INSPECTION TEST REPORT

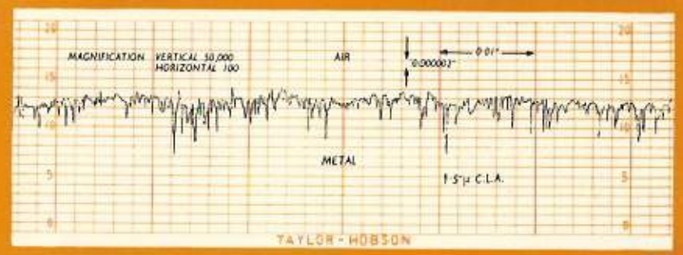
Description 2442 quill **Identification No. 9N**

Mean measured diameter 5·24972″ **Variation in diameter 0·00004″**

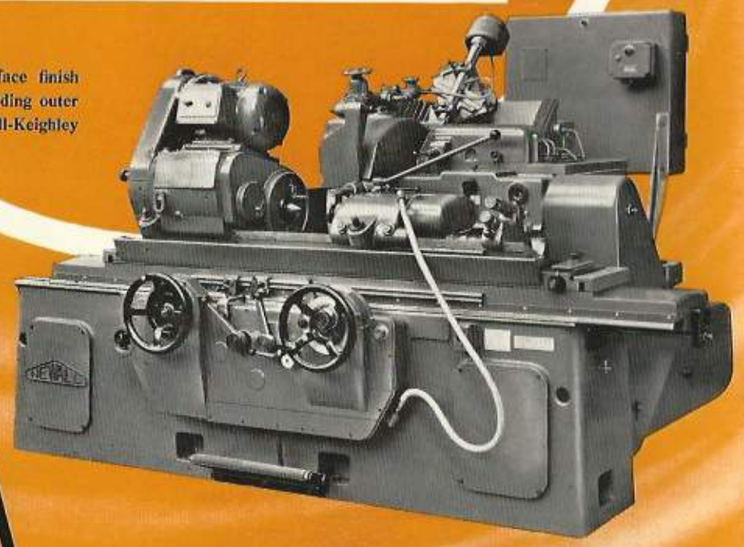
Straightness of surface 0·00002″ **Max error on 4 generators at 90°**

Graphs of auto-collimation of surface —

GROUND FINISH OF SURFACE 1·2 to 1·9μ″ C.L.A.



The above graphic record depicts surface finish obtained and tolerance achieved in grinding outer diameters of jig borer quills on a Newall-Keighley LA machine.



NEWALL-KEIGHLEY **LA**

CYLINDRICAL GRINDING MACHINES

products of THE NEWALL ENGINEERING CO. LTD., PETERBOROUGH

sales organisation

NEWALL GROUP SALES LTD - PETERBOROUGH - ENGLAND

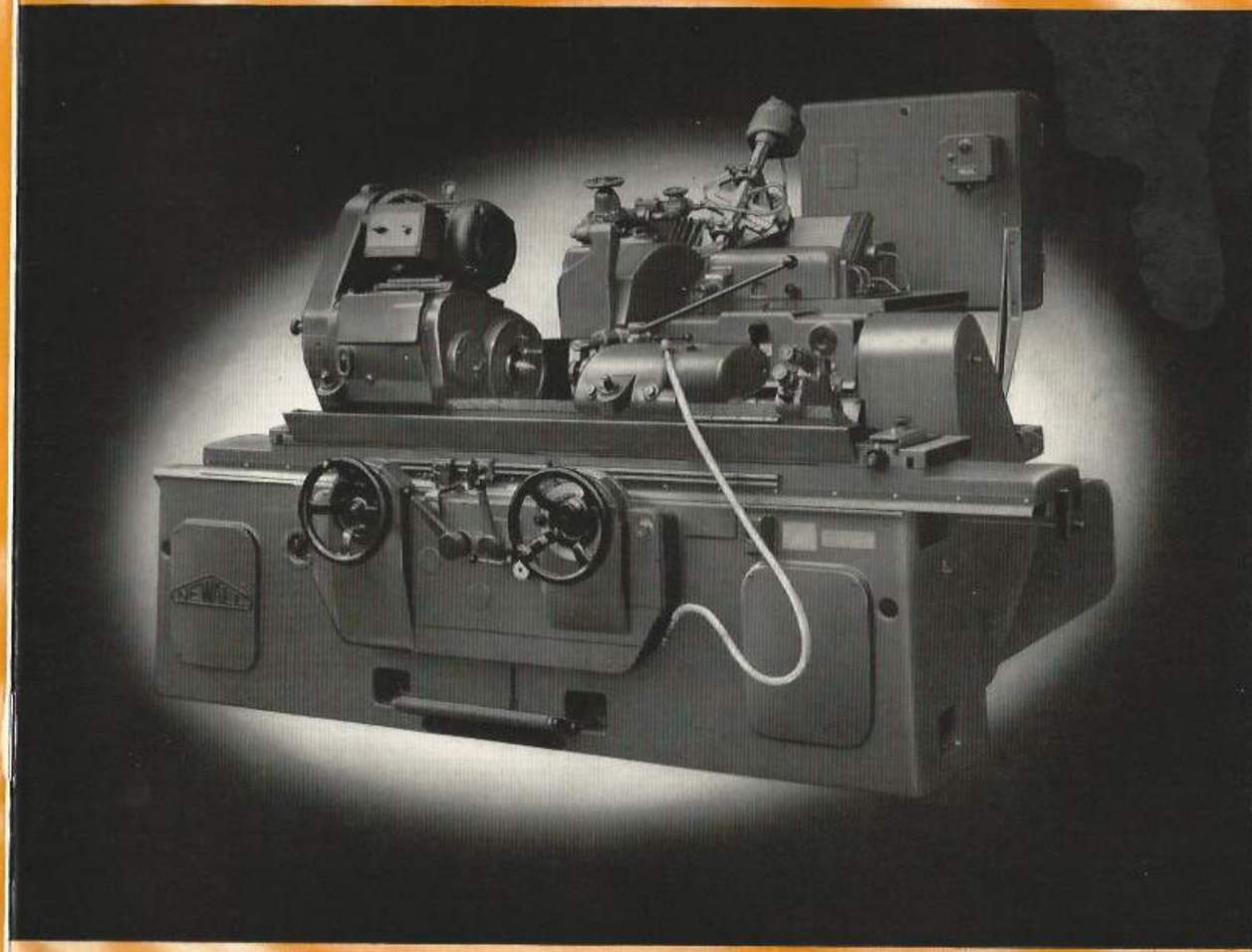
Telephone: Peterborough 3227 Cables: 'Precision,' Peterborough

BROCHURE 13/62 replaces Publication 13/59 PRINTED IN ENGLAND

NEWALL-KEIGHLEY *model* **LA**

PRODUCTION CYLINDRICAL GRINDERS

STANDARD · UNIT AUTOMATIC · LINK-LINE AUTOMATIC MACHINES



products of THE NEWALL ENGINEERING CO LTD PETERBOROUGH ENGLAND

ONE OF THE NEWALL GROUP

NEWALL-KEIGHLEY

L.A.

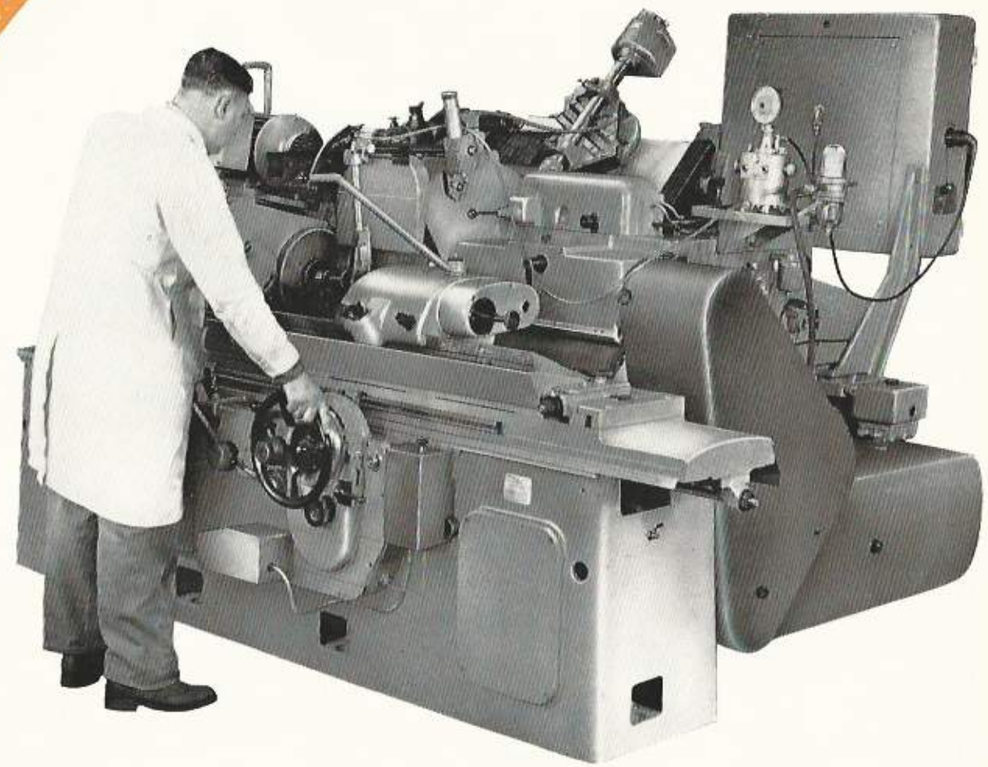
CYLINDRICAL GRINDER

GUARANTEED FOR TWELVE MONTHS

The NEWALL-KEIGHLEY "L.A." Heavy Duty Cylindrical Grinding Machine has been designed and built to provide a machine of such sturdy proportions that not only will it be capable of exceptionally fast and accurate grinding production, but that it will maintain such speed and accuracy after prolonged service with the minimum of attention. All materials used in the construction of the machine are the best of their respective kinds and have been selected as being the most suitable for the purpose. Extensive laboratory and operational research has resulted in our employment of Meehanite metal for all iron castings; produced in the Newall foundry, these ensure optimum rigidity with which is associated freedom from machine vibration and chatter. The workmanship throughout is to a meticulously high standard and each machine undergoes a comprehensive series of acceptance tests when completed. All features required for high precision production grinding are incorporated in the "L.A." Grinder which is also available in automated form as detailed on pages 18 and 19 of this publication. The machine is manufactured with centre heights to grind diameters up to 12", 16", 18" or 24" (305, 406, 457, or 610 mm.), the 16" machine being designated "H.L.A." and the extra heavy duty 18" and 24" models "E.L.A.". The capacity between centres for the "L.A." and "H.L.A." machines is from 24" to 84" (610 to 2,134 mm.) and for the "E.L.A." series, 36" to 144" (915 to 3,658 mm.). Machines in this series are built throughout to J.I.C. standards if required.

ALL ENQUIRIES TO NEWALL GROUP SALES LTD PETERBOROUGH TELEPHONE 3227

Telegrams: "Precision" Peterborough—Telex.



WORKHEAD

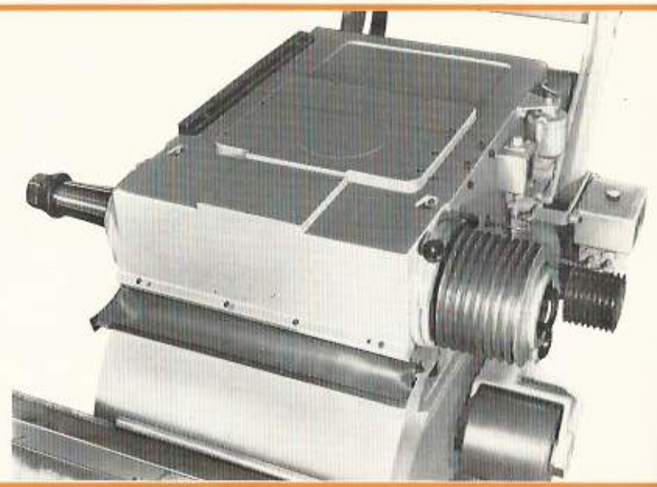
The exceptionally sturdy design of the geared dead-centre workhead is shown in Fig. 1. It is fitted with a spindle carrying a No. 5 Morse-taper centre. Drive for the 12" and 16" swing machines is obtained through a 2 h.p. motor providing nine speeds in the range 25 to 360 r.p.m. A 4/2 h.p. motor powers the workhead of the 18" and 24" swing E.L.A. models which have twelve speeds from 8 to 210 r.p.m. Automatic lubrication is provided from a sump integral with the workhead casting. The workhead is operated by a switch working in conjunction with the lever operating the rapid advance and withdrawal of the wheelhead, and a special switch for "inching" is provided. As an alternative, a live, or live and dead-centre workhead is supplied to order.

★ *MASSIVE PROPORTIONS ENSURE VIBRATIONLESS OPERATION*

Note: 12" × 36" machine weighs 14,000 lbs. (6,350 kg.)

wheelhead

Fig. 2. The massively proportioned fixed spindle wheelhead.



WHEELHEAD

A fixed spindle wheelhead is fitted as standard with the following supplied as alternatives:

(*a*) A hydraulic oscillating spindle type with a reciprocating movement steplessly variable between 0 and $\frac{3}{8}$" (0 to 9mm.). This wheelhead is particularly recommended for employment where a high order of component surface finish is required.

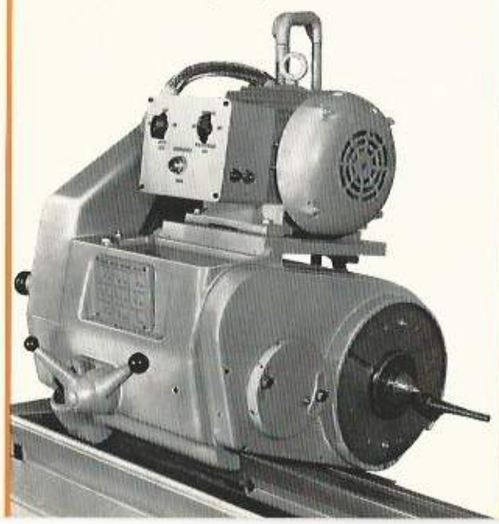
(*b*) A spark-splitting type mainly for employment on crankshaft journal grinding. Operation of a lever permits the spindle to be moved axially during grinding.

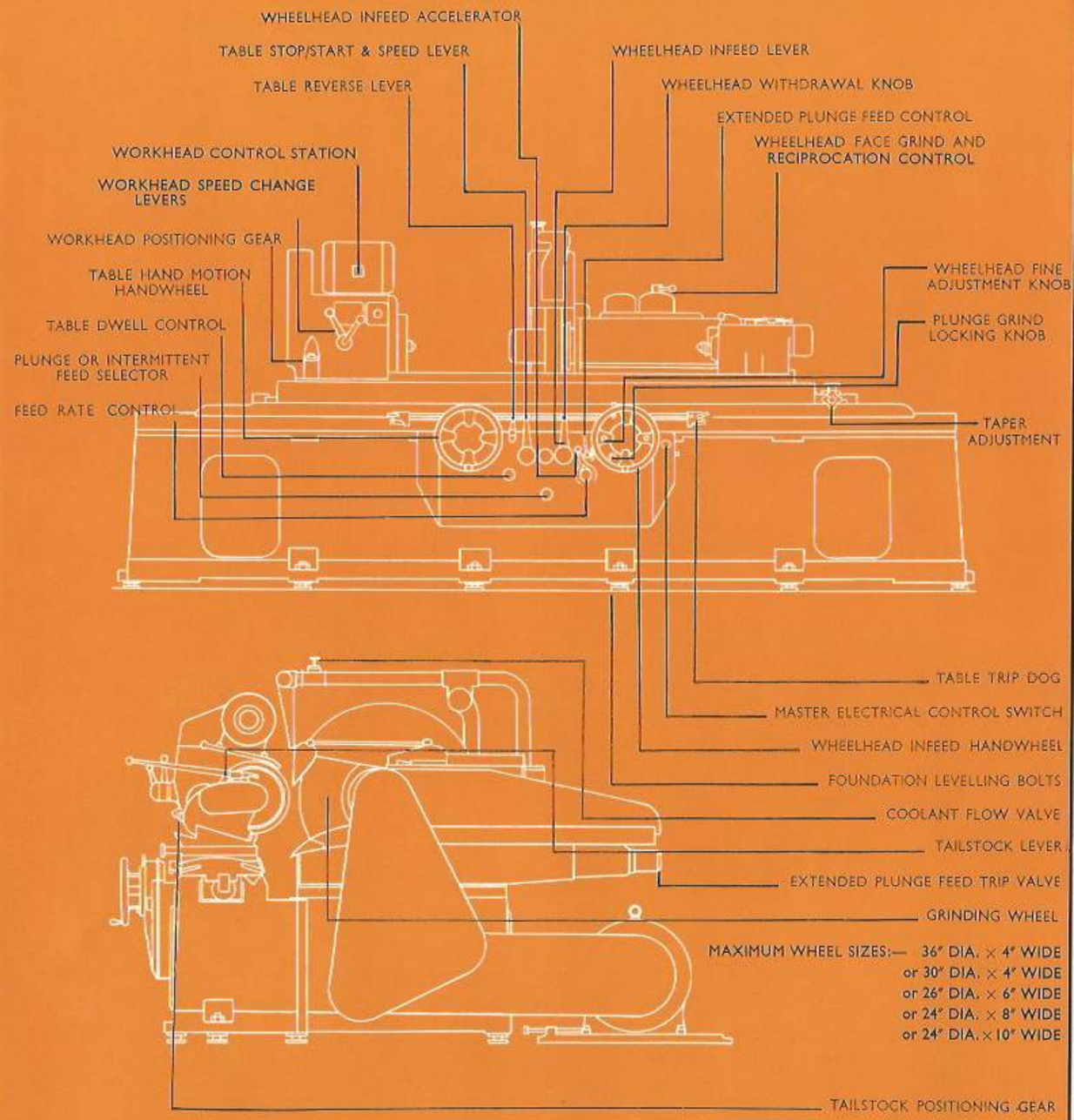
(*c*) This is designed specifically for production form grinding and is supplied with the hydraulic wheel forming attachment described on page 6. The spindle is adjustable by worm and worm wheel control for setting purposes.

Each of the above types is fitted with a hardened super-finished nitralloy steel spindle. The wheelhead slides on long, accurately scraped vee and flat surfaces, automatically lubricated, and is provided with a hydraulically operated rapid approach and withdrawal movement of either 3" or 4" (76 or 102 mm.). The standard amount of regulated infeed for grinding is 0·080" (2 mm.) but where necessary this can be increased to 2" (51 mm.) by the extended plunge feed cylinder (fig. 13) for face grinding. The distance and speed of this extra infeed can be controlled accurately, the distance by a setting at the rear of the machine directly beneath the wheelhead casting, and the speed by the controls in the normal manner. The spindle bearings are lubricated by means of a pump driven by an independent motor, pressure oil being fed through a filter; the system incorporates a pressure switch which automatically stops the machine in the event of pressure falling below the safety limit. Drive to the wheelhead is through multiple endless Vee belts from a 20 h.p. motor situated at the rear of the machine; to user preference this motor may be wheelhead mounted. Seating faces are machined on the wheelhead casting for the assembly of straight peripheral or form dressing attachments.

workhead

Fig. 1. The exceptionally sturdy construction of the workhead fitted to the 12", 16" and 18" swing machines is portrayed in this illustration.





LA CONTROLS

HYDRAULIC FORM DRESSER

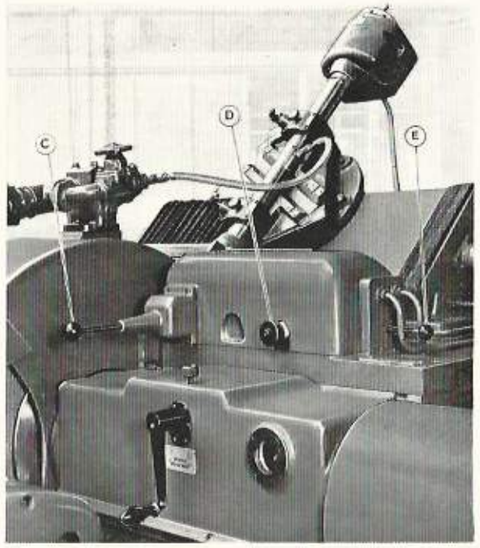


Fig. 3. Front view of the Dresser.

Developed specially for use with the Newall-Keighley range of type " L.A." heavy duty production grinders, the principal advantages of the new dresser are considerably improved dressing speeds and the ability for wheel dressing to be accomplished without disturbing the machine or component. Alternatively dressing may take place while the operator is changing components.

The dresser is arranged to dress any form including side face of wheel at 90 degrees to the periphery, up to 10 inches wide and 1 inch deep either from left to right, or right to left, as the form may require.

Infeed of the diamond is controlled by a push button mounted at the front of the machine or alternatively for setting purposes, by means of the wheel 'A' or lever 'B'. When either the push button or lever is employed the diamond is advanced by 0.0005" per movement.

The dresser is set in motion by depressing knob 'C' which is also applied for stopping and returning the dresser to the rest position at any time during the cycle.

The complete cycle consists of:

I Rapid approach of diamond to wheel.
II Actual dressing.
III Retraction of diamond and return to the rest position.

The form to be dressed is traced from a 1:1 former plate 'F' and the speed of the dressing motion, controlled by knurled knob 'D', is variable. Direction of dressing and thereby the 'at rest' position is determined by the position of control 'E'.

The unit is automatically lubricated and coolant is fed to the diamond point during dressing.

AUTOMATIC WHEEL TRUING COMPENSATION

A distinctive feature of the " L.A." machine is automatic compensation for wheel truing. This is associated with the wheelhead feed mechanism and is brought into effect when the diamond is advanced for dressing purposes. Application of the push button controlling diamond infeed simultaneously causes the wheelhead to advance an identical distance.

For specific types of wheel forming, a dresser is supplied with the diamond bar slide fitted vertically instead of in the angular position as depicted in the accompanying illustrations.

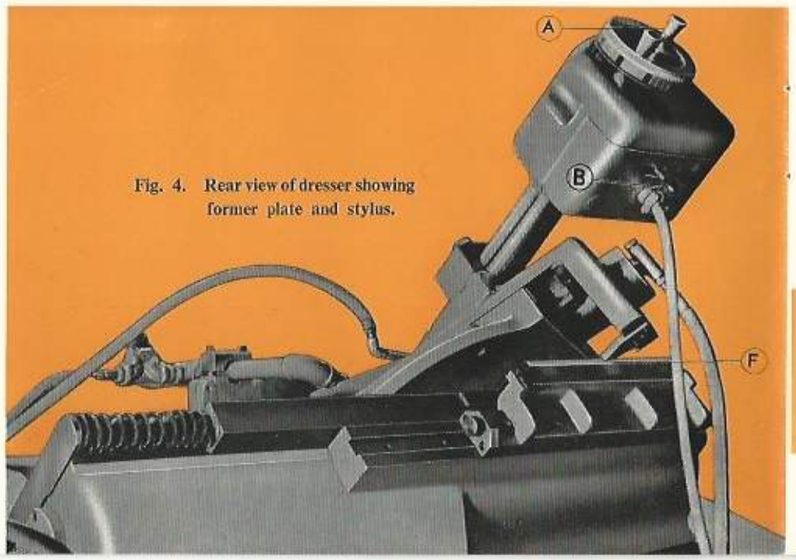
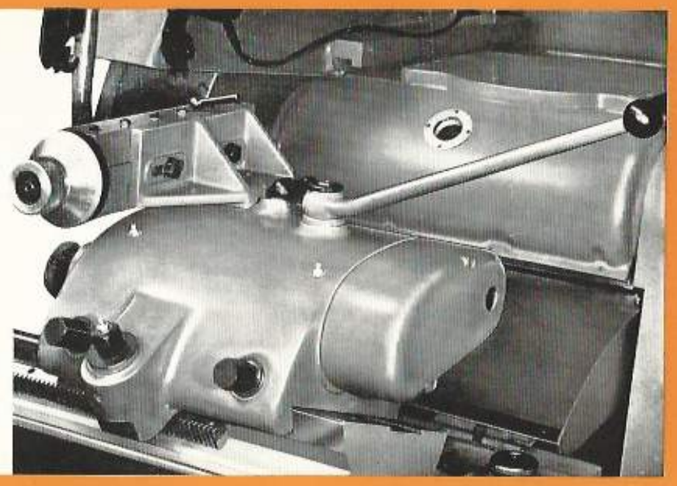


Fig. 4. Rear view of dresser showing former plate and stylus.

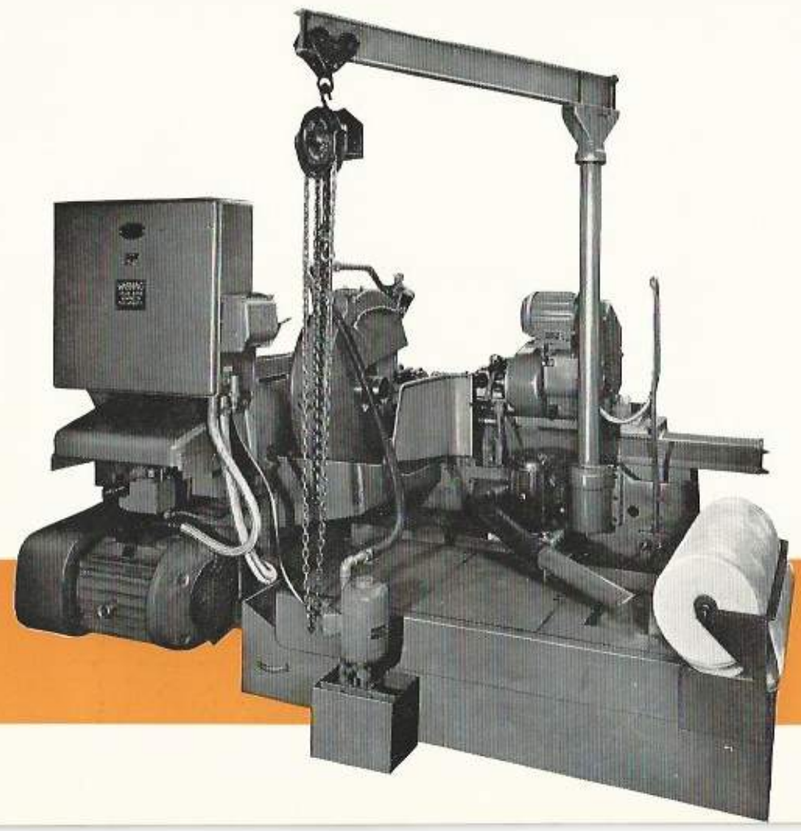
micrometer adjusted tailstock mounted dresser

Fig. 5. Illustration showing the above attachment, one of several types of wheel dressers supplied.



TRUMATIC WHEEL DRESSING

The micrometer adjusted tailstock mounted dressing attachment is offered for employment on machines not fitted with the wheelhead mounted dresser and can be employed to advantage for large batch production. By the hydraulic system the wheelhead is set to a positive stop at its withdrawn position and this, coupled with the micrometer adjusted diamond dresser, enables the wheel to be dressed and the grinding operation continued without having to reset the feed dial for sizing.



BED

The bed is a rigid construction box section, suitably designed and ribbed to eliminate vibration. The bed houses the main hydraulic controls.

COOLANT

Coolant is supplied from a self-contained unit with a capacity of 60 gallons by means of an electric pump. The tank is fitted with filters and baffles, and the whole unit is mounted on wheels and can be easily withdrawn for emptying and cleaning. Magnetic or fabric clarifiers are fitted to customer's order.

crane

Fig.7. The crane, shown in this rear view of the machine, facilitates the removal or lifting of the wheel. Fitted to the rear of the bed, it is easily swung into position.

To cater for the requirement of users who specify the addition of such systems to grinding machines, OMT-ETAMIC pneumatically operated equipment is recommended for installation with the LA series. Extremely compact and of proven reliability, a comprehensive range of units is offered to cover all applications within the scope of the machines and to promote improved accuracy, size uniformity and increased output of components.

The following systems are available.

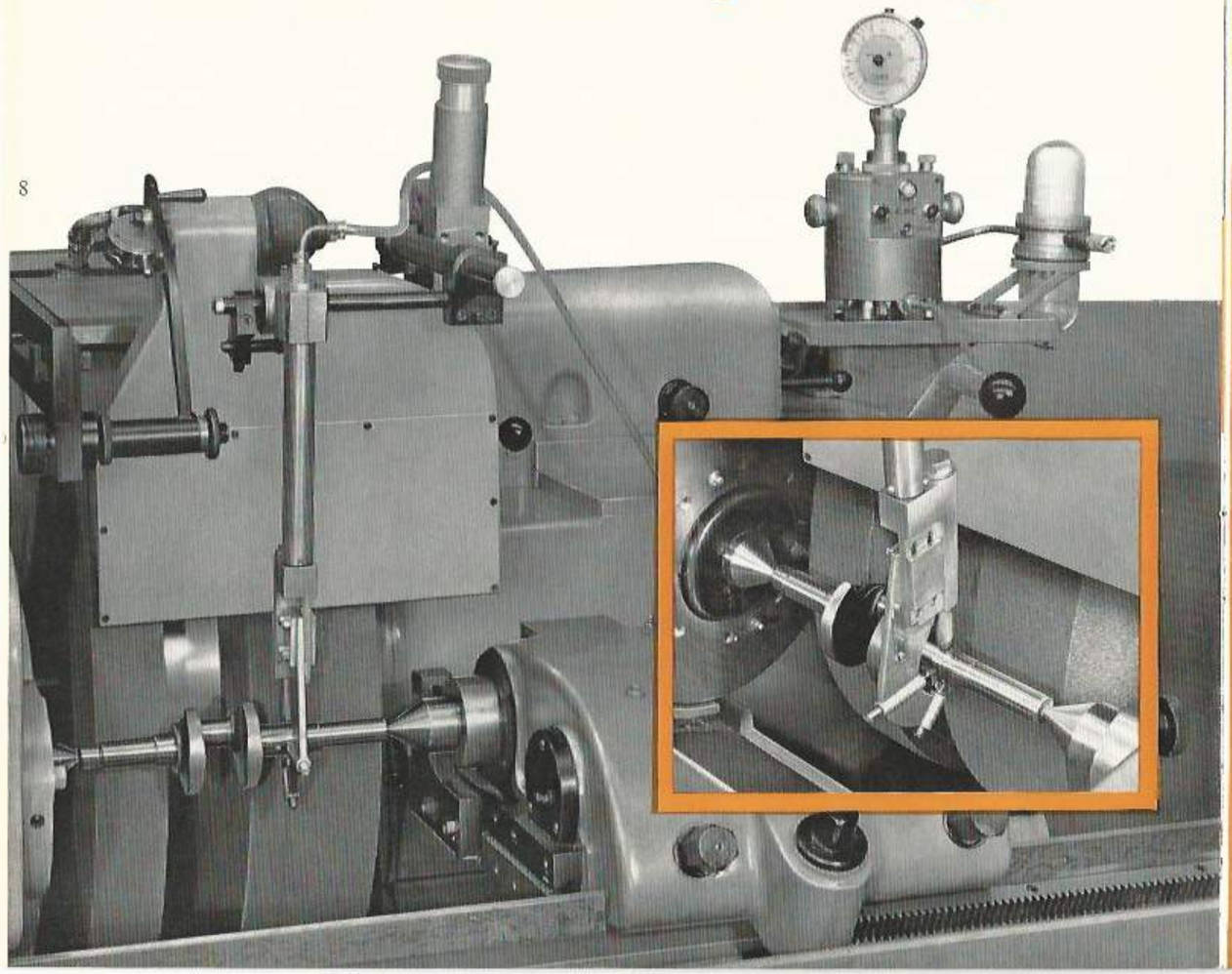
(*a*) Single stage—This controls component size and actuates withdrawal of the wheelhead.

(*b*) Double stage—With this system two signals are received from the automation head. The first reduces the primary grinding feed at a pre-determined rate; the second signal controls component size and, when this is established, wheelhead retraction.
This system is normally employed for average production grinding.

(*c*) Three stage—Generally specified for exceptionally close tolerance work, this equipment is identical in operation to the two stage system but includes an extra signal. The function of this is to introduce a two-phase finish grinding feed or, alternatively, to permit a dwell period to ensue prior to the final signal being given when size is reached and the wheelhead withdraws.

To customer demand other automatic size and control systems are also supplied.

automatic size and machine cycle control systems



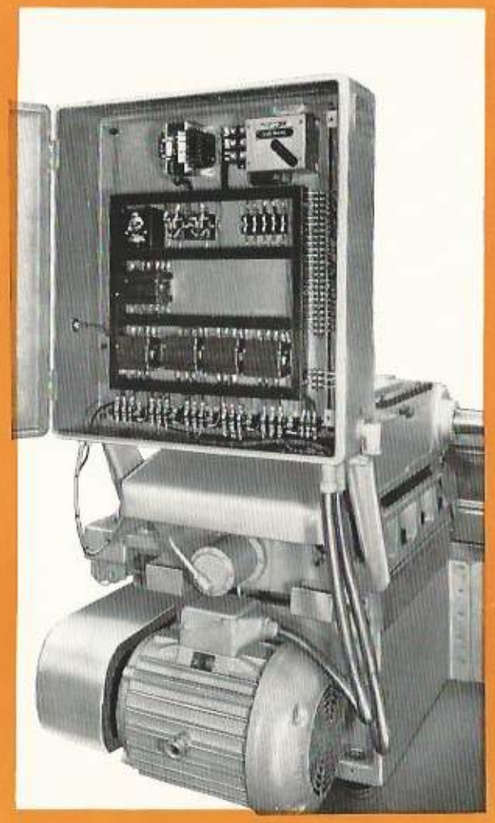


Fig. 8. Electrical Control Panel

TABLE

The table can be swivelled for taper grinding as stated in the specification. The table traverse is hydraulically operated, has a steplessly variable speed of 1-160" (25 to 4064 mm.) per minute, and is automatically lubricated by a separate pump. A table dwell valve, which, if engaged, operates at every reversal, is incorporated in the hydraulic system. The amount of dwell at the end of the traverse of the table is steplessly variable.

TAILSTOCK

The tailstock shown in Fig. No. 9 and supplied as standard with the 12" and 16" swing machines, is fitted with a hardened, ground and lapped spindle of alloy steel. The amount of pressure to the No. 5 Morse taper centre is adjustable, and a lever-operated toggle mechanism is incorporated which allows the spindle to be withdrawn easily, and automatically held out to facilitate the loading of heavy work. Both the workhead and the tailstock can be moved along the table in either direction by means of a ratchet lever through a rack and pinion.

Hydraulically-operated or heavy duty screw-operated tailstocks are offered as alternatives. Screw-adjusted heavy duty tailstocks are fitted as standard to the 18" and 24" swing models.

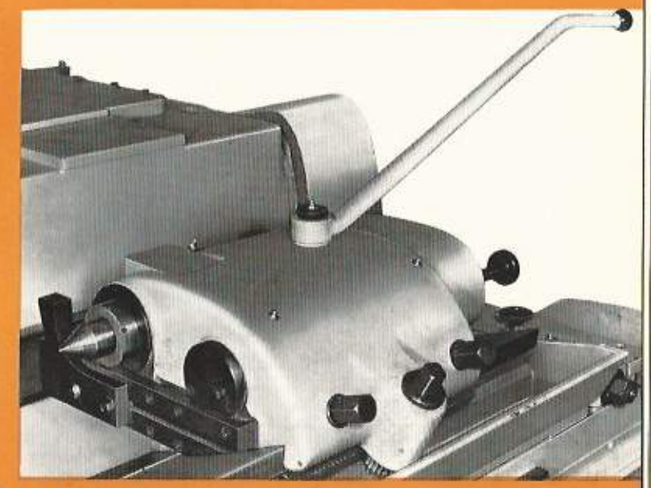


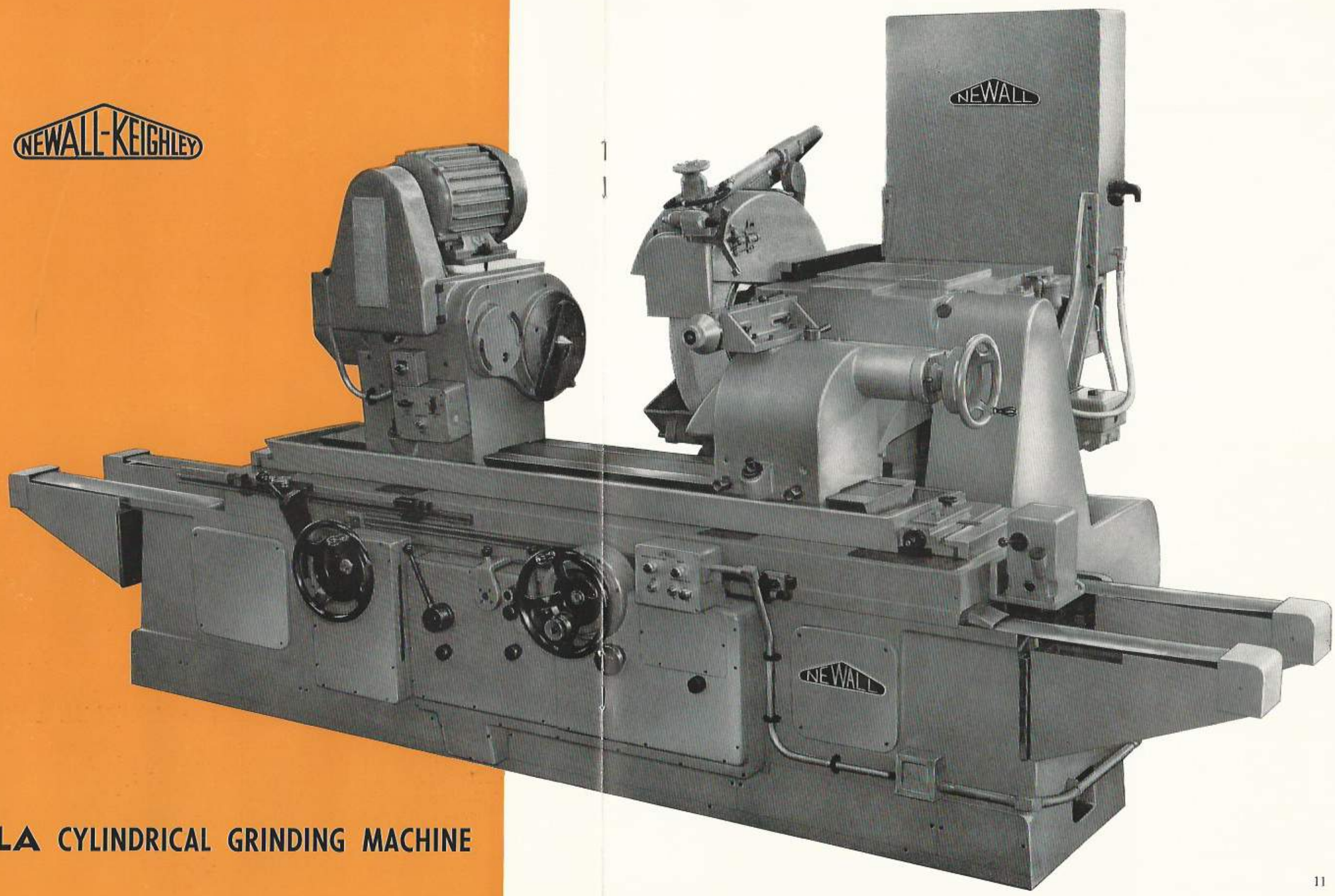
Fig. 9. Tailstock.

ELECTRICAL EQUIPMENT

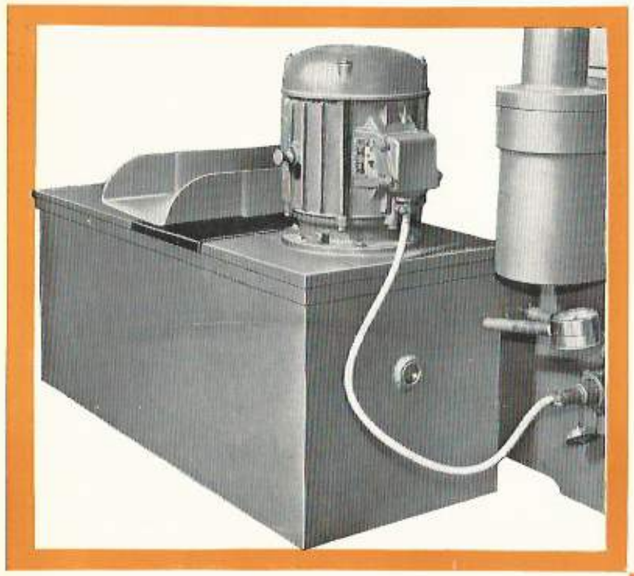
All contactors, overloads, fuses, time relays, etc., are contained in a sheet metal cabinet mounted at the rear of the machine in a position easily accessible for servicing and out of the way of coolant and oil mist.

The electrical equipment incorporates a fault-finding device enabling all circuits to be checked rapidly and any fault pin-pointed.

NEWALL-KEIGHLEY



MODEL **ELA** CYLINDRICAL GRINDING MACHINE



hydraulic oil supply tank

Fig. 10. The supply of hydraulic oil is contained in a 20 gallon (90 litre) capacity tank. The hydraulic oil pump is driven by a motor mounted on this tank.

HYDRAULIC OIL SUPPLY TANK

The hydraulic oil supply tank is situated at the rear of the machine as, by experience, it has been found that by having the hydraulic oil out of contact with the machine main castings the slight temperature rise of the oil after continued use has no adverse effect on the accuracy of the machine. The ease of cleaning and servicing the unit in this position will also be appreciated by the plant engineer.

HYDRAULIC STEADIES

Hydraulic steadies can be supplied as extra equipment and work in conjunction with the hydraulic wheelhead infeed mechanism. As the wheel removes metal from the component being ground the steady shoes maintain a constant pressure on the workpiece, the rate of infeed being accurately regulated by valves in the hydraulic system.

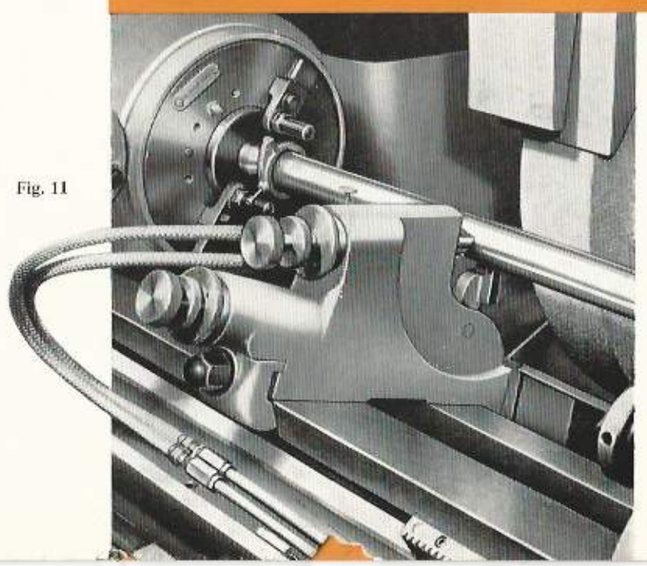
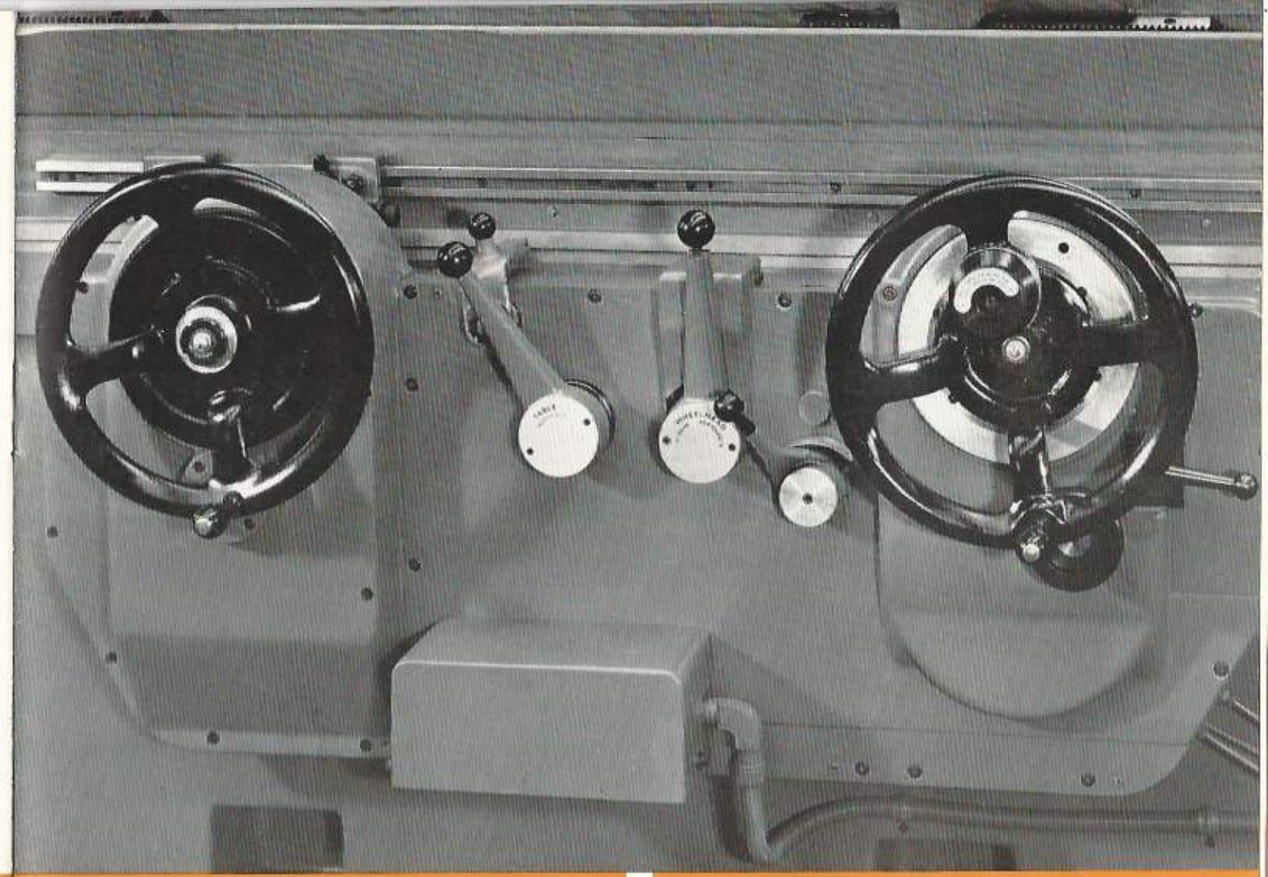


Fig. 11

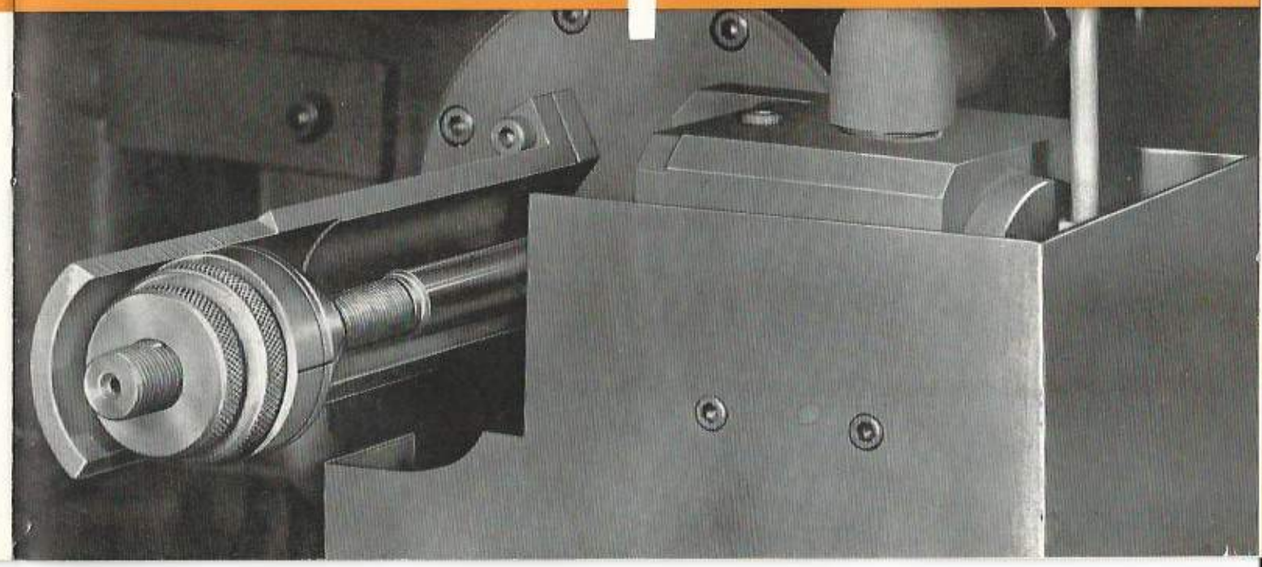


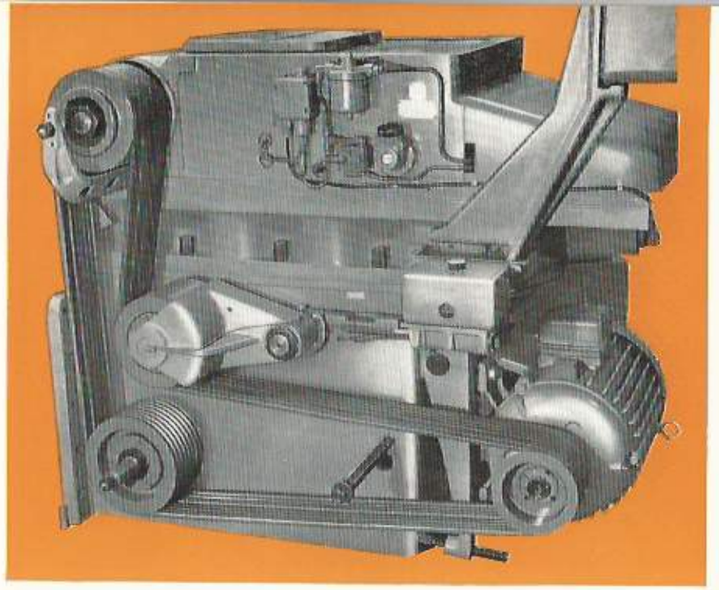
control panel

Fig. 12. Showing compact grouping of handwheels, etc.

plunge feed cylinder

Fig. 13. View of the extended plunge feed cylinder. This unit allows faces up to 2" (51 mm.) to be plunge ground.



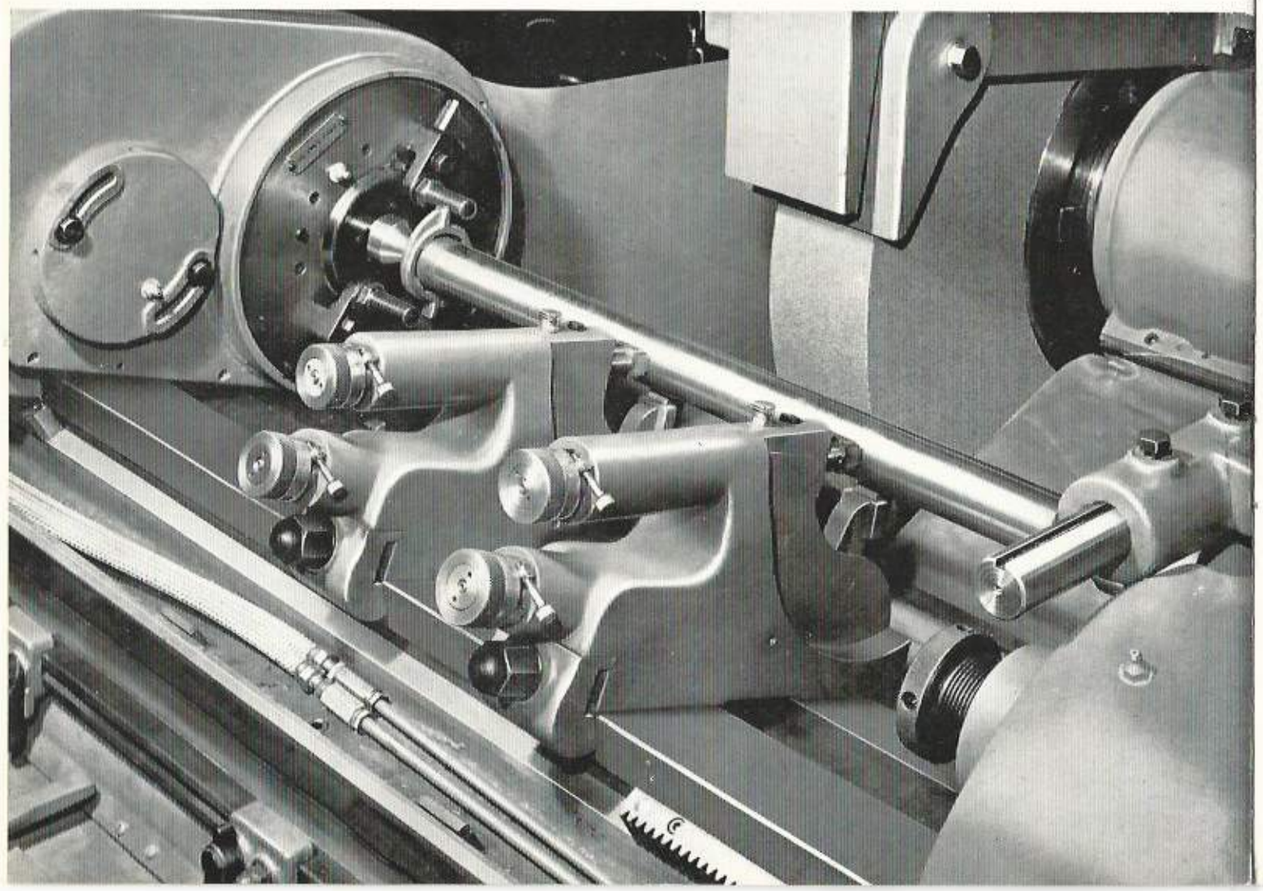


drive to wheelhead

Fig. 14. Drive to the wheelhead is through multiple endless Vee belts from a 20 h.p. motor situated at the rear of the machine. Belt tension for this drive is automatically applied. As previously mentioned, a wheelhead-mounted motor is available if preferred.

two point steadies

Fig. 15. Two-point steadies which are part of the extra equipment with each machine. The number of these supplied depends upon the length capacity of the machine.



SPECIFICATION

Metric in **Yellow**
English in **Black**

CAPACITY BETWEEN CENTRES

12" swing LA... ...	ins.	24	36	48	60	72	84					
	mm.	610	915	1220	1525	1830	2134					
16" swing HLA ...	ins.	24	36	48	60	72	84					
	mm.	610	915	1220	1525	1830	2134					
18" swing ELA ...	ins.		36	48	60	72	84	96	108	120	132	144
	mm.		915	1220	1525	1830	2134	2438	2743	3048	3353	3658
24" swing ELA ...	ins.		36	48	60	72	84	96	108	120	132	144
	mm.		915	1220	1525	1830	2134	2438	2743	3048	3353	3658
Table maximum swivel 'LA' & 'HLA'		10°	10°	8°	5°	4°	3°					
'ELA'			10°	8° 40'	8°	7°	6° 20'	6°	5° 20'	5°	5°	4° 40'

COMMON STATISTICS	12" LA	16" HLA	18" ELA	24" ELA
Max. diameter ground ins. / mm.	12 / 305	16 / 406	18 / 457	24 / 610
Wheel diameter ... ins / mm.	24, 26, 30 or 36 / 610, 660, 762 or 914		24, 26 or 30 / 610, 660 or 762	
Wheel width ... ... ins. / mm.	10, 8, 6, 4 or 3 / 250, 203, 152, 102 or 76		10, 8, 6, 4 or 3 / 250, 203, 152, 102 or 76	
Wheel Spindle speeds	677–1,150 r.p.m. (4)		677–1,150 r.p.m. (4)	
Wheelhead: Quick run back ... ... ins. / mm.	3 / 76		3 / 76	
Plunge grinding feed ...	Steplessly Variable		Steplessly Variable	
Max. stock removal with standard plunge feed ins. / mm.	0.080 / 2		0.080 / 2	
Workhead Spindle speeds	25 to 360 r.p.m. (9)		8 to 210 (12)	
Table speeds (steplessly variable) ins. / mm.	1 to 160 / 25 to 4064		1 to 160 / 25 to 4064	
Wheelhead motor ...	20 h.p.		20 h.p.	
Hydraulic pump motor	2 h.p.		5 h.p.	
Workhead motor ...	2 h.p.		4/2 h.p.	
Coolant pump motor...	½ h.p.		½ h.p.	

FLOOR SPACE REQUIREMENT

LA & HLA	Feet	Metres	ELA	Feet	Metres
24"	13 × 9	3.9 × 2.7	36"	14 × 11	4.2 × 3.35
36"	16 × 9	4.8 × 2.7	48"	16 × 11	4.8 × 3.35
48"	19 × 9	5.8 × 2.7	60"	19 × 11	5.8 × 3.35
60"	22 × 9	6.7 × 2.7	72"	21 × 11	6.3 × 3.35
72"	25 × 9	7.6 × 2.7	84"	23 × 11	6.9 × 3.35
84"	28 × 9	8.5 × 2.7	96"	25 × 11	7.6 × 3.35
			108"	27 × 11	8 × 3.35
			120"	29 × 11	8.7 × 3.35
			132"	31 × 11	9.3 × 3.35
			144"	33 × 11	9.9 × 3.35

STANDARD EQUIPMENT

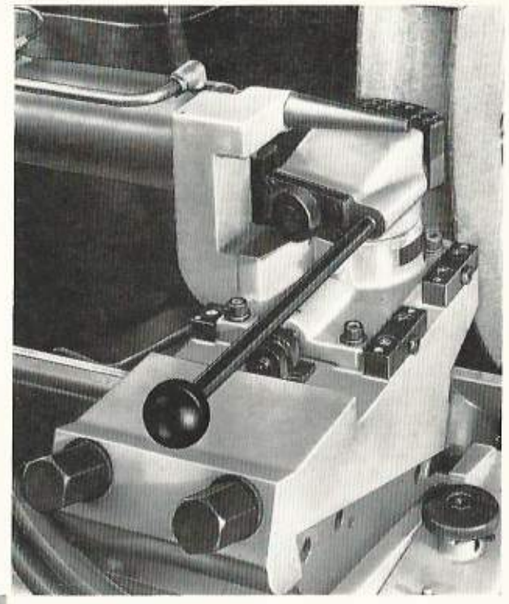
Spindle Speed Change Pulleys; Wheel and Pulley Remover; No. 5 Morse Full Centre; No. 5 Morse Half Centre; Balancing Mandrel; Wheel Cradle; Splash Guards; Complete Set of Spanners and Wrenches; Tailstock Diamond Holder, peripheral; Tailstock Diamond Holder, side; Bed Lifting Nut; Foundation Plates; Grease and oil guns; Complete Fill of Lubricating and Hydraulic Oils.

WEIGHT OF MACHINES AND STANDARD EQUIPMENT

12" × 36" LA ...	14,000 lbs.	6,350 kg.
16" × 36" HLA ...	15,680 lbs.	7,112 kg.
18" × 36" ELA ...	20,820 lbs.	9,443 kg.
24" × 36" ELA ...	22,500 lbs.	10,205 kg.

EXTRA EQUIPMENT

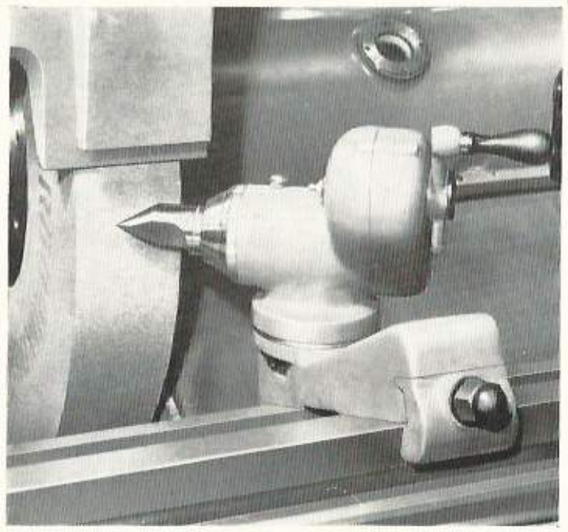
Grinding Wheel to customer's requirement; Wheel Flanges—additional; Non-Standard Wheelheads; Extended Plunge Feed; Intermittent Feed Unit; Table Dwell Unit; Interlock Unit for single lever operation when traverse grinding; Wheel Dresser—tailstock mounted and micrometer adjusted; Wheel Former Dresser—wheelhead mounted and fully automatic; Radius Dresser; Centre Grinding Attachment; Workhead—live centre, multi-speed; Workhead—live and dead centre, multi-speed; Tailstock—hydraulic; Tailstock—screw operated, heavy duty; Table Positioning Devices, including hydraulic; Steady Rests—two point; Work Rests; Wheel Hoist; Sizing Devices — OMT-ETAMIC or to customer's requirement; Coolant Clarifier.



radius dresser

Fig. 16. Standard or special purpose radius dressers for either concave or convex wheel forming are supplied to customer's request.

The above illustration depicts an attachment for concave dressing, with this a locator is provided to establish constant relationship between grinding and dressing positions.



centre grinding attachment

Fig. 17. This enables the operator to grind his own centres, thus avoiding delays caused by returning the centres to the toolroom for regrinding. It is fitted as shown, and with the machine set for parallel grinding, the attachment grinds the centre to the angle to which the attachment is set.

In addition to the standard application the " L.A." machine can be supplied specially tooled to grind a number of diameters on a component at one plunge of the wheelhead. For this a wheelhead mounted hydraulic dresser (see p. 6) is supplied which, in conjunction with a former plate manufactured to the exact profile of the work to be ground, allows the wheel to be dressed with the various steps in accurate relationship. In cases where the physical dimensions of the workpiece will not permit one wide wheel to be used, twin wheels are fitted with an appropriate spacer.

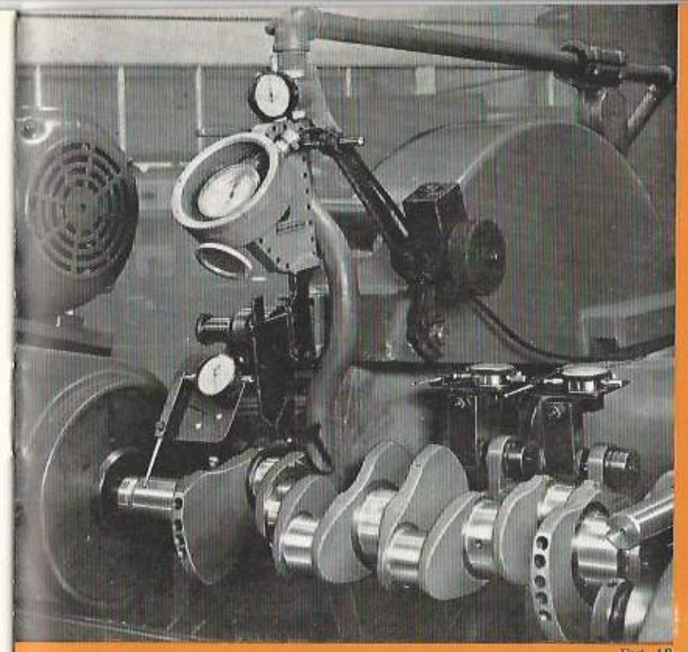


Fig. 18.

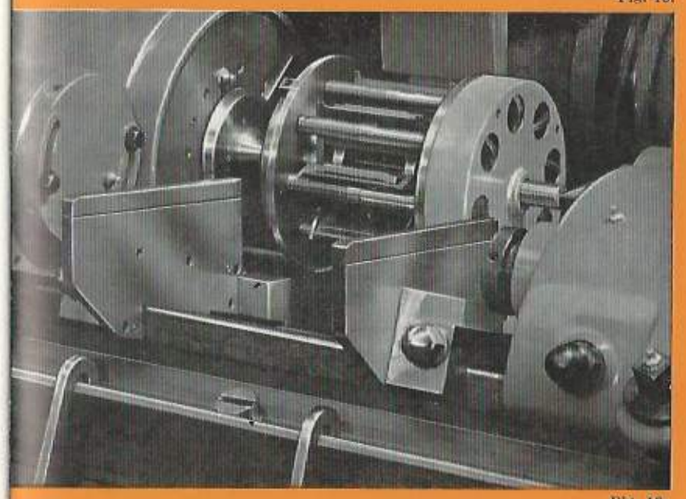


Fig. 19.

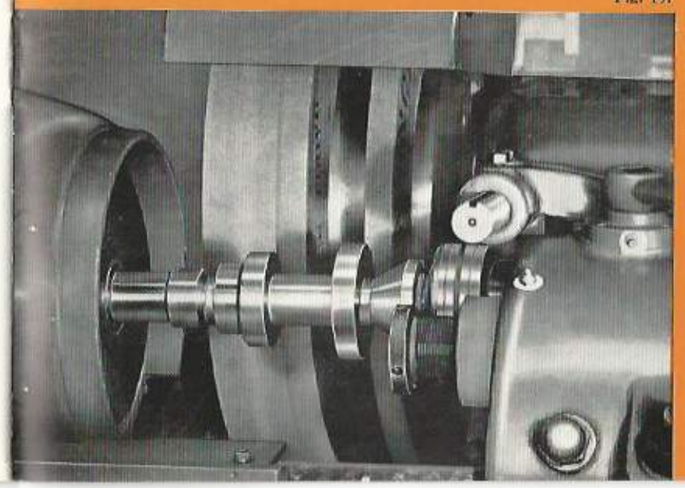


Fig. 20.

LA APPLICATIONS

With a considerable variety of applications in modern engineering practice and supplied where necessary with special tooling, the Newall-Keighley LA Grinder is widely employed in many branches of the industry for accurate, economical production. Featured on this page is a short selection illustrating potential use of the machine.

Fig. 21.

Fig. 18. Crankshaft journal grinding. Note employment of the Newall Endwise Locators.

Fig. 19. Plunge grinding leading edge of turbine blade for datum face. Holding fixture accommodates eight blades.

Fig. 20. Formed wheel grinding of four diameters simultaneously.

Fig. 21. Twin wheel grinding of automobile differential case.

AUTOMATIC CYCLE

LA

The application to the 12″ × 24″ machine of automatic loading and a fully automatic grinding cycle by a timing unit represents a considerable advance in production technique for grinding small shafts and similar components.

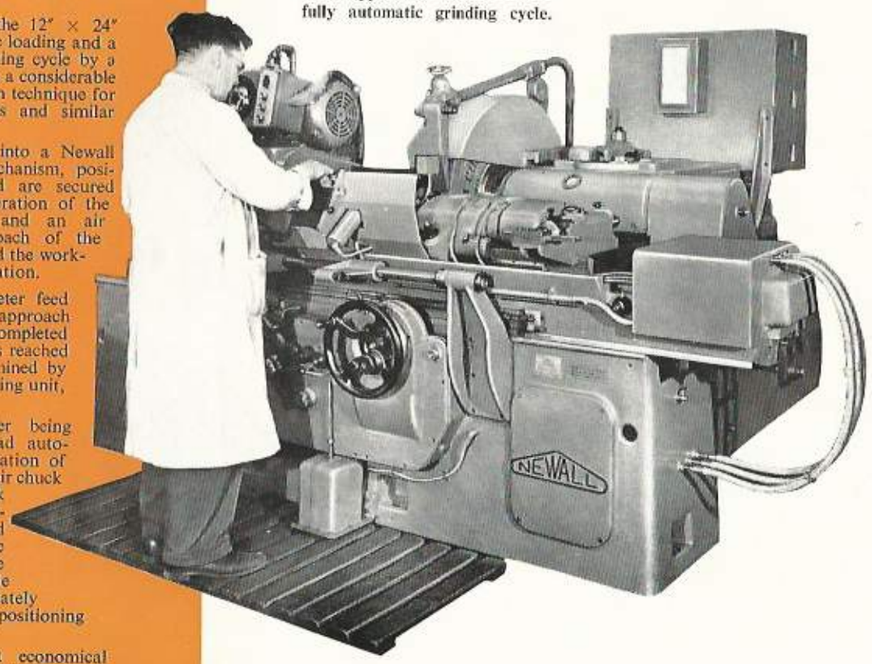
Workpieces are fed into a Newall designed hopper mechanism, position themselves, and are secured automatically by operation of the hydraulic tailstock and an air chuck. Rapid approach of the wheelhead follows and the workpiece commences rotation.

An automatic diameter feed takes over when rapid approach of the wheelhead is completed and when dead stop is reached a dwell period, determined by set of an electrical timing unit, ensues.

On finished diameter being reached the wheelhead automatically retracts, rotation of workpiece ceases, the air chuck opens and the tailstock centre is withdrawn permitting the finished piece to drop into the lower receptacle of the hopper. The cycle recommences immediately with a new component positioning itself.

A factor of distinct economical importance is that the steadily paced automatic operation enables a single operator to supervise production on a battery of these machines.

Fig. 22. The machine equipped with hopper feed mechanism and fully automatic grinding cycle.



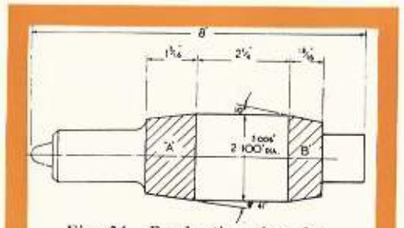
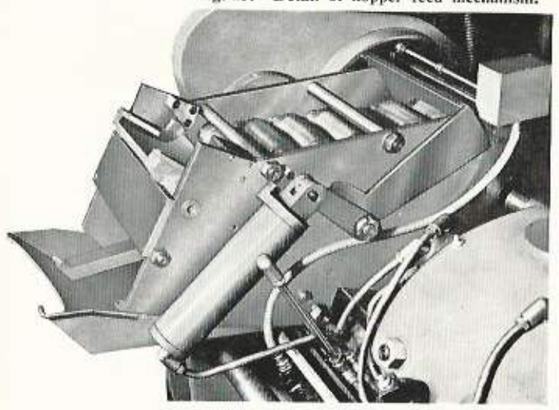
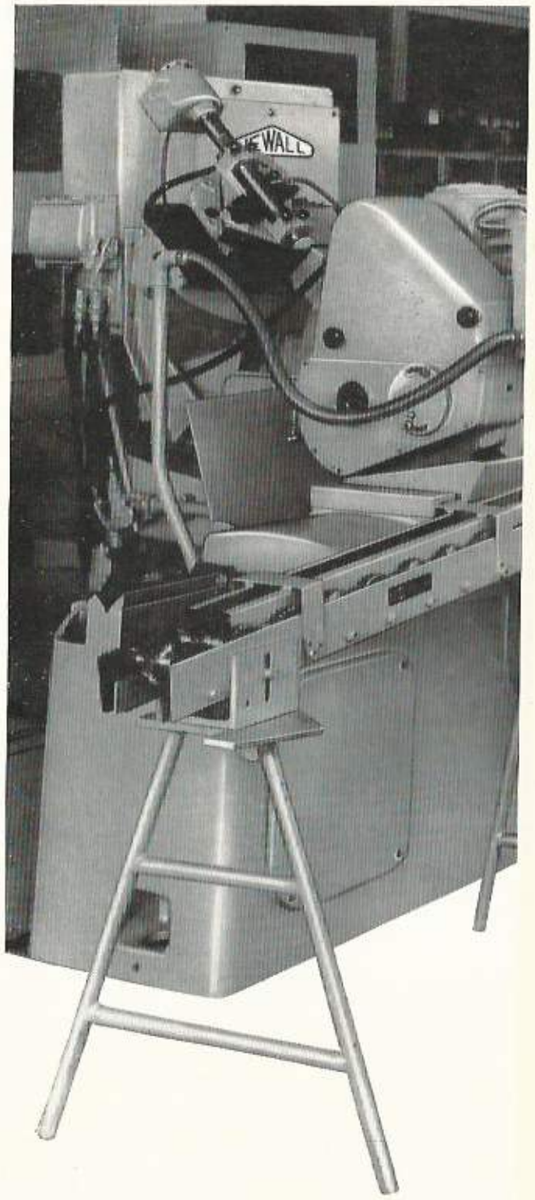


Fig. 24. Production time for stock removal of 0.025″ from tapers A.B. of a batch of 10 components was five minutes.

Fig. 23. Detail of hopper feed mechanism.



FULLY AUTOMATED LA



Newall Products

NEWALL

Jig Boring Machines

STANDARD MACHINES

Model 1520 : Table size 15″ x 20¾″
Model 2443 : Table size 24″ x 43″
Model 2451 : Table size 24″ x 51″
Machines other than model 1520 are equipped with table milling feeds.

AUTOMATIC CO-ORDINATE—SETTING MACHINES

'Spacematic' 1520 : Table size 15″ x 20¾″
'Spacematic' 2443 : Table size 24″ x 43″
'Spacematic' 2657 : Table size 26″ x 57″
Spacematic 2657 is also available with tracer-controlled copy-milling and profile generating features.

NEWALL-KEIGHLEY

Grinding Machines

STANDARD RANGE

Cylindrical Grinding Machines
Heavy Duty Cylindrical Grinding Machines
Thread Grinding Machines
Crankpin Grinding Machines
Camshaft Grinding Machines
Internal Grinding Machines
Universal Grinding Machines
Turbine Blade Grinding Machines
Lapping Machines

AUTOMATIC MACHINES

Cylindrical—unit, or for link-line production
Internal—with gauge and diamond sizing
Thread—magazine loading for tap production
Crankpin—automatic cycle for production of in-line bearings
Camshaft—automatic cycle for cam lobe grinding

NEWALL-OMT

Optical-Inspection Equipment

Optical Rotary Indexing Tables, Plain and Inclinable
Rotary Tables—automatic indexing
Universal Workshop Projectors
Horizontal and Vertical Comparators
Projection Pantometers
High Precision Measuring Machines
Universal Toolmakers Microscopes
Optical Dividing Heads
Unit Optics and Optical Systems

OMT-ETAMIC

Air Gauging and Machine Control Equipment

Fig. 22. The machine equipped with hopper feed mechanism and fully automatic grinding cycle.

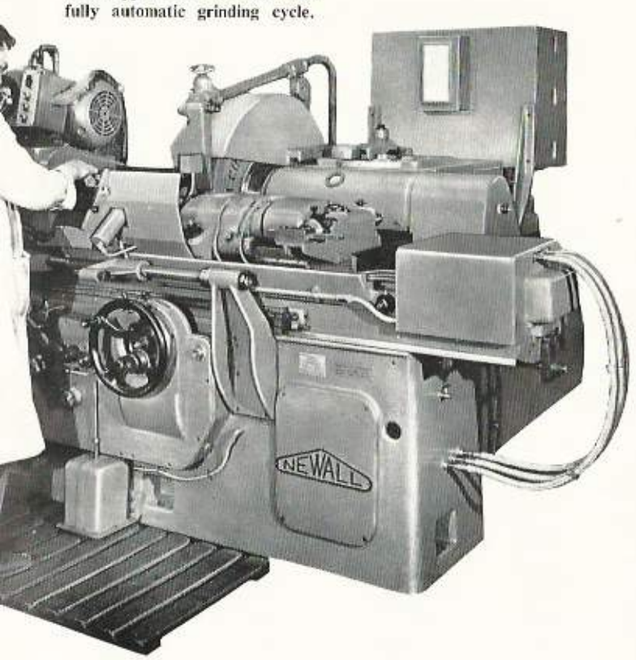
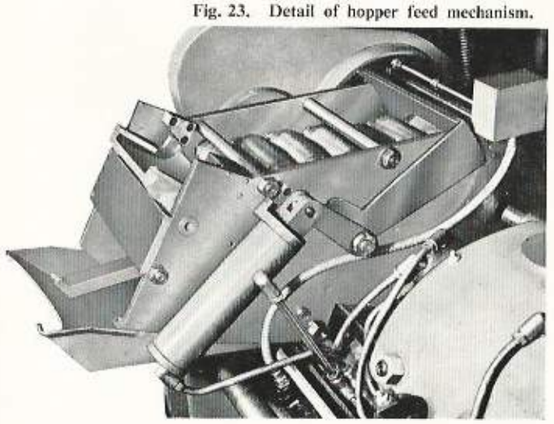


Fig. 23. Detail of hopper feed mechanism.



FULLY AUTOMATED LA for LINK-LINE PRODUCTION

As distinct from the automatic unit described on the preceding page, a more recent Newall development has been the production of fully automated LA grinders for inclusion in transfer lines containing automatic machines of varying types for completely processing components.

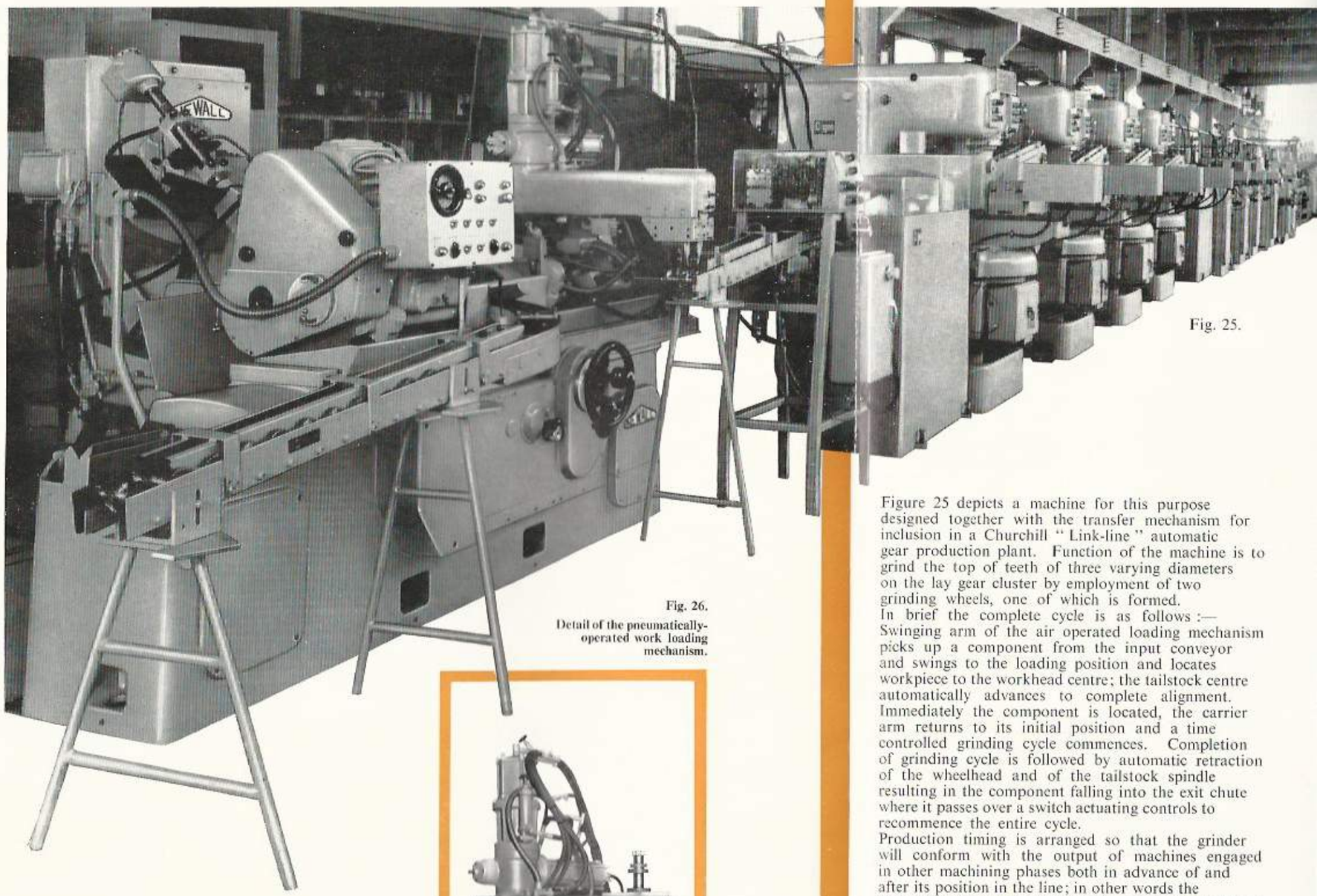


Fig. 25.

Figure 25 depicts a machine for this purpose designed together with the transfer mechanism for inclusion in a Churchill " Link-line " automatic gear production plant. Function of the machine is to grind the top of teeth of three varying diameters on the lay gear cluster by employment of two grinding wheels, one of which is formed.

In brief the complete cycle is as follows :— Swinging arm of the air operated loading mechanism picks up a component from the input conveyor and swings to the loading position and locates workpiece to the workhead centre; the tailstock centre automatically advances to complete alignment. Immediately the component is located, the carrier arm returns to its initial position and a time controlled grinding cycle commences. Completion of grinding cycle is followed by automatic retraction of the wheelhead and of the tailstock spindle resulting in the component falling into the exit chute where it passes over a switch actuating controls to recommence the entire cycle.

Production timing is arranged so that the grinder will conform with the output of machines engaged in other machining phases both in advance of and after its position in the line; in other words the cycle will not recommence unless (*a*) a component is located at the end of the input conveyor and (*b*) no finished workpiece is at the front of the output conveyor.

Fig. 26.

Detail of the pneumatically-operated work loading mechanism.