

FILE 6

DORSET HOUSE SCHOOL OF  
OCCUPATIONAL THERAPY LTD.

# THE LARVIC REHABILITATION LATHE



By D. E. COURTNEY M.A.O.T.

W. A. LLOYD M.A.O.T.

REFERENCE BOOK  
NOT TO BE REMOVED  
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### General Specification

Overall Width: 24"  
 Overall Height: 67"  
 Overall Length: 46½"  
 Height of Centres: 5½"  
 Between: 36"  
 Spindle bored 13/16"  
 Tail stock bored: 13/16"  
 Spindle Nose: No 3 Morse Taper  
 No of speeds: 3.  
 Weight, nett: 448 lbs.

### Standard Equipment

1 Footplate for knee and ankle  
   exercise  
 1 5" Face Plate  
 1 6" Hand Rest  
 1 12" Hand Rest  
 1 No. 3 Morse Taper Soft Centre  
 1 No. 3 Morse Taper Fork Centre  
 1 each 1lb, 2lb, 4lb, and 7lb.  
   weights  
 1 Tool Rest  
 1 Bowl Turning Rest  
 1 Sling Bar  
 1 Knee Bar  
 1 Spindle Lock

### Optional Extras

Prosthetic Socket  
 36" Hand Rest  
 Electric Motor

Long handled Turning Tools  
 ⅜" and ½" Gouges  
 ½" and ¾" Chisels.  
 ⅜/16" Parting.

## INTRODUCTION

### THE LARVIC REHABILITATION LATHE

A large number of lower limb orthopaedic cases are treated at Etwall Rehabilitation Unit. The basic treadle lathe was found to be inadequate when aiming at returning patients to industrial work requiring crouching, kneeling or weight lifting.

We were fortunate in obtaining the services of the local Engineer who was interested in remedial work and willing to alter any of our equipment. A standard treadle lathe was used as a basis for the Larvic Lathe.

We have tried to produce a machine that is compact and designed:—

- (a) to enable a therapist to alter the attachments with ease,
- (b) to increase the range of movement,
- (c) to give a more gradual and controlled increase in resistance.

The standard parts of this lathe are manufactured by Denford Small Tools Ltd., Brighouse, Yorkshire, whilst the therapeutic adaptations are made by F. John Large Ltd., Etwall, Derby.

The sole distributors for the United Kingdom and Overseas are:

Nottingham Handcraft Company,  
Melton Road, West Bridgford,  
Nottingham.

### ACKNOWLEDGMENTS:

We should like to thank the following for their assistance and advice:—

Dr. G. M. Cochrane, M.A., M.R.C.P., D.Phys.Med., Director of Physical Medicine (Derby No. 1 H.M.C)

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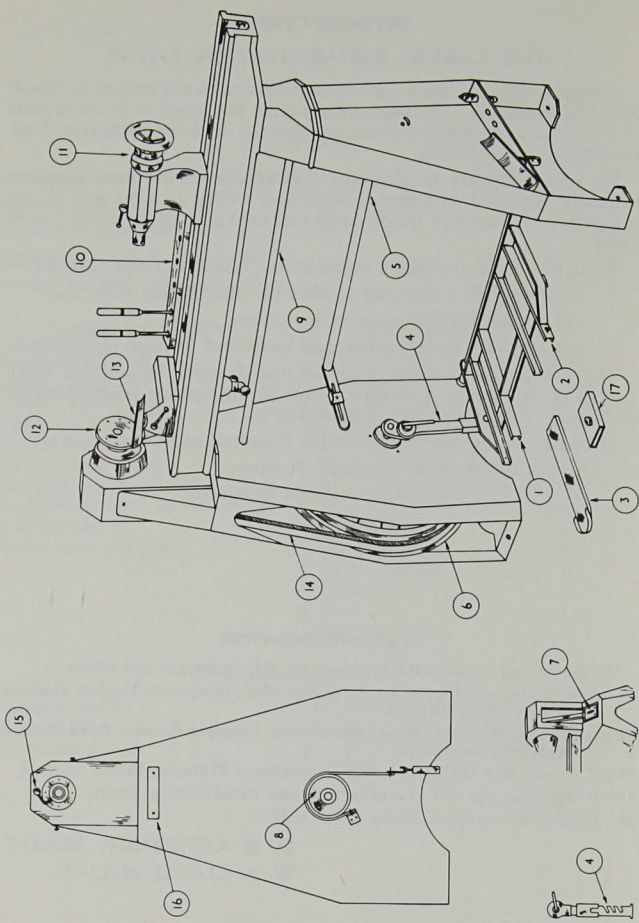
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## PARTS LIST

| Part No. | Description.                  |
|----------|-------------------------------|
| 1        | TREADLE                       |
| 2        | TREADLE                       |
| 3        | FOOTPLATE                     |
| 4        | PITMAN                        |
| 5        | ADJUSTABLE KNEE BAR           |
| 6        | 3-SPEED DRIVE FLYWHEEL        |
| 7        | NYLON TIPPED BELT ADJUSTER    |
| 8        | RESISTANCE PULLEY AND WEIGHTS |
| 9        | STATIC QUADRICEPS BAR         |
| 10       | TOOLSHELF                     |
| 11       | TAILSTOCK                     |
| 12       | FACEPLATE                     |
| 13       | TOOL RESTS 6"—12"—36"         |
| 14       | VEE BELT DRIVE                |
| 15       | SPINDLE LOCK                  |
| 16       | OUTRIGGER PLATE               |
| 17       | PROSTHETIC SOCKET PLATE       |

## ADAPTATIONS TO A BASIC LATHE

### (1) The Treadle

The treadle has been divided into two parts (Plates 1 and 2). The detachable footplate can be placed between the parallel bars on either side, thus providing a comfortable treading position for each foot. The space between the two parts enables the patient to stand with his weight-bearing leg beside the leg that is treading, encouraging better posture while working.

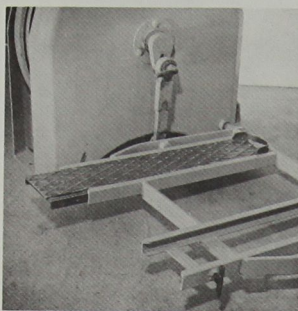


Plate 1. The Treadle.

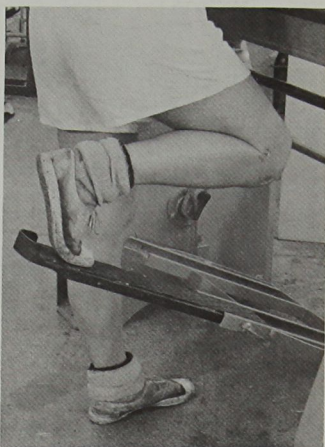


Plate 2, Use of Footplate, showing knee flexion

### (2) The Footplate

The footplate is 24 inches long and 5 inches wide, and has a safety lip at one end. When the footplate is inserted between the parallel bars it is secured by a wing nut. It can be fixed in a wide variety of positions, the exact position being decided by the therapist according to the individual requirements of the patient.

### (3) The Prosthetic Socket (Optional extra).

The socket is attached to a sleeve which is fitted to the free end of the footplate and is secured with a wing nut. Each Limb Fitting Centre supplies a different Rocker Rubber and therefore a standard Rubber socket cannot be provided. When ordering a prosthetic socket attachment it is necessary to enclose the Rubber in order that the correct socket plate may be supplied.

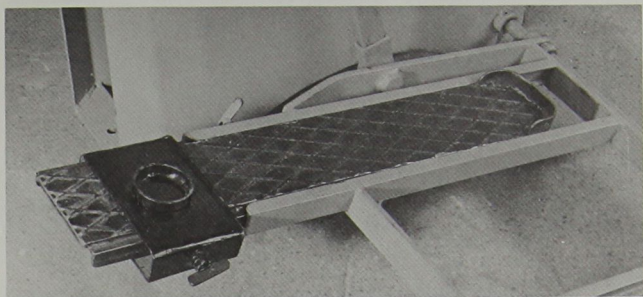


Plate 3. Footplate showing Prosthetic Socket.

### (4) The Pitman

The design of the pitman has been altered to enable the treadle to be attached at three different heights (Plate 4) to give three different arcs of movement. In each arc the range of movement remains constant. The treadle is secured to the pitman by a collar which affords great ease of alteration.

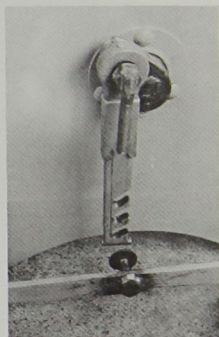


Plate 4.  
The Pitman.

### (5) The Knee Bar

An adjustable knee bar (Plate 5) was added to prevent compensatory movement by the knee, while exercising the ankle from the back of the lathe.



Plate 5. Adjustable Knee Bar.

#### (6) The Gears

The flywheel has three gears, low, middle and top. The belt can be adjusted to take up any slack by means of a nylon plate secured by a wing nut (Plate 6). This maintains the effectiveness of the gears.

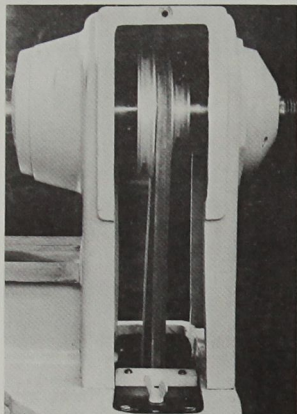


Plate 6. Belt Adjustment

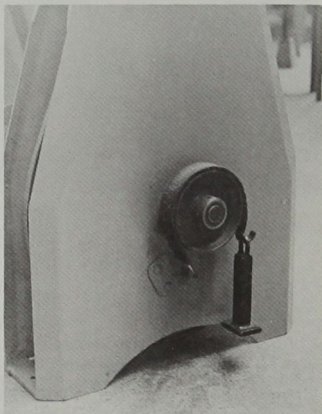


Plate 7. Resistance Wheel



**(7) The Resistance Wheel and Weights**

The Resistance Wheel is attached to the flywheel spindle. It only takes effect when the wheel revolves in a clockwise direction. It has been added to allow more accurate and gradual increase of resistance. Weights are attached to vary the resistance (Plate 7). 1, 2, 4, and 7 lb weights are supplied.

**(8) The Static Quadriceps Bar**

The Static Quadriceps Bar is situated 8" below the face bed and 2' 6" from the ground. It spans the width of the machine (Plate 8).



Plate 8. Exercise for Static Quadriceps drill

**(9) The Block**

The sound limb is placed on the block when full extension of the injured knee is required.

**(10) The Toolshelf**

The toolshelf has been fixed to the back of the face bed for the convenience of the patient working, and to store the tools. (Part No. 10.)

(11) **Electric Motor** (Optional extra).

The treadle lathe can be converted to a standard electric lathe by means of the electric motor assembly. This assembly can be easily fitted, particularly if the instructions and full working drawings are carefully followed. A micro-switch has been incorporated in the assembly to ensure that the motor will not operate unless the belt cover is in the closed position. (Plates 9 and 10.)

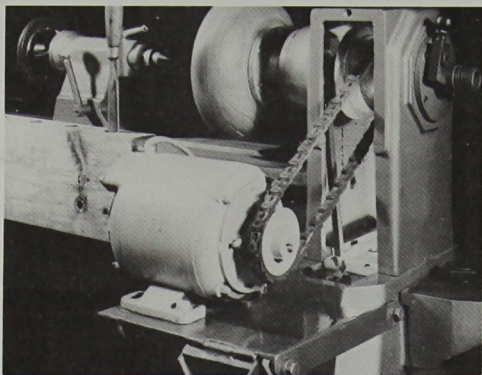


Plate 9. Electric Motor Assembly (open position)

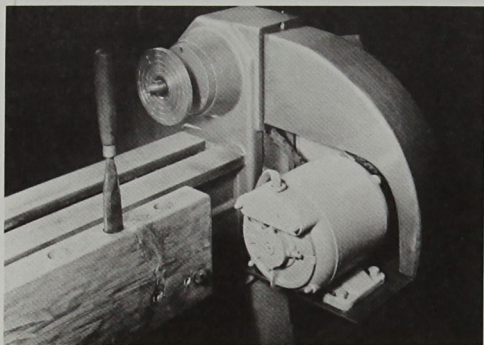


Plate 10. Electric Motor Assembly (closed position)

## **IMPORTANT POINTS WHEN ANY PATIENT USES THE LATHE, REGARDLESS OF AIMS OF TREATMENT**

1. When turning, ensure that wood revolves **towards** the turner.
2. Chisel and gouges must be kept sharp; this prevents juddering, which could result in a broken chisel or ruined work.
3. The "T" rest must be as close as possible to the wood being turned or the chisel may become trapped between the wood and the "T" rest, the handle of the chisel flying up and hitting the patient under the chin.
4. If the patient stands on a block, the block must never be higher than the treadle at its lowest point (see later).
5. The heel should not be allowed to drop below the level of the toe when treadling. If the patient cannot maintain this position the prophylactic foot support may be used. It must be remembered however that when this plate is used a large amount of plantar flexor muscle work is eliminated.
6. The chuck must revolve towards the operator for the resistance wheel to have effect.
7. When changing the gear always remove the belt from the lower pulley first. Replace the belt on the upper pulley first and whilst manually turning the lower pulley gradually ease the belt on to it (Parts 6 and 14).

## **THERAPEUTIC USES OF THE LATHE**

- A. To increase the range of movement at hip, knee and ankle.
- B. To increase the strength of (1) extensors of the hip,  
(2) extensors of the knee,  
(3) plantar flexors,  
(4) extensors of the spine.
- C. General exercise—to increase work endurance.
- D. Co-ordination of movement.

### **A. TO INCREASE RANGE OF MOVEMENT**

The Lathe is not used to force range but rather to encourage it. Thus the treadle is placed in such a position that the patient treadles in his maximum range of movement, the treadle being altered as his movement improves. This can be obtained by adjustment of pitman, footplate or block.



1. **Hip Extension.** The fullest hip extension that can be obtained on this lathe occurs when a patient stands with his unaffected limb on a block and pedals with the affected limb, i.e., when the treadle is pushed down both feet are level as in a standing position—the block must never be higher than the treadle at its lowest point as this causes unnecessary strain on the hip that bears the body weight. The footplate should be fully inserted, with the safety lip at the back against the axle; in this position it is operated in the same way as a basic lathe.

2. **Hip Flexion.** Hip flexion is encouraged by gradually raising the treadle as increase in joint range occurs. The treadle is raised by shortening the Pitman, and the height varies up to approximately 7". It must be remembered that shortening the Pitman does not increase range in movement of the treadle, but alters the position of starting the arc. Thus, extension of the hip must be sacrificed for more flexion. If both flexion and extension are required, then two periods of treatment must be given, dealing with each increase in range of movement individually.

N.B.: this also applies to the knee joint. Footplate is positioned as for Hip Extension, with lip at axle.

3. **Knee Extension.** As for hip extension.

4. **Knee Flexion.** In very early stages of knee flexion, it may be found that the patient has very little movement. This being so, the patient stands on a block as for early hip flexion. Progression is made by:—

- (a) decreasing the height of the block
- (b) increasing the height of the treadle (when patient has progressed from the block)
- (c) introduction of the knee flexion plate.

The footplate is positioned as in Plate 2. The patient stands with his uninjured foot well forward and with an erect posture. He treadles the lathe with his injured leg on the flexion plate. The patient is encouraged to move his foot gradually backwards on the plate, until his heel is below his ischial tuberosity; i.e., the leg is in the natural crouching position.

The lip on the end of the flexion plate was designed to prevent the foot from slipping back off the plate, which, if the patient were pumping quickly, could result in an injury. The plate has a pattern in relief, to prevent slipping of the foot.

5. **Plantar and Dorsiflexion of the foot and the ankle.** The patient stands at the rear of the lathe with his heel on the axle (note Plate 5). The lip is away from the axle. It is most important that the heel is on the axle as a certain amount of dorsiflexion is lost should the patient's foot slip forwards. The knee bar is positioned just below the patella (as in Plate 5) to stabilize the position of the knee and prevent compensatory movement.



## B. TO INCREASE STRENGTH

To increase the strength of any muscle the patient must put **effort** into his work. Increase in strength can be encouraged by:—

- (a) a succession of gears, which can be diversified by:
- (b) weights
- (c) gradual increase in duration of **time** the patient treadles without rest.
- (d) **standing on the injured leg** to encourage sustained contraction of quadriceps and thus hypertrophy of muscle.

It is easier to standardise the individual treatment and grading of the patient if only one person works on the lathe at a time.

Muscle groups strengthened by pedalling against Resistance on the Lathe are:—

1. Hip Extensors
2. Knee Extensors
3. Plantar Flexors.

## STATIC QUADRICEPS EXERCISE

Static quadriceps exercise is used when the patient is either non weight bearing, or in the very early stages of weight bearing, to maintain the tone of the muscle. Static quadriceps contraction can be obtained when the patient is sitting on a bicycle seat in front of the lathe, with his injured limb supported from the bar (Plate 8). The injured limb should be supported in a caliper, or gutter splint reaching from mid-thigh to ankle. The patient treadles with his sound leg at a rate of 80—90 revs. per minute. In the majority of cases this will produce static contraction in the injured limb. It has been found in athletes that this static contraction does not always occur, due to their efficient balancing mechanism.

## HEAD INJURIES

Some head injury patients cannot tolerate revolving objects, and nausea and vomiting occur. In assessing a patient's working capacity with respect to revolving machinery, the lathe offers an excellent opportunity.

## MAINTENANCE

Continuous good performance of the lathe will depend on the care with which it is handled and on regular weekly oiling. It is advisable to keep an oily rag at hand to wipe the surface of the lathe bed, and any other unenamelled working parts, especially when the lathe is not in regular use.

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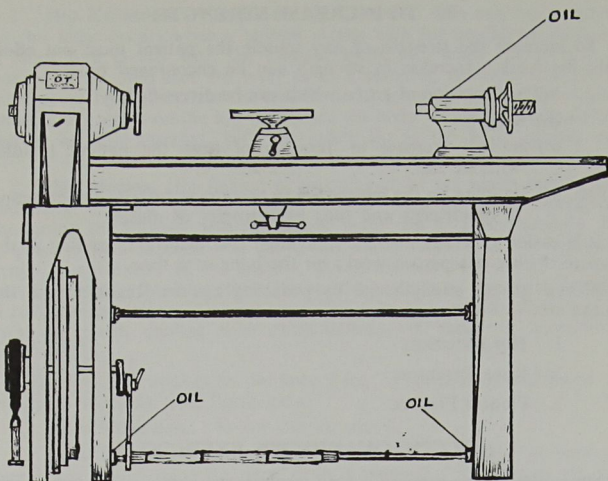
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Oiling Diagram.

OILING MUST BE CARRIED OUT WEEKLY

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**OTHER PUBLICATIONS**

|  |        |
|--|--------|
| THE OLIVER REHABILITATION MACHINE          | at 4/6 |
| THE THAME WIRE TWISTING MACHINE            | at 4/6 |
| THE ANKLE ROTATOR MACHINE                  | at 4/6 |
| THE WALKER ANDREWS REHABILITATION RUG LOOM | at 4/6 |

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