If Not in Stk = N.A.

MURRY

$18 Use This

OPERATORS MANUAL

MODEL: 818
BENCH LATHE

INSTRUCTION BOOK
FOR
OPERATION & MAINTENANCE

******* FOREWORD *******

The purpose of this book is to provide you a clear and concise instruction for operation and maintenance

Yet this machine in size is Mini but in capacity is Maxi. She is not only a bench lathe but a mill and drill as well. Of course she will bring you a pleasant work practice and great operation benefit. Please read this book carefully, so you will know how to treat her nice. Since she is a very precise machine therefore do avoid any damage or overloading from, but give every kind of care and maintenance to her.

* * * * * * C O N T E N T S * * * * * *

CHAPTER VI - ELECTRICAL DIAGRAMS

CHAPTER VII - PARTS CATALOGS

CHAPTER I-RECEIVING

1. UNCRATING THE MACHINE

The will be delivered packed in a special shipping case containing in addition to the fully assembled machine all parts of the basic equipment and a tool box. The chip pan is firmly fastened to the bottom of the container with four bolts. The milling head had been matched to the bed but was removed to packing into a polylon box to prevent from shipping damage. Please find attached with the crate a packing list and an accuracy chart for your acceptance.

The machine with its chip pan should be mounted with its bearing surfaces absolutely level on the base to prevent any distortion of the bed when screwed down.

Our chip pan is firmly suitable to the stand of legs or cabinet whichever is available in your shop, only with leveling and rigidity.

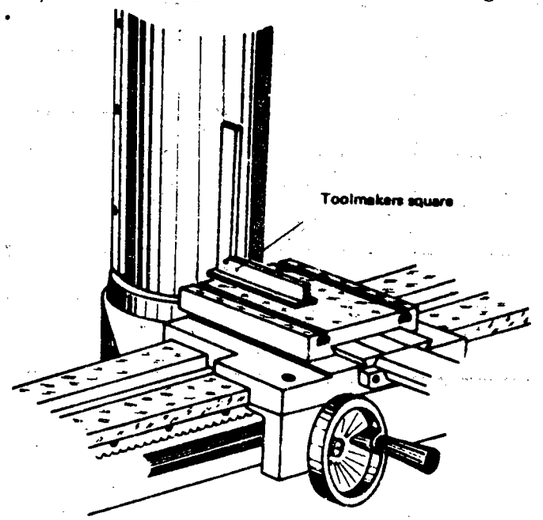
2. PREPARATION FOR OPERATION

When using three phase induction motors, watch the direction of rotation. If the motor runs in the wrong direction phase 2 and phase 3 must be interchanged.

Before using the machine, remove the protecting oil film, which has been applied to all bright surfaces, with paraffin. (Remove the solvent and oil residue thoroughly with a clean cloth.) Now oil all slide ways with a good quality acid-free oil. Fill the headstock gear box with SAE 10 oil. (See lubrication diagram.)

3. MOUNTING THE MILLING UNIT

The Milling Unit mounts to the rear of the lathe bed with four fastening bolts. Check with try square angle rule for the accuracy of the angle (refer to sketch). The electric connection of the milling unit motor is to be provided according to the connection diagram (Chapter VI, Diagrams 1 and 3).



4. TECHNICAL DATA OF THE MINI UNIVERSAL MACHINE

Centre distance	17 1/2" (450 mm)
Centre height	3 7/8" (99 mm)
Swing over cross slide	4 7/8" (124 mm)
Headstock Spindle nose	E-M30 DIN 800
Spindle bore	25/32" (20 mm)
For collets to DIN 6341	K 20
Spindle bearing	Adjustable Precision taper Roller bearing
Spindle speeds	65-130-265-350 530-700-1400 2800 R.P.M.
Leadscrew	19/32 - 16 T.P.I. 15 dia. x 1.5 mm
Feeds	with push and pull knob 0.002"/0.0047" (0.05/ 0.12 mm) per Rev.
Thread pitches	0.4 - 3 mm 8 - 80 T.P.I. 0.2 - module
Dia of tailstock barrel	1,023" (26 mm)
Traverse of barrel	1,023" (26 mm)
Morse taper	No. 2
Tailstock set-over forwards backwards	 12 mm 8 mm
Motor speeds	1400/2800 R.P.M.
Power	3/4 - 1 H.P.
Weight	160 kg
Floor area	1000 x 40 mm 40" x 16"

5. TECHNICAL DATA OF MILLING UNIT

Maximum height between cross slide and spindle	9 3/8" (240 mm)
Centre line spindle to column reach	5 11/16" (145 mm)
Drilling stroke	1 9/16" (40 mm)
Spindle taper	Morse No. 2
Spindle speeds	350-640 780-1450 R.P.M.
Motor rating	0.25 HP

6. INSTALLATION DIMENSIONS

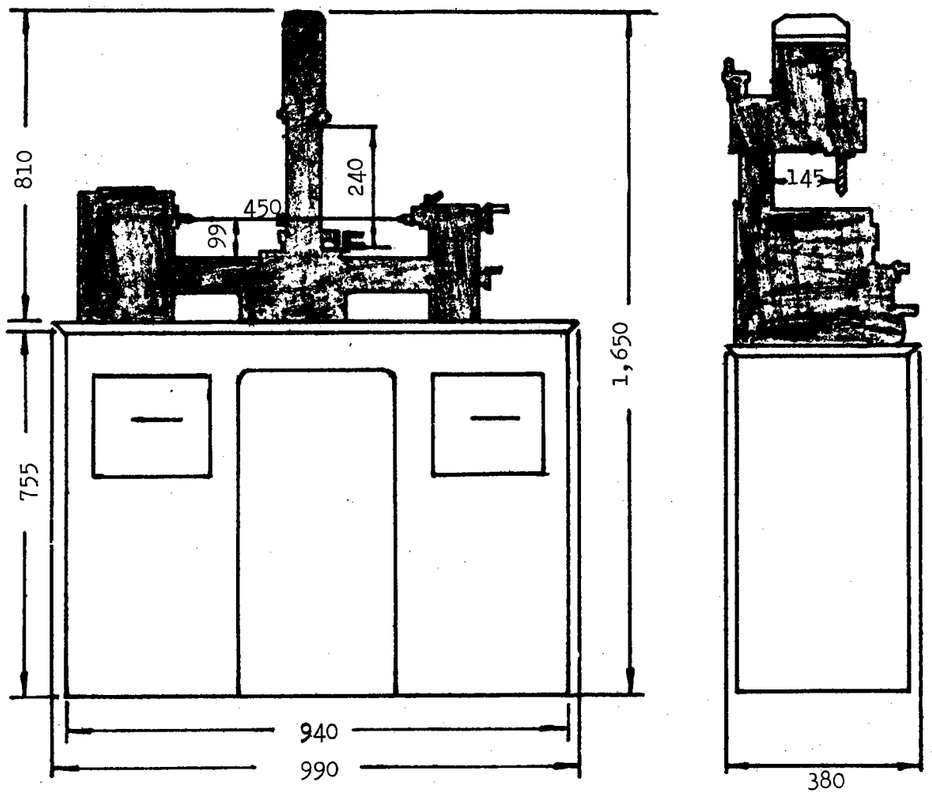


Fig 2

CHAPTER II-ASSEMBLES

1. HEADSTOCK

The hardened and ground main spindle runs in a precision taper roller bearings. The spindle bore is 20 mm. The spindle nose is provided with a taper for type D K20 collets. The headstock spindle gears are oil bath lubricated. Three jaw and four jaw chucks are fitted to the lathe (main) spindle by means of a chuck plate.

2. TRANSMISSION GEAR TRAIN

There are a set of forward-reverse control gears for controling direction of rotation and a set of push-pull gears for changing feed rate and a set of nine pieces of interchangeable gears for thread cutting. All these arrangements are cooperated to drive the lead screw in a versatile manner to provide various feed conditions in operation.

3. SLIDES

The sturdy saddle carries the cross slide. Equipment for use in conjunction with the milling unit can be fitted to the cross slide. The top slide is arranged on the cross slide and can swivel in either direction. All slide gibs are adjustable and slides can be locked in any position with the aid of clamping screws. The graduated index collars on the slide wheels to permit accurate adjustments and readings.

4. CARRIAGE APRON

The apron is bolted to the saddle and carries the conveniently arranged saddle traverse. Handwheel and its pinion gear are engaged to the rack to act as manual feeding. Automatic feed handle and its half nut to act as automatic feeding.

5. TAILSTOCK

The tailstock is of a compact design. The heavy duty tailstock barrel is provided with a scale graduated in inch or millimeters and has a No. 2 internal morse taper. The handwheel is provided with a graduated adjustable index collar for precision work. An off-center lock handle is the most convenient item in operation.

6. BED AND CHIP PAN

The lathe bed with its heat treated ground guide ways is structure strengthened with diagonally ribbing and made of high grade case iron. The chip pan is casted in whole piece with the grill ribbs strengthened on the bottom. It is used for increasing the rigidity of the lathe besides its major purpose of containing products and chips.

7. DRIVE AND ELECTRICAL EQUIPMENT

The drive is taken from a single-phased or from a three-phased A.C. motor installed on to the rear of the lathe bed. The power is transmitted from the motor shaft by a timing belt to the back gear shaft and from there through geared driving pinions to the main lathe spindle. All electric parts (push button control unit, capacitors, etc.) are factory wired and totally in an E-housing located at the rear of the headstock casing.

CHAPTER III-ACCESSORIES

1. COLLET TIE-DOWN TUBE HANDLE

Insert this handle from head end of the lathe into the spindle and insert the K-20 collet from spindle nose end into the spindle, (Note the correct position of slot.) and screw them together. The collets must NOT be used for the work sizes other than their specified capacity.

2. DRILL CHUCK

With its 3 self centring jaws, it is used for holding centre drills and twist drills.

3. ARBOR

The arbor is necessary to hold the drill chuck in the tailstock or milling unit spindle and it is provided with a No. 2 morse taper.

4. LIVE CENTRE

The live centre is mounted on 3 ball bearings and is recommended for turning at speeds in excess of 500 R.P.M.

5. RESTS

The rests are used when turning slender shafts to prevent from chattering. The steady rest is bolted to the bed way and the follower rest is bolted to the saddle.

(1) The Steady Rest serves as a support for shafts on the free tailstock end. For many operations the tailstock cannot be used as it is in the way of the turning tool or the drilling tool, and therefore must be removed from the machine. It is then functions as end support ensuring a chatter-free running of the machine. The sliding centers require continuous lubrication at the contact points with the workpiece to prevent their premature wear. When applying the jaws to the workpiece care should be taken not to press it out of its centre position lest it get loose in the lathe chuck and damaged by the lathe chuck jaws.

(2) The Follower Rest is mounted on the longitudinal slide, and thus follows the movement of the turning tool. As the centre part of the follower rest is always level with the height of the tool only two sliding jaws are required whereas the place of the third is taken by the turning tool.

The sliding centers are set similarly to those of the steady rest: free of play but not seizing. The should be adequately lubricated during operation.

6. THE THREAD DIAL INDICATOR

The thread dial indicator is provided as an aid in screw cutting and is predominantly used on machines with inch system leadscrews.

The indicator is fitted to the right hand side of the apron with a hexagon headed screw and pushed forward to engage with the lead screw. The zero mark on the body is now marked to coincide with the dial.

When screw cutting it is essential that the marks on body and dial coincide otherwise split threads will result.

7. CHUCK PLATE

It is used as an adaptor for three or four jaw chuck.

Both the spindle nose and the threaded flange adaptor must be thoroughly cleansed of adhering chips (borings or millings). Then proceed with screwing the flange on to the spindle nose taking care that the flange bears snugly to the face of the spindle nose. Now turn a shoulder of approximately 2 mm depth (but not deeper than 2 1/2 mm) to fit jaw type chucks.

This diameter must conform exactly to the centering diameter of the chuck and this diameter must be turned so accurately, that the chuck can be mounted without the use of force, although free from play and firmly adhering. Then take off another fine cutting from the contact surface of the above said shoulder, thereby providing a clean and smooth bearing surface for the lathe chuck. Clean thoroughly the centering rim of the chuck. Lubricate lightly the fitting surface and screw the jaw type chuck on to the chuck plate with location screws.

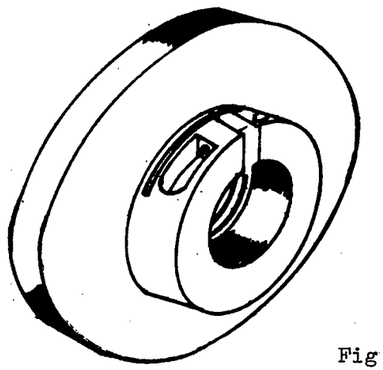


Fig 3

8. CHANGE GEAR

(1) General Description:

The set consists of 9 gears and a quadrant pin; with this set of gears metric threads ranging from 0.4 to 3 mm pitch, module threads from 0.2 to 1 module and English threads from 8 to 80 T.P.I. can be cut.

For cutting right hand threads the saddle must move in direction of headstock (The working piece is in normal direction of rotating and the half-nut is in closed condition).

When mounting the change gears and the shear pins take care that the individual change gears will accurately mesh but without undue pressure at the root of the tooth. The correct adjustment will be facilitated by pressing a strip of paper between the teeth, by ensuring the snug position of the gears and firmly tightening the shear pins. After removal of the strip of paper the teeth will have the correct amount backlash which is about 0.10 - 0.30 mm.

As a principle during the thread cutting operation the half-nut should not be opened from beginning to the completion of the thread so as to ensure that the turning tool will always return into its correct initial position.

As exception is the cutting of metric threads, which are incorporated in the lead screw pitch. In this case the half-nut can be opened after each cutting operation and the saddle returned into the starting position by means of the handwheel, i.5 - 0.75 - 0.5.

GEAR COMBINATION FOR A METRIC THREAD

TRANSMISSION GEAR TRAIN

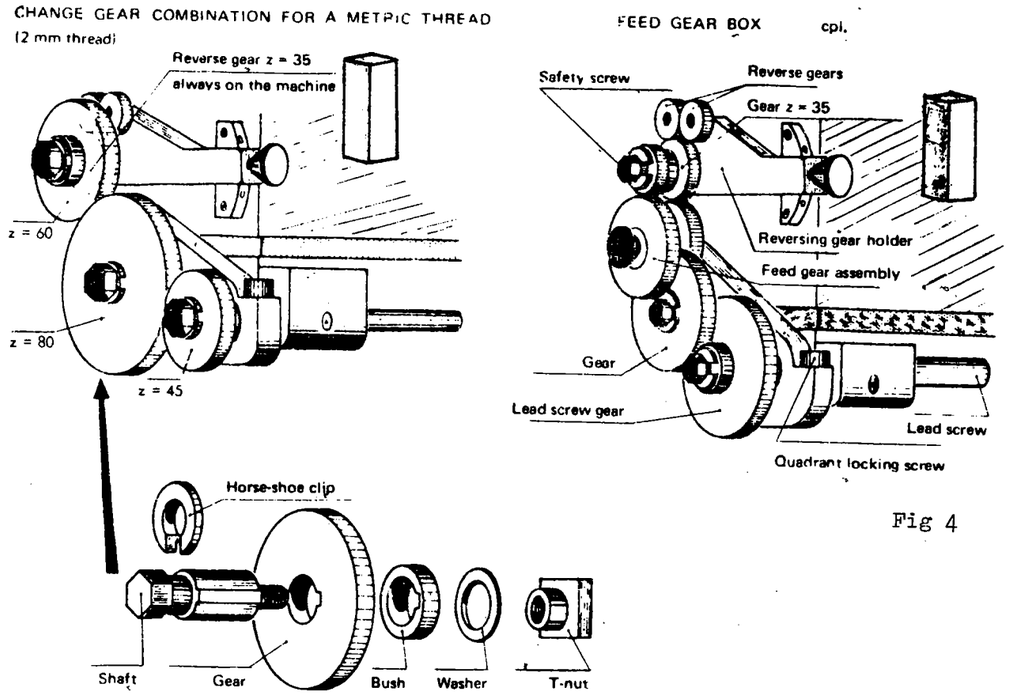


Fig 4

(2) Instruction for Mounting the Gearwheel Combination:

a. Take down the feed gearing.

(a) Slacken the locating screw SW 10; removed locking plate, and withdraw the 20-teeth gearwheel and sleeve. The 35-teeth tumber gear will not be removed from the machine.

(b) Withdraw the feed unit.

(c) Withdraw the intermediary gear and the lead screw gearwheel after having slackened the hexagon head screws and removed the locating plate.

b. Slip the 60-teeth gearwheel on to the tumbler gear bolt and then fit up the sleeve. Fix the gearwheel with the locating plate and locking screw to the tumbler gear bolt.

c. Slip a sleeve on to the lead screw and mount and secure the 45-teeth gear.

d. Insert the shear pin into the top nut of the quadrant.

e. Slip a bush on to the shear pin and then fit up the 80-teeth gear.

9. THE SQUARE TOOL POST

The four-tool post is mounted on the top slide in place of the tool post and permits simultaneous clamping of 4 tools. Any tool can be swung into the correct position merely by unlocking the turret.

10. TOOL BOX

The containing of this box is as follows:

(1)	Open End Wrench	3 ea
(2)	Allen Wrench 9 pcs	1 set
(3)	Cross Point Screw Driver 4"	1 ea
(4)	Plain Screw Driver 4"	1 ea
(5)	Oil Filler	1 ea

11. THE MILLING UNIT

(1) Clamping the tool and removing it from the milling spindle.

To use drawbolt 6061 for tool 6062 clamping and removal.

The drawbolt is screwed with its external thread M8 direct into the tool for clamping. See following figure for reference.

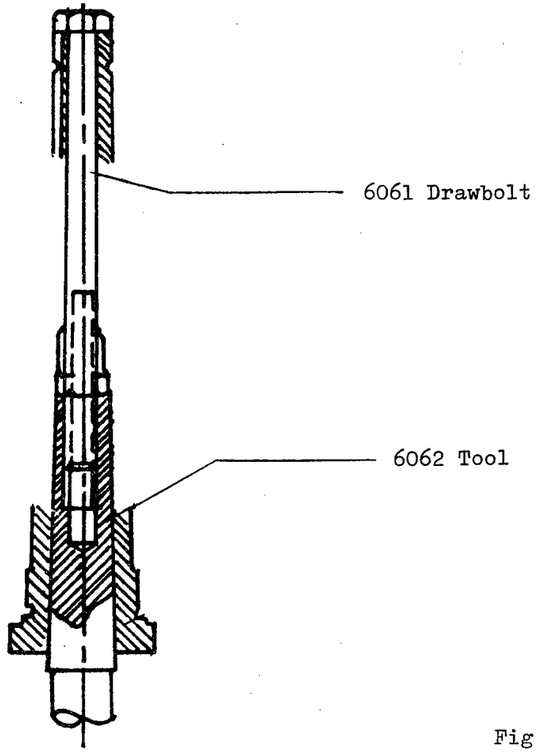


Fig 5

To remove the tool from the Milling Unit Spindle unscrew the drawbolt and push the spring loaded jacking pin from above into the spindle, with the jacking nut press the tool out of the spindle; hold the tool with one hand as it will drop out after being released.

Tools without draw-in threads (with fixing device) are only inserted in the spindle. These tools are likewise removed with jacking pin and jacking nut.

(2) Setting Constant Drilling Depth

If several holes of identical depth are to be produced, it is desirable to set the stop as follows to achieve this:

a. Slacken quill locking screw The quill returns to the zero position.

b. Slacken hexagon screw part (2) while holding hexagon screw part (1).

c. Fit drilling key and drop quill together with tool until the latter touches the workpiece.

d. Hold the quill in this position. Turn index collar clockwise to its stop and lock with hexagon head screw part (2) while holding screw part (1).

e. The required depth has been reached, hold down the quill, slacken screw part (2) and rotate the dial counter-clockwise to the stop and re-lock with screw part (2) while holding screw part (1).

Any number of holes whichever have same depth.

ADJUSTING DRILLING DEPTH

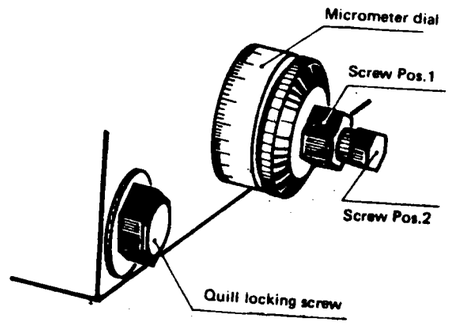


Fig 6

CHAPTER IV-LUBRICATION

LUBRICATION CHART

Sym ***	No.	Service Interval	Lubrication Point	Grease	Oil
◇	1	Before Use	Check oil level in gear box through glass window*		SAE 10
◇	2	"	Drive gear bores	✓	
◇	3	"	Gear bearing grease nipples	✓	
◇	4	"	Gear Teeth		✓
◇	5	"	Leadscrew bearing, left side	✓	
◇	6	"	Bedways - keep clean, free of chips		✓
◇	7	"	Rack - lubricate entire length	✓	
◇	8	"	Leadscrew - keep clean, free of chips, lubricate entire length		✓
◇	9	"	Leadscrew bearing, right side	✓	
◇	10	"	Compound slides & feed screw		✓
◇	11	"	Milling leadscrew		✓
◇	12	"	Milling column		✓
▭	13	Every 1000 hrs	Tailstock lubricating nipple	✓	
▭	14	"	Cross slide lubrication nipple	✓	
▭	15	"	Rack gear (lubricated through 14)	✓	
○	16	Every 100 hrs	Lathe headstock gear box - change completely		½ pint
○	17		Milling head gear box**	✓	

* LATHE HEADSTOCK: Before use, check oil level through glass window in casting near spindle nose. Oil level should show in middle of glass. If additional oil is required, remove gear box cover by removing the 4 top screws.

** MILLING HEADSTOCK: To service milling head gears, remove both side plates. Clean off old grease completely, and pack with new grease (Kuber Lubrication, ST 15/400 PP) or equivalent. All sliding surfaces should be oiled with an acid free oil from time to time.

*** Symbols Meaning:

◇ Prior Start

▭ Every 500 Operating Hours

○ Every 100 Operating Hours

LUBRICATION DIAGRAM

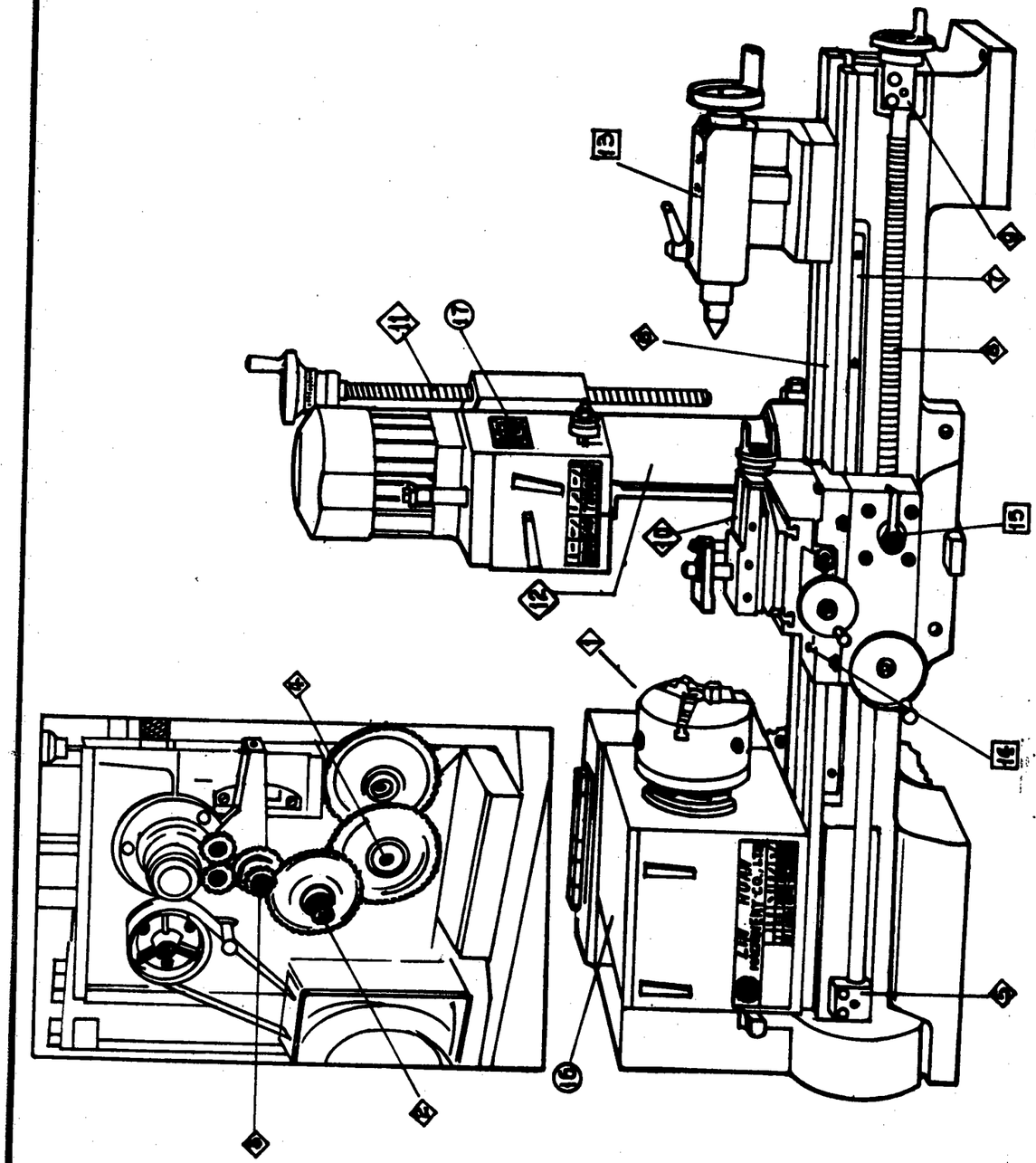


Fig 7

CHAPTER V -ADJUSTMENTS

ADJUSTING THE HEADSTOCK SPINDLE BEARINGS

The main spindle bearing are correctly adjusted at the works. If end play becomes evident after considerable use, the bearings can be adjusted by slackening the grub screw in the slotted nut on the left-hand side of the spindle and to tighten the slotted nut with a "C" spanner until all end play is taken up, but with the spindle still revolving freely. (Excessive pre-loading will damage the bearings). Tighten grub screw (Fig 8).

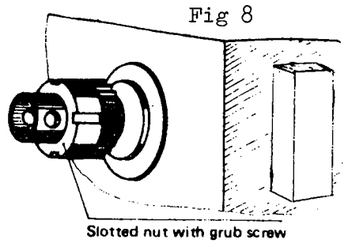


Fig 8

ADJUSTING THE SLIDES

Each slide is fitted with a gib strip which can be adjusted with screws fitted with lock nuts. The gib strip is adjusted with the screws until the slide moves freely without play, after which the lock nuts are tightened (Fig 9).

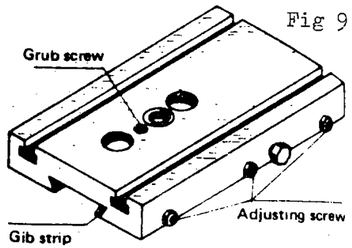


Fig 9

ADJUSTMENT OF FEED SCREW END FLOAT

When one of the three slides (saddle, cross and top slide) develops and float, slacken the screw in the relevant hand wheel and adjust the nut until all play is taken up. Re-lock the nut with the screw (Fig 10).

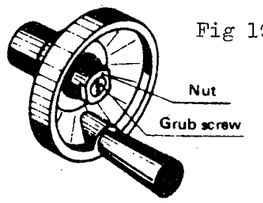


Fig 10

ADJUSTING THE FEED SCREW BACKLASH

CROSS SLIDE SCREW

Remove top slide and adjust grub screw until the backlash is eliminated (Fig 8).

TOP SLIDE SPINDLE

Remove the 2 screws holding the spindle bracket in position and unscrew the spindle. Adjust the screwed ring until all backlash is eliminated (Fig 11).

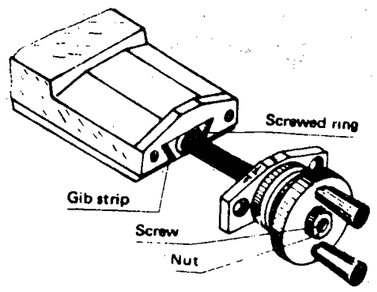


Fig 11

ADJUSTING THE HALF-NUT GUIDE

Loosen the 2 right-hand socket head screws on the apron and adjust the control screw behind the lever until both half-nuts move freely without play (Fig 12). Tighten both socket head screws.

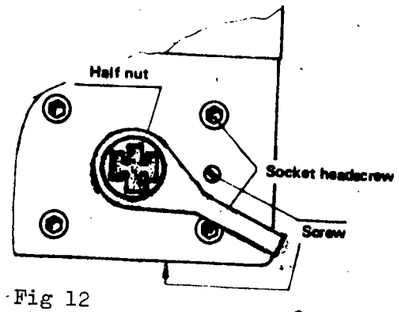


Fig 12

ADJUSTING LEAD SCREW BACKLASH

Unscrew the stop screw on the bottom face of the apron until the backlash is eliminated when the half-nuts are closed (Fig 12).

ADJUSTING THE BACKLASH OF THE MILLING HEAD FEED SCREW

Also, in this case, adjust the screwed ring until all backlash has been removed (Fig 13).

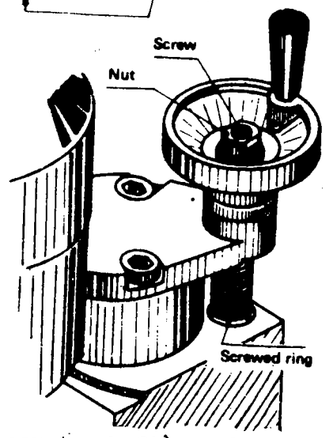


Fig 13

CHANGING THE TIMING BELT

When the driving timing belt (between the motor and countershaft) needs replacing, remove the motor fan casing, remove safety ring and then the timing belt pulley, followed by the belt itself. Now replace the belt, timing pulley and lock. When replacing the fan casing make sure that the belt lies properly inside the recesses to prevent scuffing.

CHECKING OF CORRECT TENSION OF THE TIMING BELT

For securing a quiet running of the machine and for avoiding a quick wear of the toothed belts, these must have the correct tension.

Checking of correct Tension:

1. The belt may give in 6-8 mm (1/4" to 5/16"). See Drawing, Pos. 2

2. For changing the belt tension, slacken front and rear motor fixing screws (pos. 1). Displace motor parallelly until the right tension of belt is obtained.

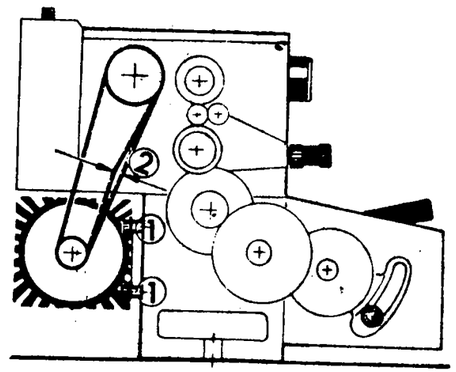


Fig 14

f. Slide the 80-teeth intermediary gear fitted to the shear pin close to the lead spindle gearwheel and engage the intermediary gear in the latter toothed wheel. The intermediary gear is then to be secured in this position.

g. Swing the quadrant with the intermediary gear upward and engage it with the 60-teeth gear on the tumbler gear stud.

The following thread charts are provided for your reference.

(3) THREAD CHART FOR METRIC LEADSCREW

mm	0.4	0.5	0.6	0.7	0.75	0.8	1	1.25	1.5	1.75	2	2.25	2.5	3
W	20	20	20	35	20	40	40	50	35	70	60	45	50	40
Z1	80 H	75 H	75 H	H 80	80 H	80 H	80 H	80 H	80 70	80 H	80 H	80 H	80 H	80 H
Z11														
L	75 H	60 H	50 H	H 75	40 H	75 H	60 H	60 H	40 H	60 H	45 H	30' H	30 H	20 H

Mod	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.6	0.7	0.9	1
W	55	55	55	55	55	55	55	55	55	55	55
Z1	70 40	70 50	70 60	70 H	70 80	50 60	70 40	70 80	75 80	70 60	70 80
Z11							H 60			50	
L	H 75	H 75	H 75	75 H	H 75	H 70	H 30	H 50	H 40	H 25	H 30

n/"	8	9	10	11	12	13	16	18	19	20	22	24	26	28	32	36	40	44	48	56	64	80
W	55	55	55	50	55	65	55	50	40	55	50	55	30	50	50	25	40	25	55	25	25	20
Z1	65 50	45 50	65 60	65 60	65 50	70 H	50 H	65 55	80 H	70 H	70 H	65 25	45 H	70 55	65 55	50 H	65 55	70 H	50 H	40 H	40 H	40 H
Z11	H 45	60 65	H 45	H 45	H 45		20 25					H 80	50 65			65 55			60 25	70 55	65 55	65 55
L	H 20	30 H	H 30	H 30	H 30	50 H	H 55	H 45	45 H	H 55	H 55	H 30	H 60	H 65	H 80	H 45	H 80	65 H	H 65	H 65	H 80	H 80

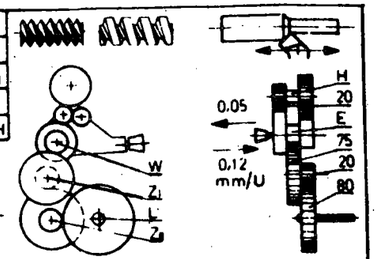


Fig 15

(4) THREAD CHART FOR INCH LEADSCREW

n/"	8	9	10	11	11.5	12	13	14	16	18	19	20	22
W	40	40	40	40	50	40	40	40	30	40	70	40	40
Z1	80 H	50 H	80 H	50 H	45 25	80 H	50 H	70 60	60 40	80 H	50 45	80 H	80 H
Z11		45 60		25 60	H 60		65 60	H 50	H 50				
L	20 H	H 30	25 H	H 30	H 20	30 H	H 30	H 30	H 20	45 H	H 75	50 H	55 H

n/"	24	26	28	32	36	40	44	48	56	64	72	80
W	20	40	40	20	20	20	20	20	20	20	20	20
Z1	50 H.	70 H	65 H	80 H	80 H	80 H	80 H	80 H	65 H	60 H	55 H	55 H
Z11	55 H										45 30	50 30
L	30 H	65 H	70 H	40 H	45 H	50 H	55 H	60 H	70 H	80 H	H 60	H 60

mm	0.4	0.5	0.6	0.7	0.8	1	1.25	1.5	1.75	2
W	50	55	35	55	50	40	50	60	70	65
Z1	75 30	70 30	65 75	60 H	75 60	50 H	45 H	55 65	55 65	75 80
Z11				50 30		55 65	55 65			
L	H 80	H 75	80 H	H 75	H 80	H 75	H 75	H 75	H 75	H 55

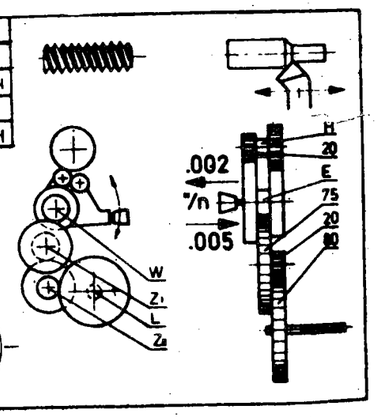


Fig 16

LEGEND TO THE THREAD CHARTS

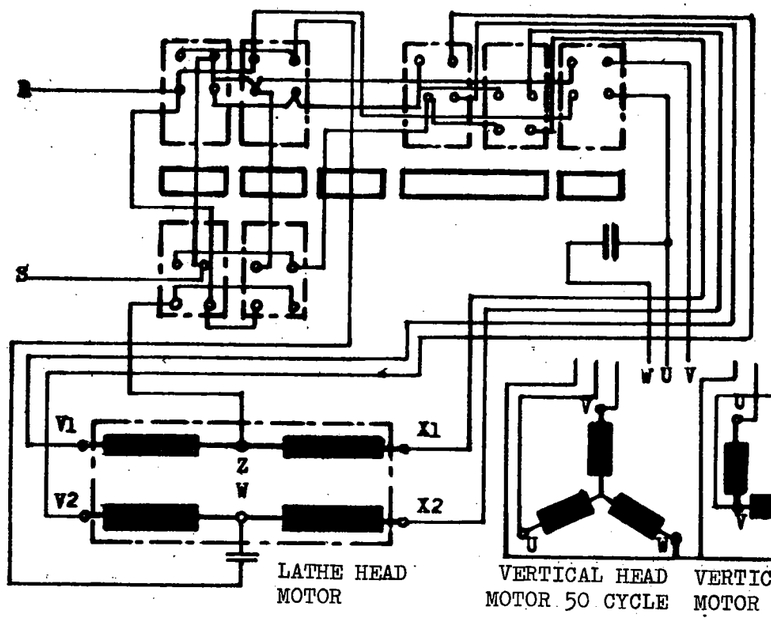
mm = Metric Thread Pitch
Mod = Module Thread
n/" = Thread Pitch Inch System
W = Tumbler Bolt
Z, = First Intermed. Gearwheel
Z,, = Second Intermed. Gearwheel
L = Lead Spindle Gearwheel
H = Spacing Bush
E = Feed Unit

CHAPTER VI-ELECTRICAL DIAGRAMS

WIRING DIAGRAM FOR SINGLE PHASE MOTOR

WIRING DIAGRAM FOR SINGLE PHASE MOTOR " 1 PH " 110V (220V)

60 HZ (50 HZ)



X1 = WHITE
X2 = YELLOW
V1 = ORANGE
V2 = BLUE
W = RED
Z = BLACK
U = WHITE
V = BLACK
W = RED
R = RED
S = BLACK
E = GREEN

Fig 17

NOTE:

VOLTAGE	CAPACITANCE	
	LATHE	MILLING
220V	12 µF	4 µF
110V	25 µF	10 µF

CONNECTION DIAGRAM FOR SINGLE PHASE MOTOR

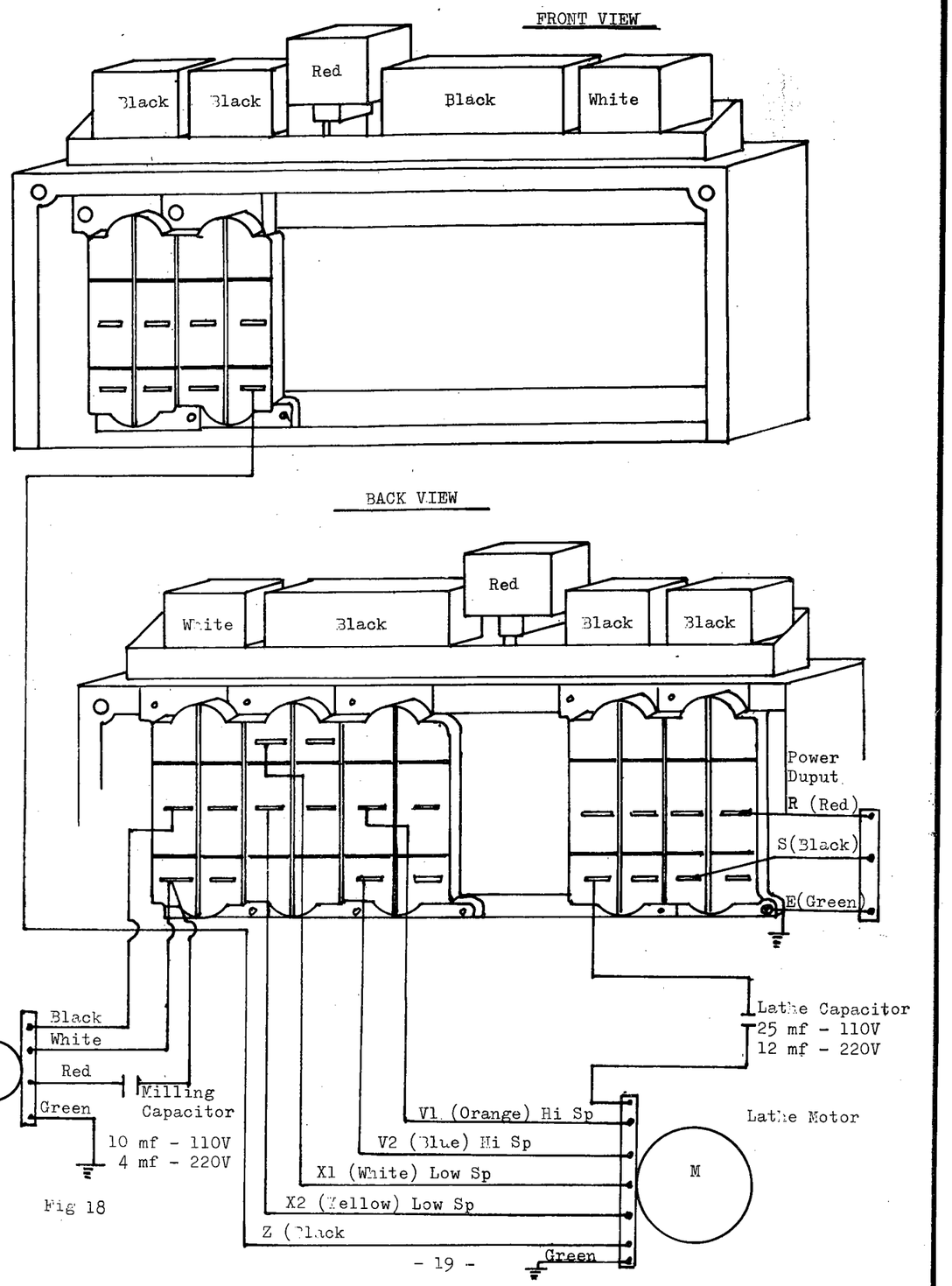


Fig 18

HEAD STOCK

Part No.	Nomenclature	Specification	Qty	Unit Price	Remarks
M2-1-0	Head Stock Housing		1		
M2-1-0-1	Housing Cover		1		
-1	Spindle	S45C	1		
-2	Front Bearing Cover	AL	1		
-3	Front Bearing	32007	1		
-4	Moveable Gear 49.00	S45C	1		
-5	Fixed Gear	"	1		
-6	Positioning Sleeve	"	1		
-7	Rear Bearing	32006	1		
-8	Positioning Sleeve	S45C	1		
-9	Power take off Gear	"	1		
-10	Ring	"	1		
-11	Key	3x3x16L	1		
-12	Retaining Nut	S45C	1		
-13	Screw	M5x0.75x5L	6		
-14	Power Input Shaft	S45C	1		
-15	Brass Sleeve	Phos. Brass	1		
-16	Fixed Gear 63.00	S45C	1		
-17	Moveable Gear Use 24.20 # 0107	"	1		
-18	Shaft Cover	SS-41	1		
-18-1	Brass Sleeve	Phos. Brass	1		
-19	Timing Belt Pulley	SS-41	1		
-20	Key	4x4x10L	1		
-21	Snap Ring	S-13	1		
-22	Speed Change Lever	S25C	1		
-23	Speed Change Braket	Die Casting	1		
-24	Speed Change Block	S45C	4		
-25	Speed Change Lever	"	1		
-26	Speed Change Braket	"	1		
-27	Snap Ring	G8	2		
-28	"O" Ring	6φ	4		
-29	Belt Adjusting Plate	Brass	1		
-30	Roller	S45C	1		
-31	Roller Shaft	"	1		
-32	Bearing	608Z	1		
-33	"	"	1		
-34	"C" Type Snap Ring	G8	1		
-35	Timing Belt T23		1		

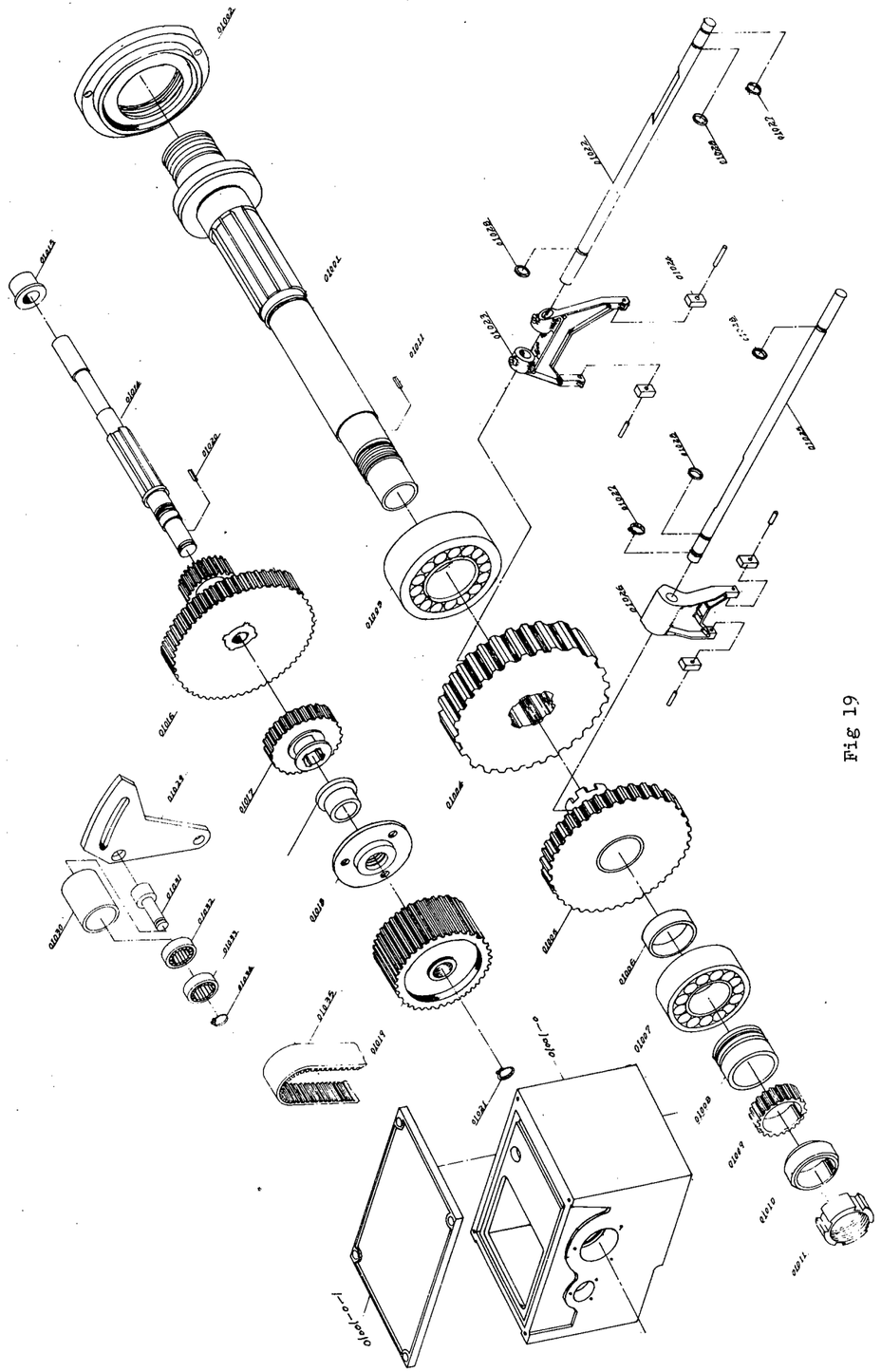


Fig 19

TRANSMISSION GEAR TRAIN

Part No.	Nomenclature	Material and Specification	Qty	Unit Price	Remarks
M2-2-1	F.R. Braket	Die Casting	1		12/2/88 84,20
-2	F.R. Gear	~~[illegible]~~	2		
-3	Gear Shaft	S45C	2		
-4	Needle Bearing 12.20	HK1010	2		
-5	Nut	M5x0.9	2		
-6	F.R. Handle	S45C	1		
-7	Spring	SUP3	1		
-8	Snap Ring	G5	1		
-9	Handle Positioning Mount	Die Casting	1		
-10	Privot	S45C	1		
-11	Sleeve	Powder Met.	1		
-12	Gear	S45C	1		
-13	Fixed Sleeve ~~6.00~~ 7.20 N	"	2		
-14	Gear 55.00	"	2		
-15	Spring Washer 5.60	"	3		
-16	Nozzle Screw	Sexag. Bar	3		
-17	Oil Nozzle	3/16"	3		
-18	Clutch Handle 7.20	S45C	1		
-19	Clutch Shaft 8.40	"	1		
-20	Ball	3ϕ	1		
-21	Spring	3ϕx0.3ϕx5L	1		138.60 12/2/88
-22	~~Clutch Gear A 15.00~~ N. 8.80,	Powder Met.	~~1~~		
-23	Clutch 19,00	" "	1		
-24	Intermediary Gear ~~5.45~~ ~~N7.70~~	S45C	~~1~~		N. 19,25
-25	Clutch Gear B ~~14.00~~	Powder Met.	~~1~~		~~N. 15.50~~ 152,00 12/2/88
-26	Square Nut ~~3.50~~ 4,20	Steel	2		
-27	Gear Shaft ~~5,00~~ 6.00	S45C	1		
-28	Sleeve ~~11,00~~ 14,28	Powder Met.	1		
-29	Interchangeable Gear 19,50	FC-20	1		
-30	Gear 5,00	S45C	1		
-31	Washer ~~2.75~~ 3,30	SS-41	2		
-32	Support	FC-20	1		
-33	Interchangeable Gear	"	1		
-34	Fixed Sleeve 7,00	S45C	1		
-35	Lead Screw	"	1		
-36	Front Mount Block	FC-20	1		
-37	Screw	M6xlx25L	2		
-38	Rear Mount Block	FC-20	1		
-39	Screw	M6xlx30L	2		
-40	Handle Wheel	FC-20	1		
-41	Dail	S45C	1		
-42	Half Moon Key	3xl0	1		
-43	Adjusting Nut	S45C	1		
-44	Handle	"	1		

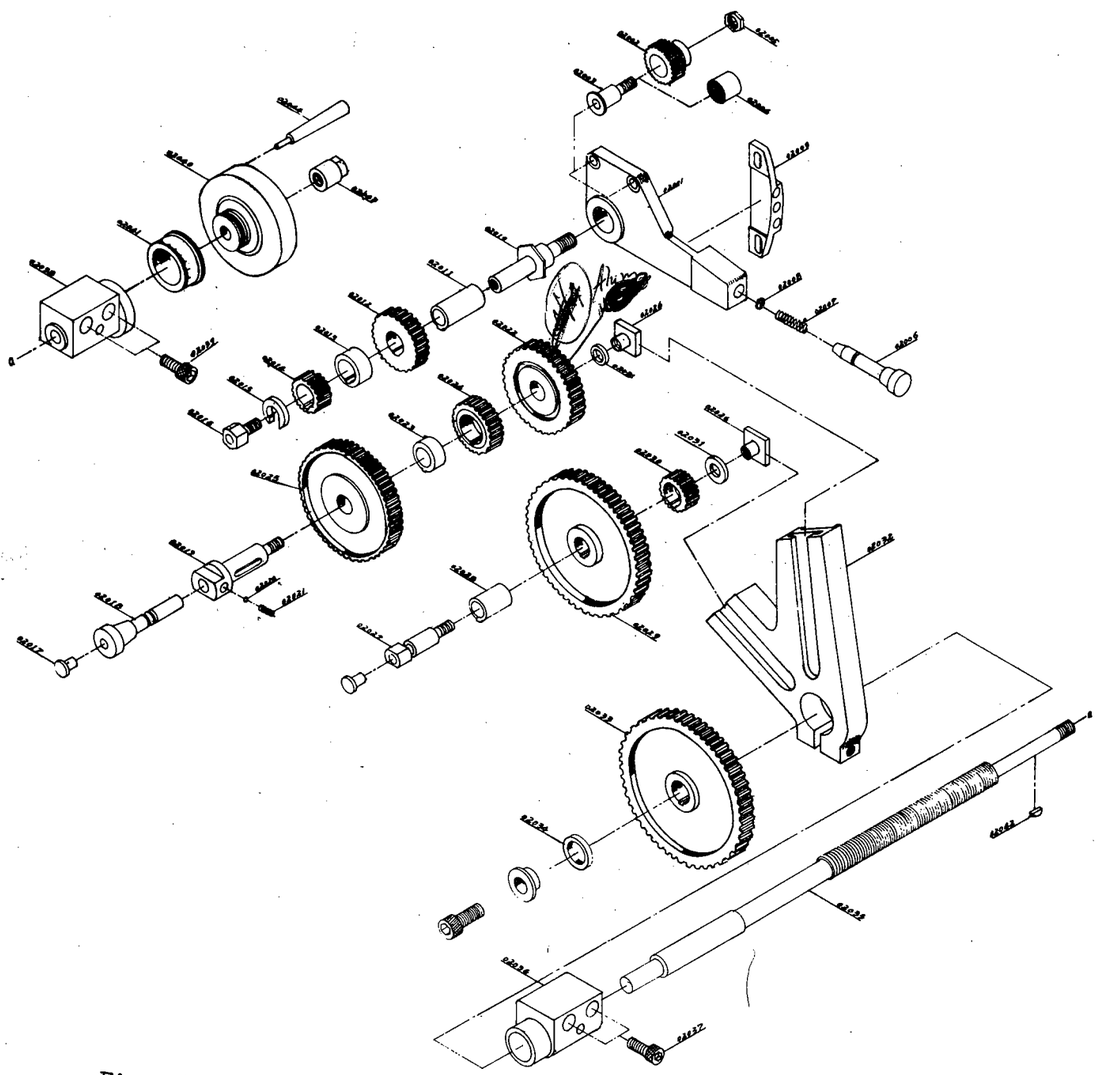


Fig 20

CROSS SLIDE

Part No.	Nomenclature	Material and Specification	Qty	Unit Price	Remarks
M2-3-1	Bottom Slide	FC25	1		
-2	Top Slide	"	1		
-3	Jib 3.50	SS-41	1		
-4	Adjusting Screw	M4x0.75x12L	3		
-5	Positioning Pin	3.2Øx21L	3		
-6	Lock Nut	M4x0.75	3		
-7	Feed Rod Mount	Die Casting	1		
-8	Hand Wheel	FC20	1		
-9	Spring	SUP	1		
-10	Dial	S45C	1		
-11	Handle	SS-41	1		
-12	Adjusting Nut	"	1		
-13	Feed Rod - 21.00	S45C	1		
-14	Feed Nut	Die Casting	1		
-15	Counter Sink Washer	SS-41	1		
-16	Retaining Bolt	M6x1x14L	1		
-17	Jib	SS-41	1		
-18	Front Press Plate	"	1		
-19	Bolt	M5x1x16L	1		
-20	Rear Plate	FC-20	1		
-21	Tool Post Lower Slide	FC-25	1		
-22	Tool Post Upper Slide	"	1		
-23	Dail	S45C	1		
-24	Top Plate	SS-41	1		
-25	Square Head Bolt 1.25	S45C	2		
-26	Tool Post Feed Rod	"	1		
-27	Feed Nut	Die Casting	1		
-28	Adjusting Screw	S45C	1		
-29	Feed Rod Mount	Die Casting	1		
-30	Hand Wheel	FC-20	1		
-31	Dail	S45C	1		
-32	Spring	SUP3	1		
-33	Handle	SS-41	1		
-34	Adjusting Nut	S45C	1		
-35	Center Bolt	"	1		
-36	Square Tool Post	SS-41	1		
-37	Handle	S45C	1		
-38	Tool Bit Press Bolt	M6x1x20L	8		
-39	Jib	SS-41	1		
-40	Positioning Pin	3.2Øx8L	3		
-41	Apron	FC-25	1		
-42	Pinion Gear	S45C	1		
-43	Intermediary Gear	"	1		
-44	Snap Ring	G8	1		
-45	Hand Wheel	FC-25	1		
-46	Handle	SS-41	1		
-47	Swivel Plate	S45C	2		
-48	Half Nut ~~34.50~~ 29.40	Die Casting	1		
-49	Clutch Bracket	Powder Met.	1		
-50	Bolt	M6x1.0	4		
-51	Clutch Knob	AL	1		

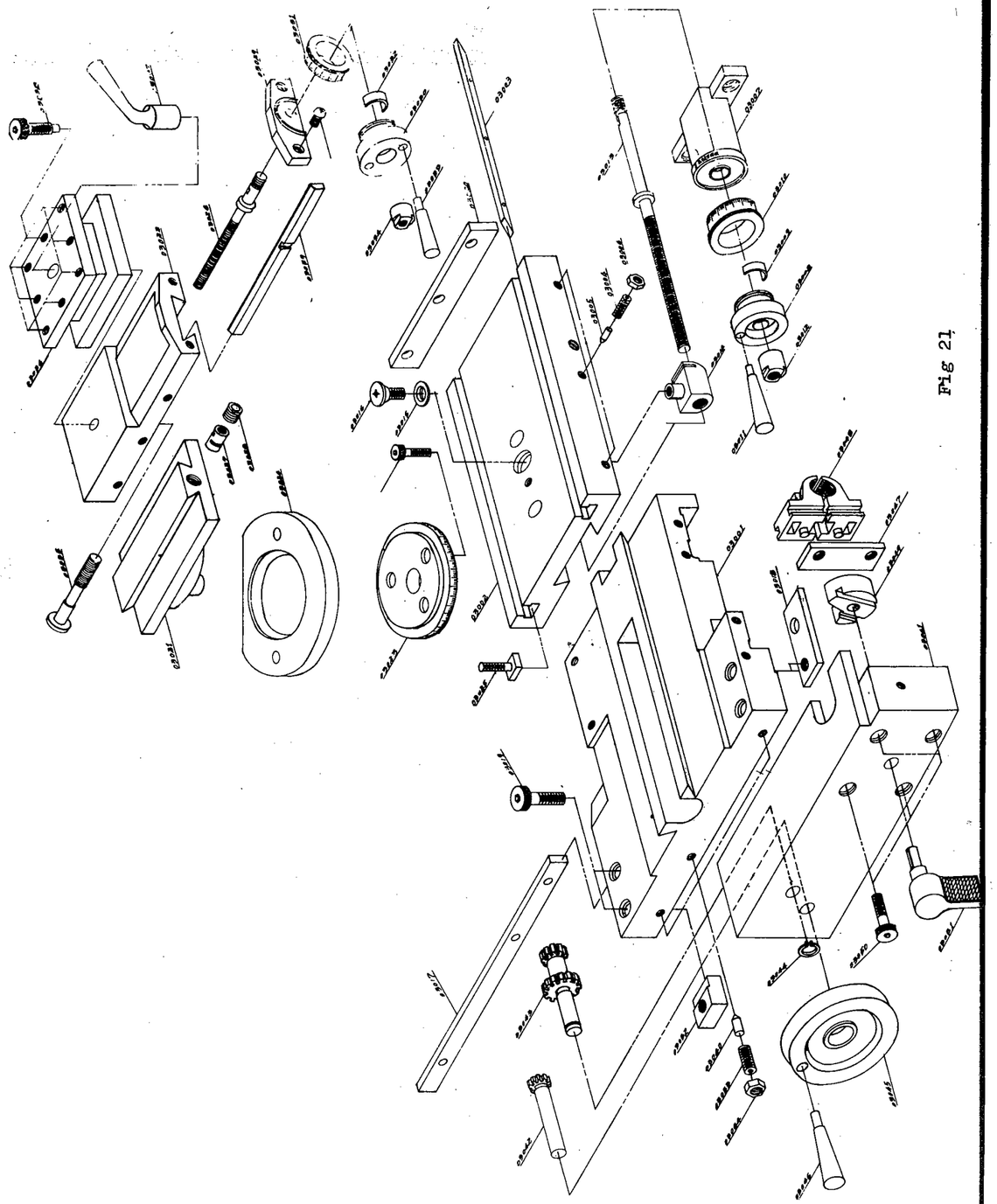


Fig 21

TAIL STOCK

Part No.	Nomenclature	Material and Specification	Qty	Unit Price	Remarks
M2-4-1	Tail Stock Housing	FC-20	1		
-2	Tail Stock Mount	"	1		
-3	Barrel	S45C	1		
-4	Positioning Ping	M8x1.25	1		
-5	Bolt	S45C	1		
-6	Bushing	Phos. Brass	1		
-7	Hand Wheel N27,72	FC-20	1		
-8	Dial	S45C	1		
-9	Spring	SUP	1		
-10	Half Moon Key	3x10	1		
-11	Adjusting Screw	M8x1.25	1		
-12	Adjusting Nut	"	1		
-13	Handle N11.40	SS-41	1		
-14	Barrel Pull Up Lever	Die Casting	1		
-15	Barrel Pull Down Lever	" "	1		
-16	Barrel Lock Bolt	M6x1	1		
-17	Barrel Lock Handle	AL	1		
-18	Adjusting Screw	M6x1	2		
-19	Press Plate	FC-20	1		
-20	Lock Handle	S45C	1		
-21	Off Center Shaft	"	1		
-22	Snap Ring "C"	Steel	1		
-23	Handle	S45C	1		
-24	Set Screw	M6x1	1		
-25	Nut	M8x1.25	1		
-26	Washer	S45C	1		
-27	Adjusting Bar	FC-20	1		
-28	Set Screw	M4x0.75	2		
-29	Bolt	M6x1.0	2		

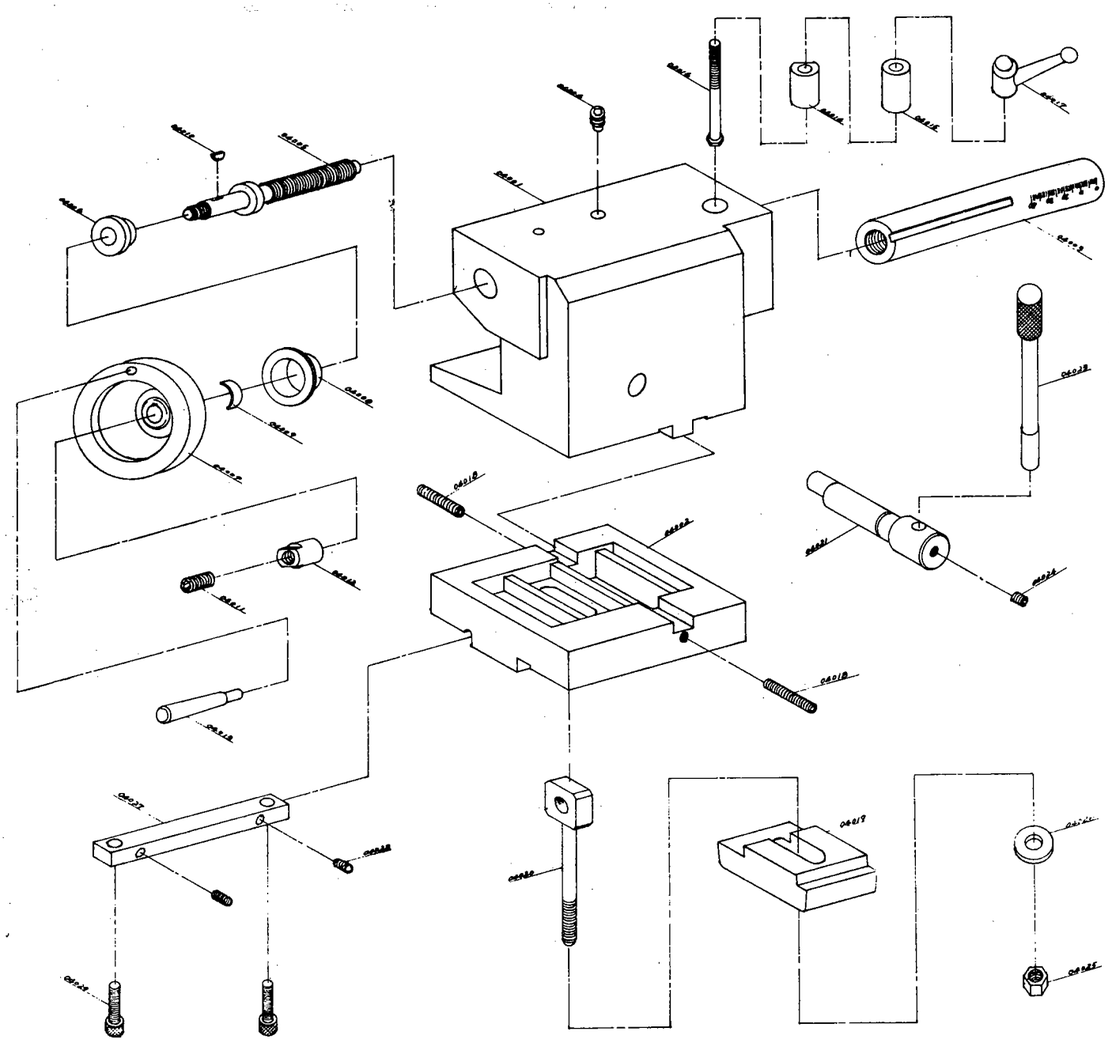


Fig 22

BED

Part No.	Nomenclature	Material and Specification	Qty	Unit Price	Remarks
M2-5-1	Chip Pan	FC-20	1		
-2	Bed	"	1		
-3	Safety Guard	AL	1		
-4	Switch Box	AL	1		
-5	Switch - Push Button Type		1	~~¥ 11,760~~ 137.00	

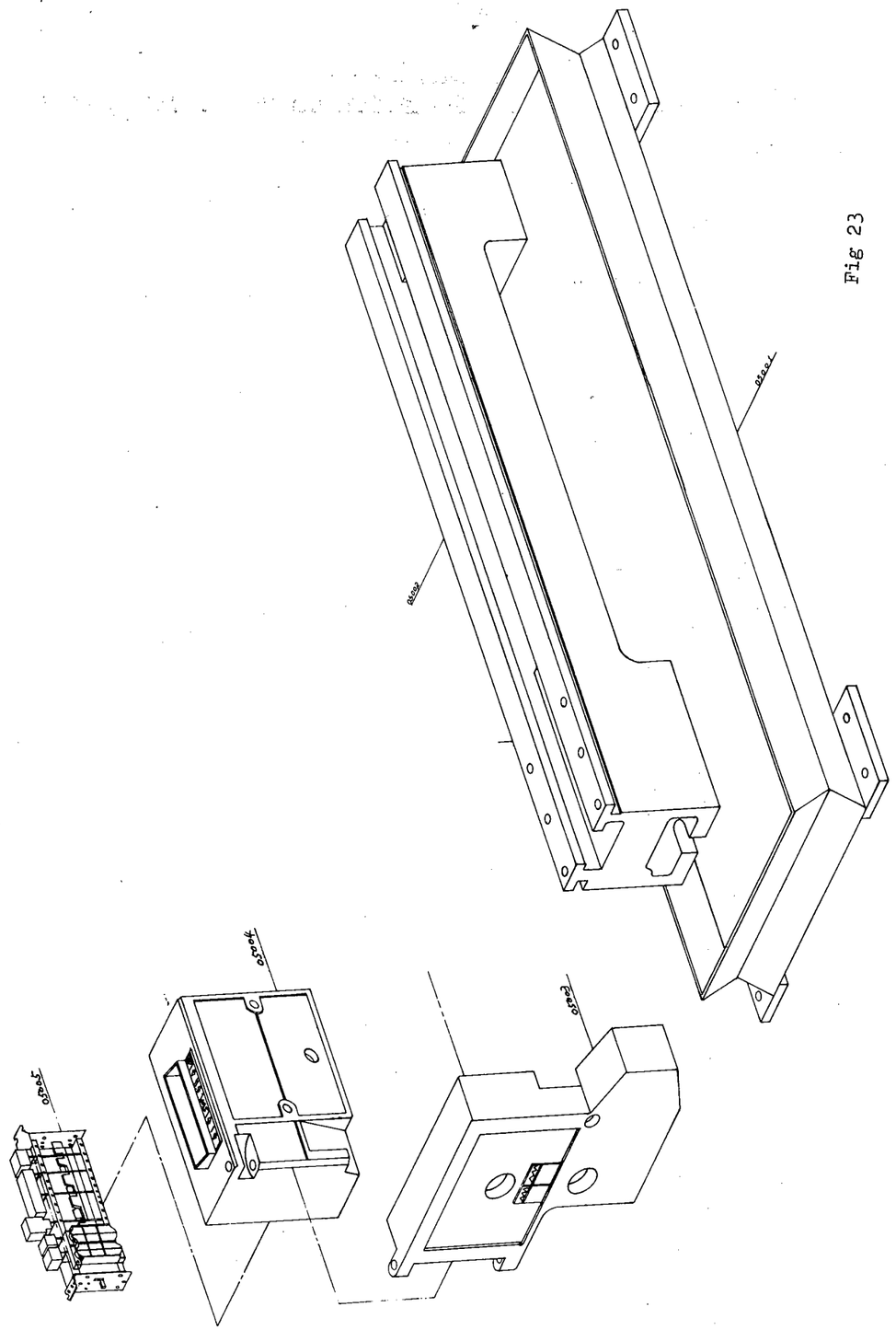


Fig 23

MILLING UNIT

Part No.	Nomenclature	Material and Specification	Qty	Unit Price	Remarks
M2-6-1	Mounting Braket	FC-20	1		
-2	Spindle Head	"	1		
-3	Transmission Gear Box	"	1		
-4	Column	S45C	1		
-5	Slide Guide	"	1		
-6	Lead Screw	"	1		
-7	Lead Screw Sleeve	"	1		
-8	Spindle	"	1		
-9	Spindle Sleeve Gear	"	1		
-10	Retaining Nut	"	1		
-11	Pinion Shaft	"	1		
-12	Transmission Gear	"	1		
-13	" "	"	1		
-14	" " 23,80	"	1		
-15	Retaining Nut	"	1		
-16	" "	"	1		
-17	Name Plate	AL	1		
-18	Shaft	S45C	1		
-19	Speed Change Lever	"	1		
-20	" "	"	1		
-21	Hand Wheel	FC-20	1		
-22	Handle	S45C	1		
-23	Dail	"	1		
-24	Speed Change Knob	"	1		
-25	Speed Change Bracket	"	1		
-26	Speed Change Bracket 8,32	"	1		
-27	Pinion Shaft Retaining Nut	"	1		
-28	Column Top Cover (19,11)	"	1		
-29	Dail	"	1		
-30	Retaining Nut	"	1		
-31	Bearing	6000ZZ	1		
-32	Motor		1		
-33	Bearing	K30x35x17	1		
-34	Allen Head Bolt	M8xl.25	4		
-35	" "	"	2		
-36	Adjusting Nut	S45C	1		
-37	Bearing	6004Z	1		
-38	Allen Head Bolt	M6xl	8		
-39	Set Screw	M4x0.7	2		
-40	Allen Head Bolt	M8xl.25	4		
-41	~~Spring~~ Orgn	6004ZR	1		

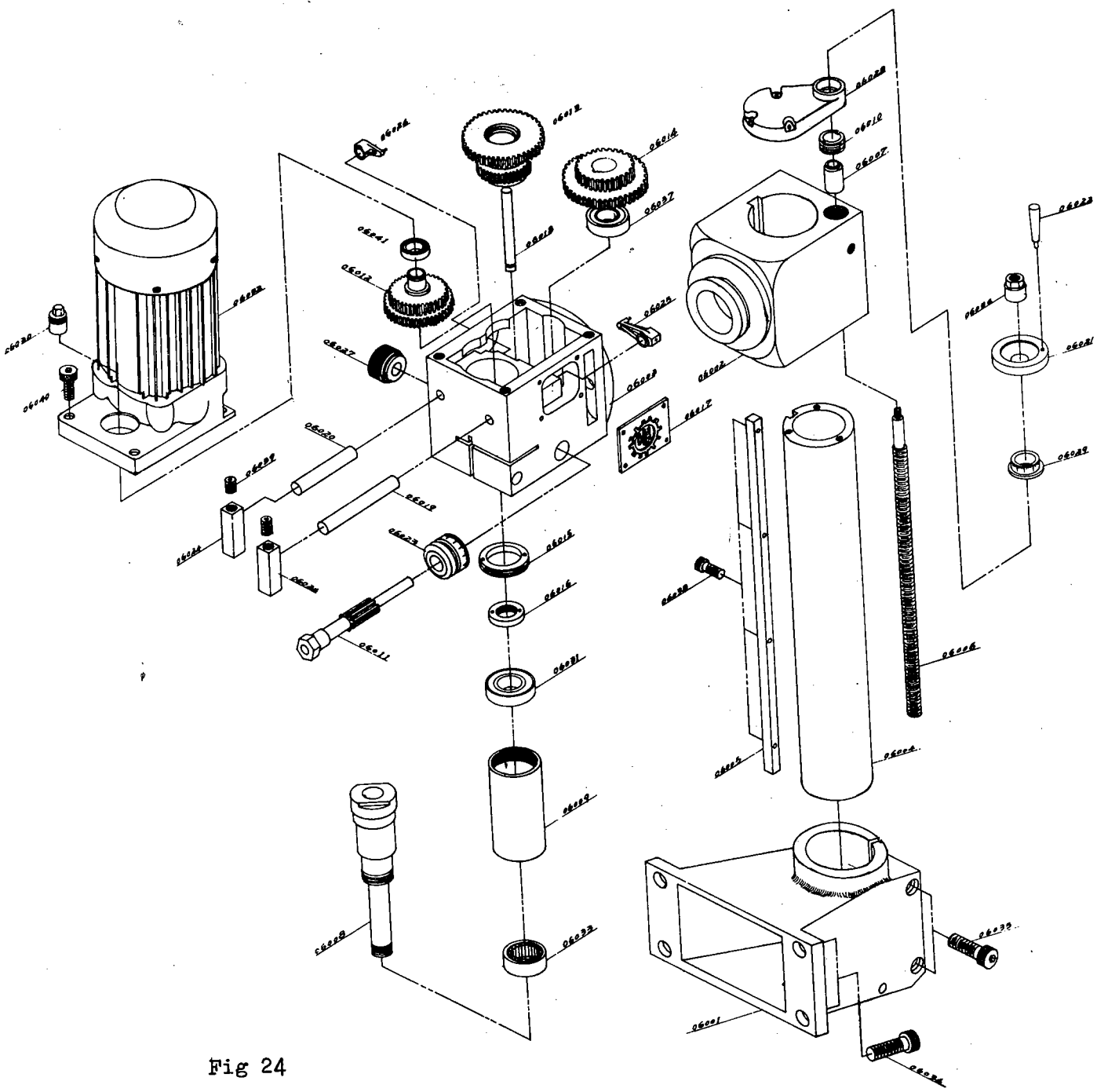


Fig 24