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*for a sustainable future*

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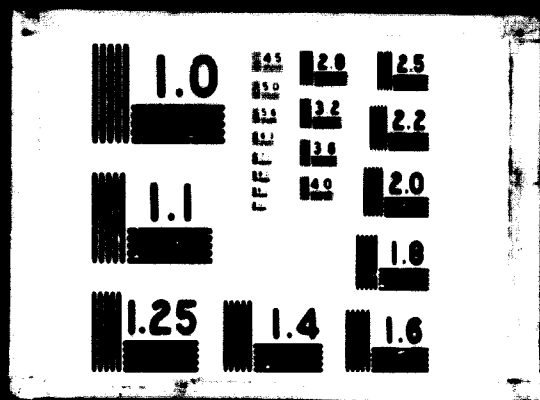
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Buenos Aires, Argentina

26 to 27 October 1972  
Sao Paulo, Brazil

**PROPOSAL**

For the Establishment of a  
Jig, Fixture, Die and Mould  
Training Centre 1/

presented

by

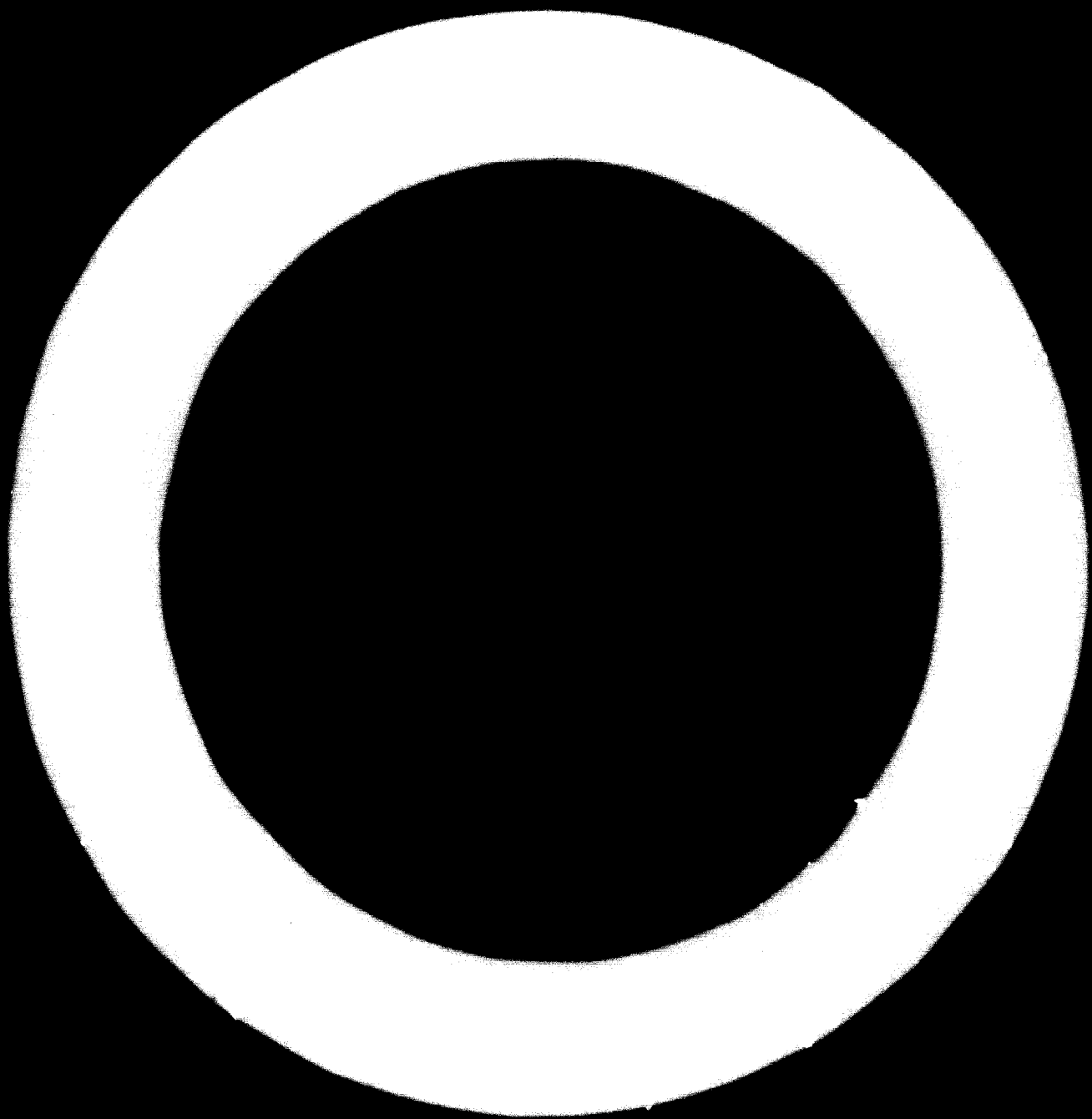
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## 1. Introduction.

The industrial progress of most developing countries, especially in the engineering industry, is seriously hampered by the lack of any indigenous production of -

Jigs and fixtures;

Dies for press-work;

Dies and moulds for forgings;

Dies and moulds for diecasting;

Dies and moulds for plastic moulding.

Many of the developing countries have to buy from abroad the jigs, fixtures, dies and moulds needed for production. Some have to buy the appropriate grades of steel in order to manufacture these tooling items. All these purchases require foreign currency which is usually in short supply in developing countries. Apart from the financial disadvantages accruing from the purchasing abroad of these items serious delays may result which causes further expenditure due to the disruption of manufacturing programmes. In addition to these tangible difficulties arising from the purchase abroad of these items there are many intangible problems which are difficult to quantify. These result from a lack of understanding of the design of the tooling with a consequent failure to use the most suitable methods of manufacture, this results in low levels of utilisation of the extremely expensive presses and forging machines and subsequent unnecessary expenditure on secondary operations which otherwise would be unnecessary or more economically undertaken.

Manufacture of jigs, fixtures, dies and moulds is a labour intensive operation which makes it specially desirable that this should be undertaken in a developing country rather than importing these items from one of the industrialised countries where the

labour rates are much higher. The design techniques for dies and moulds have advanced very considerably during the past decade but it is not yet a science which is fully understood and there remains a considerable element of art in the operation. It is therefore necessary to spend considerable numbers of hours of hand finishing dies and moulds before they are capable of use on prolonged production runs.

The efficient operation and the ultimate expansion of the engineering industry will be severely constrained unless management has adequate training in the most effective use of their metal forming machines and their diecasting and plastic moulding machines. Forging techniques and die design are directly interrelated and have to be fully understood if efficient forging is to be undertaken. Quality of production is directly affected by the initial quality of the dies and by the maintenance of them throughout their working life. This knowledge can most easily be obtained through the study of design and manufacturing techniques in a centre actually producing these items. The training of the specialist labour required can also be effectively undertaken at such a centre while at the same time meeting the requirements of the country for jigs, fixtures, moulds and dies.

## 2. Background Information.

The manufacture of jigs, fixtures, dies and moulds is a highly specialised operation requiring a highly skilled team of management and work people. The organisation producing these items can benefit considerably from close proximity to its principle customers who in turn improve their efficiency by an adequate understanding of the design problems and manufacturing techniques involved.

The industrialised countries have benefitted considerably by the close proximity of their jig and die shops to their main manufacturing plants. The continuous exchange of knowledge between the jig and die manufacturer and the user leads to continually improving methods of production. Die maintenance in most developing countries has been neglected, principally due to the delays resulting from sending the die back to a suitable establishment for servicing or reworking. Adequate maintenance may prolong the life of a die set by at least 100%.

The facilities needed for the effective manufacture of jigs and dies is not unduly extensive. The key to success lies in the skills which have to be developed in the management, designers and workforce. The provision of suitable equipment and skilled instructors should enable such an undertaking to achieve complete success in most developing countries where a reasonable level of engineering production has been reached.

### 3. Description of the Project.

#### Objectives.

The main objectives of the establishment of a Jig, Fixture, Die and Mould Centre are:-

- To provide an advisory service on the economic justification of special tooling methods and stamping, pressing or forging components of varying complexity and at different levels of production.
- To provide training for senior management and particularly production managers in the efficient application of jigs, fixtures, dies and moulds.



- To provide training for production managers in modern methods of manufacturing jigs, fixtures, dies and moulds.
- To provide training for designers of jigs, fixtures, dies and moulds and to enable them to obtain practical experience of the performance achieved by their design under operating conditions.
- To train skilled workmen in the special skills required for manufacturing jigs, fixtures, dies and moulds.
- To enable company managers to see good utilisation of modern tooling.
- To provide a manufacturing service for jigs and fixtures.
- To provide a manufacturing service for dies and moulds.
- To advise on programmes of maintenance for jigs and fixtures.
- To advise on programmes of repair and recutting dies and moulds.
- To provide a service for repairing and recutting dies and moulds.

**Method.**

The Centre to be housed in a suitable building comprising a factory area together with management and general offices with a large design office in order that additional designers can be accommodated for training purposes, and two small lecture rooms where management lectures and workshop classes can be held.

Details of the equipment for the factory are provided in the Annex to the Report.

Full tooling facilities for making jigs and fixtures would be provided, equipped with lathes, milling machines, drilling machines, cylindrical internal and surface grinders, hacksawing machines, bandsawing machines and a special section in a temperature controlled room for jig boring.

The Die and Mould Section to be equipped with milling machines suitable for machining all sizes of die blanks and a surface and grinding machine. The key equipment for this Section would consist of the die sinking milling machines of suitable capacities to meet all requirements, profile milling and profile grinding machines and electro-discharge machines (E.D.M.) for finishing dies, sinking dies in hardened material and for servicing dies when recutting is necessary.

A small press should be provided for proving dies and training purposes as well as a small diecasting machine and plastic moulding machine. Heat treatment facilities will be required, but as the volume of parts will be relatively small and some of these will be of considerable size requiring large furnaces, it is suggested that the heat treatment operations be sub-contracted to a local industrial company, if one with adequate facilities exists in the area.

#### Duration.

The duration of the project is expected to be four years. During this period U.N. or other experts will train local personnel in accordance with the abovementioned objectives.

Outside Contribution.

An outside contributor is expected to provide the services of experts, fellowships and equipment.

	<u>Number of Man/Months.</u>	<u>Cost in U.S. \$</u>
<b>a) <u>Experts.</u></b>		
Project Manager. (Tool & die engineer)	48	120,000
Tool Design Engineer	48	120,000
Production Engineer	24	60,000
Toolroom Superintendent	24	<u>60,000</u>
Sub Total	<u>144</u>	<u>360,000</u>
<b>b) <u>Fellowships</u></b>		
Plant Manager	6	3,000
Tool Engineer (2)	12	6,000
Production Engineer	6	3,000
Toolroom Superintendent (2)	12	<u>6,000</u>
Sub Total	<u>36</u>	<u>18,000</u>
<b>c) <u>Equipment</u> <sup>1/</sup></b>		
6 Lathes		74,000
6 Milling Machines		92,000
2 Drilling "		16,000
2 Cylindrical Grinding Machines		32,000
2 Surface " "		26,000
1 Hacksaw Machine		2,000
1 Bandsaw "		5,000
1 Jig Boring Machine		48,000
1 Jig Grinding Machine		26,000
4 Die Sinking Milling Machines		<u>124,000</u>
	C/fwd.	445,000

<sup>1/</sup> This provisional list of equipment is subject to changes; the final version will be prepared by a consulting firm or the project manager on the spot

c) Equipment (Cont.)

	Cost in U. S. \$
	b/fwd. 145,000
1 Profile Milling Machine	22,000
1 Profile Grinding Machine	26,000
2 Electro-discharge Machines	74,000
1 Press	24,000
1 Diecasting Machine	18,000
1 Plastic Moulding Machine	16,000
5 Tool Servicing Machines	13,000
Cutting Tools, etc.	32,000
(Drills, Milling Cutters, Boring Bars, Turning Tools, Surface Plates, Clamps, Blocks, Dial Indicators, Micrometers, Height Gauges, etc., and Tool Storage Cabinets).	
Work storage racks, pallets and trucks	6,000
Inspection equipment	16,000
Office & Lecture Room Equipment.	8,000
(Desks, Chairs, Typewriter, Photocopier, Cupboards, Filing Cabinets, Drawing Boards, Plan-files, Cine Projector and Screen).	
Sub Total	<u>705,000</u>
Total	<u><u>1,083,000</u></u>

Government Contribution

(a) Local Staff

Director	1
Technical engineers	4
Production engineers	2
Toolroom Superintendents	2
Toolroom Foremen	3
Office Manager	1
Typists/Secretaries	4
Materials Controller	1
Buyer	1
Storekeepers	2
Machine Operators	30
Toolroom Fitters (For hand-finishing dies and assembling and fitting jigs and fixtures).	14
Labourers for Workshop duties	4
Cleaners for offices, etc.	2

Totals: Management and office 19  
Works and Stores 52  
71

(b) Building <sup>1/</sup>

	<u>Floor Area</u> <u>Square m.</u>
Production Shop	600
General Office	80
Design Office	60
Manager's Office	25
2 Small Lecture Rooms	70
Toilets, Passages & Stores	<u>150</u>
<u>Total:</u>	985

Based on a cost of \$ 200 per sq. m., including professional fees, excluding site and roads ... .. US. \$ 197,000

<sup>1/</sup> layout subject to changes; the final version will be prepared by a consulting firm or the project manager on the spot

### Detailed Description of the Equipment.

Each of the machines have been carefully selected to comply with the overall objectives of the Centre and to provide maximum flexibility in operation so that the widest variety of jigs and fixtures may be manufactured as well as a complete range of dies and moulds for forging, stamping, pressing, diecasting and injection moulding.

#### 6 Lathes.

4 Dean Smith & Grace Model 2412, Heavy Duty Engine Lathes.

2 Colchester Triumph Medium Duty Engine Lathes - 1 Fitted with Digital Read Out Equipment.

These lathes will primarily be used for turning the various components required in the manufacture of jigs and fixtures and in addition, will be used for producing the bushes, guide bars and studs required for press tool sets. The heavy duty lathes may also be used for machining the faces of die blocks.

#### 6 Milling Machines.

2 Cincinnati Model 2MK Plain, Horizontal, Knee and Column Machines.

1 Cincinnati Model 2MK Vertical, Knee and Column Machine.

2 Cincinnati Model 315-16 Cinedo Plain, Horizontal, Knee and Column Machines.

1 Cincinnati Model 315-16 Cinedo Vertical, Knee and Column Machine.

These machines will be used for general purpose milling work and especially for milling the die blocks and moulds.

#### 2 Drilling Machines.

1 Herbert 1" Vertical Fixed Column Drilling Machine.

1 Staveley Asquith Radial Drilling Machine.

These two machines will provide a flexible programme for drilling

operations enabling work to be undertaken on both small jigs and fixtures and on much heavier duty work on the moulds and die blocks.

2 Cylindrical Grinding Machines.

1 Jones & Shipman 1300 EU Semi Universal Machine.

1 Jones & Shipman 1051 Semi Universal Machine.

These two machines will cover a wide range of grinding requirements in the general purpose and high accuracy areas.

2 Surface Grinding Machines.

1 Jones & Shipman Model 1400.

1 Jones & Shipman Model 1411.

The smaller of these two machines is intended to undertake the normal tool room surface grinding requirements while the larger heavy duty machine will be capable of handling any extra large tool room parts and in particular, is intended for grinding the faces of die blocks.

1 Hacksaw Machine.

Qualters & Smith Power Feed Hacksaw.

This machine to be used for cutting up barstock.

1 Bandsaw Machine.

Jaespa Series ASH6 Heavy Duty Bandsaw.

This machine to be used for cutting templates and other flat plate

1 Jig Boring Machine.

Societe Genevoise Model 5E

or alternatively

Newall Model 2443 or 24A51 With Digital Read Out.

The jig boring machine will be required to undertake all jig boring operations and should be installed in a temperature controlled or preferably air conditioned room. Alternative makes of machine, together with an alternative size, have been submitted as it is suggested that a final decision on this should only be made when the Director of the Centre has been appointed as there is considerable personal preference in the selection of jig boring machines. Optimum performance is usually only obtained when the management has had the opportunity of selecting the machine of their personal choice.

1 Jig Grinding Machine.

Moore Model 2G.

Accurate holes are frequently required in hardened components and this can only be effectively undertaken by a jig grinding machine.

4 Die Sinking Machines.

2 Cincinnati 16 x 30 Hydrotels.

2 Bridgeport Model 3D Hydraulic Duplicating Machines, with  
20" Head.

These four machines, together with the profile milling and profile grinding machines mentioned hereunder, form the key equipment for the manufacture of the dies and moulds. Both these machines are widely accepted wherever die manufacture is undertaken throughout the world. The Cincinnati Hydrotel is a very much heavier machine than the Bridgeport and will concentrate on the production of the heavier dies while the Bridgeport would handle the smaller dies where less metal removal is necessary.

1 Profile Milling Machine.

Bridgeport 3D2JA with 'Con-Trol-Path'.

This machine is a specialised form of die sinking machine with a 360° tracer capability.



1 Profile Grinding Machine.

Mägarle Model F.D.7.

or alternatively

Wickman Optical Profile Grinding Machine.

These machines are important for the accurate production of die punches. An alternative has been given as in this type of machine management preference is again important.

Electro-Discharge Machines.

1 Agietron Model EMS 15.

1 Agietron Model F.L.

Electro-discharge machining is playing an increasingly important part in the manufacture of dies and moulds and more particularly in the re-cutting operation after the moulds have become worn. Two sizes of machine have been included in order to handle the wide range of dies and moulds which will be necessary in a Centre of this type.

1 Press, 1 Die Casting Machine, 1 Plastic Moulding Machine.

No specific machines are submitted to meet these specifications because it is felt that the requirements of the country in which the Centre is to be located should be carefully surveyed before making a decision on the type of equipment to be installed. These machines, in addition to being used for proving the dies and moulds, can be used to meet the production requirements of the country. In addition, they can be used for training purposes to assist the local industry in the development of this class of product.

No specific machines are therefore recommended but literature is included with the Report from the following suppliers.

Taylor & Challan of Birmingham, England.

Ludwig Engel KG of Schwertberg, Austria.

Emanuel Presse of Torino, Italy.

Vaccari of Vicenza, Italy.

5 Tool Servicing Machines.

2 Jones & Shipman Model 310 Tool and Cutter Grinder.

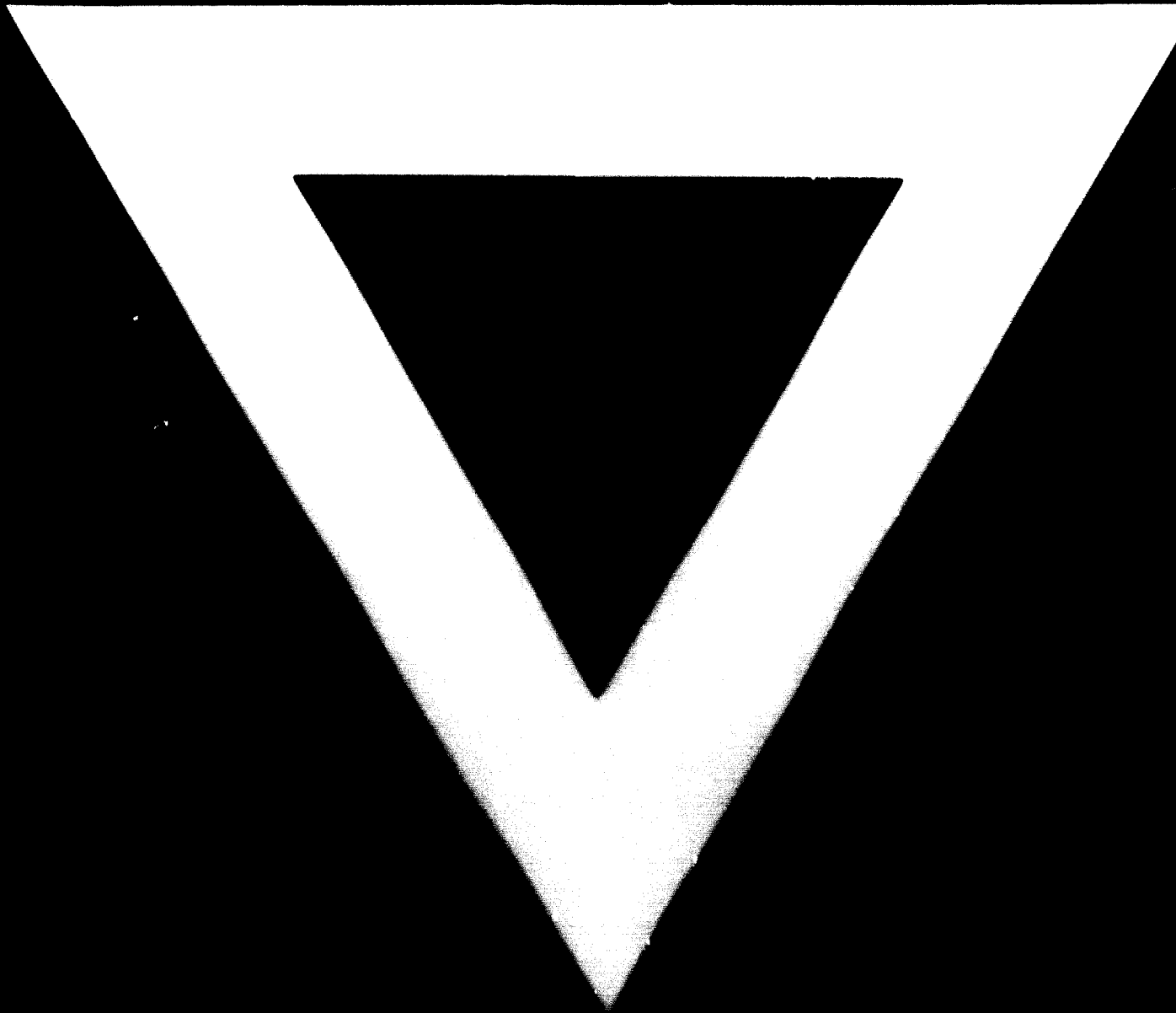
1 Hunt Model DG.100 Drill Point Grinder.

1 Brierley Model ZB.32 Drill Point Grinder.

1 Abwood Tool Grinder.

These machines to be used for general purpose tool servicing including sharpening drills, grinding turning tools and re-grinding milling cutters etc.





**23.7.74**





