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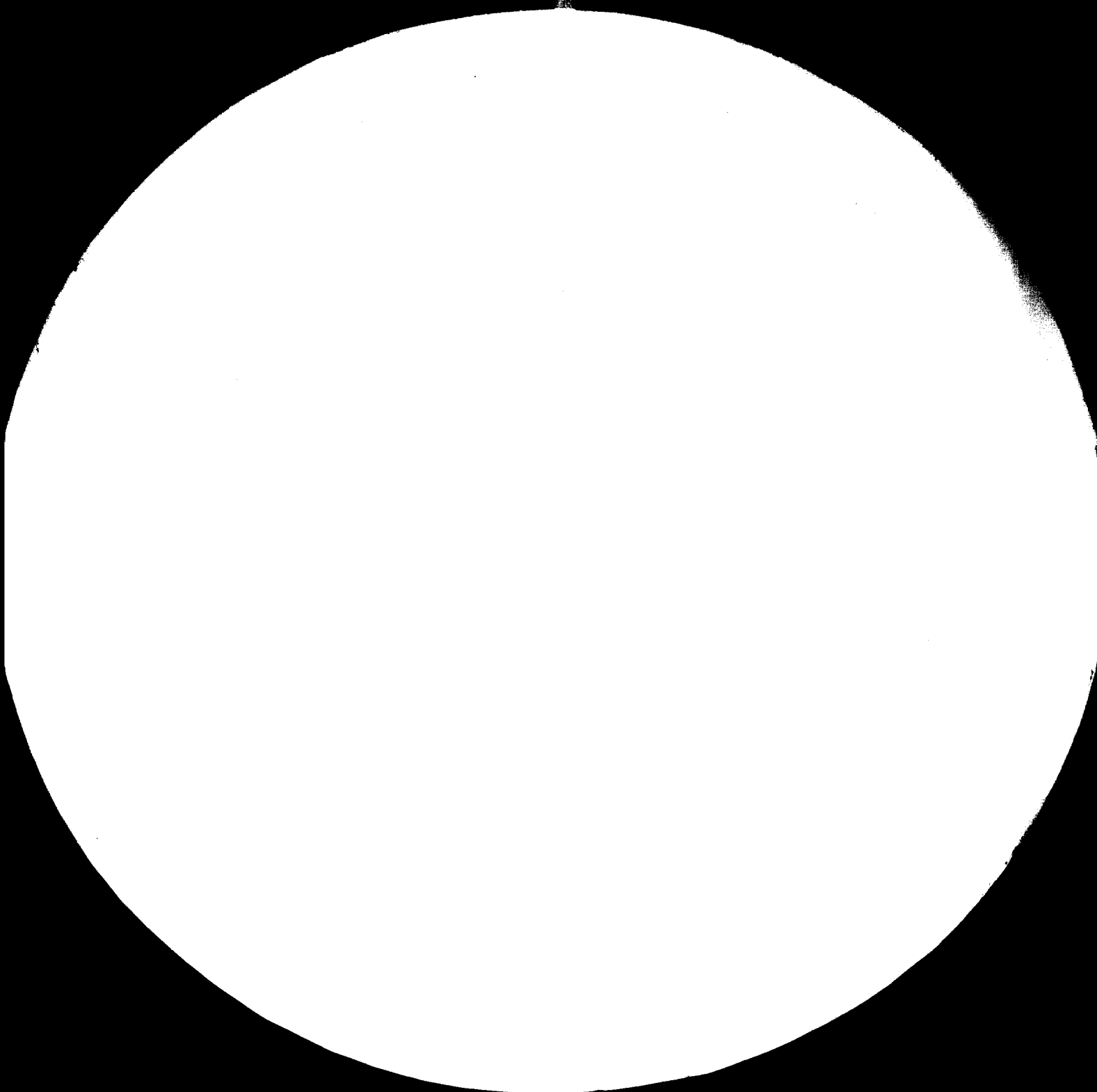
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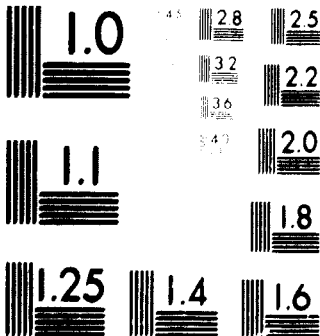
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MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

RESTRICTED

12566

DESIGN AND APPLICATION OF JIGS AND FIXTURES,
DESIGN AND APPLICATION OF PRESS TOOLS AND DIES,

DP/ROK/72/023

REPUBLIC OF KOREA

Terminal Report

Prepared for the Government of the Republic of Korea
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

based on the work of Derek A. Williams,
expert in the design and application of jigs and fixtures,
press tools and dies

United Nations Industrial Development Organization (UNIDO)
Vienna

This report has not been cleared with the United Nations Industrial Development Organization, which does not, therefore, necessarily share the views presented.

ACKNOWLEDGEMENTS

The expert wishes to thank the following officials and staff of KOIRA, Ministry of Science & Technology, U.N.D.P., and U.N.I.D.O. for their contributions towards the success of this mission:

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INTRODUCTION

(A) BACKGROUND OF THE PROJECT

The Korea Trade Promotion Corporation (KOTRA) supervised by the Ministry of Commerce and Industry (MCI) is responsible for implementing the country's export promotion drive and maintains a network of offices overseas; at the same time, they introduced a "PRODUCT ADAPTION" programme in 1975 to complement marketing activities by providing technical assistance from the United Nations Development Programme (UNDP) for the projects as follows:

DP/RCK/72/023/11-01/AA - "Application and Design of Press Tools and Dies" (two months)

DP/RCK/72/023/11-01/BB - "Application and Design of Jigs and Fixtures" (three months)

wherein the two things are related to each other; to collaborate with the Small & Medium Industry Promotion Cooperatives/National Federation of Medium Industry Cooperatives in helping member companies in the design and use of proper jigs & fixtures/tool & dies for drilling, boring, milling etc. with the object to improve productivity and quality; so as to improve the products for export.

The United Nations Development Organization (UNIDO) was the executing agency and Korea Trade Promotion Corporation (KOTRA) was the counterpart.

(B) OBJECTIVES

The project was aimed to provide technical assistance to small & medium sized manufacturers, who lack a strong technological base and resources to develop and adapt modern methods of manufacture, which would allow them to remain competitive in international markets.

In specific areas, selected by KOTRA on the basis of export potential, short term experts provided by UNIDO would assist individual manufacturers to improve their designs, production methods and product quality leading to a significant improvement in helping ROK to achieve planned export targets.

II SUMMARY

Throughout the life of the project-"PRODUCT ADAPTATION", twenty-three (23) short Term UNIDO experts have contributed their specializations giving direct technical assistance to individual manufacturers and specific industries as designated by KOTRA office, since the project started in 1975. The last expert completed two (2) assignments running consecutively:

(i) Tool and Diemaking - Design and Application

(ii) Jigs and Fixtures - Design and Application

starting September 1, 1982 to January 8, 1983 (4.5 months).

According to studies and survey covering small/medium industries, machinery and equipment were often unsuitable for efficient mass production due to errors made in its' selection. Tool and die designs are frequently incorrect and faulty, giving poor performance in production while affecting product quality and increasing unit costs.

Factories often lack the highly trained technical personnel to improve design and solve production problems. Even if the right level of expertise was available. Most small/medium companies do not have the financial resources to support or engage additional technical staff. Even in large companies, where machines, equipment and facilities are first class, serious problems exist due to limited experience of management, designers and technicians. Tooling performance is being hampered by faulty design of the product and/or the die; thus, making cost effective production an impossible task.

It is recommended immediate action be taken to reduce this problem, which is affecting most light engineering industries throughout Korea.

III PROJECT ACTIVITIES

(A) SURVEY OF TOOLMAKING FACILITIES

In ROK, overall captive and non-captive toolmaking establishments total 1,300 of which 958 employ over (5) five persons consisting of toolmakers, designers, and technicians. The remaining usually employ 2 or 3 personnel mainly doing repair and maintenance of production tools. Of all toolrooms, 82% employ less than 20 persons.

Toolmaking in ROK is a young industry and became very active after 1971. 90% of toolmakers started operations after this date. Experience is limited, as 84% have less than 3 years of experience.

The ratio of toolmakers per enterprise is 1:1.7 men, design assistants and technicians 0.7 to 1.0 men respectively.

Specialized machine tools are few. Only 12% of all toolrooms have E.D.M. and only 1.6% have jig borers. Less than 1% have E.D.M. wirecutting, N.C. Milling or Jig Grinding Machines, which makes construction of tools and dies time consuming & wasteful.

The working environment in most toolrooms is unsuitable in relation to the skill & high level of concentration required, to build highly accurate production tools. At least 50% had poor lighting and benches to machine tool locations.

The supply of dependable quality tool steels and hardening facilities available locally, is a constant complaint of most toolmakers.

The workforce, individual skill and effort in every company visited showed a responsible, hardworking team. Always receptive to good advice and technical assistance

NOTE: Although exact figures are not available, it is known, a high proportion of sophisticated production tooling is imported due to the facts given.

(B) SERVICE TO INDUSTRY

The UNIDO expert arrived on station 31 August, 1982 and commenced project work on 1st Sept. in line with a planned work schedule arranged by KOTRA.

A total of 21 work-visits were undertaken with the assistance of a representative from KOTRA. The companies were located in the following areas:

Seoul and Incheon

Chuncheon

Daejeon

Pusan

Pohang

Ulsan

Taegu

Masan and Changwon

Chinju

Visits were also made to the Ministry of Science and Technology, Ministry of Industry and Commerce, Korea Institute of Metals and others.

Mainly small/medium industries were assisted. A small number of large manufacturers - toolmakers/users were also visited and assisted.

Two seminars were given by the expert: (i) "Tool and Die Making" & (ii) "Jigs and Fixtures" to a total of over 150 participants in Incheon and Changwon Industrial Complex. (See attachment)

Individual company visits varied in duration from one to four days. All were given full technical assistance to the limits of time available. Problems dealt with, were often extreme technically complex and in some cases, far beyond the range of the job description due to their varying technical nature.

Production engineering, product design, most types of tool-

making applied to cast, pressed, fabricated metal/plastic components, assemblies, and machines were just some of the areas covered by the expert. In one case, technical assistance was provided in the design of a welding fixture to manipulate & lift a sub-assembly of 40 tons.

On the spot evaluations of machines and equipment, tooling and production methods were regularly carried out by the expert. Where and when necessary, modifications were proposed and implemented.

Safe press working practice was frequently recommended and further qualified by two simplified inexpensive designs for general industrial use (See Annex II)

Model examples, demonstrations and advice to solve numerous problems were presented.

A number of designs and sketches making full use of materials and standard parts available locally were given to clearly define a concept. In some cases, it was found necessary to hold a one to two-day "In-plant teach-in" in order to quickly upgrade the technical skill and knowledge of the participants. (See Designs & Sketches Annex II).

IV FINDINGS AND RECOMMENDATIONS

Investigations into problems of ROK small & medium industries revealed that major production tooling problems are evident and directly influencing high unit cost and quality due to the following:

- (i) Shortage of highly experienced technical expertise
- (ii) Inadequate training facilities for toolmakers, designers and technicians.
- (iii) Lack of proper process and production planning
- (iv) Insufficient financial resources
- (v) Few specialized machine tools to produce tools & dies
- (vi) Incorrect selection of production machinery & equipment
- (vii) Faulty product and or tool design
- (viii) Unreliable supply of correct quality tool steels and hardening services
- (ix) Poor understanding of "cost effective" product development

Re-orientation towards the essential needs of light engineering as opposed to heavy engineering must be fully understood by all concerned in the establishment, in order to be successful in expanding exports of top quality mass produced products from small & medium industries.

There is an urgent need to eliminate the problems stated. The alternative will be retarded industrial growth or worse.

Light engineered products depend on "tooling", as they are internationally far more competitive in cost per unit/volume; therefore, extremely sensitive to any minor errors made in design, construction and usage of "production tooling" (press tools moulds & dies)

Economically, the only way to permanently solve the problems now being experienced is to provide intensive, practical, and theoretical

training, while providing consultancy as an ongoing and continuous operation.

It is recommended that two (2) new government departments be set up to provide the required services working in close co-ordination with each other. The departments will be: (1) a Technical Consultancy (2) an Advanced Training/Production Unit- Tool and Die making. Within the framework of the proposed organization, other specialized expertise outside the range of the consultancy could be called in, as provision has been made for short term U.N.I.D.C. consultants in the proposal. (See Annex I)

COMMENTS

The considered opinion of the writer, is that the present pattern of technical assistance falls short in achieving the long term industrial goals set by the ROK. government by using only short-term U.N.I.D.C. expertise due to the following:

- (1) The technical assistance provided is by nature, very temporary covering only a few of the immediate needs of a company
- (2) There is no follow-up activity to examine production results & further improve performance
- (3) In many cases, only token technical assistance and guidance can be given, due to limited time when dealing with major problems
- (4) Any technical input cannot be fully utilized and applied to direct training of Korean counterpart engineers and has no multiplier effect
- (5) The previous level of technical assistance is totally inadequate to meet the future needs of industry.

ANNEX I

DRAFT
PROPOSAL

for

ADVANCED TOOLMAKING and
MANUFACTURING CO-OPERATIVE

to

PROVIDE DIRECT ASSISTANCE & SERVICES TO SMALL/MEDIUM INDUSTRIES

in the

REPUBLIC OF KOREA

D.A. Williams
Dec. 1, 1962
Seoul, Korea

This proposal has not been cleared with the United Nations Industrial Development Organization, which does not, therefore, necessarily share the views presented.

C O N T E N T S

I. INTRODUCTION

II. SUMMARY OF FINDINGS AND CONCLUSION

III. PROJECT CONCEPT

IV. FRAMEWORK OF PROPOSED ORGANIZATION

V. DETAILS OF EQUIPMENT/FINANCIAL INPUTS

VI. UNIDO EXPERT ASSISTANCE & GOVERNMENT PERSONNEL INPUTS

C O N T E N T S

ORGANIZATION CHART

INTRODUCTION

When we compare Western countries with Korea, it is interesting to note the difference in the pattern of industrial development. In the West, training of the skilled "Toolmaker" has been traditional and a natural development, always keeping pace with the advance of technology. Even after the "Industrial Revolution", the village "Blacksmith" had for generations, acquired many skills which were passed on from father to son. These skills were, later extended into engineering by the demands of industry and have progressed with the ever accelerating advance of technology to present day standards. We, now have many branches, subdivisions, & specializations devoted to the design, building, and operation of "tooling" used to mass produce components and assemblies of a very high standard.

In Korea, due to a much shorter historical development pattern and different experience, it is understandable that there is a "Technological Gap". In order to overcome this inherited problem, which is particularly critical, when considering light engineering, there is an urgent need for immediate advanced training to be concentrated on selected personnel, to enable them to cope with the present and future production problems. Otherwise, difficulties being now experienced will be magnified and industrial progress will stagnate.

Korea must plan for the future to prevent this arising situation, as it will be imperative soon to design, build, and operate much better productive "Tooling". Korea needs to put a plan of action into operation immediately to offset rising labour costs and increasing work competition. If, it is assumed that R.O.K. plans to develop and accelerate her expansion into such industries as automobiles, electronics & aircraft building, "Tooling" becomes an increasingly important "Key Factor" towards making these ambitions possible. The importance of "Tooling" in its' relationship to mass production is paramount and should be fully understood by the establishment, management and its work force.

II SUMMARY OF FINDINGS AND CONCLUSION

Having visited (21) Korean small/medium sized companies, it was found at best that companies can only just cope with their immediate needs and in most cases, there is an urgent need for the following:

- (A) Better Training
- (B) More Toolmakers
- (C) Better and more up-to-date Tool/Product Designs
- (D) Better and more suitable machines and equipment
- (E) Better supply and understanding of tool and die steels (and other materials)
- (F) Better working environment
- (G) Closer association with other Tool Users/Makers.

As observed, Korean small/medium industries suffer from a great number of production problems and are unable to solve them due to lack of sufficient expertise and resources. Unlike the larger heavy industries, who have training facilities and are not as "Tooling sensitive" (their type of work being often larger and of smaller volume). To resolve the problems of small/medium industries, direct assistance and training is the only "Cost effective" method of providing a solution. The following draft presentation has been given to rectify the problems of production tooling quickly.

PROPOSED ORGANIZATION:

It is proposed two new organizations should be set up. K.I.M. (Korean Institute of Metals) will be the main base of the project. This is due to excellent work they are performing for industries by manufacturing inspection gauges & equipment, having earned a high level of creditability. Meanwhile, workshops and design section are already in existence; some machines and equipment can be immediately utilized. The present staff can be trained, learning new technology and skill, while undertaking additional responsibility. Workshops can be expanded, thereby, reducing building costs. The project can be started without difficulty & delay.

III PROJECT CONCEPT

The aim of the project would be to provide "Key service" to small/medium industries by advanced design and construction of tooling and special purpose machines. With consultancy providing technical assistance in liaison between industry and the "Advanced Training/Production Unit".

Training would be of a practical & theoretical nature "on-the-job" an actual sample of production, not an imitation. Specialized machining techniques, together with complete design & construction of press tools, moulds, and dies would be offered to individual manufacturers. Product development with consultancy can compliment and or provide a comprehensive service.

When the project becomes fully operational, it can be anticipated 60% self-support will be reached within, say 2-3 years, dependent on the volume of training undertaken. Any plans for further expansion can be generated later by accurately measuring the progress in relation to performance.

OBJECTIVES:

- (A) To train Toolmaking personnel to design & construct advanced tooling
- (B) Develop cost effective tooling and product designs
- (C) Build first class tooling at reasonable cost for small & medium industries
- (D) Design, develop & build special purpose machines/equipment where needed
- (E) Enlist the services of university engineering departments to assist in solving complex problems & development projects
- (F) Evaluate & advise the most suitable machines & equipment to be used in production
- (G) By design modify existing machines, equipment and tooling to improve production efficiency

IV. FRAMEWORK OF PROPOSED ORGANIZATION

1. INDUSTRIAL PRODUCTION ENGINEERING CONSULTANCY (I.P.E.C.):

Which would consist of three Korean engineers as counterparts to three U.N.I.D.O. expert engineers and one chief technical adviser to control both projects.

(a) PURPOSE: By consultation to assist directly small/medium sized industries to improve quality & productivity at the same time working in close co-ordination with A.T.O.M.C.

(b) DUTIES:

- (i) Analyze problems, now being experienced in production through visits to factories
- (ii) Recommend, improve working methods to increase productivity
- (iii) Make working briefs for development of tooling & new equipment in A.T.O.M.C. workshops
- (iv) Arrange assistance from appropriate university engineering departments in solving major problems and developing new technology.
- (v) Train counterpart engineers & make recommendations to upgrade "on going" training in A.T.O.M.C.
- (vi) Coordinate & control cost of projects for industry
- (vii) Evaluate and report progress to H.C.I./R.O.K. government.

2. ADVANCED TOOLING OPERATION AND MANUFACTURING COOPERATIVE (A.T.O.M.C.):

Shall consist of some present K.I.M. staff plus additional 2/3 new Korean engineers. The existing toolroom, workshop, design office would require extending ^{ALSO} classrooms for theoretical training. Three UNIDO experts shall assist in establishing and training of project personnel.

DUTIES: To provide an on-going service to industries by design, development & manufacture of tooling and equipment to improve productivity in coordination with recommendations given by I.P.E.C. consultants. To assist "on-the-job" training in advanced design & construction of equipment/tooling as follows:

- (i) Press tools
- (ii) Moulding tools
- (iii) Jigs & fixtures
- (iv) Special purpose machines
- (v) Product/tool development

V. DETAILS OF EQUIPMENT/FINANCIAL INPUTS

<u>DESCRIPTION OF EQUIPMENT</u>	<u>ESTIMATED COST</u>
Universal Milling Machine (similar to "MAHC" MH 800 or "BOKO" with digital control)	US \$ 75,000
E.D.M. (Wirecut) "PANUC" with digital control	70,000
E.D.M. (for cavities) similar to "JAPAX",	45,000
20 TON PRESS (for tool try-out)	25,000
PROJECT MINI-BUS ("KIA" or "HIACE").	7,000
OFFICE EQUIPMENT & STATIONARY (Includes Library Books)	10,000
Total (Dollar)	<u>US \$ 232,000</u>
UNIDO. Expertise (120 Man/month)	US \$ 960,000
Equipment	232,000
Building (RCK building extension).	508,000
Total	<u>US \$1,700,000</u>

UNIDO EXPERT ASSISTANCE AND GOVERNMENT PERSONNEL INPUTS

		1983	1984	1985
CHIEF TECHNICAL ADVISER	IPEC/ATOMC	[Timeline bar from start to end]		
CONSULTANT PRODUCTION ENG.	I.P.E.C.	[Timeline bar from start to end]		
CONSULTANT INDUSTRIAL ENG.	"	[Timeline bar from mid-1984 to mid-1985]		
CONSULTANT PRODUCTION ENG.	"	[Timeline bar from mid-1984 to end]		
EXPERT PRESS TOOLS	A.T.O.M.C.	[Timeline bar from start to mid-1984]		
EXPERT SPECIAL MACHINES	"	[Timeline bar from mid-1984 to mid-1985]		
EXPERT MOLDING TOOLS	"	[Timeline bar from mid-1984 to mid-1985]		
COUNTERPARTS (6)		[Dashed line from start to end]		
FELLOWSHIPS			[Timeline bar in 1984]	[Timeline bar in 1985]
SHORT TERM CONSULTANT(S)		(2) 2m/m [Timeline bar]	(2) 2m/m [Timeline bar]	(1) [Timeline bar] (2) [Timeline bar]
TOTAL ^x MAN/MONTHS	120	10	60	50

NOTE: Fellowships/short term consultants taken within the period illustrated or when project development identifies the need(s). Also, should expert performance prove exceptional could be converted into fixed term status. Saving time/problems of selection.

^x Total man/months does not include fellowships

COMMENTS:

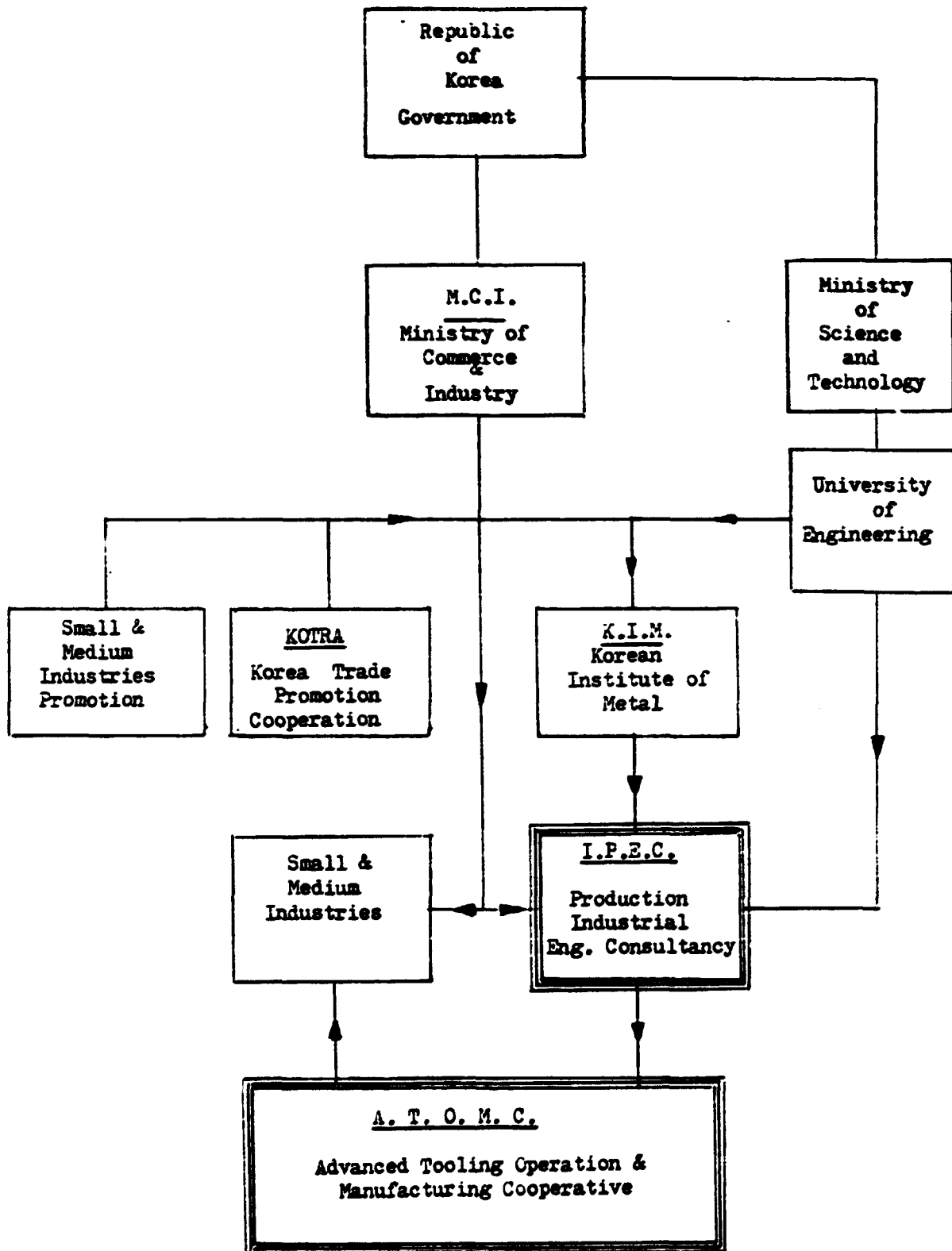
1st year 1983: It can be seen financial inputs for the first year start up of project, would be low at around \$80,000 (U.S. Dollars)

2nd year 1984: Would require the largest inputs as follows:

Equipment	\$ 232,000
Building	508,000
Personnel	420,000
Total	<u>\$1,160,000</u>

3rd year 1985: Financial input would taper off to around US Dollars \$460,000

NOTE: As no figure has been used to calculate income earned by service to industry gained from the manufacture of tools and dies; it can be anticipated costs given in the 2nd and 3rd year would be offset, lower than stated. An additional budget allowance has also been added to the total to cover salary increases which may be lower than calculated.



ORGANIZATION CHART

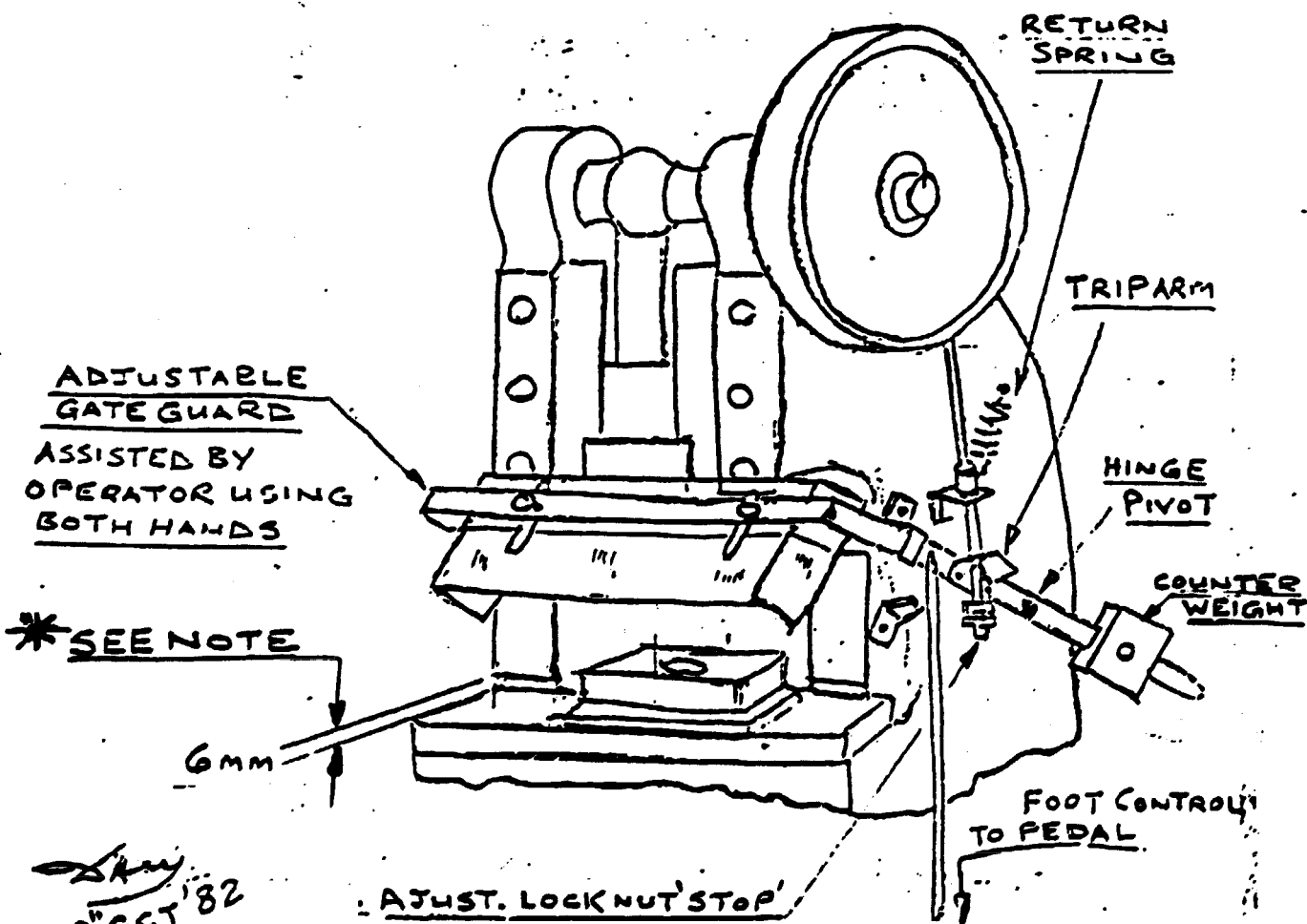
(Proposed Advanced Tooling Operations & Manufacturing Co-operative)
and Production Industrial Engineering Consultancy

ANNEX. II

DESIGNS AND SKETCHES

PRESS SAFETY DEVICES

* NOTE:- THE GUARD MUST BE SET UP BY RESPONSIBLE ENGINEER. TO 6MM SHORT OF CONTACT WITH PRESS PLATEN

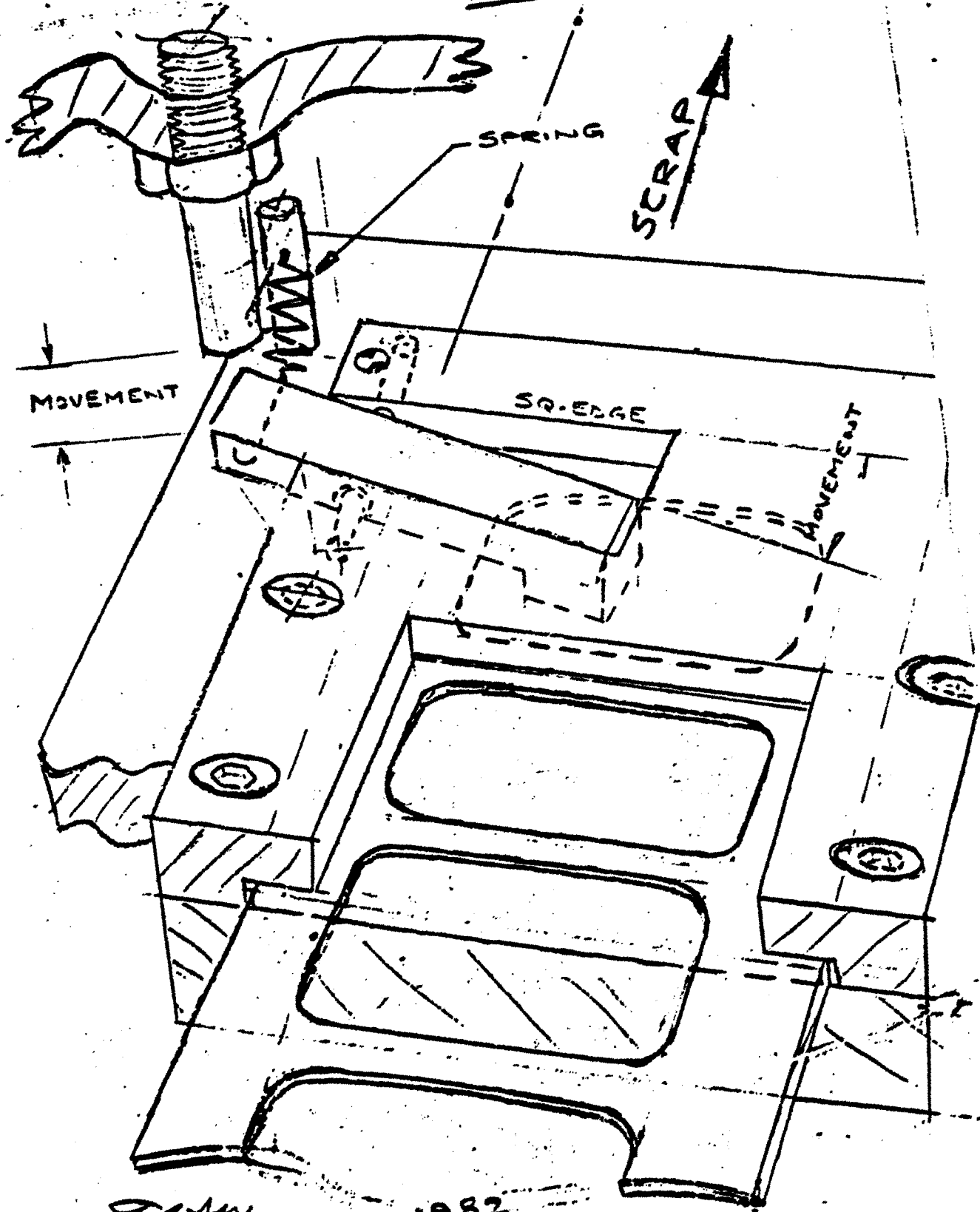


SWING GATE GUARD (FOOT OPERATED)

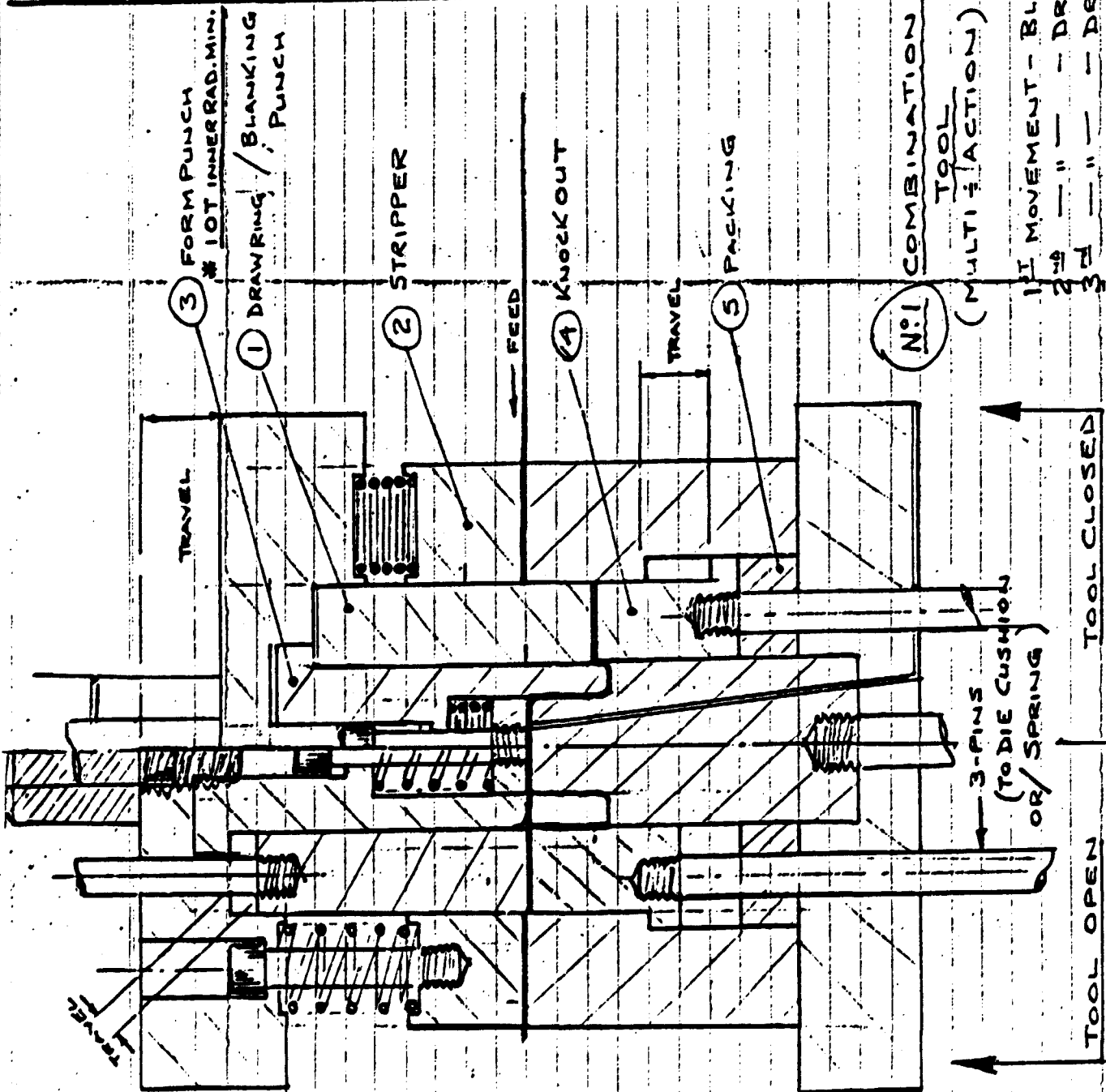
MATERIAL:-

CONSTRUCT FROM STEEL TUBE OR STRIP IN LINE WITH SIZE OF PRESS

SWING TRIGGER END STOP
for HANIL CAN CO.

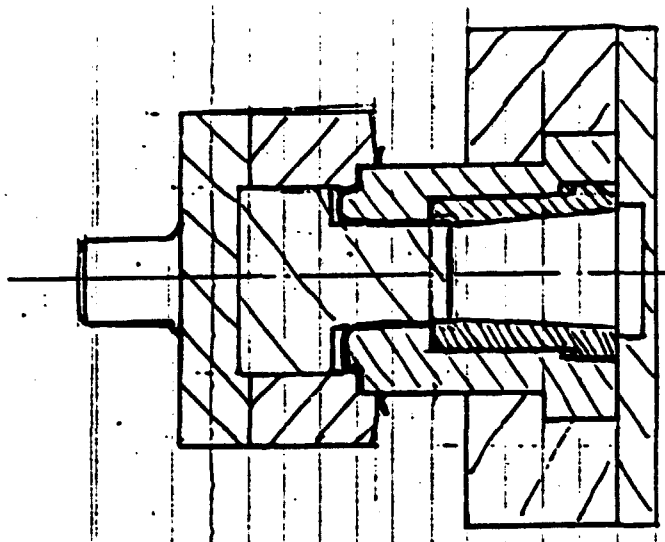


14 Nov 1982



N:1
COMBINATION
TOOL
(MULTI-ACTION)

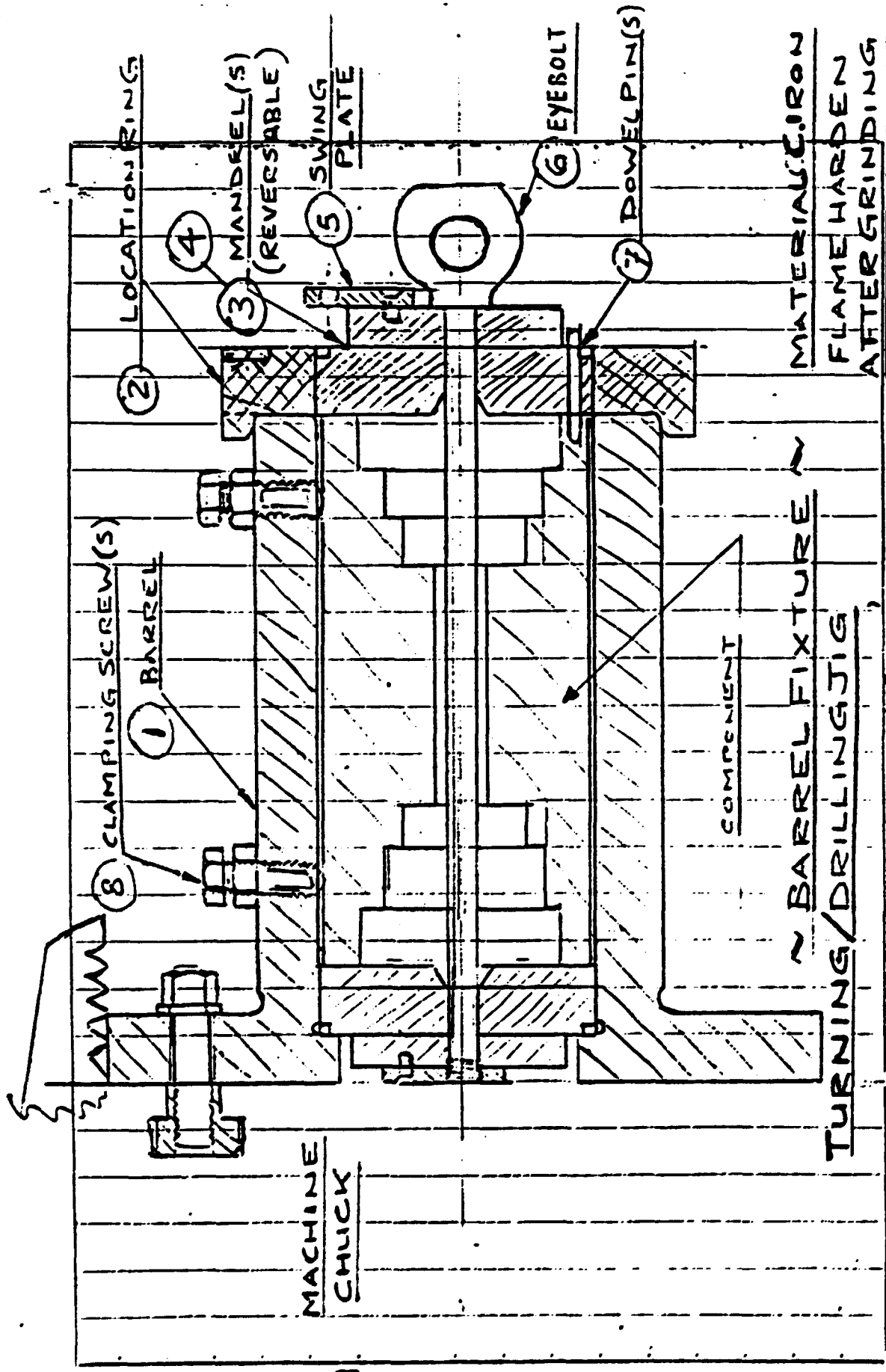
- 1ST MOVEMENT - BLANK
- 2ND " - " - DRAW (DEEP) * RATIO 1.13 (70115)
- 3RD " - " - DRAW (SHALLOW) - " - 0.13



N:2 PUNCH/TRIM TOOL

- (A) PUNCH / DIA. 26mm
- (B) TRIM / DIA. 53mm
- (C) RE-STRIKE RADIUS

NOTE: - EJECTION NOT SHOWN



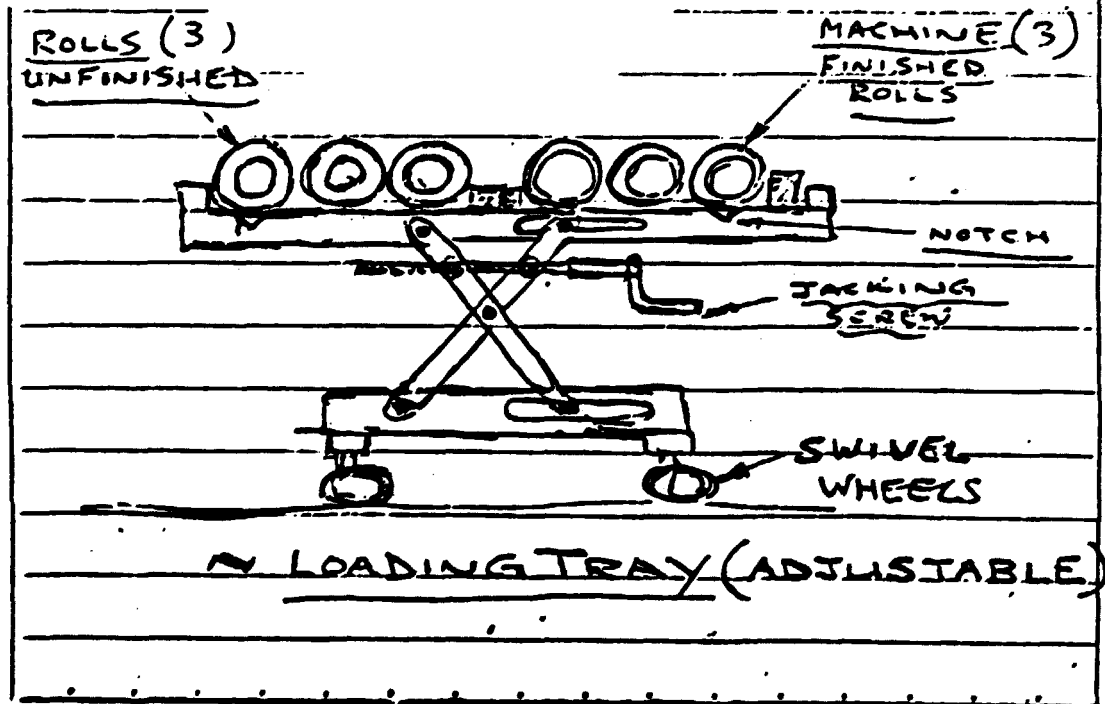
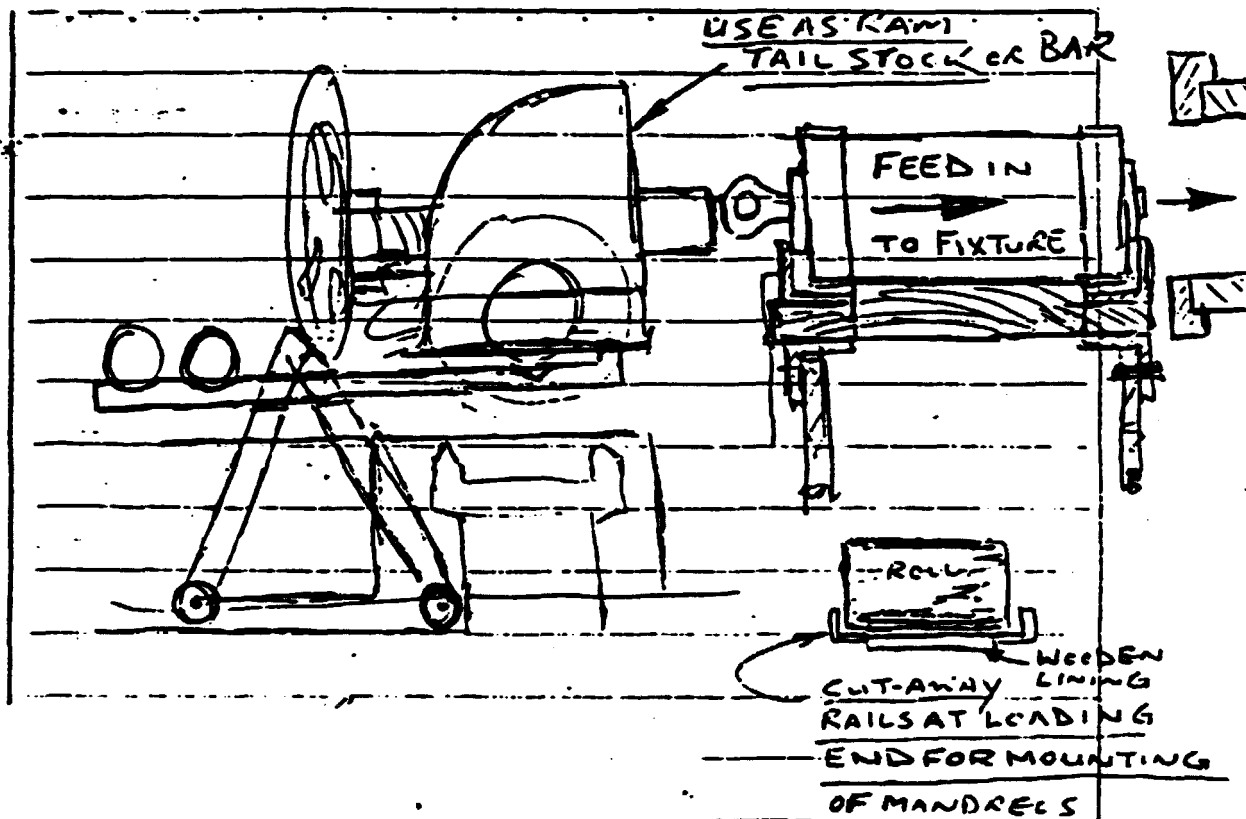
NOTE: - GRIND ALL DIAS

USE WITH 'STEADY' IN

PRODUCTION (IF REQUIRED)

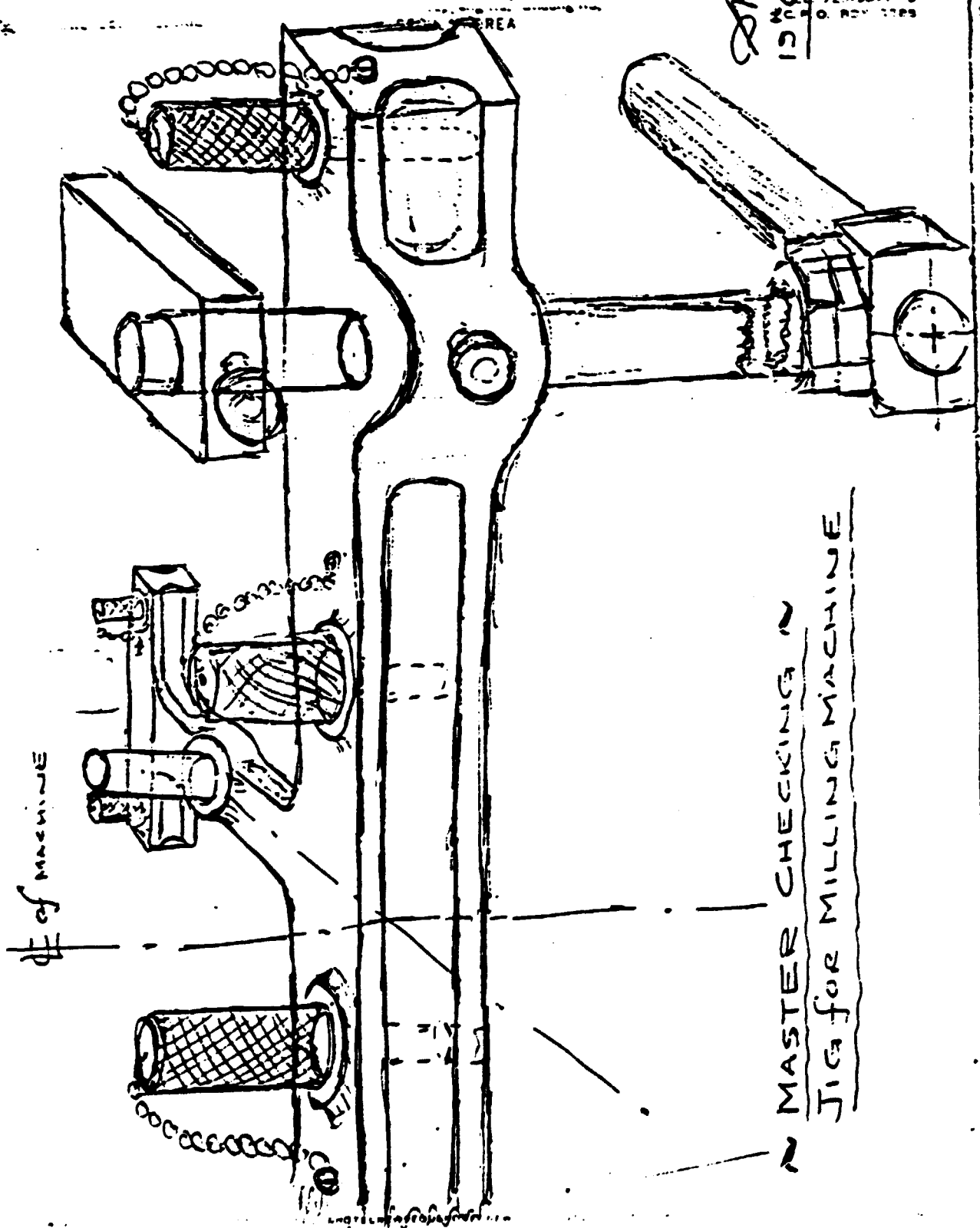
SCALE 1/4 FULL SIZE

17th OCT 1982



Z.M.S.
17 OCT 1982

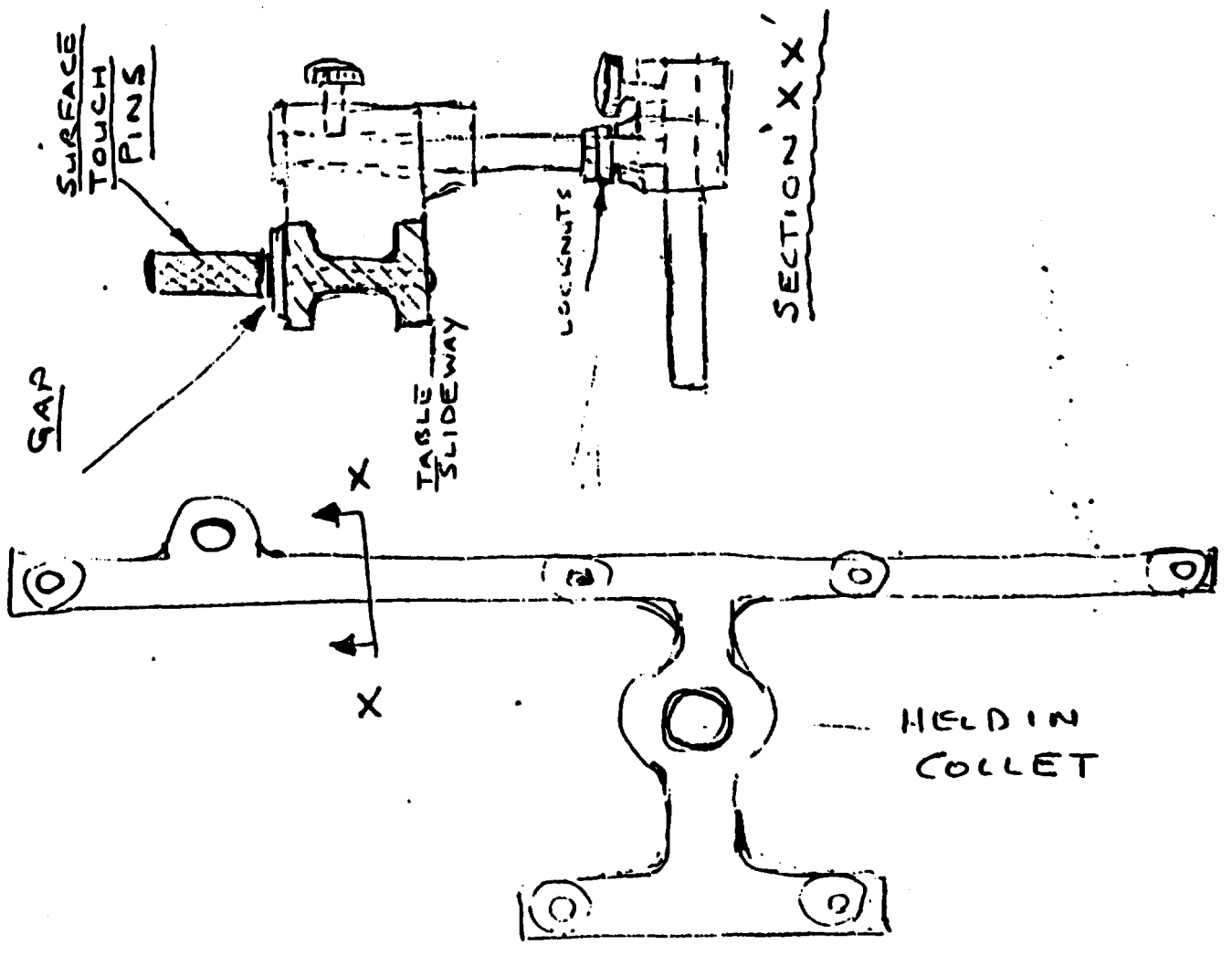
MATERIAL:- (NOMINAL)
33mm X 3' L' ANGLE IRON.
OR 'DEXION' TYPE ANGLE
+ 50mm HARDWOOD



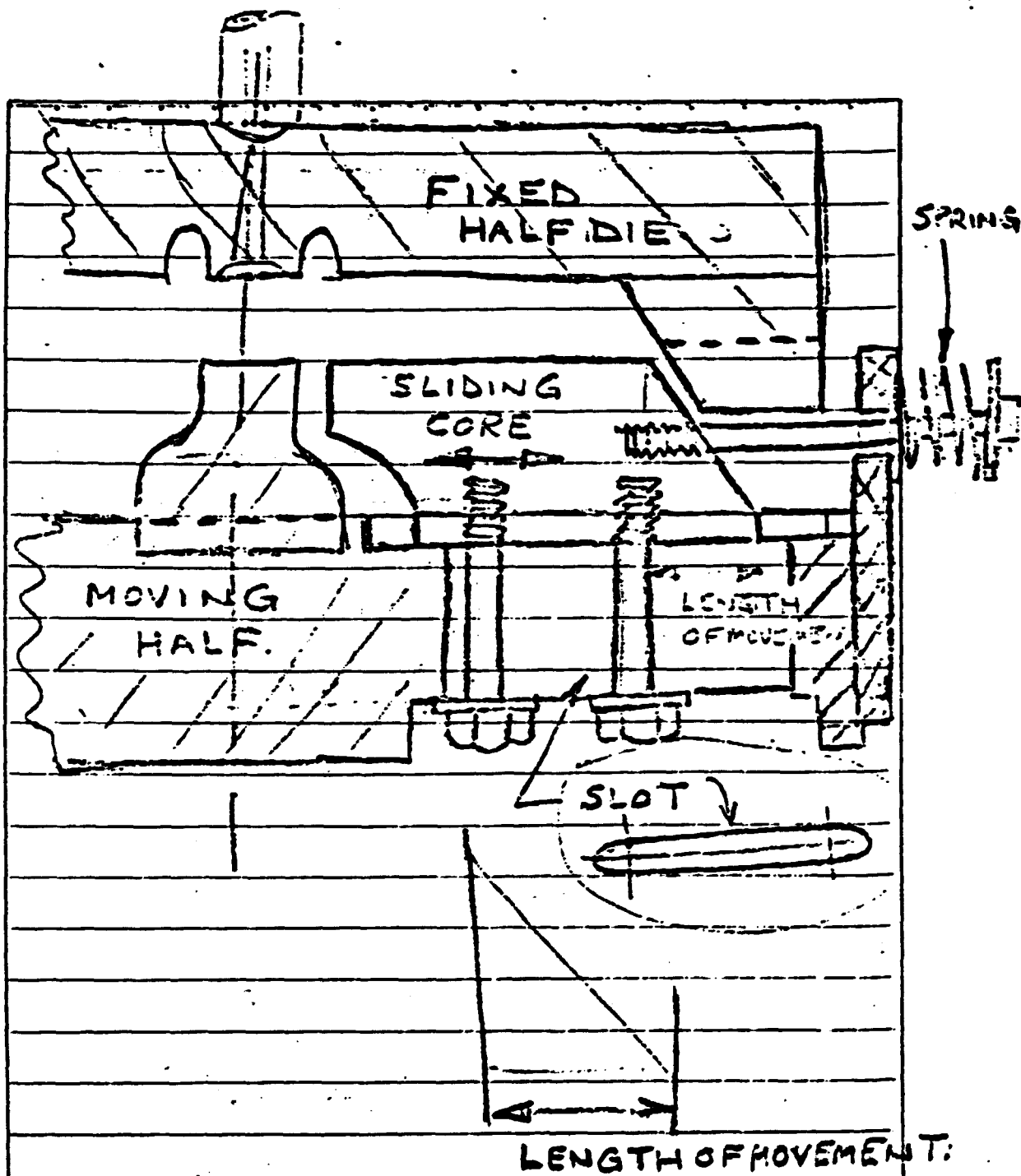
15 OCT 1982

725.9071-8
O. ROY 1199

MASTER CHECKING JIG
JIG FOR MILLING MACHINE



MUST BE GROUND
DEAD PARALLEL =

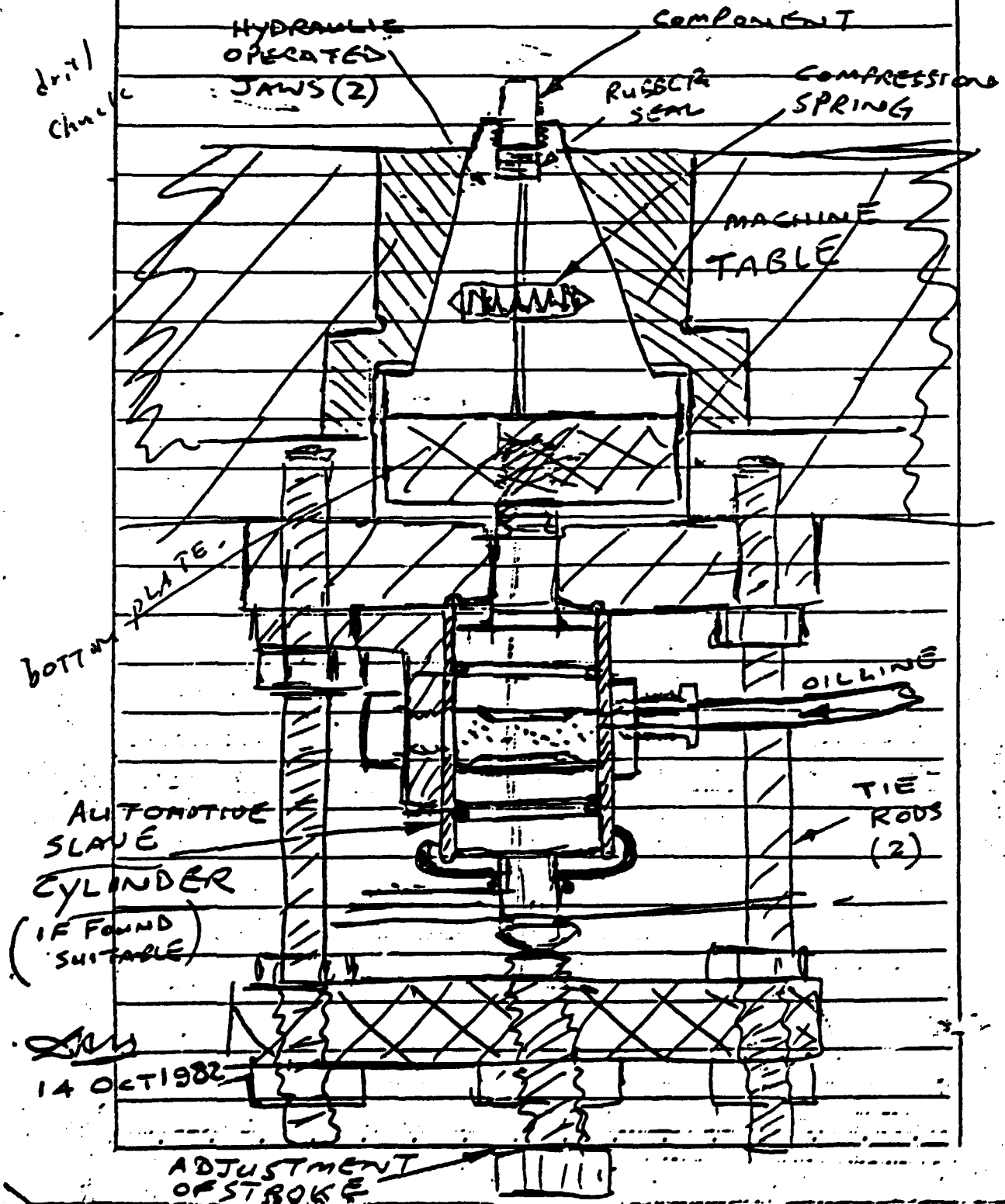


LOST WAX DIE
SLIDING CORE MECHANISM

11. NOV. 82

SELF-CENTERING HYDRAULIC JAWS

FOR TRANSFER MACHINE



ANNEX III

EXTRACTS FROM 5th 5 YEAR PLAN
1982-86

EXTRACTS FROM: "THE FIFTH FIVE-YEAR PLAN FOR ECONOMIC & SOCIAL DEVELOPMENT"
1982-1986 of Republic of Korea

Chapter Four

"TRANSFORMING THE INDUSTRIAL STRUCTURE ON THE BASIS OF COMPARATIVE ADVANTAGES"

.. for light industries, quality improvement & replacing obsolete facilities will be the major tasks. Investment will be expanded to improve productivity in low-productivity sectors, such as Agriculture & small/medium industry thereby enhancing the overall efficiency of investment.

The infrastructure will be further enlarged to prevent it from creating a bottleneck in future industrialization.

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"OUTLINES OF INDUSTRIAL POLICIES"

..the comparative advantage of Korea exist in skill-intensive products such as machinery & electronics. To expand such industries, particularly where employment effects are greatest.

For the export-oriented light industries, technological development & investment in production facilities will be encouraged.

-In addition, financial assistance as well as management training extension services will be given to small and medium industries to enhance their self-sufficiency.

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"AUTOMOTIVE INDUSTRY"

Korea's auto industry must also advance. Special emphasis will be placed on the parts industry. To increase productivity, the plan will promote specialization, standardization, and mass production of automobile parts & components.

Research institutes will lead the development of key technologies and expand the base for absorbing foreign technologies.

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SMALL AND MEDIUM INDUSTRIES

Small & medium industry is one of the less developed sectors in Korea's economy. Small/medium sized enterprises have not been able to gain easy access to new production technologies, proper information, or bank loans.

Their level of production technology is relatively low, and linkage with large enterprises is not well established. However, the development of small & medium industries is emphasized in the fifth plan. During the plan period, the government will lay emphasis on voluntary structural improvements of small & medium enterprises, instead of excessive protection and assistance to them

page 53

Efforts for cooperation among small & medium enterprises such as cooperative plant will be supported legally and systematically.

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