

TYPE 13Z LATHE

MACHINE No.

GENERAL NOTES

Ample and proper lubrication is essential to ensure good results and lasting accuracy.

Lubrication of the Lathe should start as soon as it has been cleaned and before any mechanisms are operated or sliding parts moved.

Do not fill oil wells above the level shown on the oil sights, and use only high grade oil with an approximate specification to that given on the chart.

If difficulty is experienced in maintaining turning, facing and boring operations to within standard limits, the chances are that this is caused by the lathe being out of level. Most complaints of this nature have been found to be due to this cause, and the lathe should be carefully re-levelled, using a good sensitive level.

Plain Bearing Head Lathes should not be used at the top spindle speeds until a few days' heavy work has been done on the slower speeds. After this, when using the top speeds, the lathe should be first started up on a slower speed to warm up the headstock parts.

Hammers, spanners, tools, etc. should not be placed on the bed shears or slides. This prevents scratching and other damage to the same.

CAUTION.—Do not change spindle speeds or feeds with the shafts revolving any faster than is necessary to engage the gears properly; the lathe should be slowed down or stopped to do this. When stopped, if the gears do not mesh instantly the friction clutch should be lightly engaged to revolve the gears slowly.

CHATTER.—May be due to the following causes and these should be checked over before asking for a service call:—

Work extending too far from chuck; change method of chucking or support outer end in stay or with loose head centre.

Too great a distance between centres without support; use a stay.

Oil, grease or dirt in between spindle nose and flange and chuck; these parts should be cleaned before mounting chuck on the spindle.

Dirt between centres and workpiece or bad fitting centres in fast or loose heads.

End play in spindle.

Improperly adjusted compound rest and saddle slips or gib plates.

Cutting edge of tool below centre of spindle.

Tool too weak or having too much overhang.

Tool insecurely clamped in tool-rest.

Irregular shaped work and fixtures causing out of balance or intermittent cutting.

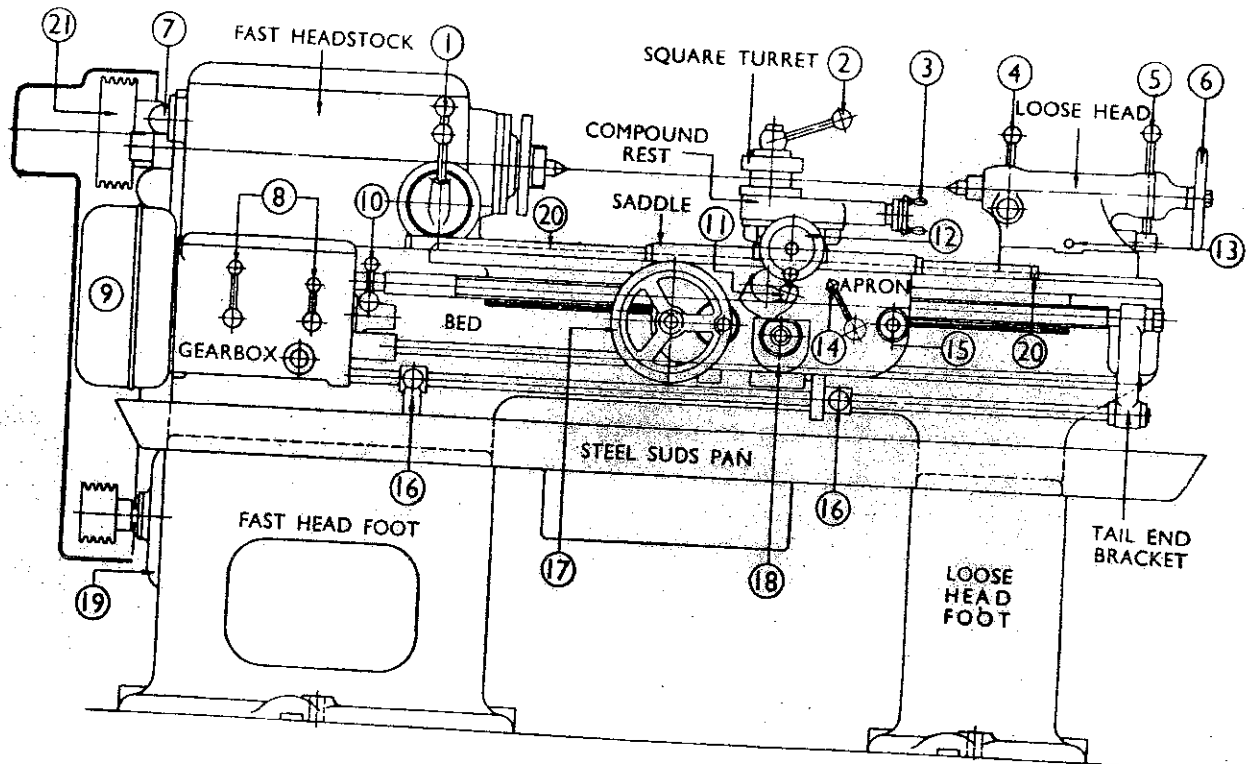
Incorrect selection of cutting speed and feed.

Wipers for bed shears should be cleaned frequently and adjusted or replaced as required.

SPARES.—When ordering spares, clear descriptions or sketches of parts should be given, and in all cases it is important to quote the machine number given on the lathe nameplate or end of bed shears.

13Z. TYPE LATHE

IDENTIFICATION CHART.



1. SPINDLE SPEED CHANGE LEVERS.
2. SQUARE TURRET LOCKING HANDLE.
3. COMPOUND REST HANDLE.
4. LOCKING LEVER FOR LOOSE HEAD SPINDLE.
5. LOCKING HANDLE FOR LOOSE HEAD.
6. LOOSE HEAD HANDWHEEL.
7. PERSPEX OIL SIGHT.
8. GEARBOX FEED CHANGE LEVERS.
9. CHANGE WHEEL COVER.
10. FEED AND SCREW REVERSE LEVER.
11. SLIDING AND SURFACING FEED CHANGE LEVER.
12. SADDLE HANDWHEEL.
13. SETTING SCREWS FOR TAPER WORK.
14. OPERATING LEVER FOR LEADSCREW NUTS.
15. SCREWCUTTING DIAL.
16. CLUTCH AND BREAK OPERATING LEVERS.
17. APRON HANDWHEEL.
18. FEED ENGAGE AND TRIP LEVER.
19. ELECTRIC DRIVING MOTOR.
20. COVERS AND WIPERS FOR BED SHEARS.
21. CLUTCH DRIVING PULLEY.

Instructions for Operating Lathes

13 Z



It is essential that the lathe should be on a good foundation. The shears of the bed must be correctly levelled, failure to observe this will result in incorrect work.

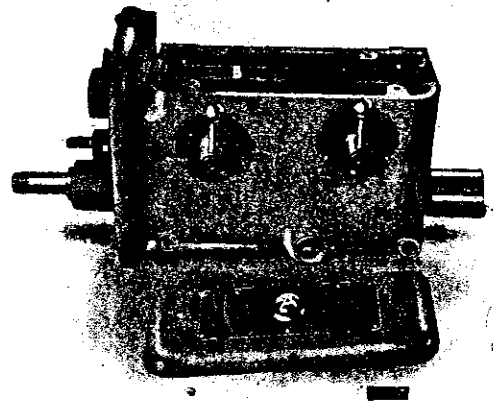
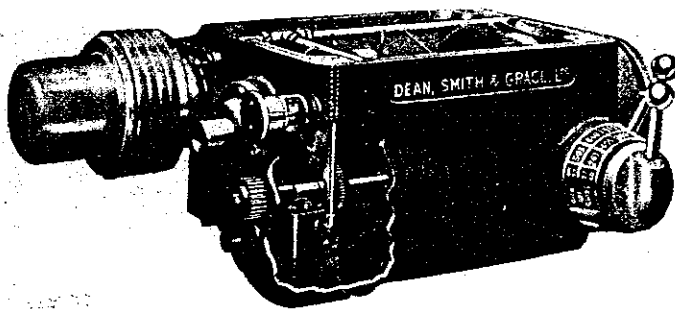
Lubrication. (Absence of lubrication is disastrous. Over lubrication is wasteful, dirty and annoying). USE VACUUM OIL CO'S. "ETNA HEAVY."

Before starting up a lathe, see that it is thoroughly lubricated and oil wells filled. When new or after standing for a period it is advisable to run slow and light for a short time to allow the oil to work into any bearings that may have become dry. Cases of seizing have been traced to the lack of this simple precaution.

Headstock. A pump inside the head supplies oil to the gears and bearings inside. An oil sight is fitted at the left end of the headstock, only sufficient oil is required to cause the oil to drip in this oil sight when the head is running. A lathe despatched from the works for immediate installation has already the requisite amount of oil in the headstock.

Lathes shipped overseas or having stood for a considerable time before installation should have the top cover of the headstock removed and supplied with oil to approximately the level in the diagram. The total quantity in the headstock should be about (6 pints) 3½ litres. As an additional precaution pour oil into the main spindle bearing oil holes as the supply from the pump may not be immediately available due to empty pipes, and running the spindle dry may do considerable damage.

(For Multi-plate Clutch Adjustment, see Instruction Sheet No. 251 or 253).



The Feed Gear Box. Maintain the oil level in the box at centre of oil sight. To oil bearings fill reservoir "B" through hole "A" in lid, once a day. Surplus oil accumulates in the sump and can be drawn off when necessary through the plug tap underneath. Quantity of oil about 1 pint.

Use oil of a specification of approximately:

Specific gravity
Flash point
Viscosity at

.92
410° F.
70° 1,500 sec.
100° 460 "
200° 56 "

(Redwood)

The Apron Bearings are supplied by syphon from reservoirs at each end of the saddle, the one at the tail end also supplies the worm box.

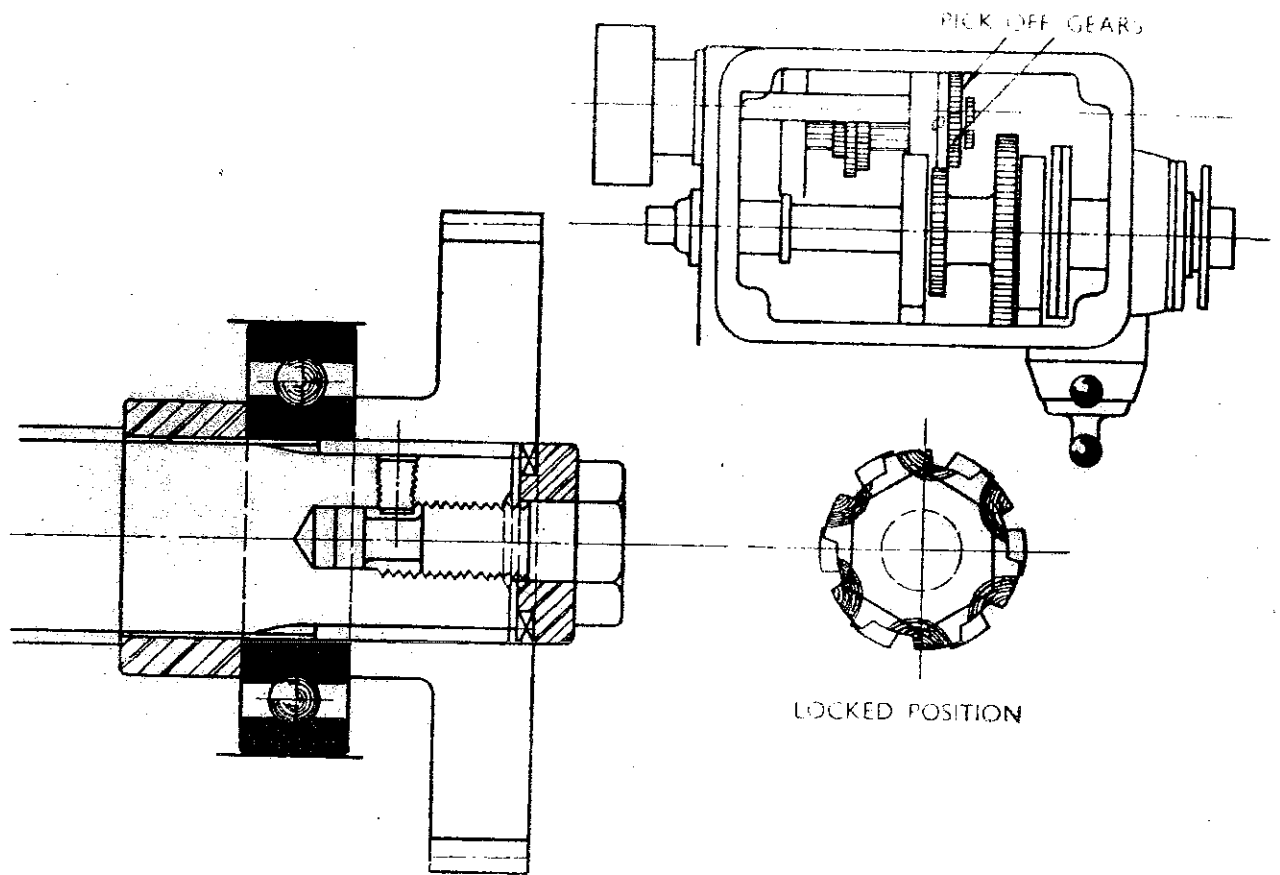
SCREWCUTTING

The screw and feed reverse motion can be used when screwcutting to reverse the screw and run back the tool to the starting point, without disconnecting the lead screw nut and without danger of cross threading. This can be used for metric threads.

Instruction Sheet No. 1 (MInor)

13Z LATHE

Instructions for Changing Pick-Off Gears.



The Pick-Off Gears are held in position by a Castellated Washer and Hexagon Headed Screw.

To remove a Gear, give a partial turn of the Hexagon Head to loosen the Washer, turn the Washer in the same direction, this will engage the Spline of the Gear, and the Gear can be slipped over the Washer and Hexagon Head.

To replace a Gear, pass the Gear over the Hexagon Head and Washer onto the Shaft, turn the Washer until the projections on the Washer engage the projections on the bore of the Gear and tighten Hexagon Head.

The Hexagon Head SHOULD NOT be given more than a partial turn as there is a pin in the Shaft to prevent the Hexagon Head being screwed out.

Interchange the Pick-Off Gears to alter the Speed Range.

13Z & 4AV LATHES

SCREWCUTTING

When setting the change gears it is important that there should be a small amount of backlash between each set of gears. This ensures that the drive to the screw will be smooth and that no undue stress is set up on the change gear studs which might lead to breakage. Care should be taken to see that the gears are set up in correct position (i.e. as 'drivers' and 'driven' gears).

If the screwcutting motion has been standing for any length of time all the parts concerned should be lubricated together with the change gears.

Reverse to the leadscrew is by the reverse Feed and Screw lever operating a single tooth clutch running at the same speed as the spindle. Consequently the clutch may be used to run back the saddle to the starting position when cutting metric or odd pitches.

For accurate screwcutting it is essential that all slides should be adjusted properly without backlash and locked where possible.

The leadscrew thrust is taken on hard steel thrust washers running against the faces of the leadscrew bracket and any wear which takes place can be adjusted by means of the split checknuts adjacent to the thrust washers. The Leadscrew motion should be disconnected when not in use, this can be done by swinging the change gears on the swing plate out of mesh.

THE SCREWCUTTING DIAL

This is a most useful aid to screwcutting although its use is limited to certain threads and pitches. Where applicable it enables the nuts to be engaged without cross threading.

The dial may be used when cutting any pitch which is contained a whole number of times in a length of 4". From this it will be seen that the whole numbers of threads per inch can be cut, also threads per inch ending in quarters and halves, viz. $2\frac{1}{4}$ and $2\frac{1}{2}$ t.p.i.

The dial makes one revolution for 16 turns of the leadscrew and as the screw is $\frac{1}{4}$ " pitch this is equivalent to 4 ins. length of thread on the screw. As the dial is divided into 8 divisions, the alternate ones being numbered 1 to 4 then from one numbered division to the next is $\frac{1}{4}$ of a revolution and is equivalent to 1" of screw thread. It will be seen, therefore, that when cutting a screw having a whole number of threads per inch the spindle will make a whole number of revolutions in one inch length, and as the leadscrew likewise makes a whole number of revolutions in the same distance the leadscrew nuts can be engaged at any numbered division on the dial. From this it follows that if the threads per inch on the screw to be cut is an even number a whole number of threads is contained in $\frac{1}{2}$ " and the nuts may be engaged at any of the 8 divisions on the dial.

Similarly, odd numbers of t.p.i. can only be engaged at any numbered division, threads ending in halves engaged at every half revolution, and threads ending in quarters every revolution. For linear inch pitches, convert the pitch to an equivalent number of threads per inch (viz $\frac{1}{4}$ " pitch = 3 t.p.i.) and follow the above rules.

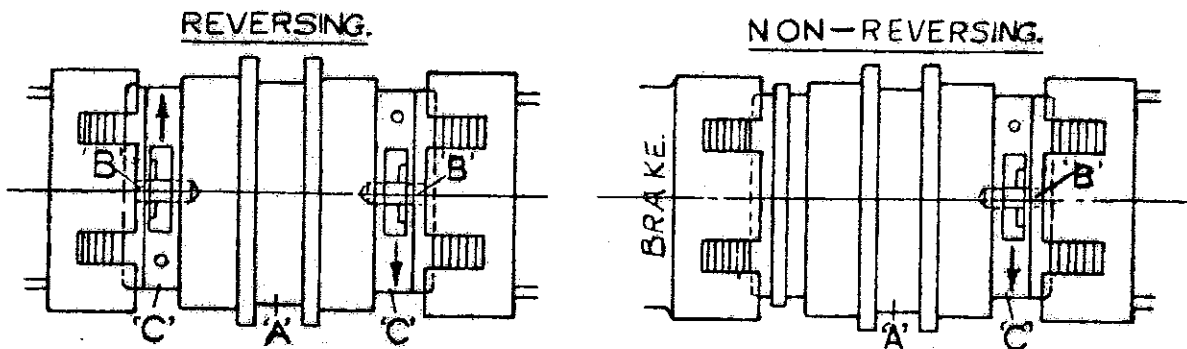
If the number of threads per inch is neither a whole number nor does not end in $\frac{1}{2}$ or $\frac{1}{4}$ then the dial cannot be used, in which case the screw must be cut completely without disengaging the nuts and by using the screw reverse mechanism to run the saddle back with the nuts engaged.

There are certain other special applications of the dial and information on any particular case will be supplied by our technical department on request.

CHUTE MAY BE LIKE THIS



INSTRUCTIONS FOR ADJUSTING AND LUBRICATING MULTI-PLATE CLUTCHES AND GEARS



NOTE: TO ADJUST THE CLUTCH IN THE PULLEY

First remove the cover from back of bed, this will expose the clutch.

- Then:
1. Move sliding sleeve "A" into disengaged position.
 2. Withdraw locking pin "B."
 3. To increase driving power, slightly turn adjusting collar "C" in direction of arrow, until locking pin "B" inserts itself in next hole, as usually this amount is sufficient.

LUBRICATION OF CLUTCHES AND GEARS

When the Lathe is stopped, if the oil sight at the back of bed shows oil half way up, there is an ample supply. This can be renewed through the lid on top of Headstock, about 4 gallons for 4 AN. and 5 gallons for 4 BN. There is a tap to withdraw surplus oil, this drains both headstock and bed.

TO BRAKE WHEN FITTED WITH REVERSE

To "brake," the start and stop lever is only moved to the brake position momentarily, otherwise, if left in that position the Lathe will reverse.

SPINDLE SPEEDS



TO CHANGE SPEEDS, SLOW DOWN THE HEAD
BY OPERATING LEVER BELOW SPEED CHANGE LEVERS.

| MOVE LEVERS TO EXTREME RIGHT & LEFT. | | SPINDLE SPEEDS R.P.M. | CUTTING SPEEDS IN FEET PER MIN | | | | | | | | | | | | | | | | | | | |
|--|-------------|--------------------------------|--------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| | | | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 | 120 | 140 | 160 | 180 | 200 | 240 | 280 | 320 | | |
| | | | DIAMETERS OF WORK IN INCHES | | | | | | | | | | | | | | | | | | | |
| | | | 4 | 4 ⁵ / ₈ | 5 ⁵ / ₁₆ | 6 | 6 ⁵ / ₈ | 8 | 9 ¹ / ₂ | 10 ¹ / ₂ | 12 | | | | | | | | | | | |
| PICK OFF GEARS. | 27 INTO 40. | | 28.9 | 4 | 4 ⁵ / ₈ | 5 ⁵ / ₁₆ | 6 | 6 ⁵ / ₈ | 8 | 9 ¹ / ₂ | 10 ¹ / ₂ | 12 | | | | | | | | | | |
| | | | 49.5 | 2 ⁵ / ₁₆ | 2 ¹¹ / ₁₆ | 3 ¹ / ₁₆ | 3 ¹ / ₂ | 3 ⁷ / ₈ | 4 ⁵ / ₈ | 5 ³ / ₈ | 6 ³ / ₈ | 7 | 7 ¹ / ₂ | 9 ¹ / ₂ | 10 ¹ / ₂ | 12 ¹ / ₂ | | | | | | |
| | | | 81 | 1 ⁷ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 2 ¹ / ₈ | 2 ³ / ₈ | 2 ⁵ / ₈ | 3 ¹ / ₄ | 3 ³ / ₄ | 4 ¹ / ₂ | 4 ³ / ₄ | 5 ¹ / ₈ | 6 ¹ / ₈ | 7 ¹ / ₂ | 8 ¹ / ₂ | 9 ¹ / ₂ | 11 ³ / ₈ | | | |
| | | | 144 | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 2 ¹ / ₈ | 2 ³ / ₈ | 3 ¹ / ₈ | 3 ³ / ₈ | 4 ¹ / ₂ | 4 ³ / ₄ | 5 ¹ / ₂ | 6 ³ / ₈ | 7 ¹ / ₂ | 8 ¹ / ₂ |
| | | | 247 | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 1 ¹⁵ / ₁₆ | 2 ¹ / ₈ | 2 ³ / ₈ | 3 ¹ / ₈ | 3 ³ / ₈ | 4 ¹ / ₂ | 5 |
| | | 405 | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 ¹ / ₂ | 3 | |
| | 40 INTO 27. | | 63.4 | 1 ¹⁵ / ₁₆ | 2 ¹ / ₈ | 2 ¹ / ₈ | 2 ³ / ₈ | 3 | 3 ¹ / ₈ | 4 ¹ / ₂ | 4 ¹ / ₂ | 5 ¹ / ₂ | 6 | 7 ¹ / ₂ | 8 ¹ / ₂ | 9 ¹ / ₂ | 10 ¹ / ₂ | 12 | | | | |
| | | | 108 | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ |
| | | | 177 | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ |
| | | | 317 | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ |
| | | 543 | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | |
| | 889 | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | | |

13Z LATHE. SPEED TABLE.



13Z LATHE

SCREWCUTTING, THREADS PER INCH

| SCREW THREAD CHART | | | | |
|--|-----------------|------------------|----|-------------|
| FOR SCREWCUTTING SET LEVER AT FEED SHOWN AT TOP OF COLUMN CONTAINING DESIRED THREAD AND USE CHANGE WHEELS INDICATED. | | | | |
| FEEDS | | | | |
| A | B | C | N | P R S |
| THREADS PER INCH | | | | |
| 2 | 3 | 4 | 60 | 64 INTER 30 |
| 2 $\frac{1}{4}$ | | 4 $\frac{1}{2}$ | 80 | 40 INTER 45 |
| 2 $\frac{3}{8}$ | | | 64 | 57 60 40 |
| 2 $\frac{1}{2}$ | | 5 | 60 | 30 40 50 |
| 2 $\frac{5}{8}$ | | | 64 | 60 INTER 42 |
| 2 $\frac{3}{4}$ | | 5 $\frac{1}{2}$ | 60 | 30 40 55 |
| 2 $\frac{7}{8}$ | | | 64 | 50 INTER 46 |
| 3 | 4 $\frac{1}{2}$ | 6 | 40 | 60 INTER 30 |
| 3 $\frac{1}{4}$ | | | 64 | 65 50 40 |
| 3 $\frac{1}{2}$ | | 7 | 64 | 42 30 40 |
| 5 | 7 $\frac{1}{2}$ | 10 | 40 | 60 INTER 50 |
| 5 $\frac{1}{2}$ | | 11 | 40 | 60 INTER 55 |
| | | 11 $\frac{1}{2}$ | 40 | 80 64 46 |
| 7 | | 14 | 40 | 60 INTER 70 |
| 8 | 12 | 16 | 30 | 70 INTER 60 |
| 9 | | 18 | 40 | 60 30 45 |
| | | 19 | 30 | 50 40 57 |
| 10 | 15 | 20 | 30 | 50 40 60 |
| 11 | | 22 | 30 | 55 40 60 |
| 13 | | 26 | 30 | 65 40 60 |
| 14 | 21 | 28 | 30 | 70 40 60 |
| 16 | 24 | 32 | 30 | 80 40 60 |

13Z LATHE LEADSCREW 4 T.P.I.



13 Z LATHE

METRIC SCREWCUTTING

| METRIC PITCHES 1 ^m / _M TO 12 ^m / _M PITCH. | | | | | | | |
|--|---|------|----|----|-------|----|--|
| FOR SCREWCUTTING SET LEVER AT FEED SHOWN AT TOP OF COLUMN CONTAINING DESIRED THREAD AND USE CHANGE WHEELS INDICATED. | | | | | | | |
| FEEDS. | | | | | | | |
| A | B | C | N | P | R | S | |
| PITCH IN MILLIMETRES | | | N | P | R | S | |
| 2 | | 1 | 42 | 50 | 30 | 80 | |
| 2.5 | | 1.25 | 63 | 60 | 30 | 80 | |
| 3 | 2 | 1.5 | 63 | 50 | 30 | 80 | |
| 3.5 | | 1.75 | 63 | 60 | 42 | 80 | |
| 4 | | 2 | 63 | 50 | 30 | 60 | |
| 5 | | 2.5 | 63 | 40 | 30 | 60 | |
| 6 | 4 | 3 | 63 | 50 | 45 | 60 | |
| 7 | | 3.5 | 63 | 40 | 42 | 60 | |
| 8 | | 4 | 63 | 60 | INTER | 50 | |
| 9 | 6 | 4.5 | 63 | 40 | 54 | 60 | |
| 10 | | 5 | 63 | 60 | INTER | 40 | |
| 11 | | 5.5 | 63 | 40 | 55 | 50 | |
| 12 | 8 | 6 | 63 | 40 | 60 | 50 | |

13Z LATHE LEADSCREW 4 T.P.I.

ADDITIONAL GEAR to Standard Set 63T,

Calculations based on:

$$8000 \text{ m/m.} = 315''$$

with $\frac{1}{4}''$ pitch lead screw, and lever on gear box set at "A"

$$\frac{\text{DRIVER } 126 \quad 63}{\text{DRIVEN } 800 \quad 400} = \dots \text{ to cut 1 m.m. pitch.}$$

$$\therefore \frac{63}{400} \times \text{pitch required in m/m.} = \frac{\text{DRIVERS}}{\text{DRIVEN}}$$

$$\text{e.g. } \frac{63}{400} \times 4 = \frac{63}{50} \times \frac{1}{2} = \frac{63}{50} \times \frac{30}{60} = 4 \text{ m/m. pitch.}$$

$$\text{Error in 10 m/m. pitch} = + .00042''.$$

Pitches may be obtained in the other columns in the proportion shown in the table.

| OIL TYPE | HEADSTOCK | THREAD & FEEDBOX | APRON, SADDLE & SLIDEWAYS | ELEC. TURRET | GEARBOX | REVOLVING CENTRE | HYD COPY UNIT | OIL NIPPLES | AIR LUBE |
|----------|----------------|------------------|---------------------------|----------------|------------------|-------------------|----------------|------------------|----------------|
| SHELL | VITREA 32 | TONNA T68 | TONNA T68 | VITREA 32 | TONNA T68 | ALVANIA EP 2 | TELLUS 68 | TONNA T68 | TELLUS R10 |
| CASTROL | HYSPIN AWS 32 | MAGNA BD68 | MAGNA BD68 | HYSPIN AWS 32 | MAGNA BD68 | SPHEEROL EPL 2 | HYSPIN AWS 68 | MAGNA BD68 | HYSPIN AWS 10 |
| GULF | HARMONY 32AW | GULFWAY 68 | GULFWAY 68 | HARMONY 32AW | GULFWAY 68 | GULFCROWN EP 2 | HARMONY 68AW | GULFWAY 68 | HARMONY 10AW |
| FINA | HYDRAN 32 | ARTAC EP68 | ARTAC EP68 | HYDRAN 32 | ARTAC EP68 | MARSON EPL2 | HYDRAN 68 | ARTAC EP68 | CIRKAN 10 |
| ESSO | NUTO H32 | FEBIS K68 | FEBIS K68 | NUTO H32 | FEBIS K68 | BEACON EP2 | NUTO H68 | FEBIS K68 | NUTO HI5 |
| TEXACO | RANDO 32 | WAY LUBRICANT 68 | WAY LUBRICANT 68 | RANDO HD32 | WAY LUBRICANT 68 | MULTIFAK EP2 | RANDO HD68 | WAY LUBRICANT 68 | SPINTEX 10 |
| BP | ENERGOL HLP 32 | MACCURAT 68 | MACCURAT 68 | ENERGOL HLP 32 | MACCURAT 68 | ENERGREASE LS EP2 | ENERGOL HLP 68 | MACCURAT 68 | ENERGOL HLP 10 |
| ELF | ELFOLNA HM32 | MOGLIA 68 | MOGLIA 68 | ELFOLNA HM32 | MOGLIA 68 | | ELFOLNA HM68 | MOGLIA 68 | ELFOLNA HM10 |
| MOBIL | DTE 24 | VACTRA NO 2 | VACTRA NO 2 | DTE 24 | VACTRA NO 2 | MOBILPLEX 47 | DTE 26 | VACTRA NO 2 | DTE 10 |
| OIL WELL | WICKLOW 32 | ULTRATAK 68 | ULTRATAK 68 | WICKLOW 32 | ULTRATAK 68 | | WICKLOW 68 | ULTRATAK 68 | WICKLOW 32 |

SLIDEWAY VOGEL UNIT

Q8 HEAVYBEAR 68

or OIL WELL ULTRATAK HEAVY 68.

METRIC CONVERSION TABLES

1 METRE = 39.370113 INCHES

INCHES TO MILLIMETRES

FRACTIONS

| Inch | | | M/m. | Inch | | | M/m. | Inch | | | M/m. | | | |
|----------------|-----------------|-----------------|---------|--------|-----------------|-----------------|-----------------|---------|-----------------|-----------------|-----------------|-----------------|---------|---------|
| $\frac{1}{16}$ | $\frac{1}{16}$ | $\frac{1}{64}$ | .015625 | .3969 | $\frac{1}{8}$ | $\frac{11}{32}$ | .34375 | 8.7312 | $\frac{1}{4}$ | $\frac{33}{64}$ | .671875 | 17.0656 | | |
| | $\frac{3}{32}$ | $\frac{3}{64}$ | .03125 | .7937 | | $\frac{3}{8}$ | $\frac{27}{64}$ | .359375 | | 9.1281 | $\frac{11}{16}$ | $\frac{55}{64}$ | .86875 | 17.4625 |
| | $\frac{1}{4}$ | $\frac{1}{16}$ | .046875 | 1.1906 | | $\frac{5}{8}$ | $\frac{15}{32}$ | .375 | | 9.5250 | $\frac{3}{2}$ | $\frac{33}{32}$ | .703125 | 17.8594 |
| | $\frac{5}{16}$ | $\frac{5}{64}$ | .0625 | 1.5875 | | $\frac{7}{8}$ | $\frac{7}{16}$ | .390625 | | 9.9219 | $\frac{5}{4}$ | $\frac{15}{16}$ | .71875 | 18.2562 |
| $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{32}$ | .078125 | 1.9844 | $\frac{3}{16}$ | $\frac{13}{32}$ | .40625 | 10.3187 | $\frac{3}{4}$ | $\frac{47}{64}$ | .734375 | 18.6531 | | |
| | $\frac{3}{16}$ | $\frac{3}{64}$ | .09375 | 2.3812 | | $\frac{1}{2}$ | $\frac{1}{2}$ | .421875 | | 10.7156 | $\frac{7}{8}$ | $\frac{7}{8}$ | .75 | 19.0500 |
| | $\frac{1}{2}$ | $\frac{1}{16}$ | .109375 | 2.7781 | | $\frac{5}{8}$ | $\frac{5}{16}$ | .4375 | | 11.1125 | $\frac{9}{8}$ | $\frac{45}{64}$ | .765625 | 19.4469 |
| | $\frac{3}{4}$ | $\frac{3}{32}$ | .125 | 3.1750 | | $\frac{3}{4}$ | $\frac{3}{8}$ | .453125 | | 11.5094 | $\frac{11}{8}$ | $\frac{11}{8}$ | .78125 | 19.8437 |
| $\frac{3}{16}$ | $\frac{3}{16}$ | $\frac{3}{64}$ | .140625 | 3.5719 | $\frac{1}{4}$ | $\frac{15}{32}$ | .46875 | 11.9062 | $\frac{7}{8}$ | $\frac{35}{64}$ | .796875 | 20.2406 | | |
| | $\frac{5}{8}$ | $\frac{5}{32}$ | .15625 | 3.9687 | | $\frac{1}{2}$ | $\frac{1}{4}$ | .484375 | | 12.3031 | $\frac{15}{8}$ | $\frac{15}{8}$ | .8125 | 20.6375 |
| | $\frac{7}{8}$ | $\frac{7}{32}$ | .171875 | 4.3656 | | $\frac{3}{4}$ | $\frac{3}{16}$ | .5 | | 12.7000 | $\frac{17}{8}$ | $\frac{17}{8}$ | .828125 | 21.0344 |
| | $\frac{15}{16}$ | $\frac{15}{64}$ | .1875 | 4.7625 | | $\frac{5}{8}$ | $\frac{5}{32}$ | .515625 | | 13.0969 | $\frac{19}{8}$ | $\frac{19}{8}$ | .84375 | 21.4312 |
| $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{1}{16}$ | .203125 | 5.1594 | $\frac{3}{8}$ | $\frac{17}{32}$ | .53125 | 13.4937 | $\frac{15}{16}$ | $\frac{39}{64}$ | .859375 | 21.8281 | | |
| | $\frac{3}{8}$ | $\frac{3}{32}$ | .21875 | 5.5562 | | $\frac{1}{2}$ | $\frac{1}{8}$ | .546875 | | 13.8906 | $\frac{17}{4}$ | $\frac{17}{4}$ | .875 | 22.2250 |
| | $\frac{1}{2}$ | $\frac{1}{8}$ | .234375 | 5.9531 | | $\frac{5}{8}$ | $\frac{5}{16}$ | .5625 | | 14.2875 | $\frac{19}{4}$ | $\frac{19}{4}$ | .890625 | 22.6219 |
| | $\frac{3}{4}$ | $\frac{3}{16}$ | .25 | 6.3500 | | $\frac{3}{4}$ | $\frac{3}{8}$ | .578125 | | 14.6844 | $\frac{21}{4}$ | $\frac{21}{4}$ | .90625 | 23.0187 |
| $\frac{5}{16}$ | $\frac{5}{16}$ | $\frac{5}{64}$ | .265625 | 6.7469 | $\frac{7}{8}$ | $\frac{19}{32}$ | .59375 | 15.0812 | $\frac{15}{8}$ | $\frac{43}{64}$ | .921875 | 23.4156 | | |
| | $\frac{3}{4}$ | $\frac{3}{8}$ | .28125 | 7.1437 | | $\frac{1}{2}$ | $\frac{1}{4}$ | .609375 | | 15.4781 | $\frac{17}{4}$ | $\frac{17}{4}$ | .9375 | 23.8125 |
| | $\frac{7}{8}$ | $\frac{7}{16}$ | .296875 | 7.5406 | | $\frac{3}{4}$ | $\frac{3}{16}$ | .625 | | 15.8750 | $\frac{19}{4}$ | $\frac{19}{4}$ | .953125 | 24.2094 |
| | $\frac{15}{16}$ | $\frac{15}{32}$ | .3125 | 7.9375 | | $\frac{5}{8}$ | $\frac{5}{32}$ | .640625 | | 16.2719 | $\frac{21}{4}$ | $\frac{21}{4}$ | .96875 | 24.6062 |
| $\frac{3}{8}$ | $\frac{3}{8}$ | $\frac{3}{16}$ | .328125 | 8.3344 | $\frac{15}{16}$ | $\frac{31}{32}$ | .65625 | 16.6687 | $\frac{15}{8}$ | $\frac{45}{64}$ | .984375 | 25.0031 | | |

UNITS

| Inches | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|--------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| 0 | | 254.0 | 508.0 | 762.0 | 1016.0 | 1270.0 | 1524.0 | 1778.0 | 2032.0 | 2286.0 | 2540.0 |
| 1 | 25.4 | 279.4 | 533.4 | 787.4 | 1041.4 | 1295.4 | 1549.4 | 1803.4 | 2057.4 | 2311.4 | 2565.4 |
| 2 | 50.8 | 304.8 | 558.8 | 812.8 | 1066.8 | 1320.8 | 1574.8 | 1828.8 | 2082.8 | 2336.8 | 2590.8 |
| 3 | 76.2 | 330.2 | 584.2 | 838.2 | 1092.2 | 1346.2 | 1600.2 | 1854.2 | 2108.2 | 2362.2 | 2616.2 |
| 4 | 101.6 | 355.6 | 609.6 | 863.6 | 1117.6 | 1371.6 | 1625.6 | 1879.6 | 2133.6 | 2387.6 | 2641.6 |
| 5 | 127.0 | 381.0 | 635.0 | 889.0 | 1143.0 | 1397.0 | 1651.0 | 1905.0 | 2159.0 | 2413.0 | 2667.0 |
| 6 | 152.4 | 406.4 | 660.4 | 914.4 | 1168.4 | 1422.4 | 1676.4 | 1930.4 | 2184.4 | 2438.4 | 2692.4 |
| 7 | 177.8 | 431.8 | 685.8 | 939.8 | 1193.8 | 1447.8 | 1701.8 | 1955.8 | 2209.8 | 2463.8 | 2717.8 |
| 8 | 203.2 | 457.2 | 711.2 | 965.2 | 1219.2 | 1473.2 | 1727.2 | 1981.2 | 2235.2 | 2489.2 | 2743.2 |
| 9 | 228.6 | 482.6 | 736.6 | 990.6 | 1244.6 | 1498.6 | 1752.6 | 2006.6 | 2260.6 | 2514.6 | 2768.6 |

MILLIMETRES TO INCHES

UNITS

| M/m. | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0 | | .39370 | .78740 | 1.18110 | 1.57480 | 1.96851 | 2.36221 | 2.75591 | 3.14961 | 3.54331 |
| 1 | .03937 | .43307 | .82677 | 1.22047 | 1.61417 | 2.00788 | 2.40158 | 2.79528 | 3.18898 | 3.58268 |
| 2 | .07874 | .47244 | .86614 | 1.25984 | 1.65354 | 2.04725 | 2.44095 | 2.83465 | 3.22835 | 3.62205 |
| 3 | .11811 | .51181 | .90551 | 1.29921 | 1.69291 | 2.08662 | 2.48032 | 2.87402 | 3.26772 | 3.66142 |
| 4 | .15748 | .55118 | .94488 | 1.33858 | 1.73228 | 2.12599 | 2.51969 | 2.91339 | 3.30709 | 3.70079 |
| 5 | .19685 | .59055 | .98425 | 1.37795 | 1.77165 | 2.16536 | 2.55906 | 2.95276 | 3.34646 | 3.74016 |
| 6 | .23622 | .62992 | 1.02362 | 1.41732 | 1.81103 | 2.20473 | 2.59843 | 2.99213 | 3.38583 | 3.77953 |
| 7 | .27559 | .66929 | 1.06299 | 1.45669 | 1.85040 | 2.24410 | 2.63780 | 3.03150 | 3.42520 | 3.81890 |
| 8 | .31496 | .70866 | 1.10236 | 1.49606 | 1.88977 | 2.28347 | 2.67717 | 3.07087 | 3.46457 | 3.85827 |
| 9 | .35433 | .74803 | 1.14173 | 1.53543 | 1.92914 | 2.32284 | 2.71654 | 3.11024 | 3.50394 | 3.89764 |

| M/m. | | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 |
|------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0 | | 3.93701 | 7.87402 | 11.8110 | 15.7480 | 19.6851 | 23.6221 | 27.5591 | 31.4961 | 35.4331 |
| 10 | .39370 | 4.33071 | 8.26772 | 12.2047 | 16.1417 | 20.0788 | 24.0158 | 27.9528 | 31.8898 | 35.8268 |
| 20 | .78740 | 4.72441 | 8.66142 | 12.5984 | 16.5354 | 20.4725 | 24.4095 | 28.3465 | 32.2835 | 36.2205 |
| 30 | 1.18110 | 5.11811 | 9.05513 | 12.9921 | 16.9291 | 20.8662 | 24.8032 | 28.7402 | 32.6772 | 36.6142 |
| 40 | 1.57480 | 5.51181 | 9.44883 | 13.3858 | 17.3228 | 21.2599 | 25.1969 | 29.1339 | 33.0709 | 37.0079 |
| 50 | 1.96851 | 5.90552 | 9.84252 | 13.7795 | 17.7165 | 21.6536 | 25.5906 | 29.5276 | 33.4646 | 37.4016 |
| 60 | 2.36221 | 6.29922 | 10.2362 | 14.1732 | 18.1103 | 22.0473 | 25.9843 | 29.9213 | 33.8583 | 37.7953 |
| 70 | 2.75591 | 6.69292 | 10.6299 | 14.5669 | 18.5040 | 22.4410 | 26.3780 | 30.3150 | 34.2520 | 38.1890 |
| 80 | 3.14961 | 7.08662 | 11.0236 | 14.9606 | 18.8977 | 22.8347 | 26.7717 | 30.7087 | 34.6457 | 38.5827 |
| 90 | 3.54331 | 7.48032 | 11.4173 | 15.3543 | 19.2914 | 23.2284 | 27.1654 | 31.1024 | 35.0394 | 38.9764 |

TABLE OF CUTTING SPEEDS

FEET PER MINUTE

| Diam. Inches | REVOLUTIONS PER MINUTE | | | | | | | | | | | | | | | | | | | | |
|--------------|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 15 | 20 | 25 | 30 | 50 | 75 | 100 | 125 | 150 | 175 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 550 | 600 | 700 | 800 |
| 1/2 | 114 | 153 | 191 | 228 | 382 | 573 | 764 | 955 | 1146 | 1337 | 1528 | 1910 | 2292 | 2674 | 3056 | 3438 | 3820 | 4202 | 4584 | 5348 | 6112 |
| 3/4 | 76 | 102 | 127 | 153 | 254 | 381 | 509 | 636 | 763 | 890 | 1018 | 1272 | 1526 | 1781 | 2036 | 2290 | 2544 | 2798 | 3052 | 3562 | 4072 |
| 1 | 57 | 76 | 95 | 114 | 191 | 286 | 382 | 477 | 573 | 668 | 764 | 955 | 1146 | 1337 | 1528 | 1719 | 1910 | 2101 | 2292 | 2674 | 3056 |
| 1-1/4 | 45 | 61 | 76 | 91 | 153 | 229 | 305 | 381 | 458 | 534 | 610 | 763 | 916 | 1068 | 1220 | 1374 | 1526 | 1679 | 1832 | 2136 | 2440 |
| 1-1/2 | 38 | 51 | 64 | 76 | 127 | 191 | 254 | 318 | 381 | 445 | 509 | 636 | 763 | 890 | 1018 | 1145 | 1273 | 1399 | 1526 | 1781 | 2037 |
| 1-3/4 | 32 | 44 | 55 | 65 | 109 | 164 | 218 | 273 | 327 | 382 | 436 | 545 | 654 | 764 | 872 | 981 | 1090 | 1199 | 1308 | 1528 | 1744 |
| 2 | 28 | 38 | 48 | 57 | 95 | 143 | 191 | 239 | 286 | 334 | 382 | 478 | 573 | 668 | 764 | 860 | 956 | 1051 | 1146 | 1328 | 1528 |
| 2-1/4 | 25 | 34 | 42 | 51 | 85 | 127 | 170 | 212 | 255 | 297 | 340 | 425 | 510 | 595 | 680 | 765 | 850 | 935 | 1020 | 1190 | 1360 |
| 2-1/2 | 23 | 30 | 38 | 46 | 76 | 115 | 153 | 191 | 229 | 267 | 306 | 382 | 459 | 535 | 611 | 689 | 764 | 840 | 917 | 1070 | 1221 |
| 2-3/4 | 21 | 28 | 35 | 42 | 69 | 104 | 139 | 174 | 208 | 243 | 278 | 348 | 417 | 487 | 556 | 626 | 696 | 765 | 834 | 974 | 1112 |
| 3 | 19-1 | 25 | 32 | 38 | 64 | 96 | 127 | 159 | 191 | 223 | 255 | 319 | 382 | 446 | 510 | 573 | 637 | 701 | 765 | 891 | 1020 |
| 3-1/4 | 17-6 | 23 | 29 | 35 | 59 | 88 | 117 | 146 | 177 | 206 | 235 | 294 | 354 | 412 | 471 | 530 | 589 | 649 | 708 | 824 | 942 |
| 3-1/2 | 16-4 | 22 | 27 | 33 | 54 | 82 | 109 | 136 | 164 | 191 | 218 | 273 | 328 | 382 | 436 | 491 | 546 | 600 | 655 | 764 | 872 |
| 3-3/4 | 15-3 | 20-3 | 25 | 30 | 51 | 76 | 102 | 127 | 153 | 178 | 204 | 259 | 306 | 357 | 408 | 459 | 510 | 561 | 612 | 714 | 816 |
| 4 | 14-3 | 19-1 | 24 | 29 | 48 | 72 | 95 | 119 | 144 | 167 | 191 | 239 | 288 | 335 | 383 | 431 | 478 | 526 | 574 | 669 | 765 |
| 4-1/2 | 12-7 | 17-0 | 21 | 25 | 42 | 64 | 85 | 106 | 128 | 149 | 170 | 212 | 256 | 297 | 340 | 383 | 425 | 468 | 511 | 595 | 681 |
| 5 | 11-5 | 15-3 | 19-1 | 23 | 38 | 57 | 76 | 95 | 114 | 134 | 153 | 191 | 229 | 267 | 306 | 344 | 382 | 420 | 458 | 534 | 612 |
| 5-1/2 | 10-4 | 13-9 | 17-4 | 21 | 35 | 52 | 69 | 87 | 104 | 121 | 139 | 174 | 209 | 244 | 278 | 313 | 349 | 383 | 418 | 488 | 558 |
| 6 | 9-5 | 12-7 | 15-9 | 19-1 | 32 | 48 | 64 | 80 | 96 | 112 | 128 | 160 | 192 | 224 | 256 | 287 | 319 | 351 | 382 | 446 | 510 |
| 6-1/2 | 8-8 | 11-7 | 14-7 | 17-6 | 29 | 44 | 59 | 73 | 88 | 103 | 118 | 147 | 177 | 206 | 236 | 265 | 294 | 324 | 353 | 412 | 471 |
| 7 | 8-2 | 10-9 | 13-6 | 16-4 | 27 | 41 | 54 | 68 | 82 | 95 | 109 | 136 | 164 | 191 | 218 | 246 | 273 | 300 | 327 | 382 | 436 |
| 7-1/2 | 7-6 | 10-2 | 12-7 | 15-3 | 25 | 38 | 51 | 64 | 76 | 89 | 102 | 127 | 153 | 178 | 204 | 229 | 255 | 281 | 306 | 357 | 408 |
| 8 | 7-1 | 9-5 | 11-9 | 14-3 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 119 | 144 | 168 | 191 | 215 | 239 | 263 | 287 | 334 | 383 |
| 8-1/2 | 6-7 | 9-0 | 11-2 | 13-5 | 22 | 34 | 45 | 56 | 67 | 78 | 89 | 112 | 135 | 157 | 180 | 202 | 225 | 247 | 270 | 315 | 360 |
| 9 | 6-4 | 8-5 | 10-6 | 12-7 | 21 | 32 | 42 | 53 | 64 | 74 | 85 | 106 | 128 | 148 | 170 | 191 | 212 | 234 | 256 | 297 | 340 |
| 9-1/2 | 6-0 | 8-0 | 10-0 | 12-0 | 20-1 | 30 | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 161 | 181 | 201 | 221 | 241 | 281 | 322 |
| 10 | 5-7 | 7-6 | 9-5 | 11-5 | 19-1 | 29 | 38 | 48 | 57 | 67 | 77 | 96 | 115 | 134 | 153 | 172 | 191 | 210 | 230 | 267 | 306 |
| 11 | 5-2 | 6-9 | 8-7 | 10-4 | 17-4 | 26 | 35 | 43 | 52 | 61 | 70 | 87 | 104 | 122 | 139 | 156 | 174 | 192 | 209 | 244 | 279 |
| 12 | 4-7 | 6-4 | 7-9 | 9-5 | 15-9 | 24 | 32 | 40 | 48 | 56 | 64 | 80 | 96 | 112 | 128 | 143 | 159 | 175 | 191 | 223 | 255 |
| 13 | 4-4 | 5-9 | 7-3 | 8-8 | 14-7 | 22 | 29 | 37 | 44 | 51 | 59 | 74 | 88 | 103 | 118 | 132 | 147 | 162 | 176 | 206 | 235 |
| 14 | 4-1 | 5-4 | 6-8 | 8-2 | 13-6 | 20-5 | 27 | 34 | 41 | 48 | 55 | 68 | 82 | 96 | 109 | 123 | 137 | 150 | 164 | 191 | 219 |
| 15 | 3-8 | 5-1 | 6-4 | 7-6 | 12-7 | 19-1 | 25 | 32 | 38 | 44 | 51 | 64 | 76 | 89 | 102 | 114 | 128 | 140 | 153 | 178 | 204 |
| 16 | 3-6 | 4-8 | 6-0 | 7-2 | 11-9 | 17-9 | 24 | 30 | 36 | 42 | 48 | 60 | 72 | 84 | 95 | 108 | 120 | 132 | 143 | 167 | 191 |
| 17 | 3-3 | 4-5 | 5-6 | 6-7 | 11-2 | 16-9 | 22 | 28 | 34 | 39 | 45 | 56 | 67 | 79 | 90 | 101 | 112 | 124 | 135 | 158 | 180 |
| 18 | 3-2 | 4-2 | 5-3 | 6-3 | 10-6 | 16-0 | 21 | 27 | 32 | 37 | 42 | 53 | 64 | 74 | 85 | 96 | 106 | 117 | 128 | 149 | 170 |
| 19 | 3-0 | 4-0 | 5-0 | 6-0 | 10-0 | 15-0 | 20 | 25 | 30 | 35 | 40 | 50 | 60 | 70 | 80 | 91 | 100 | 111 | 121 | 141 | 161 |
| 20 | 2-87 | 3-8 | 4-8 | 5-7 | 9-5 | 14-4 | 19-1 | 24 | 29 | 33 | 38 | 48 | 57 | 67 | 77 | 86 | 96 | 105 | 115 | 134 | 153 |
| 21 | 2-73 | 3-6 | 4-5 | 5-5 | 9-1 | 13-7 | 18-2 | 22 | 27 | 32 | 36 | 45 | 55 | 64 | 73 | 82 | 91 | 100 | 109 | 127 | 146 |
| 22 | 2-61 | 3-4 | 4-3 | 5-2 | 8-3 | 13-0 | 17-4 | 21 | 26 | 30 | 33 | 43 | 52 | 61 | 69 | 78 | 87 | 96 | 104 | 122 | 139 |
| 23 | 2-50 | 3-3 | 4-1 | 5-0 | 8-3 | 12-5 | 16-6 | 20-8 | 25 | 29 | 33 | 42 | 50 | 58 | 66 | 75 | 83 | 92 | 100 | 116 | 133 |
| 24 | 2-39 | 3-2 | 4-0 | 4-8 | 7-9 | 12-0 | 15-9 | 20-0 | 24 | 28 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | 112 | 128 |
| 25 | 2-30 | 3-1 | 3-8 | 4-6 | 7-7 | 11-5 | 15-3 | 19-3 | 23 | 27 | 31 | 38 | 46 | 54 | 61 | 69 | 76 | 84 | 92 | 107 | 123 |