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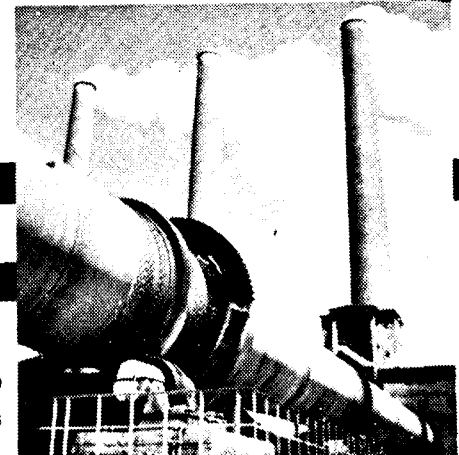
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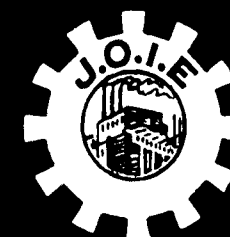
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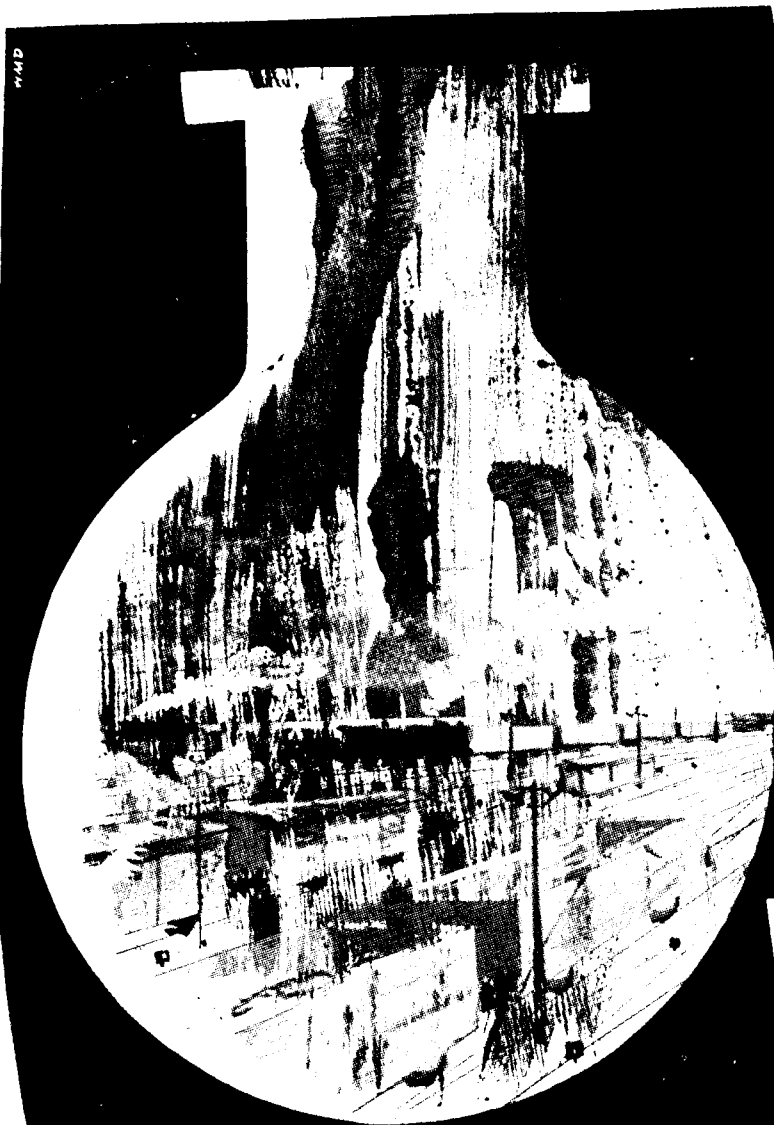
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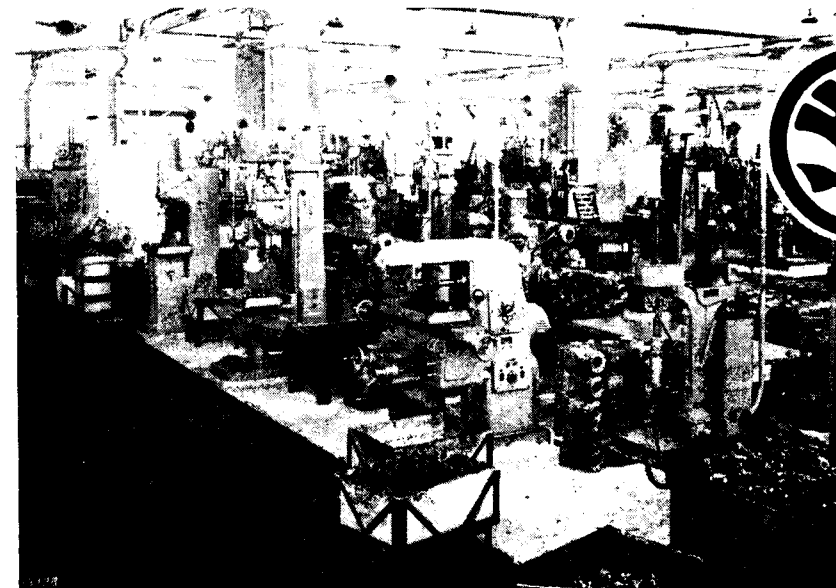
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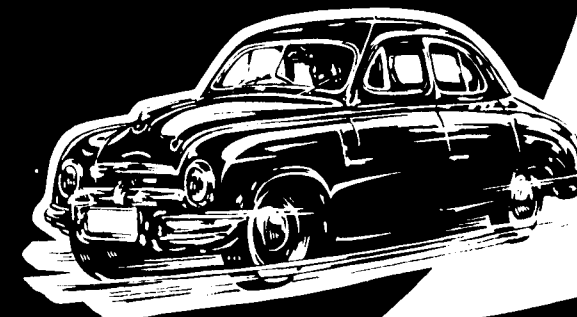
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SOVIET OIL & MACHINERY FOR DISTRIBUTION

SOVIET oil production has more than doubled between 1953 and 1959, from about 59.2 million tons a year to 128.4 million tons. The Soviet Union has naturally entered the world market to boost up her sales all over.

India is not the only new customer; there are several countries in Europe which are buying oil from the Soviet Union purely from commercial viewpoint. The soviet oil is quite good judged by all standards and cheaper than the oil sold by monopolistic western Oil companies. Russian methods of production of oil are very scientific, and the manufacturing cost is kept down at each level of processing with the result she is able to compete in the world market against most powerful and monopolistic oil companies of the west.

So far as India is concerned, apart from the cost of the Soviet oil, which is cheap, another important factor particularly at this juncture when India's foreign exchange position is considered, is the facility offered by the Soviet union to accept payment in rupees. Government of India's oil policy so far as the agreement entered into with the Soviet Union for the import of various types of Oil is quite in consonance with the national interests and the Oil Companies in the country have no right whatsoever to interfere with the Government's decisions in the above respect. However crude attempts have been made in the recent months to put all sorts of difficulties in the Government's way by campaigning a "rate-war" and trying to mislead public opinion on the subject through a section of the press.

The other day The Managing Director of the state-owned Indian Oil Company told the press that sales of the high speed diesel oil imported from the U. S. S. R. were fast improving and that the "rate-war" had come to a halt because IOC was able to compete successfully with the established Oil Companies which dislike Government's entry in this field, for reasons of their own.

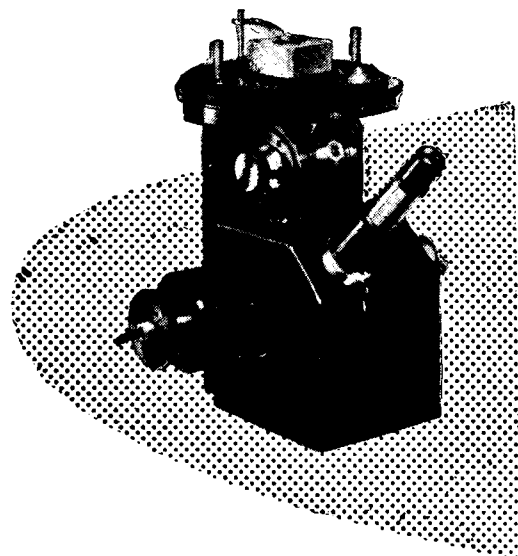
The problem of storage of imported petroleum products is being vigorously tackled by the Indian Oil Company. Side by side quick arrangements for the sales of the imported oil and products are being made on a country-wide basis. Already about 50 depots for sales are being set up in the interior to meet local demands for high speed diesel oil and kerosene oil.

The price factor is also being kept in view to match with the competitive prices offered by Oil Companies. Although individuals are forthcoming to market the Oil products imported by the Government, but preference is given by the IOC to Co-operative Societies which are interested in undertaking sales of the oil through their chain of centres.

The IOC has also assured all their Sales Executives and individuals engaged in distribution of the imported oil products that the Government will maintain an uninterrupted supply of all the products to their consumers. The IOC has no reason to find it difficult to implement this assurance particularly in view of the fact that the latest agreement entered into with the Soviet union envisages an import of 30 crores gallons of petroleum products per year within the next three years including high quality kerosene, jet fuel and high speed diesel. Furthermore, the Government of India is also considering the extension of this agreement to cover one more important item viz. furnace oil for industries.

In the meantime, the two Oil projects at Ankleshwar and Cambay are making good progress thanks to the role of Russian and Rumanian Engineers and also to our own band of young engineers and technicians who are actually doing the job under the supervision of Russian and Rumanian technicians.

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NEW CZECHOSLOVAK EQUIPMENTS

By Our Special Correspondent

SMALL HEATING UNIT FOR PLACING UNDER THE WINDOW

AT the Second International Trade Fair in Brno a small heating unit for placing under the window was shown in the stand of Techno export. This unit is a novelty in the production of air-conditioning devices in Czechoslovakia. Its great advantage as compared with similar units known so far consists in the fact, that its motor can be driven by lighting current.

This unit, manufactured by the Zavody Rudych letnic 1930 in Radotin will serve for the heating and ventilation of small rooms like offices, storehouses, shops, and apartments. Its output is about 400 to 500 cubic metres per hour. It is installed directly in the room, under the window. If it is to exhaust stale air from the room, this unit may be used with the motor running in the opposite sense. For exhausting air, the unit may be used only with an entirely closed air circuit. It must not, therefore, be used for this purpose if it is installed in a room into which no fresh air is fed.

This heating unit consists of a fan with a small motor, a dry air filter, a laminated air heater and a segmented regulating valve for closing the intake of air. All parts of the unit are closed-in in a self-supporting cover with an exhaust grating in its chamfered upper part. By setting the grate the discharge air current can be directed upwards, downwards or sideways. The heating unit is fitted on both sides with doors closing the chambers in which the regulating valves, the closing valve of the heating gas and the switch/change-over switch/of the fan motor are mounted. Adequate space is also provided for installing an automatic room temperature regulation device. This regulating device is not normally supplied with the heating unit, but it can be delivered and mounted on special request. The projection on the rear wall of the unit enables fresh air to be fed in from outside the heated room. If the unit is used for exhausting air, the projection serves for the discharge of stale air. The projection is designed in such a way as to enable its building-in into the wall. The heating gas feeding pipes can be led through the rear or side-wall or through the bottom of the unit. The sockets

of the heaters for feeding of the heating material are also provided in these lateral chambers of the unit.

Servicing of a correctly installed unit placed under the window is comparatively very easy. To ensure perfect filtering of the air, it is quite sufficient to clean the unit or to exchange the air filter, while the output of the heating unit can be regulated either by hand or automatically with the aid of a thermostat.

This new product, which is now in the stage of typization, will soon be manufactured in an adequate quantity to satisfy the needs of all purchasers. The manufacturing plant/Zavody Rudych letnic 1930 in Radotin/supplies also centrifugal fans, coolers, and heaters, as well as different kinds of equipment for air conditioning, ventilation, exhaustion and climatization.

TYPE TZO 40 DEGREASING APPARATUS

Degreasing is one of the most important methods of surface treatment of materials before metallizing, varnish coating, sand blasting, phosphating, annealing, or assembling them into a vacuum system, etc.

When using chlorinated hydrocarbons degreasing in vapours, by spraying and submersion are applied as suitable methods. The basis of these degreasing methods is as follows: When using the vapourized method the degreaser, heated to the evaporating temperature, fills the degreasing vessel containing the parts to be treated. The cold workpieces situated in this space cause the degreaser vapours to condense, to wash the former and to dissolve the fats, waxes, resins, etc. The workpieces are in contact with a pure degreaser, so that no further rinsing is required. When using the spraying method for degreasing the workpieces are flooded with the solvent which overflows back to the storage tank for spraying. When using the submersion degreasing method the solvent is kept in the degreasing tank in order that the workpieces may be completely submerged. When using the spraying or submersion degreasing method with a cold degreaser, the degreasing is not so effective as when using hot vapours of the degreasing agent, which is the most effective method of degreasing by means of chlorinated hydro-carbon.

When using a vapourized degreasing agent the problem arises, however, of how to remove grease

from the surface of thin-walled workpieces. The generally used degreasing apparatus, with which the workpieces to be treated are inserted directly into the space containing the solvent already heated to the evaporating temperature, have not proved well for this purpose, since the component parts are quickly heated to the temperature of the vapours, so that degreasing by condensing cannot take place.

In addition, the degreasing apparatus generally manufactured are more suitable for degreasing of coarse workpieces more produced in heavy engineering factories both due to their size and degreasing possibilities as well as their general arrangement.

Best factories concerned with these problems have not succeeded in finding a suitable solution and they carry out degreasing in a cold solvent either by spraying or by submersion, but mostly as a hand-operated process. These working methods, however, do not correspond with the modern manufacturing method and manufacturing equipment due to the quality of degreasing as well as the fact that they create unhygienic working conditions.

In Czechoslovakia the Prsovice factory of the national corporation of TESLA, Roznov, has developed the TZO 40 degreasing apparatus, which is an absolutely new feature in the degreasing technique and complies with all requirements encountered in fine mechanics, electronics, optics, etc.

The type TZO 40 degreasing apparatus is a laboratory type of small dimensions and is suitable for degreasing fine and medium size workpieces. It can be used for degreasing by means of vapours, spraying, and, when using an overflow tank, also by submersion. The apparatus can be used also for redistilling the solvent which can be fed into the storage tank for spraying or also to a vessel outside the equipment.

It consists of a frame in which the degreasing tank and the boiling tank are incorporated. Both these tanks are interconnected by arms with coolers. When degreasing by means of vapours the latter flow from the boiling tank through the arms to the degreasing tanks, where they condense on the workpieces and the cooler. When replacing the workpieces to be degreased the flow of vapours is interrupted by cooling the arms. Degreasing by spraying and by vapours can be combined with advantage. The storage tank for spraying is mounted under the boiling tank, and the

degreasing agent is delivered by a pump controlled by push-buttons. According to the degreasing method used the degreasing agent is fed through stop valves either to the storage tank or to the boiling tank.

During the degreasing process the degreasing tank is air-tightly closed. When replacing the baskets with the workpieces the vapours in the degreasing tank are condensed after cooling the arms. After opening the flap of the exhaust equipment the baskets containing the workpieces can be removed without the attendant coming into contact with the vapours of the degreasing agent.

Separation of the degreasing tank from the boiling one has enabled the time of the degreasing process in vapours to be lengthened. It has also enabled the combined degreasing method and the inlet into the degreasing tank from which the vapours of the degreasing agent have been removed.

The degreasing apparatus is fitted with a water and slurry trap. The temperature is controlled by a contact thermometer which is mounted in the control box together with the switches. The workpieces intended for degreasing are inserted into the degreasing tank in such manner as to get into mutual contact on the smallest possible surface. Should this condition be unattainable, the workpieces can be degreased in a removable swing basket situated in the degreasing tank. The swinging of the basket is controlled by push-buttons.

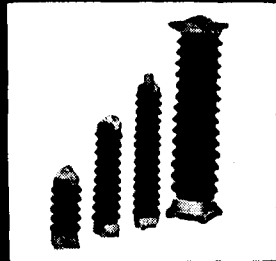
When using trichlorethylene for degreasing it is not recommended to process Al, Mg, and their alloys without stabilizing. Technical data:

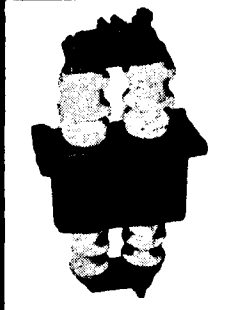
Capacity: boiling tank	..	approx. 40 lit.
Storage tank	..	approx. 40 lit.
Evaporating temperature	..	87°C, adjustable for C_2HCl_3
Time of boiling of C_2HCl_3	..	15 to 20 min.
Electric input	..	max. 9.5 kW— 3×380 V
Weight of charge	..	10 to 15 kg.
Time required for degreasing	..	1 to 15 min.
Capacity of the degreasing space		500×300×400 mm.

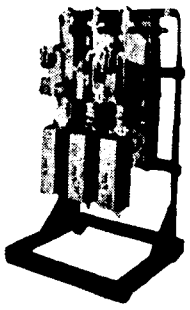
Pump output	..	20 lit. per min.
Water consumption	..	approx. 9 lit. per min.
C_2HCl_3 consumption	..	approx. 100 g. per sq. m. according to drying
Exhausting	..	0.1 cu. m. per sec.
Covered floor area	..	1.35×0.8 m.

The design of the type TZO 40 degreasing apparatus enables its incorporation into manufacturing lines as well as use in laboratories, in general manufacturing processes, and in factories where degreasing has been hitherto carried out by means of obsolete apparatus, or by hand.

The degreasing apparatus was displayed in the TECHNO EXPORT stand at the International Trade Fair in Brno, which took place from 11th to 25th September, 1960.







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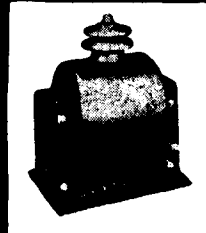
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A. E. I. MULTI-CHANNEL CARRIER EQUIPMENT FOR OIL INDIA PIPELINE PROJECT

THE Transmission Department of A. E. I. Telecommunications Division announce that a £130,000 order for carrier transmission equipment has been received from Murphy Radio of Welwyn Garden City. The equipment will form part of an extensive radio network for the 720-mile Oil India Pipeline Project in Northern India.

Work on the laying of the pipeline, considered to be one of the largest of its kind in the world, is scheduled to start in November.

Main purpose of the radio link will be to provide the control headquarters of Oil India Private Ltd., at Nunmati with telemetering facilities, ensuring a constant check on oil flow output along the pipeline from the issuing station to the terminal refinery. The radio link will have an ultimate capacity of 34 channels for telemetering and teleprinter facilities, and speech transmission. Teleprinter services will be allocated on a separate channel connecting pump and maintenance stations on an individual link basis.

The transmission path will follow the oil pipeline route from the issuing station at Nahorkatiya, in the state of Assam, westwards along the Brahmaputra Valley for 260 miles to the pipeline control headquarters and Government oil refinery at Nunmati. It will then cross to the north side of the river and continue westwards or a further 460 miles skirting the Pakistan frontier and ending at the terminal oil refinery of Barauni, in the state of Bihar.

A. E. I. transistorised channelling equipment of the most up-to-date type will be installed at the terminal and intermediate stations, and at most of the repeater stations along the route.

Over the longer communication arm, to the west, fifteen radio repeaters and back-to-back terminals will be positioned with local access to A. E. I. channelling equipment, while nine radio repeaters will be spaced at intervals over the shorter distance, to the east.

Access points established at the repeater pumping stations and maintenance stations will allow mobile V. H. F. links to be fed into the main network.

In the event of a possible emergency breakdown, the carrier channelling equipment will automatically transfer to stand-by radio repeater units.

The A. E. I. multi-channel carrier system chosen conforms to the international standards recommended by the Comité Consultatif International Téléphonie et Télégraphie (C. C. I. T. T.).

Each voice channel occupies a bandwidth of 4 kc/s and will transmit speech frequencies from 300–3,400 cycles. The speech channels are combined into a basic group of 12 channels covering a frequency bandwidth of 60–108 kc/s. Three of these 12 channel groups are then translated into the frequency band 6–156 kc/s so as to allow a total of 36 channels to be transmitted over the radio path. Two of the 36 channels are concerned with the control frequencies associated with the working of the radio link, leaving a total of 34 channels available for conveying pipeline information.

The contract will be carried out in two phases. Carrier equipment for the eastern link will be shipped out in June, 1961 and should be fully operational by December. The western section will follow in October, 1961, and should be ready for switch-over in April, 1962.

THE AUTOMATIC LEVEL "KONI 007"

By Ulrich Schmidt
Jena—Germany

IN all fields of technology, automation is continuously gaining in importance. In addition to a considerably higher economy, partial or full automation also results in an increased accuracy of the results obtained. By putting less strain on the operator, the accidental error which depends to a great extent on the degree of fatigue, is largely eliminated.

What is said above in general, applies also to surveying in particular. Any relief afforded to the surveying engineers is of help towards improving on the accuracy of the measurement. Economy can be increased by improving the measuring processes and by applying more economical instruments. The first is largely a matter for surveyors, whereas the design of efficient surveying instruments is the task of the instrument producing industry. Below there is a report about the newest development by VEB Carl Zeiss Jena in this field: the Automatic Level "Koni 007".

For height measurements by means of levels it is usually necessary to align the line of sight of the level horizontally before reading the staff. With classical levels this is done manually by means of a spirit level, whilst with modern levelling instruments it is done to a limited extent automatically with a compensator.

When inclining the sighting line (telescope axis) of a levelling instrument through an angle of tilt α from the horizontal, a horizontal ray is no longer incident on the horizontal line of the telescope graticule but on a point removed by $\alpha \times f = a$ (Fig. 1). If an optical element is arranged behind the objective, which shifts the target image relative to the inclination by the same amount α in the opposite direction (Fig. 2), the horizontal ray is again incident on the horizontal line of the graticule and the reading is accurate.

As optical element for this purpose a roof mirror with 180° deviation is useful. A displacement of this roof mirror, designed as a prism in this instance, by $a/2$ in the direction of its hypotenuse, shifts the emergent ray by the amount of a (Fig. 3). If this roof mirror is fixed to a gravity pendulum of $f/2$ length, the roof mirror at an inclination of the

instrument is shifted by an amount of $\frac{f}{2} \times \alpha = \frac{a}{2}$ and the target image by the amount of a .

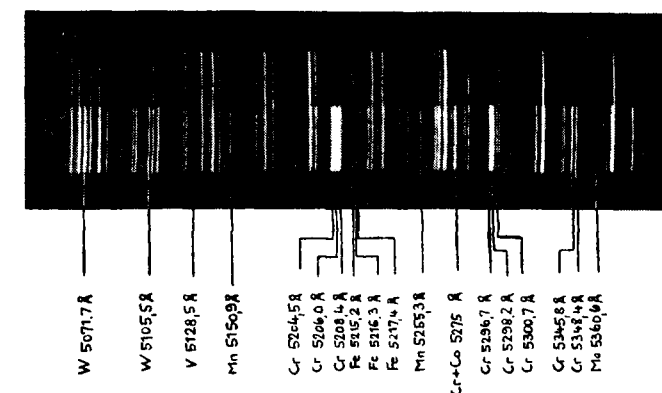


Fig. 1. Course of a horizontal beam in a telescope inclined by α to the horizontal

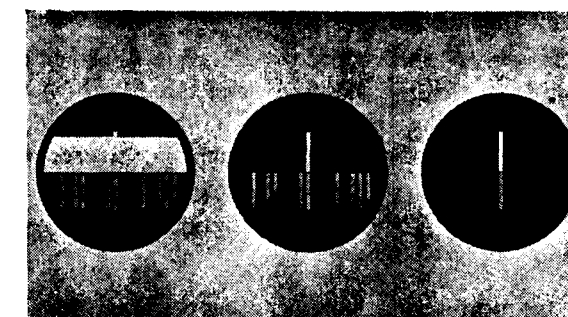


Fig. 2. Diagram same as Fig. 1, but with the horizontal beam shifted by the amount of $f \times \alpha = a$

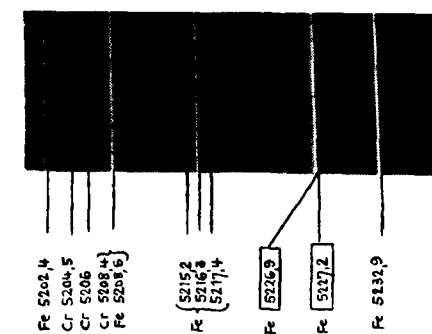


Fig. 3. Displacement of the emergent beam when shifting a 180° deviation prism

The Automatic Level "Koni 007" applies the above described system. The optical arrangement is illustrated in Fig. 4. Behind the cover glass (1) is the pentagon prism (2) which serves simultaneously

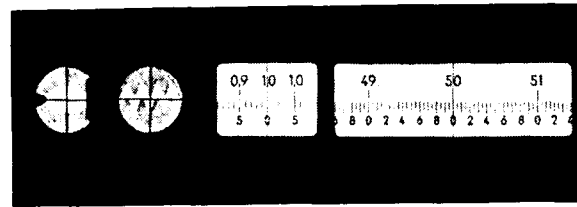


Fig. 4. Optical diagram of Automatic Level "Koni 007" 1=Front glass; 2=Penta-prism; 3=Objective; 4=Focusing lens; 5=Compensating prism; 6=Roof-prism; 7=Graticule; 8=Eyepiece.

as an optical micrometer. Below the objective (3) with the focussing lens (4) is the compensating prism (5) suspended in pendulum fashion. Next follow the roof prism (6) the graticule (7) and the eyepiece (8). The image produced is upright and right and left correct.

The vertical shape of the levelling instrument resulting from the optical design and the length of the pendulum, has the advantage that the line of sight passes higher above the ground than in the case of a horizontal levelling instrument. This means that the measurements are affected to a lesser extent by refractions close to the ground.

The Automatic Level "Koni 007" (Fig. 5) consists of the vertically standing, rotatable telescope body (11) and the tribrach (12), which is fixed by means of a tightening screw on the tripod. On the telescope body are the viewing aperture (13), the focussing knob (14) and the fine-motion screw (15) and the clamp (16) for lateral movement, the pinion head with graduation (17) for the micrometer, the clamping knob (18) for clamping the micrometer in the central position, the microscope eyepiece (19) for the horizontal circle and the telescope eyepiece (20). Not visible in the illustration is a box level according to which the levelling instrument can be coarsely set in vertical position as well as a sight for the sighting of the staff.

On the telescope graticule graduations for the optical distance measurement are marked. All air-

glass surfaces are anti-reflection coated. The compensating pendulum is provided with air damping, and operates over a range of tilt of ± 10 minutes of arc. The built-in micrometer (Pentaprism) has a setting range of 5 mm, and can be clamped firmly in its central position. The horizontal circle is made of glass and is supplied with a graduation of $400''$ or 360° .

The Automatic Level "Koni 007" can, when using appropriate staves, be used for all pertinent work of medium to high accuracy. On the basis of experiments carried out so far, under average conditions and without the use of a micrometer, an average error of ± 2 to ± 3 mm for 1 kilometre of double levelling is achieved. When using the micro-

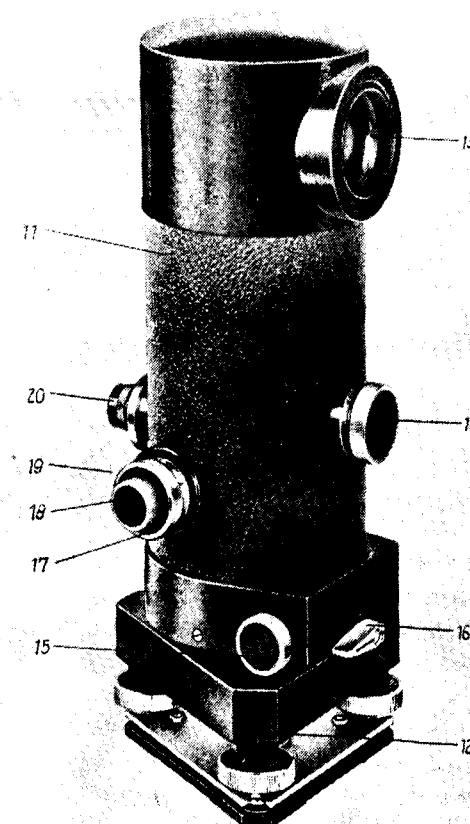


Fig. 5. The Automatic Level "Koni 007" 11=Telescope body; 12=Tribrach; 13=Objective-opening; 14=Focusing head; 15=Fine-setting screw for lateral motion; 16=Clamping lever for lateral motion; 17=Micrometer drive; 18=Clamping head for micrometer; 19=Microscope eyepiece; 20=Telescope eyepiece.

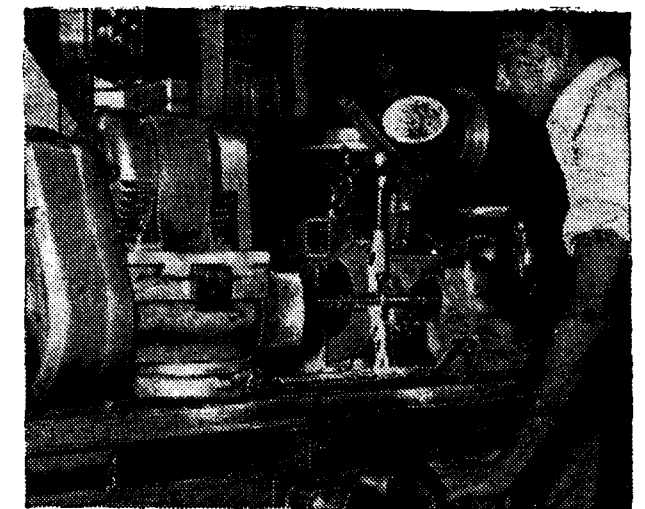
meter and precision staves with invar tape, an average kilometre error of 0.5 to 0.8 mm is attained.

SPECIFICATIONS

Telescope	Magnification	31.5 x
	Internal objective diameter	40 mm.
	Angular field of vision	1.3°
	Multiplication constant	100
	Addition constant	0
	Shortest sighting distance	2.2 m.
Horizontal circle	Scale intervals	10' bzw. 10°
	Estimation to:	1' bzw. 1°
Box level	Indication	8'/2 mm.

Two high flotation fully-tracked trailers with removable bogies which can be converted on the spot to conventional road transport, have been made in the U. K. for the first time. They were shipped recently to Port Harcourt for use by Shell-BP Petroleum Development Company of Nigeria Limited. The use of removable tracked bogies means that the trailers can either be used fully tracked in the swamps or, fitted with normal rubber tyred bogies, for road work. The trailers are standard 28-ton oilfield trailers adapted to the design of Shell engineers by a firm in northwest England. The rear bogie arrangement is readily removable and can be fitted with either a fully tracked bogie or a conventional rubber tyred bogie. At the front end, when the tracked bogie is removed, the trailer can be attached to a fifth wheel tractor and operated as a semi-trailer.

The front end dollies are joined to the trailer frame by a normal fifth wheel attachment, thus allowing the trailer to be used in a fully articulated application. The rear bogie is also fitted with a quick release catch similar to the fifth wheel attachment, with the addition of rubbing plate guides to enable it to slide on to the king pin. Spring loaded pins are used on each side which lock in position when the bogie is properly connected.



Product performance counts

For the speedy production of machine parts to close size tolerance with good surface finishes, Grinding Wheels of high quality, efficiency and precision are essential. The picture above shows a Hardened Steel Machine Shaft being precision ground by Carborundum Universal Grinding Wheel on a Jones & Shipman Universal Cylindrical Grinder.

CARBORUNDUM UNIVERSAL manufacture a wide variety of Grinding Wheels and other Abrasive products of the highest quality for every industry. These products are helping top firms to make better products, to cut costs, and to speed production. Whatever the Grinding operation, Bonded Abrasives by CARBORUNDUM UNIVERSAL cannot be beaten for high quality and economy.

We are now in a position to manufacture and supply large wheels upto 36 inches in diameter thus offering our customers a complete range of Vitrified and Resinoid Grinding Wheels.

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Z-601

U. S. ELECTRIC INDUSTRY PLANS TO DOUBLE ITS GENERATING CAPACITY BY 1970

By An Engineering Correspondent

THE nation's privately owned electric light and power companies are already planning and building to meet "staggering" requirements of the 1970's and 1980's, according to the President Allen S. King of the Edison Electric Institute, the industry's trade association.

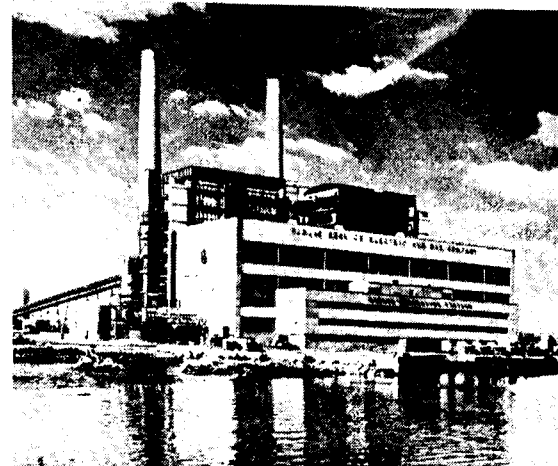
"All indications are that the use of electricity will continue in the future as it has in the past at a rate that will double the power-producing capability of the nation's investor-owned electric companies by 1970 and again by 1980," Mr. King said.

"By 1970 the privately owned electric companies will more than double their present power-producing capability, reaching a total of 263,000,000 kilowatts, compared with 127,000,000 at the beginning of 1960. By 1980, their capability is expected to reach more than 492,000,000 kilowatts, nearly four times today's total and almost twice that predicted for 1970."

(Approximately 76 percent of the present installed generating capacity that produces power for public use is owned by private companies which serve 77 percent of all electricity customers. The balance is owned by Federal, State and municipal power agencies. Industrial plants and land transportation systems also generate power for their own use. Total U. S. generating capacity at the end of 1959 was 174,139,000 kilowatts. With about 6 percent of the world's population, the United States produces nearly 40 percent of the world's energy—more than three times as much as the USSR, the next largest producer. In 1959 U. S. total electric power production by private and public utility and industrial plants was 794,509 million kilowatt-hours).

The Edison Electric Institute president admitted that it might be difficult to understand how U. S. consumption of electricity could quadruple in the the next 20 years, but he claimed his figures were not too optimistic.

In discussing the future U. S. power requirements,



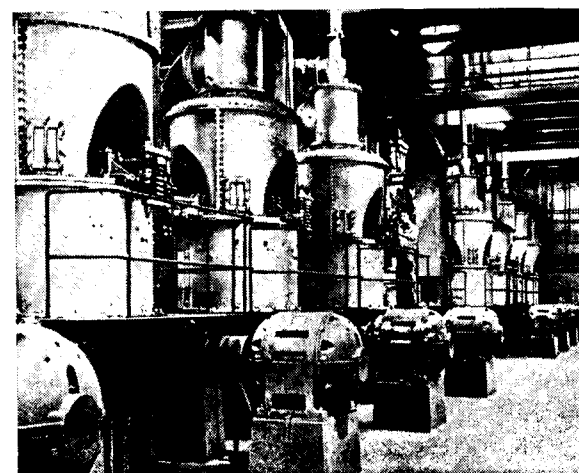
580,000 KILOWATT GENERATION STATION

This is the Bergen Generating Station, at Ridgefield, New Jersey, owned by the Public Service Electric & Gas Company of New Jersey. Because capital cost per unit of added generating capacity fall as the size of plant increases, the trend in the United States has been for construction of bigger and bigger power plants. As a result, generating additions of 100,000 kilowatts and over have accounted for four-fifths of aggregate additions in recent years, while units of 50,000 kilowatts or less have accounted for less than 5 per cent of the total. Cost per unit of added capacity dropped from \$17 in 1947-50 to \$12 in 1956-59.

Mr. King said the use of electrical appliances had increased tremendously.

"There are literally dozens of appliances available today that hadn't even been invented in 1940," he added. "About 600,000 U. S. homes are now heated with electricity and we haven't yet scratched the surface in electric home furnace installations. Ten years ago, the average residential consumption of electricity was 1,830 kilowatt-hours. Last year, it was 3,563, nearly twice as much—and the predicted yearly figure for 1970 is 7,000 kilowatt-hours."

Mr. King stressed that the nation's increase in population—it grew 18.5 percent in the decade 1950-60—was a constant factor and automatically supplied a continuing new market, with more than 1 million



BOWL MILLS FOR PULVERIZING COAL

In the world's steam-fired electric generating plants, pulverized coal has become the most widely used fuel. In America today pulverized coal produces about 70 per cent of the nation's fuel-generated capacity which, in turn, accounts for 80 per cent of total electric generating capacity. This shows a line of bowl mills in a U.S. power plant which are grinding lumps of coal into superfine black powder and spewing it into the plant's furnaces where it is instantly consumed. Pulverized coal firing was first developed commercially about 40 years ago by Combustion Engineering, Inc., a U.S. Company.

new customers being added each year. Moreover, the average residential rate per kilowatt-hour has consistently dropped over a period of years.

Sales of electric power by private electric companies to industrial customers in 1959 totalled 303,000 million kilowatt-hours compared with 120,700 million kilowatt hours in 1949, Mr. King said. In terms of electric energy used per worker, he said, usage has increased from 12,258 kilowatt-hours in 1948 to 25,032 kilowatt-hours in 1958. The 1958 usage per worker was equivalent to the muscular energy of 300 men.

Due to industrial growth and increasing mechanization and automation, Mr. King said, the Edison Electric Institute expects consumption by industrial customers of the private companies will more than double by 1970 to a total of 620,000 million kilowatt-hours and will increase again to 1,150,000 million kilowatt-hours by 1980.

"On the farm," Mr. King continued, "the potentialities for growth are at least equally exciting."

He predicted many new uses of electricity are "just around the corner," citing, as one example, the developing interest in a small electric passenger car for

use as a town car. Its batteries would be recharged from the house current.

As other possibilities, Mr. King mentioned the electronic cooking stove which roasts meats in only a few minutes, large mural television projection in the home, heating and cooling wall panels, ultra-sonic clothes washers and dish washers that use sound waves to do the cleaning, electro-luminescent wall panels that change colour electrically, and the automatic laundry.

However, statistics show the chief user of electricity in the United States is industry and the predictions are that industry will continue to be the leading consumer. Of the 709,700 million kilowatt-hours generated by private owned electric utility companies in 1959, 303,000 million kilowatt-hours, or 42.7 percent, was consumed by their industrial customers.

In order to market the output from the much larger generating units being constructed now and being planned for the future, power has to be transported over longer distances and transmission voltage levels will continue to be raised as in the past. Along with larger units and higher transmission voltage there will be a greater degree of inter-connection and co-ordination among utility systems, according to Federal Power Commission experts.



LOAD DISPATCHER

This shows two of the three dispatchers at the Newark, New Jersey, load dispatching center of an electric company who control the generation and distribution of electricity for the northern area of the State by means of automatic remote load-control equipment, graphic instruments on a 210-foot-long panel, and 100 telephone lines. Weather changes can be observed on the graphic instruments as they occur as well as the electric load on the entire system, how much is being carried by each station, the voltage, and other important data.

Recently the Public Service Electric and Gas Company of Newark, New Jersey, unveiled an installation which is likely to be common in future years. It is a remote control system for distributing electricity. Although not the first such system in the United States, it is said to be the largest now in operation.

The company says that its \$500,000 electric load dispatching centre at Newark is expected to serve the company's needs in the northern New Jersey area for the next 25 years.

At the Newark centre, from a panel board 10.5 feet high and 210 feet long, three dispatchers control the operation of the northern part of the system. A second centre at Burlington, New Jersey, regulates power in the southern part of the system.

Altogether the two centres regulate the company's output of more than 2,800,000 kilowatts of generating capacity and the exchange of power with a group of four other electric companies with which it is interconnected. The pool has more than 12,000,000 kilowatts of generating capacity at its disposal.

From the huge panel at the Newark centre, load dispatchers are able to observe and then control from consoles the output of turbine-generators, transformers and transmission lines; see that the electricity is being produced at the lowest possible cost and that high voltage equipment is properly de-energized and made safe for maintenance and repair work.

Each load dispatcher is stationed at a console where 100 telephone lines connect him with all the stations he supervises, as well as with other vital points in the system. All telephone conversations originating or terminating in the centre are automatically recorded on magnetic tape for future reference.

The boards in front of the load dispatchers contain diagrams of the equipment in the stations through which the electricity travels to the customers. There are instruments to indicate the load on the entire system and the amount carried by each station, the voltage and other data.

Since whether is an important factor in electric load, the centre also is equipped with instruments to measure wind direction, wind velocity, barometric pressure, temperature, and humidity.

New Computer Incorporating Ultra High-Speed Switching Technique

A new digital computer which incorporates the new ultra high speed switching technique, making it about 1,000 times faster than previous models has been announced by a leading electronics firm in London. Known as the 503 it has a switching time of only 5 milli-micro seconds, which, the firm claims, by the best of present day standards is one of the fastest computers to be marketed anywhere. The high switching speed gives the new computer a working capacity incomparably greater than that of conventional types of machines.

The computer is designed so that it retains the simple, easily understood instructions developed for earlier types. The company is producing a complete system for the 503 which incorporates an unlimited extension of the storage facilities by means of new high speed magnetic tape storage units as well as a

wide range of input and output equipment and special keyboards for the running of parallel programmes. The capacity of the new computer is such that, by time-sharing, it will be possible for computers of this type to undertake a number of different jobs simultaneously. The firm says that a full range of automatic programming routines, including internationally agreed autocoding systems, will be available for the new computer, and claim that with the enormous work capacity which results from the ultra high speed of operation of the machine, the unit cost of work done is a fraction of that incurred on other machines of comparable size both in this country and in the U. S. A. The first applications for a machine of this speed and work capacity are likely to be for scientific work in research establishments, universities and technical colleges.

VOKES DIESEL LOCOMOTIVE FILTRATION EQUIPMENT

By A Railroad Engineer

THE finding of a satisfactory solution to the problem of diesel powered locomotive air filter selection is not an easy one. In fact, it is much more a question of compromise. Selection and the final decision depends on a number of factors such as pressure—drop and space.

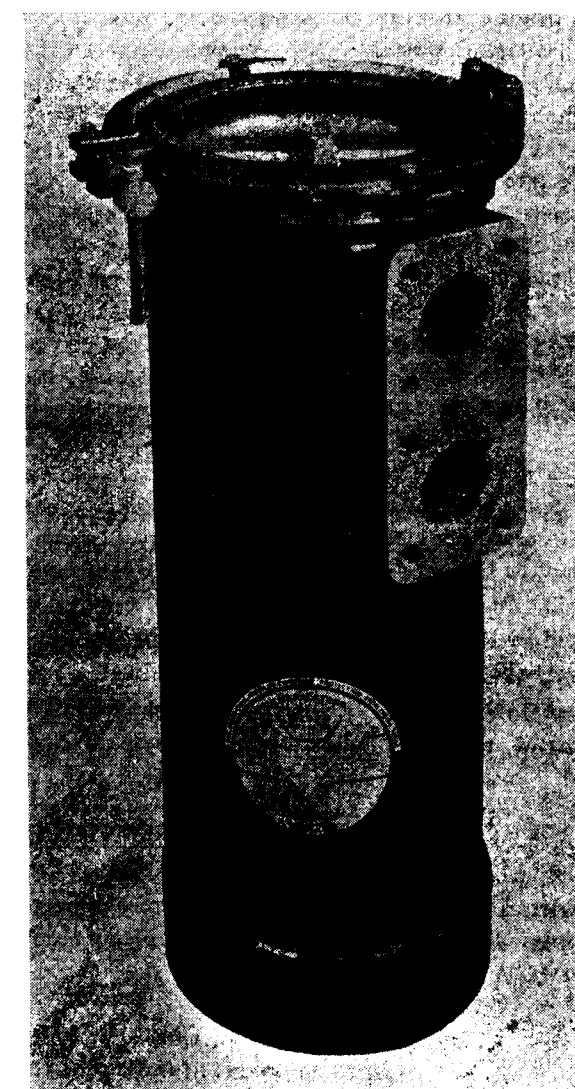
Due to the very construction of diesel locomotives, the space problem is always foremost in the minds of filter designers. This then has a great bearing upon the type of filter produced and of course, the standard of efficiency obtainable. In the majority of cases, the locomotive designer has arranged for the filters to be fitted along the bodies of the locomotive. Therefore, the filter manufacturer must design accordingly and the narrow panel type filter seem to be the most applicable.

Vokes Limited manufacture types of panel filters for various applications where air is required to be free of harmful abrasive matter. With the development of the diesel powered locomotives, the filtration of intake air to the engines and generators is equally as important as the necessity to lubricate. In fact, the two are inseparable for if the contaminants in the air are free to mix unhindered with oil, the contaminating agents reduce the lubricating efficiency and hence increase the overall wear of moving parts. The ultimate effect is to rapidly shorten the periods between servicing and also reduce the life of the equipment which is of course reflected in increased and uneconomic running costs.

Vokes 3-ply and 5-ply are used extensively for application on diesel powered locomotives. They combine the advantages of the viscous type filter (large dust capacity and flow rate) with those of the dry fabric filter (high, constant efficiency) by employing a finer structure than the latter. They incorporate an absorbent layer or layers, which would enable a greater quantity of wetting agent to be retained without danger of being carried through. The 3-ply and 5-ply oil wetted filters have a higher dust load capacity than the dry varieties.

The 3-ply element is composed of a layer of cotton gauze, sandwiched between two layers of wire mesh

arranged in a uniformly deep-pleated form and housed in a light, extremely strong metal surround for safe and easy handling. The cotton gauze serves the dual purpose of decreasing the average air passage dimensions and acts as an absorbent to increase the effective mass of oil the panel can accommodate. Also, this type of filter is inherently free from "channeling" effects experienced with some filters, whereby when partially loaded, dust laden air tends to concentrate towards one or more local channels without being



Clamp-type Lubricating Oil Top Servicing Filter.

cleaned or giving adequate warning by rise of pressure loss.

The 5-ply element is of similar construction to the 3-ply, but employs three layers of wire mesh interspersed with two layers of cotton gauze. In all other respects, including physical dimensions and applications, the elements are identical. It is of course the more expensive and is for use where additional retention efficiency is called for.

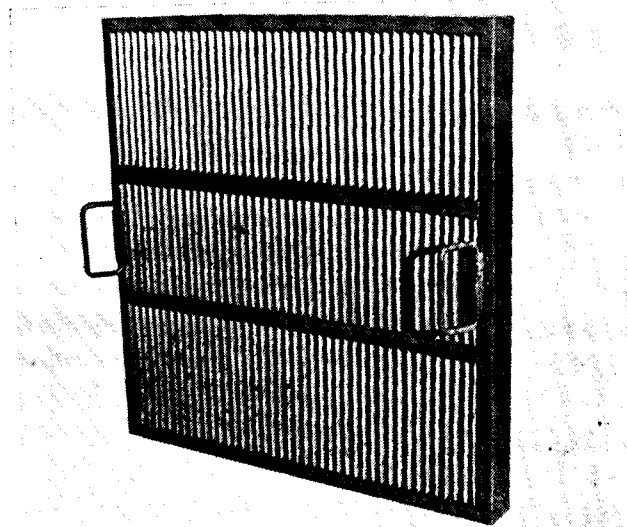
These two types of filters have given first class service over more than twenty years and the extent of their use is proof that it is virtually impossible to find a better filter for the particular application required.

In addition to panel filters for locomotive application, Vokes also have available fuel and lubricating oil filters. The most recent development is the Top Servicing Lubricating Oil Filter. Apart from embracing all the important performance characteristics of Vokes' lubricating oil filters, it has an additionally unique method of servicing. It has been designed specifically with a view to reducing maintenance time to a minimum with the attendant saving in costs.

The filter insert is so constructed that the minimum spares are necessary for servicing. The only replacement parts required are the high grade felt element, which is backed with stout wire gauze and two felt end-pads. The insert is supported by means of a spring, which also controls the operation of the filter by-pass.

The functioning of the filter is for the oil to enter the inlet port and then it is directed to the inside of the insert assembly from whence it flows through the element to the outlet port. Should the element become choked due to neglect of servicing, the pressure exerted by the spring is overcome and the whole insert assembly moves downwards, thereby allowing the oil to pass directly from the inlet port to the outlet port across the top cap. This "built-in" by-pass ensures

that the lub-oil circuit or system can never be starved of oil through choking of the element. It possesses the additional advantage of permitting the oil to by-pass



Vokes 3 or 5-ply air filter panel.

the element without taking back into circulation any previously collected foreign matter.

The advantage of the Top Servicing filter over the conventional type of lubricating oil filter is the simple method of servicing. Unscrew the clamp-ring or bolts, remove the cover plate and inner seal, then the element is easily withdrawn. The clamp-ring type can also be locked in any radial position, which makes it particularly useful for confined spaces. The whole operation takes place in a matter of minutes, thereby greatly reducing labour costs.

The flow capacity rates are :—

Bolt Type 1,500 to 5,000 gallons per hour.

Clamp-type 3,000 to 5,000 gallons per hour.

UZBEKISTAN MACHINES ABROAD

Soviet Uzbekistan has shipped a consignment of machines for sowing, cultivating and picking cotton to the U. A. R.

Today Uzbekistan, which 40 years ago had no industry at all, exports products to 50 countries. New textile machines of the latest design, for example, have been exported to Cambodia, Bulgaria, Turkey,

China, Burma and Greece. The output of Uzbekistan's electrical engineering industry is also well-known abroad.

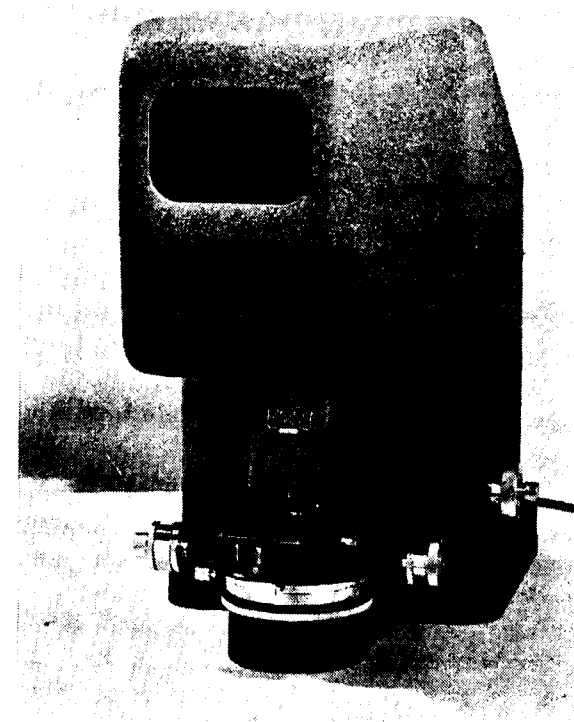
Her chemical products, fabrics, preserves and wines are gaining a bigger market with every passing year. These goods have received gold and silver medals at many international fairs.

Testing Instruments for the Textile Industry

By A Special Engineering Correspondent

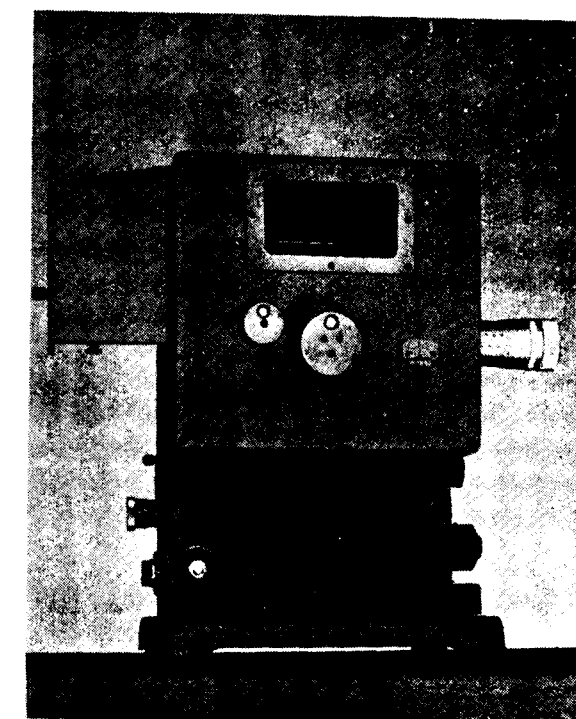
FOR material inspection and quality control of finishing processes in the textile industry, the following instruments are of particular importance: some special types of microscopes, optical measuring instruments and technical precision measuring instruments. Below we list those which can be applied to particular advantage.

With the projection microscope "Lanameter", diameters of animal, vegetable and synthetic fibres of any kind can be measured and in suitable preparations fibre sections evaluated as to their shape and size. For measuring the degree of fineness of wool, as well as of other fibres or, in microscopic work for fibre technicians, the Zeiss-Jena Lanameter in its new and improved design has become indispensable and enjoys general preference. Salient points of the new Lanameter are: the fixed ground glass plate with graticule at eye-level, low-positioned specimen stage situated in the observer's field of vision, special object traverser with adjustable locks for systematic exploration of the specimens, displacement of slide



Lanameter.

and rotation of the fibre in its measuring position by the same left-hand pinion head, thus leaving the right hand free for focussing and writing, attachable light shield for work in non-darkened rooms. The new Lanameter in a metal casing with fixed projection



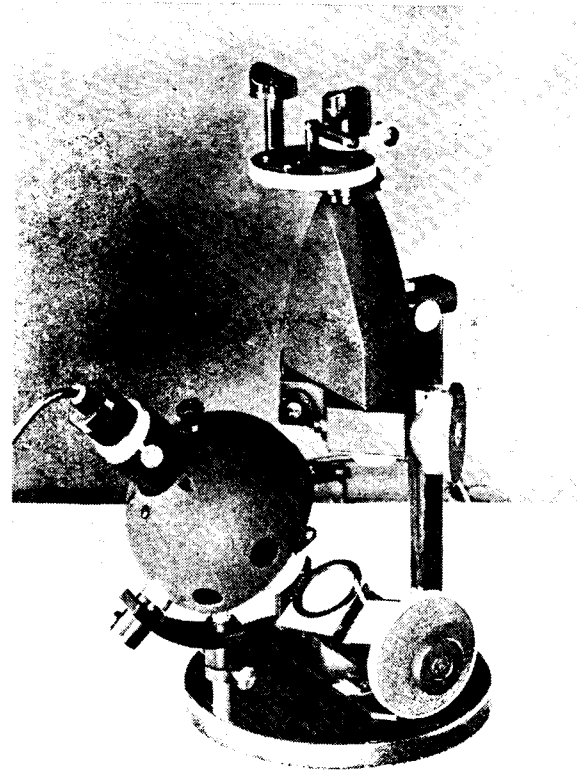
Leucometer.

screen, with upright microscope together with rotary and adjustable specimen stage, with illumination equipment and the cylindrical light hood can be placed on to any normal working table.

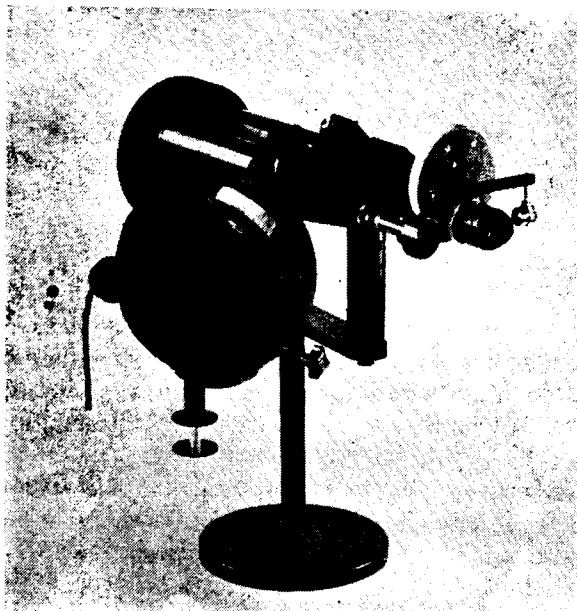
By means of the measuring graduations arranged crosswise on the projection screen, and with the standard magnification of 500:1 object particles of 2 to 200 μ diameter can be measured.

For stereo-microscopic research work and investigations of all kinds in workshops and laboratories of the textile industry, the *Stereo-Microscope SMXX* is universally used. The optical equipment of this instrument provides natural images of large, even fields of vision up to 44 mm diameter in excellent

relief with the result that even after prolonged work the eyes do not become strained. The 100 mm. working distance remains unchanged for all magnifications from 4 to 110 times, which can be very simply adjusted by turning a control knob without any com-



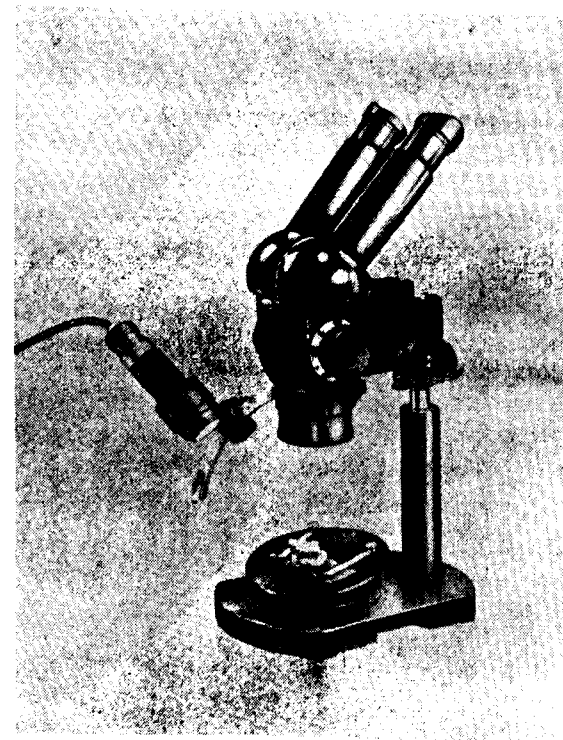
Pulfrich Photometer for Gloss Measurement.



Pulfrich Photometer for Whiteness Measurement.

plicated and time wasting interchanging of paired objectives. The eyepiece tubes of the inclined binocular body can be adjusted to observers' interocular distance, which always remains convergent. The exit pupil of the inclined binocular tube is so computed that spectacle wear can carry out observations comfortably without having to remove the spectacles. Whilst the Stereo-Microscope SM XX is primarily used for observations in incident light, it can also be easily supplemented for investigation of specimens in transmitted light or for both methods of illumination.

As a microscope for the inspection of fabrics in the textile industry the *Measuring Microscope* with horizontal measuring stage adjustment is used in workshops and testrooms. The horse-shoe shaped base of the microscope can also be placed directly on to the area to be tested, after removing the stage support and the stage as well as the hinged mirror.

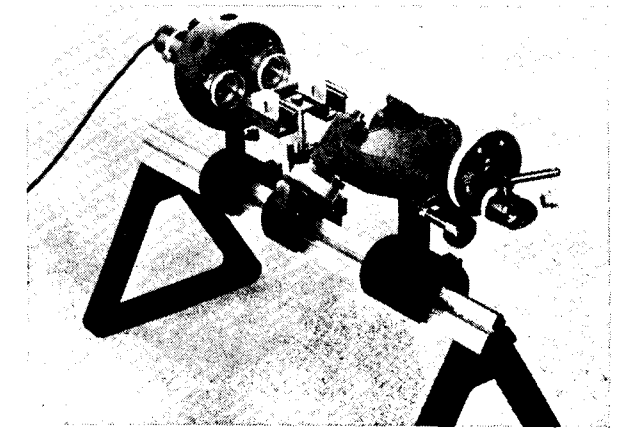


The *Zeiss Leucometer* is used for testing cellulose specimens, for the quantitative control of bleaching or washing processes in the staple fibre and textile industry. By means of this instrument differences in reflection which can no longer be reliably determined with a visual photometer can be exactly measured. This is of particular importance where slight differences in reflection of materials which may still be classified as "white" are to be understood.

The photoelectric arrangement of the Leucometer permits even an inexperienced observer to read the overall reflection from the specimen on the measuring drum only a few seconds after insertion of the specimen, the measured result being independent of the structure and orientation of the specimen surface. By measuring with coloured filters the subjective estimation of non-neutral specimens can also be measured with the Leucometer. The light intensity reflected from all sides of the specimen is compared with a light beam of variable but measured intensity from the same light source. Two photoelectric cells serve as radiation receivers, the current in the compensating circuit operating a single filament electrometer used as a suppressed zero instrument. Some of the special advantages of this instrument are the following: percentage reflection value immediately readable on the graduated drum, graduation of the measuring drum 0.1%, reproducibility up to $\pm 0.01\%$, horizontal position of specimen when measuring over various spectral ranges.

The *Pulfrich Photometer for Gloss Measurements*, the *Gloss Meter* is largely used for measuring the gloss of fabrics of all kinds and for controlling mercerising in the textile industry, dye-works and bleaching plants, and in textile institutes. It is appreciated as an especially valuable instrument in many countries. By measuring the gloss, it is frequently possible to characterise the consistency and structure of flat surfaces. The gloss figure enables the works inspection to check and control the uniformity of production. Furthermore it is possible to compare and evaluate products of various manufacture. The Gloss Meter consists of the photometer, the gloss measuring stage and the photometer lamp. The measurements provide reproducible figures for the

difference between specimen and standard and for the level of the gloss. This is one of the advantages compared to subjective methods. The Zeiss-Gloss



Pulfrich Photometer for Colorimetric Measurement.

Meter permits specimens to be measured at angles from 0° to 75° . The gloss is characterised in accordance with the subjective impression of the viewer by the gloss figures of Klughardt and Richter. These take into consideration parallel and diffuse reflective power of the specimen. They are therefore equally applicable to light and dark surfaces.

The *Pulfrich Photometer with Ulbricht Sphere* (Spherical Reflectometer) is an instrument used in textile institutes for measuring *reflectance* and *transparency*.

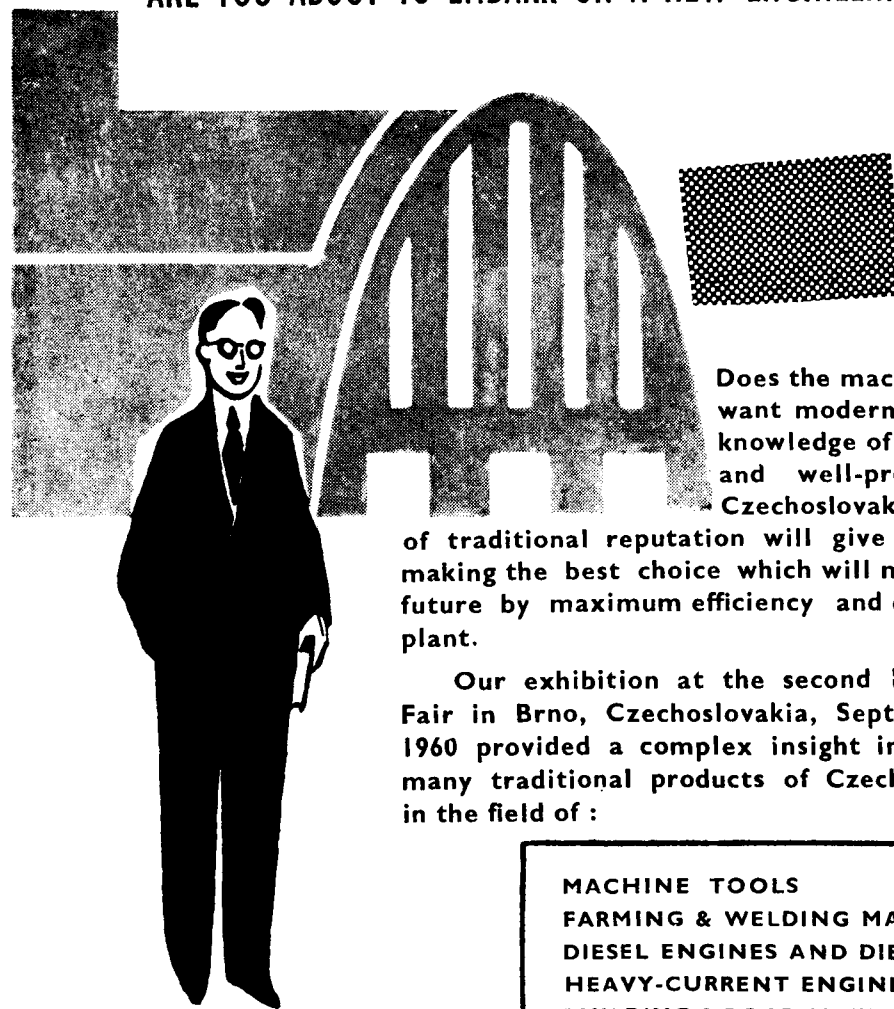
For measuring colours and concentrations of solutions of all kinds, textile institutes and the textile industry are using with greatest success the *Pulfrich Photometer for colorimetric measurements*.

LOW-COST ILLUMINATED CEILING

A new low-cost illuminated ceiling just announced by a U. K. firm makes it economic for a luminous ceiling to be installed in a variety of industrial situations, while the attractive appearance favours its use in public areas such as shops, hotels and restaurants. The system—the latest in the range produced by the company—is based on three-foot square diffusing panels supported by a lightweight aluminium track suspended from the structural ceiling. Daylight from laylights, or artificial lighting from lamps in the plenum, is diffused through the panels so that the space below is evenly illuminated, without causing glare or shadows. The

diffusing medium used in the three-foot panels is a translucent sheet of flexible p. v. c., specially developed to provide a stable and optically correct material. It is available in a range of qualities extending from high-efficiency daylight to non-glare, and in a variety of colours. The diffusers are supported on all four sides by the flanges of an aluminium track of inverted T-section, suspended from the true ceiling. The underside of the track, which is the only visible metal part of the Westminster ceiling, is attractively fluted. The complete ceiling weighs less than 7 oz. per square foot.

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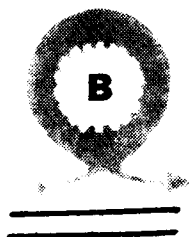


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December 1960

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21

ELECTRONICS IN THE PLASTICS INDUSTRY

SURVEY OF PRESENT AND FUTURE APPLICATIONS

By P. E. Merry, A.M.I.E.E., A.M.I. Plant E.*

[The author surveys the established applications of electronics for process control of the manufacture of plastic materials. Probable future applications are also discussed including the use of computers based on the automatic chemical analysis of materials—EDITOR.]

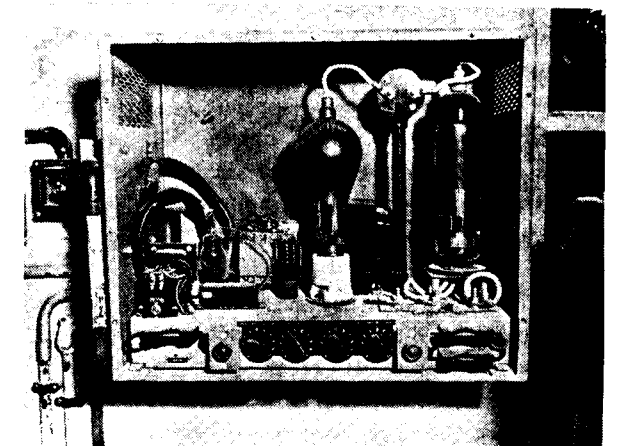
THE plastics industry is concerned with the conversion of basic chemicals into plastic materials which are then converted, either direct or through intermediates, to "end products." The production of plastic materials involves chemical processes and the use of chemical plant, while the production of intermediates and end products employs mainly mechanical operations. A brief description of the processes employed in the production of plastics is necessary before considering the present and potential uses of electronics in the plastics industry.

Plastics can be divided into two main groups, namely, thermoplastics, such as polyvinyl chloride and polyethylene; and thermosetting materials, such as those derived from phenol, urea and melamine resins. The thermoplastics soften to a greater or lesser extent with a rise in temperature, while the thermosetting materials, in the form in which they occur in the end product, do not soften with a temperature rise and are not readily combustible.

The basic process in the manufacture of thermoplastic materials is that of polymerisation, in which the basic chemicals, with the addition of a catalyst, are subjected to closely controlled conditions of pressure and temperature. These processes are carried out either as continuous or batch operations, according to the particular production technique used. These operations involve the handling and storage of the chemicals in solid, liquid or gaseous form, and the process of measuring, reacting, drying, screening, grinding, blending and finally packing the resultant product.

The production of thermosetting resins involves similar processes, but is usually carried out as a batch operation. These resins are then usually subjected to

*Bakelite Ltd.



Control unit for Heenan & Froude dynamic-controlled slip coupling

further processes, according to the particular intermediate product for which the resin is intended. Among the intermediate and end products are moulding materials, paint, varnishes, industrial and decorative laminated sheet.

Moulding powders are produced by crushing the resultant resin obtained from the reaction process, blending, mixing with dyes and filler, rolling under controlled time and heating conditions, crushing, grinding, sieving, blending and finally packing. Varnishes are produced from synthetic resins by mixing with drying oils, heating, thinning with solvents, and filtering to a clear state. Industrial and decorative laminated products are made with resin-impregnated papers or cloths, cut to size or shape, and treated in hydraulic presses under controlled heat and pressure conditions.

The fabrication of finished products is carried out in many ways according to the plastics used and the

particular product. Mouldings are produced in presses or by injection moulding, while other forms are produced by extrusion. Plastic sheet is manufactured on calenders, and rigid or semi-rigid sheet on presses.

In all these processes, pressure, temperature, time and measurement and control of quantities within close limits are extremely important, and careful regard for all these factors is essential for the making of a uniform product. Temperature control is of extreme importance in the manufacture of thermo-setting resins, and with some reaction processes high pressures can develop, which require careful control.

Electronic equipment can be used with advantages in all phases of production, providing it is available in a suitable form to meet any special hazards or safety features of the particular phase. Its accuracy and quickness of response would be ideal for the control of temperature, pressure and quantity, which are very critical factors in practically all the processes.

Unfortunately, in the initial stages, many of the raw materials used are of an explosive or inflammable character, and some also create problems of corrosion and chemical reaction with certain metals. This means the extensive use of flameproof equipment for the electrical installation and, in certain cases, non-corrosive or chemically-inert materials must be used.

Other raw materials come into Group IV category of inflammable gases and vapours, as listed in B.S.S. 229. This fact raises further complications, since these materials are outside the range for which approved enclosures of electrical apparatus are at present available. When the plastic is in a powder form there may still be a need for flameproof equipment. The prime need, however, is for dust-tight apparatus, as the majority of resin dusts can create an explosion hazard under certain conditions.

ESTABLISHED APPLICATIONS

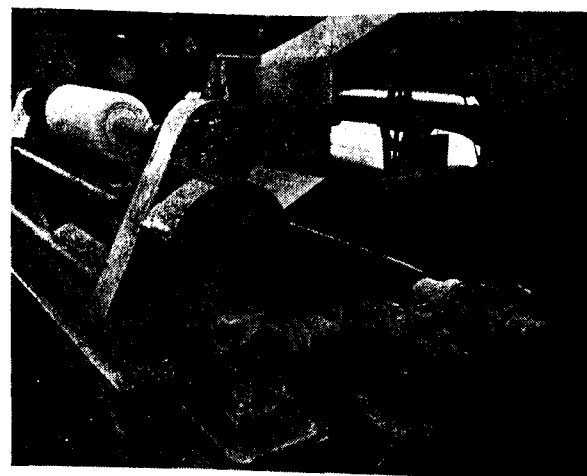
In view of the difficulties arising from the use of electrical equipment, as mentioned above, and as the safety of plant and personnel must always receive primary consideration, the use of electronic equipment has been rather slow and restricted in the plastics industry. Electronic equipment has, however, been used with success and advantage for certain applications, brief mention of which is made in the following paragraphs.

Low-voltage electrode systems are being used for the control and indication of liquid levels in storage vessels where they act as a control over feed pumps and give audible indication when the level drops below a set range. They are also used in a similar manner to control the rate of feed into and out of powdered resin feed hoppers in production lines.

In addition to the usual applications, such as smoke density measurement and machine guarding, photocells are also employed to control the quantity and stacking on paper cutting machines and as tracking controls for the winding-up side of paper impregnators, in which two photocell units are positioned at the paper edge, one being normally covered and the other clear. Any change in this state operates a reversing motor control contactor to give the desired change in direction to the winding mandrel.

Thickness gauges of the beta-ray type are used in the measurement of varnish impregnation on paper impregnators and the thickness of calendered polyvinyl chloride sheet. Attempts have been made to use similar gauges for the measurement of metal wear and erosion on the shells of pressure vessels, but in some cases these are not wholly successful due to the build-up of scale and uneven surface pitting.

In hydraulic presses where pressures of the order of 4,500 p.s.i. are common, distortion of the press through mechanical failure or incorrect loading of the daylight could create a hazard. Strain gauges fitted at critical points on the structure and working in conjunction with electronic equipment give indication of the extent of deflection and can close down the plant under critical conditions.



Pantograph frame on constant tension reeling equipment for calender

Instruments embodying electronic equipment are also applied with advantage in multi-point measurement and control of heating processes or extruders where the heating medium is electrical rather than steam or hot water. These latter methods have their own difficulties, which are discussed in a latter paragraph.

High-frequency heater cabinets are used extensively for pre-heating materials prior to final forming in presses, giving a much better and uniform product and considerably improving throughput.

For remote indication of weighed batches of material, successful methods using Selsyn units are employed. Master Selsyn units coupled to the weighing equipment are wired in parallel to follower units installed at the central control station, and marked with the appropriate scales. An extension of this system is used to control rotary valves in the supply lines.

Electronic detectors are used to reveal foreign metal in certain stages of production where the plastic is in powder, pellet or strip form. Apart from the effect of such metal on the quality of the product, extensive damage could be done to rolls or calenders, with subsequent loss of production. Therefore, additional controls are linked with the detector to mark off the contaminated area, set off audible and visual signals, and also shut down the conveyor and preceding feed lines.

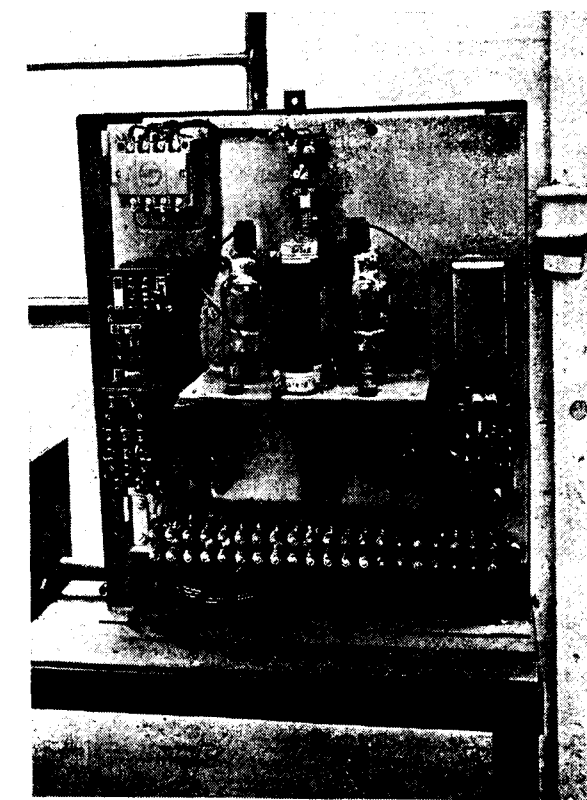
VARIABLE-SPEED DRIVES

In the intermediate stage of manufacture, extensive use is made of electronic controls working in conjunction with variable-speed drives on calenders, rolls and extruders, or as a medium for providing a variable-speed drive, such as the dynamatic-controlled slip coupling.

Calenders working on thermoplastic materials are usually driven by large horse-power variable-speed motors in order to give the maximum economic output compatible with the material and thickness of sheet. Because the sheet leaves the calender in a hot and plastic state, and solidifies as it cools along the run, it is necessary, in order to avoid distortion and variation in thickness, to apply constant tension across the width of the sheet at the wind-up end. The wind-up drive must also cater for the speed range of the calender drive and the build-up of material on the winding mandrel. This latter requirement necessitates a reduction in radial speed as the diameter increases,

to maintain constant linear speed. A successful method of achieving this result is by means of a thyatron speed control equipment operating on a closed loop system to control the wind-up drive. Briefly, the system is as follows:—

A d.c. wind-up motor with a constant voltage field supply from a metal rectifier has its armature fed from a pair of grid-controlled rectifiers. Pre-set speed to match up with the calender speed is obtained by adjustment of a speed control potentiometer in the grid voltage circuit, and speed adjustment to take care of mandrel build-up and to maintain constant tension is controlled by transducers fitted to a swinging pantograph frame through which the plastic sheet runs. The transducer is mounted on the central spindle of this frame and the sheet is threaded through to run over free rollers at the top and bottom of the frame and then on to the wind-up mandrel. Predetermined applied tension can be adjusted by the alteration of weights on a lever attached to the frame. Under stable conditions the frame is maintained in a vertical position as the weights balance against the tension in the sheet which is running freely on to the mandrel. With an increase in tension, the frame swings in the direction of the pull, thus altering the position of the transducer rotor, and creates a potential difference between



Control unit for constant tension reeling equipment

the control and reference voltages in the rectifier grid. This voltage difference is used to adjust the armature supply to slow down the wind-up motor until a state of equilibrium is reached. With a loss of tension, the frame swings in the reverse direction which, in turn, speeds up the wind-up motor to readjust the tension. A similar control system, but without the pantograph, is used for applying excess tension to calendered sheet in order to stretch the material into film thickness of stable dimension.

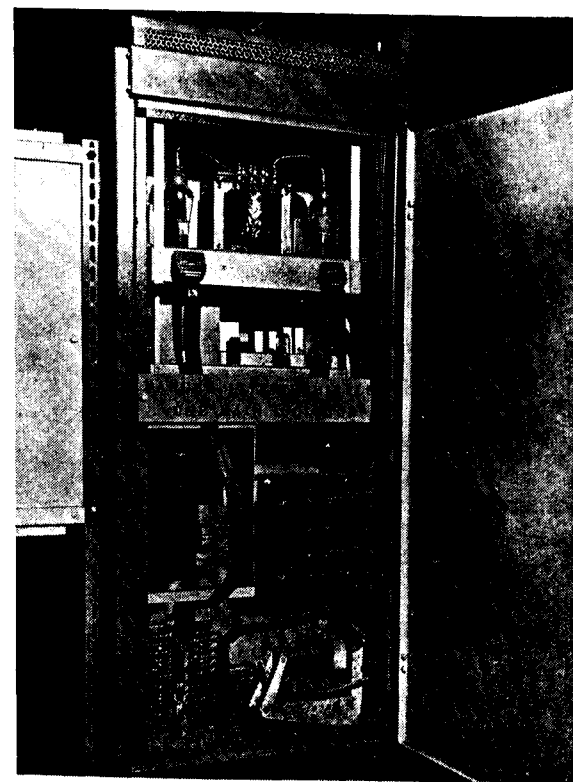
FUTURE APPLICATIONS

The future application of electronics to the plastics industry is likely to be more extensive, especially in the light of recent developments. There are complementary developments in electronics and plastics, such as printed circuits, using copper-faced laminated sheet and encased or potted components, which lead to greater simplicity and reliability in circuit design. The development of transistors and semi-conductors will tend to eliminate the thermionic valve, which was always treated with a certain amount of suspicion by the more conservative plant engineers.

The greatest development is likely to be in the instrument field, with particular reference to the control of process functions, such as quantity, time, heat and pressure. This will lead to more automatic control of the processes which, in turn, will mean electronic control on the main plant machinery to give a corresponding accuracy and speed of response to match the instruments.

It is the modern practice for chemical plants with explosive or inflammable hazards to be housed in widely-spaced open or light structures, with a central instrument station or control room housed in a more enclosed building some little distance away. Primary elements are often situated about the plant, with or without local indication, and with the connections carried through to indicating, recording and control instruments in the instrument station. Independent means of control are possible for the sections of the process for which it is impossible or undesirable to have automatic instrument control. It will be appreciated that this arrangement would lend itself readily to electronic automatic control of the process if the necessary equipment were available to suit all requirements, and if the economics and advantages gained outweighed those of the existing systems sufficiently to justify such a development.

In view of the hazards present in such a plant, it



Control cabinet for plastic film stretching equipment

will be necessary for all electronic instruments, the associated primary elements, interconnecting wiring and the electrical actuator on the controlled medium either to be flame-proofed to the required classification, intrinsically safe, housed in a non-hazardous area or treated by purging. If all the equipment is not available in one form there must be a combination of all these requirements.

HEATING CONTROL

In certain processes there is a need to apply large quantities of heat in a very short time, followed by an equally rapid cooling cycle, while keeping the process within critical temperature limits. Where the heating agent used is medium-pressure steam, or high-pressure hot water, and the cooling medium cold water, or recirculated hot water through a heat exchanger, this means the rapid action and careful modulation of large 8 in. or 10 in. valves.

To do this by a completely electronic system, entails the use of an electrical actuator on the valves. Such actuators are not readily available, or their cost is prohibitive, as compared with air-operated diaphragm valves. It is possible to have a control system combining both pneumatic and electric elements

by the use of pneumatic-electric convertors, but there is a natural reluctance to install a mixed system unless there is some over-riding consideration, such as non-availability of a particular element in an electric or pneumatic form, or prohibitive cost, which compels a mixed system to be adopted.

The alternative to the development of satisfactory electronic-controlled hot water heating systems is the development of electrical methods of heating, such as high frequency, induction heating, infra-red or pure resistance heating for those processes now carried on with steam and hot water. Such systems would more readily lend themselves to electronic control and the problem is then mainly a matter of deciding which is the cheapest method, with due regard to the maintenance of the quality of the product.

QUALITY CONTROL

The great handicap to the development of a fully automatic process is the need for frequent sampling and inspection of the product and subsequent adjustment of the process controls if any variation from the standard is detected; this is often done manually. This is a comparatively slow process, and results in a certain material loss, depending upon the interval between the discovery of a defective sample and the necessary corrective adjustment of the controls.

With the development of electronic instruments to give continuous measurement of the primary variables in the material and immediate adjustment of the controls for corrective action, there will be a resultant saving in time, material and labour, and a better and more stable product.

Work is proceeding on the development of equipment in an industrial form for the automatic chemical analysis of materials and the continuous measurement of viscosity, turbidity and density of liquids and solids in suspension. When such equipment is available, it may become possible to achieve the ultimate goal of a fully automatically-controlled chemical reaction process in which, apart from electronic instruments, computers would take a major role. A typical arrangement for such a process may then take the following form:—

Analysis elements in the raw material storage con-

tainer would register in a computer the composition of the raw materials. This information would be used to vary the quantity or rate of flow of materials into the processing equipment in conjunction with the pre-set quantities required in accordance with that particular production formula, which could also be previously registered in the computer. Another analysis element in the processing equipment continuously measuring the state of the mix would supply information to control the addition of catalysts or solvents and as a secondary variable on the heating and cooling cycles.

The heating and cooling cycles would be under the primary control of temperature and pressure recording controllers in conjunction with pre-set heating and cooling programme times. All the information supplied from these instruments could be routed through a computer to act as primary or secondary variables on the process control in accordance with a set production programme. At the conclusion of the process the finished product would be automatically discharged into appropriate storage vessels.

Infra-red analyser equipment is in use for the detection and measurement of gases, although development is still in progress for equipment suitable for general plant applications. With the successful development of such equipment it may become possible to use such apparatus for the measurement and control of certain process functions. In the initial processes, where gases are used as ingredients in a basic chemical material, analysers may be used to control the flow of gas to that material, based on the quality of the gas. In other processes where volatile gases are given off due to applied heat, analysers may be used as a control medium, either on the amount of heat applied or the rate at which the material is passing through that particular process.

In general, electronic control has been applied where it has obvious advantages over existing systems, and where it does not jeopardise the very necessary safety precautions required in certain processes. The further application will depend largely on the development of special equipment to compete with, and eventually replace, existing systems. In this competition, electronic systems have the merit of being able to use computer systems to the best advantage.

[Courtesy: "ELECTRICAL REVIEW"]

FRENCH EQUIPMENT FOR THE CHEMICAL INDUSTRY

By J. Pouch

Engineer, E.C.P., France

IN the present world-wide industrial expansion, the chemical industries distinguish themselves by a rate of expansion considerably higher than the average. Due to this, the equipment of these industries represents a market of growing importance because, in addition to the fact mentioned above, chemical installations have a relatively short life, probably three to four times shorter on the average than that of machine-tools.

We can actually note, on the one hand, a very rapid evolution of techniques in numerous branches of industrial chemistry. This leads to a rapid obsolescence of an installation as soon as a process becomes outmoded, due to the discovery of a new method providing for greater quality or higher output or both. On the other hand, there are also the factors inherent in the industry, the corrosion and wear of equipment which necessitate more frequent replacement.

The demand for equipment is evolving toward a more and more intensive specialization of the installations of the chemical industry. Reaction equipment, centrifuges, filters, slubbing machines, etc., in which operations are adjustable in wide limits, belong more and more to the past. In this field, series construction tends to become the exception.

In the present branches of the chemical industry, we distinguish :

- (a) the industries in which techniques are relatively stable ;
- (b) the industries in which techniques are undergoing practically effervescent evolution.

In branch (a), we refer in particular to the manufacture of sulphuric acid and its derivatives and to the potassium fertilizers.

In branch (b), we refer to the manufacture of plastics and their processing ; the manufacture of synthetic rubber and tires ; the preparation of serums, vaccines and antibiotic ; the manufacture of new detergents ; the preparations of fluorine ; the manufacture of nitrogen and phosphate fertilizers ; that of colorants

from titanium oxide ; that of varnishes ; the preparation of photographic film, and also the processing of uranium and thorium ores, the manufacture of heavy water and of radioactive salts.

In view of the diversity of these activities and the limited space available to us, we can refer to only a small number of these realizations, in particular those which have been constructed abroad by French enterprises.

MANUFACTURE OF SULPHURIC ACID AND OLEUM

Modern installations whose daily output some times reaches 300 tons of monohydrates, have been created with vanadium as catalytic agent and starting either from pyrites or from sulphur. The heat developed in the reaction is recuperated in boilers which produce steam and electric power through the use of generator units with capacities up to 2,500 kW.

MANUFACTURE OF SUPERPHOSPHATES

We refer to the realizations effected in Great Britain, Spain and Yugoslavia. The latter is capable of producing daily 2,000 tons of superphosphates in powdered or granulated form. Located in the proximity of the Danube, this installation receives the phosphate through barges which are unloaded by chain and belt conveyors. The ground phosphate serves for the production of supercalcium-phosphate, with the reaction being obtained in continuous caves. The fertilizers obtained are loaded mechanically into barges or railroad cars. The fluorine gas produced in the manufacture of the superphosphates is utilized in the manufacture of artificial cryolite. In order to obtain granulated fertilizers, a production chain including granulators, dryers, coolers, screens, etc... has been installed and permits an hourly production of 20 tons of granules with diameters from 2 to 4 mm. approximately.

EVAPORATION AND CRYSTALLIZATION APPARATUS

Such apparatus permits solving the multiple

problems confronting the chemical industry in the preparation of numerous products by way of evaporation and crystallization.

During the manufacture of ammonium nitrate by direct action of nitric acid on anhydrous ammonia, the processes used make it possible to recuperate to the maximum the calories produced, both during the reaction and during the crystallization. The reaction is effected in an apparatus which functions automatically and in which the expansion of the solutions takes place in several stages. For crystallization, rotary equipment is used which operates at atmospheric pressure. This makes it possible to obtain regularly a crystalline salt, containing less than 0.5% of water, from a solution containing 95%. A vacuum crystallizer gives directly a powdermill-type product from a solution with 90% of water.

The manufacture of ammonium sulphate is effected either by concentration and crystallization of the solutions obtained by the gypsum process or by direct action of sulphuric acid on synthetic ammonia. These installations for continuous operation have the great advantage of producing uniform crystals of good size, corresponding perfectly to the demands of the users.

As far as the concentration of soda is concerned, the French equipment produces mercerizing, caustic and electrolytic soda. During concentration, these solutions produce deposits of either sodium carbonate or chloride. In general, the installations are of the triple-action vacuum-type and equipped with special devices which make it possible to eliminate during operation the undesirable salts and so provide for continuous operation of the equipment. The use of nickel is necessary in all parts which come into contact with the solutions.

We terminate this chapter by calling attention to the installations for drying by atomization. This process is necessarily employed for all products subject to deterioration by heat. This is the case of tanning extracts, powdered detergents and soaps, thermoplastics such as polyvinyl chloride, etc..

MANUFACTURE OF SOAP

A process for continuous soap manufacture makes French techniques a leader in the field and has made it possible to construct more than 40 modern soapworks. The process provides for an appreciable improvement in the finished product and also permits large savings of labour and uniform manufacture. It includes

three operations : saponification, washing, and settling.

Soda and the mixture of fatty matter intended for saponification are pumped in metered proportions into a homogenizer which produces an emulsion. The latter flows into a heated tube where the reaction takes place. A slight pressure prevents the entry of air. The soapstock flows into a tank where it remains for 15 minutes. The proportioning permits obtention of a soapstock containing 59 to 63% of fatty acids and a slight excess of free soda (about 0.2%).

The liquid soap is pumped to the base of a six-story tower, in which each story contains an agitating area and a decanting area. The lye is injected at the top of the tower. The temperature is brought to 85°C. The soap rises gradually to the various stories and the lye flows downward so as to extract the maximum of glycerine.

After discharge from the sixth story, the soaps flows into a vertical tank equipped with an agitator and is mixed with the quantity of alkaline and saline water necessary for settling. From the tank, the soap goes to a decanting vat where it separates from the nigre. All of the latter is returned to the agitator at the top of the washing tower. Two decanting vats are required for continuous operation.

All these operations, strictly controlled, permit high recuperation of the glycerine and require only 220 pounds of steam per metric ton of soap manufactured. The elimination by washing of the peroxides contained in the fatty matters permits obtention of a soap which keeps well and is capable of receiving perfumes which do not evaporate.

MANUFACTURE OF ACETATE RAYON

French techniques have known how to make use of the abundant by-products, found in certain countries, for manufacturing acetate rayon under remarkably economical conditions.

In the State of Hyderabad in India, large quantities of cotton linters and sugar cane molasses are available and a plant has been built here for manufacturing large quantities of cellulose acetate rayon.

The schematic sequence of operations is the following :

- the manufacture of acetic aldehyde from alcohol and air ;

- the manufacture of acetic acid from acetic aldehyde and air ;

The two reactions are carried out with the aid of catalyzers and the crude acetic acid is purified by distillation.

- the manufacture of acetic anhydride by vacuum cracking of acetic acid vapors in coils. The product of the cracking, ketene, acts on the acid to give acetic aldehyde which is purified by distillation under pressure ;
- the manufacture of cellulose acetate by reaction between the cotton linters and the acetic anhydride.

As a complementary operation, it is necessary to manufacture acetone. This body is obtained from alcohol by means of a catalyzer and a gas oven which eliminates the water. Distillation in a series of continuous permits purification of the acetone which is utilized as solvent in spinning the cellulose acetate.

Since these operations produce important quantities of dilute acetic acid, the acetone is used as solvent of this acid which permits economical elimination of the water. The acetone and the acetic acid are recuperated by distillation.

PRODUCTION OF GAS

In this field, French equipment has accomplished remarkable realizations.

Thanks to the expansion of gases with exterior work, the cold necessary for the obtention of very low temperatures has permitted obtaining the liquefaction, rectification and separation of gases from such mixtures as air, coke oven gases, petroleum refinery gases, etc...

We list below the principal gases obtained with their general applications :

30,000 KW Generator for Hirakud built in Leningrad

The first 30,000 kilowatt hydro-generator has been built on India's orders by the Leningrad "Elektrosila" Plant. This machine is intended for the Hirakud-2 Hydro-Electric Station. Work is under way also on the blue-printing of another 50,000 kilowatt hydro-generator for the Mettur power station in Madras state.

Turbines for these stations are being built also at the local metal works.

Both undertakings are pioneers of Soviet electrical engineering. They have produced the world's biggest machines for the operating string of hydraulic stations on the Volga and are now building the first hydroturbine of 225,000 kilowatts capacity for the Bratsk station on the Siberian river Angara. Their designers are also working on the blueprints of 1,000,000 kilowatt turbines for the Krasnoyarsk station on the Yenissei.

Oxygen : oxyacetylene welding ; oxygen blast in metallurgical converters ; various cracking processes ; preparation of nitric acid.

Nitrogen : synthesis of ammonia ; manufacture of cyanamide ; creation of neutral atmospheres.

Argon : inert gas welding ; titanium industry.

Hydrogen : synthesis of ammonia and methanol ; manufacture of fertilizers, synthetic fuels.

Methane : various cracking process ; manufacture of ammonia by cracking.

Ethane : obtention of chlorinated products ; various cracking processes.

Propane : industrial fuel gas ; various cracking processes.

Butane : domestic fuel gas.

Ethylene : obtention of plastics, ethyl alcohol, glycol chlorohydrin, ethylene glycol, ethylene oxide, and organic products.

Carbon dioxide : obtention of dry ice.

Carbon oxide : various syntheses with hydrogen.

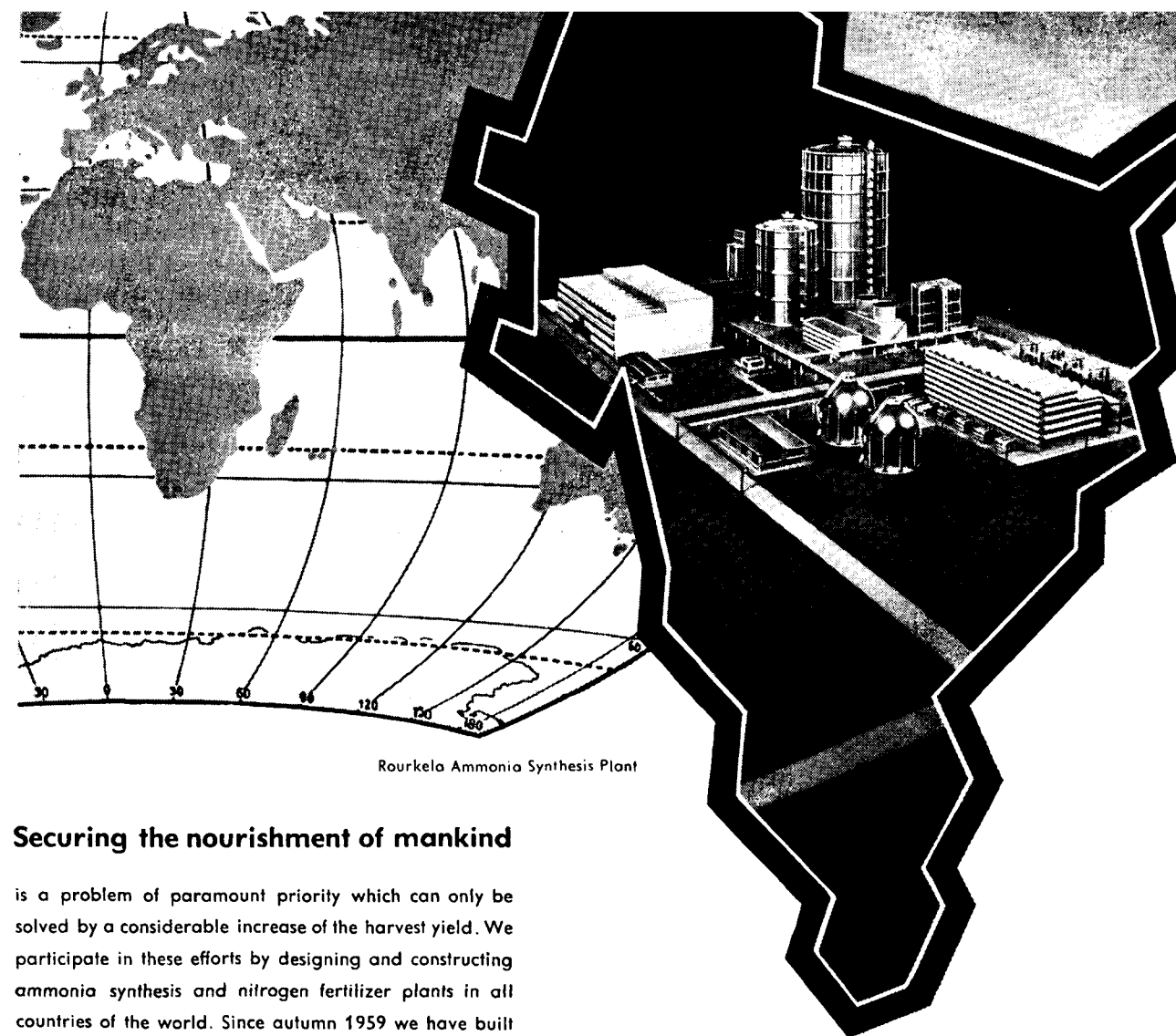
Numerous installations for the production of gases have been created throughout the world. We will cite only a few facts :

In Italy, hourly output of 212,000 cubic feet of oxygen and 335,000 cubic feet of nitrogen.

In Holland, hourly output of 758,000 cubic feet of a mixture of nitrogen and hydrogen.

CONCLUSION

For the numerous traditional and new requirements of the world-wide chemical industry, the French manufacturers have followed the necessary evolution perfectly. Their numerous accomplishments, both in France and abroad, are certain proof of the technical value of their constructions and of the dynamism of their designing offices.



Rourkela Ammonia Synthesis Plant

Securing the nourishment of mankind

is a problem of paramount priority which can only be solved by a considerable increase of the harvest yield. We participate in these efforts by designing and constructing ammonia synthesis and nitrogen fertilizer plants in all countries of the world. Since autumn 1959 we have built in India an ammonia synthesis plant in which per day 1 680 000 NPT m³ coke oven gas coming from the Rourkela steel mill will be processed to 463 tons liquid ammonia.

Our field of activity comprises design and construction of industrial plants and technical equipment for:

Petroleum and synthetic oil industries
Production of coal and petrochemicals
Nitrogen and fertilizer industries
Production and purification of synthesis gas
Organic and inorganic chemical industries
Plastic and synthetic fibre industries.

Uhde, furthermore, designs, constructs and delivers the following special equipment:

Thermal installations, including furnaces
Filter installations including those for the removal of finest dust particles
Vibrating conveyors and mono-vibrators (unbalanced motors)
High pressure vessels, valves and fittings
Brown finitube heat exchangers



FRIEDRICH UHDE GMBH DORTMUND



Our customers and interested parties abroad are requested to contact for advice and technical assistance their local representative of the

HOECHST-UHDE INTERNATIONAL GMBH FRANKFURT (M)-HOECHST

BHARAT ELECTRONICS LIMITED

Jalahalli, Bangalore-13

BHARAT Electronics was set up by the Government in the Public Sector to make the country self-sufficient in electronic equipments in the shortest possible time.

The construction of the factory began in 1953 in Jalahalli, a suburb of Bangalore. Bangalore was selected for locating the factory for several reasons, the chief among them being availability of cheap electricity its salubrious and dust-free climate.

As and when each factory shop was completed, machinery was installed and work commenced towards the end of 1956. By 1957 the factory buildings were all complete. The layout is well planned so as to provide for smooth flow of raw materials and components from stores to shops and from shop to shop and finally to the despatch centre.

Within
our factory
has been
designed and
manufactured
ELECTRONIC
EQUIPMENT
for every
purpose :

GENERAL PURPOSE RECEIVER
HF TRANSMITTER
AIRBORNE TWIN CHANNEL
VHF TRANSRECEIVER
MANPACK
VHF TRANSRECEIVER

and
BELWIN TRANSMITTER

The Belwin Transmitter has been found very satisfactory by the Meteorological Department. More and more BEL Electronic Equipment are being used by Indian Railways, Civil Aviation and Police Department.



BHARAT ELECTRONICS LTD.

(A Government of India Undertaking)

JALAHALLI P.O.

BANGALORE - 13

The factory is divided into several shops having distinct functions. We have first the Tool manufacturing shop where all the tools required by various departments for the manufacture of metal parts are fabricated. The Machine Shop is adjacent to this where mechanical components are manufactured. Both the Tool Room and the machine shop are fitted with the latest type lathes, grinding, milling, jig boring, engraving, and other machines.

The Fitting Shop, which is situated closeby, is an adjunct to the machine shop. All precision drilling and fitting of small components into sub-assemblies are done in this shop.

Next to these shops, is the Electro-plating section where electro-deposition of Cadmium, Nickel, Chromium, Gold, Silver and anodising are done. Adjoining it is the sheet metal shop where all structural work of chassis, brackets, frames, drawers, cabinets and JF Coils including cutting, bending, forming, welding and spot-welding are done. The painting shop closeby is responsible for sandblasting and painting of metal surfaces.

In addition, there is Works Inspection Section where inspection of all the materials manufactured by Tool Room, Machine shop, Fitting shop, Sheet Metal Shop, Painting Shop, Electroplating Shop and Heat Treatment Shop are carried out. This section ensures that the standards laid down in the specifications are always maintained.

The Crystal Department completely manufacture Piezo Electric Crystals from raw quartz, required for this industry and Coil Winding Section produces different types of Coils, Chokes, and Transformers.

Then the Assembly Hall takes over all the components and sub-assemblies to make up a complete equipment and assemble them with precision, care and accuracy.

A Measuring Instrument section supplies and maintains a complete range of instruments required for alignment and testing of electronic equipments. A climatic and durability test laboratory subjects manufactured equipment to severe climatic and durability tests.

In all the shops, the Inspection Department carries out specification checks at various stages and maintains the standard required for these precision equipments, with due care and efficiency. This is absolutely necessary, in view of the fact that these instruments are required for important and vital work in the Defence Services, Civil Aviation, Railways and other Government Departments.

Compared to other industries, electronic industry is a highly complex and specialised one with its own special problems. The wide variety of equipment and the requirement of some of them in small and on economic numbers, make their production difficult. The large number and variety of components which go into a wireless equipment and their non-availability in India also poses new problems in setting up this industry. The necessary skill to fabricate and assemble the equipments needs to be developed by specialised and intensive training. These and similar problems have to be resolved before the Electronic Industry can be established on sound lines.

However, despite these difficulties, various types of HF and VHF equipment are now in the production line of the factory. These include a general purpose Communication Receiver, a 400 WHF Transmitter, a 25 WHF Transreceiver, a HF Man-pack 20 W and 50 W VHF Transreceivers, 750 mw VHF Man-pack, a light weight UHF transmitter for the Meteorological Department and some studio equipments for the All India Radio. HF Transmitters of 1 and 5 KW output power are expected to go into production shortly.

An important agreement was signed with PHILIPS OF HOLLAND in 1959 for the manufacture of Valves. Eighteen types of receiving valves, standardized by the Radio and Cable Board and accepted by the Radio Manufacturers' Association in India will be taken up for manufacture in the initial stages. The capacity of the plant will be 1.8 million valves of the miniature type which can be substantially increased, if the demand warrants such a step. It is expected that the valves will be available for sale during the early part in 1961.

A Research and Development Department exists in the factory to foresee future requirements and develop new equipments to meet them. The major achievement of this department is the development of a Twin Channel VHF Transreceiver for air to ground communication. This set is primarily meant for fitment in the HT-2 Trainer Aircraft and will

satisfy a long felt need of the country. The set was subjected to stringent tests and has passed all the trials successfully. This set is in production now. Modified versions of the set for single and Ten Channel Operation are under development.

A Transistorised hearing aid has been constructed and tested in the factory. It has been found to be quite satisfactory, its performance being comparable to imported equipment. After further trials, it will be put into mass production.

Bharat Electronics has also developed a transistorised Loud hailer called "BELHAILER". A Large Demand exists for this popular item throughout the country. It is an electronic megaphone with self-contained power supply and is required by the police, the Fire Fighting Departments, Defence Establishments, Rail and Dock-yards and a host of others as a handy public address system.

For the India Meteorological Department, Bharat Electronics manufacture 'BELWIN' Transmitters for upper air observation. Efforts are being made to find foreign market for this equipments.

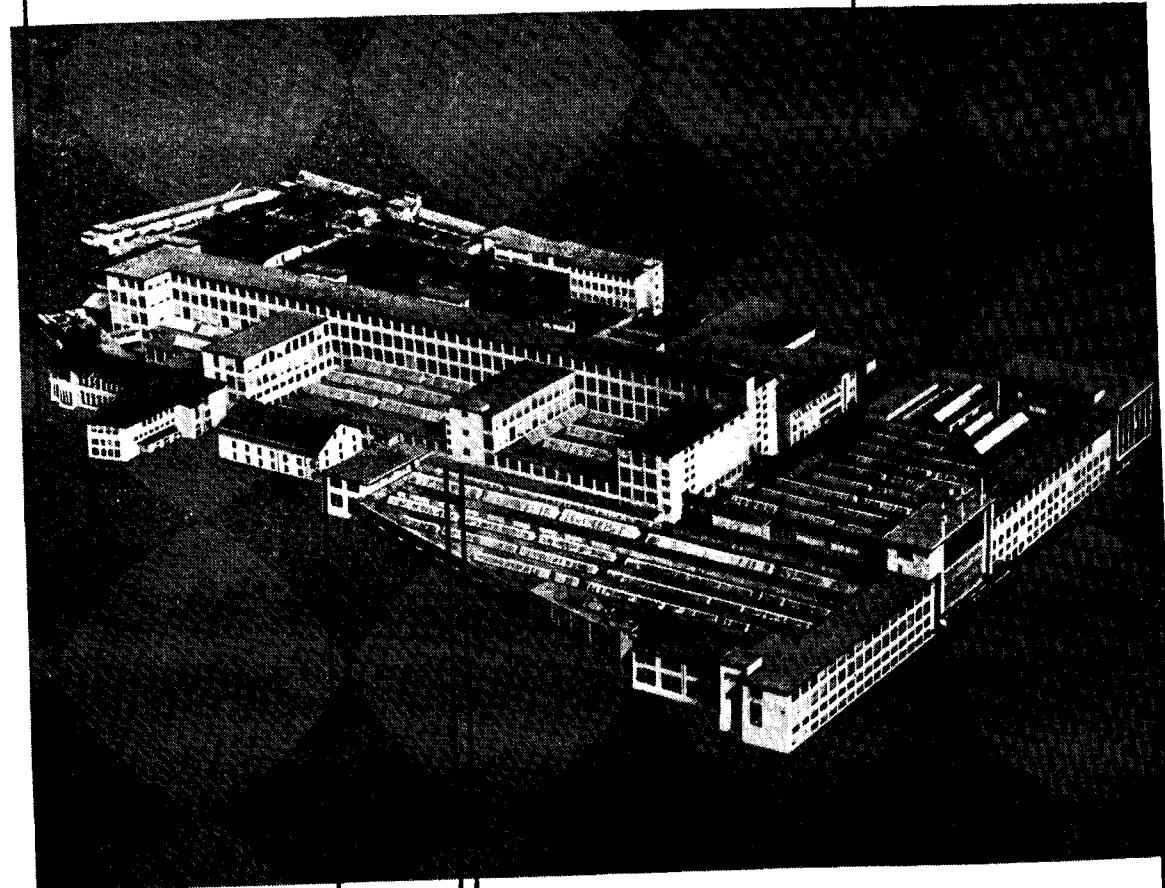
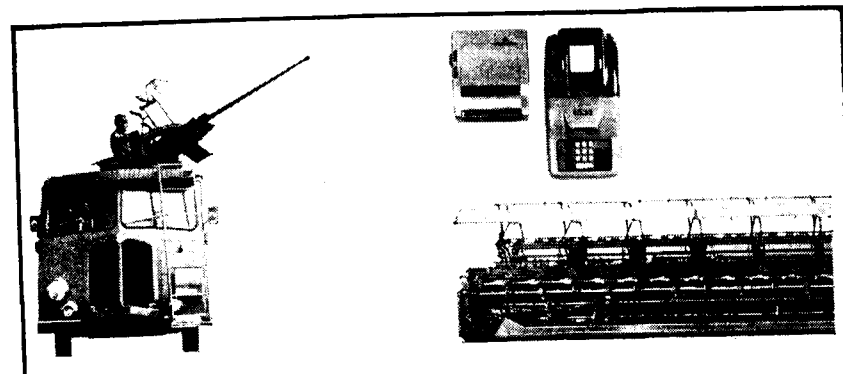
The Crystal Division of the factory manufactures Piezo Electric Crystals which are critical components required to stabilise the frequency for all types of electronic equipments.

The Transformer section is well equipped for the design and manufacture of a wide range of high quality Transformers and chokes including power transformers smoothing Chokes (sealed and oil filled types) suitable for a wide variety of electronic applications.

In an agreement entered into with Marconis Wireless Telegraph Co., we will shortly take up for production in our factory VHF Multi-channel Equipment type HM-100/150 for South Eastern Railway communication scheme from Calcutta to Chakradharpur and Adra, covering a distance of about 250 miles. This is the first major Multichannel Radio Link in India.

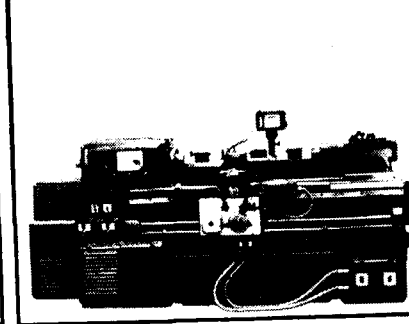
We shall also be shortly taking up the manufacture of console and portable type professional Magnetic Tape Recorders and tape Decks which are required by All India Radio and other Government Department.

An agreement has been signed with Nippon Electric

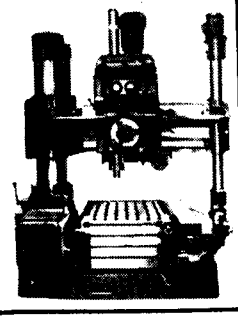


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3
2

Co. Ltd., of Tokyo, Japan for the manufacture of medium wave Broadcast Transmitters.

In the component field, we will shortly be producing ceramic capacitors under an agreement with National Research and Development Corporation. Mica capacitors will also be manufactured according to a process evolved by one of our Engineers.

Negotiations are in progress for the manufacture of transistors with foreign collaboration. It is expected that production will start in 1962.

There has been a steady increase in production

since 1957. In 1958-59 production amounted to Rs. 65 lakhs as against Rs. 28 lakhs during the preceding year. During the year 1959-60 production reached Rs. 110 lakhs, and for 1960-61 we have planned to manufacture equipments worth Rs. 175 lakhs.

The activities of Bharat Electronics Ltd., have been accelerated in the recent past with the technical collaboration of reputed firms mentioned above. With much technical collaborations Bharat Electronics in particular and the country in General look forward to the achievement of self-sufficiency in the field of electronic equipments in the very near future.

New man-made material for protective clothing

After two years of research and experiments in collaboration with outside manufacturers a British firm has developed a new man-made material which will have a wide range of uses particularly in the protective clothing industry. The material is the result of an exclusive process of laminating specially constructed Terylene fabrics between two layers of flexible PVC sheeting. The manufacturers are already investigating the possibility of many types of end product including covers for sports grounds, awnings, garden furniture, swimming pool liners and tarpaulins. By using different formulations of PVC and incorporating different types of Terylene fabric, the firm can produce the material with physical properties to suit practically every requirement. The variations already being tried include special low temperature grades, flame resistant material (conforming to the British standard for flameproof industrial clothing), types with resistance to particular chemicals and a range of heavy-weight laminates.

The firm says that one of the main advantages of the material is its "weldability". It has been particularly constructed so that it can be welded dielectrically. This means that end products are waterproof and have high strength of seams of very neat appearance. Other great advantages are its high strength/weight ratios which can be developed according to specifications; resistance to the majority of acids and chemicals; and its extensibility which even under low rates of loading provides "give" in the correct places—which adds greatly to the comfort of wearers in the case of industrial protective clothing. It has an attractive appearance and is easy to clean—a damp cloth will remove most marks and warm soapy

water gets rid of any grime. The material is available in 50 in. wide rolls of 60 yards in a variety of plain clear colours and printed effects.

* * * * *

SINGLE SHAFT STEAM TURBINE OF RECORD CAPACITY BUILT IN LENINGRAD

The stand tests of a single shaft 325-megawatt steam turbine have been successfully completed at the Leningrad Engineering Works. Judging by published figures, its capacity exceeds by 75 megawatt the maximum capacity of a single shaft steam turbine built by Westinghouse in the United States and hitherto regarded as a record, a TASS correspondent was told by Vasily Nannov, the chief designer of the Works.

The Leningrad turbine is a three-cylinder condensation turbine for high, medium and low pressure. It has been designed for operation in block with a uniflow boiler with an hourly capacity of 950 tons of steam. The turbine has been designed for steam with an initial pressure of 240 atmospheres at a temperature of 580 degrees Centigrade.

After the tests the turbine is to be installed at the Cherepovets State District Electric Power Station. Experience in running this machine will be used for the manufacture of a 500,000 kilowatt single shaft steam turbine which has already been designed at the Leningrad Engineering Works.

INTEGRAL COACH FACTORY, PERAMBUR

THE Integral Coach Factory, a production unit of the Indian Railways, is located at Madras in South India. As a commitment under India's First Five Year Plan, this factory was set up with a project cost of Rs. 7.35 crores to achieve self-sufficiency in respect of passenger coaches for the Indian Railways. The production was inaugurated on an auspicious Gandhiji's birthday, i. e. 2nd October in the year 1955. During the first five years of production, 1,427 coach shells (i. e. about 50% more than the original targets) have been produced at unit costs which are presently even less than half the cost of similar imported coaches. The production efficiency has been steadily increasing and the quality of manufacture has been maintained at a high standard.

MANUFACTURING ACTIVITIES

This coach Factory was thus planned initially to

SELF SUFFICIENCY BETTER TRAVEL and now towards HIGHER PRODUCTIVITY

Production of Integral Coaches from ICF has been increasing year after year and presently it is at the rate of 600 coaches per annum. The jobbing layout, selected machinery, special jigs, best production methods and skilled personnel of this factory ensure uninterrupted flow of manufacture with all round efficiency and economy. The production costs are very competitive and the quality is of a very high standard. The factory is now trying to build coaches for the export market.

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**INTEGRAL COACH FACTORY
MADRAS—INDIA**

produce only third class integral coach shells during its first five years. Soon after the establishment of production, however, this factory was recognised as an ideal industrial unit for the manufacture of all-welded rolling stock and was given to design and produce other types of integral coaches. The factory has already designed and started production of Passenger-cum-luggage-cum-brake vans (TLRs), Third Class Sleepers (TCNs) and First Class (Fs) coaches.

During India's Third Five-Year Plan period, the production activities of this factory will be further diversified by producing coaches for the Metre Gauge for Electrical Multiple Unit Stock and also Diesel Rail Cars, apart from B. G. Passenger Coaches.

PRODUCTIVITY

The output of coach shells was fixed at 350 per annum (30 shells per month) in single shift working. It was scheduled to achieve this target production of 350 coach shells per year during the 5th Year of production. Starting humbly with the assembly of coach shells from components received from Switzerland this factory has repeatedly beaten its production targets, and achieved its single shift capacity production much ahead of schedule. It is now producing coach shells from almost all Indian-made components. The comparison of the targets and the actual output during the five years of production is indicated below:

Production Year (Oct.—Sept.)	Original target	Actual output
1.	20	43
2.	100	150
3.	200	308
4.	300	424
5.	350	502

A Second shift has been introduced in this factory from April '59 to meet the increasing requirements of coaching stock as well as to obtain further utilisation of machinery and plant. Work during the second shift is being increased as and when additional technical manpower and materials become available. It was due to this partial second shift during the fifth year of production that it was possible to produce 502 coach shells. The present production rate is 52 coach shells per month which will soon be

increased to 60 per month by intensifying work in the second shift.

The efficiency of the shops has been increasing from year to year as the men have been gaining skill and experience. The manhours spent on each coach shell have come down from about 19,600 at the start of production to about 8,600 in the latest batch. The present manhours compare very favourably with those taken for similar coach production in European countries.

The unit production costs have similarly been coming down steadily from initial Rs. 1.86 lakhs to present Rs. 78,000 inclusive of overheads and depreciation. The ex-works cost of a similar coach imported from Switzerland was about Rs. 1.07 lakhs, its landed cost in India working out to Rs. 1.87 lakhs. With the production of each coach shell there is a saving at present of more than Rs. 1 lakh. During this short span of 5 years, such savings would amount to nearly twice the capital invested in the Shell Factory.

To eliminate all wasted time to obtain still better utilisation of our plant and equipment and to stimulate greater effort from our workmen, a bonus system of payment has also been introduced in this factory from the beginning of the year 1960. As a result of this incentive system it is expected that the production will further improve in the years to come.

THE FURNISHING UNIT

The original intention was that this Integral Coach Factory would produce only shells while they will be furnished in the Railway workshops. Due, however, to the impact of the Second Plan, it has been decided to cater for furnishing all the shells at I. C. F. itself. A separate furnishing unit, with a project cost of Rs. 3.69 crores is therefore being set up adjacent to the present Shell Unit. Construction work for this Permanent Furnishing Factory is already in hand and

is expected to be completed early in the Third Five Year Plan.

In the meanwhile, furnishing of shells on a small scale has been commenced by providing temporary facilities. Starting from May 1957, this temporary furnishing unit has gradually developed its output and is now furnishing at the rate of about 25 coaches per month.

TRAINING FACILITIES

There are at present about 7,000 men at work in both shell and furnishing units. Manning of this factory was taken due care of from the early stage of the project. The technical know-how has been completely assimilated from our Swiss collaborators and production is now in charge of Indian Engineers and workers whose skill is second to none.

A fully equipped technical training school caters to the need for training skilled personnel for the factory as well as for providing refresher and promotional courses for the staff. Apart from these measures of betterment the I. C. F. Administration takes warm and friendly interest in its workers welfare, amenities and cultural activities.

Since October, 1955, when this Integral Coach Factory first stirred into productive life, its story has been one of continuous development and growing productivity. The object with which the factory was set up has been more than fulfilled. Having achieved self-sufficiency in the matter of passenger coaches for the Indian Railways this factory is now looking forward to building coaches for the export market. The costs are very competitive and quality in production is of a very high standard. The factory is not only trying to develop export markets for integral coaches in the neighbouring and South-East Asian countries but is hoping to export some even to East European and South American countries.

STEAM TURBINES OF 300,000 KW BUILT

The Central Committee of the CPSU and the Council of Ministers of the USSR have congratulated the workers of the Leningrad Metal Works and the Kharkov Turbine Works upon manufacturing ahead of time the samples of unique steam turbines of 300,000 kilowatts each. These turbines are designed to operate on steam with initial parameters of 240 atmospheres and 580 degrees Centigrade.

For their technical and economic operation characteristics the turbines are well up to the most up-to-date

world standards. Each such unit will save 15 million roubles' worth of fuel a year as compared with three units of 100,000 kilowatts each, and will greatly reduce power plant construction cost.

The development and building of thermal units of 300,000 kilowatts, says the message of the Central Committee of the CPSU and the USSR Council of Ministers, represents an outstanding achievement in the development of power engineering.

CZECHOSLOVAKIA BUILDS A FORGE AND FOUNDRY IN INDIA

[Specially contributed to J.O.I.E.]

 THE contract for the delivery of equipment for the Forge and Foundry at Ranchi was signed on August 19th, 1958, in New Delhi. The construction of the Works was scheduled in three stages. The contract was concluded between the Government of India and the Czechoslovak foreign trade corporation of Technoexport and signed on behalf of the President of India for the Government of India by the Secretary of Trade and Industry, Dr. A. N. Rao and for Technoexport by the First Deputy general manager Mr. O. Mojzisek.

The construction of the Forge and Foundry at Ranchi is part of the national economy plan of the Central Government of India which decided to re-establish the country's independence on the basis of planned construction of a number of metallurgical works, in the absence of which it would neither be possible to establish a sound industrial foundation nor ensure successful development of the national economy of the country. The Forge and Foundry at Ranchi will be one of the basic industrial plants in India, its steel output being planned to reach 4,500,000 tons towards the end of the Second Five-Year Plan.

Czechoslovakia's collaboration in the construction of this plant is the result of a previously established co-operation of considerable standing between India and Czechoslovakia, based on principles of mutual understanding, respect and assistance with application of the basic principle of mutual advantages for both parties to the Contract.

The economic co-operation between these two countries was extended and reinforced in the course of the visits of leading Indian and Czechoslovak statesmen who discussed the future possibilities of extension of the co-operation between the two countries and came to an agreement on the outlines and the scope of this co-operation. On the basis of the outcome of these negotiations between the Government representatives of the two countries the Czechoslovak Socialist Republic offered the Government of India credit for Rs. 23.1 crores for the construction of the third stage of the Forge and Foundry, a plant for the manufacture of heavy-duty machine-tools a

power engineering plant, and other industrial plants, the construction of which is to be agreed upon between the two Governments at a later date.

The agreement on economic co-operation concluded between the Czechoslovak Socialist Republic and the Government of India, which included also the said credit agreement for Rs. 23.1 crores was signed on November 24th, 1959, in New Delhi by the Czechoslovak Minister for Foreign Trade, Mr. F. Krajcir and on behalf of the Government of India by the Minister for Industry, Mr. Manubhai M. Shah. Under the terms of this agreement deliveries of the equipment for the aforesaid industrial plants will be paid for in eight yearly instalments at low rate of interest and a substantial part of these payments will be used by the Czechoslovak Foreign Trade Corporations for the purchase of Indian goods.

The fact that the economic needs of the two countries are most conveniently complementary provides a natural basis for steady development of the relations between the two countries. Indian products have found a safe market in Czechoslovakia with a long term capacity, unaffected by boom and slump risks of fluctuations, giving the Indian economy a chance of obtaining financial means for the purchase of a wide assortment of Czechoslovak industrial products, particularly high-grade machines and machinery equipment, all of which are essential to India's industrial development. Thus it is natural that the complementary economic needs of the two countries must lead to rapid development of trade relations between industrially highly developed Czechoslovakia and India, where the process of industrialisation is still in its beginning. Thus, for instance, whereas the export of machine and machinery equipment from Czechoslovakia to India in 1956 amounted to 48.4 per cent of Czechoslovakia's overall exports to India, in 1957 these exports rose to 56.6 per cent and in 1958 they amounted to 58.7 per cent and in 1959 to approximately 80 per cent. At the same time the production of capital investment deliveries rose from 17.3 per cent of the overall export of machines and machinery equipment in 1956 to 21.7 per cent in 1957, and again to 22.8 per cent in 1958, whereas in 1959 it already amounted

to 31.2 per cent. In 1957 Czechoslovakia supplied India with 50 steam locomotives and 2050 goods wagons, in the State of Punjab a cane sugar mill was put into operation at Panipat, in 1958 another sugar factory was put into operation in the State of Assam and yet another sugar factory is under construction at Madurantakam in the State of Madras. The fact that about 50 per cent of Indian engineering works act as subcontractors in Czechoslovak deliveries is yet another proof of the well-established friendly co-operation with Czechoslovak technicians temporarily working in India industrial plants and for the progress that has already been achieved in India's industrialisation. With the growth and development of Indian industry, the latter will gradually be able to undertake greater deliveries of some industrial equipment and the Czechoslovak engineering industry will then supply only the technically most intricate parts.

Cement works and power engineering plants also play an important part in the exports of Czechoslovak engineering equipment to India. The Czechoslovak engineering industry is engaged at present in deliveries of equipment for extension of the Churk Cement Works in the State of Uttar Pradesh, which has a capacity of 350 tons a day, and in Madras of a capacity of 200 tons a day, the latter with a possibility of extension to achieve a daily output of 350 tons.

Czechoslovak enterprises have equipped a steam power plant at Jamnagar in the State of Bombay and are now completing the construction of a second steam power plant with a capacity of 3×15 MW at Uttran, also in the State of Bombay. To the State of Bihar the Czechoslovak industry is now supplying the complete equipment for the manufacture of HT insulators, a plant with a scheduled yearly capacity of 2,400 tons, while deliveries of machinery equipment for a factory for the manufacture of refractory materials are at present under preparation.

Among the other deliveries now under way is the equipment for a brick factory, supplied to the State of Kashmir. All industrial plants supplied by Czechoslovak foreign trade corporations are put into operation by Czechoslovak technicians, whose duty it is also to ensure training of the Indian personnel both in the management and the manufacturing process of the plant concerned.

In addition to deliveries of machinery equipment for complete industrial plants, Czechoslovak industry also supplies to India a wide assortment of individual engineering industry products, among them in

particular machine-tools, welding machines, tractors, textile industry machinery, etc.

An agreement on co-operation in the building of tractors and motor-cycles is pending. Under this agreement the Czechoslovak industrial plants will assist Indian industry in the gradual construction of two plants for the manufacture of tractors and motor-cycles, the scheduled programme including assembly of the machines from imported component parts in the first stage up to the final introduction of the complete manufacture of these machines in Indian factories.

The present steadily growing development of the economic co-operation between India and Czechoslovakia, the rise in the volume of goods exchanged between the two countries, the assistance offered by sending Czechoslovak experts to aid in the building and development of the industries of India, assistance which has now been greatly strengthened by the recent agreement on economic co-operation signed between the Government of the Indian Republic and the Government of the Czechoslovak Socialist Republic on November 24th, 1959, provide a sound guarantee of long-term future development of the mutual economic relations between the two countries.

Within the framework of the said agreement Czechoslovakia is to supply to India the machinery equipment for a heavy machine-tool plant, a heavy power engineering plant, a plant for the manufacture of high pressure boilers, including heavy steel structures and the third stage of the Forge and Foundry. The completion of the Forge and Foundry will be a most important achievement in the building up of India's metallurgical basis for her heavy engineering industry, which, in turn, will facilitate speeding up of the industrialisation of the country. The forgings and castings produced in the Forge and Foundry will be of the order of up to 100 tons a piece and will thus cover the requirements of the engineering works of a capacity of 45,000 tons of engineering products which is to be constructed in this area by the Soviet Union.

Czechoslovakia will equip the Forge and Foundry at Ranchi with a heavy forge, a non-ferrous foundry, a cast-steel foundry, a grey cast-iron foundry, a Krupp-Renn process plant, wood-working shops, and auxiliary and power engineering plants. The manufacturing programme of the Forge and Foundry is also scheduled to include the manufacture of rolls for rolling mills.

The Forge and Foundry and the other factories and plants constructed within the framework of the agreement on economic co-operation are to be commissioned successively between 1961 and 1965 and the Czechoslovak Socialist Republic has also undertaken to offer technical assistance in the course of the erection of these plants as well as their putting into operation.

The Czechoslovak Skoda Works at Plzen are to supply all the equipment for the Forge and Foundry at Ranchi. Deliveries for the 1st stage of construction are scheduled to begin at the end of 1960. The construction of the Forge and Foundry will provide working facilities for approximately 7,000 Indian workers as this stage. It is estimated that considerably more than 25,000 workers will have to be employed in the construction of the third stage, which will provide a living for no less than 60,000 to 70,000 persons.

When completed, the Forge and Foundry at Ranchi, will cover an area of 1,400,000 sq.m. The length of the road communications inside the plant is estimated at 16.5 km./i.e. 10 miles/ and that of the rail communications at approx. 33.25 km/i.e. 20 miles/.

The Ranchi Forge and Foundry will produce grey cast-iron castings, steel castings, non-ferrous castings and forgings. The castings and forgings will be further processed in the new heavy engineering work which is being built by the Government of India, with the assistance of the Soviet Union, near the Forge and Foundry.

During the first stage of construction of the Forge and Foundry, the grey cast-iron foundry is scheduled to produce approx. 25,000 tons of castings per year, the maximum weight of the individual castings being up to 50 tons. In the second stage of construction this figure will rise to 39,200 tons and the maximum weight per piece to 100 tons.

In the first stage the Work will be equipped with four cupola furnaces of a diameter of 1,200 mm. and these are to be supplemented in the second stage with electric induction furnaces with two crucibles and a capacity of 3 tons.

The steel foundry is scheduled to produce during the first stage approx. 30,000 tons of castings per year, the maximum weight of one piece being up to 50 tons. In the course of the third stage the output of castings will rise to 145,000 tons of castings and ingots per year with weights of up to 160 tons per piece.

The Forge and foundry at Ranchi will be provided with the most up-to-date equipment. During the first stage of construction the following equipment is to be

erected: two open-hearth furnaces, each of a capacity of 40 tons, two electric furnaces, one with a capacity of 20 tons, and the other 2 tons, and the latter are to be supplemented in the course of the second stage of construction with two electric furnaces with capacities of 20 and 5 tons.

The output of the forge in the first stage of construction is scheduled at 14,000 tons of forgings per year with maximum weights of the forgings of up to 17 tons.

On completion of the third stage, the yearly capacity of the forge will rise to 69,700 tons of forgings with weights of up to 100 tons a piece.

The Forge and Foundry will also be equipped with the necessary hardening equipment. In the third stage the works will be equipped with a several-thousand-ton press and will be able to provide heat treatment for pieces 16 m. long in its own electric furnaces.

The Forge and Foundry will also incorporate a series of other buildings such as, for instance, a non-ferrous foundry for the production of copper and aluminium alloy castings and such shops as dressing shops for castings, etc.

The joinery and model shop will process 4,000 cu.m. of cut wood in the third stage of construction.

The auxiliary shops incorporated in the Forge and Foundry are for instance, a tool shop, a generator plant, an acetylene generating plant, a compressor plant, an oxygen plant, an incoming transformer plant, an installation shop, etc.

The power generation plant, the central boiler room, the oxygen plant and the acetylene plant will supply not only the Forge and Foundry, but also a near-by heavy engineering works.

As already mentioned in the aforesaid, the Forge and Foundry, will be put into operation in three stages, i.e. the completion of the first stage is scheduled for 1962 to 1963, that of the second stage for 1964, and that of the third for 1965.

This short outline of the principal features and characteristics of the economic relations between India and the Czechoslovak Socialist Republic and the description of the Forge and Foundry will give a clear picture of the attention devoted by both countries to matters connected with strengthening and extension of their mutually advantageous co-operation. Considerable progress has already been made in the work

connected with investment studies of the other factories to be equipped by Czechoslovakia within the framework of the terms of the Credit Agreement signed in New Delhi on November 24th, 1959.

These facts provide a fairly clear picture of the rapidly growing and developing as well as, mutually advantageous co-operation between India and Czechoslovak Socialist Republic.



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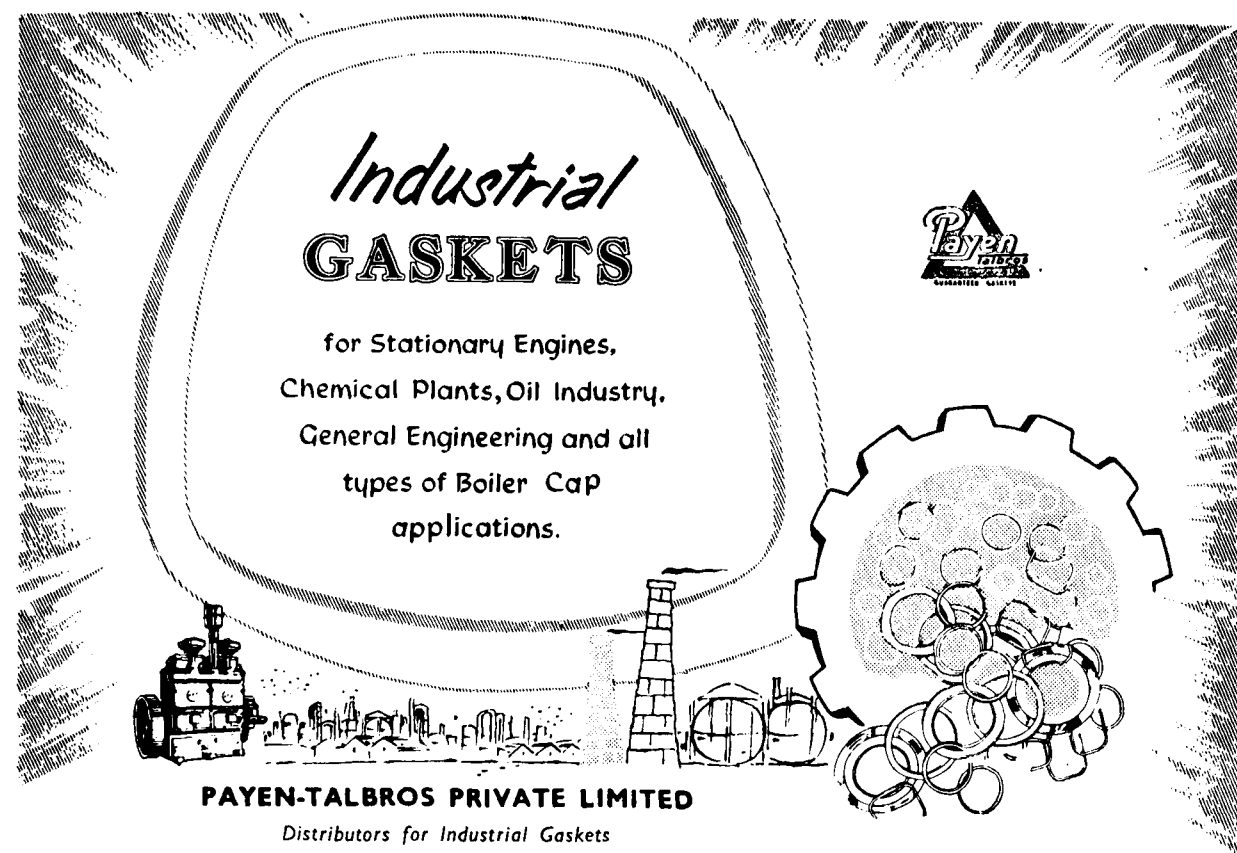
Contribution of Payen-Talbro's to the Nation's Automobile Industry

THE growth of the automobile ancillary industry in India came into limelight after the Second Tariff Commission Enquiry. The Commission submitted its report in October, 1956 when it became abundantly clear that the automobile ancillary industry was to play a very vital role in the expansion of the country's automobile production.

In the industrially advanced countries of Europe the ancillary content of passenger cars and commercial vehicles is anything between 30 to 70% and this would show how important a part ancillary industry plays in those parts of the world. Due to the relatively small demand in our country for ancillary products of the

automobile industry, it was really a challenge to set up extensive plant for the manufacture of ancillary products for the automobile industry and Payen-Talbro's are one of the early pioneers who accepted this challenge.

With faith in the nation's capacity to rapidly industrialize itself, they laid plans for the formation of a Gasket Manufacturing Company in close technical collaboration with a group of experienced and reputed British Gasket Manufacturers. In February 1957 the foundation stone was laid and in barely nine months the factory was constructed with modern equipments imported from abroad and the first batch of wholly-



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A view of the factory.

Indian Gaskets rolled off the Assembly lines on Dussera Day in 1957 which marked a new era not only for Payen-Talbro's but also for the country's automobile industry.

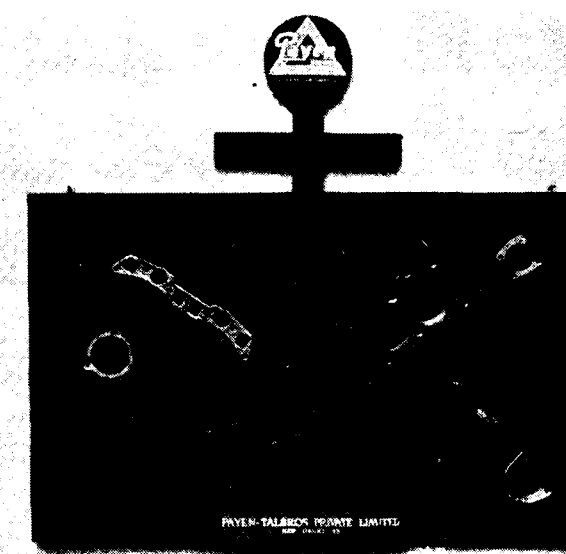
Several difficulties inherent in a new venture of this kind had to be met but Payen-Talbro's, with the zeal and enthusiasm of executives and staff, surmounted these hurdles and difficulties and within two years they were not only meeting 75% to 80% replacement market demands of the country but also became suppliers of gaskets for original equipment to all the manufacturers of automobiles in India. Conscious of the fact that the country is passing through a very difficult period due to our ambitious plans, Payen-Talbro's, not only contented themselves with the savings effected in foreign exchange by meeting fully the internal demands for gaskets but also launched a vigorous export drive to introduce in neighbouring Asian & Middle East countries our quality gaskets in the face of very keen and heavy competition from established European and American Gasket Manufacturers who had entrenched themselves in these markets for the past several decades. The company is now making further headway in their plans to manufacture Industrial Gaskets suitable for Boiler Cap applications, Chemical Plants, Refrigerator Units etc.

First 70,000 KW Turbine Ready for Atomic Power Station

The first 70,000 kilowatt steam turbine for the Novovoronezhskaya atomic power station has been built at the Kirov Plant in Kharkov. The turbine which will make 3,000 revolutions per minute will work on saturated steam under a pressure of 29 atmospheres. It will be automatically controlled. In the coming year two more turbines of the same capacity will be built for the Novovoronezhskaya atomic power station whose rated capacity is 420,000 kilowatts.

Ever since the inception, Payen-Talbro's, have been making remarkable progress both in quality and quantity production, which is now six times than what it was in the first year. Payen-Talbro's with the accent on standardised quality have increased production of gaskets to fully meet the internal demands and also to export these quality products to Iran, Ceylon, and various other West Asian countries.

A visit to the factory of Payen-Talbro's, which has an imposing facade of modern architecture, with the streamlined cycle of gasket manufacturing processes in motion, fully convinces any one that it could compare itself favourably with any such unit in the west. Modern machines and equipments are in



A display of various types of gaskets.

operation for various skilled and precision jobs under the supervision of qualified and experienced team of experts in each technical branch. Apart from standard sizes of gaskets for various purposes, enquiries for new types of gaskets or new designs are also attended to and details of processing and manufacture supplied.

JANUARY 26—PLEDGE AND FULFILMENT

AS the Republic Day dawns, it brings back memories of the Indian people's struggle for liberty and its fulfilment.

It was exactly 31 years ago today that the people of India took a pledge to wage a ceaseless struggle to attain Purna Swaraj. At innumerable meetings and gatherings throughout the country on January 26, 1930, millions of people solemnly affirmed: "We believe that it is the inalienable right of the Indian people, as of any other people, to have freedom and to enjoy the fruits of their toil and have necessities of life, so that they may have full opportunities of growth."

This declaration of the people's right and determination to be free was issued by the Working Committee of the Indian National Congress a few days after the Congress, meeting in plenary session at Lahore, had adopted the goal of complete independence and asked the country to make sacrifices in the pursuit of that goal.

Thereafter, through years of struggle the pledge was repeated at mass meetings on January 26 until the country became independent.

ADDED SIGNIFICANCE

This historic day in the struggle for freedom was invested with added significance when the Sovereign Democratic Republic of India was founded on January 26, 1950. As was to be expected, when the Constituent Assembly was nearing the end of its labours, this day was chosen for the promulgation of the Constitution, marking the launching into the world of the youngest republic with its roots in a civilisation going back to the remotest period of the existence of man.

Now that two General Elections, embracing hundreds of millions of voters, have been successfully held under the Constitution, and preparations for a third General Election have begun, it may be interesting to recall some of the developments associated with the framing of the Constitution.

The Constituent Assembly began its deliberations on December 9, 1946, in Parliament House in New Delhi and completed its task at the end of two years, 11 months and 17 days, when the 395-Article Constitution was adopted on November 26, 1949.

OBJECTIVES RESOLUTION

Within four days of the commencement of its work, the Assembly, after electing Dr. Rajendra Prasad as its President, got down to business, when the Objectives Resolution was moved by Shri Jawaharlal Nehru.

This Resolution outlined the basic concept of the Constitution on which the Assembly was to work in the next three years. It declared that India would be an "Independent Sovereign Republic" and a Constitution would be drawn up "wherein all power and authority are derived from the people" and "wherein shall be guaranteed and secured to all the people of India justice, equality and freedom" and safeguards would be provided for the minorities, backward classes and tribal people.

The Resolution, which was substantially reproduced in the Preamble to the Constitution, was adopted in January 1947, at the second session of the Assembly.

Despite the difficult problems faced by the country and its leaders during a fast-changing situation—the indecision and doubts in the period preceding the transfer of power and the problems created by partition—the Constitution-makers steadfastly adhered to their task. A number of committees on different aspects of Constitution making were appointed, many of them with Shri Nehru or Sardar Patel as Chairman, to prepare detailed reports for consideration of the Assembly. By the end of August 1947, adequate progress had been made on these reports to enable the Assembly to set up a Drafting Committee to prepare a Draft Constitution.

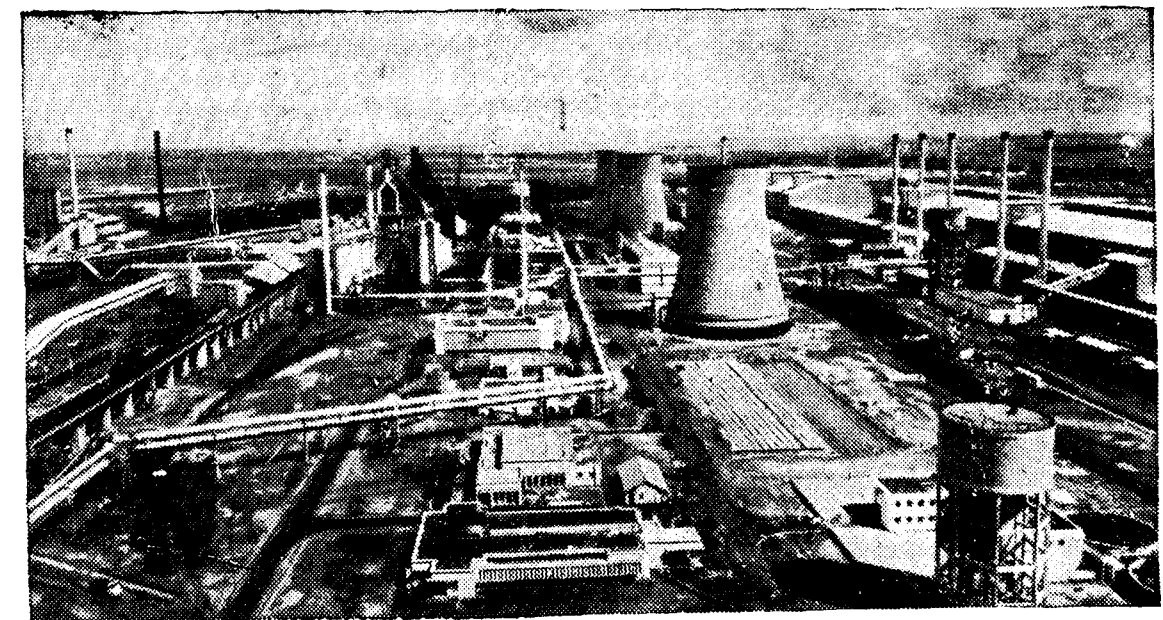
A DRAFT

The Committee, with the late Dr. B. R. Ambedkar as its Chairman, and distinguished lawyers and administrators as members, had before it a draft prepared by the Honorary Constitutional Advisor, the late Sri Benegal Narsinga Rau. After prolonged sittings and detailed examination of several Constitutions, the Committee presented its draft to the Assembly in February 1948.

Sufficient time was allowed for the study of the draft before the Assembly met again, this time to start a detailed consideration of the Draft Constitution.

TOWARDS ACHIEVEMENT

In three brief years a wilderness of swamp and paddy fields has been transformed into the giant steelworks at Durgapur. This remarkable achievement has been made possible by ISCON—a consortium of thirteen leading British firms who are responsible together for the construction of the steelworks. When completed, the steelworks will have capacity for one million ingot tons of steel and a wide range of end products for the industrial markets of India.



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BRITISH COMPANIES WORKING FOR INDIA

Whereas the first six sessions of the Assembly were devoted to the consideration of the objectives Resolution and the reports of its different committees, the last five sessions were taken up with the examination of the Draft Constitution.

Of the total of 165 days on which the Assembly sat, 114 days were spent in considering the draft Constitution. The range and the intensity of interest shown by members in the work of Constitution-making can be seen from the fact that as many as 7,635 amendments to the Draft Constitution were tabled of which 2,473 were actually moved. Nearly 53,000 people witnessed this historic task of the writing of their charter of freedom from the visitors' galleries.

PAST AND PRESENT

It was natural that the Constitution-makers should have thought it proper to draw on the experience of other countries while rooting themselves in the tradition of the country and the aspirations and urges of the people as reflected in the recent struggle.

In the long history of India there were several republics. The republican form of government is not unknown to the student of ancient Indian history and culture. The ancient law makers while describing the monarchical form of government laid stress on the cabinet system and the king giving full weight to the counsel of his ministers. The king was not above the law.

In the Buddhist Sangha (religious order) there was a system of democracy remarkably akin in procedure and rules to our modern system. The Sangha could have borrowed this completely democratic system from some existing political set-up. In the panchayat system of rural India, which has survived so many empires and kingdoms, there existed a form of democracy at the grass-roots. Above all, the freedom struggle was inspired by the ideals of equality and unity of all the people of India.

The Constitution, with 395 Articles and 8 Schedules, which the 308-Member Assembly passed on November 26, 1949, therefore, enshrines the principle of government of the people, for the people and by the people. Through it the Indian people gave themselves for the first time a Constitution bringing together the entire territory of India under one system of government, based on the people and answerable to them.

The Constitution has conferred on the people fundamental liberties which can be enforced through courts

of law. It also embodies Directive Principles, which, though not enforceable like the Fundamental Rights, are nonetheless fundamental in the governance of the country and enjoin upon the Central and State authorities to work for the well-being of the people. It ensures an independent judiciary and audit of public accounts, a statutory public service commission and election commission.

OTHERS' EXPERIENCE

The makers of the Constitution took into account the experience of the working of other Constitution. Apart from the Government of India Act 1935, the Constitutions of Australia and Canada, the United States of America, Ireland (Eire), the Soviet Union, the Weimar Republic, and Switzerland were studied with great care, compared and, where necessary, were drawn upon.

The Government of India Act 1935, of course, provided a useful basis for the drafting of various Articles with necessary adaptations to suit the requirements of a free country. The Directive Principles of State Policy were inspired by similar provisions in the Irish Constitution. The Fundamental Rights' Chapter reminds one of the Irish and American Constitutions. In providing for an independent judiciary the American system supplied a useful parallel. The Rajya Sabha, like the American Senate, is not dissolved, one-third of its members retiring every two years. The Canadian and Australian Constitutions proved useful guides because both countries have a federal parliamentary form of government.

PREAMBLE RECALLED

The Preamble to the Constitution, phrased in elevating language, reflects its spirit. It gives expression to the determination of the people to secure to all the citizens social, economic and political justice, liberty of thought, expression, belief, faith and worship and equality of status and opportunity.

Special mention is made of the resolve to promote among the people "fraternity, assuring the dignity of the individual and the unity of the Nation."

It is not without significance that in forging this instrument of government, the founders had the unity of the country uppermost in their minds which also found succinct expressions in the Preamble. On this day it is important to recall this because it is the duty of every citizen to maintain and strengthen national unity and help achieve emotional integration.

INDIA IN 1961

1961 WILL mark the completion of the Second Plan and the start of the Third, with the emphasis on self-generating industrial economy. It will be a busy year in various fields.

In the three steel works at Rourkela, Bhilai and Durgapur, all blast furnaces and rolling mills will have been commissioned during the year; production of lignite at Neyveli in Madras State will begin; the first unit of the 250,000 kw thermal power station at Neyveli, using lignite as fuel, will start operating.

The construction of the 720-mile pipeline for bringing crude oil from Assam to the refinery in Bihar is expected to be completed; plants to manufacture cement-making and paper-making machinery will go into production.

The Avro-748 plane, in the making by the Indian Air Force, is expected to be ready for flight trial.

1961 will see the commissioning of three major irrigation works forming part of the Hirakud, Chambal and Ghataprabha Projects in Orissa, Rajasthan, Madhya Pradesh and Mysore. Four more in West Bengal, Andhra Pradesh and Kerala will advance rapidly towards completion. Work will also begin on nine other projects elsewhere.

Three more units of the Bhakra Left Bank Power House will be commissioned.

Fertiliser production will start at the Nangal Factory with an annual capacity of 80,000 tons.

The "package programme" of intensified agricultural production will go into operation in Uttar Pradesh, Punjab and Madhya Pradesh. The campaign is already on in Madras, Andhra Pradesh, Rajasthan and Bihar.

There may be free food movement to ensure uniform distribution of available supplies and to reduce regional disparities in prices; construction will begin of 22 agricultural warehouses.

70 co-operative farming pilot projects will be launched in April. Orissa and Punjab, and possibly Uttar Pradesh, will put into effect the three-tier

system of Panchayati Raj — Panchayats at the village level, Panchayat Samitis at the block level and Zila Parishads at the district level.

Mass production of consumer goods like watches, time-pieces and cheap radio sets will begin; a record number of Industrial Estates will be set up.

In the field of communications, 1961 will see the linking up of the metre-gauge railway systems of the north and south with the opening of the Khandwa-Hingoli line in central India to passenger traffic.

In the Cultural field, 1961 will be the Tagore Year marking the Centenary of the birth of the Poet.

The Census will start on February 10 and continue till the night of February 28. The most comprehensive yet undertaken, it will bring out various aspects of the nation at work, its resources and talents as well as its requirements.

The New Year will also bring new schemes for the welfare of children, youth and women.

Millions of more boys and girls in the age-group 6—11 will go to school under the Compulsory Primary Education Scheme.

The National Discipline Scheme will be extended to cover over 7 lakh children in about 1500 schools; the first National Institute for Women's Education will be set up; the National Institute of Sports will start working in Patiala to make available trained coaches for various games.

India will play host in the New Year to distinguished visitors from many lands, notable among them, Queen Elizabeth and the Duke of Edinburgh.

The country will also be the venue of several International conferences, including the World Health Assembly.

RETROSPECT AND PROSPECT A DECADE OF PLANNED PROGRESS

Ten years of planned endeavour in India—1950-5 to 1960-61—have enabled the planners and the

people to visualise a marked advance towards self-sustaining growth in the course of the next five years.

This means that the country will develop a capacity to produce capital goods and equipment required to support the scale of development envisaged and there will be adequate savings and investment in the economy to yield a progressively rising level of income.

As we look back upon this first decade of planning—a unique undertaking within a democratic framework—we find that the country has made substantial advance on all fronts. An increase of about 42 per cent has been achieved in the national income (at constant prices). Per capita income has gone up by 20 per cent and the consumption has increased by 16 per cent—a significant increase considering that our population goes on rising at the rate of 2 per cent per year.

FOOD OUTPUT UP

In the field of agriculture, which continues to enjoy the primacy of place in the economy, the production has increased by nearly 40 per cent. The output of foodgrains has risen from 52.2 million tons at the beginning of the First Plan to about 75 million tons in the current, the last year of the Second Plan.

Agriculturists in nearly 4 lakh villages now have the advantage of agricultural extension services to help and guide them in adopting better farming practices and in securing increasing yields. Great strides have been taken in the development of primary agricultural societies which are playing an increasingly important role in agriculture. Their number has almost doubled—from slightly over 1 lakh to 1.83 lakhs by 1958-59. The membership has advanced from 4.4 million to 12 million. Irrigation facilities have been provided for nearly 70 million acres as against 51.5 million acres at the beginning of the First Plan.

INTENSIVE AGRICULTURE

Our agriculturists have become increasingly conscious of the importance and benefits of fertilisers. Nearly 22 million acres of land have been brought under green manure and the consumption of nitrogenous fertilisers has increased from 55,000 tons to 3.6 lakh tons. The demand for fertilisers is almost insatiable, indicating the extent to which the peasant—often ignorantly described as conservative

and reluctant to learn—has gone in applying modern methods of cultivation.

Intensive agriculture, in fact, has been accepted as a message over large parts of the country and it is only a question of being able to cope with the demand for better seeds, more fertilisers and other facilities.

In the sphere of industrialisation the advance has been more marked and extensive. Many new industries have been set up, significant progress has been made in the setting up of producer goods and machinery-making industries and industrialisation has spread to many new areas. Industrial production has risen during these ten years by nearly 60 per cent.

The steel expansion programme, raising the capacity from 1 million tons at the beginning of the First Plan to 4.5 million tons by the end of the Second Plan, is almost nearing completion. Three modern giant steel plants have come up in the public sector, at Rourkela, Bhilai and Durgapur, and the production capacity in the private sector has been doubled.

Significant advances have been made by the chemical industries. A beginning has been made in the production of heavy electrical equipment and the annual output of industrial machinery has increased from Rs. 11 crores to over Rs. 100 crores during these ten years. At the same time the foundations for a heavy machinery industry, which can supply complete steel plants, have been laid.

SMALL INDUSTRIES

No description of the industrial advance of the country in the first decade of planning will be complete without the mention of the new direction provided to the growth of village and small industries. The handloom industry, which was at one time faced with serious paralysis threatening the livelihood of millions of people, has not only been rehabilitated but has now come to higher levels of production. The output of handloom cloth has increased from 742 million yards to over 2,100 million yards. Khadi cloth output has gone up to 80 million yards from 7 million yards, providing partial and full employment to several lakhs of people.

The growth of small industrial units is considered to have outstripped all expectations, a consequence of the enterprising spirit of people with small means

combined with the extensive facilities provided by Government.

Power generating capacity has doubled from 2.3 million Kw. to 5.8 million Kw. As against just about 3,700 towns and villages with power, now there are 19,000 having the facility for lighting and power for industry and agriculture.

TRANSPORT CAPACITY

There has been considerable expansion of transport capacity. The railways which carried about 91 million tons of goods in 1950—51 have now a capacity to carry about 162 million tons. The mileage of surfaced roads has increased from 97,500 miles to 1,44,000 miles. There are nearly twice the number of commercial vehicles on the road today than there were ten years ago. Indian shipping tonnage is now 9 lakh tons GRT against about 3.9 lakh tons.

Social services have registered a substantial progress. In the primary age group, 6—11 years, 60 out of 100 boys and girls now go to school as against 43 in 1950—51. The total number of students in schools has gone up by about 75 per cent and in the universities by 140 per cent.

Hospital facilities have been increased and the number of medical colleges has risen from 30 to 55. The incidence of diseases like malaria has been controlled and the death rate has fallen. There are now nearly 2,000 family planning centres providing guidance and advice on ways of planning a family.

PLAN-CONSCIOUSNESS

Perhaps the most outstanding achievement is that people all over have become increasingly Plan-conscious and our thinking has become Plan-oriented. Travelling across the country, one is bound to meet people who will proudly point to what in their own limited spheres are notable milestones of planned progress, reached in the First or the Second Plan. The talk is dominated by consideration of the merits of different planned schemes.

That the demand for inclusion of schemes and projects in various district and State plans is considerably ahead of the available resources is also indicative of the intense interest in planning and the desire to achieve progress in as fast a manner as possible.

During these ten years a number of measures have

also been adopted to reduce economic and social disparities. Land reform has made significant progress and peasants have been afforded security of tenure and reduction in rents. Land ceilings are now in the process of being enforced. Programmes for the welfare of backward classes have been carried out. Expansion of primary education, the progress of co-operation and the community development movement have brought increasing opportunities for development within the reach of the less privileged sections of the community. Through different and deliberate measures the growth of less developed parts of the country has also been promoted.

THE FUTURE

Where do we go from here? Planning is a continuous process and Five Year Plans are only convenient stages for laying down and working towards targets and computing progress. It was realised early in the course of planning that we should have a long-term view which gave rise to what is called perspective planning.

It is the objective that national income should be doubled by 1967—68 and the per capita income by 1973—1974, taking the beginning of the First Plan as the base. Greater industrialisation not only in the urban but also in the rural areas to reduce the dependence of the population on agriculture to 60 per cent is also one of the long-term objectives.

In the Third Plan, the draft of which has been before the country for some months and which will attain final shape in the next two or three months, the national income is proposed to be raised by over 5 per cent a year. An investment target of Rs. 10,200 crores, more than the aggregate investment in the first two Plans of Rs. 10,110 crores, is envisaged so that by the end of the Third Plan 14 per cent of the national income will be invested as against 11 per cent by the end of the Second Plan and 7 per cent by the end of the First Plan.

While the general pattern of the investment in the Second Plan will continue in the Third, greater emphasis will be laid on agriculture, industry and power and certain aspects of social services.

Food production is proposed to be raised from 75 million tons to nearly 105 million tons so that the per capita availability will be 15 ozs. of cereals and 3 ozs. of pulses per day. Steel output will be raised to 10 million tons of unfinished steel (6.9 million tons of

finished steel). Power generation capacity will be doubled from 5.8 million Kw. to 11.8 million Kw and the number of towns and villages electrified will go up to 35,000.

The community development programme will embrace the entire rural area. Free and compulsory education is to be provided for children between 6 and 11 years of age. Villages are to be assured of minimum amenities—drinking water, a road linking each village to the nearest main road or railway station and a school building.

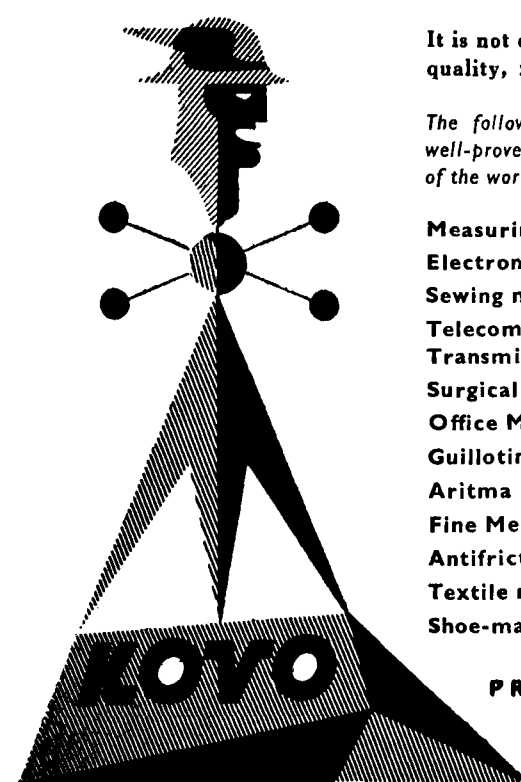
PEOPLE'S PLAN

Planning which seek to provide to the people the good things of life cannot be complete without the active and intelligent participation of the people. This has been forthcoming in some measure in the past decade. Increased association of the people with the processes

of planning has now been assured through Panchayati Raj, under which the responsibility for planning and executing development and welfare schemes has devolved on the representatives of the people at the village and district levels also.

Increasing realisation on the part of the people of their vital role in planned development will ensure a smoother transition to the goal of self-sustaining growth and quicken the processes of development.

This role can take a variety of forms: participation in Plan schemes, particularly those intended for immediate welfare like village roads, schools etc., increased output in the field and the factory making available larger savings to the national economy for investment, intelligent approach to family planning schemes, which have an important bearing on the progress of the country, and the like.



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PLANNING IN INDIA

THE attainment of economic progress through planning was an integral part of the national thinking during the struggle for freedom. At the Karachi session of the Indian National congress in 1931 a resolution was adopted outlining certain basic economic and social objectives which a free India would pursue.

Leading engineers, economists and administrators also laid great emphasis on the need for planned development of the country and suggested 10-year or 5-year plans for the purpose.

In 1938, the then President of the Congress, Shri Subhash Chandra Bose, set up a National Planning Committee, with Shri Nehru as Chairman, to enquire into the possibilities of planned economic development in India and suggest practical schemes.

The Committee, which consisted of economists and experts as well as some administrators from the former Indian States, made several useful and detailed studies and prepared 16 final and 10 interim reports on different aspects of national development.

SEVERAL BLUEPRINTS

The Second World War came in the way of the Committee's work. During this period, however, leading industrialists and economists got together to prepare what has come to be known as the Bombay Plan. One or two similar blueprints were prepared by others. In the closing years of the War there was sustained discussion and thinking on the question of planning for economic advance.

With the coming transfer of power in view, the former Government of India set up a Department of Planning and Development and studies on development schemes to be undertaken after the War were initiated at the Centre and in the Provinces. After the formation of the Interim Government in 1946, an Advisory Planning Board was set up.

In the years following Independence, major development schemes, like the Hirakud Project, were launched. With the complete integration of the country having been achieved and the problems created by partition more or less out of the way, the

time was ripe for the setting up of the Planning Commission in March 1950.

It was recognised that comprehensive planning, after a careful appraisal of resources and with certain basic long-term objectives in view, could be undertaken by an organisation working in close co-operation with different organs of Government but free from the routine of administration.

AIMS AND OBJECTIVES

The Directive Principles of State Policy in the Constitution require the State to work for the social and economic progress of the country and secure the welfare of all sections of the people. With that background, the objective of planning was visualised as initiating a process of development to raise living standards and to open out to the people new opportunities for a richer and more varied life. It was also realised that economic planning should aim not merely at the development of resources in the narrow technical sense but at the development of human faculties and the building of an institutional framework adequate to the needs and aspirations of the people.

The main functions of the Planning Commission are (1) to make an assessment of the material, capital and human resources of the country and investigate the possibilities of augmenting those resources which are deficient in relation to the requirements, (2) to formulate a plan for the most effective and balanced utilisation of these resources, (3) to define the stages in which the plan should be carried out and to propose the allocation of the resources for the completion of each stage on determination of priorities, (4) to indicate the factors retarding economic development and to determine the conditions necessary for the successful execution of the plan, (5) to determine the machinery required for the implementation of each stage of the plan, and (6) to study the progress of execution of the plan and recommend necessary adjustments.

The Prime Minister has been Chairman of the Commission from its inception and, apart from full-time members, the Ministers of Planning, Finance and Defence are also members of the Commission. There

is close liaison between the planning body and the Government at various levels.

PLAN FORMULATION

The Commission is assisted in its work by programme advisors, secretariat personnel and technical divisions manned by subject specialists and research workers. The Five Year Plans are formulated after prolonged consultation with the State Governments and the Central Ministries.

The formulation of the Plans is preceded by a detailed study of the position of resources, the targets to be proposed, the progress achieved in different sectors and the needs of different areas. The plans of States are framed keeping in view the national targets in different fields. The details of various projects are examined by working groups or committees on which officials with knowledge of the subjects are represented.

Consultations are also held with non-officials having expert knowledge of different subjects through committees and panels and the release of a draft well in advance of the finalisation of the Plan ensures nation-wide deliberation and discussion of the objectives and targets.

The details of the Plan are examined by the

Lithuania—A Republic of Machine-Tool Industry

India is among the many countries where Lithuanian machine-tools with the "Zalgiris" trade-mark are popular. The firstling of the machine-building industry of the Republic, the Zalgiris Plant was set up in 1947 and has become a powerful modern enterprise since then. At present it specialises in the output of bracket milling machines of normal and heightened precision and in the manufacture of automatic and semi-automatic machine-tools. There are several more such plants in Lithuania manufacturing machine-tools of different kinds.

Machine-tool industry is developing rapidly in Lithuania. Last year, for example, 6.5 per cent of the total number of metal-cutting lathes made in the USSR were put out at Lithuanian factories. Particularly wide prospects lie ahead in the seven-year period. A number of new enterprises are to be built. They include plants for the manufacture of automatic transfer machines, diamond-boring machines and grinding and drawing

National Development Council which is the highest policy co-ordinating body for planning in the country. The Prime Minister is Chairman of the Council of which Chief Ministers of all States are members. (The Council also reviews the work of the Plan from time to time and considers matters of social and economic policy affecting national development and recommends measures for achievement of the aims and targets of the Plan). The Plan assumes final shape consideration and approval by Parliament.

EVALUATION

The Planning Commission keeps a continuous watch on the execution of Plan projects through periodical progress reports and discussions with the Project authorities and State Governments. The breaking down of a five-year plan in five annual plans also ensures continuous scrutiny of the progress of schemes and comparison with the overall targets. Special organs have been created to watch the progress of Plan schemes. The Programme Evaluation Organisation, set up in 1952, makes a systematic and periodical assessment of the results of the Community Development Programme. A high-level body, the Committee on Plan Projects, has under it teams to investigate and study the working of national extension service, utilisation of irrigation potential and building projects.

machines. Under the Seven-Year Plan Lithuania will account for nearly 40 per cent of all high-precision machine-tools manufactured in the USSR.

STEAM TURBINES FOR OPEN AIR POWER STATIONS

Urals engineers are completing the design of 25,000 kilowatt steam turbines for open air power stations. No building has to be erected for the installation of these turbines. They can function in the open air with a system of protective facilities ensuring reliable work at any season and any weather.

The first two such steam turbines will be manufactured in Sverdlovsk next year and installed in Uzbekistan. Open air power station steam turbines are being manufactured for the first time in the Soviet Union.

GROWTH OF INDIAN ECONOMY

ECAFE COUNTRIES COMMEND

DEVELOPMENT

INDIA'S progress in the development of iron and steel industry in the last few years was favourably commented upon by the countries of the region that participated in the 9th Session of the ECAFE Sub-Committee on Metals & Engineering which met at Rourkela in December, 1960. The expansion and development of engineering industries in India was also considered praiseworthy. In the field of aluminium industry progress was considered satisfactory. Reference was also made to the development of the ship-building industry for commercial advancement as well as for the development of ancillary industries.

Nearly 50 delegates from 19 countries attended the session which was inaugurated by Sardar Swaran Singh, Union Minister for Steel, Mines and Fuel.

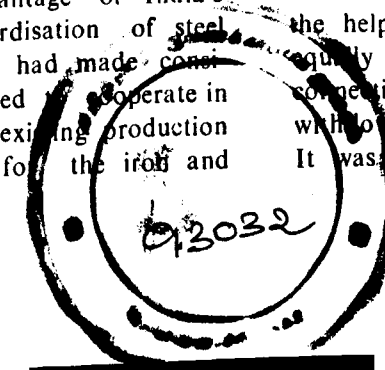
Referring to the development of iron and steel industry, the Indian delegate, Shri A. S. Bam, recalled how some sceptics at home and abroad had not believed in the country's capacity to raise her production from nearly two million tons to six million tons within a span of five years. India, he said, had not only achieved that target but had now planned to increase her production capacity by another 4 million tons, raising it to 10 million tons by 1965-66. In fact, he said, a target of 20 million tons by 1972-75 would not be unrealistic or illusory.

Acting on the advice of Sardar Swaran Singh, who in his inaugural address had advised the countries in the region to exchange information and ideas on how development problems were being tackled under different conditions, this Indian delegate invited ECAFE countries to take advantage of India's experience in regard to standardisation of steel productions in which his country had made considerable progress. India also offered to cooperate in the comprehensive study of the existing production facilities and development plans for the iron and

steel industry. Similarly if any member-country required an appraisal of iron and steel demand, India would be ready to extend the necessary cooperation.

Another Indian delegate, Mr. Firoz Kutar, was applauded when, basing on India's experience, he outlined the specific aspects of development for smaller countries and suggested concrete measures for the same. His specific offer of help in supply of iron ore as a basic raw material and ferro-manganese as one of the important ferro-alloys, training facilities for technical personnel, machinery for steel plants when the Heavy Machine Building Plant went into operation, as well as heavy electrical equipment and sharing of research experience from National Metallurgical Laboratory and Fuel Research Institute, were greatly appreciated. His suggestion that the under-developed countries should concentrate on the development of transport and power before developing heavy industry, was not favoured by Mr. A. Pertzev, the U. S. S. R. delegate, who suggested a simultaneous growth.

The U. K. delegate Mr. E. W. Scafe's advice that the ECAFE countries should concentrate on light finishing and consuming goods industries rather than start iron and steel industry at the present stage of their development, was not received favourably. The consensus of opinion, however, was that the countries should arrive at some arrangement for an intra-regional exchange of raw materials for the development of the iron and steel industry in the ECAFE region. It was felt that even the countries where no raw materials were available, should, as a first step, establish small merchant rolling mills for processing imported billets for the production of rails and structurals to economise on expenditure of foreign exchange. It was also agreed that it might be advantageous to create such heavier mills on pool basis by several countries. The production of pig iron with scrap in electric furnaces or with ores with the help of other proved technical processes was regularly emphasised at the meeting. In this connection India's experiment with low shaft furnace with lower quality of coal received particular mention. It was suggested that efforts should be made to



find out whether raw materials in other ECAFE countries could be benefited.

Mr. Bundit Watanasupat of Thailand said that his country had substantial quantities of iron ore and lignite reserves but no coking coal and, therefore, he gladly accepted the offer of India for testing the raw materials in his country at the small low-shaft pilot plant at the National Metallurgical Laboratory, Jamshedpur. He also invited the foreign investment to set up the steel works in his country and assured investors favourable conditions and good co-operation.

The delegates from the U. K., the U. S. A., U. S. S. R. and France offered to extend all possible help to the ECAFE countries. It was also agreed at the meeting that the production of alloy and special steels was an essential item of industrialisation and that efforts should be made to set up plants in the region in co-operation by two or three countries on the basis of scrap. Here again, India's plan to set up two alloy steel plants—one in the public and the other in the private sector during the Third Five Year Plan—received commendable references.

ENGINEERING INDUSTRIES

The 'remarkable spurt' in the development of general engineering industries in India during the two Plan periods was highlighted by the Indian delegate, Shri Geji. He stated that the index which stood at 183 at the beginning of the Second Five Year Plan period had risen to 283 in 1959. Taking 1951 as the base period, machine tool production in 1959 was up by 828 per cent, that of diesel engines by 315 per cent, sewing machines by 467 per cent, screws by 1083 per cent, winding wire by 874 per cent, electric motors by 302 per cent, power transformers by 544 per cent, electric fans by 242 per cent and bicycles by 767 per cent. He added that the industry was bound to develop further with the planned industrial development in India and particularly with the production of over 10 million tons of steel ingots targeted in the Third Plan. The setting up of Heavy Machine Building Plant at Ranchi was another step that would encourage the engineering industry in the country. He, however, did not consider it imperative that the development of the industry should be invariably tied up with the development of steel industry. He also mentioned the setting up of prototype centres in India and acknow-

ledged the help and co-operation which India had received from the U. S. A., West Germany and France.

Agreeing with the opinion expressed by the Indian delegate that the engineering industries should not be tied up with the development of steel industry, the Pakistan delegate Mr. Shareef, hoped that Japan and India with their production targets of 22 and 10 million tons of steel respectively, would be able to supply the requirements of Pakistan's engineering industries.

The Malayan delegate recounted how the industry had shown considerable improvement in his country which now had 6550 factories.

The Thai delegate pleaded for co-operation in the development of the industry in his country which did not have resources enough in either public or private sector to encourage its growth.

Only 45 per cent of the rated capacity of the industry in Philippines was in operation, said her delegate, for want of raw materials, which in its turn could not be had for want of foreign exchange. He wanted preferential treatment in the procurement of raw materials for the industry in his country.

The USSR delegate emphasised the need of mass production techniques in the region which could be achieved only if all the countries co-operated in sharing the products. He also urged the adoption of uniform standards in weights and measures.

Delegates from Japan offered assistance to countries in the region with her know-how and other resources.

The other delegates that participated in the discussion represented France, the U. K., China (Taiwan), Korea and Singapore.

SHIP-BUILDING INDUSTRY

The development of ship-building industry was considered important at the meeting as most of the

ECAFE countries had coastal lines and needed ship-building for commercial advancement as well as for the development of ancillary industries.

The Indian delegate, Admiral Bose, said that the industry had great importance for India which had 3,000 miles of coastal line. The country had set up a shipyard and hoped to raise her capacity from 850,000 tons to 900,000 tons by 1961—62. Shri Bose also recounted the progress made by Japan and Pakistan in the field. The delegate from Philippines said that his country comprised as many as 7000 islands and depended largely on sea transportation. He wanted help and co-operation from countries in the region for the development of the industry in his country. The other countries that participated in the discussion included Sarawak, China (Taiwan), Malaya, Singapore, Japan, Pakistan and Korea.

ALUMINIUM PRODUCTION

The Sub-Committee reviewed the developments of aluminium production and manufacture in the ECAFE

region where reserves of bauxite existed and recommended increased regional co-operation in this field. India had a target of 82,500 tons of aluminium production by 1965—66 which was to be achieved by the expansion of the Indian Aluminium Co., at Hirakud by 10,000 tons per annum, the Aluminium Corporation of India by 5,000 tons per annum and by establishment of smelters at Rihand, Koyna and Salem.

In regard to the development of foundry industry, the Sub-Committee noted the progress made by India during the last several years. The development on mainland China and Japan also received attention but the lack of trained personnel and capital in the region was high-lighted. India's offer for training the personnel was again appreciated in this connection.

Shri S. Bhoothalingam, leader of the Indian delegation, who presided over the 7-day conference, in his concluding address advised the delegates to ensure that experience gained by them at the conference was utilised by their Governments in the implementation of developmental programmes.

One Plant will produce a Million Tons of Cement A Year

The new cement plant near Leningrad, construction of which is in the finishing stages, will have an annual output of nearly one million tons. It will be one of the world's most modern, fully automated plants. Its sacking machines, for instance, will have an hourly output of 2,000 sacks. No wonder this huge enterprise will have a staff of only 20 workers and engineers: a fraction of the personnel at any cement plant abroad. Six such plants are now being built in the USSR. This year the Soviet cement output will reach 45 million tons, much more than produced in Britain, Italy and France taken together. In the seven-year period cement production will double.

UNUSUAL TOWER CRANE

A new type of tower crane has been put into production at the Kuibyshev Construction Machinery Plant. In transporting the machine from one place to another there is no need to dismantle it. The arm is lowered and the whole aggregate folds into a horizontal position. Then wheels are put on its steel "legs" and

a lorry hauls it to its destination. Once there, special mechanisms fitted to the crane push the arm and the body into an upward position again. The plant will build 15 such cranes before the end of the year.

Another interesting machine being assembled at the plant is a wheeled crane capable of lifting 20 tons.

40 COUNTRIES RECEIVE

BYELORUSSIAN TRACTORS

There is one industrial establishment in Byelorussia to-day to every 3,200 of its population. Byelorussia has already outpaced the USA and Britain in the per capita output of tractors, which it exports today to 40 countries of the world. Its per capita output of metal-cutting machine tools and lorries is greater than in many European countries. Since January 1, industrial output has increased by 14 per cent in comparison with the corresponding period of last year. In the 1959—65 period the Republic will almost double the industrial production.

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December 1960

JOURNAL OF INDUSTRIAL ENGINEERING

M.T.1

BALDING ENGINEERING LTD.'S NEW RANGE OF MILLING MACHINES

By An Engineering Correspondent

 THE famous British manufacturers, Balding Engineering Ltd., Beaver Works, Bessemer Road, Norwich, England, have placed in the market three new types of Milling Machines, Beaver Model "VBA", Model "A" and Model "VBRP". All the three Milling machines can also be purchased with hydraulic control to the knee column which make them a completely automatic miller or diesinker.

Also they can be bought as optical jig borers and also as a Jig borer fitted with measuring troughs and clocks.

Brief Description :

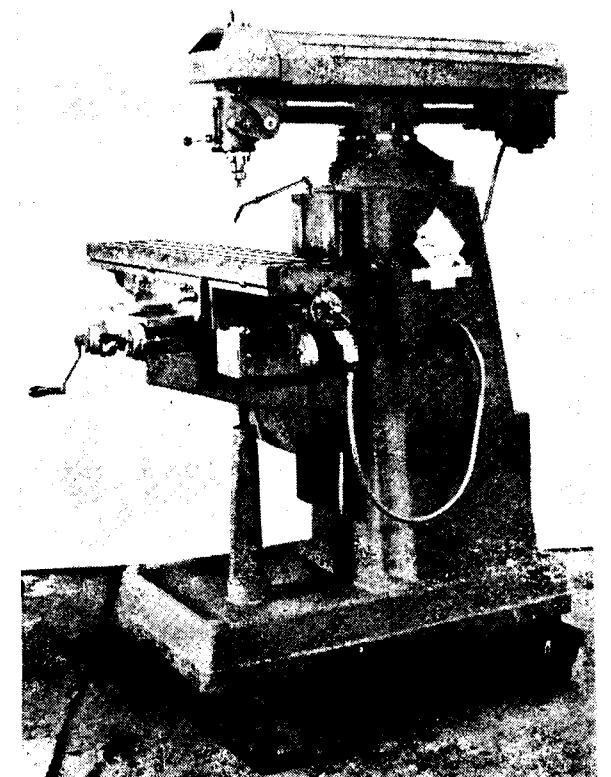
BEAVER SWIVELLING TURRET MODEL "VBA" MILLING MACHINE

The "Beaver" Model "VBA" light precision vertical milling machine, has been developed by simply scaling up our "very successful" Model 'A' machine.

Many of the parts are interchangeable. The result is a very versatile "proven machine" of considerable capacity range, at an extremely competitive price.

Drive : The drive is taken from a $\frac{3}{4}$ h. p. machine tool balanced motor and thence to a 5-step idler pulley. This pulley is mounted on two precision ball bearings which are grease packed and rubber oil sealed. The idler pulley is attached to a T slot bolt which gives very easy tensioning and adjustment of the secondary belt and the actual tensioning of the motor belt is carried out by quick acting cam lever.

The drive then continues from this 5-step idler pulley to the main drive pulley on the headstock spindle. This pulley is made from very close grained cast-iron, machined all over and carefully balanced. The spindle pulley is mounted on two precision ball bearings which are grease packed and rubber oil sealed for long life. The design is such that all belt pull is taken completely on these bearings mounted in the



Beaver Swivelling Turret Model "VBA" Milling Machine

upper housing thus freeing the spindle from any stress.

The drive then continues from the splined sleeve in the main driving spindle pulley to the spindle itself which is in turn supported by two large capacity taper roller bearings within a very precisely machined quill. The quill is hard chrome plated on the outside thereby ensuring a long lasting life. The quill housing is carefully fine bored and honed to a very high standard of finish roundness and close tolerance fit.

The machine cut rack is an integral part of the quill. Drive to the rack for advancement of the spindle quill is taken through a train of machine cut gearing

giving the following ratios, 1 : 1 or 1 : 4. The machine has a rapid traverse for plunge cutting a radius with a milling cutter or drilling, reaming, etc., with instant change to a very fine feed which is very handy for fine boring, etc. The quill is spring loaded for automatic return.

A depth micrometer reading to 0.001" plus a rule movement of 3" permits resetting work to various levels and repetition to depth of cut.

Column and Knee: The main column and base of the machine is a one piece casting of very rugged construction. It is honeycombed webbed throughout to evenly distribute the cutting stresses and absorb all the vibration. The base of the column incorporates a reservoir for the cutting oil. The suds pump is mounted within the column and is a completely self-contained unit. All sware ways of generous bearing proportions are utilised throughout the machine.

The knee is of extremely wide proportions for this size of machine, thereby ensuring stability of cut over large areas, particularly when fly cutting. The narrow type square saddle guide bearing is utilised together with a full length key for maintaining accuracy. The elevation screw of the knee has a precision Acme thread turning on ball thrust bearings thence to high precision machine cut bevel gears.

Saddle: The saddle is a very rugged casting which is virtually machined all over, thereby retaining its original machined precision. Long bearing support is given to the table on the V ground dovetail ways, approx. 22". The feed screw for the cross feed is 3/4" dia. made from high carbons steel and precision produced for pitch and accuracy. Very accurate movement is obtained through the back lash eliminating double nuts.

A ball thrust race is incorporated to give fine feel. The cross travel is 12". It should be noted that this screw has been carefully tucked away underneath the right-hand knee way to ensure that it is kept free from falling chips, dirt etc.

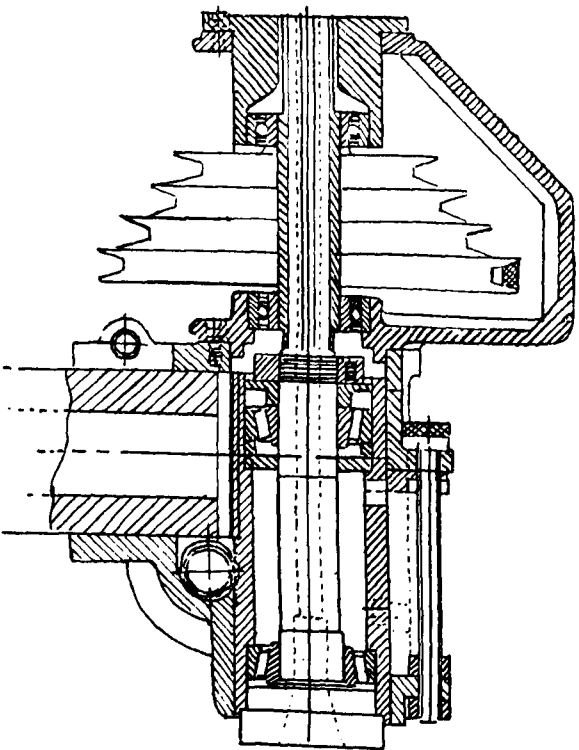
Table: The table can be supplied in any one of the four sizes as specified on the back page. It will be noted that the table has false ends ensuring that the cutting oil is correctly returned to the sump within the base. Two suds trap ways are also incorporated in the design and the three main T Slots have been carried through to the ends of table ensuring that when necessary the complete working surface of the table, as specified can be utilised at any time.

The drive to this table is by hand, or power through the gearbox. The drive is taken through a precision steel screw working through double nuts which act as back lash eliminator enabling the operator to feed cuts in either direction. Adjustment to this back last eliminator is very easily made *in situ*.

Large easily read micrometer dials, "friction loaded" are attached to each end of the table and ball handles with rotating handles are fitted at each end for ease of operation so that the operator may work right or left hand as desired.

The T slot in front of the table has adjustable stops which can be adjusted to give extreme accuracy for length of cut. They also operate as automatic knock-offs for the power feed gearbox.

Gearbox: This electrically driven gearbox has been designed for the customer who feels that a long power traverse is essential. The whole thing is very neat and light, driven by a 1/10th h.p. motor which is totally enclosed.



Headstock Arrangement

The gearbox can be supplied in two ranges of feeds, 1/2"–4 1/2" or 1"–9" per min. The method of change is by pick-off gearing. The drive is taken direct from the motor which has a worm attached to its shaft

engaging with a worm wheel. Various reductions are then achieved through spur gears to the table feed screw. The right hand and left hand traverse is

instantly obtainable through the selection lever. All gears within this gearbox are running in an oil sump system.

BRIEF SPECIFICATION

RANGE				SPINDLE	
Table length	32"	36"	44"	48"	Spindle nose No. 30 IST.
Longitudinal Feed	13 1/2"	17 1/2"	25 1/2"	29 1/2"	Spindle Speeds No. 7
All with power feed				Spindle Speeds range	200 to 3,600 R.P.M.
Width of Table	10"			Spindle quill traverse	3"
T slots	3 @ 11/16" x 2 1/2" crs.			Spindle centre line turns through	180 deg.
Longitudinal Power Feed				Overarm turrets through	180 deg.
table only, L. H. or R. H.	1/2"–4 1/2" or 1"–9" per min.			SPINDLE MOTOR	
Cross table traverse	12"			3/4 h.p. recommended at 1,500 R.P.M. or 1 h.p. as extra	
Vertical table traverse	19"			Voltages to suit customers' requirements.	
				NETT WEIGHT	17 cwt. 850 kg.
				Overarm adjustment from column face, Maximum	17"
				Overarm adjustment from column face, minimum	2"
				Spindle nose to top of table, maximum	19"
				Spindle nose to top of table, minimum	0"
				Face of column to centre line of T slot in table, maximum	17"
				Face of column to centre line of T slot in table, minimum	5"

Illustrations and specifications not binding as to detail

BEAVER SWIVELLING TURRET MODEL 'A' MILLING MACHINE

The Beaver Model 'A' light precision vertical milling machine has been engineered by this Company to fill an essential part of the present day machine shop equipment. The machine is intended to be precise and yet at the same time very universal, freeing costly heavy plant which is often utilised for work which can easily and rapidly be carried out at a much less cost on the Bever A.

It will be obvious to the competent machinist that this a very versatile machine which can be used in various angles for diverse operations, such as drilling, light boring, etc., and as an all-purpose miller. It is ideally suited for jig, tool, die, fixture work, the model maker, experimental engineers, etc.

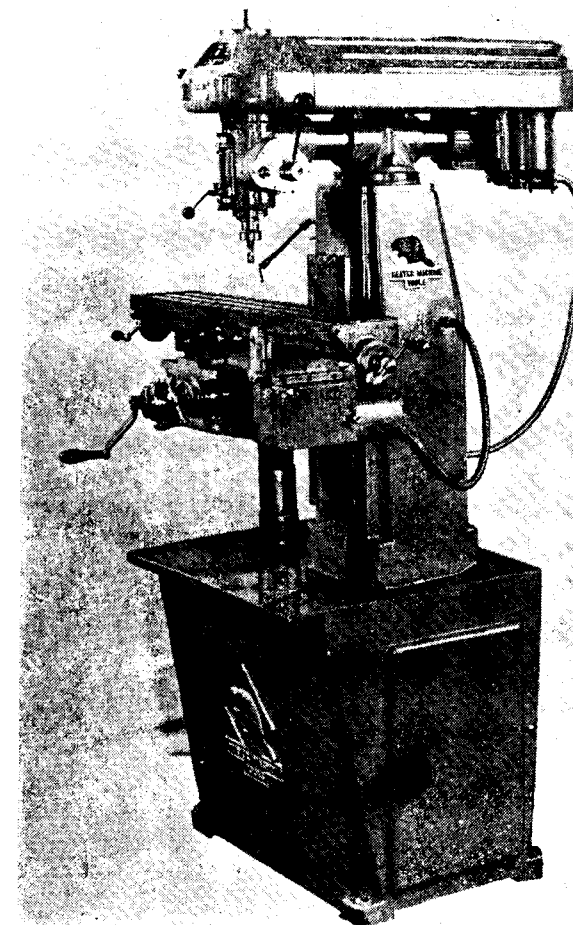
Drive: The drive is taken from a 3/4 h.p. machine tool balanced motor and thence to a 5-step idler pulley. This pulley is mounted on two precision ball bearings which are grease packed and rubber oil sealed. The idler pulley is attached to a T slot bolt which gives very easy tensioning and adjustment of the secondary

belt and the actual tensioning of the motor belt is carried out by quick acting cam lever.

The drive then continues from this 5-step idler pulley to the main drive pulley on the headstock spindle. This pulley is made from very close grained cast-iron, machined all over and carefully balanced. The spindle pulley has a six-spline steel driving sleeve. The pulley itself is mounted on two precision ball bearings which are grease packed and rubber oil sealed for long life. The design is such that all belt pull is taken completely on these bearings mounted in the upper housing thus freeing the spindle from any stress.

The drive then continues from the splined sleeve in the main driving spindle pulley to the spindle itself which is in turn supported by two large capacity taper roller bearings within a very precisely machined quill. The quill is hard chrome plated on the out side thereby ensuring a long lasting life. The quill housing is carefully fine bored and honed to a very high standard of finish roundness and close tolerance fit.

The machine cut rack is an integral part of the quill. Drive to the rack for advancement of the spindle quill



Beaver Swivelling Turret "A" Milling Machine

is taken through a train of machine cut gearing giving the following ratios, 1:1 or 1:4. The machine has a rapid traverse for plunge cutting a radius with a milling cutter or drilling, reaming, etc., with instant change to a very fine feed which is very handy for fine boring etc. The quill is spring loaded for automatic return.

A depth micrometer reading to 0.001" plus a rule movement of 3" permit resetting work to various levels and repetition to depth of cut.

Column and Knee: The main column of the machine is one-piece casting of a very rugged construction. All square ways of generous bearing proportions are utilised throughout the machine. The knee is of extremely wide proportions for this size of machine, thereby ensuring stability of cut over large areas, particularly when fly cutting. The narrow type square saddle guide bearing is utilised together with a full

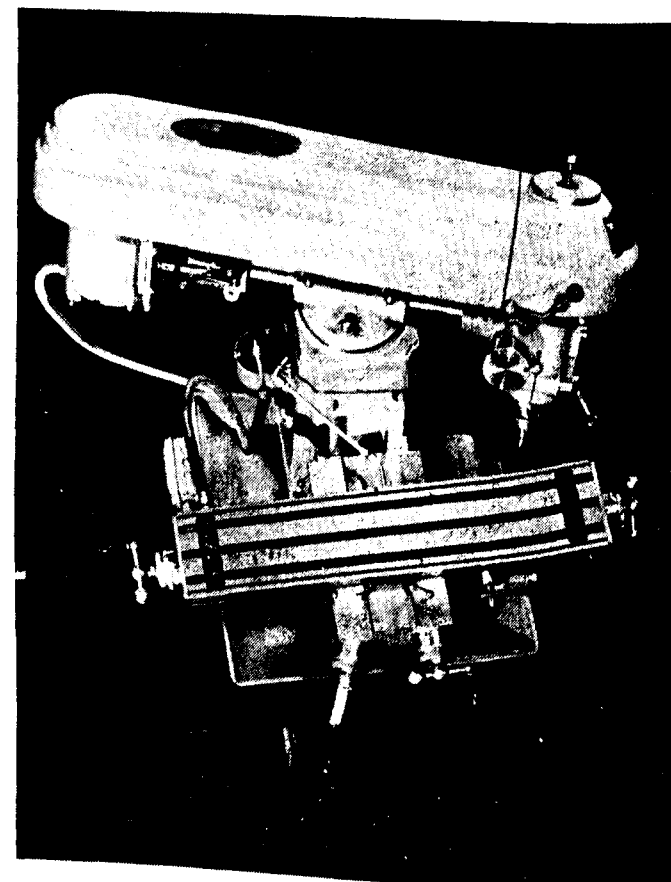
length taper key for maintaining accuracy. The elevation screw of the knee has a precision Acme thread turning on ball thrust bearings thence to high precision machine cut bevel gears.

Saddle: The saddle is a very rugged casting which is virtually machined all over, thereby retaining its original machined precision. Long bearing support is given to the table on the V ground dovetail ways, approx. 13 $\frac{3}{4}$ ". The feed screw for the cross feed is $\frac{3}{4}$ " dia., made from high carbon steel and precision produced for pitch and accuracy. Very accurate movement is obtained through the back lash eliminating double nuts.

A ball thrust race is incorporated to give fine feel. The cross travel is 7 $\frac{1}{2}$ ". It should be noted that this screw has been carefully tucked away underneath the right-hand knee way to ensure that it is kept free from falling chips, dirt etc.

Table: This is a large table for the size of the machine, but is in keeping with all other proportions. It will be noted that the table has false ends thereby

Beaver Swivelling Turret Model "A" Milling Machine



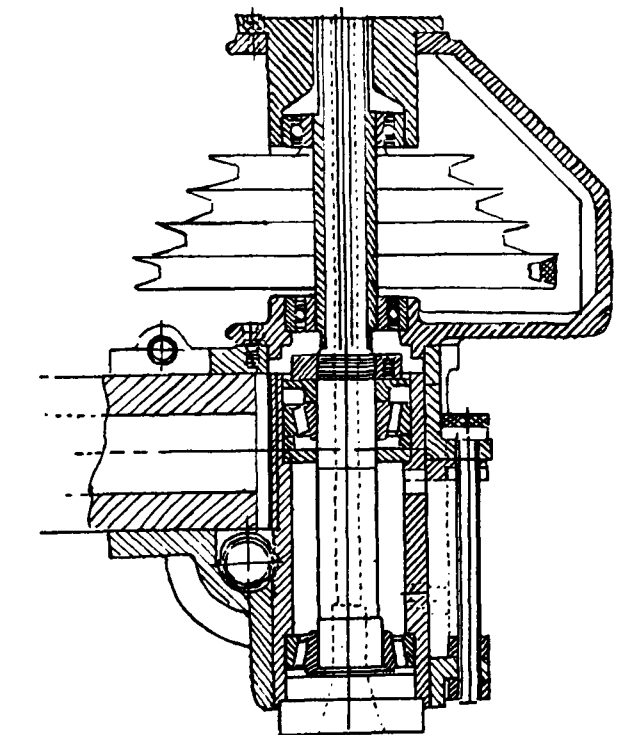
ensuring that the cutting oil is correctly returned to the sump within the base. Two suds trap ways are also incorporated in the design and the three main T slots have been carried through to the ends of the table, ensuring that when necessary the complete working surface of the table 28" x 6", can be utilised at any time.

The drive to this table is by hand, or power through the gearbox. The drive is taken through a precision steel screw working through double nuts which act as back lash eliminator enabling the operator to feed cuts in either direction. Adjustment to this back lash eliminator is very easily made *in situ*.

Large easily read micrometer dials, "friction loaded", are attached to each end of the table and ball handles with rotating handles are fitted at each end for ease of operation so that the operator may work right or left hand as desired.

The T slot in front of the table has adjustable stops which can be adjusted to give extreme accuracy for length of cut. They also operate as automatic knock-offs for the power feed gearbox.

Cabinet Base: A heavy box section casting internally webbed giving complete rigidity to the machine and at the same time serving as a cupboard for equipment, a reservoir for the cutting oil. The suds pump



Headstock Arrangement

is mounted within this cabinet and a completely self-contained unit.

Gear Box: This electrically driven gearbox has been

BRIEF SPECIFICATION

RANGE		POWER FEED	
Longitudinal table traverse	15"	For table longitudinal	$\frac{1}{2}$ to 4 $\frac{1}{2}$ inches/min.
Cross table traverse	7 $\frac{1}{2}$ "		or
Vertical table traverse	13"		1 to 9 inches/min.
Overarm adjustment from column face, maxm.	9 $\frac{1}{2}$ "	SPINDLE	
Overarm adjustment from column face, minm.	3 $\frac{1}{2}$ "	Spindle nose	No. 30 I.S.T.
Spindle nose to top of table, maxm.	13"	Spindle speeds—number	7
Spindle nose to top of table, minm.	0"	Spindle speeds—range	200-3600 R.P.M.
Face of column to centre line of centre T slot in table, maxm.	10 $\frac{1}{4}$ "	Spindle quill traverse	3"
Face of column to centre line of centre T slot in table minm.	3 $\frac{1}{4}$ "	Spindle centre line turns through 180 deg.	
		Overarm turrets through 180 deg.	
TABLE		SPINDLE MOTOR	
Working surface	28" x 6"	$\frac{3}{4}$ H.P. recommended	1,500 R.P.M.
Size overall	28" x 6"	Voltages to Customers' requirements	
T slots number and size	3—9/16"	NET WEIGHT	
Distance between T slots	1 $\frac{3}{4}$ " cts.		8 cwt. 3 Qrs.

Illustrations and specifications not binding as to detail.

designed for the customer who feels that a long power traverse is essential. The whole thing is very neat and light, driven by a 1/10th h.p. motor which is totally enclosed.

The gearbox can be supplied in two ranges of feeds, $\frac{1}{8}$ "— $4\frac{1}{2}$ " or 1"—9" per min. The method of change is by pick-off gearing. The drive is taken direct from the motor which has a worm attached to its shaft engaging with a worm wheel. Various reductions are then achieved through spur gears to the table feed screw. The right and left hand traverse is instantly obtainable through the selection lever.

All gears within this gearbox are running in an oil sump system.

BEAVER SWIVELLING TURRET MODEL "VBRP" MILLING MACHINE

The "Beaver" Model "VBRP" medium duty precision vertical milling machine has been developed by simply scaling up the "very successful" Model 'A' machine.

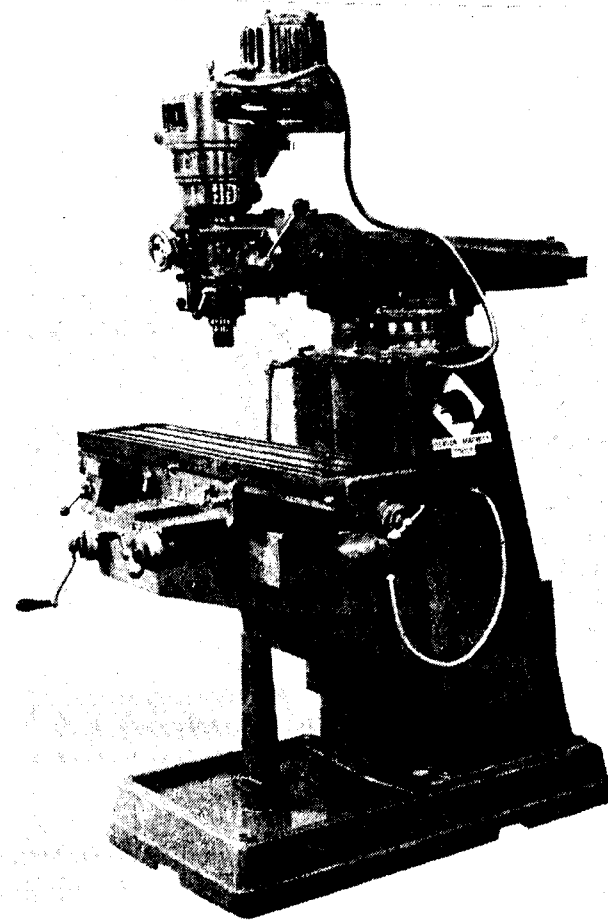
Many of the parts are interchangeable. The result is a very versatile "proven machine" of considerable capacity range.

The "RP" head on this miller attached to its veep prismatic overarm, is a powerful versatile unit swivelling 360 deg. in the longitudinal plane, and 45 deg. inwards or outwards in the transverse plane.

Three rates of auto power down feed are available. This, coupled to the precision built into this machine, enables you to cover a very wide range of work including jug boring at a very economical price.

"RP" Milling Head: This all angle milling head is a completely self-contained unit. Eight spindle speeds are provided, four on the high speed range and four on the low speed range, operated by a quick action single lever.

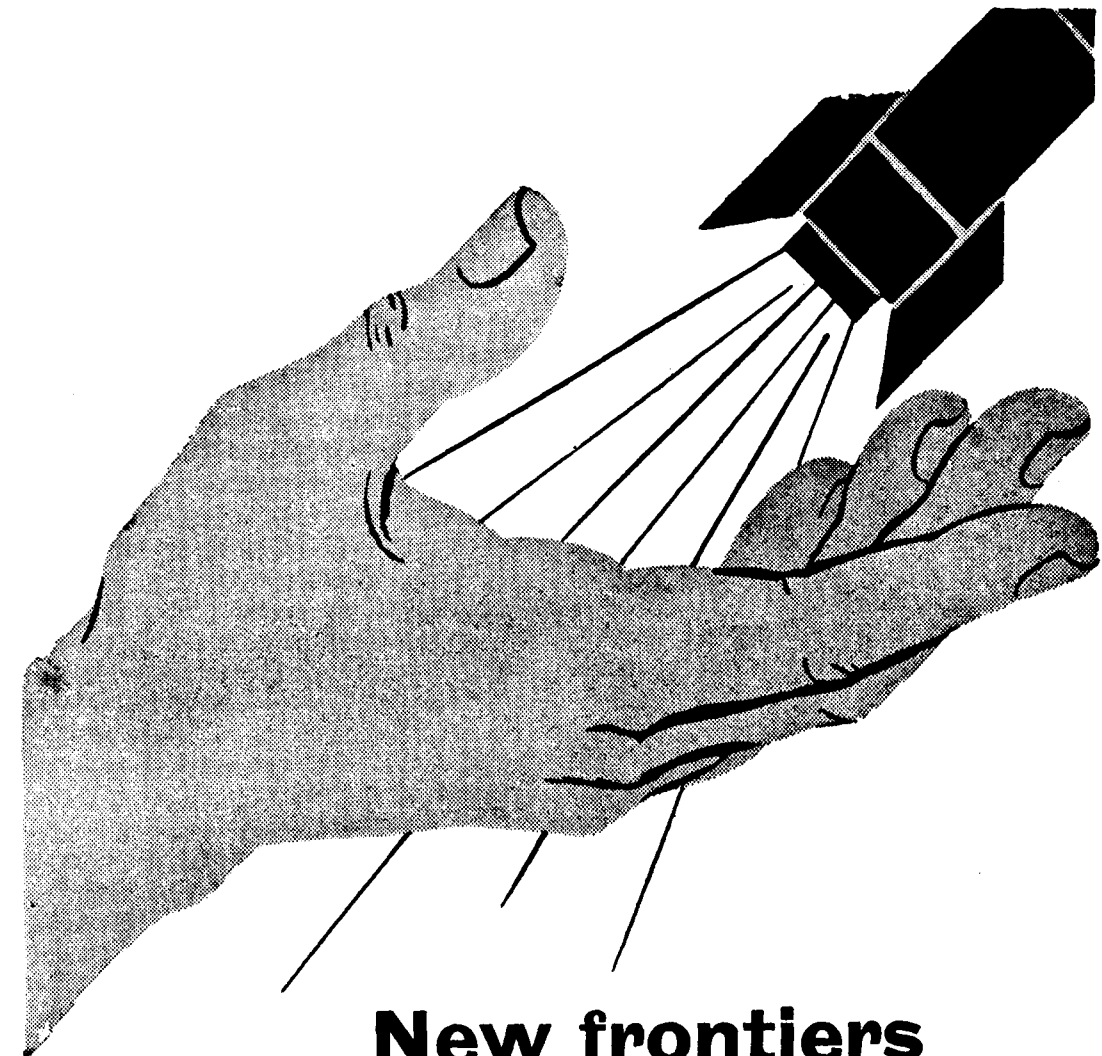
The drive is taken from a machine tool balanced motor by vee belt to a four step idler pulley. This pulley is mounted on two precision ball bearings housed in the top aluminium bracket. The motor is hinged so that the belt can be easily changed and adjusted for tensioning. The drive is then taken from the idler pulley through a powerful precision cut helical back gearing. All the pulleys and gears are



Beaver Swivelling Turret Model "VBRP" Milling Machine

dynamically balanced electrically to ensure a vibration free head. A six spline driving sleeve is mounted in the upper housing on two precision ball bearings. All the load from the back gearing is taken on these bearings thus freeing the spindle from any stress. The spline sleeve drives the main spindle which is mounted in the sliding quill as shown. The spindle is mounted on three very high precision bearings. A matched pair of pre-loaded angular contact ball bearings are positioned in the upper end of the quill. The large diameter hard chrome plated quill is precision ground. The quill housing is carefully fine bored and honed to a very high standard of finish and roundness and close tolerance fit.

The spindle travel is 5" with an adjustable depth stop on the front of the housing. A single hand lever gives rapid quill movement via a pinion and rack, very useful for plunge cutting, drilling and reaming, etc. A hand wheel complete with a micrometer collar gives fine feed through a worm and worm wheel, very useful for fine boring, etc. The quill has three rates of



New frontiers

From the beginning of time human eyes have looked up into space and wondered, and wondering, desired to possess the moon.

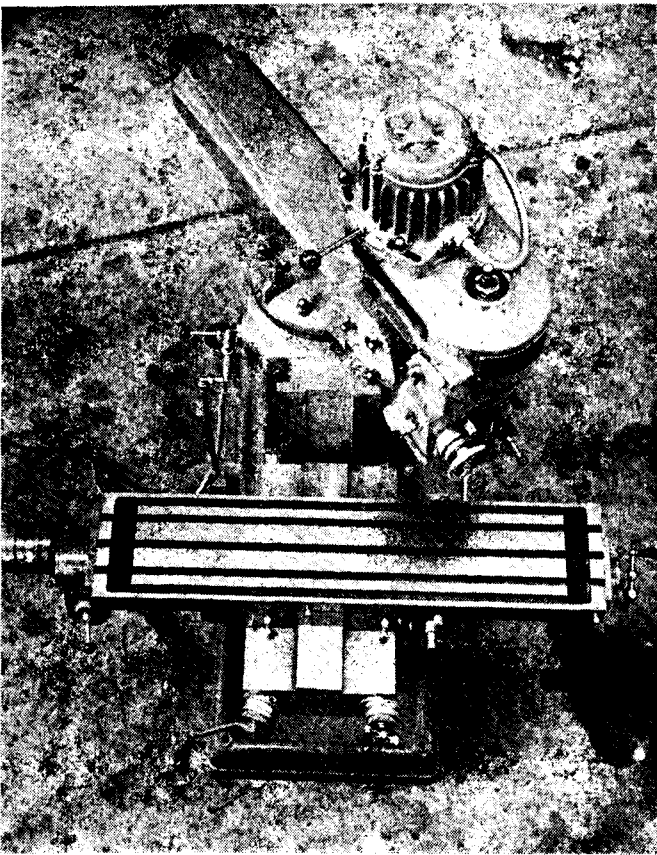
Today, man has travelled far on the road of knowledge; today he is about to inherit the moon.

We may not yet know all the details of that first flight which will send him hurtling through space. But of this we are sure, he will need Oxygen to sustain him. And of this too we are sure, that Oxygen will have helped to cut or weld his space-ship and its equipment.

**INDIAN
OXYGEN
LIMITED**



Twentyfive
Years'
Service



Beaver Swivelling Turret Model "VBRP" Milling Machine

power down feed per spindle speed. Any depth setting can be made and is automatically knocked off. An important feature is the self-retracting spindle action.

Ram & Turret: The prismatic overarm is securely clamped to the turret with two quick action clamping nuts. The ram movement is actuated by rack and pinion and revolves with the turret 180 deg.

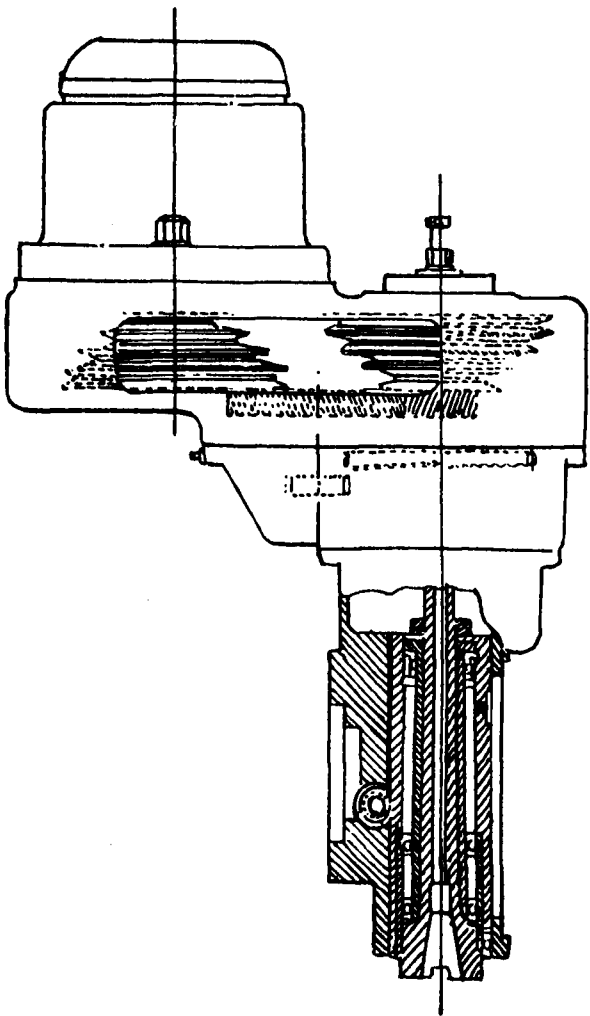
Column & Knee: The main column and base of the machine is a one piece casting of very rugged construction. It is honeycombed webbed throughout to evenly distribute the cutting stresses and absorb all the vibration. The base of the column incorporates a reservoir for the cutting oil. The suds pump is mounted within the column and is a completely self-contained unit. All square ways of generous bearing proportions are utilised throughout the machine.

The knee is of extremely wide proportions for this size of machine, thereby ensuring stability of cut over large areas, particularly when fly cutting. The narrow type square saddle guide bearing is utilised together

with a full length key for maintaining accuracy. The elevation screw of the knee has a precision Acme thread turning on ball thrust bearings thence to high precision machine cut bevel gear.

Saddle: The saddle is a very rugged casting which is virtually machined all over, thereby retaining its original machined precision. Long bearing support is given to the table on the V ground dovetail ways, approx. 22". The feed screw for the cross feed is $\frac{3}{8}$ " dia., made from high carbon steel and precision produced for pitch and accuracy. Very accurate movement is obtained through the back lash eliminating a double nuts.

A ball thrust race is incorporated to give fine feel. The cross travel is 12". It should be noted that this screw has been carefully tucked away underneath the right-hand knee way to ensure that it is kept free from falling chips, dirt, etc.



Headstock Arrangement

Table: The table can be supplied in any one of the four sizes as specified elsewhere in this write-up. It will be noted that the table has false ends ensuring that the cutting oil is correctly returned to the sump within the base. Two suds trap ways are also incorporated in the design and the three main T slots have been carried through to the ends of the table, ensuring that when necessary the complete working surface of the table, as specified can be utilised at any time.

The drive to this table is by hand, or power through the gearbox. The drive is taken through a precision steel screw working through double nuts which act as back lash eliminator enabling the operator to feed cuts in either directions. Adjustment to this back lash eliminator is very easily made *in situ*.

Large easily read micrometer dials, "friction loaded", are attached to each end of the table and ball handles with rotating handles are fitted at each end for ease of operation so that the operator may work right or left hand as desired.

The T slot in front of the table has adjustable stops which can be adjusted to give extreme accuracy for length of cut. They also operate as automatic knock-offs for the power feed gearbox.

Gearbox: This electrically driven gearbox has been designed for the customer who feels that a long power traverse is essential. The whole thing is very neat and light, driven by a 1/10th h.p. motor which is totally enclosed.

The gearbox can be supplied in two ranges of feeds, $\frac{1}{2}$ "—4 $\frac{1}{2}$ " or 1"—9" per min. The method of change is by pick-off gearing. The drive is taken direct from the motor which has a worm attached to its shaft engaging with a worm wheel. Various reductions are then achieved through spur gears to the table feed screw. The right and left hand traverse is instantly obtainable through the selection lever.

All gear within this gearbox are running in an oil sump system.

BRIEF SPECIFICATION

RANGE				SPINDLE	
Table length	32"	36"	44"	48"	Spindle nose No. 30 IST.
Longitudinal feed	12"	16"	24"	28"	Spindle Speeds No. 8
All with power feed R/T reduces above by 2"				Spindle Speeds range	80 to 3,000 R.P.M.
				Spindle quill traverse	5"
				Spindle centre line turns through 180 deg. (in longitudinal plane and 90 deg. in transverse plane)	
				Spindle power feed .0015"—.003" & .006" per rev.	
				SPINDLE MOTOR	
				1 h.p. recommended at 1,500 R.P.M. or 1 $\frac{1}{2}$ h.p. as extra Voltages to suit customers' requirements.	
				NETT WEIGHT 19 cwt. 970 kg.	
				Overarm adjustment from column face, maximum	22"
				Overarm adjustment from column face, minimum	5 $\frac{1}{2}$ "
				Spindle nose to top of table, maximum	17" with raising block 21" or 25"
				Spindle nose to top of table, minimum	0"
				Face of column to centre line of T slot in table, maximum	17"
				Face of column to centre line of T slot in table, minimum	5"

Illustrations and specifications not binding as to detail. Subject to alteration without notice.

New Development and Tradition in HENSCHEL Machine Tool Production

By An Overseas Correspondent

DURING recent years HENSCHEL-WERKE have moved further and further into the foreground as manufacturers of special machine tools for chip cutting machining tasks. The machine tool exhibition of 1960 at Hanover again showed a section of the extensive machine tool manufacturing range of HENSCHEL-WERKE.

The capacity displayed by HENSCHEL in 1960 would not surprise anybody, who had an insight into the development of HENSCHEL-WERKE, where they have produced a permanent staff of technicians and specialists second to none for 150 years, particularly in the field of engineering. In October of this year HENSCHEL-WERKE celebrate their 150th anniversary. Even before the foundation of the present day HENSCHEL-WERKE the foundryman Georg Christian HENSCHEL was manufacturing metal turning lathes to his own design. A lathe built as early as 1799 was still in service in 1900. HENSCHEL was already an established engineering works in 1817 and took up the production of hydraulic presses. In 1840 the manufacture of heavy machine tools was commenced. A HENSCHEL price list dated 1875 listed amongst others the following machines:

Support lathe, automatic with toothed rack,
Shaping machines,
Planing machine with rack drive,
Radial drilling machine,
Drilling lathe with back gear,
Slotting and drilling machine,
Facing lathe,
Roll turning lathe,
Thread cutting machine.

This supply range embraced nearly all types of machines then in operation and remained for a long time characteristic of the "Engineering Works".

The market for machine tools climbed steadily after the commencement of the so-called machine-age and an armoured plate planing machine 45 tons in weight was included in the long list of products which

HENSCHEL were supplying at that time to all parts of the world.

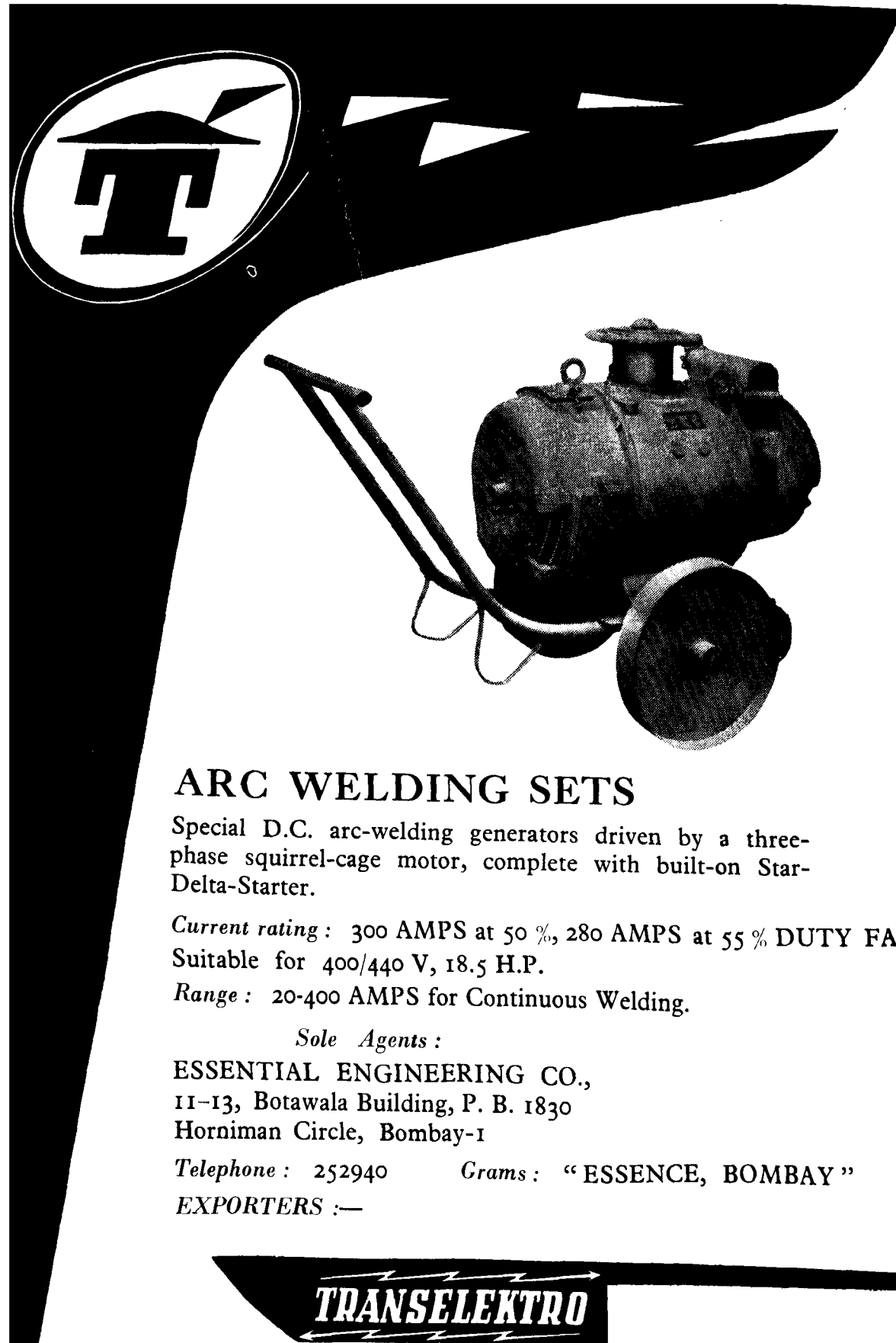
The construction of special machines and of transfer lines which are in great demand today for mass production, was taken up in 1934, coinciding with the recovery of German industry. With the manufacture of production and assembly lines, the idea was conceived in Kassel of constructing component parts designed as drilling, milling and facing units with feed table units on the standardized sub-assembly principle, enabling machine tools to be erected that could be varied according to the requirements or task to be performed.

After the second world war HENSCHEL, backed up by 150 years of tradition, reached a position with regard to quality and versatility which conforms to the high requirements of today's production techniques. In sizes from 1/2 up to 33 tons in weight, mainly the automatic machine tools have proved themselves in the various fields of chip cutting metal machining. Their capacity reaffirms the good name of HENSCHEL for modern construction and precision in engineering. Here below we give a brief description of our machine tools of popular varieties with illustrations and technical data of interest to intending buyers.

(1) No. 8 Verticalauto HENSCHEL-RYDER

This six-spindle verticalauto is electrically driven. It consists mainly of an automatic indexing table with 6 precision-mounted spindles, automatic turning, drilling, and facing equipment. HENSCHEL has acquired the sole manufacturing and distribution rights for Germany and Austria. The wide experience of the licensor, Messrs. Thomas Ryder, Bolton/England has been placed at the full disposal of HENSCHEL.

It has long been realized that in mass production, especially in the automotive industry, automatic lathes of vertical design are to be preferred to identical versions of horizontal design on account of the lower



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Special D.C. arc-welding generators driven by a three-phase squirrel-cage motor, complete with built-on Star-Delta-Starter.

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amount of operation required (clamping and releasing the components) and their universal application. This compact machine, of ingenious design, reliable

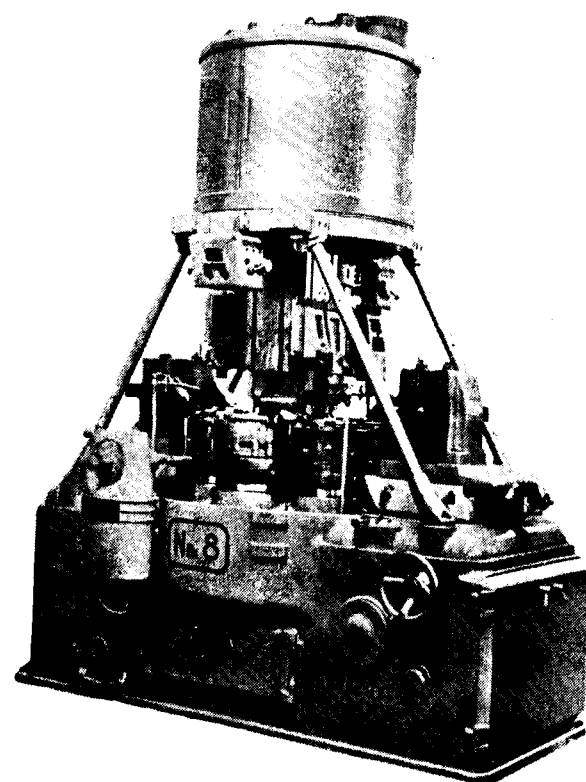


Fig. 1.
HENSCHEL - Ryder 8-6 - Spindel - Vertikal - Automat

and requiring little attendance by skilled personnel, allows a great variety of operations such as turning, drilling, tapping, milling, facing and profile turning. The HENSCHEL-RYDER Verticalauto is available in 3 sizes.

(2) *HENSCHEL-BEER Special Purpose Double Spindle Taper and Tracer Lathe "URSOMAT"*

As with all other HENSCHEL machine tools, this machine also meets all the requirements of modern production methods. This newly introduced machine will be especially welcomed by the fittings industry. Since two work spindles facing each other are located in a common headstock which may be swivelled, it is possible to simultaneously machine stopcock housing tapered seats on one side and on the other the respective stopcocks. This operation guarantees an absolutely identical taper for the housing and stopcock, which eliminates the grinding which would otherwise

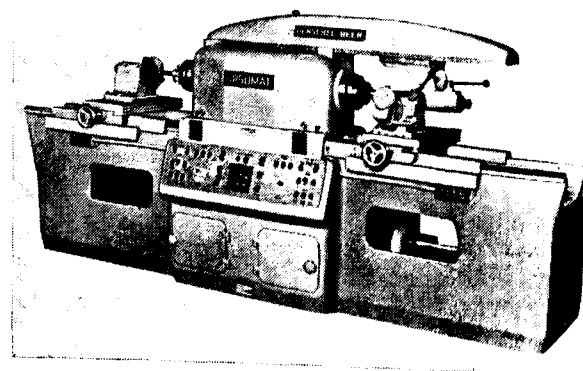


Fig. 2.
Ursomat—Spezial Kegel u. Kopier Doppel-Drehbank
HENSCHEL - BEER.

be necessary. By fitting two additional tracer attachments, the machine can be used as a double tracer lathe for various purposes.

(3) *HENSCHEL Drilling Units*

The spindle and the feed of these drilling units are operated by the drive motor through change gears, so

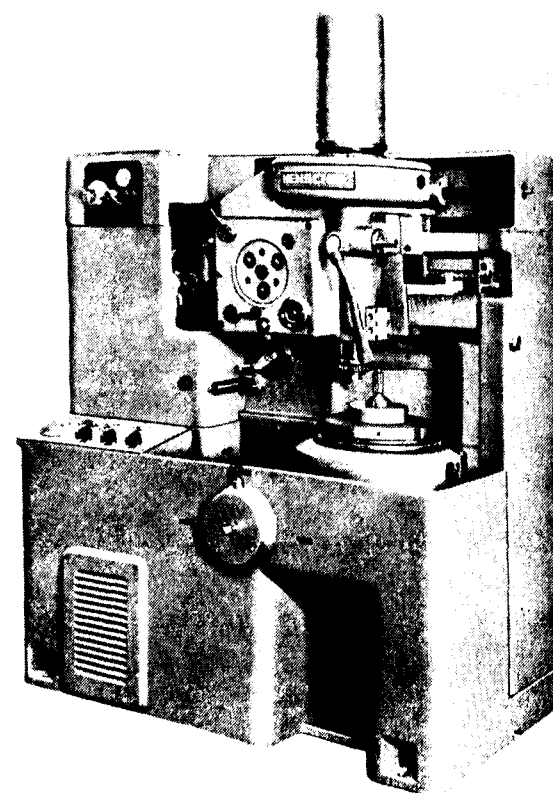


Fig. 3.
HENSCHEL - Zahnradstobmaschine.

that the speed of the spindle and the feed can be varied by changing the gears. The drive motor drives a threaded collar through a gear drive, which moves the rotating work spindle forward. Rapid traverse, forward and reverse, of the rotating work spindle is effected by a separate motor. The direction

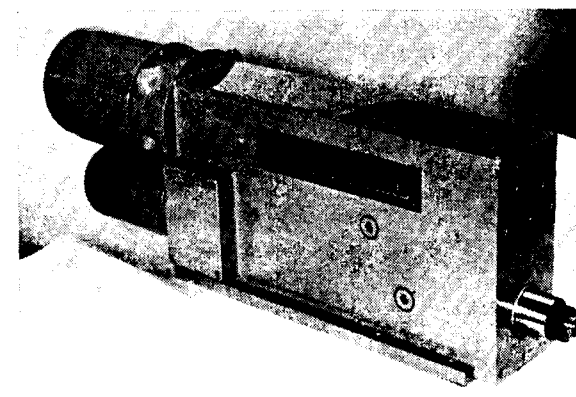


Fig. 4.
HENSCHEL - Bohreinheit.

of rapid traverse is changed by altering the direction of rotation of the drive motor. The drilling unit is also available with chip removal attachment allowing stage drilling.

(4) *HENSCHEL Gear Shaping Machine, Type ROBER*

This well-known gear shaper of proven design has in the meantime been further improved by special equipment allowing additional operations and automatic production. It has been designed for cutting internal and external gears having up to 450 mm. in dia., modulus 7, maximum width of teeth 90 mm., number of strokes ranging from 78 to 650 per minute, infinitely variable by PIV gear, 9 feeds, power requirements 3 kW.

Special features: hydraulic table return, hydraulic clamping device, sequence control—preselection of the number of the ram strokes and feeds for roughing and finishing—high speed table travel for the control of circular accuracy of the wheel blank, and for ensuring rapid return motion of the shaping gear when manufacturing gear wheel segments.

The special equipment is so designed that the standard machine can rapidly be modified into a production machine. Economic production of small and medium batches is possible.

The special equipment permits the following work procedures:

- (1) Automatic conveyance of the components in a double tube magazine feed attachment—taking the components to be shaped from one tube and automatic stacking of the machined components in the other tube (oil pump pinion).
- (2) Shaping of block gears—hydraulic clamping of components with hydro-mechanical counter-support.
- (3) Shaping of flywheel ring gears of 400 mm. in dia., modulus 3, clamped individually or in lots.
- (4) Rack cutting attachment for racks having up to 600 mm. in length, and additional attachment allowing machining of even longer racks according to the stage cutting method.
- (5) *Two-Way Special Purpose Boring Machine for Processing Truck Rear Axle Housings*

On this special purpose machine constructed from the well proved Henschel sub-assemblies, the two main openings in the rear axle housing are roughed and finished in two separate work operations. The machine shown is semi-automatic.

The hydraulic clamping device is located in the middle of the sturdy cast iron bed. The spindle units are arranged at right angles to this clamping device. They include a boring and facing head and a boring spindle with the respective gear drive units, cross feed cylinder and hydraulic feed table units. The facing head spindle is driven by a 11 KW motor, the boring spindle by a 5.5 KW motor.

In front of and behind the clamping device, there are two counter-supports to ensure true alignment of the boring bar. The hydraulic unit, located near the machine, operates the sequence controlled feed table units and the cross feed cylinder. The tank containing the coolant as well as the coolant pump are also arranged adjacent to the machine. All work operations are carried out simultaneously. The machining time necessary for one component is approx. 500 sec.

CLIFTON & BAIRD HIGH-SPEED GIRDER END MILLING MACHINE

THIS entirely new machine, specifically designed for the structural engineer, is for end-facing of built-up sections, columns, slabs, etc. Clifton & Baird have manufactured machines for this purpose during the past fifty years, making use of a large diameter cutter head fitted with inserted high-speed steel tools. The new machine has a cutter approximately $3\frac{1}{2}$ in. dia. fitted with tungsten-carbide tools. By the provision of combined vertical and horizontal traverses the cutter follows the contour of the end of the section. Cutters equipped with either solid tools for re-sharpening or 'throw-away' tips may be used.

The cutter is mounted direct on the main driving motor, the nose of the motor spindle being bored No. 50 international taper. Cutter and arbor are rigidly held in the spindle by means of a draw-bolt.

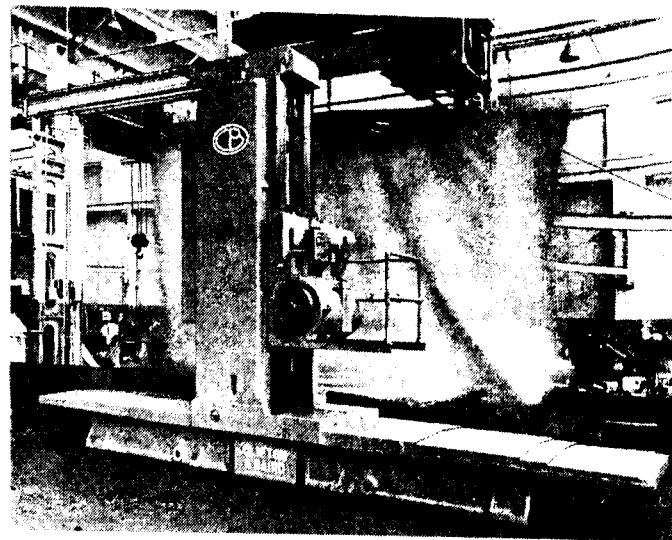
Of steel construction, the motor has been built specially for the duty required, with high-capacity taper-roller bearings on the spindle. As seen in the illustration, the motor is mounted integral with the saddle, and lateral adjustment of the cutter up to 4 in. is provided by hand-lever through gearing, with suitable micrometer indexing. During machining operations the motor is rigidly locked in position.

The main saddle, carrying the driving motor, has built-in gearing and a 3 hp. two-speed reversing motor for the vertical traverse motion. This saddle is carried on a robustly designed and well-braced column with accurately machined slide incorporating the narrow guide principle. The stationary screw for the feed motion is located in the column, and is held in tension for both directions of traverse. The saddle is counterbalanced inside the column by a weight supported on chains.

Horizontal traverse is provided on a traverse bed of robust construction, the slideways of this bed being accurately machined and amply proportioned. For ease of movement and accuracy the narrow guide principle is again incorporated.

The horizontal traverse is effected by a 5 hp. two-speed reversing motor through gearing, the screw being held in tension in the traverse bed for both directions of traverse. This motor and gearing are mounted within the saddle carrying the main column.

The traverse bed is provided with a flange along both sides, this flange having holes for foundation bolts and adjusting pins for levelling. A platform for the operator is provided and traverses with the



saddle on the main column. Integrally mounted on the saddle is an electric control pushbutton station convenient to the operator.

Two rates of vertical and horizontal feed are provided giving traverses of 30 ipm. and 60 ipm. respectively. Variation of these feeds is possible by the use of interchangeable pulleys. Suitable lubrication is provided for all slideways and gearing.

The machine is supplied complete with one carbide tipped cutter, telescopic guards over bed slides, the necessary guards over drives, all handles and screw-keys.

Electrical equipment, suitable for a.c. supply consists of:

Cutter Motor

30 hp. special steel frame, totally enclosed, squirrel cage, rotor induction motor to run about 720 rpm.

Longitudinal Traverse Motor

5 hp., totally enclosed, fan cooled, squirrel cage, rotor induction motor, 1430/720 rpm.

Vertical Traverse Motor

3 hp. totally enclosed, fan cooled, squirrel cage, rotor induction motor, 1430/720 rpm.

Control Gear

Three-motor control panel in sheet-steel enclosure, with triple-pole interlocked isolating switch, comprising:

For 30 hp. Cutter Motor

Triple-pole contactor arranged to connect the motor windings in star, interlocked with—

Similar contactor to connect the motor windings in delta.

Adjustable pneumatic timing device to govern the starting period.

Electrically operated adjustable pneumatic interlock timer.

Adjustable solenoid-type overload relays with oil dashpot time-lags.

Plug stopping of the cutter motor by depressing and holding the stop pushbutton.

For 5 hp. Longitudinal Traverse Motor

The necessary interlocked reversing two-speed selecting contactors.

Adjustable solenoid type overload relays with oil dashpot time-lags to protect low-speed windings.

Similar overload relays to protect high-speed windings.

Control circuit relays for plug stopping duty in each direction.

For 3 hp. Vertical Traverse Motor

Apparatus as specified for longitudinal traverse motor.

The panel would also include:

Neutral link. No-volt relay.

Pedestal-mounted control station having:

For the Cutter Motor

Pushbutton marked 'Start'.
Pushbutton marked 'Stop'.

$2\frac{1}{2}$ in. dia. flush-mounted moving-iron ammeter, calibrated in hp. with red line to indicate 30 hp.

For the Longitudinal & Vertical Traverse Motors

Joystick-type four-position controller with markings as follows:

0 deg.—Back	90 deg.—Up.
180 deg.—Forward	270 deg.—Down.

Lever-operated selector switch with positions marked 'Slow Feed/Fast Feed'; also limit switches for the longitudinal and horizontal traverses.

Although the machine accommodates surfaces up to 6 ft. 0 in. high $\times$ 10 ft. 6 in. long, it can easily be modified for larger surfaces. The weight of the machine is 270 cwt. Electric motors are by Laurence, Scott & Electromotors Ltd., and control gear by Brookhirst Igranite Ltd.

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New Types of Machines for the manufacture of Chains, Rings and Springs

By A Technical Correspondent

Messrs. Meyer, Roth & Pastor Maschinenfabrik G.m.b.H., Koln-Raderberg, West Germany, are leading manufacturers of popular types of machineries for the production on large-scale of chains, springs, rings, etc., besides chain-welding machines, wire straightening and cutting-off machines, etc.

They displayed a fine range of the above machines at the recent Machine Tools Exhibition in Hannover, West Germany and here we give below a brief description of their machines with illustrations and several valuable technical data of use to intending buyers.

CHAIN MAKING MACHINES

(a) Automatic Chain Link Forming Machine KBE

BESIDES hydraulic-operated machines for not bending of chain links, 7 automatic machines for forming chains in wire diameters from .004" to 1" are built. At Hannover a middle sized machine, type KBE, will be shown. This automatic bends chains continuously in diameters from 5/32"—25/64" with a speed of about 90 links/minute.

It is fed from a coil of wire and produces chains of correctly dimensioned links, clean surface, high tensile strength, and longest useful life-time.

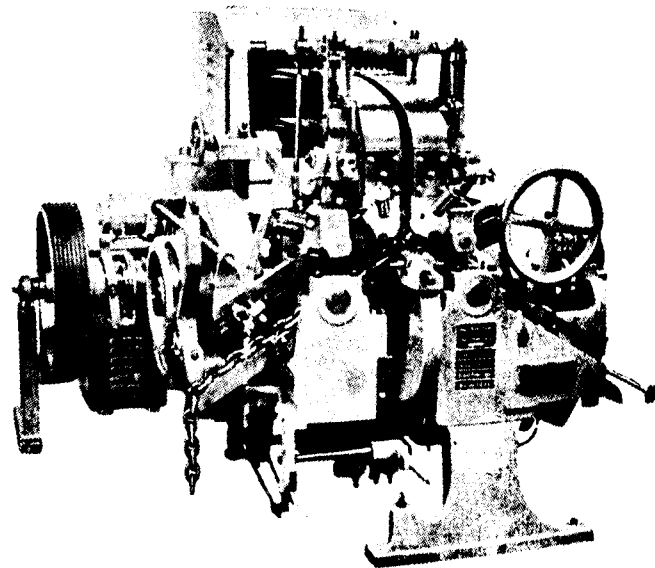
The forming process is spread over two working stations with the result that the pre-bending mandrel can be amply dimensioned, and, consequently, tool marks are avoided. As, moreover, the chain links are bent around a split mandrel, a flattening of the inside surface of the links is also prevented. In addition, all models are suitable for making short calibrated chains.

The design and operation of the machine on exhibition—which shows again further developments—represents a further contribution to the technical progress of this automatics, enjoying a world-wide reputation at home and abroad for more than 50 years.

(b) Automatic Electric Chain Welding Machine Model KAK

This fully-automatic electro-mechanic high production chain welding machine operates by the pressure

butt welding process. It is shown as one of a range of nine machines which altogether handle diameters from 0.04" to 1". The Exhibition machine, Model KAK, welds chains which have first been formed on automatic bending machines and which are made from standard chain steel and lightly alloyed special steels from 15/64" to 25/64" dia., with an output of appr. 35—22 links per minute.



Of all operations such as transport of the chain, clamping, upsetting, de-burring and pressing—all of them fully-automatic—the actual welding process is the most important.

Its sequence has been minutely thought out and runs as follows:

2 upsetting tools descend and grip the link which has

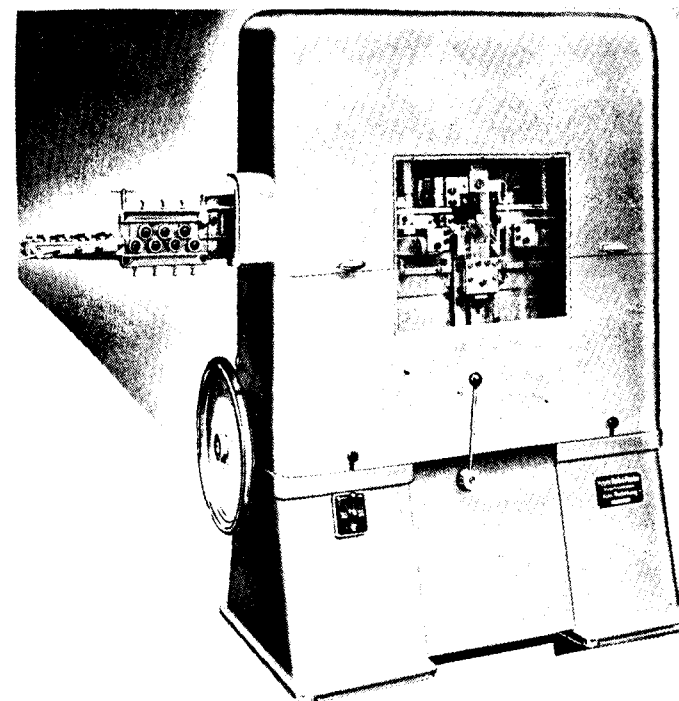
been transported into the recess of the anvil underneath the electrodes. At the same time, 4 electrodes are lowered and make contact. The welding process continues until the ends of the chain links are sufficiently heated, whereupon they are pressed together by the upsetting tools. This means that the duration of the welding process is individually controlled for each chain link and upsetting only takes place when the necessary welding heat has been reached.

After the welding current has been switched off, the electrodes return to their starting positions. Appr. 50% of the welding flash is then cut off sideways by a patented device. After this, the pressing tools press the remaining flash downwards and upwards to be subsequently cut off by a de-burring cutter in the transport slide.

The machine to be shown is also fitted with special attachments, of which only the ignitron device is mentioned here. This device can be fitted instead of the normal relay controls and has the following advantages: Silent operation, no mechanical wear, minimum maintenance, no-volt protection of welding current, stepless variation of welding current.

UNIVERSAL MULTI-SLIDE FORMING MACHINE FOR THE MANUFACTURE OF ARTICLES MADE FROM WIRE AND STRIP

Of this range, only one machine, Model UB 3, for



wire diameters up to 1/8" and corresponding strip sections, can be shown. Its main feature is the vertical arrangement of the slides, a design which has thoroughly proved itself in practice.

The main technical advantages are as follows: Direct and positive operation of the bending slides, clear arrangement and simple design of the tools, accurate in-feed, high output and little floor space required.

The exacting demands made on a modern Multi-purpose machine, output, dependability, ease of operation and change-over, simplicity of tools, tool wear etc., are fully met by our Universal Multi-Slide Forming Machine.

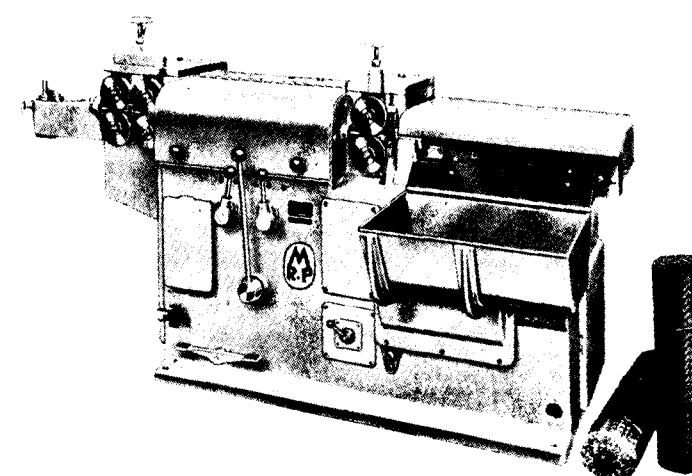
SPECIAL HIGHSPEED WIRE STRAIGHTENING AND CUTTING-OFF MACHINE FOR ELECTRODES, MODEL RAE 6

This high capacity machine is being shown for the first time at Hanover. It has been specially developed for the electrode industry and is intended for cutting electrode wire from 0.08" to 0.24" dia. and from 8" to 20" in length. The high performance expected from a machine of this type is fully assured by:

- High output
- Dead straight electrode rods
- Accurate lengths
- Clean, practically burr-free cut, eliminating special de-burring devices and ensuring a smooth flow of the rods during further processing.

Output

The output depends on the wire diameter, the type



of material and the length to be cut. On standard electrodes, the following output figures can be obtained:

Wire Diameters	Length	Cuts per minute
1/8", 5/32", 3/16" or 17/64"	18"	Approx. 240
-ditto-	14"	Approx. 300
1/8"	12"	Approx. 320
5/64", 3/32"	10"	Approx. 320

Method of operation

The wire is straightened by means of a rotating spinner and runs through the cutting-off bush into a guide rail where it abuts against a fixed stop, preset to the required rod length. After reaching its full length, the wire is first clamped and then cut by a continuously running cutter, (patent applied for at home and abroad) after which it is ejected.

Special features

Highspeed transmission shafts mounted in ball bearings.

Gears and cutting mechanism runs in oil bath.

Amplly dimensioned multi-disc clutch.

Built-in brake for rapid standstill of machine.

V-belt pulleys mounted on open-ended shaft for rapid changing of belts.

Drum type rotating guide rail with various size slots.

3 pairs of transport rollers, 2 working as feed-in rollers and one pair as draw-out rollers.

Device for clean, practically burr-free cutting (patent applied for at home and abroad).

Cutting with continuous action cutter (patent applied for at home and abroad).

Special type of rotating spinner allowing introduction of wire without stopping the machine.

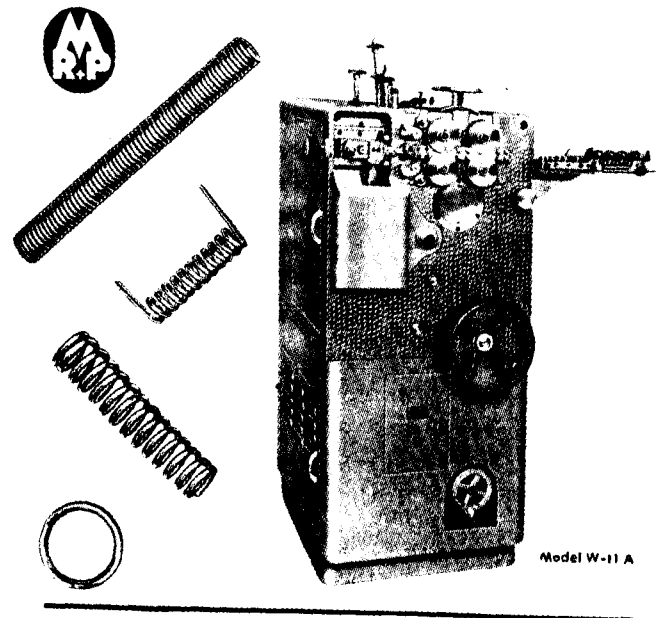
Special ejection mechanism.

Adjustment of feed through 6-stop gearbox, running in oil bath.

Adjustment of cuts per minute by means of change gears.

MR&P — TORRINGTON UNIVERSAL SPRING MAKING MACHINE MODEL W-11A

To place at the disposal of our customers in Europe the extensive development work and experience of the



Torrington Manufacturing Company, Torrington, Connecticut, U. S. A., we have arranged to build their well-known Spring Making Machine under licence at our Works in Cologne.

We are now showing this Automatic Machine to European Spring Manufacturers for the first time at this exhibition.

High output, low maintenance costs, an ingenious design and universal application are the main features of this model. In addition, easy setting, a clearer arrangement of the controls and a greatly simplified construction, result in a larger production capacity and an increase in accuracy. All these are features which have made this machine a standard item of equipment in the spring making industry. Model W-11A is suitable for the automatic production of all types of springs of the compression or extension type, with or without closed ends and with left or right-hand coils. Cylindrical, single or double taper springs, various other types of formed springs as well as simple rings can all be produced.

By means of an attachment, it is also possible to produce torsion springs with straight tails, with open or closed pitch windings and in a wide variety of shapes.

Other attachments increase the working range of the machine still further and enable universal application.

Operation

The wire is drawn from the coil stand by two pairs of feed rollers and pushed into the coiling tool through suitable guides. It is then formed into the required spring and cut off after completion. When producing formed springs the coiling mandrel and the pitch tool are controlled by easily adjustable cams.

Special Design Features

The drive is through a steplessly variable gear with hand-wheel control, to allow adjustment for maximum output on every wire diameter and size of spring.

The drive to the feed rollers is through a segment gear driven by a crank plate, again providing infinitely variable adjustment of the wire length, which is easily effected on the cam. Machines incorporating this type of feed drive are known as segment machines, as opposed to spring coiling equipment working with a controlled clutch. The segment gear drive of the feed rollers results in a higher output and more accurate wire lengths.

No special coiling plates or accessories are required for right and left-hand springs. Change-over from left to right-hand is, therefore, simply and quickly accomplished.

All adjustments respecting the diameter and the pitch can be made whilst the machine is running.

The control cams are easily exchanged and can be used on a wide variety of work, due to the built-in adjustments in the transmission.

The pitch tool operates parallel to the spring axis.

The cutting-off knives can be easily adjusted in the axial direction by turning a screw.

Most shafts run on ball or needle bearings.

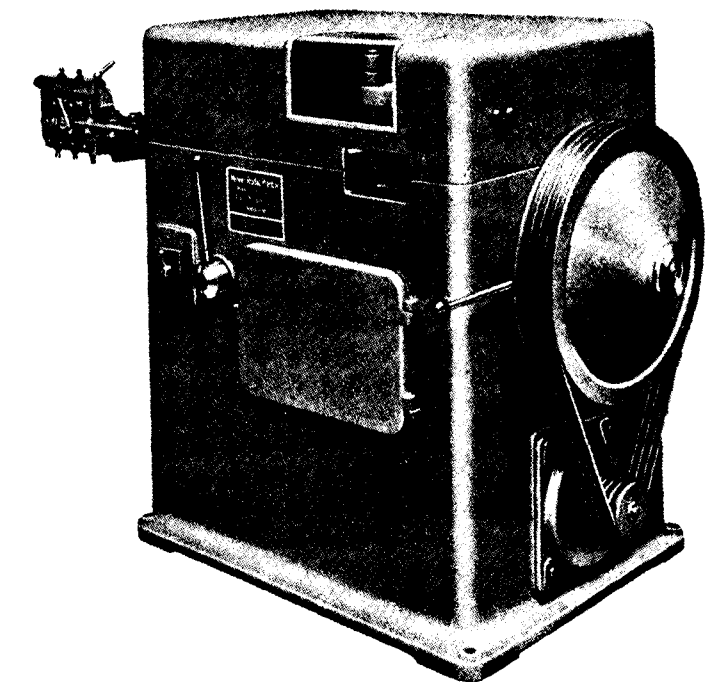
Extra Equipment

To extend the working range of the machine and to increase the accuracy and output on certain springs, a number of attachments have been designed to supplement the standard equipment.

In Addition to machine type W-11A for the manufacture of springs from 27 to 15 S. W. G., a smaller model W-10A will also be demonstrated under power. It is also a Universal Spring Coiling Machine for wire diameters from 35—23 S. W. G. and an outside diameter spring range from 1/16" to 55/64". Design and operation are similar to the W-11A type segment machine, explained above.

UNIVERSAL RING MAKING MACHINE FR 60

This machine is suitable for the economic manufacture of Lock washers to German Standards DIN 127,



retaining rings, plain, or undulated rings etc. up to 2.23/64" outside diameter.

Design

The totally enclosed construction represents a design on the most up-to-date lines, affording effective protection against damage and ingress of dust and dirt. The tool and work in progress can be observed through a perspex window in a hinged guard. The simple design ensures economical production, normally only interrupted for brief periods by loading fresh wire. All machine parts are of ample dimensions and special attention has been paid to easy accessibility, convenient operation, and to the central pressure type lubrication

system. The motor and switchgear and all mobile elements are accommodated inside the machine base for maximum protection also of the operator.

The arrangement of the tooling is particularly ingenious, comprising a basic set of tools for all types and sizes of workpieces possible, in addition to interchangeable extra tooling sets to suit any definite pattern. The tooling is of such simple design that the machine can be set and reset even by unskilled operators within a comparatively short time.

The machine is driven from a flange-mounted motor through Vee-belts and a safety disc clutch.

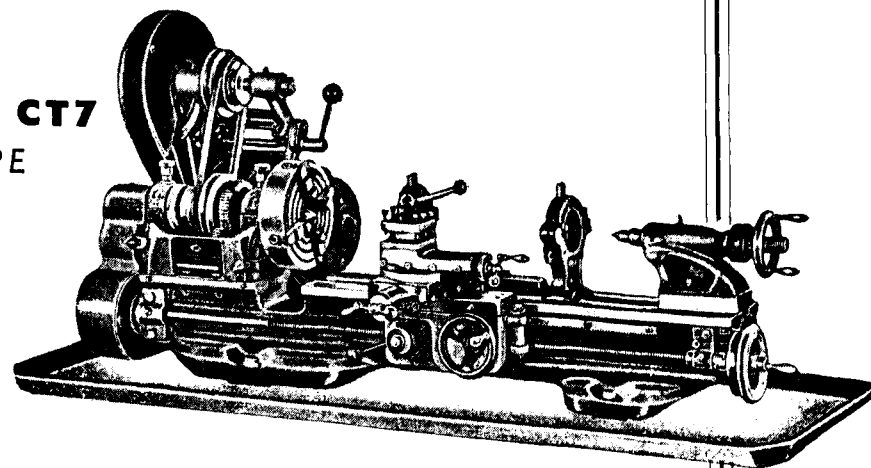
Method of operation

The material is drawn from a coil through an inlet guide and roller straightening mechanism and is then fed to the coiling tools by a specially controlled feed finger, ensuring even and accurate infeed of the wire. The length of material required can be easily varied on a crank disc. The forming tools coil the wire into an endless spiral from which one resp. two windings are cut off. This length is gripped by a reliably working conveyor mechanism and fed to the pressing station where the desired final shape is produced. This pressing operation can be combined with stamping of numbers, trade marks etc., on each workpiece. The finished product is finally ejected out of the front of the machine.

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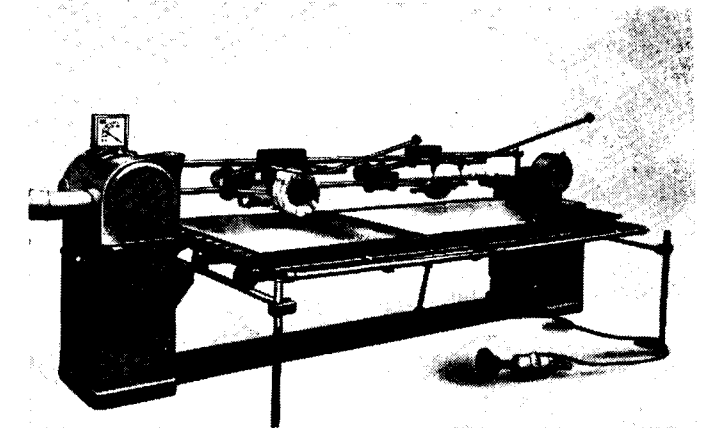
P. S. G. INDUSTRIAL INSTITUTE
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JOHANNSEN Single-belt Sanding and Buffing Machine - Model BSME

THE single-belt machine is employed wherever the work volume is not sufficient to utilize the full capacity of a double-belt grinder. It is also much better suited for fine and wet grinding since it permits better observation of the progress of sensitive work, giving the operator at the same time a better "feel" for the grinding pressure. Otherwise, operation and design are similar to those of the double-belt grinder. The machine can be equipped with a wet grinding device, a brushing and buffing unit, and a hand grinding attachment. The wet grinding device consists of a simple band sprinkler with pump, drop feed bucket, and distributing brushes which do not touch the belt so that they are not subject to wear. Dropfeed supply is easy to regulate and a container is provided to collect excess grinding fluid.

By continuously wetting the grinding belt, the grain is kept open and fully effective, the work piece is cooled, and grinding quality improved. With soft material, too, and especially with aluminium, wet grinding is indicated to obtain a clean finish.

Like the grinding device, the brushing and buffing unit is arranged movably above the table. Contact pressure on the brush and buffing mops is effected by



Model BSME Single-belt Sanding & Buffing Machine

hand. The polechanging motor is layed out for 1500 and 3000 rpm.

A Hand grinding attachment is recommended for the correction of pronouncedly faulty work. The metal is briefly ground to make the faulty spots clearly visible. After all faults have been eliminated by means of the hand grinder, the hand grinding marks are ground off uniformly with the belt. For all work on this machine, only the inexpensive paper grinding belts are used.

One-Man Grain Cleaner

A simple grain cleaning system which can work at the rate of $3\frac{1}{2}$ to 4 tons an hour, has been invented by a farmer in England. Running in a normal harvesting system, it allows one man to cut, pre-clean and store several tons of grain a day. The success of the cleaner has led a London firm to market it for world-wide sales.

The grain cleaner comprises an ordinary length of metal tubing, about four inches in diameter, with a single spiral blade running through it. A centre section of the tube is enlarged to about 8 inches diameter and extends some 4 feet. The lower, or ground side of the enlarged section is formed by a metal screen containing several hundred drill holes.

The end of the whole tube is placed in the storage bin containing the uncleaned grain and the spiral blade— and Archimedes screw—conveys it through the tubing. At the enlarged section, natural force throws the grain against the screened part of the tubing and the process separates the grain from husks, weed seeds and similar impediments.

The firm who has taken up the invention for commercial production have fitted it into a system whereby the best quality clean grain comes through two hopper chutes and another chute deposits the lesser quality small grain separately. Another channel takes away the weed and grasses.

MACHINE TOOLS FOR INDUSTRIES

By A Special Technical Correspondent

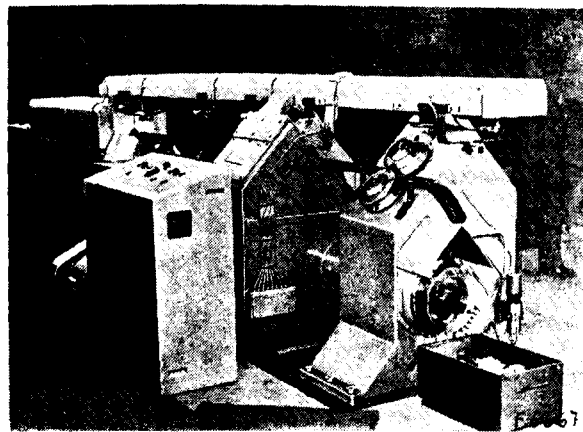
Messrs. Eumuco Aktiengesellschaft Fur Maschinenbau, Leverkusen 1, West Germany, are reputed manufacturers and exporters of popular varieties of machine tools for industries.

Here is a brief description of their heavy duty ranges for forgings and shearing jobs with illustrations.

Fully automatic EUMUCO Forging Roll

This equipment covers an induction heating plant with billet feeder and classifier—the two latter devices being produced by Messrs. AEG Elotherm of Remscheid-Hasten—and an automatic EUMUCO forging roll with 3 working stations. Number of working stations is subject to the required degree of deformation.

The vibration feeder is to arrange the charged billets and these are then fed to the induction heating



Fully automatic EUMUCO Forging Roll.

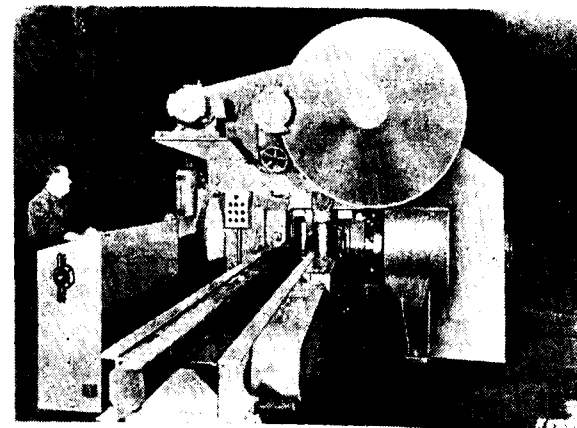
plant in spiral groove. A lifting device is conveying the billets through the heating coil in a given cycle. When the heated pieces are transferred to the forging roll, the conveyer of said machine is taking over the material to push it successively to the pairs of rolls.

After having passed the last rolling station, the piece may be pushed in front or at the side of the dies of a die forging press, a die forging hammer or a horizontal forging machine, for finishing purposes.

For finishing on a die forging press or a horizontal forging machine, an automatic bar transfer is possible if a high output is required.

EUMUCO Billet Shear with hydro-mechanical drive

The newly developed EUMUCO billet shear is characterised by hydro-mechanical drive with extremely simple and robust stroke control and without either clutch or brake. In the rigid and solid machine body the knife-slide runs in guides of extreme length and sturdiness, which are adjustable and hardened. Small knife stroke and adjustable distance of knives result in great numbers of strokes and high cutting efficiency. The gap between knives can be easily adjusted according to the requirements of the material to be cut. Both hold-down and counter-holder are arranged directly in front of knives, owing to which even the shortest blooms can be seized during the cutting process. Clean and rectangular cuts are



EUMUCO Billet Shear with hydro-mechanical drive.

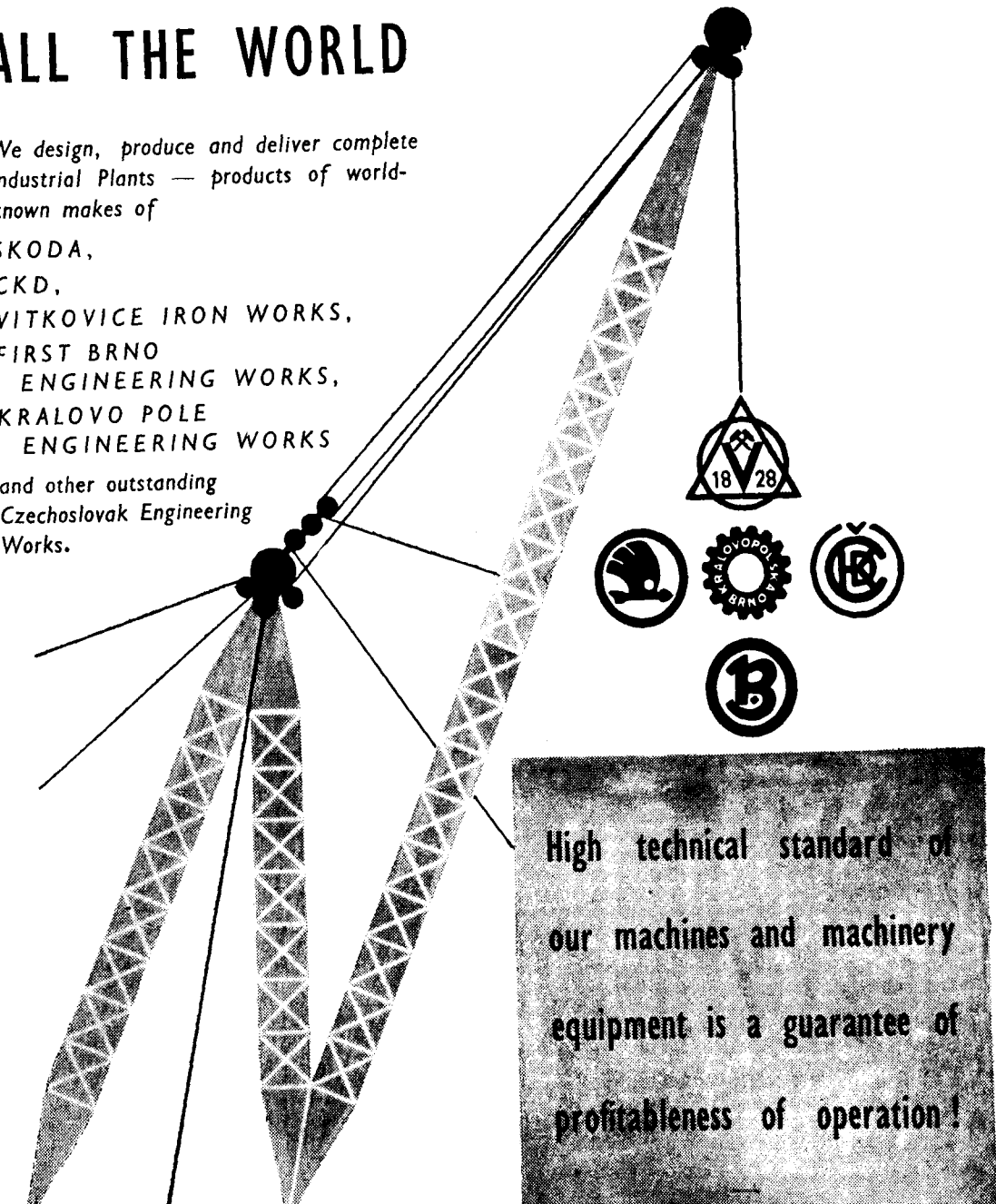
obtained with this billet shear, since hold-down force equals counter-holder force, and since both forces are always in the same proportion to the cutting force. Due to horizontal arrangement of the knife-slide the cut-off blooms, including the shortest ones, are permitted to drop out of the machine unobstructedly. The knives have a smooth, rectangular shape, so that all of the four edges can be used for cutting. Both hold-down and counter-holder are swingable, so that

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there is excellent access to the knives and knives can be changed rapidly and comfortably.

The hydro-mechanical drive of the billet shear by means of a crank driving device is simple and reliable. The entire drive unit is at continuous operation, and there is not any clutch or brake. The only control device is a valve which is controlled electro-pneumatically. A blow-off valve guarantees correct and efficient protection against any overload. The billets are introduced into the shear by means of a driven table roller. Behind the shearing knives a swingable stop is arranged, which is provided with an electric contact plate. The moment the billet touches the contact plate a working stroke of the shear takes place. With the help of this arrangement the shear works automatically.

The shear can also be delivered with an installation for fully mechanised feeding of the billets onto the table roller.

EUMUCO Precision Forging Hammer with oilhydraulic drive

Higher requirements as to precision of drop forgings gave rise to further develop the whole design of the drop hammer under this point of view.

The anvil block of this short-stroke top-pressure hammer with oil-hydraulic drive forms a single cast-steel piece together with the two stands and the upper girder. Owing to this rigid construction of the total hammer setup the displacement between upper—and lower dies is influenced only by the guide play of the hammer tup. The tup is especially high, in order to allow the hardened and ground tup guide to take up also heavy eccentric blows, such as they occur for instance with the arrangement of pre—and finishing engravings. The piston rod is very elastic and has an absolute fatigue strength.

The oilhydraulic drive is arranged in an enclosed casing, which is elastically connected with the hammer setup. The high-pressure pump works with constant delivery. The oil-pressure of 120—180 atms. results in small cylinder diameters and permits keeping oil speeds, which are not higher than with oilhydraulic presses. The oil temperature remains within admissible limits without additional air—and water cooling also with exhausting continuous operation. This proves the excellent efficiency of the hydraulic swing drive of this drop hammer, which up to now has not been achieved by any other hammer design.

Independent of die height the hammer tup always carries out the same stroke: thus working capacity of the hammer is not influenced by the die height. Control of the hammer tup is electro-pneumatic. By



EUMUCO Precision Forging hammer with oilhydraulic drive.

means of a pedal switch number of blows and impact energy can be regulated. Individual blows as well as serial blows can be given. Owing to the use of the electric control principle a programme control device can be fitted easily. The hammer can be operated with hydraulic oil as well as with fireproof hydraulic liquid.

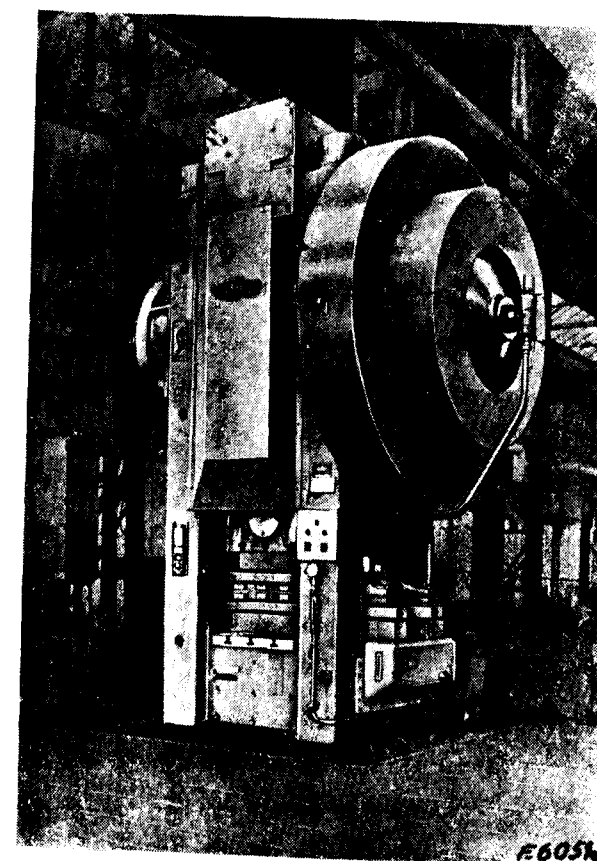
EUMUCO-MAXIMA Die Forging PRESS

The die forging press serves principally more and more for mass production of die forgings. Advantages of die forging are widely known.

The EUMUCO die forging press, however, incorporates a series of special features of construction. The connecting rod designed as a double con-rod with two bearing surfaces, is of the same overall width as the ram. As compared with the single connecting rod design, this double con-rod permits a much greater absorption of eccentric pressures

during pressing in multiple tools when main pressing operations are arranged side by side on the press table.

Electro-pneumatic control does not only facilitate attendance of machine but also further increases number of strokes and working speed, thus resulting in up to 130 strokes per minute and in more than 1,3 m per second as to pressing speed. In spite of these high numbers of strokes the exact stopping of ram in the upper dead-center position by means of single-disc laminated brake is realised, the latter being carried out with all EUMUCO presses since more than 20 years already. The increased number of strokes and the higher working speed mean practically a shorter contact time of the pressing piece with dies, a less important loss of temperature of the working piece and a reduced resistance to deformation as well as a longer life of tools.



EUMUCO Maxima Die Forging Press.

By means of a selector switch, electro-pneumatic control permits change from normal stroke with single-stroke operation to continuous strokes and to the inching of the ram to set the tools.

During setting or testing of the tools it is most

important to be able to determine the pressures arising. For this purpose a peak-pressure-indicator was developed as a portable device. This is an electronic meter indicating pressure by means of elongation strip charts whose electrical resistance is influenced by elongation of tie-rods or machine body during pressing. Such a peak-pressure-indicator lends itself above all to record pressures occurring temporarily.

Upon request die forging presses are fitted with a special device disengaging the press if it is blocked in the lower dead-center owing to overload.

Double Sided Crank Press with welded steel plate frames

This machine is a new trimming press design with mechanical drive, which has been developed in collaboration with the drop forging trade. We manufacture it in three models (AEP, ADP, and ADWP). They mainly differ as regards width of table and stroke of ram.

Drop forging trade not only wants to trim and punch with these presses, but also to pre-press billets, upset bar cuts, straighten, and locally emboss according to measurement.

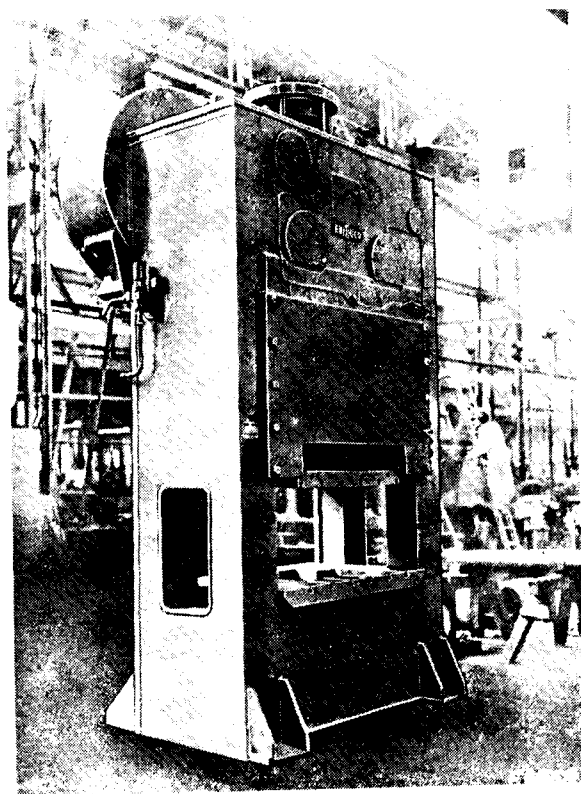
For this purpose the new double sided crank press received wide table surfaces to permit clamping of a series of tools one beside the other. In order to allow also eccentric working with full pressure, the ram is moved by two pressing rods. Under each pressing rod the full pressure can be exerted. The pressing rods bear upon pressing cups, which with their threaded part are screwed into adjusting nuts. The ram guide has been elongated. On one ram side the guide gibs are presmatic, in order to impede the ram from evading sideways.

The Machine stand is executed as box frame with extraordinary rigidity in welded steel plate. The crankshafts and the countershaft are supported in it transversally. The double gear wheel pairs are arranged within the press stand; thus three sides of the press stand are free from projecting parts. Thus the press is easily accessible in the main directions.

Into the drive a pneumatic single-disc friction clutch and a pneumatic single-disc brake are incorporated. The air valves for clutch and brake are electro-pneumatic. Three operations can be selected by means of a selector switch (setting, single

stroke operation, continuous operation). For engaging pedal switches or push-button switches are used.

The press table can be provided with openings for the work to drop through. For calibrating and



Double sided Crank Press with welded steel plate frames.

straightening also a hydraulic cushion can be incorporated, which can yield elastically when a set pressure is reached.

The ram weight is balanced by compressed-air cylinders. For ram adjustment a special electric motor is provided. For upsetting work an extraordinarily high flywheel energy has been chosen.

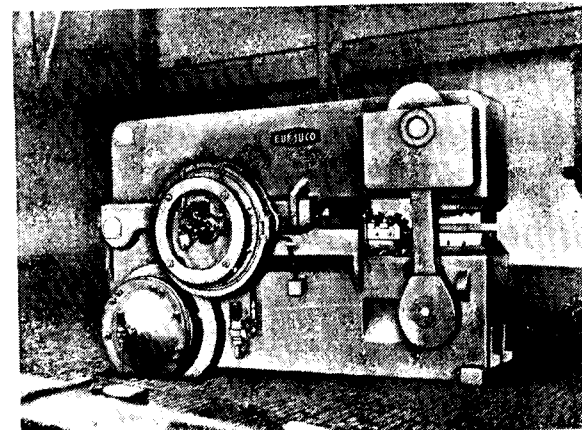
The main advantages of this new press design are :

- wide table surfaces
- increased number of strokes
- insensibility against eccentric pressing
- unbreakable columns of especially high rigidity
- excellent ram guide
- easy accessibility
- versatility of service.

Besides the overload protection by the single-disc friction clutch the new trimming presses are equipped with pneumatic torque limiting devices, which limit the contact pressure in such a way that also in dead-center proximity the nominal pressure cannot be exceeded.

EUMUCO Forging Machine with tong-type gripping system

With the development of the horizontal EUMUCO Forging Machine which tong-type gripping system we complied above all with the increasing requirements as to accuracy to size of the forgings, as the tolerances of a forging depend not only on the shape of the die, but also on the working precision of the forging machine.



EUMUCO Forging Machine with tong-type gripping system.

The fundamental advantages of the former design of the EUMUCO forging machine with tong-type gripping system have been retained :

- free accessibility of upsetting dies from 3 sides—
- free accessibility of upsetting punches from 2 sides—
- quick and easy regulation of the gripping force by means of a handwheel—
- independent setting of each upsetting punch by means of a wedge—
- fitting of an automatic bar feed to each standard machine, without modification—

Location of tools has become more rigid owing to the fact that the upsetting die holders are taken up directly in the machine bed resp. tong yoke, and that the contact surfaces are bushed with hardened and ground steel plates.

Centering between the upper and the lower upsetting die holder was likewise improved: the tong yoke carrying the upper upsetting die holder is no longer guided on the upsetting slide, but on the machine bed itself. This measure was taken in spite of the fact that after closing of the upsetting dies there is an automatic centering by the bar material.

Swelling of the forging machine in gripping direction was reduced by one half owing to the shortening of the pull-rod length, and it was essentially reduced for the movement of the gripping-jaw yoke owing to the arrangement of two eccentrics with a double bearing.

Swelling of the forging machine in upsetting direction was reduced by the fact that the tong yoke for receiving the upsetting force is supported directly behind the tool opening in the machine bed.

The extraordinarily long guide of the upsetting slide was provided with nitrated guide gibs, in order to maintain the working precision of the machine as long as possible. For the same reason the carrying capacity of the main bearings of the upsetting drive and of the gripping jaw drive has been increased.

The safety pressure arm for the gripping-jaw drive, which, by the way, has been arranged at the top for easier accessibility, works according to a hydraulic principle. This offers the advantage that the safety pressure arm reacts more accurately than the former pressure arm design, which worked according to a mechanical principle.

U.S.A. likely to adopt British landing aid

Following tests at an experimental centre near Atlantic City using apparatus supplied by Thorn Electrical Industries Ltd., of London, the Federal Aviation Agency of the U. S. A. are considering adopting Britain's Visual Glide Path Indicator system for some of their aerodromes. The apparatus was manufactured to a design jointly developed by the British firm and the staff of the Royal Aircraft Establishment of the Ministry of Aviation. For modern aircraft weighing many ton and approaching at speeds as high as 200 miles an hour, the glide path has to be defined very accurately to avoid undershoot or overshoot which may be disastrous in consequence. Some years ago, a member of the R. A. E. staff, Mr. J. W. Sparke proposed, a new Visual Glide Path Indicator. After development work, extensive trials followed at London Airport, Farnborough, Bedford and elsewhere.

Thorn Electrical Industries Ltd. was granted a licence under the Sparke patent to manufacture and sell this device and a further period of development followed culminating in a joint design which was suitable for installation and maintenance on any airfield in the world, and which was operational in rain, snow and sand-storms. Modern aircraft require an extremely accurate glide path of about 3 degrees which makes permissible error very small. The V. G. P. I. system, as it is called, defines a merely parallel path at the correct angle from some miles out right down to the runway. There are two bars of

lamp units on each side of the runway, the first 500 feet from the threshold and the second pair of bars 500 feet farther on. If the aircraft is on the correct glide path the front set shows white and the back set shows red. If the aircraft is low they both show red and if it is high they both show white. The transition from one colour to another is sharply defined with a narrow transition region where a mixture of the two lights is apparent.

The approval by the Federal Aviation Agency coming after the approval in the U. K. firmly establishes this V. G. P. I. unit and system as an essential requirement for all modern airfields. The firm reports that they are dealing with many enquiries from all over the world including South America, a number of European countries and Australia.

** ** **

STEEL BARS FOR MACHINED PARTS

The Indian Standards Institution has formulated draft Indian Standard Specification for Steel Bars for the Production of Machined Parts for General Engineering Purposes [Doc: SMDC 5 (115)]. The draft covers requirements regarding manufacture, chemical composition, freedom from defects, finish, sizes, tolerances, selection of test samples and tests for five grades of steel bars used for the production of machined parts for general engineering purposes. The distinction between the various grades is made in respect of the chemical composition.

Export Potentialities of Wood Working Machinery

By K. Duchnowski, M.Sc., Eng.

 THE Polish machine tool industry looks back at an almost century old experience in the line of production and export of wood working machinery. This branch of industry demonstrates a major development during the post-war period. This has been decided upon by both growing demands on the part of rapidly expanding wood processing industry and by the increase of potential of the machine making.

This paper because of the limited space, is confined exclusively to the discussion of production scope only of most important works, including the following: Factory of Wood Working Machinery (Fabryka Obrabiarek do Drewna) in Bydgoszcz, Machine Tool Factory (Pleszewska Fabryka Obrabiarek) in Pleszew, Machinery Works (Zakłady Przemysłu Maszynowego) in Sopot.

Fabryka Obrabiarek do Drewna (Factory of Wood Working Machinery) in Bydgoszcz—bearing the trademark FOD—is the biggest and the oldest in this line of industry—having been established in 1865; until the outbreak of World War II it was reputed at home and on the foreign markets under the name BLUMWE. The speciality of this factory was heavy duty machinery, particularly, vertical frame saws and other saw-mill machines, machine tools for the production of building carpentry elements, of flooring, machines for the production of plates and plywood, as well as basic machinery for furniture industry and machines for general use.

The development of the FOD factory production is illustrated by the below table in which the production value of 1958 is denoted as 100. The total of the production of this factory until 1965 is scheduled to double the 1958 value.

Table I

Year	1958	1959	1960 (plan)
Total value of production :	100	120	127
Share of export production in percent	11	18	25

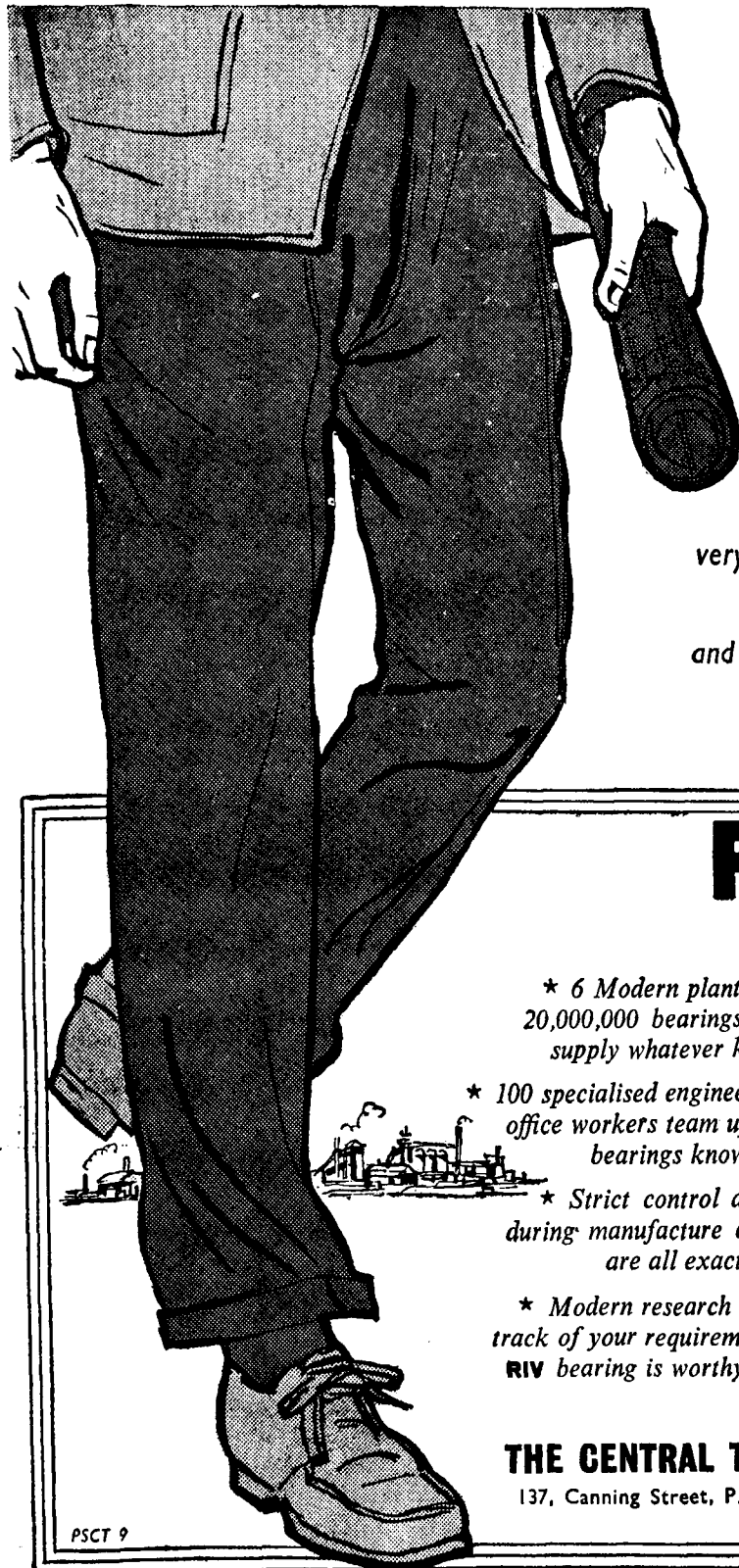
The Factory of Wood Working Machinery in Bydgoszcz looks back at a long standing tradition in the line of export of machine tools. It exported its products during the past four years to the following countries: Albania, Austria, Belgium, Brazil, Bulgaria, Ceylon, China, Czechoslovakia, Egypt, France, Hungary, India, Indonesia, Iran, Iceland, Italy, Korea, Mongolia, Norway, Pakistan, Rumania, the South African Union, Sudan, Syria, Turkey, Venezuela, Vietnam.

At the XXIX Poznan International Fair the FOD factory exhibited the two-saw edger for ripping to width DPPA-35, the panel planing and thickening machine DSGA-80, combination machine tools: the thickening and surface planing machine DSKA-2/40, the heavy duty circular saw-spindle moulder DYFA-2, and the veneer edge-to-edge joining machine SNSB.

The DPPA-35 double edger presents a machine tool easy in operation, safe, and notable for high working output. The change of distance between saw blades is mechanised, the saw shifting mechanism being guided from any distance along the auxiliary table contributes to easy and rapid setting of edging width (with grading every 5 mm. or 1/4"). The saw arbor is readily accessible from the side which facilitates rapid exchange of saws. The gears of the feed box and of the saw shifting box are immersed in oil bath, the feed and pressure rollers being lubricated centrally by an oil pump.

The DPPA-35 two saw edger for ripping to width is totally enclosed and equipped with devices preventing the plank handled striking back, this securing full safety of operator personnel. The feed box incorporating four speeds allows to select a correct speed depending on the thickness of plank machined, wood kind and conditions of working.

The FOD factory manufactures also DPPA-50 two-saw edgers for ripping to width of up to 500 mm. edging width and up to 120 thickness, working with two or six saws (which allows to obtain slats from the side portions of the machined material).



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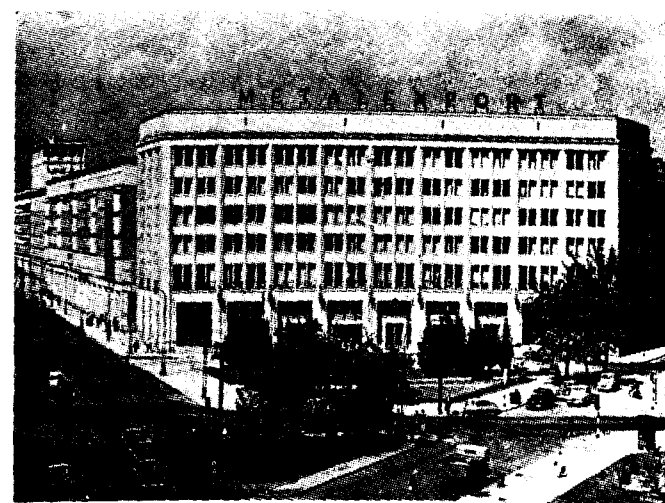
The DSGA-80 panel planing and thickening machine is one of its series of machines varied from one another by their size (the DSGA-63 and DSGA-100 thickening planing machines incorporate the planing widths of 630 and 1000 mm. respectively). Notable in the design of this machine is high degree of control mechanisation, adaptation to various conditions of machining and auxiliary equipment. The table is raised and lowered by means of electric motor and fitted with electric control device for stopping the table movement automatically in its top and bottom position. Calibrated handwheel enables table setting with up to 0.01 mm. accuracy. Feed speed is adjusted variably—depending on machining conditions while sectional front feed roll and the front sectional chip breaker offer simultaneous planing of a few elements having various initial thicknesses. Additional device preventing the elements machined from striking back and securing disengaging the feed immediately secures labour safety.

The planing machines of the DSGA series can be equipped with a grinding attachment incorporating self-acting feed of saddle which enables grinding of

knives without the necessity of removing them out of the arbor. The saddle with head of the grinding attachment can be fitted with knife trueing attachment enabling to obtain perfect uniformity of cutting edges protrusion, which allows, next to the dynamic balancing of the cutter arbor for obtaining top machining accuracy.

The DSKA-2/40 combined thickening and surface planing machine presents two plain machine tools combined in one. The round, four-knife arbor, common for both planing machines works with its upper portion while using the machine for planing, and with its lower portion while performing thickening operations (in this latter case the feed is automatic). Rapidly and efficiently acting clamps fixing the individual assemblies, the table tilting readily (aided by the action of coil springs)—decide upon the most essential advantage of this machine tool: they enable rapid and easy changing from the position for planing into that of thickening operation, and vice-versa.

The DYFA-2 circular saw bench combined with



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lower spindle moulder presents a double-spindle combination machine tool of extensive range of application. This machine offering the possibility of performing various operations is the merit not only of its basic design, but also of rich auxiliary equipment. Longitudinal sawing at a given width is facilitated by adjustable fence; cross-cutting and angle sawing can be effected precisely at a given angle, and rapidly due to the application of the rule with angle gauge, while straight or angle clipping of long elements is facilitated by supporting trolley moving alongside the table edge, and fitted with eccentric clamp; for milling operation purposes it is readily shifted on the table to the other edge, thus enabling the machining of ends of long elements (tenons, sash check rails). Swivel consol arm with additional upper bearing allows for mounting high cutters or cutter sets in exchangeable spindles of the moulder arbors (e. g. for dovetailing), while adjustable fence enables the profile machining of sides and faces of elements. Two speed ranges of the spindle allow for operation of both small and big diameter tools with correct cutting speed.

The DSKA-2/40 has been developed to the design, embodied in the DYSA 3/40 by the addition of drilling attachment. This latter model as combined with the DYFA-2 heavy duty circular saw-lower spindle moulder, form together the multi-operation plant designated as DYKA-6.

Both this combination plan and its basic element operated separately are particularly useful for small carpenter workshops, for repairing workshops and for wood working divisions in factories of the lines of industry. Wherever the installation of a few conventional single operation machine tools is impaired by confined production space or by limited investment means, with production volume being small and production range highly varied—the combination machine tools of type DYFA, DYSA or DYKA offer the correct solution to the problem of mechanisation of manufacture.

The SNSB—veneer edge-to-edge joining machine (this year for the first time on the production list of the FOD) presents a special purpose machine designed to join by means of glue the edges of two sheets of veneer having a thickness of 0.3 to 5 mm, and is used in factories of plywood and of plates, of furniture, rolling stock, etc. The SNBS joining machine offers high working output (feed rate up to 20 m/min) and top quality of joining. A spectacular proof of reliability of operation of this machine is

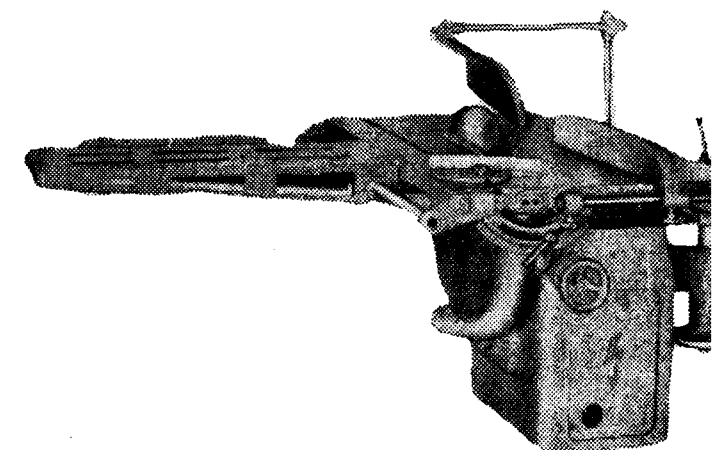
furnished by the length of bonding obtained amounting to 90 or even 100 per cent of the entire joining edge, as confronted with the figure of 50 per cent being the standard technological requirement. Electrical pre-heating devices quickening the gluing process are controlled by adjustable temperature regulators offering the accuracy of $\pm 1^\circ \text{C}$ within the range of 50 to 200°C .

The Pleszewska Fabryka Obrabiarek (the Machine Tool Factory in Pleszew) established 75 years ago—trade mark FAMOT—manufacturers band saws, cross-cutting circular saw benches with horizontal swivel arm, combined carpenters circular saw benches with drilling attachment, high speed routers, spindle moulders, horizontal drilling machines, wood turning lathes with feed screw, and beld sanders.

The Pleszewska factory sells them to scores of countries including Albania, Afghanistan, Austria, Belgium, Brazil, Bulgaria, China, Czechoslovakia, Egypt, the Netherlands, India, Indonesia, Iran, Iceland, Yugoslavia, Hungary, the German Democratic Republic, Korea, Morocco, Pakistan, Rumania, the South African Union, Syria, Turkey, Venezuela, Vietnam.

Throughout the past decade the production of wood working machine tools turned out by this factory has grown sixfold, while further increase by 50 per cent is planned for the period until 1965. The share of export production in the total will amount this year to 12.7 per cent.

The DRSA-63 band sawing machine (of 630 mm. saw wheels diameter) is, next to the DRSA-80 model, one of the series of universal carpenters' band sawing machines. It is a machine tool of general use, and



Wood-Working Universal Circular Sawbench
Type DPSA

can be recommended to factories of furniture, toys and wooden fancy goods, of sports equipment and of marine craft, of musical instruments, vehicles, etc. The table tilting within the range of up to 45° angle is fitted with adjustable fence facilitating cutting along straight lines. The 2.8 kW motor drives the lower saw wheel directly offering cutting speed of approximately 23 m/sec. The machine offers cutting height up to 380 mm, with maximum workpiece width of 585 mm. The entire construction is rigid, although of light weight (550 kg), notable for smart appearance. Saw wheels and the saw, with the exception of the actual working portion are totally enclosed what together with individual table lighting (particularly useful with cutting along curves) provides for safe and convenient operation.

The DSPA circular saw bench combined with slot drilling machine is designed to be used for resawing,

cross-cutting and angle cutting, and its table tilting at an angle of up to 30° can be extended by mounting an auxiliary table, movable along the shaft guide, which is particularly useful with clipping or cross-cutting of long elements.

The table height is adjusted according to the thickness of workpiece machined (maximum 140 mm) and to the diameter (maximum 500 mm) of saw mounted directly on the motor shaft (3.3 kW; 3300 rev/min). Resawing is facilitated by adjustable fence. The machine table is moving in either directions, its height being adjustable. This allows for drilling holes (30 mm. maximum diameter) and elongated mortises at various heights of side of work machined.

The FJNe spindle moulder is a high speed machine incorporating two speed and two directions of spindle rotation. The electric change-over switch

coupled with the brake offers immediate arresting of the spindle which is of utmost importance both with regard to labour safety and to the working output. Dustproof spindle bearings are oil lubricated, the lubricating system being of enclosed circulation forced feed type operated by centrifugal pump simplifies maintenance and provides for long lasting a machine tool operation.

The DFGA high-speed routing machine presents medium size copying milling machine for flat shaping. It is designed to be used in furniture making, in fancy goods manufacture, in the production of tools, of wooden cases, boxes and of other packings for equipment tools and instruments. Its working assembly consists of high speed motor fed by frequency changer. The cutter chuck is mounted directly on the motor shaft. The motor is tilting in either directions and movable together with the guiding plane in vertical direction (pedal operated). The height desired can be set by means of multi-stage adjustable revolving stop head. Used for straight-line milling is adjustable fence while guide roller serves the purpose of copying shaping. With the machining of big elements the table can be extended by mounting additional side flaps.

repairing machinery and equipment). It is specialising in the construction of presses, finishing machines, drying and pneumatic conveyor equipment. The above products found ready markets in China, Czechoslovakia, Hungary, India, Iran, the South African Union, the USSR, Vietnam, Yugoslavia.

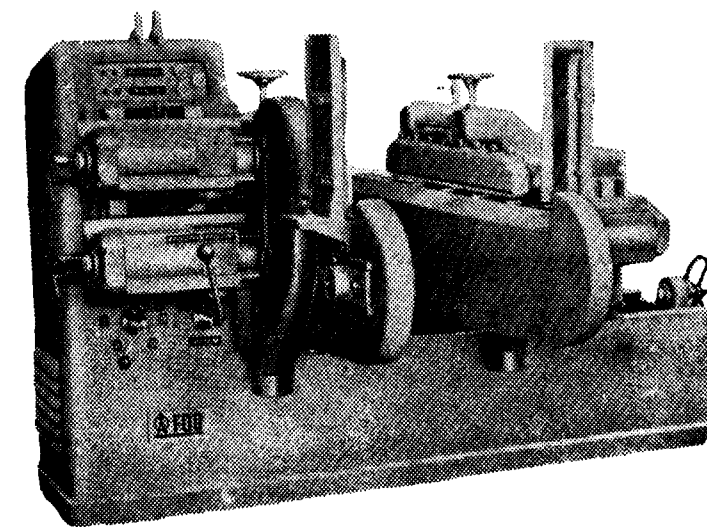
The development of production output of the Sopot works is illustrated by the below Table II, in which the total of 1958 production is adopted as 100.

Table II

Year:	1958	1959	1960
Production value:	100	292	255

The production programme of the Sopot Works comprises—among others—the following machine tools; double cut-off and squaring saw benches, DPEA-200 and DPEB-150/250 double saw benches for plywood, plates and boards; DZHA-10 horizontal belt sanders for bent furniture elements handling; DZDA-220 double opposed belt sanders, with traversing table, for grinding and polishing of veneered and varnished plates; DZTA-63 double disc vertical grinders; DZLA-90 two-drum grinders with endless travelling bed; DZWA-125 triple-drum grinders with endless travelling bed; DKGA-100 rotary glueing presses for slats and boards; DOVA-120 glue spreading rollers; DOGA-06 pneumatic steam heated presses for chair seat frames; DOHA-360 hydraulic presses for plywood; DOTA-400 endless belt drying plant for veneer, and forest fruit drying plants.

The DOHA-360 presents light-weight frame type press (with steam heated plates) designed to gluing veneer onto carpentry plates, furniture elements, and for the production of plywood. The press design enables it to be mounted on a hard floor—without expensive foundations. Feeding the press operating cylinders by means of plunger pump enables rapid closure of the press (the pump operates by means of 3 low pressure plungers), following which the pump shifts over automatically to the operation of high pressure plunger supplying working pressure desired. The operation of the press is facilitated owing to the installation of control system, and to feeler pressure gauge controlling the press operation. Self-acting control equipment adapted for purposes of a given technological process, to be installed in the press, is at the moment in the stage of development.



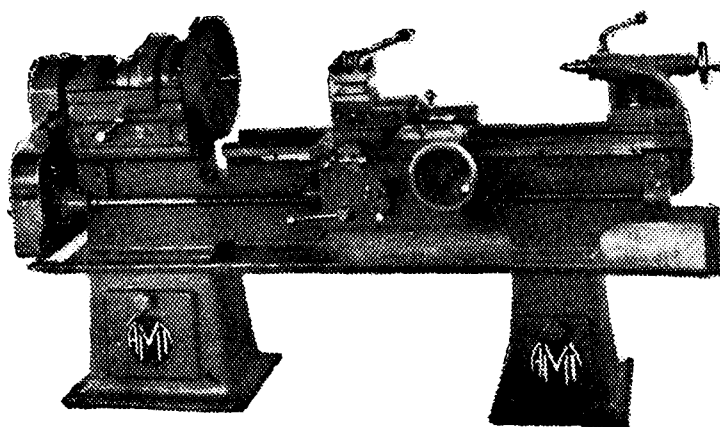
Double-End Parquet Staves Cross-Cut Saw
Type DDPA-100

Sopockie Zakłady Przemysłu Maszynowego (SZPM)—the Machinery Industry Works of Sopot, under the authority of Forestry and Wood Working Industry launched this production of machine tools no sooner than in 1957 (up to that date it was engaging in



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Articles should be elaborate supported by illustrations, wherever available, and should be of a high order. Only original photograph prints should be sent and drawings should be on drawing paper or cloth in India ink. Ferroprints are not accepted.

Summary of technical papers read before professional Institutions or at meetings of Engineers are also accepted if they are of sufficient interest to the Industrial Engineers.

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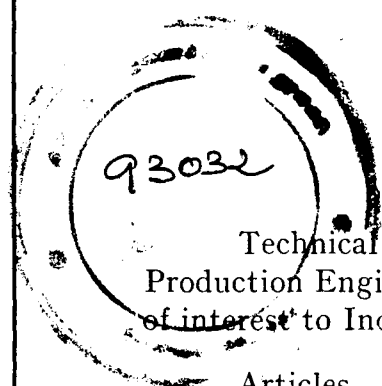
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Manufacturers of plants and equipments can send in writeups from their Technical Staff or Chief Engineer about any new technical features, developments, research notes and news having a bearing on their manufactures and which would be of sufficient interest to the Industries.

The Managing Editor reserves the right to delete, amend, or add any paragraph/paragraphs to the contributions.

Accepted original contributions would be paid for at our rates, if desired

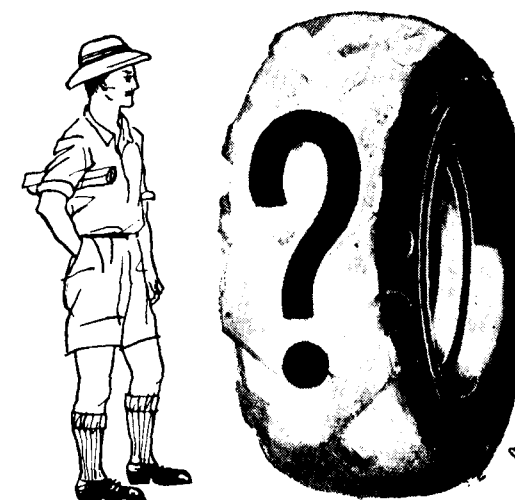


CUT OPERATING COSTS

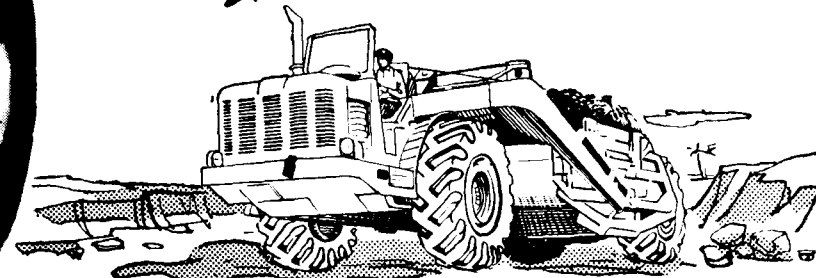
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