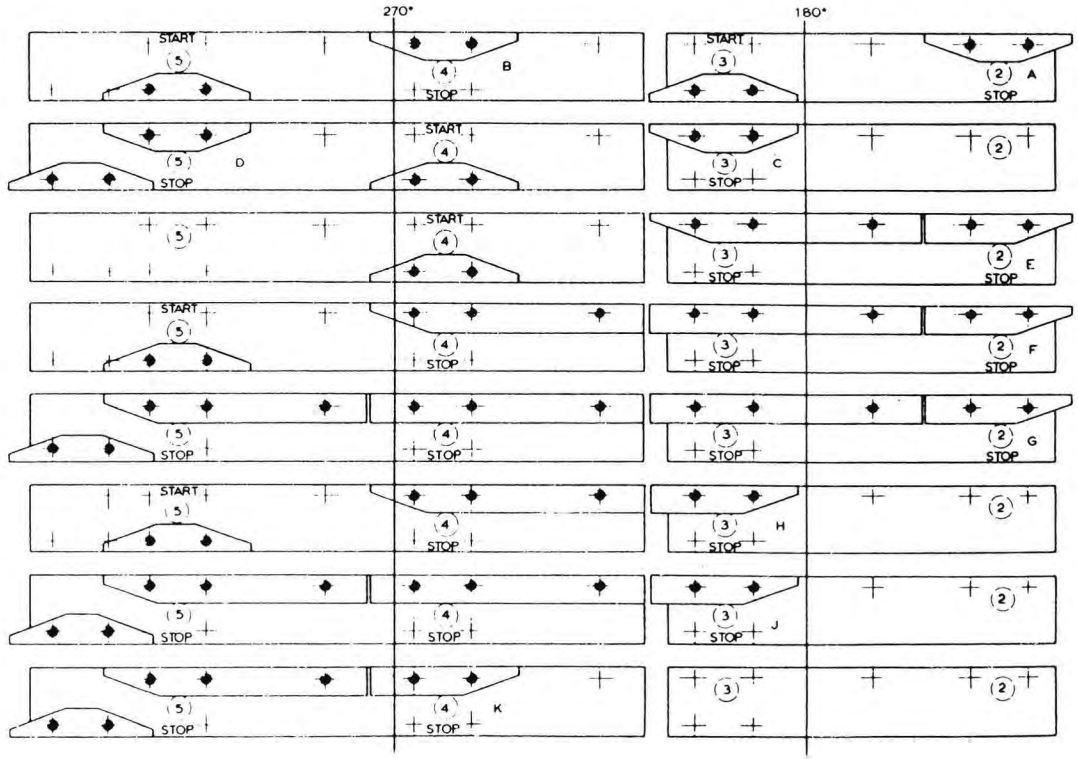


Fig. 4.8

4.7 Collet Operation and Bar Feed (2.5/8-6 and 2.5/8-6S only)

After the workpiece is cut off in 6th station the machine is indexed to the 1st station, the collet opened, bar stock fed out to the bar stop and the collet closed just before the advancing tools start cutting; see timing diagram fig. 5.6.2 in the 'Operator's Handbook'.

The collet operation mechanism consists of a cam operated slide moving on two round guide bars mounted between the drum housing and the end bracket.

A bonded fabric shoe carried in a slot in the slide engages in a groove in the collet sleeve on the work spindle. It is spring loaded so that if a collet sleeve indexes out of position the shoe will be depressed and rendered inoperative.

The collet slide is operated by a roller and barrel cam direct from the main camshaft and can be disengaged by loosening a pad bolt and pulling the roller carrier outwards clear of the cams, see sheet 6.20. Adjustable nuts carried on a rod provide a stop for the operating slide and enable the mechanism to close the collets to a constant position, with either hand or cam operation. Fig.4.9 shows the correct adjustment for these nuts.

The bar feed mechanism is spring operated and controlled by a barrel cam on the main camshaft. The slide is mounted, as the collet operation slide, on the two guide bars and carries an aligning ring and a spring loaded shoe. The aligning ring encircles all the bar feed tubes and in the 1st station restrains the feed tube bobbin between the ring and the spring loaded shoe. The spring loaded motion of the slide and the shoe feeds the bar feed tube and the bar through the collet tube to the bar stop. On the return cam stroke the aligning ring returns the feed tube to a "ready to be fed" position and holds it there, together with the other bar feed tubes. Any endwise movement of the tubes is limited by the aligning ring and the adjustable centre stop, carried on a shaft extension on the stock carriage and centrally placed between all the spindles, see fig.4.9.

Two cams are needed to cover the bar feed stoke range; a 1/2in to 5in (12.7 to 127mm) cam is supplied as standard and a 5in to 10in (127 to 254mm) cam, 544Y106B is available to order.

For the 2.5/8"-6S machines only, two cams are available. The cam supplied as standard covers a range of 1/2in to 5in(12.7 to 127mm) and a 1.1/4in to 6.1/4in (32 to 159mm) cam, 502V258 is available to order.

Collet tension and bar feed stoke adjustment is described under operating adjustments, in the 'Operator's Handbook'.

The machines are fitted with a limit switch operated by a rod and an adjustable clamp from the bar feed side. The function and the setting of this mechanism is covered under Auto-Stop Mechanism. See fig. 4.18.

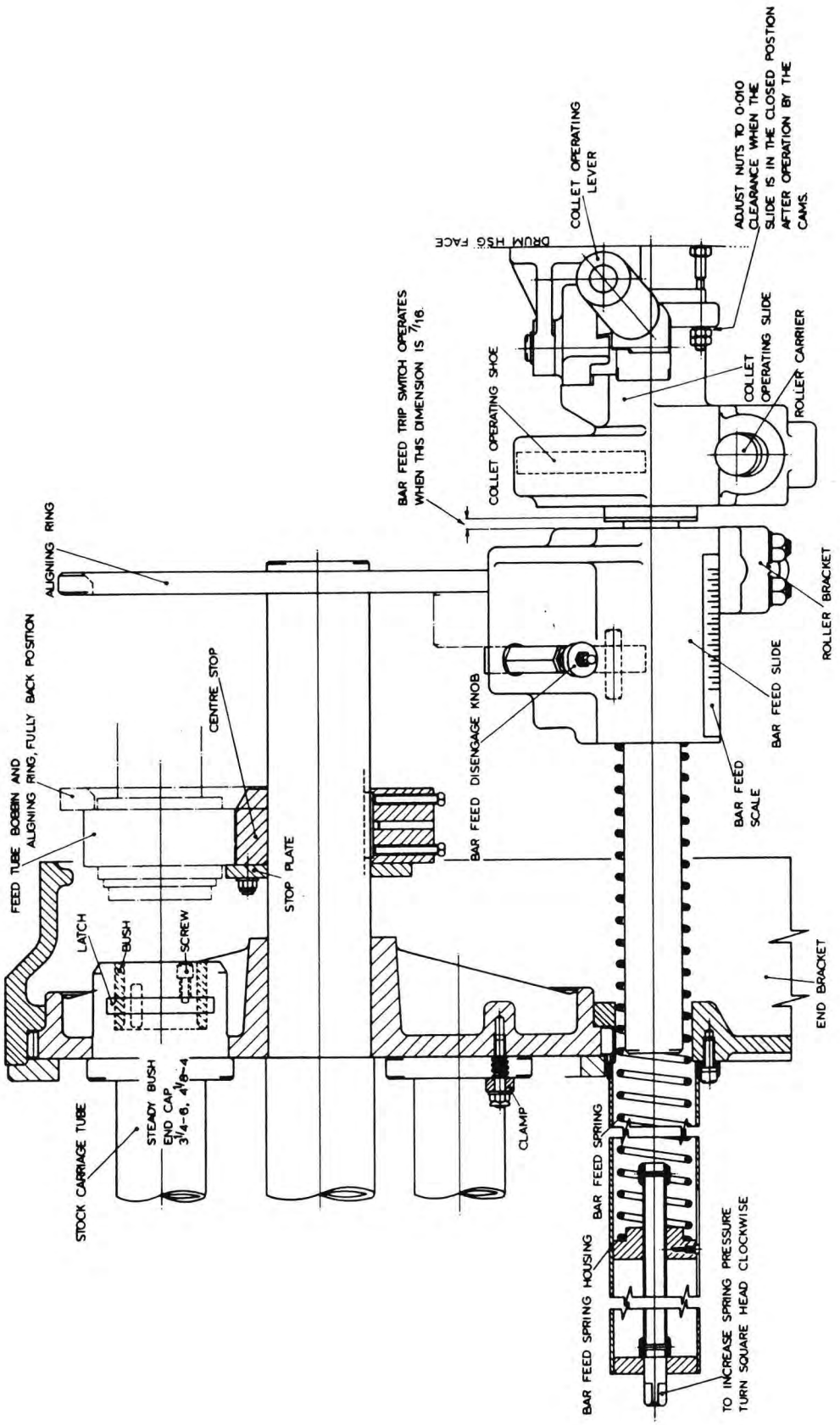

ADJUST NUTS TO 0·010 CLEARANCE WHEN THE SLIDE IS IN THE CLOSED POSTION AFTER OPERATION BY THE CAMS.
COLLET OPERATING LEVER
DRUM HSG FACE
BAR FEED TRIP SWITCH OPERATES WHEN THIS DIMENSION IS 7/16
COLLET OPERATING SHOE
COLLET OPERATING SLIDE
ROLLER CARRIER
ALIGNING RING
ROLLER BRACKET
BAR FEED SLIDE
BAR FEED DISENGAGE KNOB
BAR FEED SCALE
BAR
FEED TUBE BOBBIN AND ALIGNING RING, FULLY BACK POSITION
CENTRE STOP
STOP PLATE
LATCH
BUSH
SCREW
END BRACKET
STEADY BUSH
END CAP 3/4-6, 4/6-4
CLAMP
STOCK CARRIAGE TUBE
BAR FEED SPRING
BAR FEED SPRING HOUSING
TO INCREASE SPRING PRESSURE TURN SQUARE HEAD CLOCKWISE

Fig. 4.9

4.8 Collet Operation and Bar Feed on 2.5/8"-6 DBF Machines

The double bar feed machine has the facility to open the collet, feed bar stock out to the bar stop and close the collet in stations 3 and 7 or either in station 3 or 6. The machine timing differs to the standard 2.5/8"-6 single bar feed machine because of the double bar feed facility. Collet opening, bar feeding and collet closing takes place during the fast motion return of all the tool slides prior to indexing, see timing diagram in the 'Operator's Handbook'.

The collet operation mechanism consists of a cam operated slide moving on two round guide bars mounted between the drum housing and the end bracket.

The collet slide is operated by a roller and barrel cam direct from the main camshaft and can be disengaged by loosening a pad bolt and pulling the roller carrier outwards clear of the cams, see fig.4.10. Adustable nuts carried on a rod provide a stop for the operating slide and enable the mechanism to close the collets to a constant position, with either hand or cam operation. Fig. 4.10 shows the correct adjustment for these nuts.

Bonded fabric shoes carried in slots in the slide arm extensions engage in a groove in the collet operating sleeve on the workspindles at stations 3 and 6. The shoes are spring loaded so that if a collet operating sleeve indexes out of position the shoe/shoes will be depressed and rendered inoperative.

The bar feed mechanism is spring operated and controlled by a barrel cam on the main camshaft. The slide is mounted, as the collet operation slide, on two guide bars and carries an aligning ring and the two spring loaded shoes. The aligning ring encircles all the bar feed tubes and in the 3rd and 6th stations restrains the feed tube bobbins between the ring and the spring loaded shoes. The spring loaded motion of the slide and the shoes feed the bar feed tubes and the bars through the collet tubes to the bar stops in stations 3 and 6. On the return cam stroke the aligning ring returns the feed tubes to a "ready to be fed" position and holds them there, together with the other bar feed tubes. Any endwise movement of the tubes is limited by the aligning ring and the adjustable centre stop, carried on a shaft extension on the stock carriage and centrally spaced between all the spindles.

The bar feed cam has a bar feed stroke range of 1/2in to 5in (12 to 127mm).

Collet tension and bar feed stroke adjustment is described under operating adjustments, found in the 'Operator's Handbook'.

All machines are fitted with a bar exhaustion system. The function and setting of these systems are covered under Auto-Stop Mechanism. See fig. 4.18.

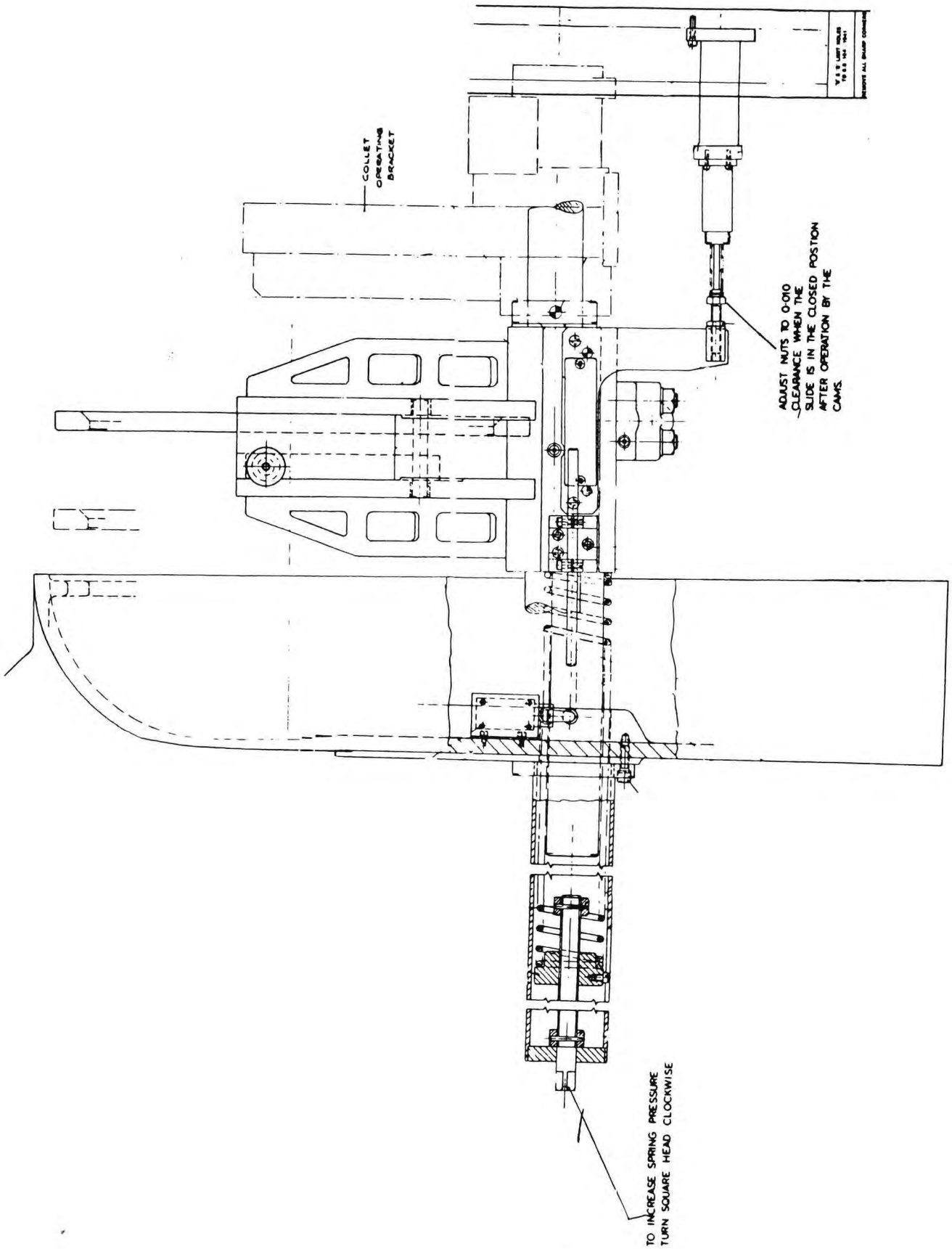

COLLET
OPERATING
BRACKET
ADJUST NUTS TO 0·010
CLEARANCE WHEN THE
SLIDE IS IN THE CLOSED POSTION
AFTER OPERATION BY THE
CAMS.
TO INCREASE SPRING PRESSURE
TURN SQUARE HEAD CLOCKWISE

Fig. 4.10

4.9 Indexing and Drum Locking

The spindle drum is indexed anti-clockwise (looking on the collets) by gearing from the Geneva wheel. The Geneva gear meshes direct with the drum gear. The mechanism is mounted at the rear of the machine on the bar feed end of the drum housing, and is shown diagrammatically on fig. 4.1. The four slot Geneva wheel and gear is driven by the passage through one of the slots of a roller carried on an arm mounted on the bar feed cam drum. During each fast motion cycle the drum is unlocked and indexed to the next station, 0.050in (1.27mm) past the final position. This allows a spring loaded latch in the spindle drum housing to drop into position before the drum is clamped back against the latch and locator pads on the drum locking mechanism.

The latch, which is accessible through the front upper cover, should be adjusted with the latch sitting on the locator pad to give 1/32in to 1/16in (0.8 to 1.6mm) clearance to the nuts, as shown on fig.4.11.

The drum locking mechanism, accessible through the rear upper cover, is essentially a toggle mechanism arranged to lock the spindle very near to the dead centre position of the toggle.

The toggle pivots on a shaft with eccentric adjustment to obtain the correct clamping pressure and a stop screw in the drum housing is set 0.010in (0.25mm) clear of the toggle link to give the correct toggle off-set when locked. The following procedure should be followed to test for correct adjustment and should preferably be done when the spindle bearings have reached their normal running temperature:-

Place a tommy bar approximately 12in (304.8mm) long 5/8in (16mm) diameter, in a socket in the upper toggle link (a screwed cover on the top of the drum housing will have to be removed). Disconnect the pin in the operating lever and the long spring box rod situated near the end bracket, fig.4.11. Pull the tommy bar down slowly by hand as far as it will go. The toggle should just bind on the drum and if correct a slight resistance can be felt as the toggle grips when the tommy bar is slowly lifted. The high point of the eccentric is marked on the end of the shaft, visible from the collet end.

The toggle is operated by a link to a lever on the drum locking shaft which is connected to a cam lever by a pre-loaded spring box assembly, fig. 4.12. The long connecting rod should be adjusted to compress the spring 1/8in (3.2mm) when the drum is locked.

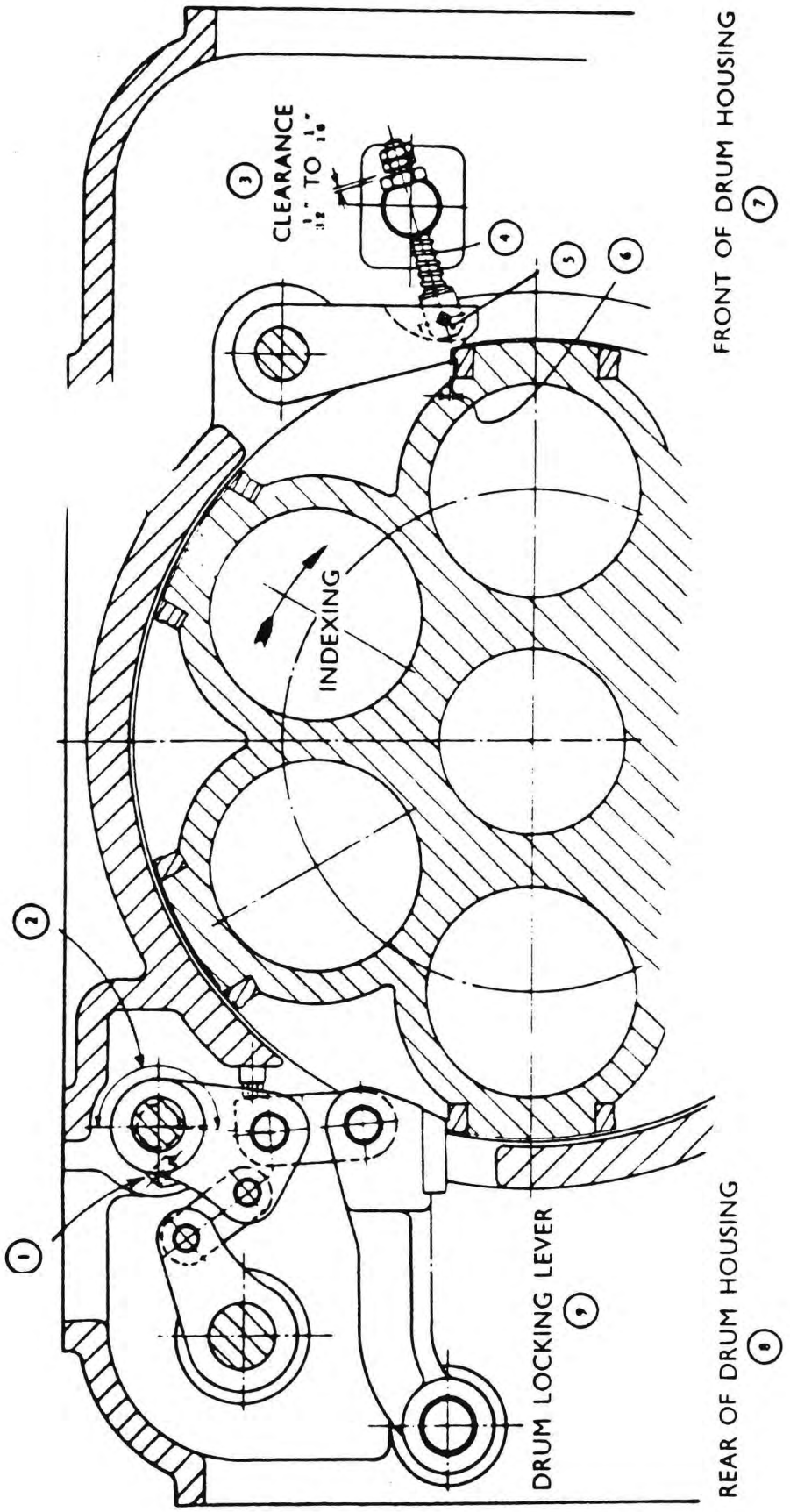

CLEARANCE
INDEXING
FRONT OF DRUM HOUSING
DRUM LOCKING LEVER
REAR OF DRUM HOUSING

Fig. 4.11


Drum Locking Rod
Stock Carriage Drive
Spring Box
Indexing Gear Bracket
Drum Locking

Fig. 4.12

4.10 Feed Drive

The feed drive is transmitted by chain from the centre shaft to a hollow sleeve carrying a gear reduction to the first feed pick off gear shaft; gear "F" on the feed and speed charts. The mating gear "H" is mounted on one end of a shaft with gear "J" on the other end, meshing with gear "K" on the final pick off gear shaft. See figs. 4.13A and 4.13B.

The final pick off gear shaft carries the feed overload slipping clutch to protect the drive during the feed portion of the cycle. The sideways disengaging action of the spring loaded clutch de-activates the electro-magnetic multi-plate feed clutch and the electro-magnetic multi-plate brake allowing the brake springs to "brake" the feed drive. The main motor then stops. Before the slipping clutch is re-engaged by sliding the driving dogs into mesh, the cause of the overload should be located and corrected. Access to the feed overload slipping clutch is through the cover carrying the speed and feed plate, fig.4.14.

After passing through the feed overload slipping clutch, the feed drive is transmitted by a pair of gears to the feed side of the feed motion-fast motion clutch.

A roller "freewheel" clutch is built into the gear on the feed motion-fast motion clutch shaft in order to maintain the drive whilst the clutch is in neutral when changing from fast to slow or slow to fast. The fast motion drive is taken from the constant speed pulley shaft by chain directly to the fast side of the feed motion-fast motion clutch.

The drive either fast motion or feed motion, then passes through the fast motion slipping clutch, to a pair of gears driving one side of the electro-magnetic multi-plate feed clutch on the final feed shaft. Adjacent to the feed clutch, mounted upon the final feed shaft is the chain drive sprocket for driving the upper longitudinal camshaft worm and wormwheel.

Bearing housing assemblies in the two outer walls and the inner wall of the attachment drive compartment of the main drive housing support the final feed drive shaft. In addition there is further bearing support between the inner wall and the motor drive end wall. The bearing housing at the motor drive end of the main drive housing also provides the means of mounting the electro-magnetic multi-plate brake which is outboard of the main drive housing.

Forward of the intermediate bearing support, the feed drive is transmitted through a dog clutch co-axially mounted upon and keyed to the final feed drive shaft. This dog clutch is spring loaded into engagement with the co-axial sleeve which provides journal support for, and to which is keyed the electro-magnetic feed clutch. The purpose of the dog clutch is to provide the means of disengaging the feed drive when hand winding the machine through its machining cycle.

The tensioning of the upper longitudinal camshaft worm chain drive is achieved by applying torque to an eccentric mounting for the chain tensioning sprocket. Access to the adjustment of the chain tensioning sprocket is from an external face of the main drive housing motor drive end. In order to adjust the chain tension loosen the hexagon clamping nut and apply a torsional load to the square provided on the eccentric mounting for the chain tensioning sprocket. On achieving the correct tension the hexagon clamping nut must be re-tightened.

The drive, either fast or feed, then passes through bevel pinions mounted on the front wall of the attachment drive compartment which drive the worm and wormwheel on the main camshaft, whose cams and mechanisms operate the cross slides, drum indexing and drum locking, collet opening and closing and bar feeding. The final feed shaft also carries the handwind gear which can be engaged by a handwind pinion when the feed and feed brake clutches are disengaged.

The feed-fast clutch is operated by a yoke and a lever from two adjustable dogs in the "T" slot on the upper wormwheel. The timing of the dogs can be set as required, normally shifting the clutch at the start of the feed period and at the end of dwell when the tools have finished cutting. A diagrammatic illustration of the feed motion and fast motion clutch control is shown at fig.4.18.

The electro-magnetic brake on the final feed shaft brakes the drive to camshafts when the electro-magnetic feed clutch is disengaged manually or by the auto stop control trip feed.

Instructions for adjusting mechanical multi-plate clutches are given on plates fixed to the machine. To increase the driving power of a clutch, rotate the spring ring around the adjusting nut and withdraw the locking plunger. Rotate the nut in the direction of the arrow stamped on the nut until the plunger can be engaged in the next hole in the locking plate. Do not adjust more than one hole at a time before testing the clutch. Replace the spring ring.

When testing the feed motion-fast motion clutches on their transmission shaft, the clutch actuating sleeve, when moved from its midway position should first move easily, build up resistance to a maximum just as the plates compress together and then ease slightly as the internal clutch toggles move over their high point. Set the minimum adjustment to obtain this feel without obtaining obvious clutch slip or overheating.

The electro-magnetic feed clutch on the final feed drive shaft is factory set and should require no further adjustment.

The electro-magnetic brake on the final feed shaft should be adjusted as follows:- Remove the cover to obtain access to the brake. Engergise the brake. Refer to the diagram mounted on the cover. Release the grub screw (A) in the centring ring (B). Introduce a resetting key (kept in a slot inside the cover) into a radial groove (C) in the centring nut (D) and turn the nut until the key can be smoothly withdrawn. Check the air gap with the brake de-energised using a 1.2mm(0.048in) feeler gauge. Reclamp the grub screw (A) when the correct gap is obtained.

Emergency brake release:- In order to release the brake for handwinding when the electric power is not available, remove two knurled plugs in the cover and remove metric screws from the tapped holes above the instruction plate. Insert screws through the cover holes into holes in the brake body and turn the screws clockwise as far as possible to release the brake. Remove the screws, replace metric screws and plugs before connecting power to the machine.

Slipping Clutches:- These clutches are assembled with the minimum number of springs and plungers necessary to transmit the torque. Spare plungers, springs and screwed plugs are supplied in the equipment kit and can be fitted when required. It is recommended that the number of plungers in use is kept to a minimum to ensure that the clutches will disengage when necessary. Fit extra plungers, etc, in pairs equally spaced around the clutch body.

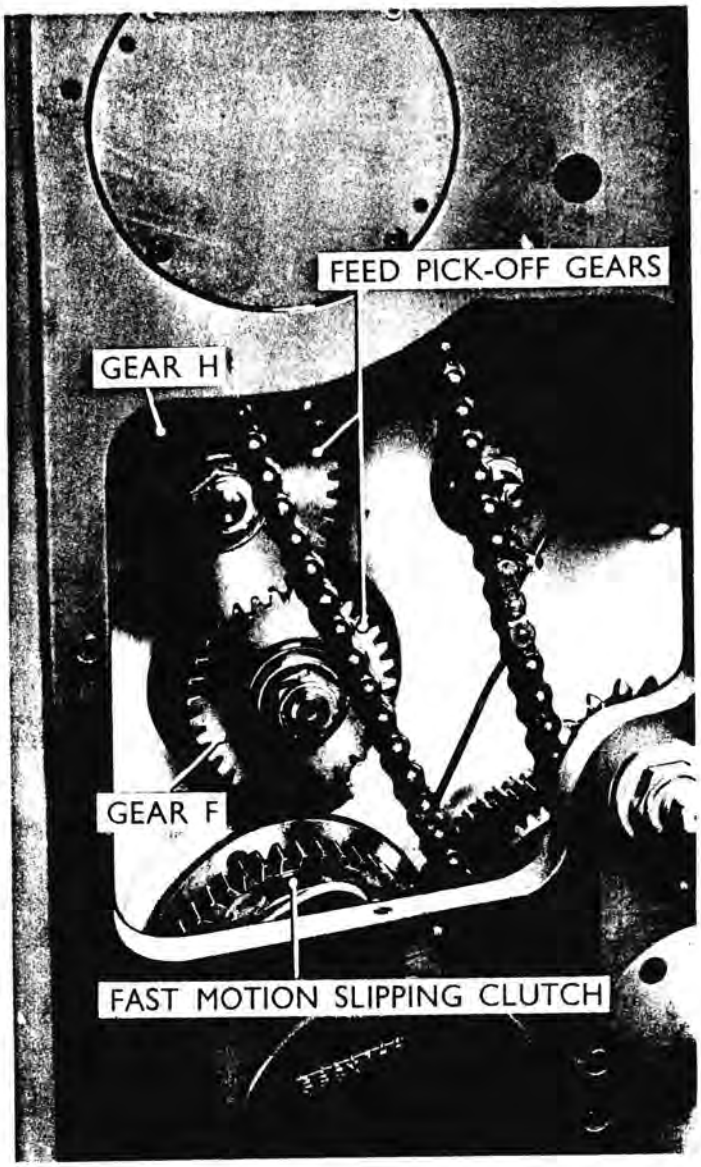

FEED PICK-OFF GEARS
GEAR H
GEAR F
FAST MOTION SLIPPING CLUTCH

Fig. 4.13A

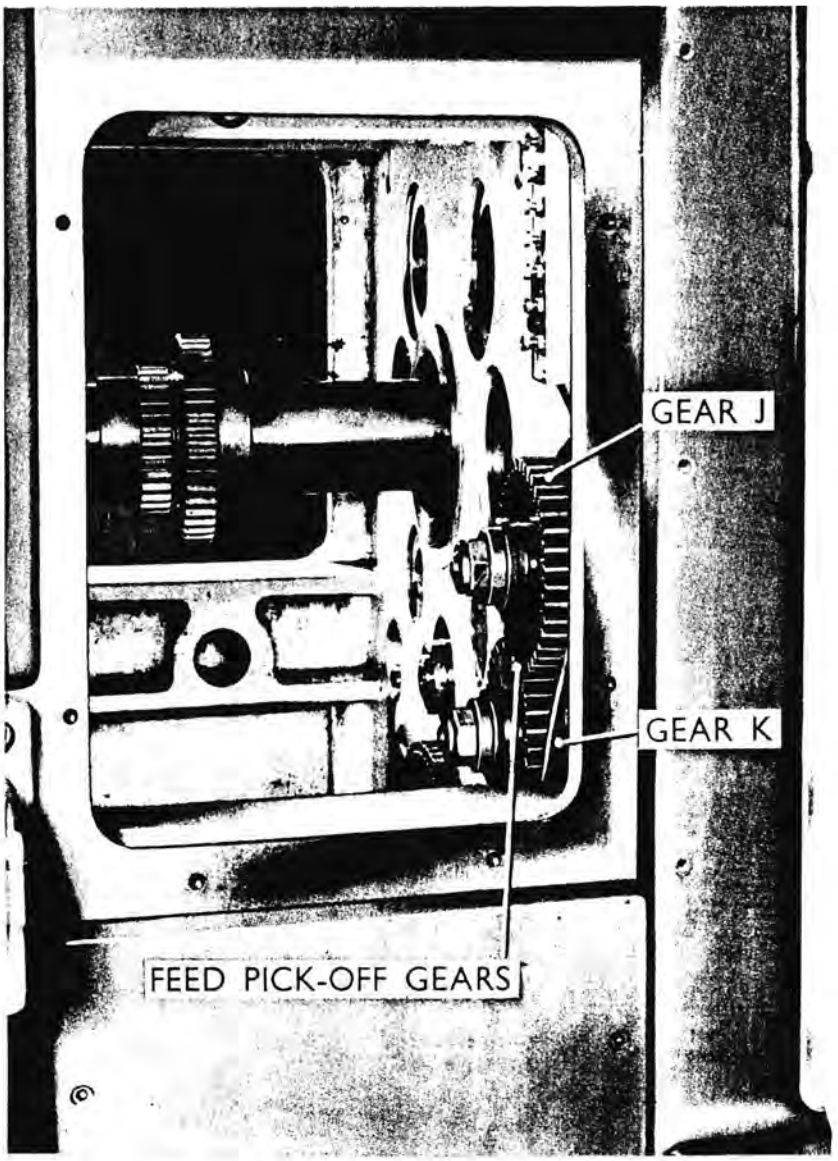


Fig. 4.13B

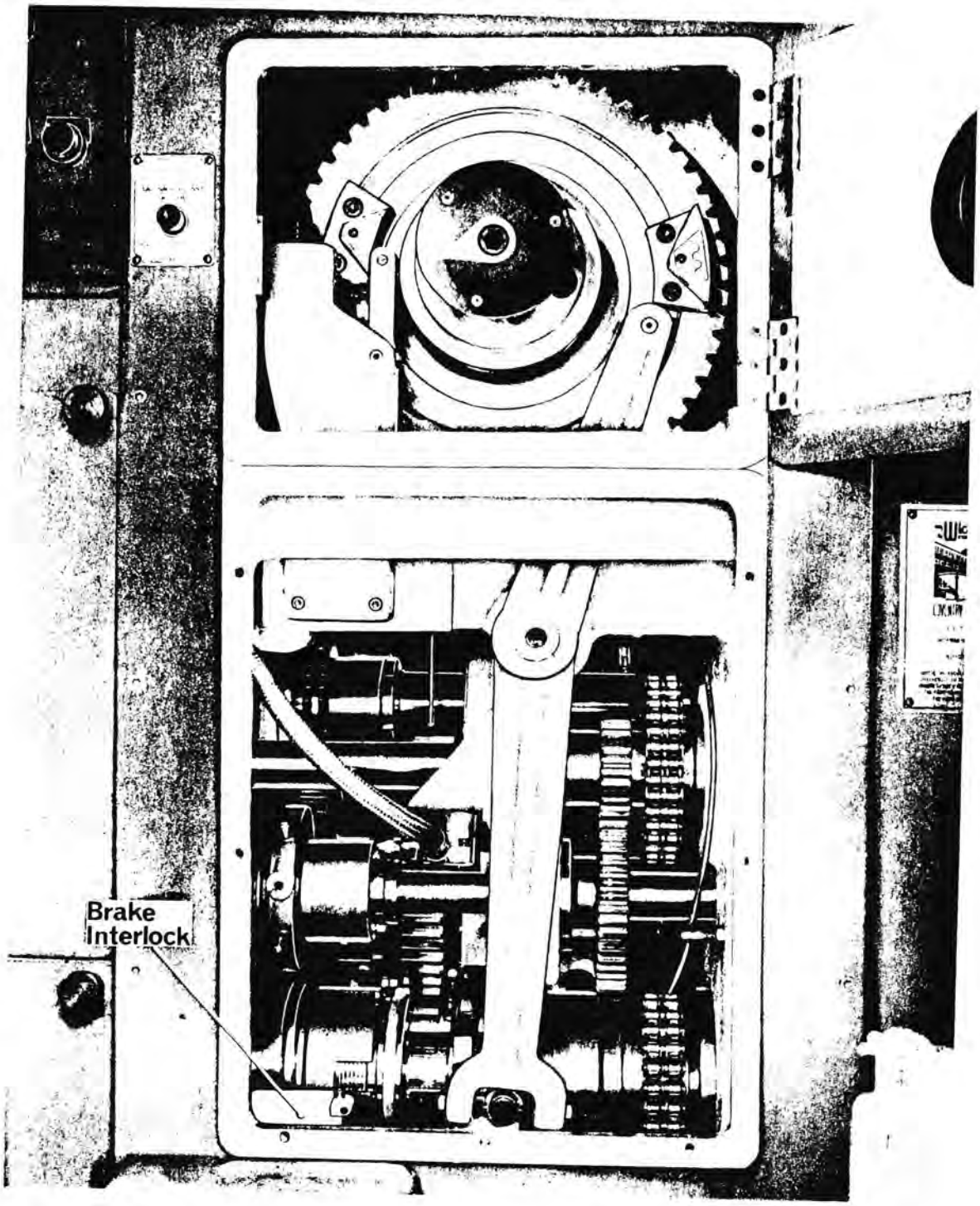


Fig. 4.14

Notes

4.11 The Main Camshaft.

The main camshaft extends from the wormwheel in the main drive housing, passing through the drum housing to the stock carriage end bracket of the machine. The camshaft is supported in plain bearings in the main drive housing attachment drive compartment walls and the walls of the drum housing and its tail end is supported by a ball bearing assembly in the stock carriage end bracket of the machine. It carries the cross slide feed and approach stroke cams, bar stop/stops, bar feed and collet operating cams, spindle drum locking cams, the Geneva arm and roller and the index clutch.

A cam drum is fitted in the main drive housing to carry cams for special end working attachments when these are required and a 2in (50.8mm) bore is provided in both walls of the housing to carry a shaft upon which the necessary cam operating levers can be pivoted.

An auxiliary cam disc is provided in the drum housing to accommodate special cams for varying independently the movements of individual cross slides or cross slide attachments when required. A timing hole is provided in this auxiliary cam disc which lines up with a corresponding hole in the drum housing wall when the camshaft is at 0 degree timing angle.

The keyway in the shaft and the vee grooves across the diameter of the auxiliary cam disc and the spare cam drum, are horizontal and to the front of the machine at 0 degree timing angle. At this point the Geneva roller is just entering the Geneva wheel. See figs. 4.15 and 4.16.

Index clutch operation.

The bar feed cam drum is driven by a dog clutch spring loaded into engagement and carried on the main cam shaft. Lifting the index clutch lever until the plunger handle locates in a hole in an adjacent bracket, withdraws the clutch teeth and renders inoperative bar feed, collet operation, drum indexing and the drum locking mechanisms. An interlock latch is fitted so that the clutch cannot be disengaged during the indexing of the drum. See figs.4.15 and 4.16.

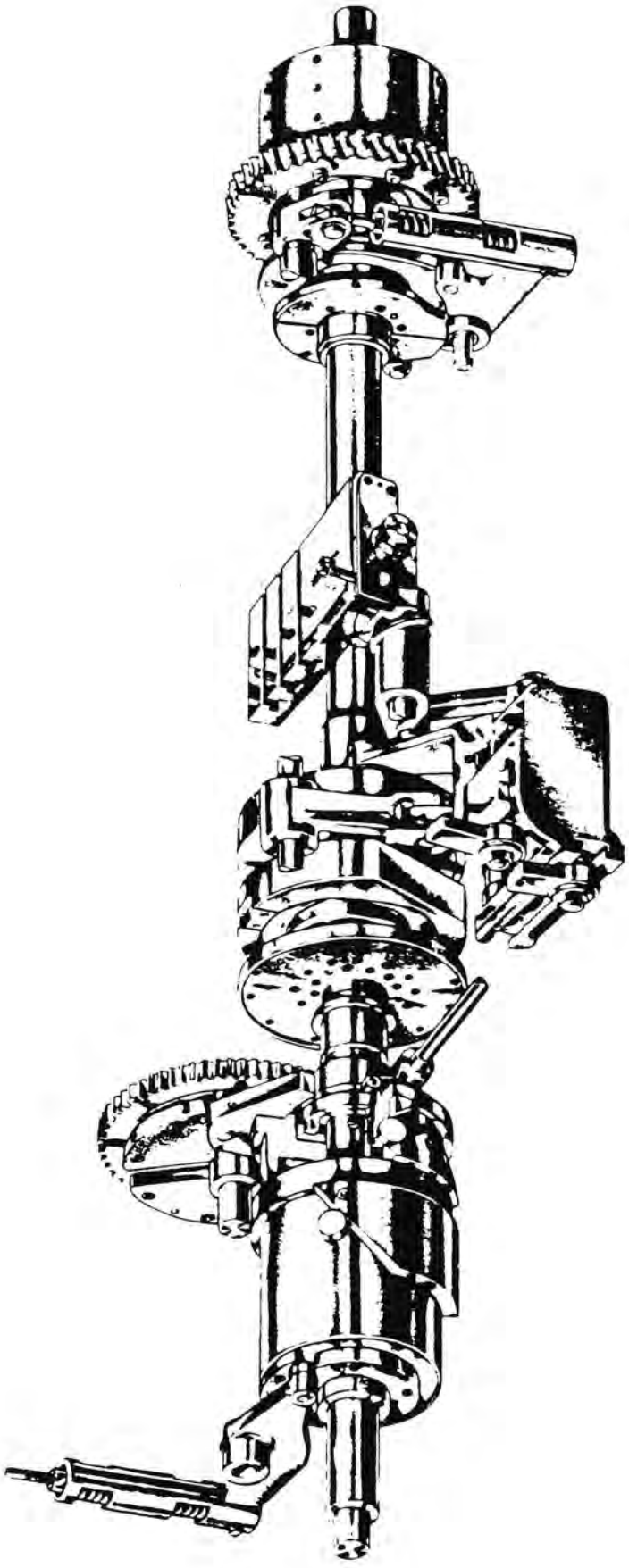


Fig. 15