

CLARK®

METALWORKER



METAL LATHE - CL430

&

LATHE/MILL DRILL - CL500M

OPERATING & MAINTENANCE INSTRUCTIONS



DISCLAIMER

This manual is intended to instruct the user on the operations peculiar to the CL430 Lathe and CL500M Lathe/Mill Drill ONLY. Although some reference is made, and advice given, regarding various metal turning techniques, it should not be regarded as a general tutorial on the subject.

It is assumed that the user has some knowledge of machinery of this type, and is familiar with metal turning and milling . If this is not the case, we strongly advise that he/she seek advice from a qualified person.

This is an important document and should be retained

DECLARATION OF CONFORMITY

We declare that this product complies with the following standards/directives:

- **98/37/EEC**
- **89/336/EEC**
- **73/23/EEC**
- **EN 60 335**

Description: **METAL LATHE**

Model Nos: **CL430 & CL500M**

Serial (Batch) No: **See Product Date Plate**

Signed: 

Clarke INTERNATIONAL
Hemnal Street, Epping, Essex CM16 4LG

DOC No. HO75/27

Clarke International is a trading style of Clarke International Limited

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INTRODUCTION

Thank you for purchasing this CLARKE Lathe.

Model CL430M comprises the lathe only, whereas the CL500M comprises the lathe with Mill Head, making it a complete machine centre. Please note that it is not possible to add a Mill Head to the CL430M, to convert it to a CL500M, at a later date.

The flat lathe bed is solidly constructed from cast iron giving it exceptional rigidity and stability, making it an ideal tool for general turning operations.

A complete range of accessories is available from your Clarke dealer, such as a Floor Stand with Drip Tray, Four Jaw Chuck, Steadies etc. Please see 'Accessories' on page 26 for full details.

It is most important that operators read this manual thoroughly before attempting to use the machine. Please therefore ensure that this manual is kept in a safe place and is readily accessible for reference purposes. Should the manual become lost or defaced, contact your Clarke dealer or Clarke International Service Department for a replacement.

It is also vital that the machine be maintained in perfect working order at all times to ensure it performs satisfactorily. Ensure that the maintenance schedule is rigorously enforced.

Similarly, the safety precautions, specified in this manual should be carefully followed at all times, thereby ensuring the safety of not only the operator, but other persons who may be in the vicinity.

By following these basic rules, you can look forward to long and satisfactory service from your Clarke Lathe.

GUARANTEE

This product is guaranteed against faults in manufacture for 12 months from date of purchase. Please keep your receipt as it will be required as proof of purchase.

This guarantee is invalid if the product has been found to have been abused or tampered with in any way, or not used for the purpose for which it was intended. The reason for return must be clearly stated.

This guarantee does not affect your statutory rights.

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SPECIFICATIONS

LATHE

Motor	230VAC, 50Hz, 1 Phase
Power Rating	3/4HP
Fuse Rating	13Amps
Distance Between Centres	430mm
Centre Height	150mm
Max. Work Diameter over Bed	305mm
Max. Work Diameter over Cross Slide	172mm
Spindle Bore	26mm
Spindle Taper	No.4 MT
Tailstock Taper	No.3 MT
Spindle Speeds	6 (170 to 1630 RPM)
Overall Dimensions (LxWxH)	1100x600x405mm
Overall Dimensions with Mill Drill attached	1100x600x880mm
Weight	129kg
Weight with Mill Drill attached	164kg
Screw Threads - Imperial	20 (11 - 40 TPI)
Metric	14 (0.5 - 3.0mm pitch)

MILL DRILL

Drill capacity	13mm
Spindle Column	175mm
Spindle Nose to Table	150 - 320mm
Spindle to Bed	212 - 382mm
Spindle Stroke	92mm
Spindle Taper	No.3 MT (with Draw Bar)
Spindle Speeds	12 (130 - 1660)
Table Size	200x150mm
T-Slots	12mm
CL430 Part No.	7610800
CL500M Part No.	7610300

Please note that the details and specifications contained herein, are correct at the time of going to print. However, CLARKE International reserve the right to change specifications at any time without prior notice.

GENERAL SAFETY PRECAUTIONS FOR OPERATING MACHINERY

CAUTION

As with all machinery, there are certain hazards involved with their operation and use. Exercising respect and caution will considerably lessen the risk of personal injury. However, if normal safety precautions are overlooked or ignored, personal injury to the operator or damage to machinery may result.

1. **KNOW YOUR MACHINE.** Read the manual carefully. Learn the machines applications and limitations, as well as the specific potential hazards peculiar to it.
2. **KEEP GUARDS IN PLACE** and in working order.
3. **EARTH ALL MACHINES.** If the machine is equipped with three-pin plug, it should be plugged into a three-pin electrical socket. Never remove the earth pin.
4. **REMOVE ALL ADJUSTING KEYS AND WRENCHES.** Form the habit of checking to ensure that keys, wrenches and tools, are removed from the machine.
5. **KEEP WORK AREA CLEAN.** Cluttered areas and benches invite accidents.
6. **DON'T USE IN DANGEROUS ENVIRONMENT.** Don't use machinery in damp or wet locations, or expose them to rain. Keep work area well lit.
7. **MAKE WORKSHOP CHILDPROOF** - with padlocks, master switches or by removing starter keys.
8. **KEEP CHILDREN AND VISITORS AWAY.** All children and visitors should be kept a safe distance from work area
9. **DON'T FORCE THE MACHINE.** It will do the job better and safer, at the rate for which it was designed.
10. **USE THE RIGHT TOOL.** Don't force a tool or attachment to do a job for which it was not designed.
11. **WEAR PROPER APPAREL.** Loose clothing, gloves, neckties, rings, bracelets, or other jewellery may get caught in moving parts. Nonslip footwear is recommended. Long hair should be contained.
12. **USE SAFETY GLASSES.** Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.
13. **DON'T OVERREACH.** Keep proper footing and balance at all times.
14. **MAINTAIN TOOLS IN TOP CONDITION.** Keep tools sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.
15. **ALWAYS DISCONNECT THE MACHINE** before servicing or changing accessories.
17. **CHECK FOR DAMAGE.** If any part of the machine, (eg. A cover or guard) is damaged, it should be carefully inspected to ensure that it can perform its intended function correctly. If in doubt, the part should be renewed. Damage to moving parts or major components should be inspected by a qualified technician before operating the machine. Contact your local dealer for advice.

18. DO NOT STAND ON THE MACHINE. Serious injury could occur if the machine is tipped over. Do not store materials above or near the machine such that it is necessary to stand on the machine to get to them.
19. NEVER operate a machine when under the influence of alcohol, drugs or medication.
20. ALWAYS ENSURE THAT ADEQUATE LIGHTING is available. A minimum intensity of 300 lux should be provided. Ensure that lighting is placed so that you will not be working in your own shadow.

ADDITIONAL SAFETY RULES FOR METAL LATHES

WARNING:

THIS MACHINE MUST NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS DESIGNED.

1. **IMPORTANT:** You should not operate this machine unless you are thoroughly familiar with metal turning lathes and turning techniques. If there is any doubt whatsoever, you should consult a qualified person.
2. Do not operate the machine until it is completely assembled, and this entire manual, has been read and understood.
3. Ensure the proper electrical regulations are followed, and that the machine is properly earthed.
4.
 - a. Ensure all chuck keys, spanners and wrenches are removed from the machine.
 - b. Examine the setup carefully, ensuring that nothing could possibly interfere with the rotating workpiece.
 - c. Ensure the tool post is secure and the cutting tool is adjusted to the correct height.
 - d. Ensure your clothing is properly adjusted.
 - e. Ensure the workpiece is properly secured.
5. Make all adjustments with the power OFF.
6. ALWAYS cut at correct speed for the size and type of material being worked. (Refer to a suitable Turning Manual for cutting speeds)
7. NEVER leave the lathe unattended whilst it is running.
8. When you have finished with machine, always remove and store the cutting tools.
9. When using a coolant, **On no account** must suds be allowed to enter the electrical system.

UNPACKING & INSTALLATION

Mounting the Lathe

On receipt, carefully remove the wooden casing to expose the lathe.

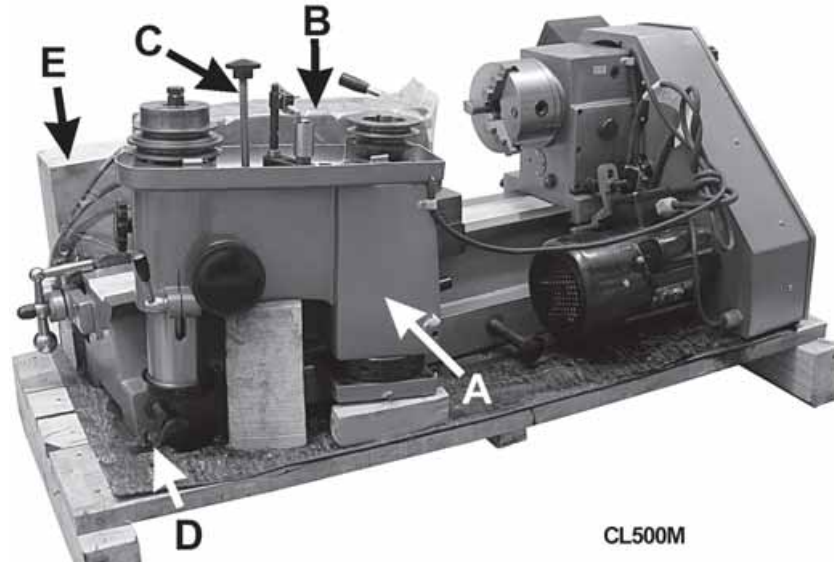


Fig.1

Fig. 1, shows model CL500M. Model CL430 is similar, but does not include the Mill Head - shown at 'A'. CL430 users should therefore ignore all reference to the Mill Head .

Inspect to ensure that no damage was suffered during transit. Should any damage be apparent, please contact your Clarke dealer immediately.

- Carefully remove the Mill Head Pulley Cover 'B'.
- The Mill Head is shown at A, and is secured with a rod - C. Undo the nut, on the threaded rod, and remove completely so that the mill head can be lifted free. Place it carefully to one side, noting that it is connected to the lathe by an electric cable. Take great care not to damage the bevel gears within the head.
- Remove the wooden box - E, which contains loose parts, as described below.
- Undo the nuts securing the two straps, one of which is shown at D, the other on the diagonally opposite lifting handle, and remove the straps completely.

The lathe is now free to be lifted.

NOTE: For ease of installation, you may prefer to free the mill head by disconnecting the cable attached to the mill head microswitch, slackening off the cable clamps and withdrawing the cable completely.

Ensure you take note of the positioning of the spade connectors on the microswitch before you disconnect.

- Four retractable handles are provided to ease manoeuvrability, but it is strongly recommended that a sling be used, on the handles, to raise the lathe with a suitable hoist in order to be located on a strong sturdy workbench or optional Floor Stand.

⚠ CAUTION The weight (129kg - 285lbs) is concentrated at the headstock end take the necessary precautions when lifting.

- Four holes are provided in the bed, for mounting purposes. Use suitable M10 bolts (not supplied) with flat washers, ensuring they are tight. At the leadscrew side of the bed, it will be necessary to thread the mounting bolts up through the bed then screw on the washers and nuts.

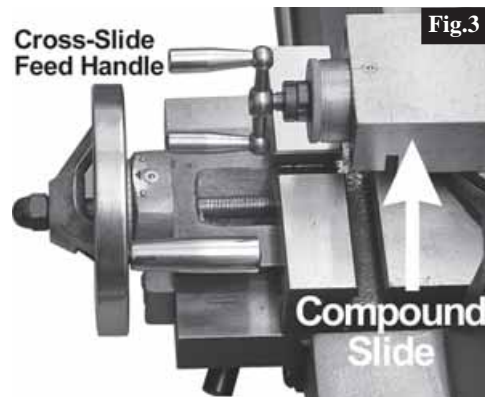
NOTES: Ensure the location is adequately lit and that you will not be working in your own shadow. Ensure an adequate power supply is close at hand. DO NOT allow cables to trail on a workshop floor. Ensure there is adequate room for safe working.

An optional floor stand complete with drip tray, specially designed for this product, is available from your CLARKE dealer. Bolt the lathe to the stand ensuring bolts are fully tightened. If the stand is not used, then the lathe should be mounted on a strong, heavy workbench, of sufficient height so that you do not need to bend your back to perform normal operations.

The lathe should be at a suitable height so that the operator does not need to bend forward when operating. It should also be perfectly level and flat, using shims where necessary to ensure it is. Do not tighten bolts if the lathe is not sitting flat on its mounting surface, as this will tend to twist the bed.

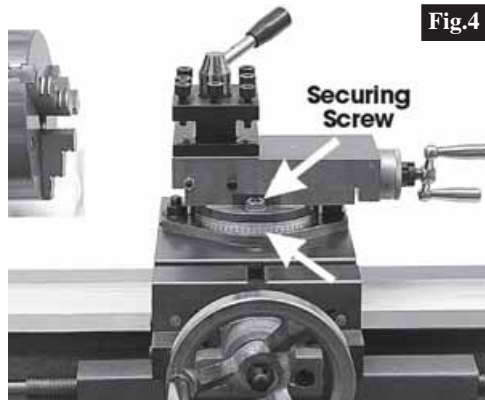
When the lathe is secure, proceed to remove all traces of preservative with paraffin or white spirits and lightly oil all machined surfaces.

- You will notice that, for transit purposes, the Cross Slide Feed handle and the Saddle Feed handle have been mounted in reverse - see Figs. 2 & 3. Remove them by unscrewing the domed nuts securing them and mount the correct way round, then turn all feed handles to ensure they are free and move evenly and smoothly.

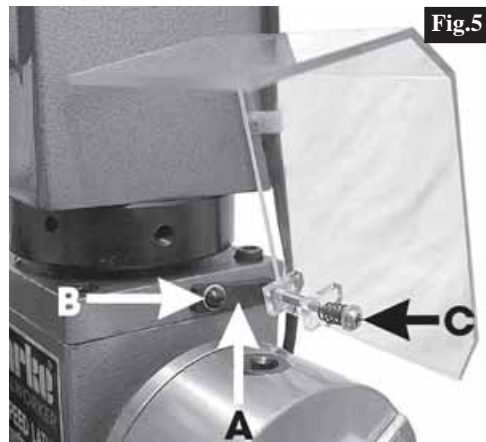


- Slacken the two nuts securing the compound slide to its base (see Fig. 4) and turn the slide through 90 degrees so that it is in line with the bed as shown in Fig. 4. Secure when the mark on its side lines up with the zero mark on the scale (arrowed).

All adjustments are factory set to ensure smooth movement in both directions of all components. If however the adjustments have been upset during transit, indicated by stiff or erratic movement, refer to 'Settings and Adjustments' on page 24.



- Fit the Chuck Guard according to Fig.5.
CL500M: Remove the transit screw in the base of the Mill Head from the position arrowed at 'B', (if fitted).
 Secure the Stop Bar 'A' with the screw and flat washer 'B' found in the guard kit.
 The screw attached to the Guard - 'C' is threaded through the remaining hole in the stop bar, and screwed into the headstock....note the rounded end of the stop bar is at the guard pivot end...or to the right side.



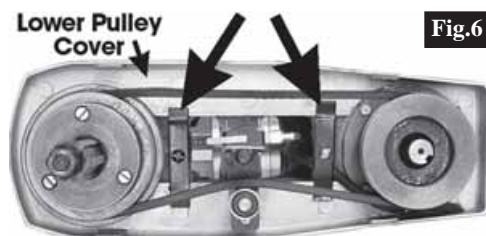
Mounting the Mill Head

Remove the protective greased paper from the headstock mounting, and ensure the surface is clean and undamaged.

- Carefully raise the Mill Head, noting that the plastic lower pulley cover is not fully secured at this stage and is vulnerable. Very carefully lower the head on to its mounting on the headstock. Secure with the four Hex socket head screws provided.
- If the cable to the microswitch has been disconnected, it should now be replaced and the cable secured in the clamps on the side of the mill head.
- You will note that cable is secured with a clamp plate, adjacent to the pulley. similar clamp is provided in the box of loose parts, and this should be screwed in place adjacent to the Driven Pulley so that the lower pulley cover is properly secured. Do not overtighten as this will distort the cover.

Both clamps are arrowed in Fig. 6

- Slip the drive belt over the pulleys in the manner shown in Fig 6.
- Slacken the nut securing the belt tension roller as shown in Fig.7) sufficient for the roller to be moved inwards, in the direction of the arrow, thereby applying tension to the belt.
 Retighten the nut when the belt may be deflected by approx. 1/2 inch, when applying reasonable pressure, in the middle of its run between the pulleys.
- Place the pulley cover in position and secure with the large knob provided.



NOTE: It is important to ensure that the microswitch is activated when the cover is in place. If you do not hear an audible click when the cover is lowered into place, you must remove the cover and raise the microswitch, on the rod, until a click is heard when the cover is replaced. Ensure the microswitch is properly secured.



Fig.8

- Slide the Arbor into the spindle and push home - fully (Fig.8).....

.....then screw the Draw Bar ('A' Fig.9), down through the spindle and into the arbor - fully.

Secure by tightening the locknut ('B' Fig.9).



Fig.9

- The chuck may now be located on the morse tapered arbor. Tap home using a block of wood ONLY.
- Screw the Spindle Cover ('C' Fig.9) into the pulley cover and place the cap on top
- Screw the two handles ('C' Fig.10) into the spindle feed hub and tighten.

- A Spindle Feed Dog Clutch
- B Spindle Microfeed Handle
- C Spindle Feed Handle
- D Mill Head Raising Lever
- E Mill Head Locking Lever
- F Spindle Locking Lever
- G Drive Belt Adjuster
- H Spindle Sleeve Locating Peg

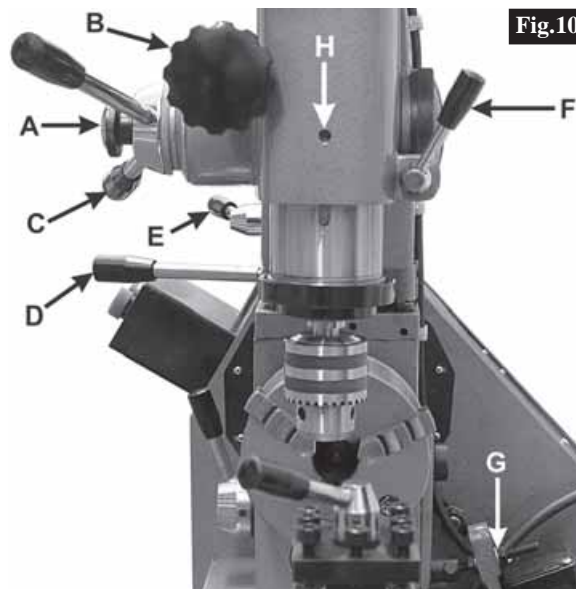
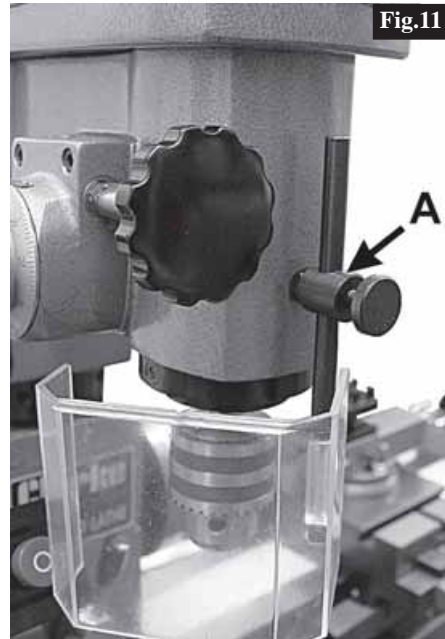


Fig.10

NOTE: A locking lever ('E' Fig.10) secures the Mill Head. By slackening the lever, the Mill Head may be rotated about the Headstock - convenient for moving it out of the way during turning operations.

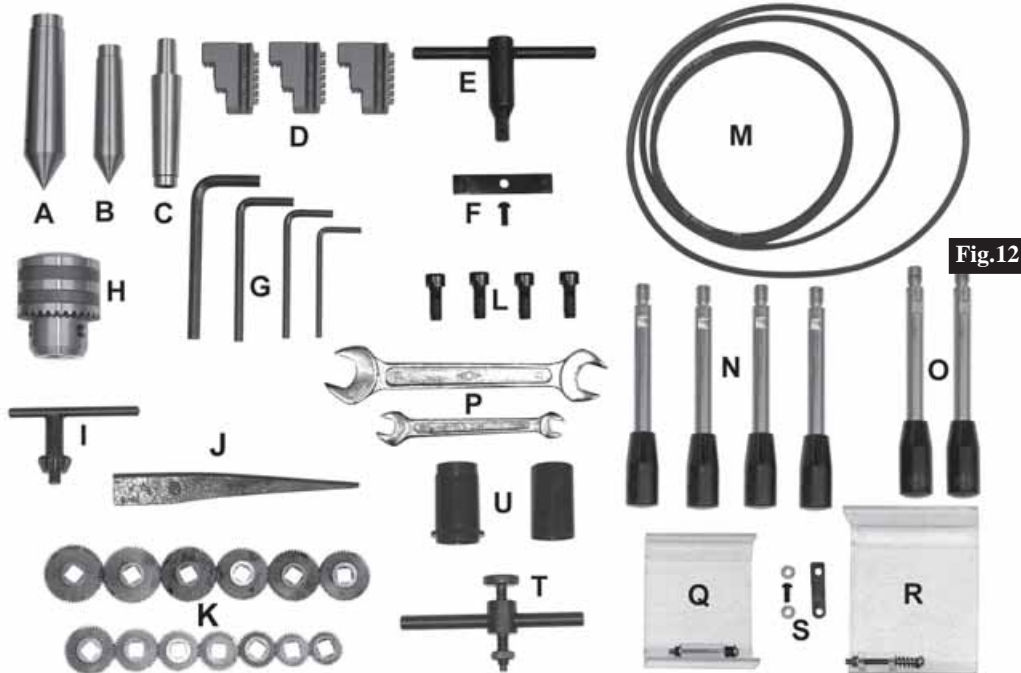
- Fit the Chuck Guard as follows:
 - a. Unscrew and remove the spindle sleeve locating peg from the front of the mill head shown at 'H', Fig. 10.
 - b. Screw the Guard Support assembly ('A' Fig. 11) - to be found in the box of loose parts, into the hole vacated by the locating peg, until it binds. Back off approx. one quarter of a turn and lock in place with the locknut. The support bar should be perpendicular, as shown.
 - c. The screw attached to the guard should be screwed into the underside of the support rod and locked in place.

The guard may be raised or lowered on the bar as required.



The following is a list of items to be found in the box of loose parts

Loose Items



- | | | |
|-------------------------------|----------------------------------|----------------------------|
| A Centre | B. Tailstock Centre | C. Arbor |
| D. External Jaws | F. Mill Head Cover Clamp w/screw | E. 3-Jaw Chuck Key |
| G. Set (4) Hex. Wrenches | H. Drill Chuck | I. Drill Chuck Key |
| J. Drift | K. Set (13) Gear Wheels | L. 4xHex. Skt. Head Screws |
| M. 4x Drive Belts | N. 4x Levers | O. 2x Levers (large) |
| P. Spanners. 8,10,17 & 19mm | Q. Drill Chuck Guard | R. 3-Jaw Chuck Guard |
| S. 3-Jaw Chuck Guard Fittings | T. 3-Jaw Chuck Guard Support | U. Spindle Cover & Cap |

ELECTRICAL CONNECTIONS

CAUTION!

DO NOT ATTEMPT TO USE THE MACHINE UNTIL INSTALLATION IS COMPLETED, AND ALL PRELIMINARY CHECKS HAVE BEEN MADE IN ACCORDANCE WITH THIS MANUAL.

Connect the mains lead to a standard, 230 Volt (50Hz) electrical supply through an approved 13 amp BS 1363 plug, or a suitably fused isolator switch.

WARNING! THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in the mains lead are coloured in accordance with the following code:

Green & Yellow - Earth
Blue - Neutral
Brown - Live

As the colours of the flexible lead of this appliance may not correspond with the coloured markings identifying terminals in your plug proceed as follows:

- Connect GREEN & YELLOW coloured cord to plug terminal marked with a letter "E" or Earth symbol "⏏" or coloured GREEN or GREEN & YELLOW.
- Connect BROWN cord to plug terminal marked with a letter "L" or coloured RED.
- Connect BLUE cord to plug terminal marked with a letter "N" or coloured BLACK.

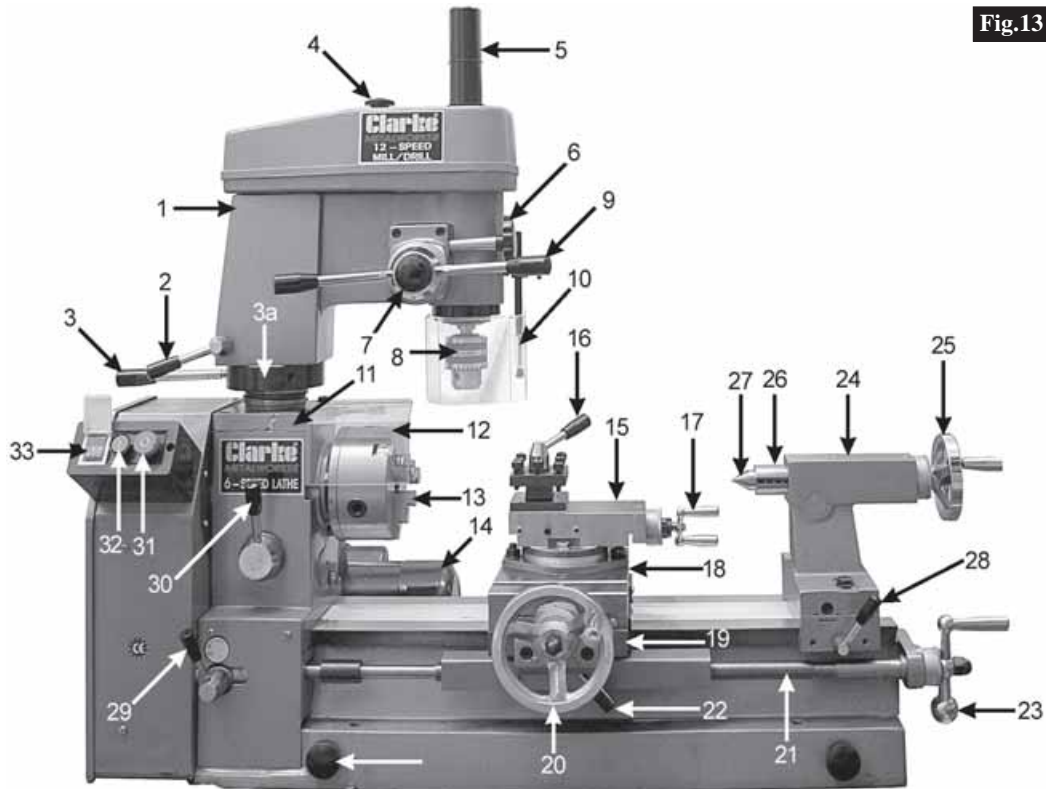
If this appliance is fitted with a plug which is moulded onto the electric cable (i.e. non-wireable) please note:

1. The plug must be thrown away if it is cut from the electric cable. There is a danger of electric shock if it is subsequently inserted into a socket outlet.
2. Never use the plug without the fuse cover fitted.
3. Should you wish to replace a detachable fuse carrier, ensure that the correct replacement is used (as indicated by marking or colour code).
4. Replacement fuse covers can be obtained from your local dealer or most electrical stockists.
5. **The fuse in the plug must be replaced with one of the same rating (13amps) and this replacement must be ASTA approved to BS1362.**

The Lathe, with Mill Head, is now ready for use, but before proceeding, it is strongly advised that operators familiarise themselves with all controls, methods of operation, and the machines limitations. These are described in the following chapters.

FEATURES

Fig.13



- | | | | |
|----|----------------------------|----|-------------------------------|
| 1 | Mill Head | 17 | Compound Slide Feed Handle |
| 2 | Mill Head Locking Lever | 18 | Cross Slide |
| 3 | Mill Head Elevating Lever | 19 | Saddle |
| 3a | Mill Head Elevating Collar | 20 | Cross Slide Feed Handle |
| 4 | Pulley Cover securing Knob | 21 | Leadscrew |
| 5 | Spindle Cover (2-part) | 22 | Leadscrew Locking Lever |
| 6 | Spindle Micro Feed Knob | 23 | Saddle Feed Handle. |
| 7 | Spindle Feed Clutch | 24 | Tailstock |
| 8 | Drill Chuck | 25 | Tailstock Spindle Feed Handle |
| 9 | Drill Chuck Guard Support | 26 | Tailstock Spindle |
| 10 | Chuck Guard | 27 | Tailstock Centre |
| 11 | Headstock | 28 | Tailstock Locking Lever |
| 12 | 3-Jaw Chuck Guard | 29 | Saddle Auto Feed Lever |
| 13 | 3-Jaw Chuck | 30 | 2-Speed Lever |
| 14 | Motor | 31 | ON Button |
| 15 | Compound Slide | 32 | OFF Button |
| 16 | Tool Post Locking Lever | 33 | Forward/Reverse Switch |

THE HEADSTOCK

The Motor drives the spindle via drive belts, which may be configured to provide 6 speeds. A three jaw self centering chuck is fitted, and may be removed by unscrewing the three bolts securing it to the spindle flange, so that optional accessories may be used, such as a Face Plate for use with the MT4 Centre provided, or an independent 4-Jaw chuck.

Three external jaws are supplied to extend the capacity of the 3-jaw chuck. The method of assembly is described on page 25.

THE RUNNING GEAR - RE: FIG. 14

The running gear is protected by a cover, the door of which must always be in place. A microswitch is activated when the door is opened, preventing the machine from operating.

Drive is transmitted to the spindle via drive belts, and to the leadscrew via a gear train. The methods of changing gears in order to provide different feed rates are described on pages 21 and 22.

Drive is also transmitted to the Mill Head by operating a Dog Clutch, shown in Fig.14. Pushing IN drives the Mill Head, pulling OUT drives the lathe spindle.

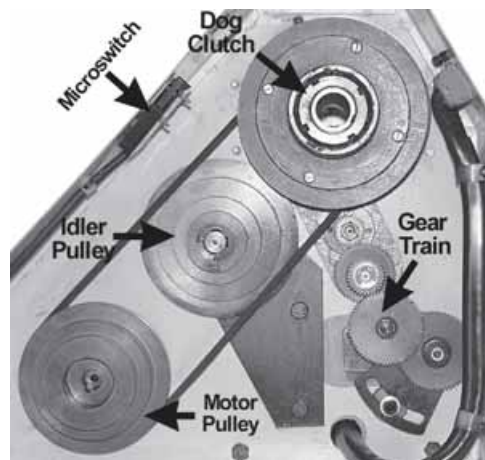


Fig.14

THE TAILSTOCK

The Tailstock may be moved along the bed to any desired position and is secured using the lever on its side. The Tailstock spindle is provided with an internal No.3 Morse Taper for use with the Centre provided, A Revolving Centre and Drill Chuck are also available from your Clarke dealer. (See Accessories on page 26).

It is also possible to remove the Tailstock completely, which may be necessary for milling large pieces. Take great care, when doing so, to retain the 'Jib Strip' which will drop away on removal. This is discussed on page 24.

THE SADDLE - incorporating the Cross Slide and Compound Slide

The Saddle carries the Cross-Slide on to which is mounted the Compound Slide with Tool Post. It may be driven by the Leadscrew to provide automatic feed when the Auto Feed lever is operated.

The position of the tool is effected by turning the cross-slide feed handle which moves it across the bed and the saddle feed handle, which moves it longitudinally. Additionally the compound slide feed handle may be used to move the tool by small amounts at right angles to the cross-slide, allowing intricate and delicate operations to be performed. The slide may also be set at an angle to the cross-slide so that short tapers or bevels may be cut. This is described in greater detail under 'Bevel Cutting' on page 19.

The cross-slide and compound slide feeds are provided with a scale. These are used to move the tool by precise amounts - one division being equivalent to 0.001" (0.025mm). As the feed handle is turned, so does the scale. The scale on the cross-slide feed may also be held stationary whilst the handle is turned, allowing the scale to be 'zeroed'. The manner in which this is put to use is discussed in greater detail under 'Operation'.

The tool post carries 8 hex socket head screws which are used to secure a cutting tool in any desired position. Four may be mounted for convenience and to speed up your operation.

The tool post is rotated by slackening the lever on its top, sufficient for the post to be lifted slightly and then turned to the desired position.

ALWAYS ensure the post, and hence the tool, is secured by screwing down the lever firmly before attempting to cut.

The Compound Slide may be removed completely so that a workpiece may be bolted to the machined surface of the Cross Slide, for milling purposes, using the 'T' slots provided. A 12 piece T-nut and bolt set is available from your CLARKE dealer. Alternatively, a Vice (supplied) may be bolted to the Cross Slide, using the T-slots, in order to secure a workpiece.

The saddle may be locked in place, using the Leadscrew Locking lever, 22 Fig.13.

This is useful when facing or cutting tapers, where the cross slide or compound slide only, is used. Under these conditions, care must be taken to ensure the saddle auto feed lever is disengaged.

THE MILL HEAD (Re: Fig 13)

The Mill Head spindle is driven when the dog clutch, within the running gear, (see Fig.16) is pushed INWARDS. 6 Speeds are available from the pulley system, which is increased to 12 via a 2-speed pulley system, mounted on top of the Mill Head. The pulley cover must always be in place and the microswitch, within, MUST operate when the cover is lowered, otherwise it will not be possible to operate the machine.

The complete Mill Head assembly may be rotated about the Headstock by slackening the locking lever - 2. Take care when rotating to ensure the 3-jaw chuck guard is fully lowered, otherwise damage to it could occur.

Additionally, the head assembly may be raised, to increase its capacity, by turning the Elevating Collar - 3a, clockwise, (it will be tight to begin with), using the levers provided. When lowering, simply turn the collar anticlockwise whilst pressing down on the head.

The spindle is provided with an internal No.3 Morse taper. An Arbor is supplied for use with the Drill Chuck (also supplied), or Mill Chucks and other accessories available from your Clarke dealer (see Accessories).

Spindle feed is controlled using either the feed levers or the micro feed knob. A clutch -7, on the spindle feed hub, when pushed fully inwards engages the drive to the micro feed knob. When pulled outwards, drive is transmitted to the feed handles.

NOTE: As the clutch may be tight, It may be necessary to 'jiggle' the feed levers in order to pull OUT or push IN the clutch.

The Chuck Guard must always be in place when the Mill Head is in use, positioned so as to provide maximum protection against flying swarf.

PREPARATION FOR USE

A. SIMPLE TURNING

The following notes are guidelines as to how to set up the lathe in order to carry out a simple turning operation.

ALWAYS plan your work. Have drawings or a plan on hand together with any measuring instruments you may require, such as micrometers/verniers/callipers etc.

1. Set Spindle speed

Determine the speed required for the job in hand, and, consulting the chart on the inside of the running gear cover door, duplicated in Fig.15, arrange the drive belts in order to achieve that speed.

Ensure the drive belts are correctly tensioned.

If two belts are used (positions C, D and E), then tension the Idler pulley first by slackening the securing nut at the rear of the casing and applying tension so that the belt may be deflected by approx. one half inch in the middle of its run, when using reasonable pressure.

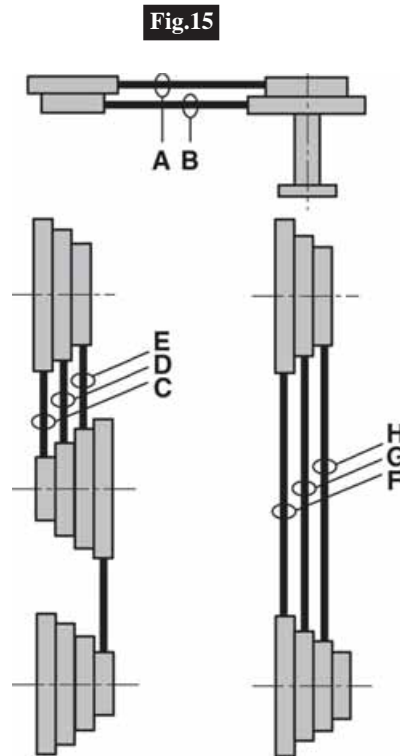
Belt Position	Speed RPM
C	160
D	250
E	400
F	630
G	1000
H	1600

The Motor pulley is tensioned by adjusting the tensioner on the motor. Tension should be similar to that provided by the Idler Pulley.

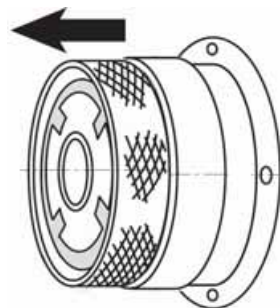
Take care when positioning the belts, that they do not twist.

It is strongly recommended that the Idler pulley be removed completely for configurations F, G and H.

Ensure the Dog Clutch is pulled out fully, then turn it by hand to ensure the drive is transmitted to the headstock spindle.

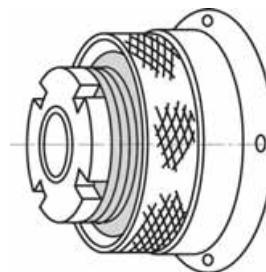


NOTE: Positions A & B are those at the Mill Head.



Dog Clutch pulled OUT for Lathe Spindle operation

Fig.16



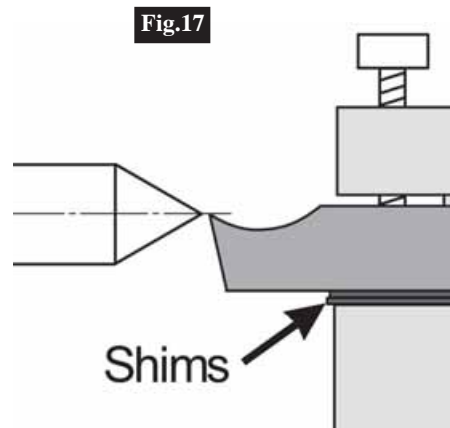
Dog Clutch pushed IN for Lathe Mill Head operation

2. Mount the Cutting Tool

Select a cutting tool that will produce the desired cut and mount it in the Tool Rest, with as little overhang as possible, securing it using three hex socket head screws. (Ideally, the overhang should be approx. 10 mm but not more than 15mm for a straight tool).

It is IMPORTANT to ensure that the tip of the cutting tool is on the centre line of the work, or very slightly below it. On no account should it be above the centre line. Where necessary shims should be used beneath the tool in order to achieve the correct height, or, if the tip is too high, the only recourse is to select another tool or grind down the tip.

To check to ensure the tip is at the correct height, position the tool so that the tip is almost touching the point of the tailstock centre, see Fig.15. They should coincide. If necessary make adjustments using shims, grind down the cutting tool tip or select another tool.



3. Mount the Workpiece

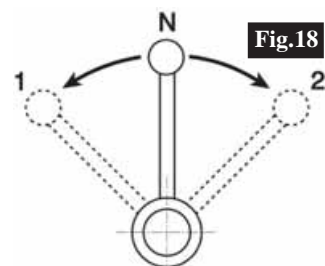
Mount the work either in the chuck or on a faceplate, and if necessary, use the tailstock centre for additional support (If the work cannot be adequately secured by the chuck, or if it is a long piece, or of small diameter).

Additionally, 'Steadies' may be used which are shown in 'Accessories'.

If the Tailstock is not to be used, you may remove it completely by turning the locking lever at its base, and sliding it free of the bed. Take care to retain the Jib Strip which will fall away when the Tailstock is lifted free.

The setup is now complete to begin your cutting operation, but before starting, check the position of:

- Saddle Auto Feed lever (29 Fig.13). Ensure it is in the 3 o'clock position for manual feed.
- The 2-Speed lever (30 Fig.13) is in the upright - neutral position, unless auto feed is to be used. If this is the case, select the appropriate speed/feed rate.



4. Starting

Plug the machine into the mains ensuring nothing can possibly interfere with the workpiece or chuck, and that the Forward/Reverse button, beneath the Yellow cover on the Switch Box, is switched to Forward

Switch the machine ON by pressing the GREEN button Marked 'I'.

B. SIMPLE TURNING WITH POWER FEED

The same basic setup is used as for simple turning, except that, before starting, the 2-Speed Lever is set to either 1 or 2 in order to provide the desired feed rate.



CAUTION: NEVER attempt to change speeds whilst the machine is operating.

As mentioned previously, the rotational speed of the leadscrew, and hence the rate of feed of the tool, is dependant upon the gear train configuration.

The feed rate for normal turning is considerably less than that used for screw cutting. The lathe is factory configured for normal turning, however, if you have been screw cutting, always remember to reset the gear configuration to that for normal turning. Please refer to the chart on page 21 which shows the gear configurations, together with an explanation of how to change gears.

1. With the cutting tool at right angles to the workpiece, wind the cross-slide so that the cutting tool tip JUST touches the work surface.
2. Hold the cross-slide handle still whilst turning the scale so that it registers zero, then, using the saddle feed handle. Move the cutting tool so that it is somewhere to the right of the work
3. Advance the cutting tool, using the cross-slide handle, the requisite number of graduations to produce the desired depth of cut. 1 graduation = 0.001 inches.
4. Taking all precautions previously mentioned and ensuring there are no potential obstacles to the rotating workpiece, switch the machine ON
5. Engage the auto feed by moving the lever towards the 12 o'clock position. At this point the cutting tool will begin its travel towards the chuck - be ready to disengage the auto feed quickly by knocking the lever firmly to the 3 o'clock position.

NOTE: Always stop short of an intended shoulder - which should always be finished manually, by switching the machine OFF. If you require a shoulder with perfectly clean comers, then you need to use an appropriately shaped tool.

6. Retract the tool by one or two complete turns on the cross-slide feed, then wind the saddle so that the tool is at the start point once again.

Advance the tool to its original position, using the scale, then advance it further by the required depth of cut. When ready, re-engage the auto feed and proceed to take another cut.

NOTE: You may notice considerable backlash on the screw threads, this is quite normal and should not cause alarm.

C. BEVEL CUTTING Re: Fig. 19

Bevel cutting involves the use of the compound slide, which is mounted on the cross-slide and set at right angles to it for all normal cutting operations. This is indicated by the zero mark, on the scale, lining up with the mark etched on the body of the cross-slide.

To set the compound slide so that the cutting tool will cut a bevel, slacken the two screws, securing the compound slide to the cross slide, sufficient to allow the compound slide to be turned to the desired angle, as indicated on the scale. Secure the slide in this position by re-tightening the securing screws.

The taper, or bevel, is cut by setting the cross slide appropriately then using the compound slide feed handle to advance the cutting tool in the direction of the arrow as shown in Fig.18.

D. SCREW CUTTING

This operation requires a degree of skill and accuracy, and should not be attempted unless you are completely familiar with all aspects of the lathe.

Essentially, the saddle will move towards the headstock **under power**, the same as cutting using auto feed, except the rate of feed is greater, as determined by the gear configuration. The cutting tool therefore, is moving ever closer to the rotating chuck.

Great care and concentration must be exercised therefore, to ensure that the two do not meet when the machine is operating, as this could be disastrous.

Imperial Threads in a range from 11 to 40 threads per inch, and Metric threads with a pitch of 0.5 to 3mm may be cut. It is important to remember that the type of thread you need to cut, i.e. Metric, UNF, BA, BSP, BSW etc., will be totally dependant upon the cutting tool profile, as profiles differ from thread to thread. .

For detailed information regarding screw cutting techniques, cutting tools etc., you should consult a suitable handbook or obtain advice from a qualified person.

The general procedure for screw cutting is as follows:

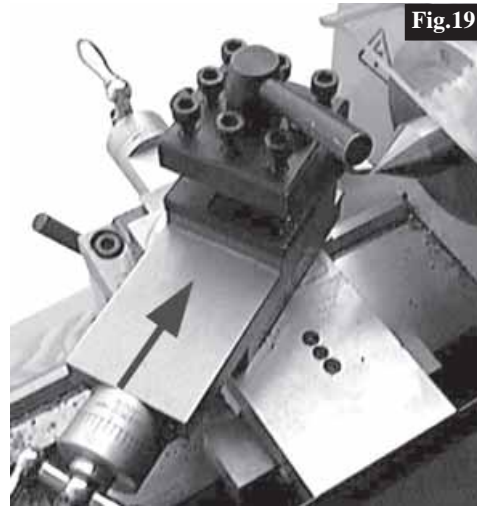
1. Try to get as much distance from the chuck to the end of the proposed screw thread as possible, and if your design allows, cut a 'run-off' into the work which is of a smaller diameter than the root diameter of the proposed screw thread.

NOTE: that for long threads it may be necessary to use steadies.

2. Install the appropriate gears for the thread required, and correctly mount the cutting tool. Set your required depth of cut, in the same manner as that for normal turning, and position the tool well to the right of the workpiece.

NOTE: Depth of cut is vitally important and may be calculated or obtained from an appropriate reference manual. Bear in mind that more than one pass may be necessary

3. Taking all necessary precautions previously stated, and ensuring the FORWARD/ REVERSE switch is in the FORWARD position, start the machine with the power feed lever in its' **disengaged** (3 o'clock) position.
4. When ready, engage the power feed and prepare to switch OFF the machine as the cutting tool approaches the end of the intended screw thread.
When the machine has stopped, continue to wind the tool forward by turning the chuck by hand to complete the thread.
5. Switch the FORWARD/REVERSE switch to REVERSE and switch ON the lathe. The cutting tool will move back towards the start point. **DO NOT TOUCH THE CROSS-SLIDE HANDLE.** Switch OFF again at the end of the thread.
6. Switch back to FORWARD, increase the depth of cut, as required, then switch ON again to take another cut.



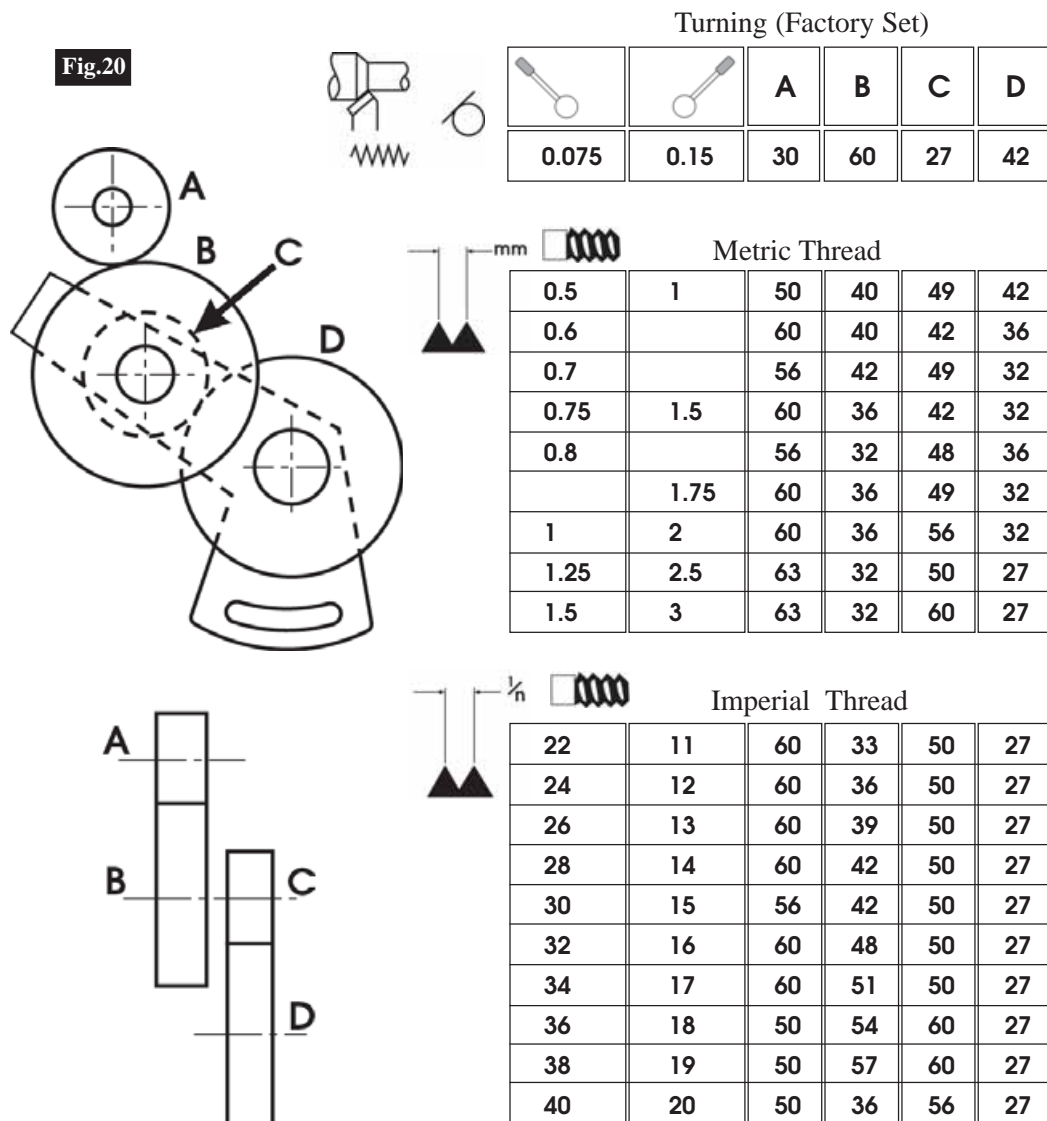
CHANGING GEARS FOR SCREW CUTTING

The leadscrew is driven via a gear train, The gear ratio will therefore determine the rotational speed of the leadscrew with relation to the spindle. i.e. one turn of the spindle will turn the leadscrew an amount determined by the gear ratio.

By setting the gears to a known ratio, we can therefore produce threads to a known size.

As previously mentioned, the actual thread produced will be totally dependant upon the profile of the cutting tool. It is not within the scope of this manual to provide detailed information regarding types of cutting tool, cutting speeds and working with various types of material etc., and it is strongly advised that you consult appropriate handbooks or seek advice from a qualified person.

The chart below shows the thread sizes that may be cut using the gear configuration shown in the corresponding columns.



NOTE: Fig. 21 shows a gear configuration for simple turning.

A - 30

B - 60

C - 27

D - 63

To cut 12 TPI, Imperial Thread, use

60T	at position A,
36T	at position B
50T	at position C
27T	at position D

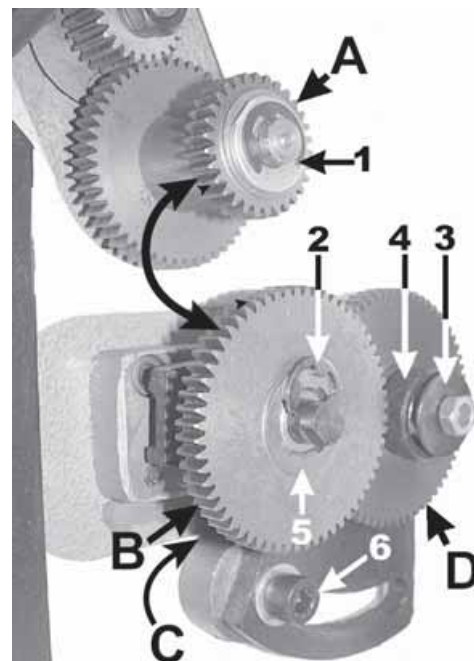
In order to change the gears, ensure the machine is switched OFF and disconnected from the mains supply.

Re: Fig. 21

Open the door to the gear train.

1. Unscrew the hex socket head screw - 6, allowing the gear train to drop so that gear B becomes disengaged from gear A - as shown.
2. To change gear A, remove the circlip - 1 and pull off the gear. Replace ensuring the boss faces towards you.
3. To change gears C and B, remove the circlip - 2 and pull off the gears. Replace ensuring the bosses - 5 face towards you.
4. To change gear D, unscrew and remove the securing nut and pull off the flat washer 3, distance piece 4, and the gear. Replace in reverse order.
5. Re-engage gears A and B and tighten the Hex socket head screw - 6, ensuring a little backlash is evident between the gears.

Fig.21



Note: Backlash should be as little as possible without being over tight. (Turn the spindle by hand to test for backlash).

6. Replace the door

NOTE: The machine will not run with the cover removed.

MAINTENANCE

For maximum performance, it is essential that the lathe is properly maintained.

BEFORE USE

Always inspect before use. Any damage should be repaired and maladjustments rectified. Damage to machined surfaces should be repaired with an oil stone. Test by hand to ensure smooth operation of all parts before use.

Inject a few drops of oil to the oilways 1 - 8 Fig. 22.

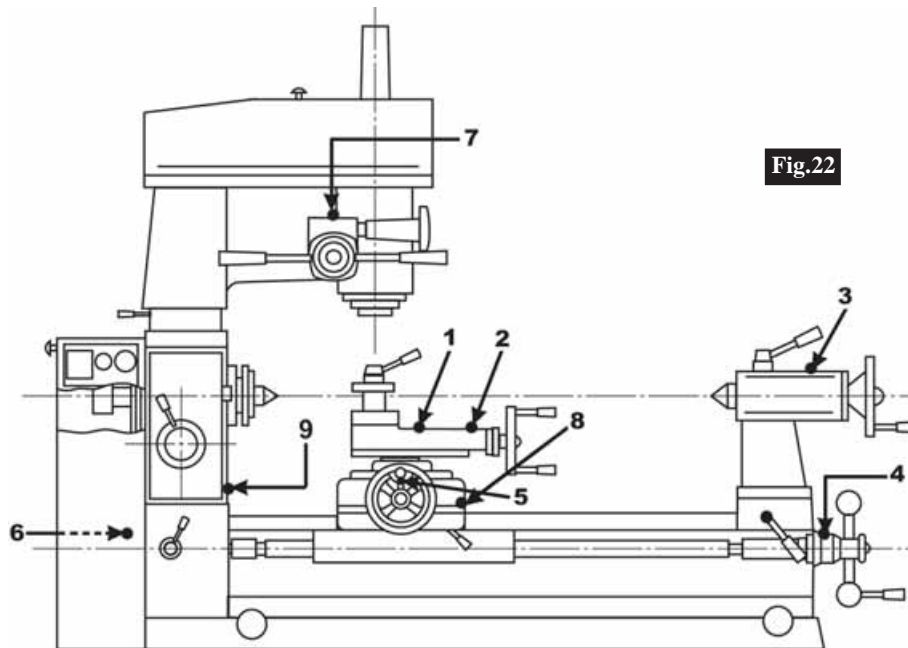


Fig.22

AFTER USE

Remove all swarf from the machine and thoroughly clean all surfaces. If coolant has been used, ensure it has completely drained from the tray, if used, and all components are completely dry.

All machined surfaces should be lightly oiled.

Always remove cutting tools, and store in a safe place.

WEEKLY

Leadscrew and Mill Head Spindle should be oiled weekly.

Check oil level on sight glass, 9, Fig.22 and top up where necessary with gear oil. Remove the filler plug, located directly above the Motor Adjuster, and fill so that the oil level is midway across the sight glass.

SETTINGS AND ADJUSTMENTS

Occasionally, it may be necessary to readjust various components in order to maintain optimum performance. The adjustments that may be performed are as follows:

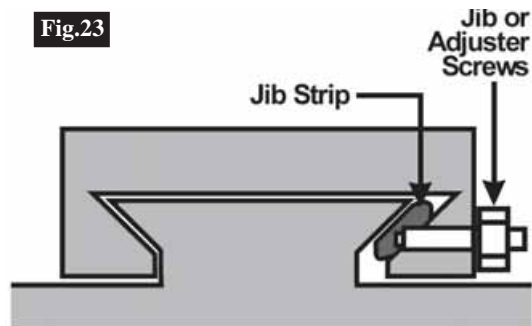
A. Compound Slide Adjustments

The cross-slide is mounted on a dovetail slide, as shown in Fig. 23. Between the sloping surfaces on one side of the dovetail, a 'jib strip' is inserted, which may be tightened against the dovetail under the influence of adjuster, or 'jib' screws, mounted along its length.

The jib screws are to be found on the left hand side of the slide. In time, wear will occur on the mating surfaces resulting in a 'sloppiness' of action.

To adjust the jib strip, to account for wear and ensure the slide moves evenly and smoothly, proceed as follows:

1. Slacken off all lock nuts and screw in the jib screws evenly, i.e. use the same torque for each screw. The slide should be held firmly. Test by trying to turn the handle, but do not force it.
2. Screw out each jib screw by one quarter of a turn ONLY, and nip up the lock nuts
3. Test again, by turning the handle. The movement should be even and smooth along its complete length.
4. If the movement is too slack, screw all adjusters 'in' by one eighth of a turn, and retry. Similarly, if the movement is too stiff, screw 'out' the adjusters by one eighth of a turn until the correct adjustment is attained.
5. Tighten all lock nuts taking care to ensure you do not move the jib screws whilst doing so.
6. When completed, retract the slide fully and apply oil to all mating surfaces and the feed screw thread, then wind the slide back to its normal position.



B. Cross-slide Feed Handle

The cross-slide feed should run smoothly, and the scale must rotate with the handle.

If any stiffness occurs, it is probably the result of swarf lodging between the mating surfaces. Undo the securing hex. socket head screw securing the handle. Remove the handle and pull off the collar with the scale. Take care to retain the small spring plate which sits in a groove beneath the collar.

Tip - Turn the shaft anticlockwise so that a small gap occurs between the mating surfaces, sufficient for small levers to be inserted. It will be quite stiff initially so care must be taken not to cause damage to mating surfaces when prising it off.

Clean the assembly and reassemble in reverse order ensuring the spring plate is correctly positioned.

C. Cross-slide Adjustments

Cross slide adjustments are made in the same way as those for the compound slide. The jib screws however are hex socket head screws and are to be found on the right hand side of the slide, i.e. facing the tailstock.

NOTE:

It is important that the cross-slide and compound slide adjustments are correctly carried out and that there is no 'sloppiness' of action. Any maladjustments will have a serious effect on the quality of your work, as they will all be transferred to the tool tip. It is vital that there is as little movement of the tool as possible.

D. Fitting External Jaws - 3-Jaw Chuck

To change the jaws, insert the chuck key and open the jaws to their fullest extent. It will then be possible to remove each jaw in turn.

Replace them with the external jaws, noting the following.

The thread segments of the jaws are progressively 'stepped' as shown in Fig 24. They are also numbered 1 to 3. This is to take into account the lead of the screw thread within the chuck. It is therefore necessary to assemble the jaws in the correct order.

Place them as shown in the Fig. 24, and assemble in the same order, clockwise in the slots in the chuck, turning the chuck key as you insert them. Close the jaws fully and check to ensure they all meet at the centre. If a jaw is out, open the jaws fully, and retain pressure on the jaw in question whilst turning the chuck key, until it snaps down into position. Re-check to ensure all jaws meet at the centre.

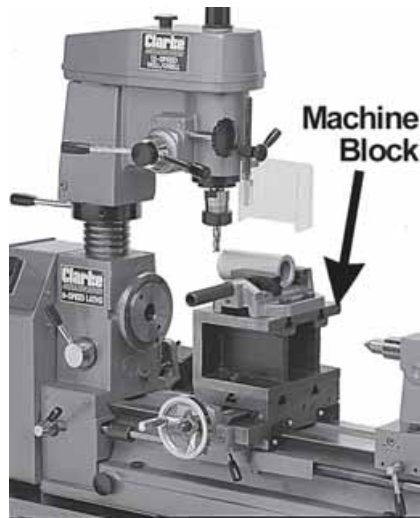


Fig.24

ACCESSORIES

A range of accessories is available from your Clarke dealer which extends the versatility of your machine. These are as follows:

1. **Machine Block**
Part No: 7610324



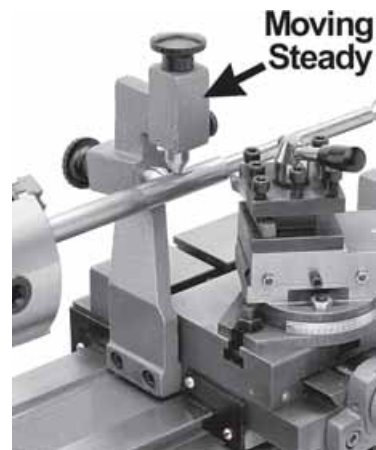
Bolted to the Cross-Slide

2. **Fixed Steady**
Part No: 7610317



Bolted to the Bed

3. **Moving Steady**
Part No: 7610318



Bolted to the Saddle

1. Independent 4-Jaw Chuck with Adapter Plate.

Part No. 7610316



2. Tailstock Revolving Centre

Part No. 7610320



3. Tailstock Drilling Chuck - MT3.

Part No. 7610330



4. 6 Piece Cutting Tool Set.
Comprising tools for 60° thread cutting,
parting/grooving, facing and general
turning work.
(Hex. wrench not shown)

Part No. 7610319



5. Face Plate - 8" (200mm) dia.

Part No. 7610325



6. Mill Chuck set
Includes 4, 6, 8, 10, 12, 14, & 16mm collets

Part No. 7610323



7. 12 Piece T-Nut and Bolt Set (12 piece)

Part No. 7610326



8. Mill Cutter 2" Dia.

Part No. 7610322



9. Stand, including Suds Tray

Part No: 7610315