



NEWALL

**MACHINE
TOOLS**

for the
automotive
industry

SUMMARY OF CONTENTS

| | |
|----------------------------------------------------------------------------------------------------|-------------|
| Introduction | Page 3 |
| Details of automotive components manufactured with the aid of Newall Group machine tools | Pages 4 & 5 |
| Type CAN 'Autocamatic' Cam Grinding Machine | Page 6 |
| Type L6 Cylindrical Grinding Machine | Page 7 |
| Type LI2 Cylindrical Grinding Machine | Page 8 |
| Type L6AH Angle Head Cylindrical Grinding Machine | Page 9 |
| Type LI2AH Angle Head Cylindrical Grinding Machine | Page 10 |
| Type LA Cylindrical Grinding Machine | Page 11 |
| Type A-LA Cylindrical Grinding Machine, Automated for Link-Line Production | Page 12 |
| Type A-ULA Cylindrical Grinding Machine with Automatic Conveyor and Loading Mechanism | Page 13 |
| Single Ended Fine Boring Machine | Page 14 |
| Double Ended Fine Boring Machine | Page 15 |
| Type K4 Automatic Internal Grinding Machine | Page 16 |
| Type HAC Standard Crankpin Grinding Machine | Page 17 |
| Type HAC Twin-Wheel Crankpin Grinding Machine | Page 18 |
| Type A-HAC Automatic Crankpin Grinding Machine | Page 19 |
| Type HAJ Crankshaft Journal Grinding Machine | Page 20 |
| Type MAC Multi-Wheel Grinding Machine | Page 21 |
| Type MU Unit-Built Cylindrical Grinding Machine | Page 22 |
| Type MU Unit-Built Cylindrical Grinding Machine with Newall 'A' Type Loader and Free-Flow Conveyor | Page 23 |
| Type MU Unit-Built Cylindrical Grinding Machine with Newall 'C' Type Loader and Conveyor | Page 24 |
| Type NKL Automatic Distributor Cam Form Grinding Machine | Page 25 |
| Type NKL Automatic Bush Grinding Machine | Page 26 |
| Type PNL High Precision Profile Grinding Machine | Page 27 |
| Type KU37 Extra Heavy Duty Universal Grinding Machine | Page 28 |
| Type LI2AA Angle Approach Cylindrical Grinding Machine | Page 29 |
| Newall Group machine tools and the British automotive industry | Page 30 |

The last quarter of a century has seen the automotive industry grow from, somewhat, modest proportions into the vast organisation it is today.

As with all growing industries, the period of growth and expansion has been accompanied by a number of relative problems. Not the least among these problems has been the securing of high-precision machine tools, designed—not merely adapted—for use within the automotive industry.

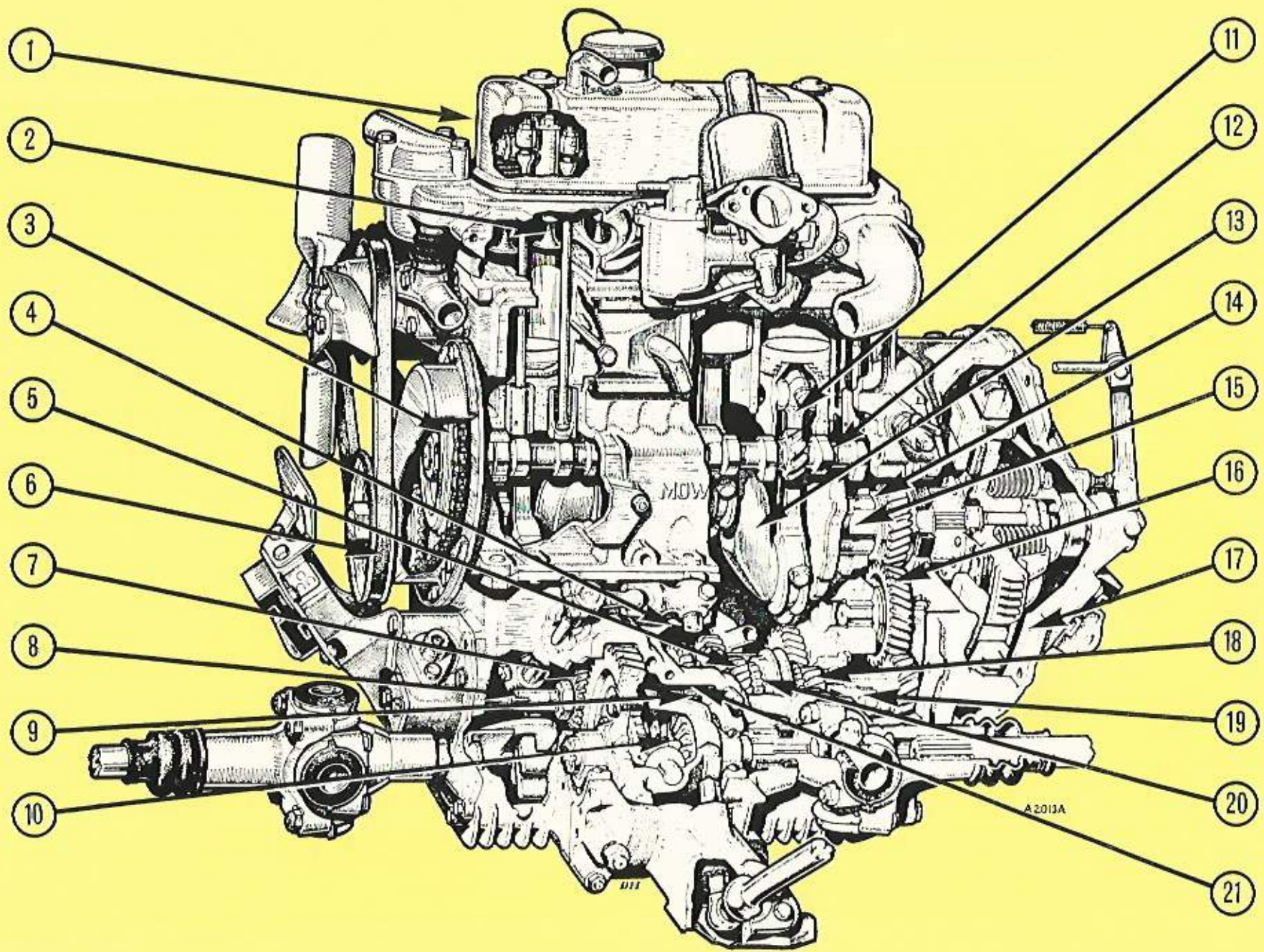
NEWALL

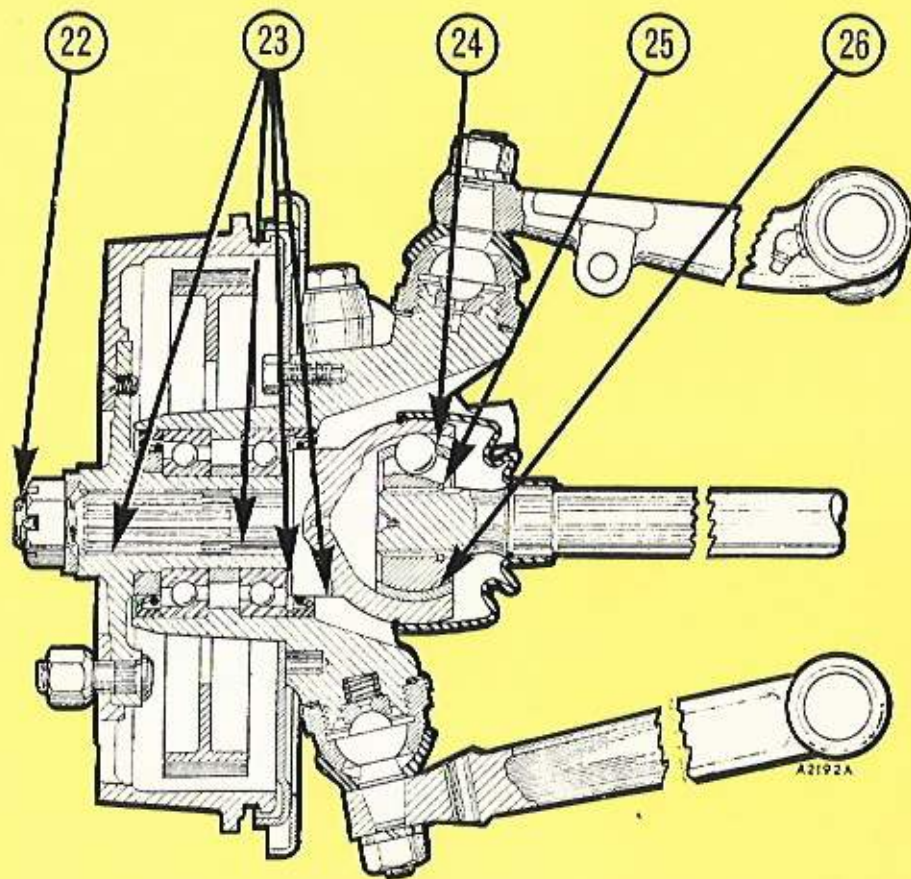
MACHINE TOOLS FOR THE AUTOMOTIVE INDUSTRY

By the pursuance of close technical liaison with its numerous customers in this particular field, The Newall Group of Companies has achieved a unique position of being specialist suppliers of high-precision production machine tools, 'tailor made', for use within the automotive industry.

A further outcome of this specialised activity is that Newall can now justly claim to offer a more comprehensive range of grinding machines for use in the automotive industry than any other single manufacturer in the world.

Ranging from conventional machines to special purpose grinders, fully automated work stations and 'link-line' units, the principal items are illustrated and briefly described in this brochure. Fully detailed publications for the majority of the machines featured are available on request.





AUTOMOTIVE COMPONENTS MANUFACTURED WITH THE AID OF NEWALL GROUP MACHINE TOOLS

Engine and Transmission Assembly
Front Suspension Assembly

1. Distributor cam — Finish-grind cam-form and skirt. (Page 25).
2. Inlet and exhaust valves — Check component diameters with O.M.T.-Etamic air gauging equipment.

3. Flywheel hub — Grind outside diameter and taper bore. (Page 16).
4. Reverse wheel — Fine-bore bushes. (Page 14).
5. 1st Speed wheel — Grind diameters and faces. (Page 9).
6. Crankshaft pulley — Grind hub boss. (Page 7).
7. Fine-bore gear bushes. (Page 14).
8. 3rd Motion shaft — Grind all diameters, faces and groove. (Page 11).
9. Nos. 2, 3 and 4 Speed gears — Grind cones and teeth outside diameters. (Page 7)
10. Fine-bore bevel pinion bushes. (Page 14).
11. Connecting rod — Fine-bore small end bush. Check component size with O.M.T.-Etamic air gauging equipment. (Page 16).
12. Camshaft — Rough and finish grind cam-forms and journals. (Pages 6 & 11).
13. Crankshaft — Grind pins, journals, thrust faces, shoulder and diameter, taper, gear and pulley diameters. (Pages 10, 11 & 19).
14. Primary gear — Grind 'C' washer.
15. Primary gear — Grind oil seal and spline diameter. (Page 7).
16. Idler gear — Grind journal diameters and faces. (Page 10).
17. Adaptor plate — Machine and fine-bore. (Page 14).
18. Lay gear — Grind three diameters. (Page 11).
19. 1st Motion shaft — Grind cone and gear outside diameter. (Page 7).
20. Fine-bore baulk rings, bore taper and grind outside diameters. (Pages 8 & 14).
21. 2nd Speed synchronous gear — Grind teeth outside diameter. (Page 7).
22. Outer race bell — Grind outside diameter of thread. (Page 8).
23. „ „ „ — Grind radii, face and all diameters. (Page 11).
24. Universal joint — Grind outside diameter of cage. (Page 27).
25. „ „ — Grind grooves of inner track. (Page 27).
26. „ „ — Grind outside diameter of inner track. (Page 27).

This compact and extremely sturdy machine, single lever controlled after initial setting up has been specifically designed for grinding cam contours of automotive camshafts.

The entire machine cycle is fully automatic and includes wheel truing and compensation for consequent reduction of the grinding wheel diameter after the grinding of each shaft is completed. Provision may be incorpora-

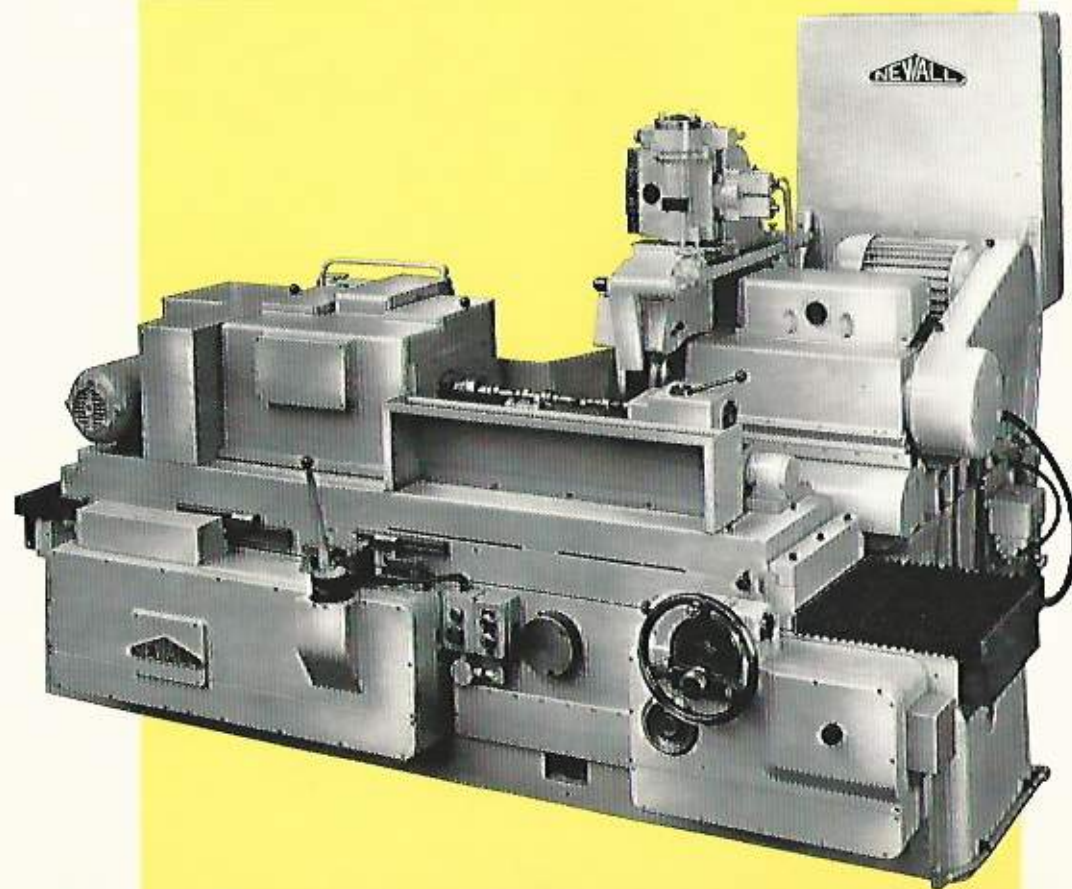
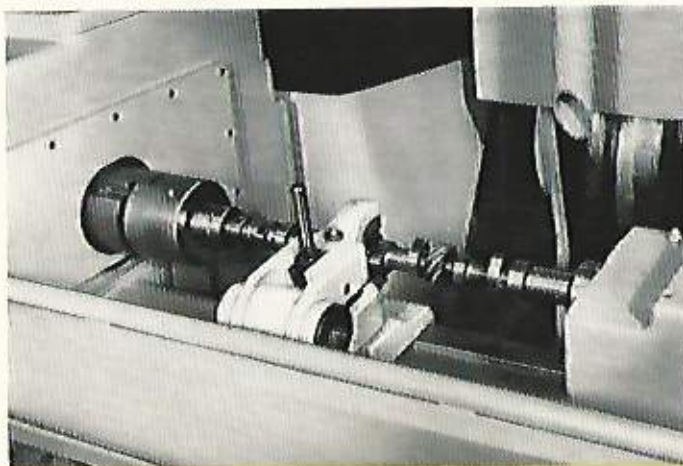
ted for the grinding of taper cams and for the production of shafts with alternating right and left hand tapering of the lobes. Master cam banks, designed to user requirement, are an integral part of the workhead spindle. Furthermore, design consideration of the workhead provides for the interchangeability of all standard master cam banks.

TYPE CAN 'AUTOCAMATIC' CAM GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|-------------------------------------------------|-----------------------------------------------------|
| Maximum wheel diameter | 24" (610 mm.) |
| Maximum diameter ground | 5" (127 mm.) |
| Capacity between centres | 20", 30", or 50" (510, 760 or 1270 mm.) |
| Maximum lift of cam | $\frac{3}{8}$ " (16 mm.) |
| Wheelhead rapid approach | 2" (51 mm.) |
| Plunge cut feed (steplessly variable) | to 0.160" (4 mm.) |
| Wheelhead motor | 7½ h.p. |
| Floor space required (30" machine) | 11 ft. 6 ins. x 7 ft. 6 ins. (3.5 x 2.28 metres) |
| Weight with standard equipment (30" machine) | 17,200 lbs. (7,802 kg.) |

Close-up view of a typical component and double-shoe work-steady.



This highly efficient and exceptionally compact unit enjoys widespread popularity in the automotive industry and in plants specialising in the production of ancillary equipment for car manufacturers. In its standard form type 'L6' is a plunge cut grinder but an intermittent feed mechanism may be incorporated if desired. A wheelhead-mounted, hydraulically operated dresser is available to requirement and the O.M.T.-

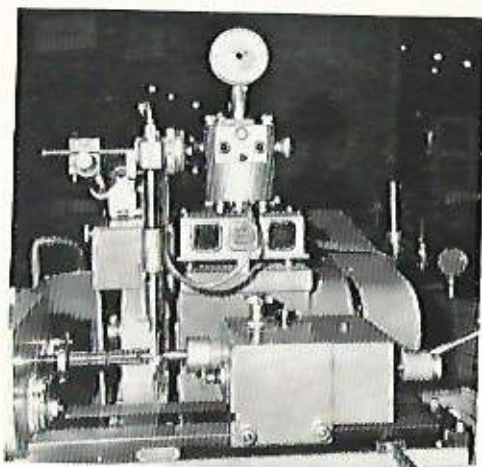
Etamic automatic size and machine cycle control system is offered as an optional extra.

When equipped with a live and dead centre workhead the machine can be supplied with an internal grinding head driven by an independent motor. This extremely useful feature materially extends the machine's field of application when employed for precision toolroom work.

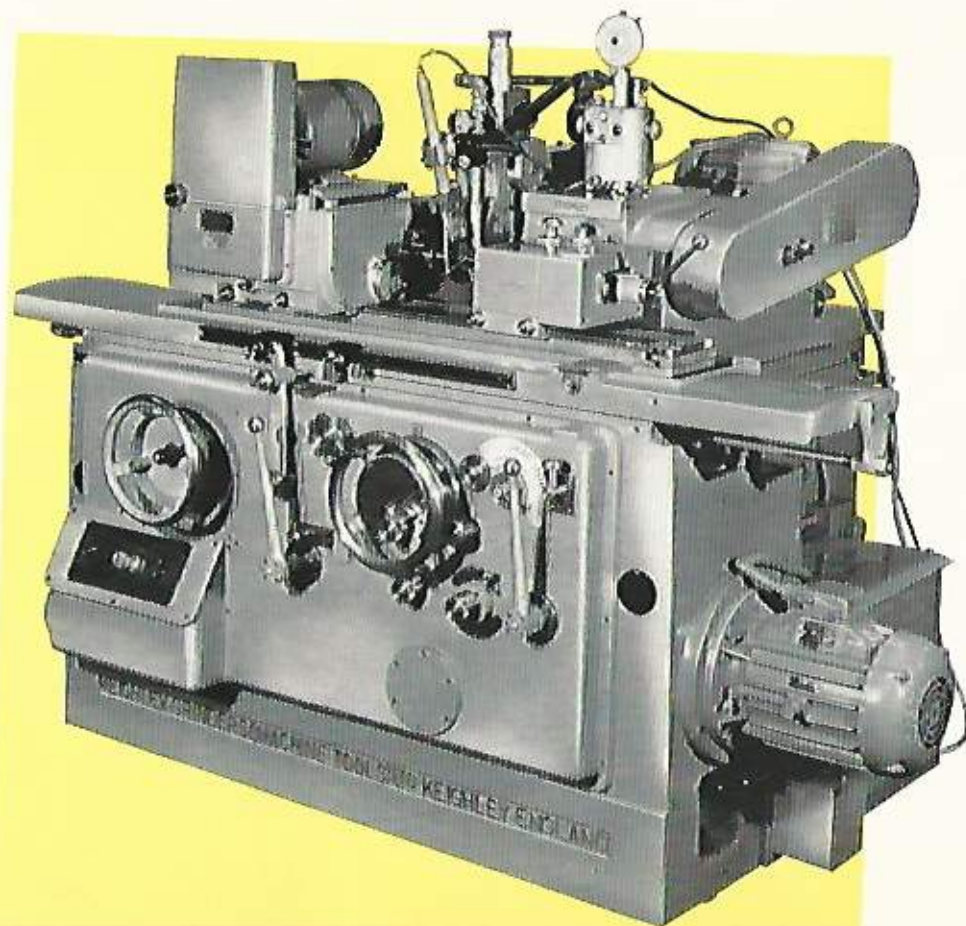
TYPE L6 CYLINDRICAL GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|--------------------------------|----------------------------------|
| Capacity between centres | 18" or 24" (457 or 610 mm.) |
| Maximum grinding diameter | 6" (152 mm.) |
| Maximum wheel diameter | 18" (457 mm.) |
| Maximum wheel width | 3" (76 mm.) |
| Plunge cut feed | steplessly variable |
| Wheelhead motor | 5 h.p. |
| Floor space required | 9 ft. x 5 ft. (2.7 x 1.5 metres) |
| Weight with standard equipment | 6,720 lbs. (3,050 kg.) |



O.M.T.-Etamic automation head and gauging equipment utilized for control of spline shaft diameter and machine cycle.



A heavily built medium capacity machine incorporating all the features necessary for producing accurate work at high output rates, this machine, tooled to user requirements, is extensively employed for producing a wide variety of gearbox and transmission components for automobiles and tractors.

In its standard form and although essentially a plain grinder, the range of

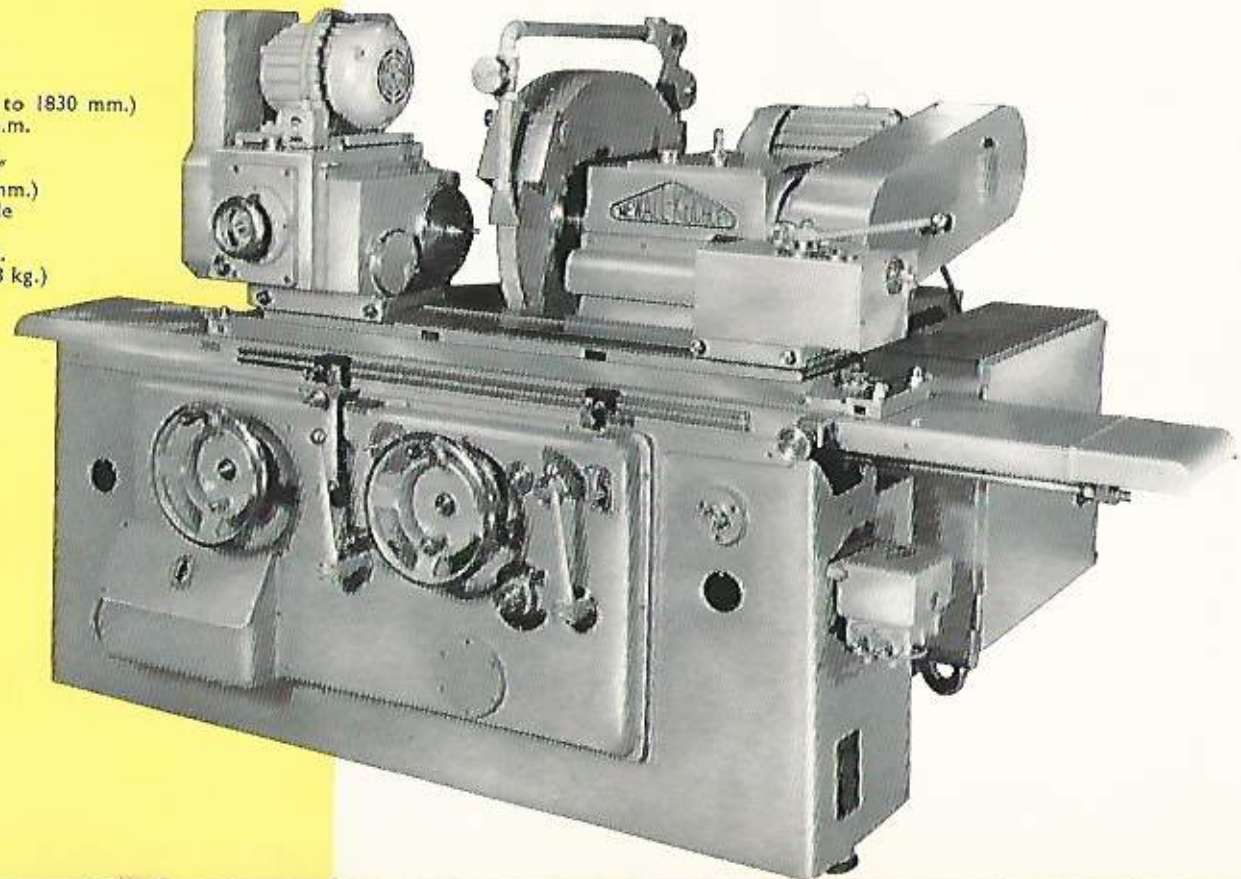
auxiliary equipment available makes the machine readily adaptable for grinding concave and convex radii, angle and shoulder work together with special form and centre grinding.

To user requirement the machine is available with a 30" (762 mm.) diameter grinding wheel in place of the 24" (610 mm.) normally supplied. Such machines are designated '30L12'.

TYPE L12 CYLINDRICAL GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|-------------------------------|-------------------------------------------|
| Maximum wheel diameter | 24" (610 mm.) |
| Maximum wheel width | 4" (102 mm.) |
| Maximum diameter ground | 12" (305 mm.) |
| Capacity between work centres | 24" to 72" (610 to 1830 mm.) |
| Wheel speeds (2) | 955 and 1205 r.p.m. |
| Work speeds (6) | 16 to 235 r.p.m. |
| Wheelhead intermittent feed | 0.0002" to 0.001" (0.005 to 0.025 mm.) |
| Plunge cut feed | steplessly variable |
| Wheelhead rapid infeed | 2" (51 mm.) |
| Wheelhead motor | 7½ h.p. or 10 h.p. |
| Weight (48" machine) | 10,976 lbs. (4,978 kg.) |



Embodying all the outstanding characteristics of the L6 Cylindrical Grinder, depicted on page 7, simplicity of operation and accessibility for servicing are salient design features of this precision grinding machine. The machine illustrated has been developed for plunge grinding to the diameter with hand traverse to bring the face of the component into contact with the grinding wheel. Reference to the diagram below shows that an external diameter and adjacent face are ground by the periphery of the wheel and therefore equivalent finishes are obtained. An intermediate slide is employed to position the wheelhead at 45°. The wheelhead feed is at 90° to the direction of table traverse. The wheel

spindle is mounted in precision taper roller bearings, grease packed to simplify maintenance. This design development has achieved an assembly where spindle expansion is controlled; movement of the grinding wheel, relative to the work face, due to spindle growth no longer presents a sizing problem.

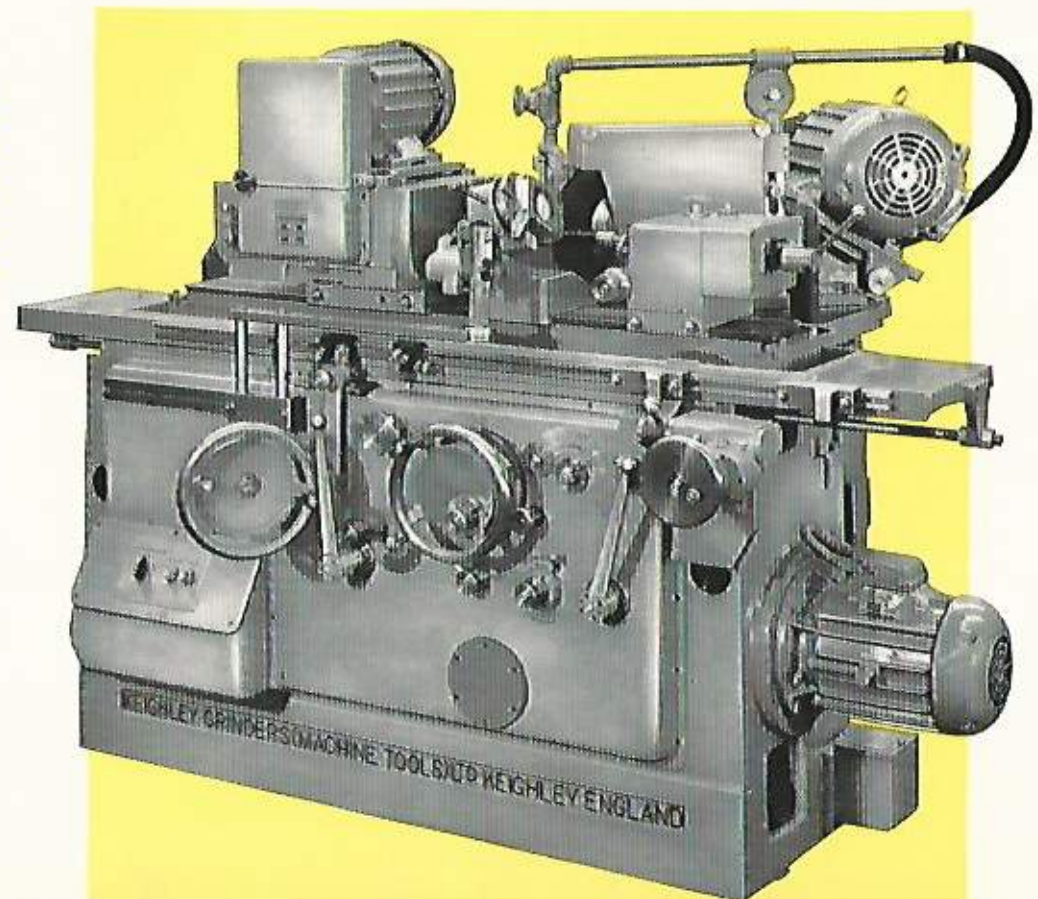
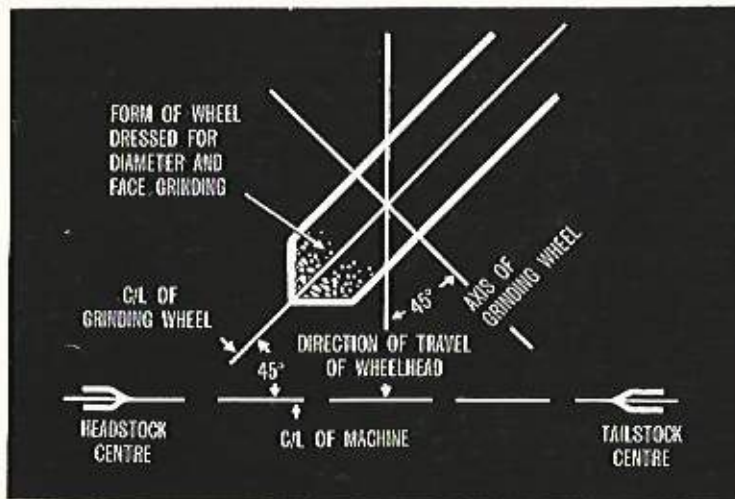
The combined effect of the developments on this machine is consistent repeatability of an order comparable with that of a conventional plain grinder working to a dead stop.

The table mounted dresser, supplied as extra equipment, is arranged to take a diamond set at 45° for truing face and periphery of the grinding wheel.

TYPE L6AH ANGLE HEAD CYLINDRICAL GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|-----------------------------|----------------------------------|
| Capacity between centres | 18" or 24" (457 or 610 mm.) |
| Maximum wheel diameter | 14" (356 mm.) |
| Maximum wheel width | 2" (51 mm.) |
| Maximum swivel of top table | 12° included angle |
| Plunge cut feed | steplessly variable |
| Wheelhead motor | 5 h.p. |
| Floor space required | 9 ft. x 5 ft. (2.7 x 1.5 metres) |
| Nett weight (approx.) | 6,160 lbs. (2,800 kg.) |



Representative of an extensive range of contemporary Newall developments for large scale production of automotive components, this unit with attendant work feed mechanism and transfer system is custom built for inclusion with other automatic machines of varying types in 'link-line' gear production plants.

Function of the machine illustrated is to grind three diameter variations formed by the teeth of a lay gear cluster.

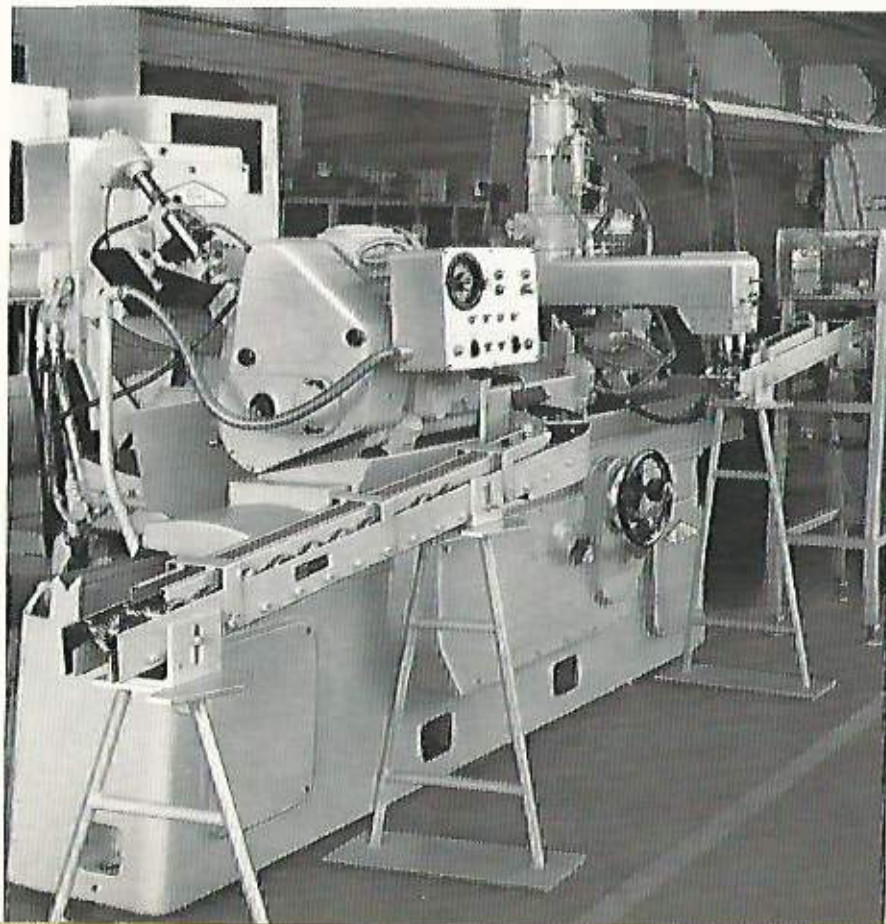
Devised by the Newall mechanical handling division, a swinging arm mechanism transfers the workpiece from the input conveyor to the grinding

position. After a timed grinding cycle, the component is ejected into an exit chute where it passes over a switch actuating controls to recommence the complete cycle.

Production timing is arranged so that the grinder will conform with the output of machines engaged in other production phases either in advance of or after its position in the line.

The general machine specification conforms with that given for standard LA grinders on page 11.

TYPE A-LA CYLINDRICAL GRINDING MACHINE, AUTOMATED FOR LINK-LINE PRODUCTION



Detail of the pneumatically operated, swinging arm pick-up mechanism and component.

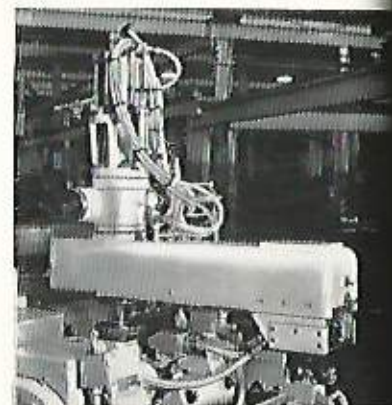
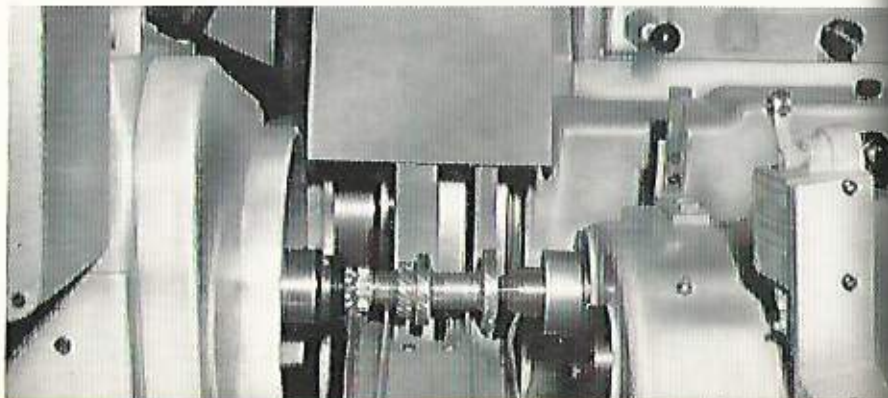


Illustration below shows a workpiece in the grinding position. The tailstock centre automatically advances to align the component and retracts to release it when the grinding cycle is completed.



Indicative of The Newall Engineering Company's policy towards the development of fully automatic, high precision grinding machines with workloading mechanisms the machine illustrated is attended by a shuttling type conveyor and overhead loading mechanism.

Typical of the hydraulically-operated loading devices available, the overhead unit depicted below (Fig. 1) consists essentially of a carriage fitted with twin arms housing gripping and lifting mechanisms. The carriage traverses a beam structure over the machine between a 'pick-up' point over the workpiece conveyor and the machine loading position.

The shuttling type conveyor, illustrated below (Fig. 2), has been developed to maintain at a minimum the "in-progress" number of components, while providing facilities for building up a stock of components between

machines to compensate for loss of production time due to tool changing or other machine stoppages.

The loader-conveyor mechanism with attendant electric and hydraulic control equipment is entirely independent of the machine: its function being related to the machine cycle by means of interlocking devices.

Although automatically controlled, the loader may be manually operated through all stages for setting-up purposes. Additional machine features include control of component size and machine operating cycle by O.M.T.-Etamic two-stage electro-pneumatic control equipment ensuring repeatability of size to close tolerances and automatic wheel dressing and compensation for wheel truing, introduced into the operating cycle after a pre-determined number of components have been ground.

TYPE A-ULA CYLINDRICAL GRINDING MACHINE WITH AUTOMATIC CONVEYOR AND LOADING MECHANISM



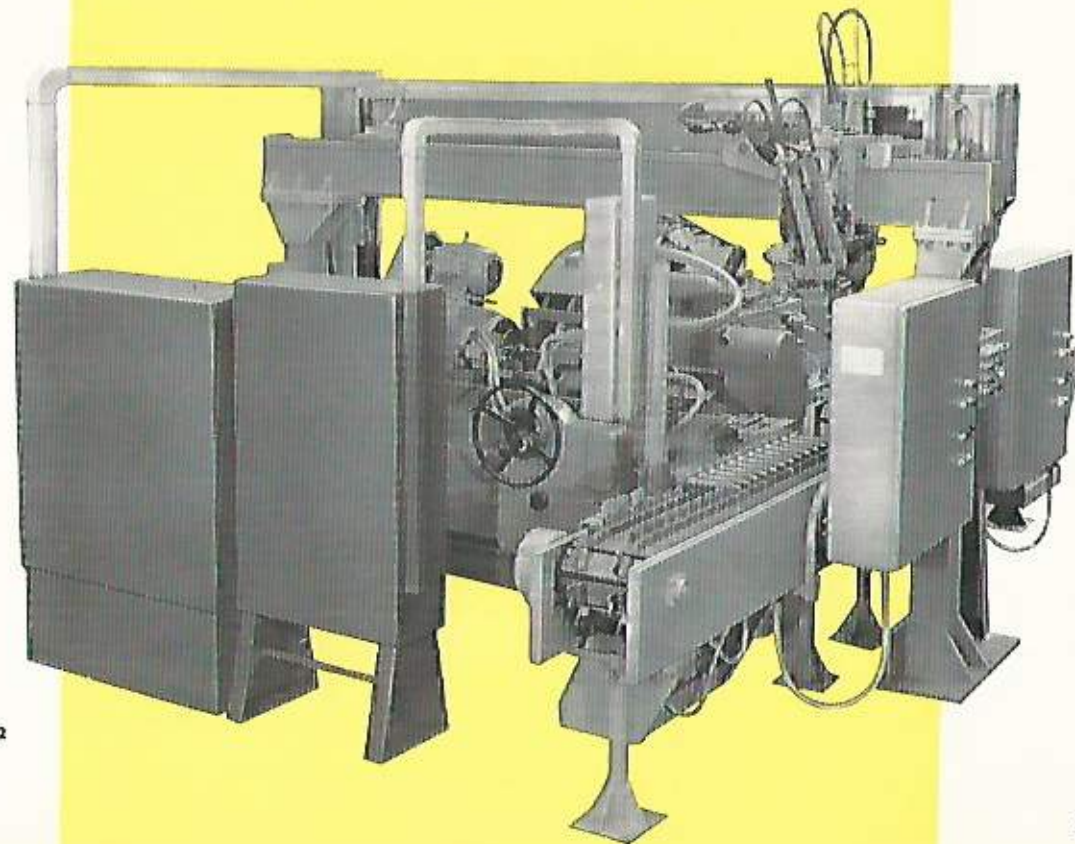
A twin wheel set-up for grinding two cone diameters on a gearbox mainshaft.



Fig. 1



Fig. 2



Developed with a high output potential and capable of maintaining accuracy under the most exacting production conditions, the Single Ended Fine Borer has acquired a prominence in the automotive and allied industries by virtue of its versatility and compact nature.

Hydraulically operated, the Newall Fine Borer provides for a large variety of components, by single or multi-point tooling and conforms with modern practice in that controls are reduced to a minimum by the application of automatic functions.

The machine illustrated was designed specifically for the machining of

automotive brake cylinders with special tooling, consisting of four high speed precision spindles mounted in line and each equipped for automatic operation of the relief boring tools mounted on the spindle nose, for the simultaneous machining of four components.

The availability and interchangeability of special purpose tooling and location fixtures divorces the Newall Fine Borer from being purely a single-purpose machine and in this respect Newall offer an unrivalled and comprehensive service towards providing maximum machine utilisation combined with operating economy.

SINGLE ENDED FINE BORING MACHINE

ABRIDGED SPECIFICATION

| | |
|----------------------------------|-----------------------------------------------------------------------|
| Table working surface | 15 $\frac{3}{4}$ " x 22 $\frac{3}{4}$ " (390 x 578 mm.) |
| Maximum traverse of table | 14" (356 mm.) |
| Hydraulic feed rate | $\frac{1}{4}$ " to 16" (6 to 406 mm.) per minute, steplessly variable |
| Rapid traverse rate | 120" (3048 mm.) per minute |
| Adjustable dwell period | 0 to 5 seconds |
| Floor space required for machine | 7 ft. 3 ins. x 2 ft. 9 ins. (2.2 x 0.8 metres) |

A typical Newall workholding fixture embodying automatic indexing and safety interlocks, employed in the manufacture of automotive pistons.

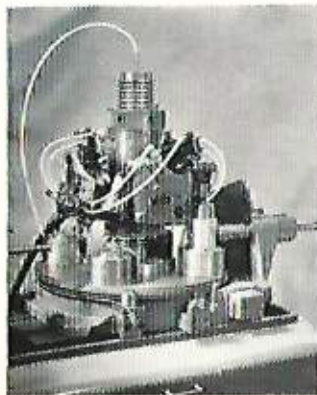
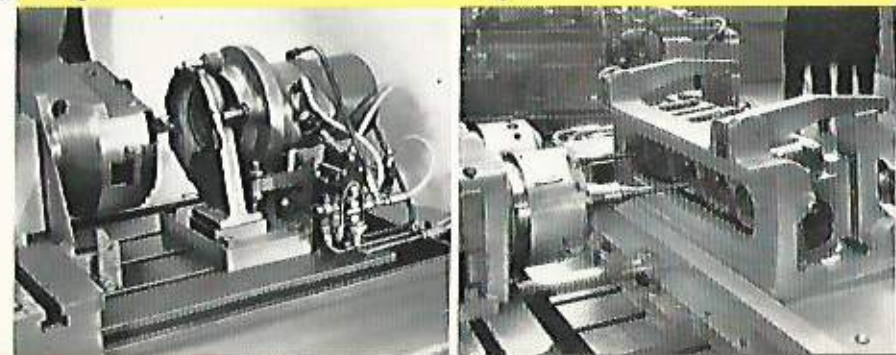
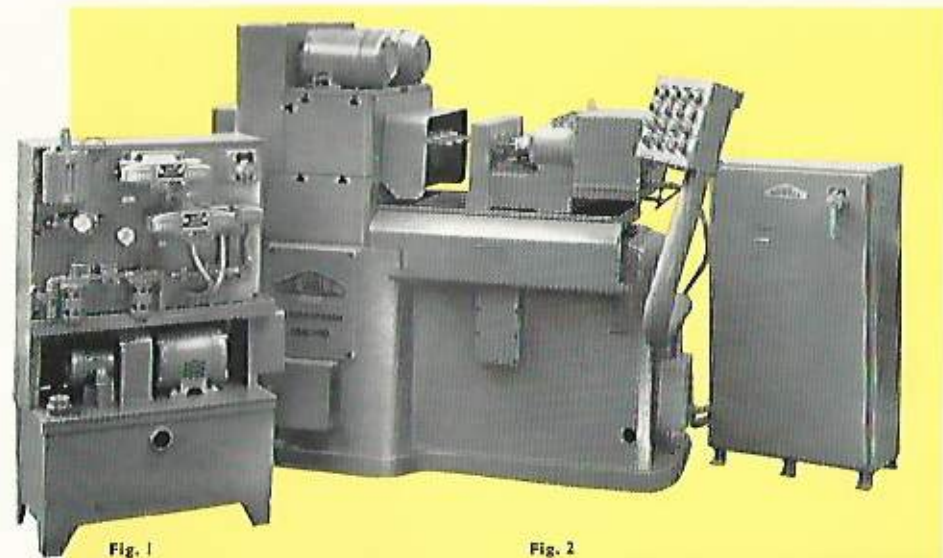


Fig. 1
A Newall 10 inch, counterbalanced facing head machining a pump body, bore and facing from a rough casting. The pneumatic workholding fixture is of Newall design.

Fig. 2
A dual spindle machine boring valve guide holes and generating valve seats with the aid of a Newall design workholding fixture.



Incorporating many of the characteristics of the Fine Borer illustrated on the preceding page, the Newall Double Ended Fine Borer has been specifically designed to meet the demand for a machine capable of precision boring in-line bores where through-boring is not always possible. Coupled with the foregoing, the availability and interchangeability of special purpose tooling and location fixtures resulted in the Double Ended Fine Borer meeting with considerable success in the automotive industry where the nature of components, such as wheel hubs, differential housings and steering boxes, necessitate in-line boring. The tooling and location fixture on the machine illustrated was designed specifically to facilitate the machining of in-line bores in automobile brake

master cylinders. These cylinders required a 4 inch depth of bore in both ends, each bore running into a centre cabinet. The boring bars and cutting tools, in this particular instance, were of solid carbide. On test, mandrels placed in each bore, locking one against the other and protruding 4 inches from each end of the component, were within a total indicator reading of 0.0004" over 12 inches.

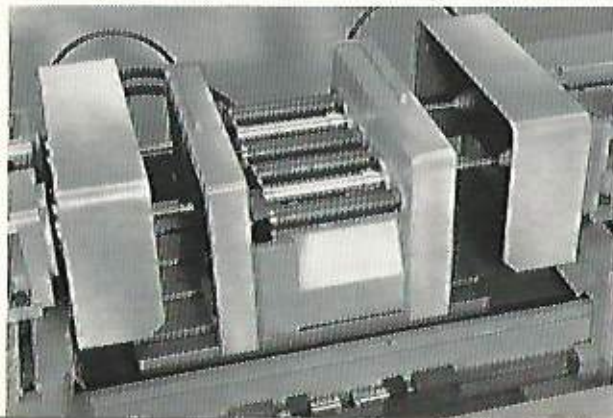
The machine, equipped to operate on a completely automatic cycle, is of Dry Bed construction, the hydraulic and electrical equipment being mounted on separate panels above the independent hydraulic motor and pump unit, with the push-button control station placed either on a console cabinet or mounted on the machine base.

DOUBLE ENDED FINE BORING MACHINE

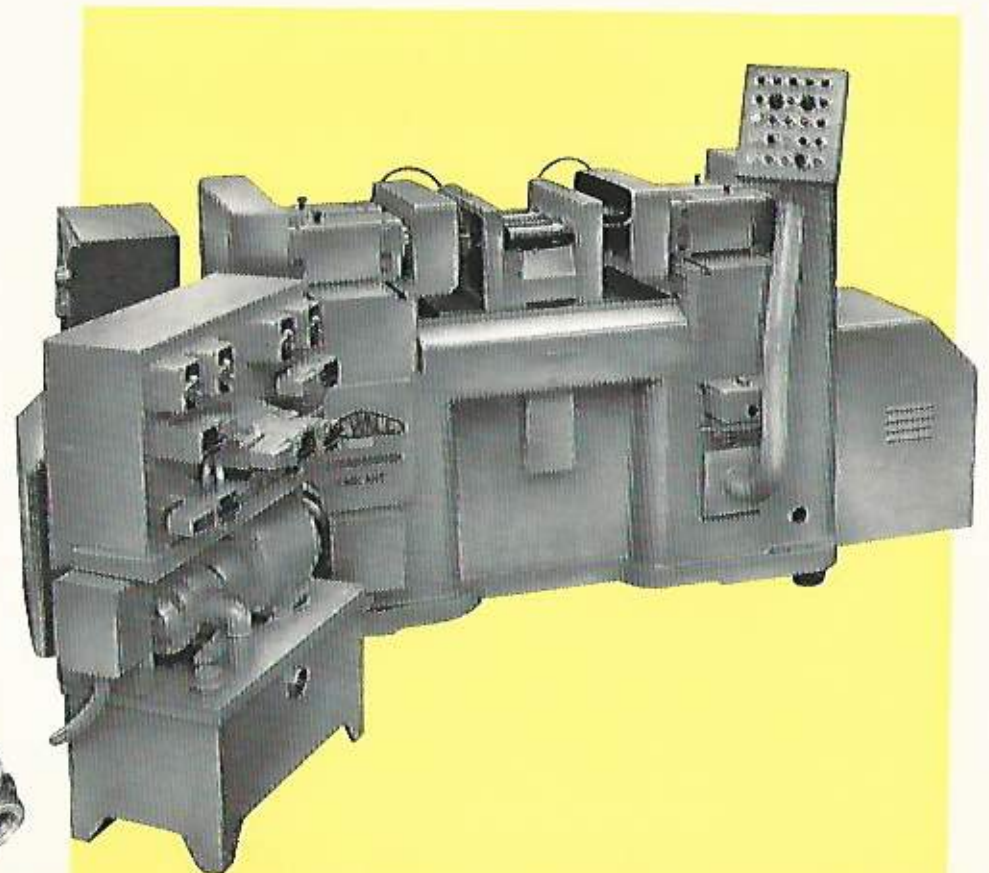
ABRIDGED SPECIFICATION

| | |
|----------------------------------|------------------------------------------------------------------------|
| Table working surface | 15 $\frac{3}{4}$ " x 22 $\frac{3}{4}$ " (390 x 578 mm.) |
| Table feed range | 16" (406 mm.) |
| Maximum traverse of table | 16" (406 mm.) |
| Hydraulic feed rate | $\frac{1}{2}$ " to 16" (12 to 406 mm.) per minute, steplessly variable |
| Rapid traverse rate | 120" (3048 mm.) per minute |
| Floor space required for machine | 6 ft. 8 ins. x 3 ft. 2 ins. (2 x 0.9 metres) |

View depicting tooling and work location fixture for the simultaneous machining of in-line bores on two components.



Brake master cylinder machined on Double Ended Fine Borer



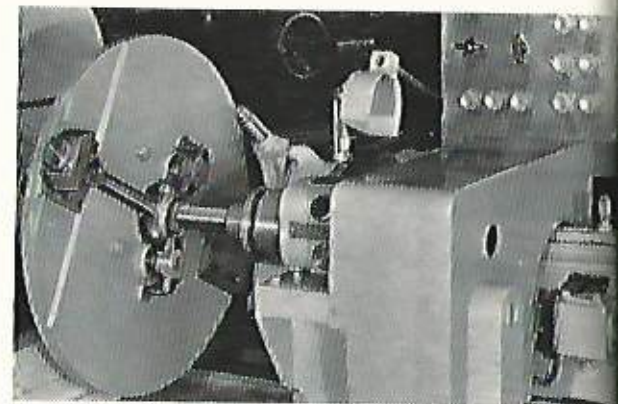
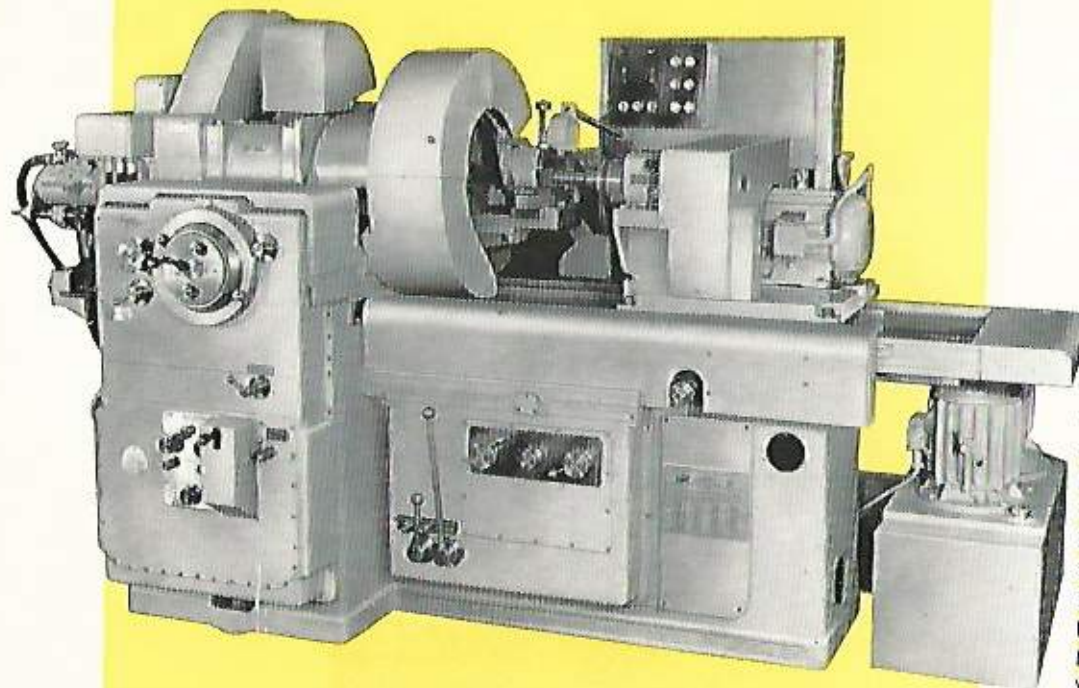
One of a variety of applications of the K4 automatic internal grinder in the automotive industry is for close tolerance grinding of bores for connecting rod big-end bushes.

Single lever controlled after initial setting up, the machine incorporates a double gauging system for control of the bore diameter during rough and

finish grinding phases. The production cycle includes automatic wheel truing with attendant compensation for reduction in wheel diameter, at the completion of each grinding cycle.

Tooling with the machine includes a special workholding fixture designed to maintain absolute parallelism between small and big-end bores.

TYPE K4 AUTOMATIC INTERNAL GRINDING MACHINE



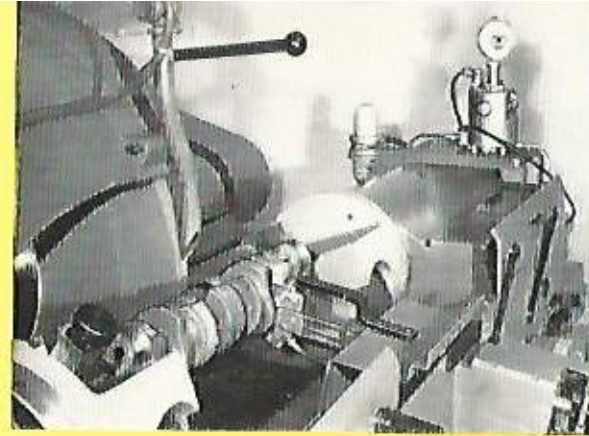
Detail of the workholding fixture. Illustration also shows the wheelhead, wheel dresser and electrical control panel.

ABRIDGED SPECIFICATION

| | |
|-----------------------------------|----------------------------|
| Maximum swing over worktable | 26" (660 mm.) |
| Maximum grinding depth | 6" (152 mm.) |
| Maximum bore diameter ground | 6" (152 mm.) |
| Minimum bore diameter ground | $\frac{1}{4}$ " (6.3 mm.) |
| Spindle speeds | 5,000 to 28,000 r.p.m. |
| Maximum worktable travel | 24" (610 mm.) |
| Maximum worktable grinding stroke | 6" (152 mm.) |
| Minimum worktable grinding stroke | $\frac{1}{32}$ " (0.8 mm.) |
| Wheelhead motor | 3 h.p. |
| Machine weight | 10,100 lbs. (4,585 kg.) |

Widely employed by major manufacturers in the United Kingdom and overseas of finish machined crankshafts for automobile, aircraft, marine and diesel engines, HAC crankpin grinders are built to extremely robust proportions to provide continuous trouble-free output to close tolerances and high-grade micro-finish.

The operating cycle is single lever controlled. Machine features include an automatic, hydraulically operated, wheelhead-mounted dresser for truing wheel periphery and radii, wheelwear compensation and O.M.T.-Etamic electro-pneumatic size control equipment.

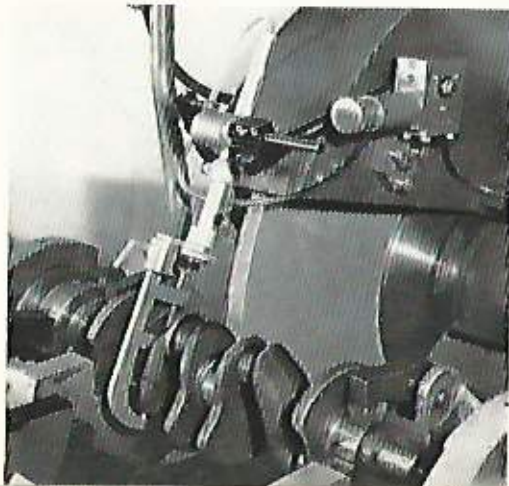


Close-up showing crankshaft in grinding position and steady-mounted O.M.T.-Etamic machine control gauge.

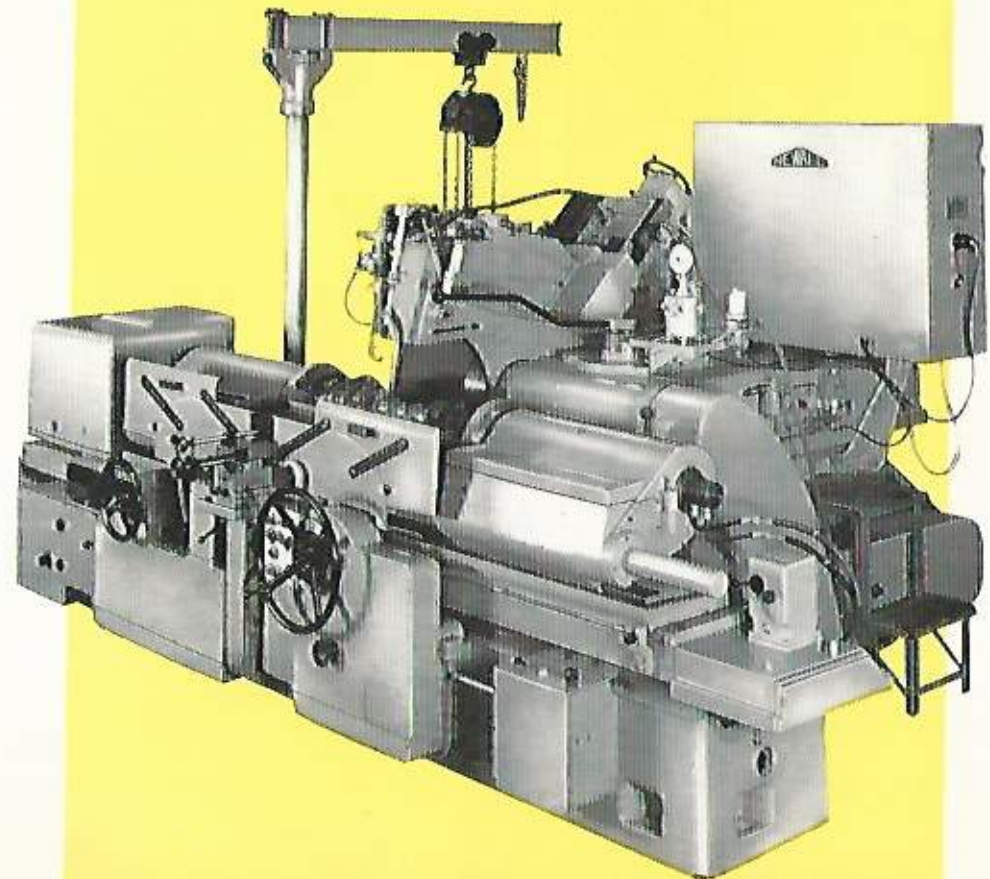
TYPE HAC STANDARD CRANKPIN GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|---------------------------------------|------------------------------------------|
| Maximum length capacity | 48", 60" or 72" (1219, 1524 or 1829 mm.) |
| Work centre height | 10" (254 mm.) |
| Maximum wheel diameter | 42" (1067 mm.) |
| Work speed | 70 r.p.m. |
| Wheel speeds (4) | 562, 623, 683 and 743 r.p.m. |
| Wheelhead rapid infeed (variable) | up to 5" (127 mm.) |
| Plunge cut feed (steplessly variable) | from 0.004" (0.01 mm.) |
| Wheelhead motor | 20 h.p. |
| Weight (48" machine) | 26,800 lbs. (12,156 kg.) |



Close-up showing crankshaft in grinding position and wheelhead-mounted O.M.T.-Etamic machine control gauge.



Designed for simultaneously grinding pairs of in-line pins on 4 or 6-cylinder crankshafts, this unit has a high output potential for finish machining shafts with pins correctly spaced and where reasonable equality of stock removal from fillet faces is requisite as a result of preliminary turning operations.

The machine is equipped with 2 quick-approach hydraulic steadies, twin dial indicator type caliper gauges for showing when pins reach finish diameter and automatically operated hydraulic throw-blocks.

Various types of crankshafts can be accommodated by adjustment of the position of the right-hand workhead and the machine is single lever operated after initial setting up. Wheel dressing and compensation for truing is an automatic cycle which takes place after each shaft is ground and during the unload/load period to avoid wastage of production time.

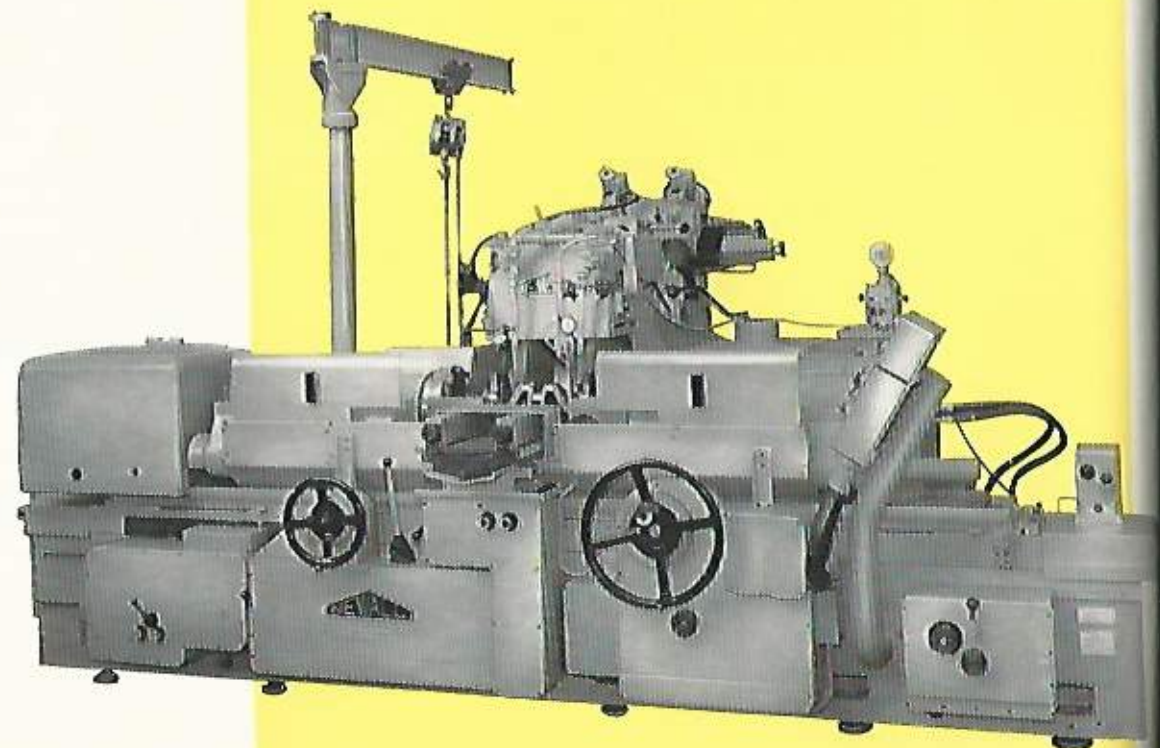


Installations of two machines for 4-cylinder shafts and three machines for 6-cylinder components are recommended. The illustrations left and right respectively depict tooling for grinding inner and outer in-line pins of a 4-cylinder crankshaft.

TYPE HAC TWIN-WHEEL CRANKPIN GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|------------------------------------------------|---------------------------------------------|
| Maximum length capacity | 48" (1219 mm.) |
| Minimum length capacity | 24" (610 mm.) |
| Work centre height | 10" (254 mm.) |
| Maximum diameter of new wheels | 42" (1067 mm.) |
| Maximum distance between outer faces of wheels | 12½" (317 mm.) |
| Plunge cut feed | steplessly variable |
| Wheelhead motor | 20 h.p. |
| Floor space required | 17 ft. x 9 ft. 6 ins. (5.1 x 2.9 metres) |
| Weight with standard equipment | 26,800 lbs. (12,156 kg.) |



Incorporating a fully automatic cycle for grinding in-line crankpins and developed for large-scale production of automobile or diesel engine crankshafts, the A-HAC automatic crankpin grinder conforms in general structural detail with the standard HAC grinder described in the foregoing pages.

In addition to enhanced output, considerable production economy is achieved by virtue of the fact that one operator can effectively control two machines. In the case of shafts for 4-cylinder engines, each machine is

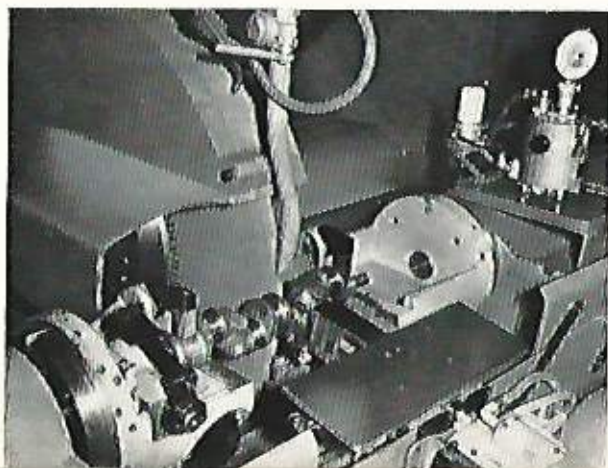
employed for grinding one pair of in-line crankpins. However, when engaged in the production of 6-cylinder engine shafts, each machine is used for grinding all pins with radial indexing of the shaft effected by the operator between each pair.

Machine features include a single control station governing all necessary machine functions after initial setting-up, O.M.T.-Etamic electro-pneumatic, automatic two-stage sizing gauge and a wheelhead-mounted hydraulic dresser for dressing periphery and radii of the wheel.

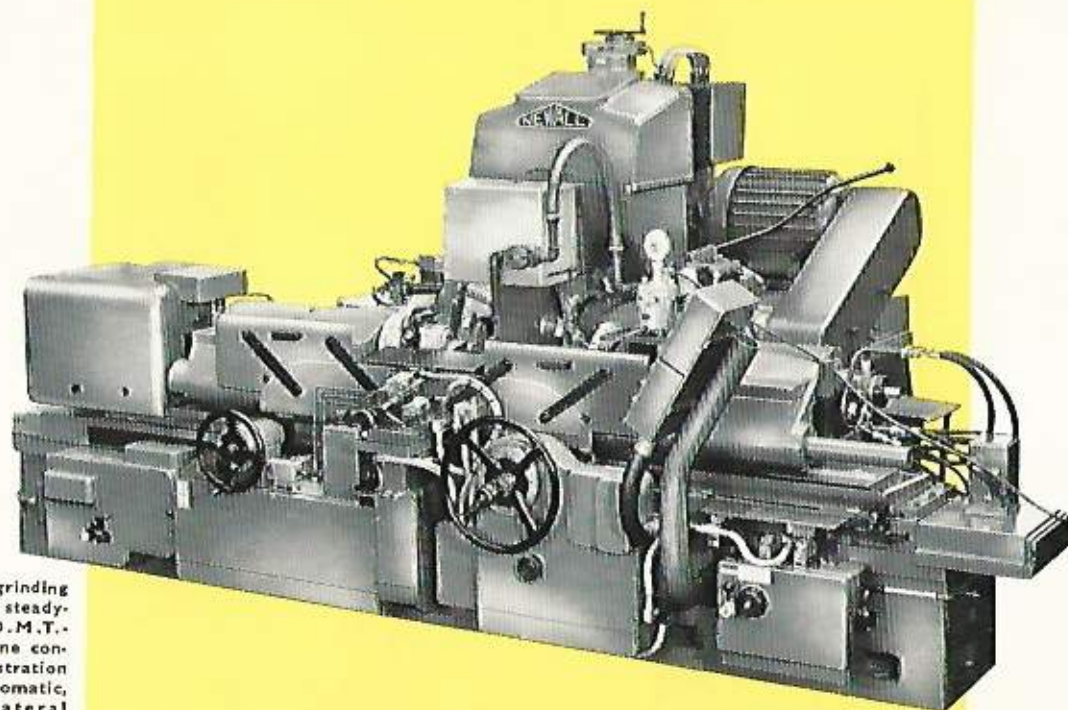
TYPE A-HAC AUTOMATIC CRANKPIN GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|---------------------------------------|---------------------------------------------|
| Maximum length capacity | 48", 60" or 72" (1219, 1524 or 1829 mm.) |
| Work centre height | 10" (254 mm.) |
| Maximum wheel diameter | 42" (1067 mm.) |
| Work speed | 70 r.p.m. |
| Wheel speeds (4) | 562, 623, 683 and 743 r.p.m. |
| Wheelhead rapid infeed (variable) | up to 5" (127 mm.) |
| Plunge cut feed (steplessly variable) | from 0.004" (0.01 mm.) |
| Wheelhead motor | 20 h.p. |
| Weight (48" machine) | 26,800 lbs. (12,156 kg.) |



Crankshaft in grinding position and steady-mounted O.M.T.-Etamic machine control gauge. Illustration also shows automatic, crankshaft lateral positioning unit.

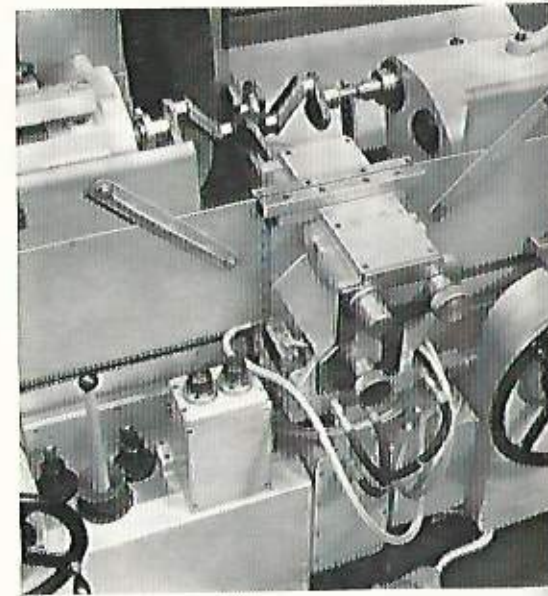
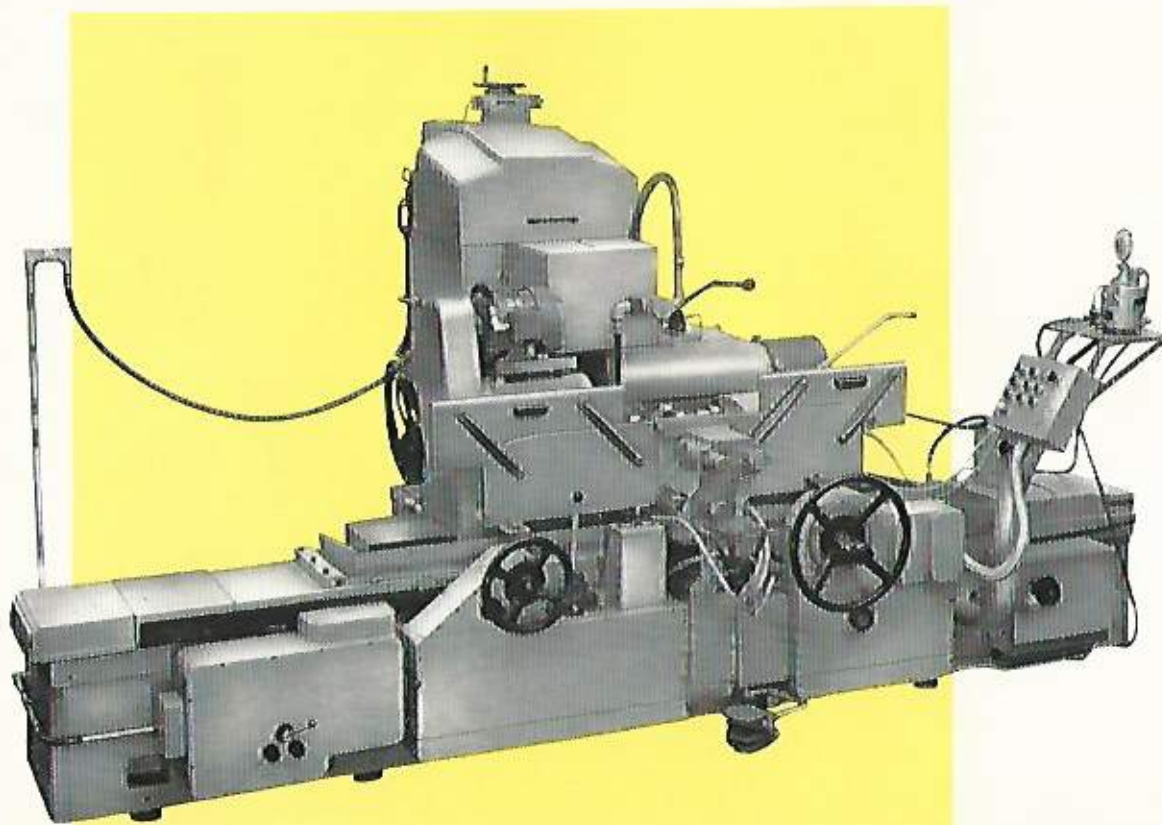


Adapted from and incorporating many of the robust characteristics of the Newall Type HAC Standard Crankpin Grinding Machine, as depicted on page 17, the machine illustrated was developed and introduced into the Newall range for the specific purpose of grinding the diameters of crankshaft main bearings.

In order to facilitate the use of a 42 inch diameter grinding wheel, with its attendant advantages for thrust face grinding, a heavy duty base and wheelhead, as used on the Type HAC Standard Crankpin Grinder, were incorporated.

Machine features available include an automatic, hydraulically operated, wheelhead-mounted dresser for truing wheel periphery and radii, automatic wheelwear compensation, automatic indexing between main bearing positions, hydraulic two-point component steady, O.M.T.-Etamic electro-pneumatic component size and machine control equipment and automatic spark splitting if unground main bearings are of the same width between fillet faces.

TYPE HAJ CRANKSHAFT JOURNAL GRINDING MACHINE



Close-up view of crankshaft in grinding position with component steady and O.M.T.-Etamic component size and machine control equipment.

This exceptionally robust machine designed to grind in one operation multi-diameter components such as crankshaft and camshaft journals, has a capacity between centres of 40" (1016 mm.) and will accept work up to 10" (254 mm.) diameter.

The wheel spindle is driven by a 30 h.p. motor and will accommodate any requisite number of grinding wheels within a maximum span of 32½" (825 mm.).

In addition to rapid approach, the wheelhead is equipped with three feed rates for roughing, finishing and, for employment where necessary, an ultra-fine ratchet for intermittent feed. Truing of the grinding wheels is effected by a hydraulically operated dresser mounted on the wheelhead; compensation for truing is automatic.

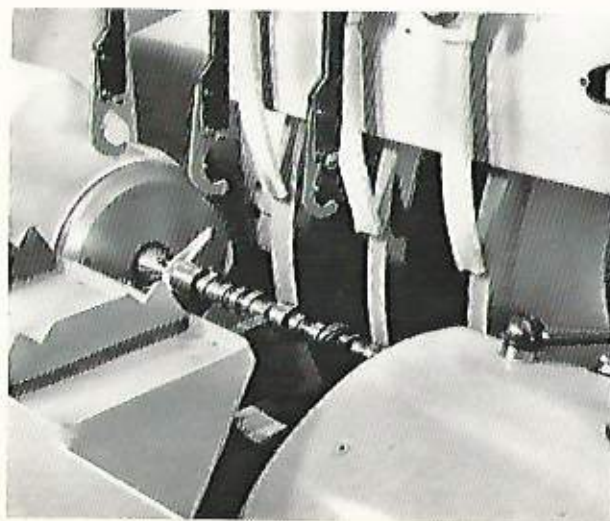


Detail of wheel assembly for machine tooled up to grind crankshaft journals. Note also the hydraulic work loader mechanism.

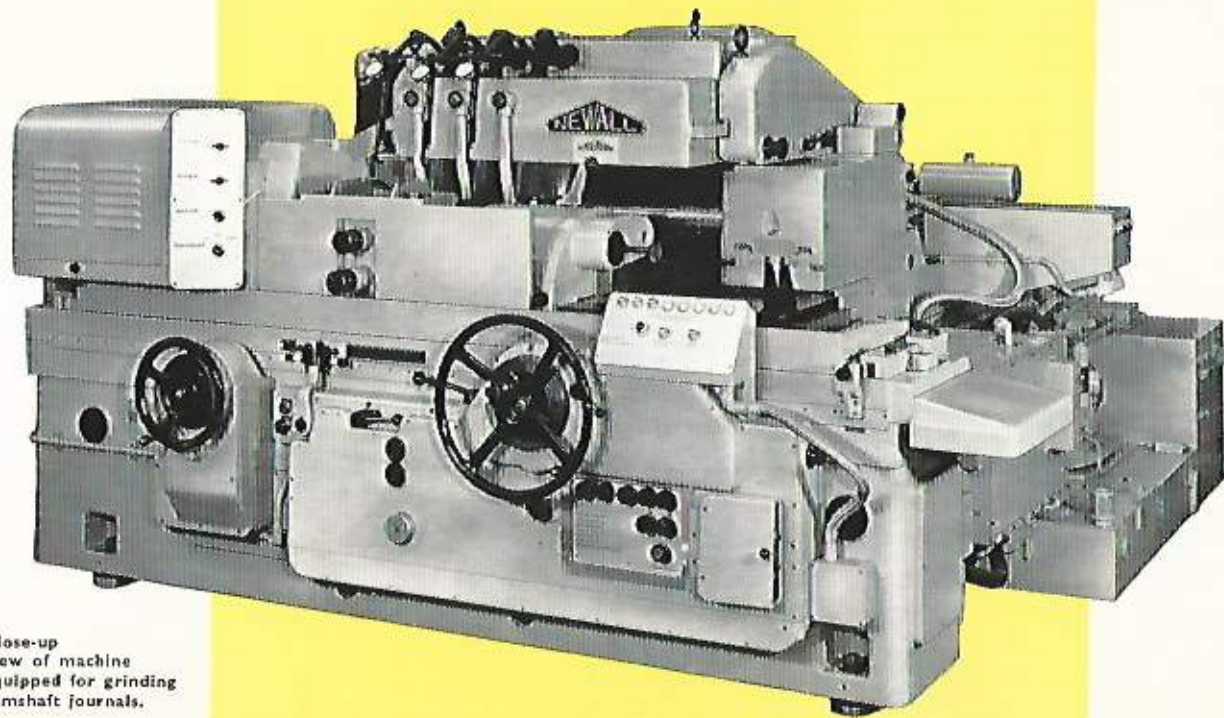
TYPE MAC MULTI-WHEEL GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|--------------------------------|------------------------------------------------------|
| Maximum wheel diameter | 36" (914 mm.) |
| Maximum diameter ground | 5" (127 mm.) |
| Capacity between work centres | 40" (1016 mm.) |
| Wheelhead rapid approach | 2" or 4" (51 or 102 mm.) |
| Wheelhead plunge cut feed | steplessly variable |
| Floor space required | 13 ft. 2 ins. x 10 ft. 6 ins. (4.01 x 3.2 metres) |
| Weight with standard equipment | 33,600 lbs. approx. (15,250 kg.) |



Close-up view of machine equipped for grinding camshaft journals.



Developed for large scale output of components by plunge grinding, the MU series comprises a range of machines assembled from standard basic elements and specially tooled for required applications. The units from which the machines are built are selected from a choice of the following:

- (a) Three base units, including worktable and electrical control panel with 18" (457 mm.), 24" (610 mm.) or 30" (762 mm.) work length capacity respectively.
- (b) Four wheelhead and infeed units with varying quick approach and feed programmes.
- (c) Four wheelhead base units for straight approach, 10°, 30° or 45° angle approach.

(d) Five workhead units with various combinations of single and multi-speed and live or dead work centres.

(e) Manually or hydraulically operated tailstocks.

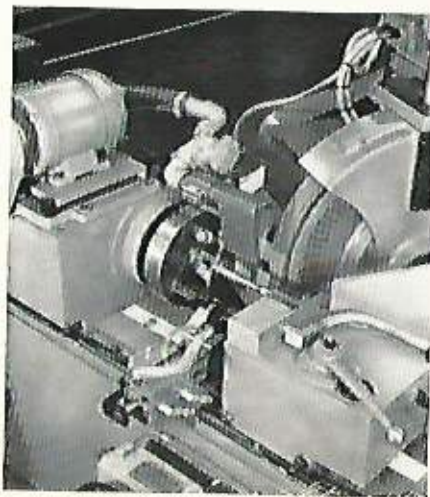
In addition, a number of ancillary units are available. These include fixed wheel spindles with either plain or roller bearings, an oscillating or spark-splitting spindle, a variety of automatic hydraulic wheel dressers, O.M.T.-Etamic electro-pneumatic auto-sizing and machine cycle control units.

The machines are supplied for operator control, as is the 45° angle approach machine illustrated on this page, and may be equipped with Newall designed work loading and conveying systems. Specimens of the latter are portrayed in the succeeding pages.

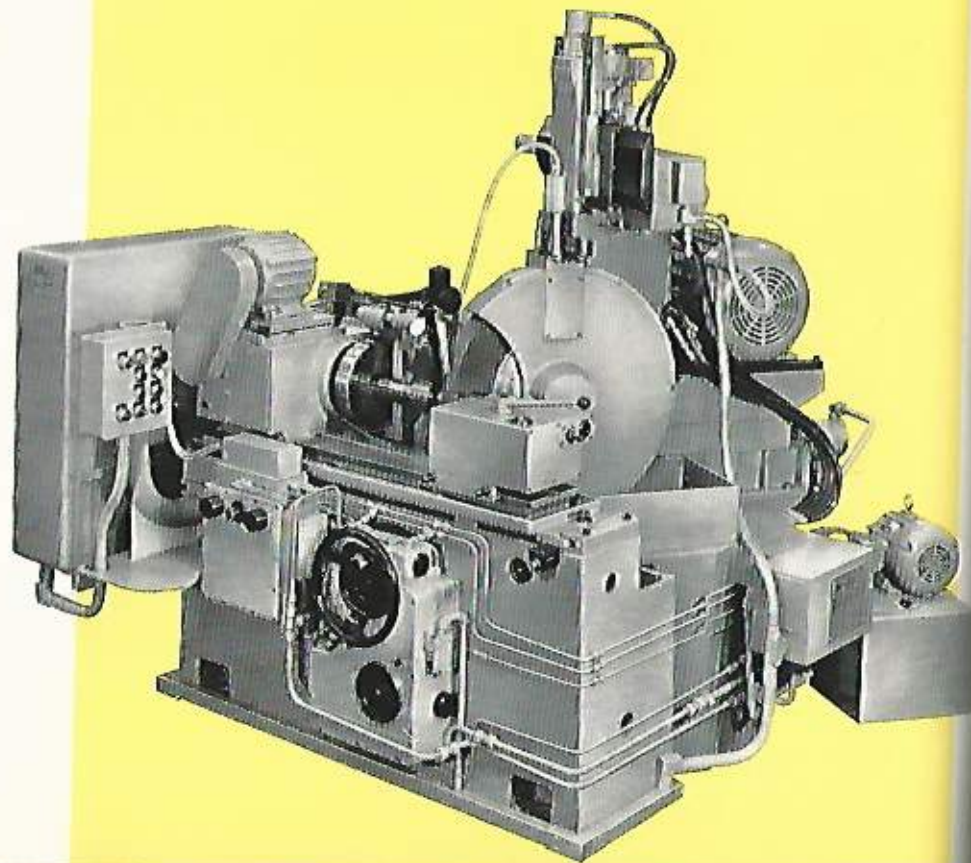
TYPE MU UNIT-BUILT CYLINDRICAL GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|-----------------------------------|------------------------------------------|
| Capacity between centres | 18", 24" or 30" (457, 610 or 762 mm.) |
| Worktable swivel (included angle) | 15°, 12½° or 11° |
| Maximum swing | 12" (305 mm.) |
| Maximum diameter ground | 7" (178 mm.) |
| Maximum wheel diameter | 26" (660 mm.) |
| Wheelhead motor | 10 h.p. |



Finish grinding two diameters, radii and face of a stub axle. Close-up shows table mounted O.M.T.-Etamic machine control equipment, automatically applied and withdrawn during machine cycle.

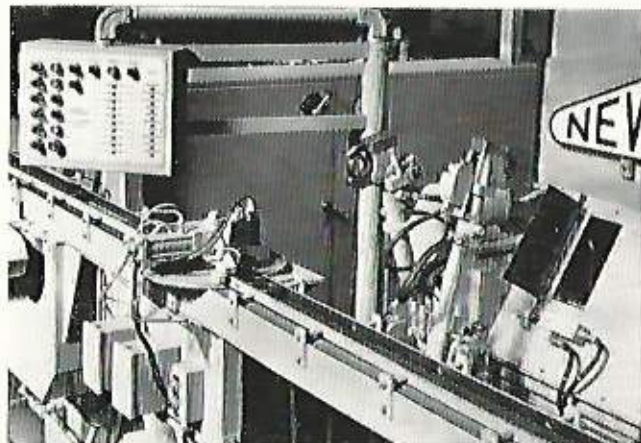


Apart from the initial starting of the machine and the placing of unmachined components onto the free-flow conveyor the machine cycle is entirely automatic. After the loading of components onto the conveyor they are carried to a hydraulically operated rotating fixture, the function of which is to remove the component from the loading side of the conveyor and place it in a tilting fixture. Similarly, it removes the finished ground component from the tilting fixture and places it on the unloading side of the conveyor. The function of the tilting fixture is two-fold. It accepts the unground component from the rotating fixture in the vertical position then tilts the component into the horizontal position in order that it is acceptable to the gripping jaws of the loader arms. Furthermore, it accepts the finished component from the unloader arm in the horizontal position and

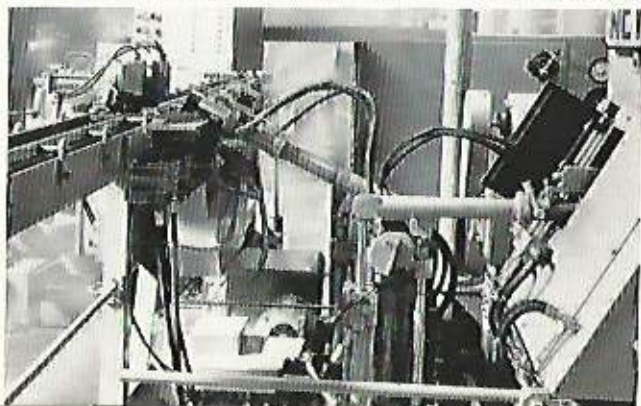
tilts it up into the vertical position, for transfer by the rotating fixture to the unloading side of the conveyor.

As with the tilting fixture, the function of the Newall automatic loader type 'A' is two-fold. The hydraulically operated loader comprises two arms each with a pair of gripping jaws. The function of each arm alternates in successive operations. In one loading/unloading operation arm 'A' is lowered to pick up an unground component from the tilting fixture whilst arm 'B' is similarly lowered to pick up a ground component from the machine. The components being located in the gripping jaws, arms 'A' and 'B' return to the vertical position and the loader body is rotated, hydraulically, through 180°. The loader arms are again lowered, arm 'A' to load the unground component and arm 'B' to unload the ground component.

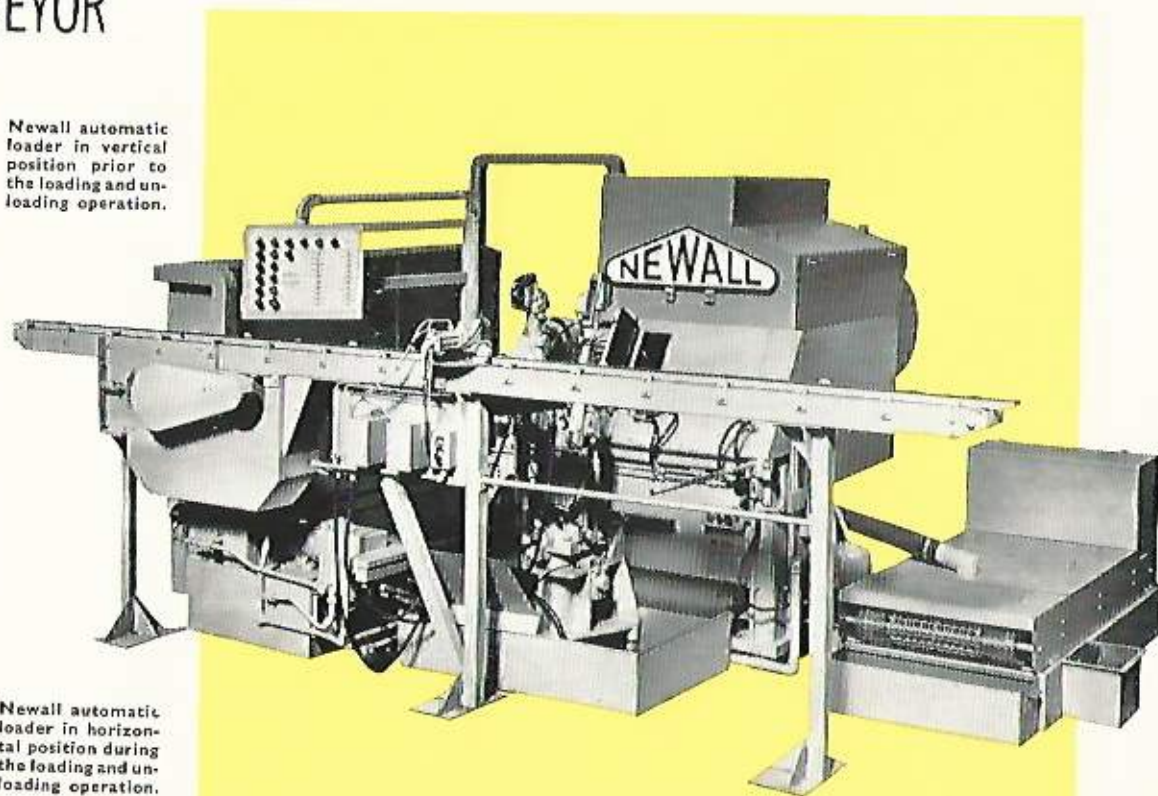
TYPE MU UNIT-BUILT CYLINDRICAL GRINDING MACHINE WITH NEWALL 'A' TYPE LOADER AND FREE-FLOW CONVEYOR



Newall automatic loader in vertical position prior to the loading and unloading operation.



Newall automatic loader in horizontal position during the loading and unloading operation.



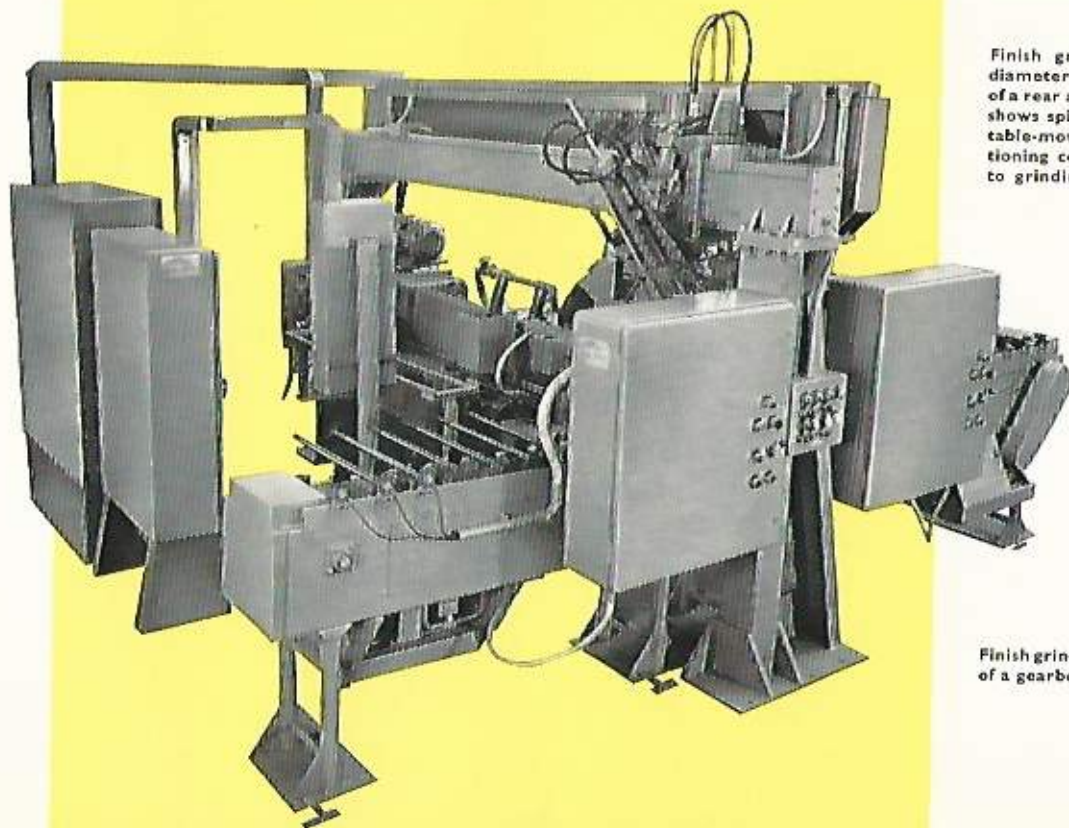
This is virtually a fully automatic work station based on any one of the MU series grinders detailed on page 22 and needing only partial or no operator supervision. Component size and the machine cycle are controlled by an O.M.T.-Etamic electro-pneumatic automation head suitably interlocked with the conveyor and loading mechanisms.

The 'C' loader consists essentially of a bridge type structure with hydraulically operated loading and unloading arms mounted on a traversing carriage.

A shuttling type conveyor is employed to index components to the pick-up position; interlocking signals between the conveyor and loading arm carriage are transmitted by proximity switches.

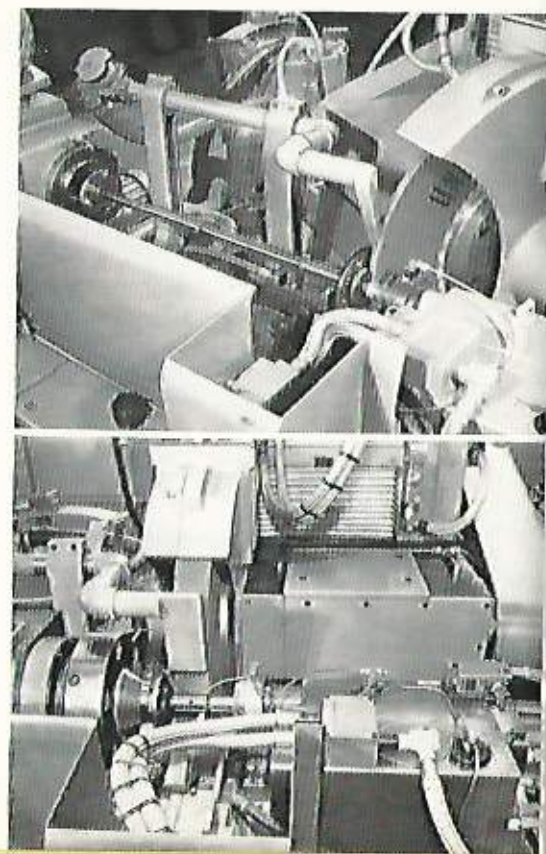
The conveyor is designed to accept widely differing types of components ranging in size and variety from small speed gears to rear axle shafts and camshafts.

TYPE MU UNIT-BUILT CYLINDRICAL GRINDING MACHINE WITH NEWALL 'C' TYPE LOADER AND CONVEYOR



Finish grinding the spigot diameter and adjacent face of a rear axle shaft. Close-up shows spline drive unit and table-mounted unit for positioning component relative to grinding wheel.

Finish grinding the diameter of a gearbox front cover.



Design considerations and rigid characteristics of this high precision, fully automatic unit eliminate the need for two separate rough and finish grinding operations. This achievement enables components requiring 0.035" (0.875 mm.) stock removal to be produced to the requisite accuracy of form and surface finish in a single grinding cycle time of 35 seconds. The cam-operated workhead houses a bank of four master cams and cam follower thus permitting left or right distributor cams for four or six cylinder engines to be produced on the same machine by simple adjustment of the cam follower position. Wheel dressing and compensation for truing takes place in the automatic

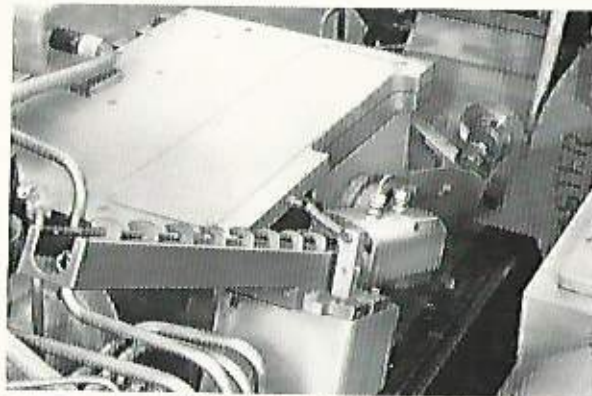
cycle of the machine after a pre-determined number of components have been ground.

Workpieces are flange-fitted and fed from an input chute on to a rotary arm loading mechanism incorporating a hydraulically operated mandrel which enters the base of the component and locates it on the workholding mechanism.

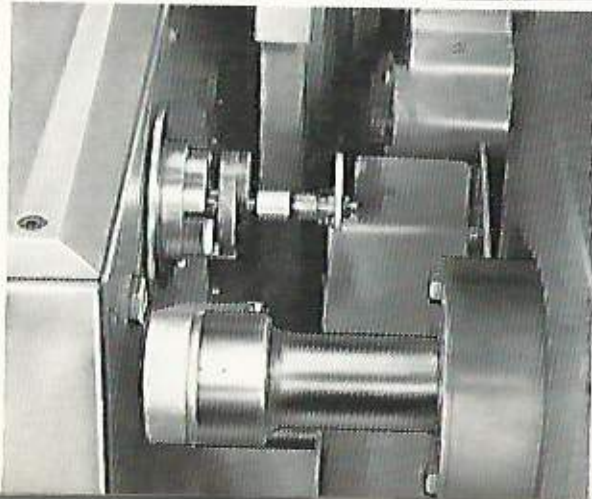
At the completion of the grinding cycle, an ejector clears the component from the workholding mandrel and the sequence of operations recommences.

For grinding the skirts of distributor cams, a machine of similar design and with identical work feed and loading systems is available.

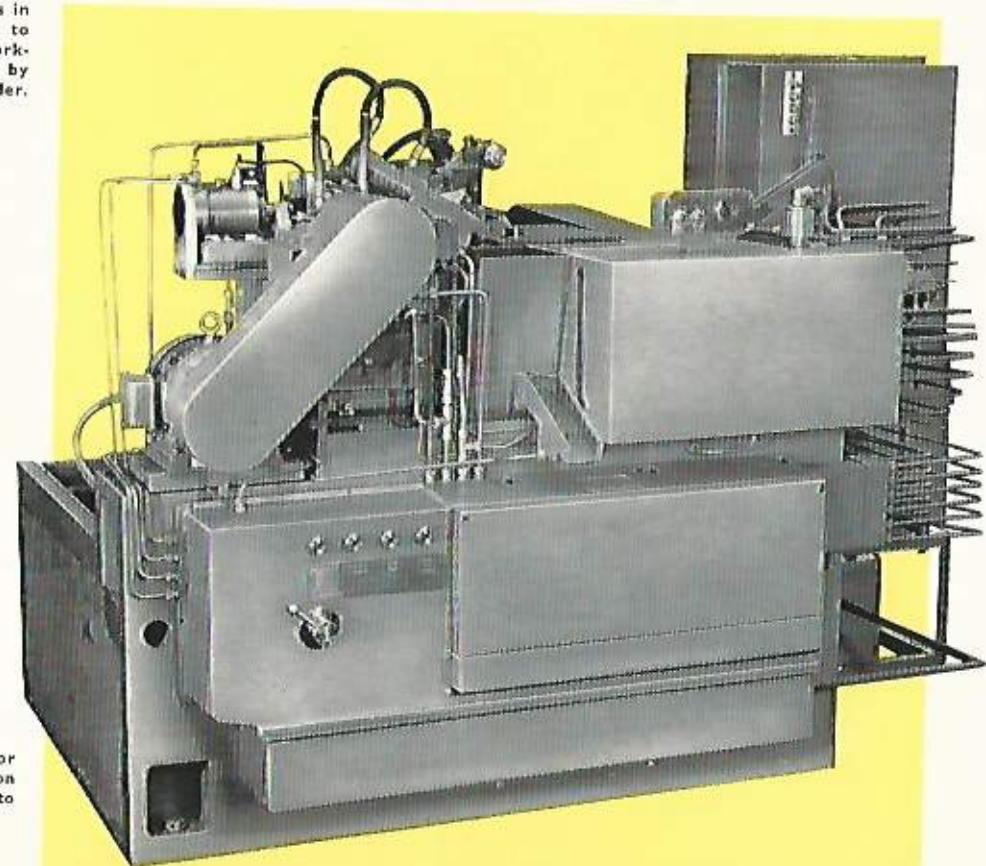
TYPE NKL AUTOMATIC DISTRIBUTOR CAM FORM GRINDING MACHINE



Unground distributors in loading chute prior to location on the workholding mechanism by the rotary arm loader.



Close-up of distributor cam form located on workholder prior to grinding.



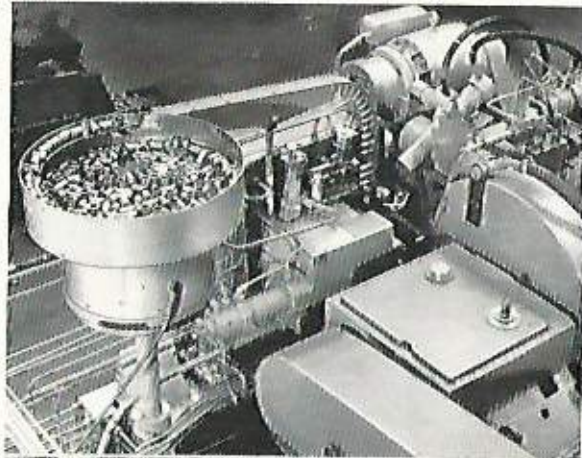
Of similar design and embodying many of the characteristics of the distributor cam form grinder depicted on page 25, the automatic grinding machine here illustrated has been developed for operations on small bushes. The component is loaded automatically and the periphery of the main body is ground to close tolerances.

In this instance, the work-spindle of the machine runs in substantial taper roller bearings and the drive motor is fitted with a disc brake to provide for rapid stopping of the spindle in readiness for loading.

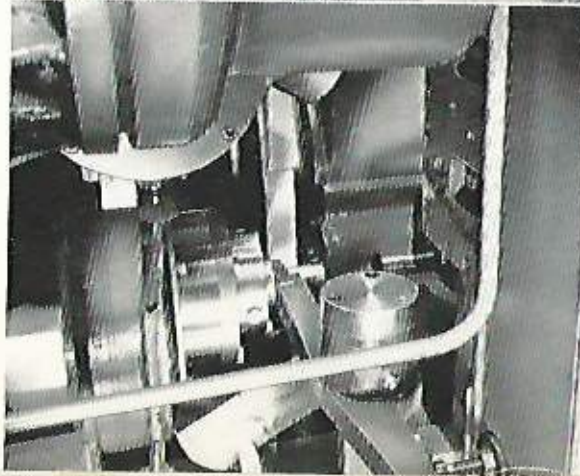
Components are loaded on to the mandrel fitted to the spindle from the vibratory bowl feeder. The mandrel incorporates a hydrostatic sleeve to ensure concentric expansion and secure location of the workpiece, without any possibility of lobing or other forms of distortion.

Hydrostatic pressure is derived from a hydraulically operated ram which is interlocked with the hydraulic control circuits of the machine and associated equipment.

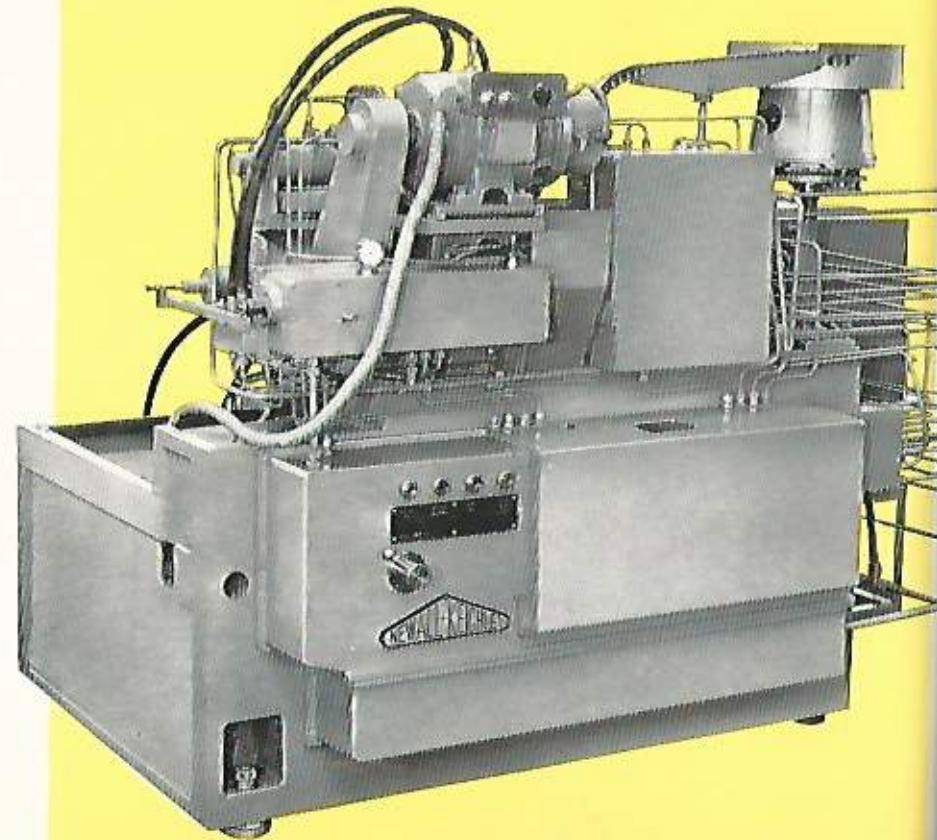
TYPE NKL AUTOMATIC BUSH GRINDING MACHINE



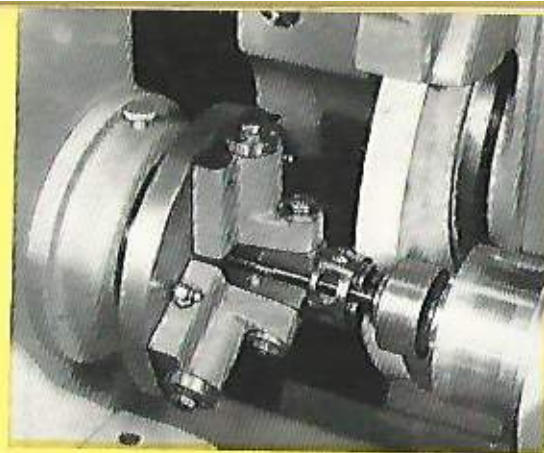
Vibratory bowl feeder and loading mechanism.



Component in position prior to grinding and ejection.

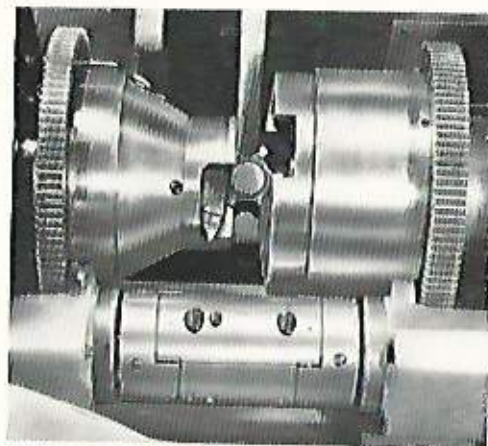


Indicative of Newall policy to meet highly specialised requirements of the automotive industry, the machine illustrated has been specifically designed and developed for finish grinding operations on two component parts of universal joints; the outer cage and inner race. Of a robust and compact nature, the PNL Profile Grinding Machine has a number of machine features which include single lever control, special purpose tooling and a choice of wheel dressing attachments.

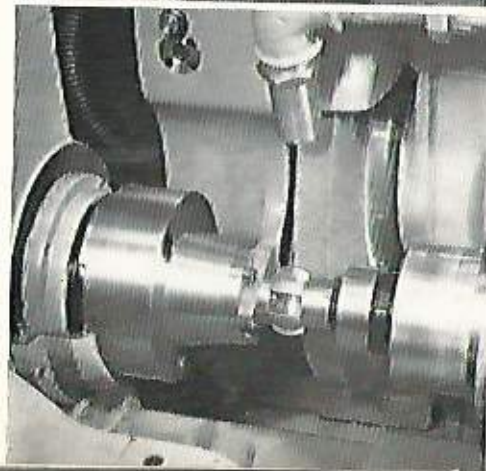


Close-up showing component cage in finish-grinding position. The hydraulic tailstock pressure operating fixture locates component on the inner spherical diameter.

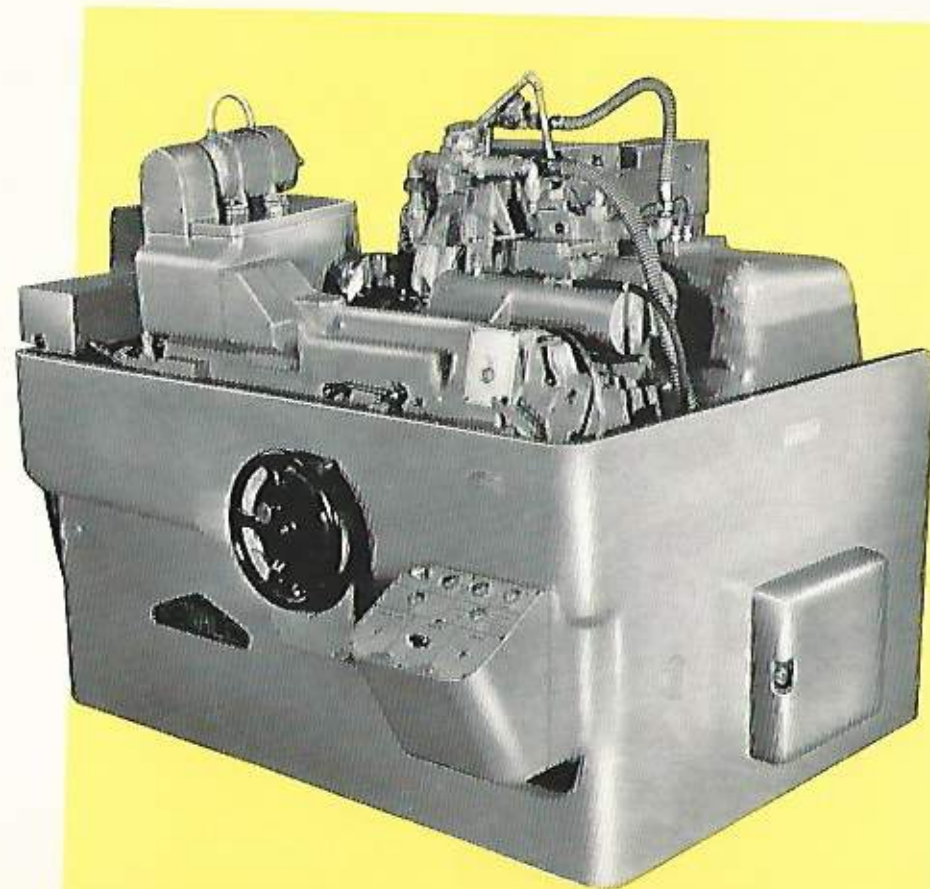
TYPE PNL HIGH PRECISION PROFILE GRINDING MACHINE



The inner race in position prior to grinding. The indexing fixture is used to locate the component in the three positions necessary for grinding six ball track grooves.



Inner race in position prior to finish-grinding outside diameter. Component location is derived from the spherical bore and hydraulic tailstock pressure in order to maintain contact of component with drive unit.



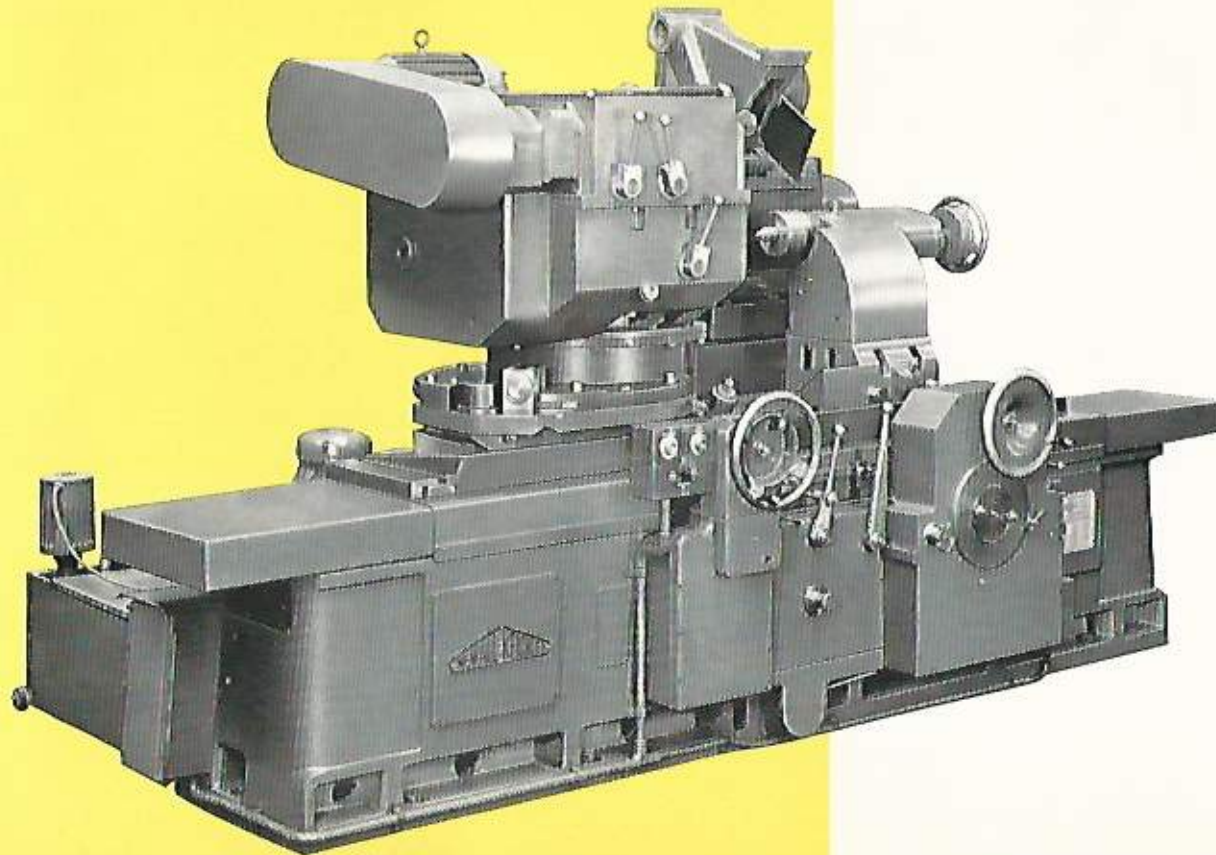
This exceptionally robust fully universal grinder provides for a 37" (940 mm.) swing and is available with length capacities from 24" (610 mm.) upwards. A typical example of this class of machine is the unit illustrated which was built to user requirement for grinding die blocks entailing a load of 1,500 lbs. (680 kg.) 11" (279 mm.) from the face plate. Apart from this primary function the machine has facilities for a wide range of alternative heavy toolroom work.

Among the many outstanding features of the machine are: workhead

and wheelhead may both be swivelled and accurately positioned to any required angle; wheelhead fitted with rapid electric traverse for positioning independent of the hydraulic feed, table hand wheel mechanism mounted in anti-friction bearings to facilitate precise manual control of table movement.

For other toolroom work a range of fully universal grinding machines is available from 8" (203 mm.) swing upwards.

TYPE KU 37 EXTRA HEAVY DUTY UNIVERSAL GRINDING MACHINE



Many years of experience in the design and manufacture of the 'L' type Plain Cylindrical Grinder and the L12AH Angle Head Grinder has ensured that the progressive development towards the Angle Approach type of equipment has been well proven in all stages.

The design of the base permits the machine to be built with an approach angle of 30°, 45° or 60° according to customer requirements and a maximum quick withdrawal of 4" can be provided to ensure that the wheel is well clear of the workpiece and to facilitate loading and unloading. Anti-creep

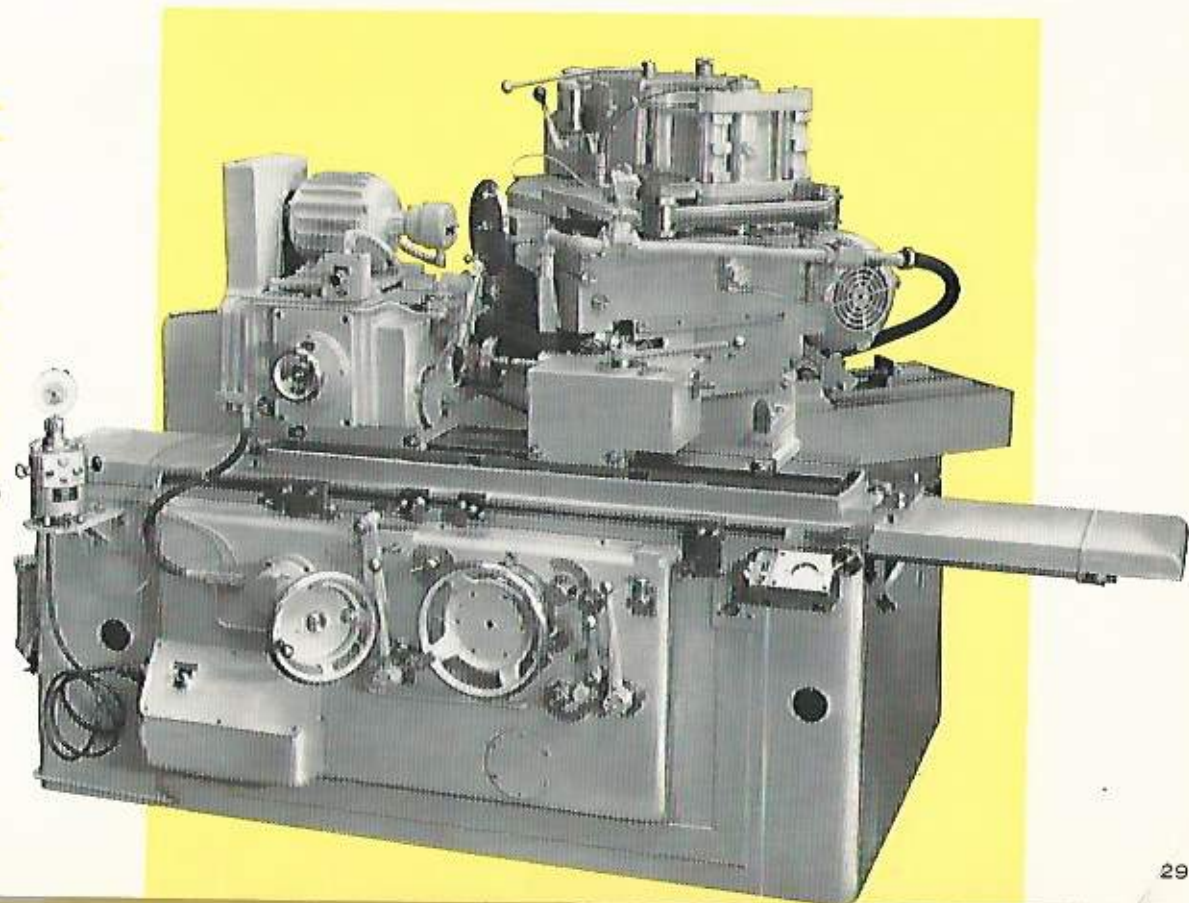
control and compensation for temperature change are built-in and combined with the very stable wheel spindle the resultant repetitive accuracy may be favourably compared with any Plain Production Grinder. The table traverse movement is supplied with the basic equipment in order that any change of position of the component, due to an alteration in a previous operation or repositioning for an alternative component, can be accomplished quite simply.

A full range of workheads and dressing equipment is available upon request.

TYPE L12AA ANGLE APPROACH CYLINDRICAL GRINDING MACHINE

ABRIDGED SPECIFICATION

| | |
|------------------------------------------|---------------------------------------------|
| Angle of approach | 30°, 45° or 60° |
| Height of centres | 6 $\frac{1}{8}$ " (154 mm.) |
| Dimensions of standard wheel | 20" x 2" x 8" (508 x 51 x 203 mm.) |
| Maximum width capacity of standard guard | 4" (102 mm.) |
| No. and range of wheel speeds (2) | 955 and 1414 r.p.m. |
| No. and range of work speeds (6) | 16 to 235 r.p.m. |
| Maximum capacity between centres | 24" (610 mm.) |
| Maximum swivel of top table | 12° included angle |
| Rate of hydraulic plunge feed | Infinitely variable |
| Quick run-back of wheelhead | 2", 3" or 4" maximum (51, 76 or 102 mm.) |
| Wheelhead motor | 10 h.p. |
| Workhead motor | 1 $\frac{1}{2}$ h.p. |
| Floor space required | 176" x 79" (4.4 x 2.0 metres) |
| Nett weight (approx.) | 10528 lbs. (4785 kgs.) |

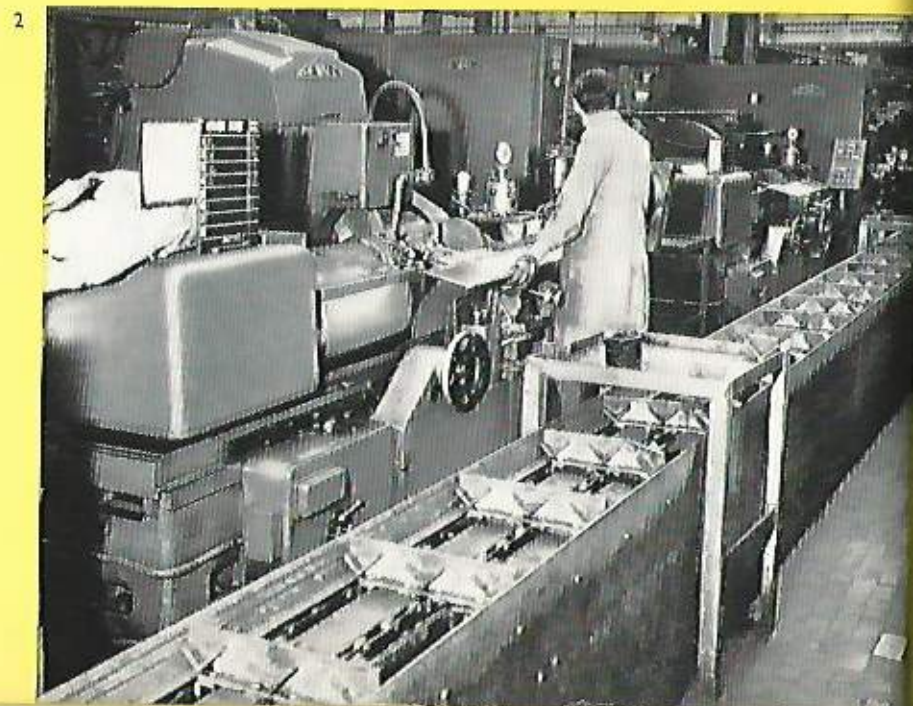
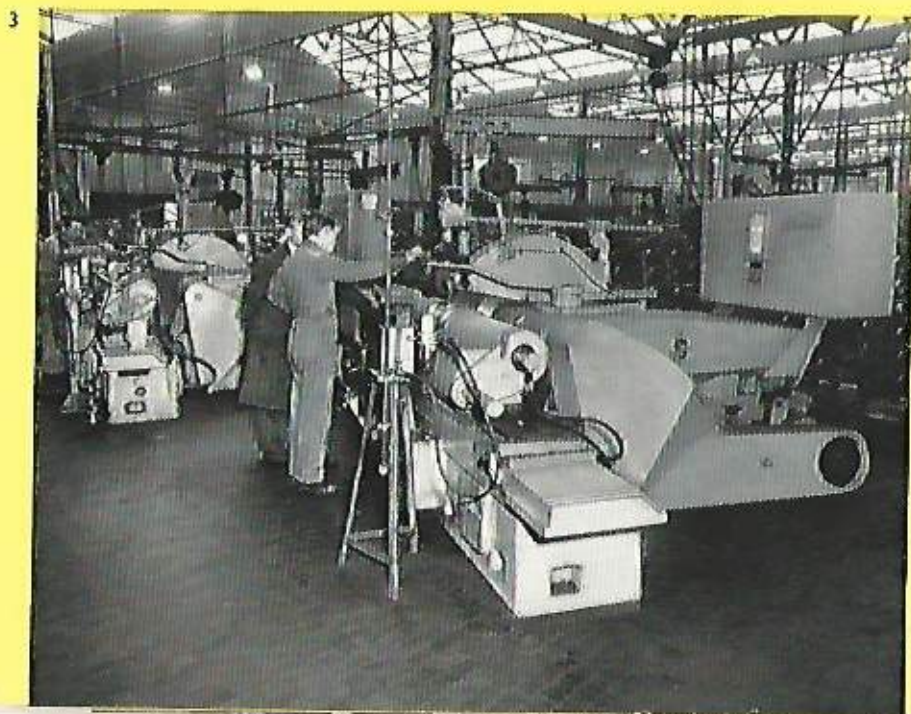
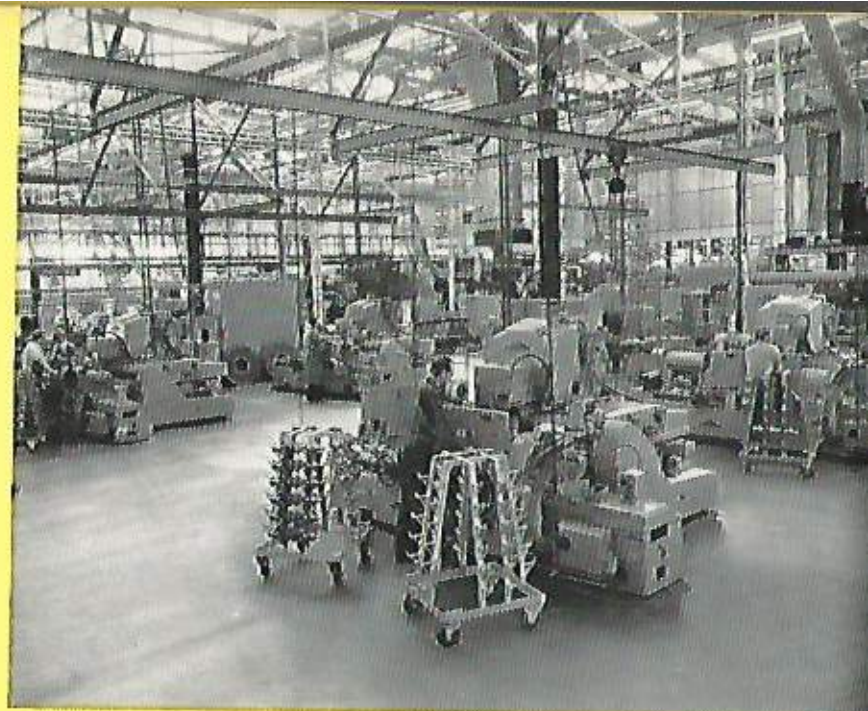


NEWALL GRINDING MACHINES as installed at various automobile plants in Great Britain

1. Newall HAJ Crankshaft Journal Grinding Machines at the Ellesmere Port plant of General Motors Ltd., Vauxhall Motors Division.

2. Newall A-HAC Automatic Crankpin Grinding Machines at the Dagenham plant of The Ford Motor Co., Ltd.

3. Newall HAC Crankpin Grinding Machines at the Peterborough plant of Massey-Ferguson Ltd., Perkins Diesel Division.



THE NEWALL GROUP



THE NEWALL ENGINEERING CO LTD
HIGH STREET OLD FLETTON
PETERBOROUGH
TELEPHONE : PETERBOROUGH 68601
TELEGRAMS : 'PRECISION' PETERBOROUGH

OPTICAL MEASURING TOOLS LTD
BRIDGE ROAD MAIDENHEAD
TELEPHONE : MAIDENHEAD 26171
TELEGRAMS : 'OPTOOL' MAIDENHEAD

KEIGHLEY GRINDERS (M.T.) LTD
AIREWORTH WORKS KEIGHLEY
TELEPHONE : KEIGHLEY 4294
TELEGRAMS : 'KAGEE' KEIGHLEY

JIG BORING MACHINES
PRODUCTION CYLINDRICAL GRINDING MACHINES
UNIT BUILT GRINDING MACHINES
FINE BORING MACHINES
LAPPING MACHINES
CRANKSHAFT GRINDING MACHINES
CAMSHAFT GRINDING MACHINES
MULTI-WHEEL GRINDING MACHINES

OPTICAL ROTARY TABLES
PROJECTION PANTOMETERS
WORKSHOP PROJECTORS
TOOLMAKERS' MICROSCOPES
OPTICAL COMPARATORS
HIGH PRECISION MEASURING MACHINES
PNEUMATIC GAUGING AND MACHINE CONTROL
EQUIPMENT
UNIT OPTICS AND OPTICAL SYSTEMS

CYLINDRICAL GRINDING MACHINES
UNIVERSAL GRINDING MACHINES
INTERNAL GRINDING MACHINES
PRECISION MACHINE TOOL EQUIPMENT
BALANCING STANDS

SALES ORGANISATION

NEWALL GROUP SALES LIMITED

TELEPHONE : PETERBOROUGH 67116

TELEX : 32136

TELEGRAMS : 'PRECISION' PETERBOROUGH