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# JOURNAL
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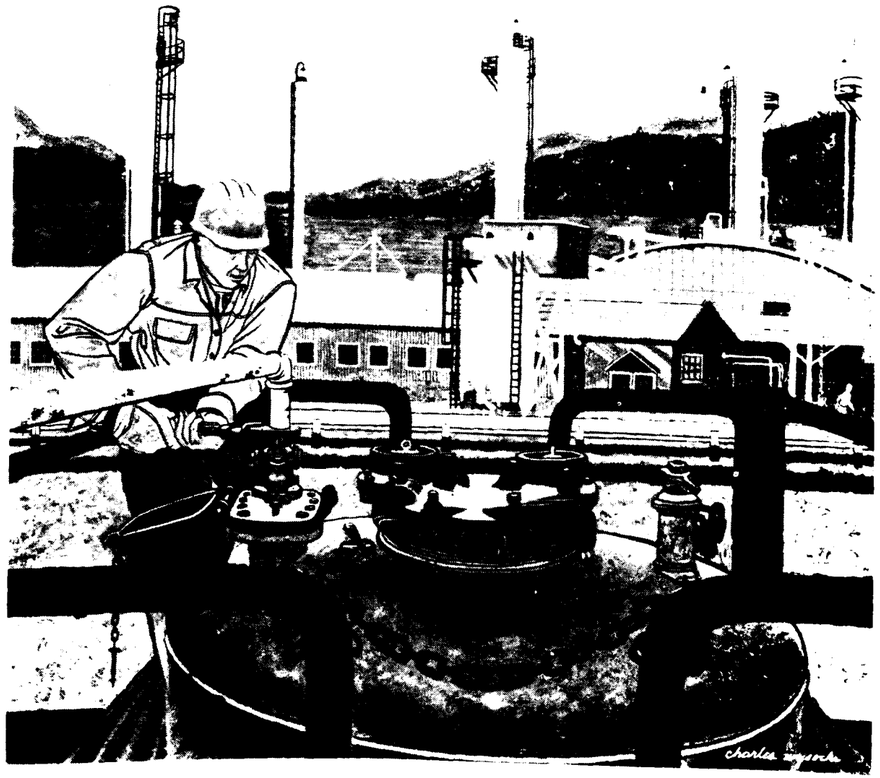

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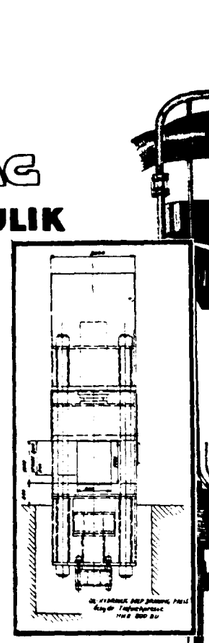

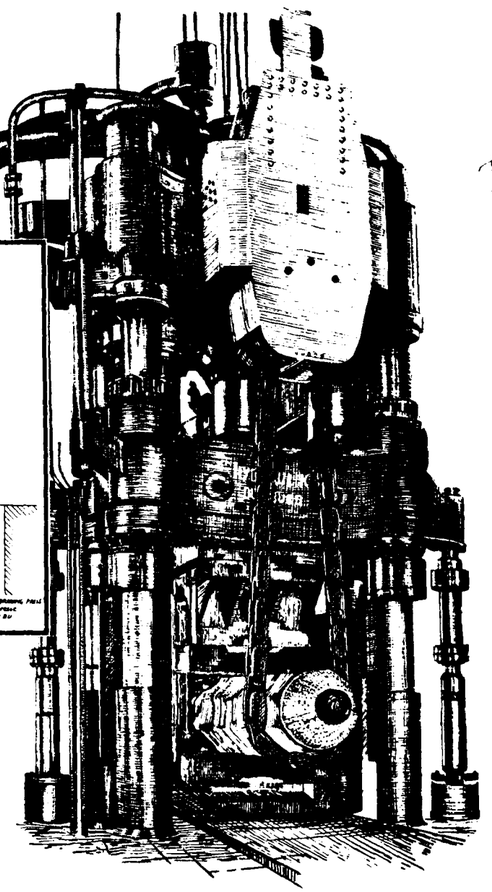

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# INDUSTRIAL ENGINEERING

ENGINEERING is the application of science to give people use of nature's materials and forces. Scientists make it known, engineers make it useful. All science known would benefit nobody if not applied by engineers to manufacturing, construction, mining, agriculture or the generation of power. These are the great engineered industries—all based on scientific knowledge.

Industrial Engineering is the application of engineering methods and the principles of scientific management to production, in fact it is the engineering approach applied to all factors, including the human factor, involved in the production and distribution of products and services.

According to the American Institute of Industrial Engineers, industrial engineering is concerned with the design, improvement and installation of integrated systems of men, materials and equipment; drawing upon specialised knowledge and skill in the mathematical, physical and social sciences together with the principles and methods of engineering analysis and design, to specify, predict and evaluate the results to be obtained from such systems.

The end result of the industrial engineering function is cost reduction. In this context the importance of this function in Indian industries to-day needs no emphasis, specially in view of the fact that under the stimulus of keen competition they will have to intensify their efforts to improve methods and reduce the cost of their products.

Among the many assignments of an industrial engineer, the most important are: (a) to investigate and analyse office or factory production operation, procedures, equipment and the flow of work for the purpose of recommending changes to increase efficiency and reduce cost without sacrificing quality; (b) to recommend changes in the design of equipment or investigate and recommend the installation of new equipment; (c) to recommend revisions in department layout; (d) to investigate the manufacture of special products, to establish a manufacturing schedule, or devise new operational methods; (e) to set standards for performance—quality, quantity, cost; (f) to establish and maintain incentive systems; (g) to analyse, establish and evaluate job content; (h) to design systems for controlling production, stock of items, quality and cost; and (i) to accept major problems on the basis of a bare outline and carry them through to conclusions.

It is a fact that some of these functions are now being carried out by the production departments attached to different factories in India under the charge of Production Engineers, but the basic function of an industrial engineering department lies in the analysing, fact-finding, simplifying, measuring and controlling factors connected with the productivity of the industry and is one of the major sources

for decision making which is available to the executives of an industry. The industrial engineer combines the aptitudes of an engineer, accountant and business executive and works in the capacity of an adviser.

In countries like the United States of America, Canada, Australia etc., industrial engineering has been successfully introduced as a separate function into an enterprise and its working relationships with other departments have been clearly defined.

In most cases the industrial engineering department exists primarily to provide specialised services to the production division. The services may be few or many and normally include the functions as already indicated earlier. The department is however ordinarily held fully responsible for the applicability and accuracy of the programmes developed and recommended.

For example, while the Production Control Department will look to the industrial engineering, department for processing, routing, tool, jig and fixture information, processing times and other operational data that will enable it to schedule production properly, it will however be responsible for ensuring that materials are at the right place in the right quantity at the right time; that machine capacities are properly utilised; and that schedules are developed.

Similarly its relation with the Drawing Office will be in assisting the development of low-cost design of a product by studying the proposed design from a processing standpoint. The responsibility for functional design of the product will continue to rest on the Drawing Office. One of the benefits of this collaboration is that it eliminates to a large degree changes in design at the time manufacturing begins. Such changes not only are expensive and wasteful of engineering time but also have a decidedly bad effect on the morale of all concerned.

The field of distribution is one of the most lucrative for cost-reduction activities in the industrial picture. The same analytical approach that has been applied so successfully to manufacturing processes will lend similar savings and cost reductions in the field of merchandising and distribution with accompanying improved service and customer satisfaction. The programme can include studies of packaging design, the preparation and mailing of sales-promotion material, analysing sales potentials, determining frequency of sales contacts and the like.

Industrial Engineering, in spite of its rather brief history has already achieved a certain degree of maturity where agreement on principles is well advanced. Although all of the necessary developments have by no means been made and new techniques and procedures will continue to appear on the scene, there is nevertheless a sound, hard core of industrial engineering practice which may be counted upon to continue the advancement of material standards of living, wherever industrial engineering is applied.

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# ISOTOPIC THICKNESS GAUGE

Dr. Willy Schnabl and Frans Söldner

IN the field of precision measuring techniques great efforts have been made in recent years in the German Democratic Republic in order to maintain the prominent position held in this field. This position entails the obligation of studying all the various precision measuring problems and of investigating more closely and possibly utilising any measuring processes which may be suitable for precision measuring purposes. Not all precision measuring problems can be solved in the traditional manner by mechanical and optical methods. For many measuring tasks new solutions have to be found and corresponding processes evolved. Thus, for example, at the moment we are endeavouring to apply electronic and pneumatic methods for precision measuring purposes. The rediation of radioactive isotopes affords the possibility—especially in the field of contact-free precision measuring—of solving measuring problems which could not be completely solved with the conventional methods. This new contact-free measuring process was quickly accepted in the manufacture of continuous bands and foils of metallic and non-metallic raw materials.

First the paper industry took to this new measuring process. The user is interested in obtaining as much printing area as possible, whilst the manufacturer wishes to use only as much raw material as is absolutely essential. Therefore paper is produced and marketed in terms of weight per unit area. Only when the paper was finished a check of the area weight was possible by weighing a certain area, so that only after termination of the production process a decision could be made whether the predetermined tolerances of the area weight were attained. This resulted either in waste or uneconomical use of raw materials. The new measuring process makes it possible to measure the area weight of the paper directly during the manufacturing process, so that now the machine operator can adjust the setting of the paper machine. Similar problems exist in the manufacture of abrasive papers where it is important to be as economical as possible with the animal glues used, but at the same time apply them in the correct thickness.

In the manufacture of technical rubber goods, plastic foils, artifical leather, oil cloth and greaseproof wrapping paper great saving can be achieved by using the expensive PVC-material sparingly. With the measuring methods used so far as is only possible to decide with the finished product whether the PVC compound has been applied too thinly. Reprocessing not only involves uneconomical consumption of valuable raw materials, but also increased working expenditure. Until now the machine operator in this field has been working without adequate measuring possibilities. On the whole he can only rely on his experience. Another complicating factor is that the condition of the PVC compound is subject to great fluctuations in the working of one shift and therefore requires great experience and much skill to work economically. Also some sections of the film industry are open to this new method for the measuring and inspection of the base material.

When rolling light metal foils, narrow strips are still out from the edges of the rolled goods and the thickness determined by means of an optimeter. Notwithstanding the fact that these can only be random tests, there is a risk that with awkward cutting of the strip the rolled material tears, thus causing appreciable diseruptions in production. In the steel foil industry it is usual to follow material with a micrometer screw for carrying out measurements. All these methods are auxiliaries sometimes provided by the works themselves, as special measuring instruments permitting continuous measurement and recording with adequate accuracy have so far not been available.

A few figures taken from the literature 1) are intended to show the great economic advantage which can be obtained with such new measuring methods.

With a medium-sized paper machine it is possible to save 100 to 200 tons of raw material per annum. In the manufacture of artifical leather and oil cloth 1—2 kilos of PVC-compound are saved per 100 sq. metres of finished product. In the film industry a measuring plant on a film-producing machine pays for itself within one year. The volume condensers could be reduced by 13.6% by reducing the paper and metal foil thickness tolerances and this would have a considerable effect on the products of the electronic industry.

The application of radioactive measuring methods in industry and processing works presumes of course that the greatest possible safety precautions are taken to protect staff members from harmful radiation and intake of radioactive substances. The radiation sources are therefore housed in capsules carefully sealed hermetically, so that only the radiation is emitted. Very dangerous intake of radioactive substances, i. e. the absorption into the human body through the mouth and the respiratory organs and through wounds is therefore safely eliminated. As it exceeds the envisaged framework of this article to enter into details of the physical basis of the method of thickness measurement by absorption of beta-rays, attention is drawn to the literature (2), (3), (4), (5). All that should be said here is that the absorption of B-rays takes place according to an e-function, the decisive factors of which are determined by the atomic number and the atomic weight of the absorbing material and by the energy of the radiation used. As radiation detector for use in thickness measurements, an ionisation chamber is generally used. B-particles release their energy by ionisation in a predetermined volume, filled with air or rare gas. The ions produced are collected by an electric field and form an ionisation chamber current. As the currents are extremely small, special electronic methods are required to measure them. In most instances artificial radioactive emitters are used as radiation sources.

Fig. 1 illustrated the arrangement of such an ionisation chamber. The magnitude of the direct

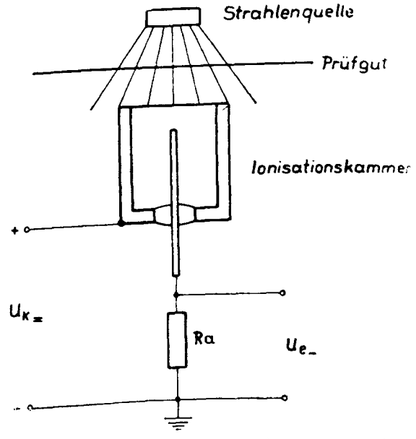


Fig. 1. Arrangement for absorption measurement
A radiation source, B test instrument, C ionisation chamber

voltage occurring in the external resistance is determined by a variety of factors, including atmospheric pressure, temperature and age of the emitter all of which play an essential part.

To eliminate these complex components the differential method (Fig. 2.) is applied. For this

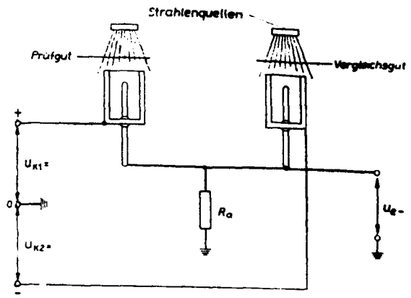


Fig. 2. Arrangement for absorption measurement with 2 ionisation chambers
A radiation source, B test instrument, C comparison material

purpose two chambers are used and the material tested is compared with a reference material. The two chambers are connected so that the voltages in the external resistance balance each other if the absorptions of the tested and reference material are the same, temperature and atmospheric pressure effects being eliminated as they apply to both chambers at the same time.

It is of course a prerequisite that the two ionisation chambers are arranged adjacent to each other to ensure that external conditions are really identical. By means of such a differential method the accuracy of an absorption measurement can be increased considerably. Two specimens must however be used. There is nevertheless the advantage that ageing of the specimens does not enter into the measurement to such an extent as in the above mentioned absolute process. Fig. 3[2]) lists the isotopes which should preferably be used as radiation sources for various measuring problems. It becomes obvious that not any isotope can be used for any measuring purpose. For certain area weights only isotopes should be used which are especially suitable for the selected measuring range. The instrument described below operates with the radioactive isotopes 204 Tl and $^{90}$Sr as radiation sources.

Numerous technical requirements are placed on a thickness measuring instrument. Special mention



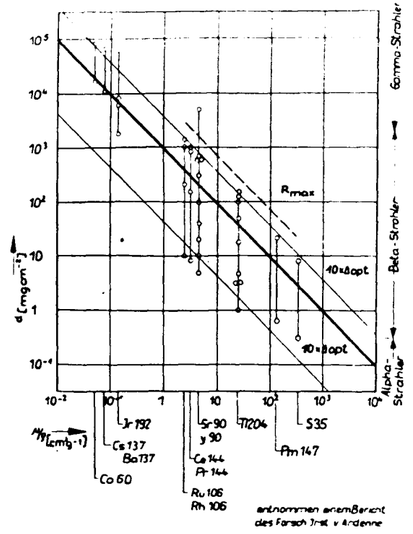


Fig. 3. Diagram for selecting the radiation for a certain measuring task.

should be made of operational safety even with rough and continuous operation as well as the provision of a recording instrument and remote reading. Furthermore a connection for automatic control of production machines must be provided for. Some of the instruments on the market operate according to the so-called deflection method (Fig. 1), others according to the compensation principle illustrated in Fig. 2. The electronic processing of the measured value can be carried out in different ways, the simplest electronic process is illustrated in Fig. 4. Essentially this is a D. C. amplifier which amplifies the voltage produced in the external resistance of the ionisation chamber and makes it visible on an indicating instrument. In this instance a direct voltage is amplified, and the well-known stability difficulties of D. C. amplifiers

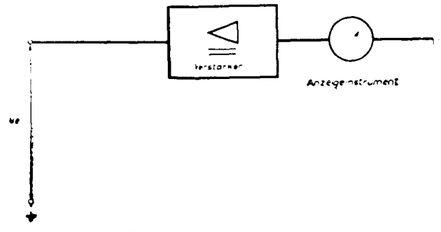


Fig. 4. Measuring amplifier
A. D. C. amplifier, B. Indicating Instrument

occur. The difficulties increase if it is required to determine the area weight with an accuracy of at least 1%. Such instruments suffer from poor stability of the zero-point, even where a differential ionisation chamber is used as receiver. To obviate the difficulties with D. C. amplifiers, an oscillating condenser is, for instance, used by which the direct voltage produced in the external resistance can be transformed into a proportional A. C. voltage. This is then further amplified by a considerably more stable A. C. amplifier. Finally it is rectified again and a direct indicating instrument is used.

Fig. 5. shows the block circuit diagram for the measuring process which is used in the instrument

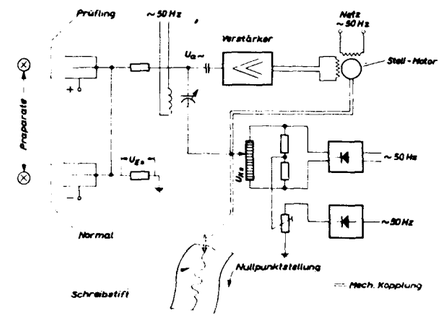


Fig. 5. Working diagram of the instrument
A. Specimens B. Material to be tested C. Comparison material D. Amplifier E. Servomotor F. Mechanical clutch G. Zero point setting H. Stylus $J_1$. Transmitter $J_2$. Receiver K. Oscillating condenser

described below. Contrary to the unstable deflection method, two ionisation chambers are used, i. e. one differential ionisation chamber which ensures to a large extent that temperature, atmospheric pressure and humidity fluctuations, and also the effects of ageing of the specimen are largely eliminated. The difference Voltage $U_e$ produced in the external resistance of the ionisation chambers is corrected to an oscillating condenser which in this instance is energised by the mains frequency of 50 c/s. The A. C. voltage thus produced is amplified in an A. C. amplifier in the usual manner and fed to a phase sensitive electro-magnetic servomotor. This motor drives a measuring potentiometer which—fed by a direct voltage—is capable of balancing the charge of the vibrating condenser, and thus the A. C. amplifier acts only as a nullamplifier. If the potentiometer has been set so that the output voltage on the amplifier is zero, the currents which produce the torque on the motor disappear. The

potentiometer is coupled with a recording device permitting the recording of its position as the measured value. The torques are so great that they produce at the same time a continuous control signal and drive a large reading device. As already mentioned, automatic compensation permits the amplifier to work as a null amplifier and no longer as a deflection amplifier, so that all electronic methods to stabilise it can be omitted. If the amplifier alters its degree of amplification either due to mains fluctuations or due to ageing of the valves, only its sensitivity changes, but never its zero-position and measured valve. Thus a very good stability of our measuring instrument has been achieved.

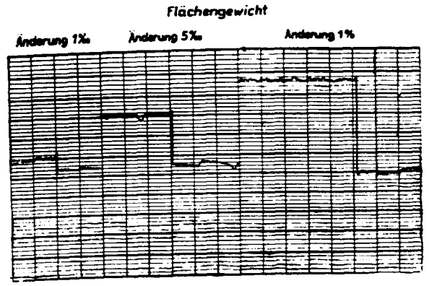


Fig. 6. Sensitivity of instrument
Area weight steps of 1‰, 5‰ and 1‰

Fig. 6. [3]) illustrates the sensitivity of the instrument. The sensitivity can be switched in stages and can be easily reduced by a corresponding increase of the compensating voltage. At maximum sensitivity 1% area weight alterations cause deflections of 5 mm on the recording paper. This sensitivity by far surpasses the figure required in most practical cases. Only due to automatic compensation methods was it possible to make the sensitivity of the instrument greater than usual despite the small electrical consumption and without the price of the instrument becoming excessive.

Furthermore, the dependence of the instrument on mains voltage fluctuations was investigated. We did not adopt the method of general electronic stabilization of the voltage, but as it is a tone compensation method, the voltage fluctuations are compensated. If the amplifier is subjected to voltage fluctuations, this does not play an important part, as changes in amplification do not affect % this system as they do the deflection method. Only a change in the sensitivity of the amplifier occurs and this, however, does not have a detrimental effect because its size is such that sensitivity fluctuations remains, anyway, within tolerable limits.

If the oscillating condenser is subjected to voltage fluctuations, the change in energising voltage naturally alters its voltage output. This dependence is linear. To balance alterations the compensation voltage $U_k$ was made dependent on the mains voltage to the same extent, so that when energising voltage fluctuations and thus input voltage changes occur, the compensation voltage alters accordingly. Fig. 7[3]) illustrates a recorded curve of a measured value,

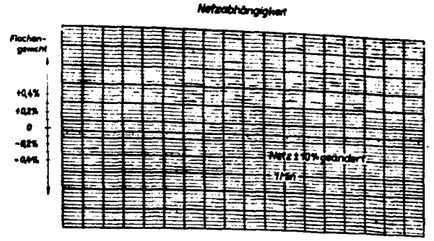


Fig. 7. Effect of mains voltage fluctuations of ± 10% on the area weight indication.

the mains voltage having changed by ± 10%. Any effect on the measured value cannot be detected. Also with continuous testing of the instrument over 8 hours on a highly fluctuating mains circuit, good zero-point stability was obtained (Fig. 8)[3].

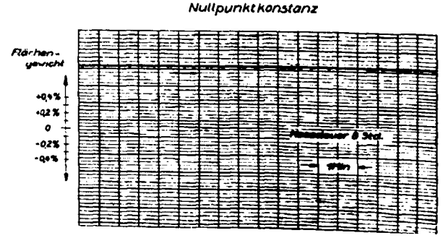


Fig. 8. Section of a record of the zero-point position during an 8-hour continuous test.

Then the warming-up of the instrument was investigated. Fig. 9 illustrates such a starting diagram recorded with the instrument at maximum sensitivity. From the curve it can be seen that the instrument after having been switched on when quite cold—operates even after only 5-10 minutes at optimum measuring accuracy.

When designing the instrument, the many years' experience of VEB Carl Zeiss Jena in the construction



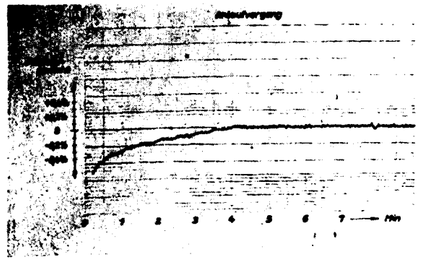

Fig. 9. Starting-up curve of the instrument as function of the area weight variation.

of precision measuring instruments for industrial use was utilised. The design aimed at producing from the existing laboratory instrument a robust measuring instrument suitable for industrial applications. After investigating the possible applications the following indispensable requirements had to be fulfilled, partly by the compensation measuring process and partly in design.

1. Safeguarding of the personnel from radiation injury.
2. High measuring sensitivity.
3. High zero-point stability with immediate readiness for use.
4. Insensitivity of the instrument against disturbing voltages and mains fluctuations.
5. Convenient operation.
6. Rigid mechanical design.
7. High resistance to climatic conditions.
8. Possibility of external ventilation.
9. Possibility of recording of remote transmission.
10. Generating a control voltage for operating the control circuit for automation of a machine or a process.
11. Application of the unit assembly system and standard housings to meet the numerous industrial applications with the smallest possible number of standardised components.

Fig. 10 illustrates the standard design of the thickness measuring instrument for industrial purposes.

The following main units can be recognised :

1. Radiation source (Dimensions: 140 × 190 × 80 mm)

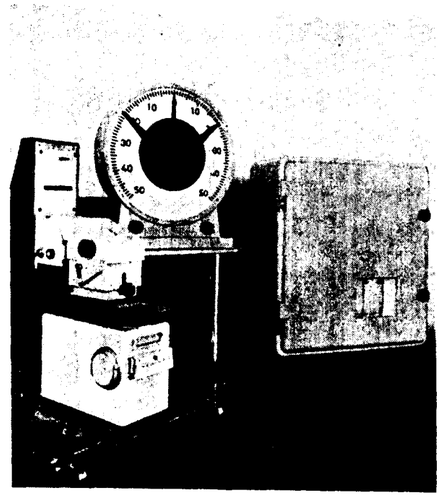

Fig. 10. General View of the area weight measuring equipment for fixed measuring position.
A. radiation source, B. receiving head, C. amplifier box with recording unit. D. large indicating instrument.

2. Receiving head (Dimensions: 370 × 270 × 200 mm)
3. Amplifier cabinet with recording unit (Dimensions: 730 × 810 × 390 mm)
4. Large indicating instrument (Dimensions: 550 mm diameter)

The *radiation source* is approx. 50-80 mm above the measuring chamber. It contains as radiating isotopes either 90 Sr or $^{204}$ Tl with an activity of approx. 20 mc. The radiation source is equipped with a warning lamp which lights up when the radiator is in working position. If the current is interrupted or the instrument switched off, the specimen carrier reverts automatically to its protected position. The instrument can only be switched on again when the specimen carrier is tilted by hand back into its working position. This ensures effective protection of the Operating personnel. The illustration shows a special model for foil rolling works. The radiation source can be tilted away so that there is no obstruction when inserting the foil. The mounting visible in Fig. 10 is not part of the instrument, but only laboratory equipment. The *measuring head* (Fig. 11) contains the two ionisation chambers of 80 mm dia. and 100 mm height. The window is closed with an aluminium foil and provided with a steel wire guard

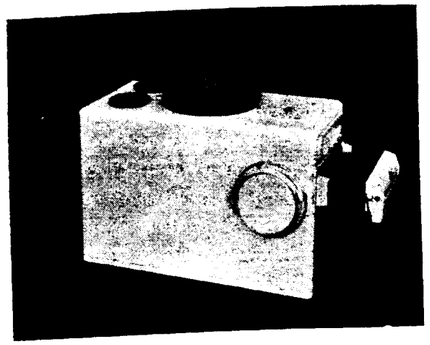

Fig. 11. Measuring head

for protection. Special attention was paid to the measuring head being stable to climatic conditions. The entire internal space is kept by a standardised blue gel cartridge at a low atmospheric humidity, the internal space of the oscillating condenser being dried specially. It was frequently noticed that a considerable amount of dust was deposited in places where the thickness measuring instrument was used. The window of the ionisation chamber was therefore provided with a special blowing device with compressed air permitting speedy cleaning of the window. Should the closing foil be destroyed it can be quickly replaced. Adjacent to the measuring chamber is the oscillating condenser with high ohmic resistance and pre-amplifier. The oscillating condenser is designed so that it can also be used as standard unit for other technical control tasks. It operates with an energising frequency of 50 c/s. and has, due to the construction and manufacturing technique, a very high stability of the contact potential. Due to the dry cartridges arranged, the insulation resistance is adequate even in damp climates. The reproducible manufacture of this precision component is ensured by the respective tools and equipment. The comparison chamber has the same dimensions as the measuring chamber. The comparison radiation source arranged above this chamber can be precision set for exact compensation. The comparison specimen (Etalon) is inserted by means of a rapid-change cassette into the comparison radiation path. The measuring head has surfaces fitted for various supports.

Fig. 12 illustrated the design of the *main amplifier cabinet*. The entire electrical design was accommodated in an airtight aluminium casing. Experience with other precision instruments under industrial

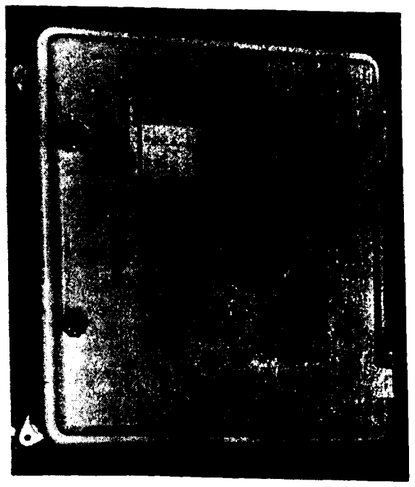

Fig. 12. Amplifier cabinet, closed

conditions proved that only an airtight casing of the shape provided will in the long run meet the exacting demands. Flying dust of 1-2 u / particle size will penetrate even through a narrow slit so that only careful packing with long half-life-periods for pressure compensation can be effective. The same applies to the diffusion of corrosive gases or vapours. The sensitive parts o the amplifier can be protected against effects of corrosion by dry cartridges and in specially complicated cases also by air conditioning with pure air. As experience in chemical works showed, this precaution is most important. The valve amplifiers and the recording unit with compensating potentiometer and servomotor are arranged on bases which can be swung out of the cabinet. (Fig. 13.) This arrangement and the clear design of the amplifier permit easy inspection during operation. To conform with safety regulations, the base can only be swung out by using a tool.

The compensation method permits a simple design of the amplifier. A VEB Carl Zeiss precision potentiometer is used for compensation and this is controlled by a servomotor. The position of the potentiometer is transmitted to a recording instrument. Parallel to it is a rotary control for remote indication and a second potentiometer for producing a voltage for the control plant (roller setting, pulley position, dosing plant, material feed, etc.). By means of an adjustable knob the rotary control can be

shifted so that the zero-point of the remote indicator can be re-adjusted as required. The main amplifier can alter the sensitivity of the instrument via a step switch. The paper feed of the recording unit can be adjusted in two positions.

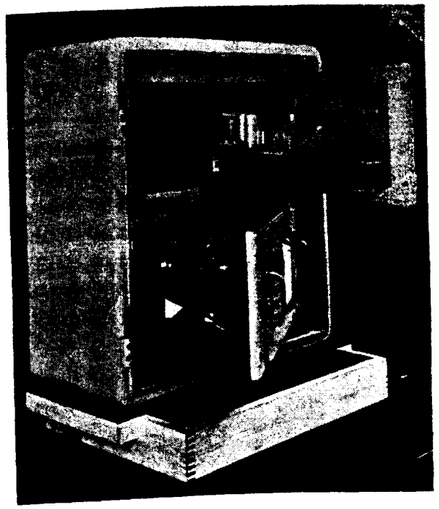

Fig. 13. Amplifier cabinet, opened

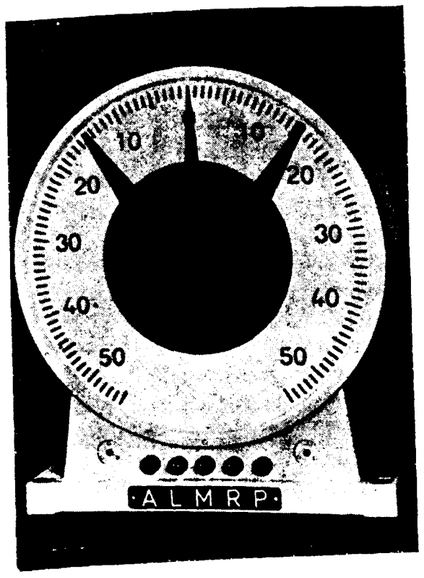


Fig. 14. Large indicating instrument

For band rolling systems, plastics and paper machines a *Large indicating instrument* (Fig. 14) was designed to allow convenient reading. All operators working on the machines can observe the measured value even from some distance. The large indicating instrument can be read from both sides, the divisions and figures are selected so that they can be discerned even from some considerable distance. Two adjustable tolerance marks permit marking of the permissible thickness tolerance. If the tolerances set are exceeded, an optical or acoustic signal is produced. If the tape tears, the indicator moves to its final position and thus releases a second signal. This arrangement became necessary because of the requirements of the paper industry where different operators control the exceeding of tolerances and the tearing of tapes. As with other units, the large indicating instrument is also completely enclosed.

For using the Thickness measuring instrument in the plastics and paper industry for band widths of 1--6 metres, the *mobile attachment* can be employed.

Fig. 15 illustrates the design of this attachment. On a box shaped hollow support the measuring chamber is guided by rollers. Synchronously with it the radiation source moves on a second support of the same design. Because of the bending and torsion-free design of the supports, span widths of 1 to 6 metre lengths are possible. The guiding tracks have smooth surfaces and the drive is effected through steel rope drives via a reliable and safe slip clutch. Inside the hollow support are lines for electrical power and compressed air. This design has no loose hanging cables impeding operation. The entire

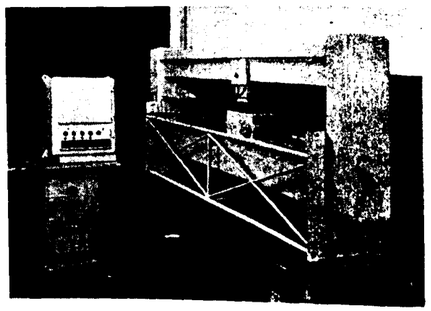

Fig 15. Transverse movement device



Fig. 16. Control box for the transverse movement device

movable device is fitted into two pivots and can be tilted so that even obliquely running tapes can be measured. For controlling the measuring equipment a special switch box is provided (Fig. 16). For use in the paper industry the following measuring scheme was devised :

1. The measuring device is in a fixed position on the right, in centre or left hand side of the tape. The position required at any time is selected by push button control on the switch box and the measuring device moves automatically into the required position. After completion of the movement the control lamp on the large indicating instrument lights up. The respective position of the measuring head is recorded at the edge of the chart paper so that it is possible to co-relate the measured result.

2. The measuring device moves pendulum-like over the tape. This movement also is released by push button control. At the same time this control increases the chart transport speed of the recording unit. The respective position of the measuring head is recorded at the edge of the recording paper so that co-relation of the measured result is also possible in this instance.

3. If the tape tears, the measuring head moves at higher speed into the protected position beyond the tape. A bracket then protects the radiation source and the measuring head against accidental damage when re-inserting the tape.

The Thickness measuring instrument can be used to economic advantage in the following fields :

1. *Paper Industry*

The instrument can be used in the wet or dry section. Saving and improvement in quality are ensured by keeping accurately to the area weight. For inspecting the layers a recording unit is required. Automatic control of the feed and other components is possible.

2. *Plastics Industry*

With plastic-coated paper the saving of coating compound produces great economical advantages. Uniform quality is ensured. The automatic control of a dosing device is possible. In the manufacture of plastic foils quality and output can be increased.

3. *Oil cloth and Artificial Leather Industry*

Here there are great possibilities for saving by economical use of the coating compound. Not only is the output increased but also re-processing avoided. The instrument pays its way within a very short time.

4. *Chipboard Industry*

The instrument could be used for measuring the layer thickness after the various processes and thus contribute towards ensuring uniform quality.

5. *Foil Rolling Industry*

By measuring the preliminary roller foil, tape of even thickness can be fed into the finished roller train. This results in less waste, an improvement in quality, and rationalisation of the working method especially at high working speeds.

6. *Film Industry*

In the film industry tape thickness measuring

instruments will be used to advantage as the measuring methods used up to now are not fully satisfactory.

The Thickness Measuring instrument made by VEB Carl Zeiss has the following technical data :

| | |
|---|---|
| Type of radiation : | B-rays |
| Working principle : | Double-beam compensation method with continuously following null point and difference indication. |
| Measuring range : | abt 30 to/0000 g/sq. metre. |
| Measuring accuracy : | 0.1—1% |
| Time constant : | approx. 1 sec. |
| Large reading : | by direct indicating remote-controlled instrument. |
| Recording equipment : | Mechanical recorder |
| Stability : | (a) Warming up time max. 10 min.<br>(b) Zero-point stability ensured by compensation principle. |

Elimination of recipe influences on the area weight by use of standards of the same quality.

Exceeding of tolerance indicated by optical or acoustic signal. Alarm for torn tape with simultaneous movement of measuring carriage. Control voltage by means of a continuously controlled precision measuring potentiometer.

Radiation protection when the instrument is not in use and in case of current failure.

Measuring window cleaned by compressed air.

Elimination to a great extent, of effects of source ageing as well as atmospheric pressure and temperature, by means of the compensation principle.

Transverse moving device for band widths up to 6 metres.

Protection against dust, industrial conditions and corrosive chemical atmosphere by enclosed units.

*Literature* :


| | |
|---|---|
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| (3) E.Klar, H.Westmeyer, H.Peupelmann, C. Schacke and W. Schnabl. | Kernenergic (Nuclear energy) 1 (1959) p. 520. |
| (4) Mandel | Brit. J. Appl. Phys. 5 (1954) p. 58 |
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## New Nuclear Contract for General Electric

The Atomic Power Equipment Department (APED) of the General Electric Company (USA) will design and manufacture the nuclear instrumentation for the AEC's Hallam Nuclear Power facility in Nebraska (U.S.A.) The nuclear portion of the 75,000-kilowatt, sodium-graphite power station will be supplied by Atomics International, a division of North American Aviation, Inc. Scheduled for completion in 1961, the station will be operated by the Consumers Public Power District of Nebraska.

The General Electric-built nuclear instrumentation system will provide nine channels with provision for spare operating channels. The system will include an automatic self-testing feature which tests operation of each safety channel once per second. Each channel will furnish safety information to the network built by Atomics International which can "scram" or completely shut down the reactor if a potentially unsafe condition is discovered.

# SPECIALISTS AGAINST CORROSION

By Adrian Soligman

( Exclusive to J.O.I.E. )

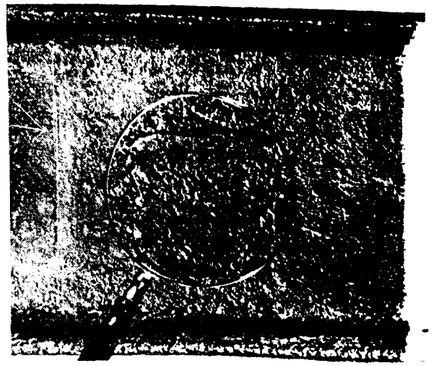
*Recent events have underlined the vulnerability of installations such as great power plants, ships in harbour, oil refineries or radio stations during periods of political unrest. Yet the most dangerous fœ that any of them has to face is "The Silent Enemy", against whose insidious attack new methods of protection are at last being developed.*—EDITOR

HOW long will our supplies of essential metals last out at the rate we are consuming them today? That rate is increasing by more than 6% compound every year, as living standards rise all over the world; and with it increases the amount of metal lost to us by corrosion, through being dissipated over the earth's crust in the form of powdery oxides.

The extent of this wastage in particular cases is staggering. £ 4 out of every £ 10 spent by farmers on machinery replacements is due to damage by rust; the cost of corrosion to the national economy of Britain alone is now over £ 600 million per annum, and total world costs must be more than ten times as great.

These are spectacular figures. But until fairly recently, statistics of this sort did not, in themselves, provide an unanswerable argument for anti-corrosion techniques—mainly because those which were known to be effective were also very costly. Cathodic protection for a moderate-sized tanker costs about £ 3,500 per annum; the protection of steel pipe lines by the same method is even more expensive; and where machinery was concerned, many were impressed by the view that money spent on the preservation of plant, in an age when machines tend to become obsolete long before they are worn out, was money wasted.

During the war, the Plus-Gas Company of London decided to devote the whole of their resources to discovering cheap but effective methods of dealing with metallic corrosion. It is not surprising, therefore, that they have had some notable successes and they are still the leading British company to specialise in this field. The product which recently made them headline news is their new Formula "E" solution,



This photograph shows the hard burnished surface produced by Plus Gas Formula 'E' on a heavily corroded surface.

based on a blend of tannins, which kills corrosion on metal surfaces before painting. But the Plus-Gas story is one of patient and logical progress, beginning at the beginning with the most urgent problem of all. This is the freeing of already corroded parts, so as to extend the life of existing plant at a cost which anyone can afford. The Plus-Gas answer to this problem was their now famous Formula "A" Dismantling Fluid (Rust remover), which loosens corroded machinery in a few minutes, by literally breaking down the corrosion.

Among the more spectacular achievements of Formula "A" was the freeing of a 6 ft. 6 ins. × 4 ins. diameter centre bolt in a coastal railway turntable, which had not been moved for 39 years and was frequently submerged in sea water. On another occasion, a forty-year-old outboard motor (which, among other vicissitudes, had spent eight years under

Showing Vilter Flanges removed from the Ammonia Liquid Line for servicing, showing very heavy corrosion.
*Photographs by courtesy of:*
*The Eldorado Ice Cream Company Ltd.*

Showing the effect of Plus Gas Formula 'A' for dismantling the above flanges and for the removal of the corrosion.
*Photographs by courtesy of:*
*The Eldorado Ice Cream Company Ltd.*

water and two on a scrap heap) was de-rusted and restored to full working order in a few hours. The use of Formula " A " for freeing seized scraper chains recently saved a colliery company £ 6,000 in a single year; freeing the chains with this fluid was found to be seven times cheaper than the cruder conventional method, and for two years no chains needed replacing.

When casing studs and turbine blades are removed for maintenance in ships' engines or large power stations, serious corrosion and metal creep are encountered due to the action of super-heated steam and excessive dry heat. Here Formula " A " is currently the only chemical known to be effective as a freeing agent. It is also used in cold storage rooms for freeing the vilter flanges in pipe joints, which have been heavily corroded by ammonia at 30° below freezing point; these flanges can be freed in two or three hours by Formula " A ", without risk of damage to threads or the costly necessity of closing down the entire plant.

The secrets of Formula " A "'s achievements are an exceptionally low surface tension, as well as ingredients which react chemically with some of the products of corrosion. It is effective on both ferrous and non-ferrous metals, and its penetrating power is so great that it has also been used to carry small quantities of lubricating oil into the innermost regions of an engine, between close fitting parts of such low tolerances that the oil itself could not pass through them.

BATTERSEA POWER STATION
Plus Gas Formula 'A' Dismantling Fluid was used to facilitate the removal of the cylinder bolts, diaphragms, nuts from cover studs, etc., on this Turbo Alternator which was installed in 1936, when opened for inspection. No studs were damaged.
Makers: Metropolitan Vickers Electrical Co. Ltd., Manchester.
*Photographs by courtesy of:*
*Central Electricity Authority, London Division*



The vapour of Formula " A " is the first to attack and soften any corrosion, which then becomes porous and absorbent, due to the chemical dissolution of some of its constituents. A particular advantage of the fluid is that it is non-acid and therefore harmless, both to the user and to the metals treated. Indeed, the fine oily residue left on the freed parts will provide temporary protection against further corrosion.

A special application is the decarbonisation of jet engine exhaust shrouds, as well as parts of rocket firing mechanisms and the heavily carbonised diaphragms of certain oil refinery equipment. Formula " A " softens and removes carbon coatings, thus obviating the damage by scoring which used to result from the old-fashioned scraping process. The fluid is also, of course, a valuable tool in the preparation of steel plates for flame cutting. It ensures a cleaner, faster cut by removing all slag-forming oxides from the path of the flame. In addition, it will serve as an effective grease solvent.

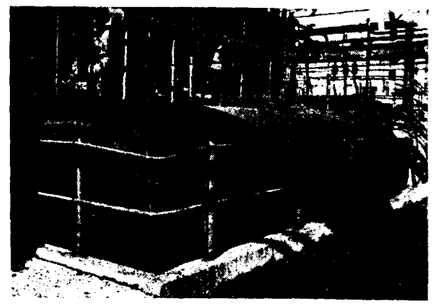
The company next turned to the problem of protecting unpainted metal parts, such as machinery in transit or metal components awaiting assembly. For this they developed Plus Gas Formula " B ", a resin-based fluid which, on drying, forms a tough protective film of very high electrolytic resistance. The principal action of the Formula " B " film is to impede the flow of the corrosion current by insulating the metals involved. An obvious advantage of this method is that when corrosion results, for example, from the close association of dissimilar metals in a humid atmosphere (as, say, in certain types of radar equipment), the application of Formula " B " to only one of the two parts is sufficient to halt the reaction.

But perhaps the most useful quality of this protective film is its elasticity. This ensures that expansion of the treated metal, due to rises in temperature, will not rupture the film and expose the metal to accelerated local corrosion, resulting from small areas of its surface being laid bare in a corrosive environment. In a recent test made by one of the major oil companies, it was this special quality of Formula " B " which allowed a consignment of high tensile bolts, coated with the fluid, to lie for several months at a Middle East depot, exposed to widely varying conditions of weather and temperature, and remain in perfect condition. Due to the success of this experiment, the oil company concerned now specifies Formula " B " for the treatment of all metal parts in transit to its overseas stations.

Formula " B " is unaffected by temperatures up to 100° Fahrenheit, and will soften but not flow between 100°F and 170°F. Consequently it is of special value in the protection of aerial masts in any climate—notably those at the R. A. F. Station on the Maldive Islands and the Burmah Oil Company's Sui installation in Pakistan. Severe weather as well as large and rapid variations of temperature have failed to impair the coatings, even after many months exposure to the elements.

On driving chains and the like, Formula " B " protects all moving parts and also acts as a dry lubricant. It will penetrate to the heart of a wire rope, protecting it against corrosion for long periods. It is of special value for the coating of spare parts and machinery during storage or in transit; and since it is soluble in oil (without, however, altering the oil's structure), it need not be removed from oil-immersed moving parts—except plain bearings—before assembly. It has a coverage of approximately 1100 square feet per gallon and can be applied to metal surfaces which are to be painted, provided that a resin-based primer is used.

Next came Formula " E ". This remarkable solution combines with the oxides on already corroded metals to form a hard and insoluble tannate film,



This photograph shows storage tanks of concentrated ammoniacal liquor where normally, due to contamination with acid and alkaline fumes, the paint surface lasts only four months. The tanks are now treated with Plus-Gas Formula 'E' External Metal Treatment, the preparation being followed by normal painting procedure. This treatment has resulted in the paint lasting four times longer, i.e. sixteen months. The conditions in this part of the works are among the most highly corrosive to be found in any industry. All pipe work, railings, walkways and other metal surfaces can be similarly treated and the same results will be achieved.
*Photographs by courtesy of the North Thames Gas Board at the Tar & Ammonia Products Works, Beckton, London, E.6.*

These 600,000 gallon storage and the walkways and stairways have been treated with Plus Gas Formula 'E' External Metal Treatment prior to the normal painting process. This photograph shows the smooth surface achieved by this process which was applied over a heavily scaled surface.
*Photographs by courtesy of the North Thames Gas Board at its Tar and Ammonia Products Works Beckton, London, E.6.*

which effectively halts further corrosion and will stand up to weathering in the open for at least two weeks. Under cover it will give protection for several months. This makes it invaluable for use on large steel structures or plates and girders awaiting assembly, which cannot be quickly painted Even if they were painted, corrosion would be likely to continue under the coating, so that the paint eventually blistered or flaked off. The tannins in Formula "E" prevent this, by rendering the metal inert, at the same time giving it a smooth, burnised surface which bonds excellently with all recognised industrial paints and increases the covering capacity of the paint.

Formula "E" is non-acid and non-toxic. It is therefore easier and safer to use as well as being cheaper than phosphate or phosphoric acid compounds. It is also twice as resistant to weathering; and a particular advantage is that a light layer of rust on the surface treated will actually assist the formation of the protective tannate complex, which usually takes about 24 hours to mature. Formula "E" is also of great assistance in welding and flame cutting operations. Lightly corroded plates can be resistance-welded after treamtment with the fluid, while an oxy-acetylene flame will burn away the tannate film without leaving any slag deposits to impede the path of the flame.

In addition Formula "E" is effective in preventing underground corrosion, for example of iron pipe lines or cable ducts. It was, in fact, this last ability which first drew attention the value of tannins for metal protection, about nine years ago, when archaeologists unearthed metallic objects remarkably preserved by the presence of tannins in the peatty soil surrounding them. Furthermore, Formula "E", like the other Pius-Gas fluids, will protect non-ferrous as well as ferrous metals. Indeed, it can be said, that with the development of these three products, the war against metallic corrosion is well on the way to being won.

## Overhaul Certification Approved for CJ-805-3

A new and far-reaching overhaul certification program for the General Electric CJ-805-3 commercial jet engine has been approved by the United States Federal Aviation Agency. Approval was given to Trans World Airlines and Delta Air Lines for "sectionalized" overhaul on the Convair 880 powerplants. This new maintenance concept establishes a separate overhaul time period for the engine's compressor and the combustion-turbine area. Initial period between CJ-805 overhauls has been established at 1600 hours for the compressor and 900 hours for the combustion-turbine area. Sectionalized overhaul is expected to result in substantial maintenance savings for the airlines

* * *

### NEW CONTRACTS FROM USAF

Letter contracts totalling more than 13½ million dollars have been awarded the General Electric Company (USA) by the United States Air Force. The contracts, awarded by the Air Materiel Command, include 5½ million dollars for T 58 gas turbines to power the Navy's two newest helicopters, and 8.3 million dollars for J 85 jet engines used in an Air Force supersonic trainer and in a decoy missile.

* * *

### FAA AWARDS GE PRODUCTION CERTIFICATE

The United States Federal Aviation Agency has awarded the General Electric Company the first original helicopter gas turbine engine Production Certificate. The Certificate authorized quantity production of the CT-58-100 commercial helicopter engines without FAA inspection of each individual powerplant shipped. General Electric's CT 58 has been chosen to power the Sikorsky S-61 and the Vertol 107.

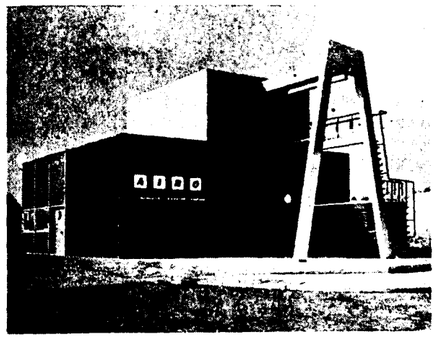


*ALL ASPECTS OF NOISE INVESTIGATED*

# NEW ACOUSTIC RESEARCH STATION OPENS

THE first complete acoustic research station in Britain was opened recently by the Acoustical Investigation and Research Organisation at Hemel Hempstead.

Airo Ltd. is the first independent non-trading organisation to be formed in the British Isles for the purpose of practical investigation and research into all aspects of noise problems. Its consultative services are available to industry on a fee-paying basis and it endorses with a written undertaking the results of any findings or recommendations it is required to make.



View of research station showing concrete frame for supporting hoist gantry which is used to facilitate the installation and removal of floor construction undergoing tests for sound transmission properties.

### CLOSE LIAISON WITH OFFICIAL BODIES

It maintains close liaison with the National Physical Laboratory, Teddington, and the Building Research Station, Garston, Watford, and Airo's Research station at Hemel Hempstead has been designed to comply with the recommendations of these two authorities.

The new laboratory is the first in this country to bring under one roof all the special equipment and techniques necessary for acoustic analysis and measurements of every description. The laboratory will undertake three principal types of work:

(1) Measurement of the acoustic characteristics of machines, materials and electro-acoustic transducers.

(2) Development projects involving acoustica problems. One of the first to be investigated by the laboratory will be the provison of effective sound insulation in lightweight structures such as office partitions and bulkheads between passenger cabins on ships.

(3) Fundamental research in the field of acoustic engineering and electro-acoustics.

### FOUR EXPERIMENTAL CHAMBERS

The laboratory consists of four experimental chambers and an underground duct. All are connected to the control room, to which information is transmitted for recording and analysis of the data obtained.

Two of the experimental test rooms require maximum insulation from extraneous noise. These are the anechoic, or echo-free, chamber and the reverberation chamber, where all surfaces reflect noise. To achieve the necessary degree of insulation, both these chambers are separately supported on high-compression rubber mountings. They are, therefore, completely independent of the structure of the building. In addition, incoming ducts and leads are insulated and a mineral wool blanket is suspended in the cavity between these chambers and the main structure.

*Anechoic Chamber*

In the anechoic chamber there is a sound-absorbent lining on all walls, floor and ceiling. This consists of "Bondacoust" cellulose acetate wadding developed by Courtaulds Ltd. and supplied by Robinson and Sons Ltd. of Chesterfield in a specially devised formation, up to a thickness of 30 in. There is a retractable metal grid floor which is used for setting up experiments.

The unusual anechoic chamber where "Bondacoust" in strip formation is used instead of the customary insulation wedges.

*Reverberation Chamber*

In the reverberation chamber all surfaces are reflective and adequate diffusion of sound is obtained by introducing reflector plates suspended from the ceiling. This technique has not been used previously in this country and is now internationally accepted.

*Upper Source Chamber*

In the ceiling of the reverberation chamber there is a pre-cast concrete panel which can be raised by hoist into the upper source chamber above. It can then be removed along a gantry and lowered to ground level for resurfacing with new materials which require to be tested for sound transmission properties.

No two walls in the reverberation chamber are parallel to one another, the object being to prevent undesirable effects associated with rectangular rooms.

*Source Chamber*

The same requirement applies to the source chamber which although not suspended independently, has highly-reflective surface and no two walls in parallel.

All experimental chambers are between 14 ft. and 17 ft. in height.

A framed reinforced concrete structure has been used for the building, with load-bearing brick work surrounding the experimental chambers. The structure rises between the suspended chambers to support the penthouse, from which the hoist gantry runs out to a supporting concrete frame. The frame with a gangway across provides access to the upper source chamber in the penthouse.

*Underground Duct*

The underground duct, which is adjacent to the building is 43 ft. long by 3 ft. square. It contains an anechoic wedge structure which can, when required, be blanked off by reflective plates.

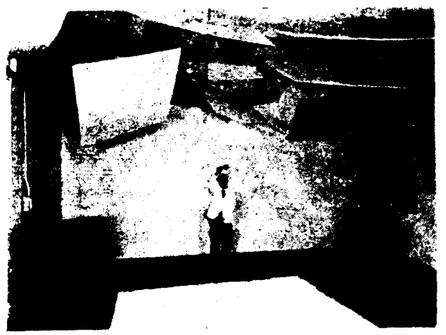
The scope of the laboratory's analytical and measuring facilities can be indicated by a brief description of the type of work which will be undertaken.

## MEASUREMENT OF SOUND ABSORPTION

An accurate measurement of the capacity of any natural or manufactured material to absorb sound is essential if new and improved sound absorbing medium are to be developed. Airo's laboratory is equipped to measure the sound absorption coefficients at random incidence of any material over the audible frequency range 40 c/s—10,000 c/s.

In the case of frequencies at or above 100 c/s, these tests will be carried out in the reverberation chamber according to British Standards, and in conditions identical to those at the national Physical Laboratory, using samples of 100 sq. ft. placed on the floor of the chamber. Measurements of the chamber's reverberation time with and without the sample enables the absorption coefficient of the material to be calculated.

Measurements of the sound absorption coefficients of materials at frequencies below 100 c/s will be carried out in the underground duct using the normal standing-wave technique. There are also facilities for measuring the sound absorption co-efficients of materials at normal incidence in the frequency range 125 c/s-4,000 c/s using the same technique in the standing wave tube.



P.A.Kneafsey, Chief Research Engineer of AIRO supervises a test in the reverberation chamber. Note unusual reflector plates suspended from ceiling to provide for diffusion of sound.

## SOUND TRANSMISSION AND SOUND INSULATION

This facility is particularly useful for experiment with sound-reducing partitions and windows, either from the point of view of their construction or the materials used.

For example, in testing partition materials and constructions, the experimental sample is placed in the test aperture between the reverberation chamber and source chamber. An accurate measurement can then be taken of the airborne sound transmission loss characteristics of any type of partition at $\frac{1}{3}$ octave intervals in the frequency range 40-10,000 c/s according to B. S. S. 2750 : 1956.

Similar measurements can be made for sound reducing floors and ceilings. In this case the test sample is placed in the aperture between the upper source chamber and the reverberation chamber. The efficiency of a floor or ceiling in reducing the transmission of impact sound, such as is caused by, for example, footsteps or machinery, can also be measured.

In testing window constructions under normal conditions the sample is placed in the aperture between the reverberation chamber and the anechoic chamber, since the anechoic chamber gives the effect of normal open air conditions outside a window.

## NOISE CHARACTERISTICS OF MACHINES

Measurement of the noise characteristics of all types of mechanical and electrical machines and components

will be carried out in the laboratory. The reverberation chamber, the anechoic chamber and the underground duct will all be employed to calculate sound power levels and spectral analysis of machine noise in the frequency range 20-20,000 c/s at frequency intervals of from ⅓rd octave to 1/40 octave as required. Directivity patterns and polar diagrams can also be produced.

The control room of the research station. All these instruments can be coupled to any of the experimental chambers in the building.

In particular, the noise characteristics of all types of ventilation plant can be measured. Fan speeds can be varied within wide limits, and measurements can be taken under given suction or discharge pressure conditions. Where overall sound power levels are to be determined, the test fan will be mounted in the reverberation chamber. Alternatively, the test plant can be mounted in the anechoic chamber to enable directivity characteristics to be measured in open air conditions. Ventilation plant may be tested either working into free air or with duct work installed at suction and/or discharge sides.

The laboratory will also investigate the problems of noise generation by all types of machines, and projects involving the reduction of noise in specific mechanical devices will be undertaken.

## VIBRATION

The laboratory is fully equipped to carry out detailed measurements of all the parameters of mechanical vibrations, spectral analyses of vibration acceleration, and determination of velocity and displacement. The problems of vibration isolation can be fully investigated and resolved.

## ELECTRO-ACOUSTICS

A major activity at the laboratory will be the measurements and calibration of all types of electro-acoustic transducers, in particular, microphones and loudspeakers.

The laboratory standard reference microphones will be periodically calibrated at the National Physical Laboratory. In addition absolute reciprocity calibrations will be carried out frequently in the laboratory.

## EQUIPMENT AND INSTRUMENTATION

To undertake these various forms of acoustic analysis the laboratory is, of course, equipped with a very extensive range of measuring devices of the highest accuracy. It would be impratical to give details of all the equipment installed, but to give an indication of the amount of instrumentation, the following are brief notes on the major equipment.

As a signal generator a Bruel & Kjaer type 1014 beat frequency oscillator is employed. This instrument can scan a frequency range 20-20,000 c/s and extremely accurate selection of frequency is possible. For many applications—for example reverberation chamber measurements—generation of "warble" tone rather than "pure" tone is required, and this is available on this instrument, the modulation being continuously variable up to 200 c/s at modulation frequencies of 1-32 c/s.

The output from this oscillator will be amplified through an extremely linear amplifier and fed from loudspeakers. In the case of both the reverberation chamber and the source chamber, a number of loudspeakers are placed in positions which will ensure adequate diffusion of sound in these rooms.

## TWO TYPES OF MICROPHONE

The microphones to be used in the laboratory consist of two types:

(a) Moving coil "ball and biscuit" for use in the reverberation chamber, source chamber and underground duct.
(b) Condenser microphones used in the anechoic chamber and others used as laboratory standard microphones.

Analyses of noise etc. are carried out by feeding the signal from the microphone through either a



Bruel & Kjaer type 2109 ⅓rd octave spectrometer or a Bruel & Kjaer type 2107 peak frequency analyser, depending on the specific requirement.

Frequently the ⅓rd octave spectrometer is more suitable, as in reverberation chamber absorption tests, standard sound transmission loss tests, etc. but in cases where close frequency content analyses are required, the peak frequency analyser is essential, as in spectra of machinery harmonics, exact determination of panel resonances, etc.

The output from the ⅓rd octave spectrometer or peak frequency analyser is frequently connected to a Bruel & Kjaer type 2304 high speed level recorder, which plots graphically the voltage passed by the filters. Thus permanent records of noise spectra, of reverberation decay, and of frequency responses, can be retained.

A very important feature of the oscillator, ⅓rd octave spectrometer, peak analyser and high speed level recorder is that they can be coupled together mechanically and driven simultaneously by the level recorder motor. Thus, by locking the oscillator frequency and ⅓rd octave spectrometer (or peak analyser) frequency and using suitably calibrated recording paper, many of the measurements can be carried out automatically over the entire frequency range. The resultant saving of time and elimination of the possibility of human error are obvious advantages.

## EQUIPMENT FOR MEASURING VIBRATION

When vibration measurements are to be carried out, a Bruel & Kjaer type 1606 accelerometer is used instead of a microphone, and by connecting via a preamplifier to the ⅓rd octave spectrometer or peak analyser vibration spectra can be obtained. Suitable intergrating networks in the preamplifier enable acceleration, velocity or vibration acceleration to be indicated directly.

Normal incidence absorption measurements are carried out in a standing wave tube. A loudspeaker is rigidly mounted at one end and the test sample at the other end. A probe microphone moving longitudinally inside the tube explores the resultant plane wave for maxima and minima. Connection of the microphone to the ⅓rd octave spectrometer enables the absorption coefficient of the test material at any frequency to be read directly on the spectrometer meter. A tube 100 cm long is used for measurement of frequencies in the range 125 c/s-1,200 c/s, and a tube 28 cm long is used for measurements in the frequency range 1,000-4,000 c/s.

### FUNCTION OF UNDERGROUND DUCT

The underground duct is 40 ft. long, 20 ft. of which is occupied by an anechoic wedge structure which, when exposed, enables the formation of a plane wave in the duct generated by a loudspeaker mounted in the other end. The duct is thus used for microphone calibration and other applications requiring free field conditions at low frequencies. By placing a completely reflective surface in front of the wedge, the duct then becomes suitable as a standing wave tube for the measurements of normal incidence absorption at low frequencies.

(COURTESY: "INSULATION")

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## Fuel Loading Program at Dresden Progresses

The fuel loading program at Dresden Nuclear Power Station, resumed on February 4th after being suspended in November and again in December for correction of mechanical problems associated with the plant's control rod drives, is now two-thirds complete. 320 of the initial load of uranium fuel assemblies have been installed in the core of the big reactor.

The reactor, which "went critical" in October, 1959, with 28 fuel assemblies loaded, was further tested with 54 fuel assemblies. During February, critical testing was completed at three additional levels of loading, one with 144 fuel assemblies in the reactor, another with 256, and a third with 320.

Fuel loading and low level tests will probably be completed in four to eight weeks. Then the reactor pressure vessel will be closed and steam will be made for the first time. Additional testing will continue until the plant is brought up in pre-determined steps to one-half power as authorized under the operating license of the Atomic Energy Commission. Although contract date for the General Electric Company (USA) to turn over the plant to Commonwealth Edison is December 8, 1960, the project is substantially ahead of this date and full operation of the plant is expected this summer.

* * *

### DRESDEN TURBINE-GENERATOR CHECKOUT COMPLETED

The General Electric Company (USA) has announced that preoperational checkout of its turbine-generator for the Commonwealth Edison Dresden nuclear power station has been successful and the turbine-generator is now ready for power production.

The nuclear part of the plant, built by General Electric, is undergoing tests in preparation for production of nuclear power.

* * *

### ANOTHER "FIRST" FOR GENERAL ELECTRIC TURBOFAN ENGINE

General Electric's commercial turbofan engine, the CJ-805-23, powered a leased Air Force RB-66 aloft for an hour and forty minutes, the first time a United States engine manufacturer has flown a turbofan engine as the primary powerplant of an aircraft. The aft-fan engines are scheduled to enter airline service on the Convair 600 in 1961. In the recent test, the plane flew to an altitude of 35,000 feet and at speeds up to March 85.

* * *

### ENGINE TESTING PHASE OF X405H COMPLETED

The General Electric Company has completed the engine testing phase of the X405H rocket engine, part of its Preliminary Flight Rating Test. An advanced version of the X 405 first-stage Vanguard engine, the X405H was scheduled to power the second stage of the Vega space vehicle until that program was ended. To place a fully qualified engine in its inventory, the National Aeronautics and Space Administration(NASA) authorized completion of the Preliminary Flight Rating Test, during which the X405H was operated for over 2000 seconds in 12 consecutive static firings without component change or repair.



# INDUSTRIAL PHYSIOLOGY

By A. C. Bhattacharya, A.M.I. Prod. E.

PARADOXICAL though it is that with increased mechanization, Industries rely on people more, rather than less in all their activities. There is no substitute for human creativeness. Even a computer is still just a tool and its full effectiveness depends on the ability of men to penetrate deeply and acquire and apply more accurate knowledge in all areas of manufacturing.

The industrial physiology, the subject under discussion, plays an important role in assessing the impact of factory environments on men. Environmental factors producing additional stress on workers are air temperature, radiant heat, humidity, and air circulation. The responsibility of the industrial physiologist is to determine their effects, in addition to physiological reactions produced by the work being performed. He is also responsible for evaluating the means of reducing this additional stress to improve worker health, efficiency, and morale and productivity of the industrial process.

There are several techniques developed in this connection to study the effects of work. For example energy requirements may be determined by indirect calorimetry. Food is the fuel, and by measuring the oxygen required to convert it, it is possible to calculate the energy input of the human machine.

If it is intended to carry out this work in a laboratory, it may be done with the help of a bicycle equipped with a dynamometer. Dividing the output by the input yields the efficiency of the process, which ranges from 15 to 30%.

The following is the description of laboratory test carried out in the Haskell Laboratory for Toxicology and Industrial Medicine of E. I. du Pont de Nemours & Co., Inc., United States. In the test, the subjects, each wearing a face mask, inhaled room air through a low resistance valve. Air was exhaled through a similar valve to the flow-measuring device, a 400-mesh wire screen placed in the air stream. A sensitive differential pressure transducer was used to measure the pressure drop which occurred as the air had flown through the mesh. This drop represents a linear function of flow in the range of interest and reaches a maximum of three centimeters of water for the highest flow rates encountered.

The electric signals as they emanated from the pressure transducer, were recorded on a chart and simultaneously on one channel of the magnetic tape recorder. Frequency modulation techniques were used for the tape recording, to handle low frequency data.

A portion of the gas leaving the flowmeter was passed through analysers for oxygen and carbon dioxide ($CO_2$) determination. The electric output of these units were also put on the magnetic tape. This information might be read back from the tape either during recording, or subsequently.

Fig. 1. Measuring breathing rate and heartbeat after exercise.

The analog voltages from the tape were fed into the computer consisting of a series of both stabilised and unstabilised operational amplifiers and the network required to perform the functions of addition, substraction, multiplication and integration. The output, in this case the oxygen consumed, appeared in the form of an integral which was repeated each minute. Finer resolution of the data was possible. For example, the oxygen consumption for each breadth could be obtained.

Pulse rate was measured by using the electric signal generated by each heartbeat to trigger a timing circuit which developed a voltage proportional to heart rate. Voltage was recorded on a chart calibrated in beats per minute.

On the tests carried out average heart rate and oxygen consumption curves were determined for six men. After a rest period, each man rode the bicycle for 30 minutes at a work rate of 540 kilogrammeters per minute, increasing the same to 900 kilogrammeters per minute for 4 minutes. Following this, the men were kept seated for a sixty-five minute period while recovery information was recorded. Each man performed in two different environments: 72 degrees F and 50% relative humidity and 90 degrees F and 82% relative humidity.

The usefulness of pulse rate measurements in industrial jobs was illustrated by the curves obtained. They show that just as the mechanical work performed was the same in both environments, so too, were the oxygen consumption curves, and recovery of this function was complete in twenty-five minutes.

In contrast, there was a steady increase of the heart rate values throughout the exercise, and that recovery was incomplete in both environments at the end of 65 minutes. The additional cardiovascular stress imposed by the hot environment is obvious.

For counting heartbeat, another instrument known as Physiological Transducer, has been developed by Donald A. Rowley, Seymour Glagor and Peter Stoner of the University of Chicago in co-operation with engineers of the Illinois Bell Telephone Company. This device, as shown in Fig. 2, can be strapped to a person's chest and it will record his heartbeat for as long as 24 hours at a time. The instrument contains a transistorized amplifier, a watch movement made into a counter and a battery. It is connected to two electrodes that are cemented to the chest.

Another electronic device recently developed in America is to test airmen while they reacted to the severe stresses of simulated high altitude flight. The test was carried out in a high-altitude pressure chamber. The pressure test took about a quarter of an hour for an Air Force Sergeant when his heart action, rate and flow of breathing and temperature were monitored continuously by electronic means.

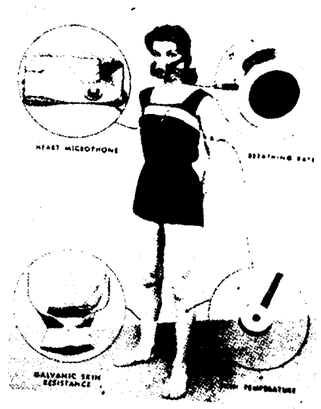



Fig. 2. Physiological Transducers (Electronic Medical Instruments)

The designed function of the equipment is to monitor human physiological and psychological reactions under severe environmental conditions, such as those to be encountered in high altitude or space flight.

The triumphs of science in fields never thought of before, are thus providing instrumentalities of great accuracy to help establish sound work standards and recruitment and selection of right man for the right job.

## NAVY FIGHTER COMPLETES CARRIER SUITABILITY TRIALS

The United States Navy's newest and fastest jet fighter, the McDonnell F4H-1, powered by two General Electric J79 engines, has completed its first carrier suitability shipboard trials aboard the USS Independence, the Navy's newest and largest aircraft carrier. The Phantom II was launched by steam catapult 15 times during the trials. The F4H is scheduled to be in active Navy service late this year.

* * * * * *

### NEW DEPARTMENT

The General Electric Company (USA) has realigned its jet engine business activity to meet changing market conditions. A large Jet Engine Department has been formed and will be headed by Neil E. Firestone. The Large Jet Engine Department builds the J79 turbojet, powering such aircraft as USAF's Lockheed F-104 Starfighter, the Convair B58 Hustler and the Navy's McDonnel F4H-1 Phantom II. The new department, a part of the Flight Propulsion Division, at Evendale, Ohio, is developing the highly advanced Mach 3 power plant, the J93, for the North American B-70 Valkyrie.



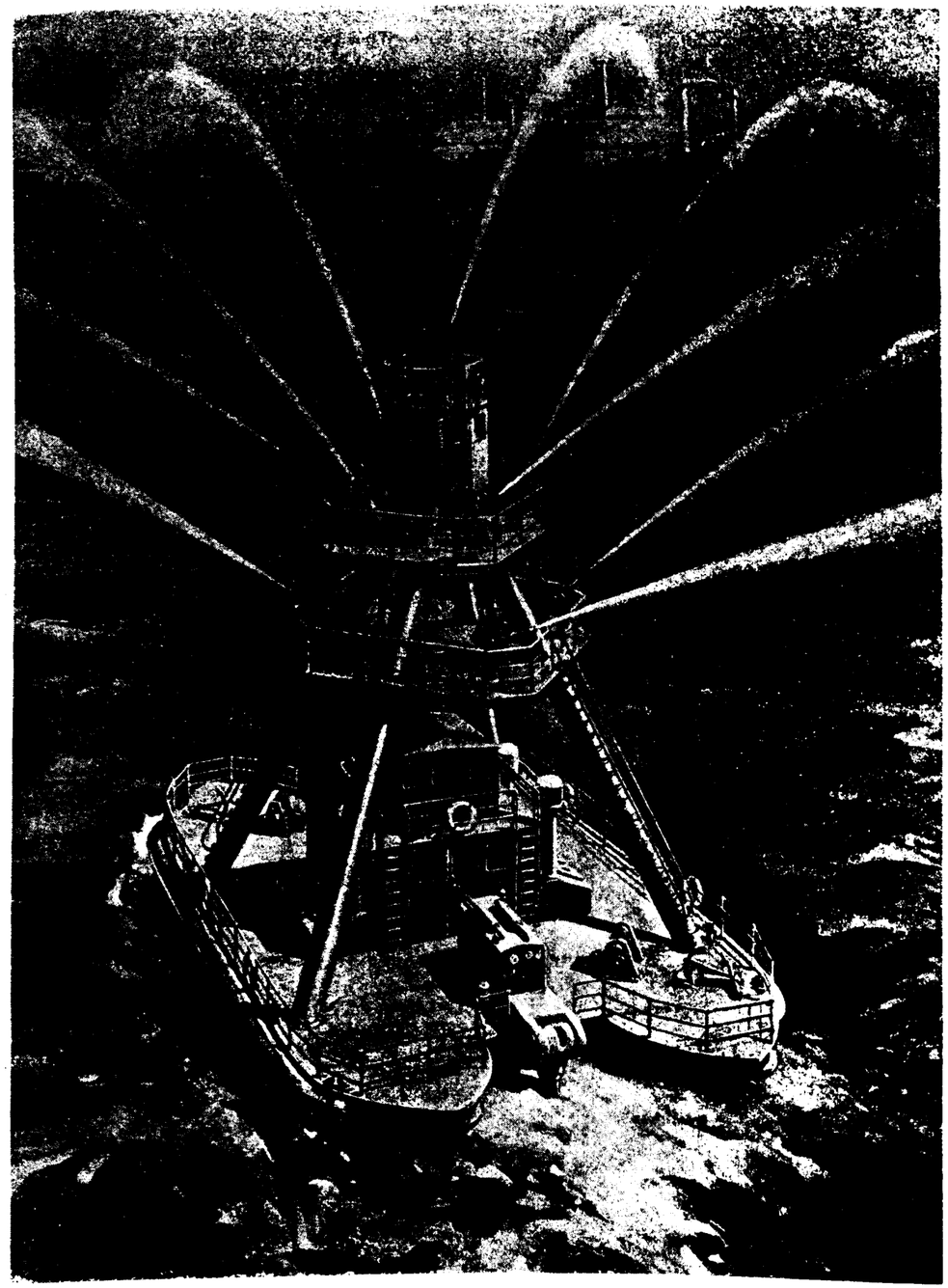
# FIRE-FIGHTING FLOAT OF UNUSUAL DESIGN

CRAFT of unusual design is nearing completion at Pembroke Dock. This is a fire-fighting float which R. S. Hayes are building for the BP Tanker Company, for use at Swansea.

Designed by the engineering department of the BP Tanker Company, with Merryweather & Sons collaborating in the fire-fighting lay-out, the main features of the craft are two pontoons each 60 ft. long by 14 ft. wide and 7 ft. 6 in. deep and spaced 8 ft. apart. The pontoons are joined together at deck level and at their base by elliptical tubes to form a "catamaran." These pontoons, each weighing 33 tons, were transported by road from Watson's yard, Gainsborough, a distance of 350 miles.

One of the shortcomings of tugs as fire-fighters is their inability to keep station when fighting a fire as the action of the water jets tends to push the tug away from the scene of the fire. The inability to utilise the maximum number of jets in any one position is another criticism of vessels with orthodox hulls. The Swansea float is designed to ensure that the propellers can be positioned to oppose the jet action no matter the direction of the monitors. The monitors themselves are so arranged that seven out of nine can be operated port, starboard, forward or aft.

The vessel is self-propelled by means of two 6KUD Dorman diesel-driven Harbormaster units mounted centrally between the two pontoons. These units are arranged for electric-starting and, as a safeguard,



*An artist's impression of the new fire-float under test.*

a Bryce Berger hydraulic starting device is also incorporated in each unit. The propulsion units are started and controlled from the wheelhouse and all necessary remote reading gauges, including lubricating oil warning lights, are incorporated on the control panels. The units can be controlled independently from the deck.

The propellers are driven through Self-Changing gear boxes which drive through suitable bevel gears a vertical shaft at the base of which the propeller is situated in a horizontal position. The propellers can be turned 360° on their vertical axis, thus eliminating the need for rudders. Manoeuvrability is obtained by the fitting of the propulsion units fore and aft.

A feature of the Harbormaster unit is that the propeller, on its vertical driving arm, can be lifted hydraulically from the water. The propeller can be cleaned, examined and lowered into the water again within a few minutes.

In each pontoon the equipment includes one Merryweather two-stage turbine fire and salvage pump directly coupled to a 6 Q 4 Dorman diesel which is fitted which electric starting and also Bryce Berger hydraulic starting equipment; one 11.5 kW. David McClure 110 v. d. c. generator (for normal lighting and power services) coupled to a Lister-Blackstone diesel and a 3 kW. 24 v. generator (for battery charging and emergency lighting) mounted above the 11.5 kW. generator; one electrically—driven bilge pump; one electrically-driven pump for transferring liquid foam compound; one set of batteries; two liquid foam tanks and two gas oil tanks.

Four tubular supports are stepped through the pontoon decks on to suitable stools and fixed to these, at 23 ft., is the lower fire-fighting platform. At a height of 7 ft. 6 in. above this is the middle platform and 4 ft. higher is the chief fire master's control cabin where there is a loud-hailer talk-back system.

Heavy-type lorry wheels are fitted at the forward and after ends of each pontoon to facilitate the movement of the float along the side of a tanker. The hull of the catamaran is cathodically protected and, with a cold plastic anti-fouling paint on the underwater surfaces, it is anticipated that the craft will remain in service for over two years without underwater attention.

## NEW DUNGENESS LIGHTHOUSE

The first major Trinity House lighthouse to be erected for over 50 years is to be built on the shingle headland at Dungeness, Kent, by Taylor Woodrow Construction Limited, Southall. The new lighthouse is the first of its kind in Britain. It will be fully-automatic and embody new technical and structural ideas. Construction is due to begin early this month and it is hoped to complete the work in three to six months.

The tower will rise 130 ft. from a white concrete base formed by a spiral ramp enclosing the machine room, which will contain stand-by generators, fog signal equipment and the electrical controls. Slenderness will be achieved by using pre-stressed concrete so that, with an overall diameter of 12 ft., the walls are only 6 in. thick. Construction is to be in a series of concrete drums 5 ft. high, placed one above the other. High tensile steel pre-stressing wires are then to be run through the walls from top to bottom and tensioned with powerful jacks.

The lighthouse will not need painting to preserve its banded appearance--black and white concrete is being used, with carefully selected aggregates and coloured cements. The top white band is patterned by the holes for 60 loudspeaker units, forming the fog signal. This signal will be set in action automatically when there is a fog warning by the Trinity House fog detector, manufactured by Stone-Chance, which will be placed at the level of the public observation platform at the top of the ramp.

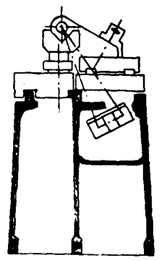
The light for the main beam is provided by a lamp of entirely new design, developed for lighthouse purposes by Trinity House engineers in conjunction with the A. E. I. Lamp & Lighting Company. While a little larger than a domestic light bulb, the light gives over 600,000 candle power.

(COURTESY: 'B. I. S.')

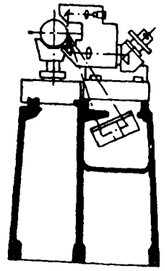
# THE UNIVERSAL LENGTH MEASURING MACHINE

Heinz Zill, Dipl.Ing.

WHEN constructing the Universal Length Measuring Machine, the designers aimed at producing a machine which—beyond internal and external measurements by physical contact, as the Zeiss Length Measuring Machine does—also permitted measurements of pitch of lead screws as well as of the division of scales both by mechanical contact and by optical scanning. To satisfy these more exacting demands with the same traditional accuracy of Zeiss measuring instruments, a considerable amount of optical outlay and of mechanical precision were called for. These efforts, as may now be stated, resulted in the advent of a major type of instrument which is actually of universal applicability and, in some respects, even lends itself to measurements not so far attainable with other precision measuring instruments built for testing specimens of that size. In the following an outline of the constructional principle governing this new machine is given.

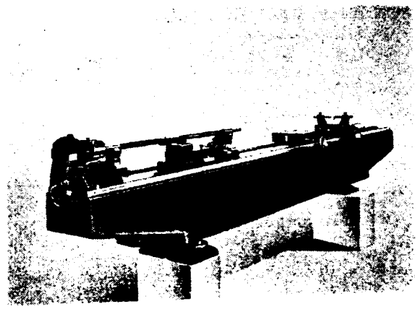


External measurement, mechanical (diagrammatic section)



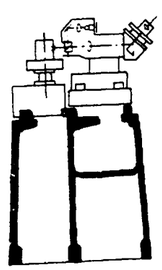
Thread measurement by the silhouetting method (diagrammatic section)

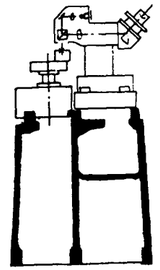
Same as with our other length measuring machines a scale is used as standard which combines the merits of a steel scale—(the same linear expansion coefficient as instrument and test-piece)—with those of the glass scale—(good divisibility and parallax-free observation in transmitted light). The line interval of the main graduation on the machine bed is 100 mm. It is spanned by a sub-division scale in tenths of a millimetre situated on the lower part of the two-component measuring carriage. The upper part of the slide can be moved over the lower one and carries the contact device which is interchangeable for a measuring microscope. At the end of the principal scale rigidly connected with the machine bed there is an index line which is optically reproduced in the image plane of the reading microscope on the measuring carriage where also the main and sub-divisions appear. By a double application of the Eppenstein principle the plane formed by the main scale and its respective optical components intersects the plane formed by the sub-scale and its optical components in the measuring axis. In this manner any guiding errors are compensated. This meets the requirements of the Eppenstein rule that the scales lie in the single focal length and the measuring axis in the double focal length. An essential new feature is that separate guideways are provided for the measuring carriage and the test-piece in the measuring bed, so that the test-pieces can now be measured in any position along their entire length. The guideways of the measuring carriage considerably benefit thereby in that they are no longer located with the weight of the sometimes rather heavy test-piece and are also protected from possible damage which may occur by awkward insertion of the test-pieces. Furthermore, a special mounting of the scale—which is not rigidly connected to the bed all along its length—ensures that any changes in the bed do not affect the measurement. By optional attachment of the various contacting and scanning means the following measurements can be carried out with the instrument; External measurements with mechanical contact with a measuring range from approx. 250 to 3000 mm long test-piece. Internal measurements with the aid of an internal measuring yoke from 30 to 2850 mm with a maximum depth of insertion of 50 mm. Thread measurements especially on lead screws are possible by several methods. The pitch of particular interest can be measured by mechanical contact with spherical-end feelers by single as well as double flank contact. Furthermore, there is the facility of determining the effective pitch error of a threaded spindle paired with the corresponding nut, i. e. a measuring method of particular significance, as it tests the threaded spindle under conditions adjusted to those of actual use. This type of measurement could not hitherto be carried out with any measuring instrument. These methods of measurements are furthermore complemented by the optical shadow image and axial intersection methods, as well as by the facility of testing the shape by comparison with traced profiles on the graduated plate of the eye-piece. By means of the 2 or 3 wire methods flank diameters are measured. A dodecahedron angle polygon in conjunction with autocollimation permits an accurate rotation of the test-piece about its longitudinal axis; this being required for determining periodic and local pitch errors. Furthermore, it is possible to measure divisions of precision scales, base subtense staves or other graduations. These almost universal applications are made possible by a comprehensive range of accessories adapted to the various measuring problems. All these parts must be manufactured with a high degree of precision according to modern manufacturing methods. The manufacture as well as the assembly of the machine are subjected to numerous inspections to ensure perfect quality standards. In 18 different test procedures specifying the testing methods and the necessary test facilities, altogether 574 points are listed which must be adhered to before an instrument leaves the works. To convey an idea of such an inspection two testing points are briefly described.



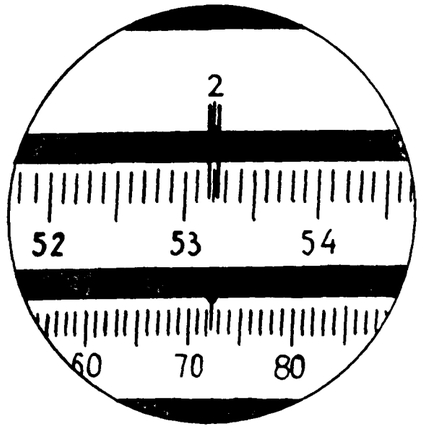
General view



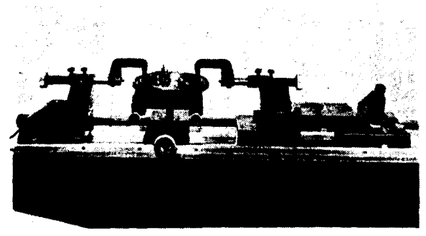




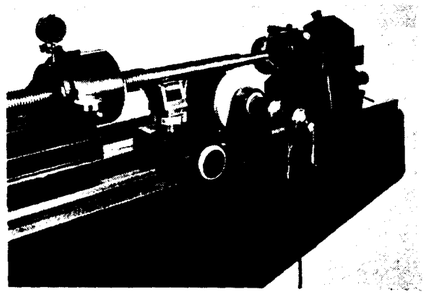
Graduation measurement (diagrammatic section)
a) with vertical position of the division
b) with horizontal position of the division




Visual field in the reading microscope.



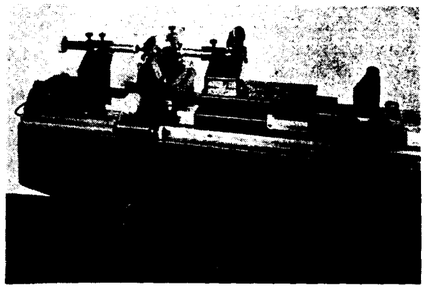
Internal measurement.



Thread measurement with nut.

Thread measurement by the axial-section method.

Graduation measurement.



Flank diameter measurements by the 3-wire method.

1. For testing the decimetre graduation serving as length standard the distances of the individual decimetre lines from the zero mark are compared with gauge blocks. For this purpose a gauge block taking the place of the test-piece is placed on the Universal Length Measuring Machine and is scanned with the measuring device for external measurements. The indication of the measuring machine must then coincide with the actual value of the gauge block or must not deviate from it only beyond the permissible tolerance. In this manner all decimetre graduations are tested.

2. The reflector polygon for the angle adjusting instrument for pitch measurements is required to measure the wobble error of a thread. For this purpose, the reflector polygon with its 12 plane mirrors equally distributed over the circumference, is rigidly connected to the threaded spindle. An angle adjusting instrument built into the autocollimation telescope then permits the rotation of the threaded spindle by exactly 30° at a time. The angle between the individual mirrors, the accuracy of which is so important, is adjusted in such a way that the polygon is fixed on a precision spectrometer on which the position of the individual mirrors relative to one another can be determined with as extremely high a measuring accuracy as ± 1″.

Some of the many applications and the respective accessories are shown in the illustrations.

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## Large Expansion Scheme

Plans for expanding steel output in Britain at a cost of £32,500,000 have been announced by the United Steel ompanies Ltd. Under the development scheme, the Appleby-Frodingham Steel Co. plans to increase its produc- ve capacity for iron and steel and to install a new rod and bar mill. Samuel Fox & Co. Ltd. is to add 100,000 tons year to its steel-making capacity. Both works are branches of United Steel. These major projects, which are to : completed by the autumn of 1964, represent the largest development schemes undertaken by the company. /hen these schemes, and others already in hand, are completed, the ingot capacity of United Steel will be raised om 3,000,000 to 4,000,000 tons a year. A United Steel spokesman said the expansion plans brought the )mpany's post-war spending up to £ 172,300,000 out of its own resources.



# New Types of Hungarian Plants, Equipments and Scientific Instruments

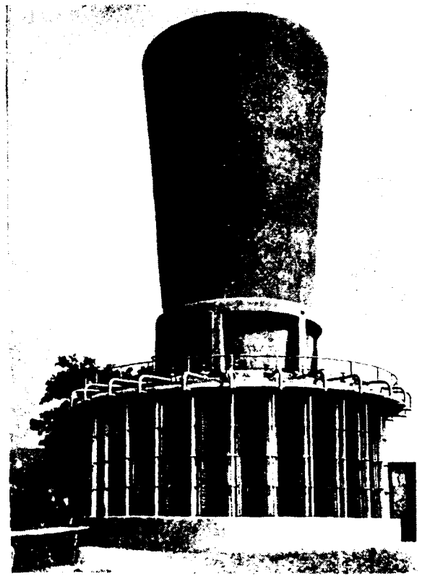
## HUNGARIAN INVENTIONS WORKING

THE English Electric Co., in Rugeley, England, is erecting an air-condensating cooling tower for a 120 MW capacity turbo-alternator set, based on the Heller-Forgo licence.

A big part of the cooling elements for this equipment will be supplied by the Jaszbereny Metal Plant in the second quarter of this year.

The cooling plant is scheduled to start operation in 1961.

Negotiations are in progress with British partners on the application of the Forgo cooling elements in various other industrial fields, for instance with transformers, mercury rectifiers, in the chemical and oil industries.



The Heller—Forgo air-condensation system cooling tower.

Marked interest is shown from overseas buyers, and negotiations are going on with several western companies regarding the licences of the Heller-Forgo dry cooling tower equipments to be used for 120 and 150 MW capacity plants.

Deliveries to the Soviet Union are foreseen for the first quarter of 1960. They ordered two units of 6000 kW capacity each. These units will have to cope with extremely difficult climatic conditions, the temperature limits being –40 and +40° C. respectively.

In northern countries where wet cooling towers would inevitably freeze up, the dry cooling tower condensing equipment, System Heller-Forgo, finds wide application.

Recently Komplex has received numerous inquiries from European and overseas countries.

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In the course of the reconstruction of a flour mill in Brussels, a Rajkay grain slicer was installed too. After the mill started operation, a public show was arranged, where several prominent representatives of the flour-milling trade took part. As a result of the Rajkay type grain licer, the mill is working more economically than expected.

## THE CSEPEL TYPE MODERN TUBE-DRAWING BENCHES

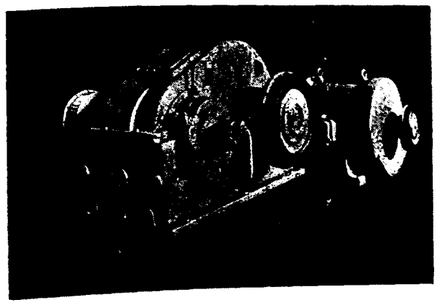
In order to meet increasing demand the Csepel Works of Budapest set up, in 1934,a tube-drawing bench for the production of tubes with a diameter less than 2″—5″ und suited for reducing. This machine manufactures seamless steel tubes in two stages. As a rule, the materials employed are square blanks which are heated to a temperature of about 1300° C. A mechanical press then performs the sizing and piercing. The bell-shaped, thick-walled, solid-bottom form of glassy consistence is put on the bench for further drawing.

Here the hollow sleeve is pulled up on the drawing mandril connected with a bar, whose forward and

ıckward motion is operated by means of a gear ;ive. The drawing mandril determines the inside ameter of the tube and may be exchanged. The riginal method was to draw the hot sleeve through ngs of gradually diminished inside diameter, disposed ne behind the other. The inside diameter of the last rawing ring gave the desired outer diameter of the ıbe.

In the first year following the mounting of the ıachine, the technical staff of the factory started xperimenting with a roller reducing die destined to eplace the rigid ring drawing system and applied for patent. Three or four rollers form a closed circle. 'he advantage of this method consists in the fact that ıe tube material is not drawn but rolled by the educing die, thus producing tubes of a superior uality. This type of drawing bench designed by he Csepel Works not only differs from the conven- ional bench as far as the tools are concerned but also y several structural features which ensure more dvantageous operation and increased productivity.

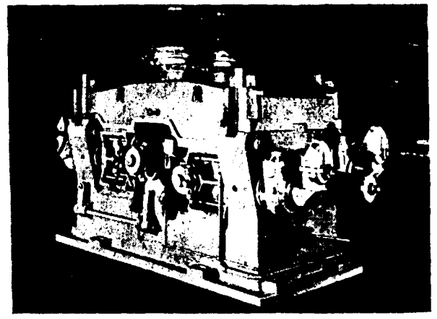
This high-capacity drawing bench operating with oller tools has attracted the attention of several mportant and famous firms, such as Wellmar leaver, London, Stewarts and Lloyd's, Birmingham nd the German firms Thyssen, Muhlheim and Demag A. G., Dusseldorf, all of which have bought he patent or the plans or the machinery. Among



High-pressure pump for the hydraulics of the push-bench.

others the Italian factory at Dalminci was fitted with Csepel-type tube drawing dies and sizing press; a ube factory in South Africa with dies piercing press. Several factories for seamless steel tubes have been regular clients for roller tube-drawing dies up to 9" diameter.

After World War II the Csepel Works supplied, in 1950, a complete tube-drawing equipment to the People's Republic of Rumania, and in 1951 equipped their own tube factory with new machines. Experience stretching over a quarter of a century has proved the undisputable advantages of the Csepel-type tube-drawing system.



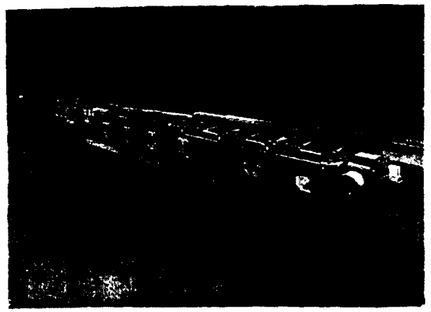
Stand of the elongator of the tube push bench.

Beginning with the year 1955 the process has been further improved. With a view to increased production and reduced wall-thickness tolerances, the sizing and piercing process by means of a hydraulic press, is followed by a technological process achieved by an oblique roller pair on a so-called preliminary rolling mill. The bell-shaped hot sleeve pulled up on its rotary mandril is subjected to preliminary rolling through the oblique rollers and subsequently by the drawing through the sizing rollers.

With tubes with an outer diameter of about 3" to 6" production has been increased by 70 to 90 per cent., and tolerance reduced in the wall-thickness by 25 to 30 per cent. The Csepel tube-drawing procedure has the important advantage of being excellently suited for the production of tubes made of strongly alloyed steel. Such material is required in an ever increasing quantity for the equipment of power plants (e. g. steam boilers), in chemical and food industries, where heat-resisting and corrosion-proof tubes are in high demand.

In 1959, Foreign Trading Company KOMPLEX, Budapest delivered up-to-date tube-drawing benches of the Csepel-type to the Chinese People's Republic. One drawing bench was sent to the tube factory at Tayuan and a complete tube mill supplied to the factory at Chengdu. (The photos were taken before the delivery of the machines).





Test assembly of a stand of a tube push bench prior to its despatch to China.

* * * * * *

## GANZ *Air-cooled Turboalternators*

As it has been building two-pole turboalternators since 1905, the GANZ Works possess considerable experience in this field. Several hundreds of this type of equipment have, since, been produced by the factory. Characteristic of these machines is that units over thirty years old are still in perfect working order.

The total power of the GANZ turboalternators produced so far amounts to approximately 41,00,000 kVA.

The rotors of the GANZ turboalternators are of the parallel groove design. This design has signal advantages over alternative types. The outstanding qualities of the system are proved by the fact that from among several hundreds of turboalternators, two only have suffered a breakdown due to defective rotor windings (short-circuits) during the last decades. (One of these alternators was in constant operation under heavy overloads, the other defect was due to faulty soldering).

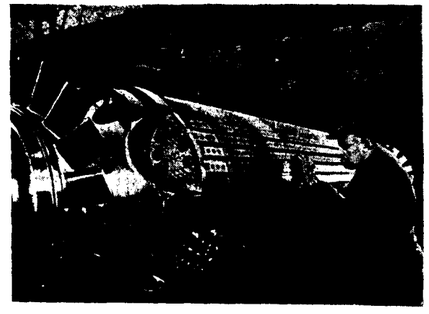
Another advantageous feature of the GANZ rotor system is the high resistance to heat of the winding. The rotor insulations being produced of mica practically without a binding agent, could (according to BSS No. 225) reach a temperature as high as 140° C owing to increased resistance (but remains considerably below it in practice). This ensures a high degree of safety since—as proven by tests and practical experience—the windings will stand up under temperatures as high as 250° C for longer periods without damage to the insulation or changes in rotor balance.

Deserving mention as a third advantageous feature is that—although such defect is not likely to occur in practice—the winding is entirely insensitive to shorts between coils due to the connection in parallel of the individual coils.

The materials of the stator sheet body and of the windings satisfy the requirements of up-to-date design. The segments of the sheet body are made of low-loss dynamo sheets stamped with such a high degree of accuracy that grooves with perfectly smooth flanks and perfectly straight centre line are obtained on assembly. The individual segments are protected against electrical connections among each other by special, burnt-in varnish insulation. The sheet body is divided into sheet packages of adequate width by radially arranged ventilating gaps.

Efficient cooling of the machines is ensured by different types of ventilation. With small machines, the cooling air is drawn in by the fan through the windings heads, the fans being arranged between the trunnions and the rotor. The air is forced by the fans into the air gaps whence it passes through the radial ventilating gaps into the discharge part of the stator.

With larger machines, two types of ventilation are applied to ensure cooling of the highest efficiency. Air is supplied to the fans through specially designed joints. On passing the fan, one part of the air enters the air gaps, it is forced into the discharge part of the stator. This air ensures the cooling of the



The cross-wired revolving part, assembled.

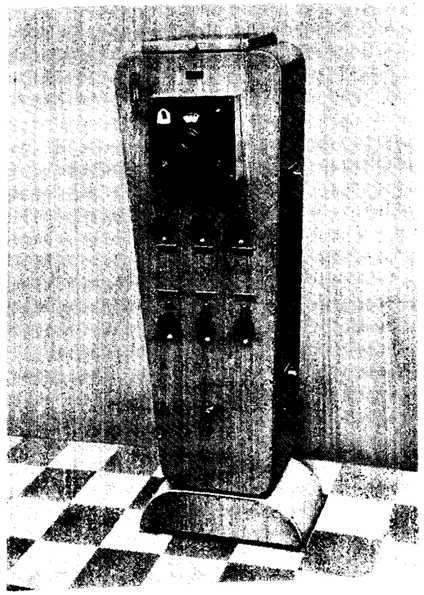
rotor and of the winding mainly. The rest of the air supplied flows through the winding heads into the axial ducts of the stator housing and, further, following a semi-circular path between the inserts in the radial ventilating gaps, into the discharge part of the rotor. This air cools the iron body and the winding of the stator.

Larger machines also incorporate so-called sectional cooling. Here, the fans also receive their supply of air through special joints and blow it partly into the air gaps and partly into the axial ducts.

The turboalternators built by the GANZ Works are available in two main types.

## A WATER DESALINIZING APPARATUS

The DESTIONEX is an ionexchanger, suitable for producing by a cold process desalinized water of better quality than distilled water. Its capacity is 50



to 100 litres per hour. Main advantages of the apparatus are: water of high purity, low operating costs and high reliability of service.

Desalinizing is effected in two stages. In the first stage the cations of the salts, dissolved in water are changing into hydrogen ions. The ions of the acids thus produced are changing into hydroxil ions in the second stage. Thus, by means of the apparatus, completely salt-free, deionized water—containing HOH molecules only and of better quality than distilled water—is obtained. According to the salt content of the water to be purified, after treatment of an exactly determinable quantity of water, the exhausted apparatus can be regenerated, namely the cation-exchanging column by means of a HCl solution—the quantity of which is determined by the size of the built-in tanks, and the anion-exchanging column by means of a NaOH solution. After regeneration the DESTIONEX is again suitable for desalinizing the same quantity of water as before.

The apparatus is easily handled by means of the control buttons located on the instrument board. The "open" and "closed" positions of the inner piping cocks are signalled by pilot lamps.

DESTIONEX has a wide range of application. It may be applied economically wherever distilled water is required, it meets therefore particularly the requirements of laboratories, research institutes, small plants, etc.

## AUTOMATIC FIBRE LENGTH TESTER

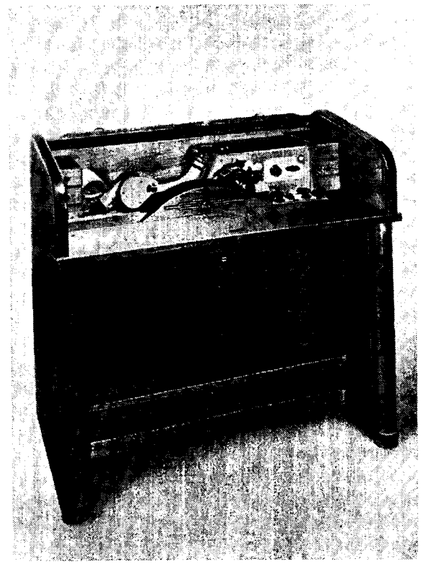
It is staple length which is the most decisive characteristic of cotton. If lots of cotton are purchased, staple length is often disapproved. To ensure successful spinning, great care is taken that only bales containing cotton of the same fibre length are blended. The staple length is the most important characteristic which means effective fibre length in some markets, while in others the upper mean fibre length according to Balls, or modale length are meant as staple length.

The new Automatic Fibre Length Tester is equally suitable for testing fibres immediately after ginning, at the opening of the bale or after spinning. In each case suitable sampling and preparation of specimen is necessary. With the help of this instrument stable length and modal length can be determined, further on the average fibre length can be computed, moreover, the quantity of fibres below a certain length, e. g. 20 mm, can be taken from the frequency diagram.

The apparatus constructed by Tibor Tihanyi, M. Eng. works on a statistical basis. From the



cotton lot a volume sample is taken and formed to a sliver on the little drawing device, an accessory of the apparatus. The sliver is placed between the pair of feeding rollers. Below the feeding rollers a pair of delivery rollers is mounted, drawing a tuft from the sliver after having it squared. In this way tufts drawn out are all from a volume sample. At the delivery side of the drawing rollers a tape of black plush is running which catches fibres freed from between the drawing rollers. From the tuft first the shorter fibres are freed, followed by those with increasing length. Consequently fibres are sorted on the plush tape according to their length. After a period of fibre



deposition, tuft drawing is repeated with synchronized deposition, i. e. fibres of a certain length are deposited always at the same section of the plush tape. When a certain number of tufts has been deposited, the plush is covered with a web-like layer. The web on the tape will be whitest about the modal fibre length. The whiteness of the shortest and longest fibres shades into the black of the plush, because these are the least frequent lengths in the sample. According to the magnified mm graduation of the running plush tape, the occurring shortest and longest fibre lengths can be determined.

The fibre layer deposited on the plush is photographed by an electromechanic device in the form of a diagram. A light beam hits the plush. Intensity of the reflected light is proportional with the number of white fibres deposited on that spot of the tape. Reflected light intensity is measured by a photocell. In the case of a sample deposited according to fibre length, intensity will be greatest at the modal length. The amplified current of the photocell is fed into the recording galvanometer. On the diagram tape running similarly synchronized the fibre length frequency diagram is plotted.

The described processes, diagram plotting included, are fully automatized from start till stop.

## NEW INSTRUMENTS

### *1. Electric Ignition Tester*

There is statistical evidence that most breakdowns of petrol-fuelled motor vehicles are due to some defect of the electric ignition system. The multifarious reasons which can have caused the fault and the intricate nature of the fault itself, may sometimes confuse even the expert. The usual symptoms which suggest an ignition fault—such as uncertain starting, irregular running, diminishing output—may also be the result of a wrongly adjusted atomizer or an untight packing.

The ignition fault locater devices used so far have furnished rather ambiguous answers to the question whether a certain defect lies in the ignition system itself.

The Kovacs type electronic ignition tester makes it possible to check within a few seconds each detail of the ignition equipment even during service, and without dismounting the engine. The apparatus can be used to test any current type of engine even if it has no starter claw since the test requires only a few leads to be coupled to various points of the ignition system. The equipment is operated either from the accumulator battery of the test car or from a mains network. The test may extend over the following details of the ignition system :

1. Breakage or short-circuit in the ignition transformer.

2. Burning or impurities of the interruptor contacts, rigidity of the tension spring in the interruptor hammer, uncertainty of

ignition timing due to the wear of the interruptor cam, adjustment of the gap.

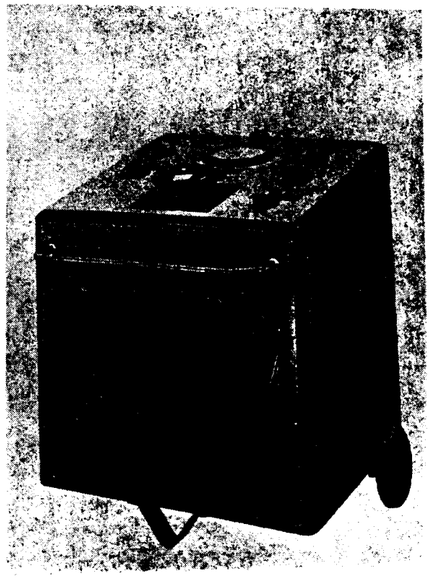
3. Breakage, temporary or permanent short-circuit in the condenser.

4. Control of the sparking advance and of its automatic regulator.

5. Short-circuit, breakage or burning in the divider.

6. Testing and measurement of the spark plug cables for breakage and crossing, checking of the radio anti-interference filter for resistance defects.

7. Identification of other spark plug defects, e. g. short-circuit, distance between electrodes longer or shorter than specified, soot, oil, slag or lead deposits, a crack in the insulator, etc.

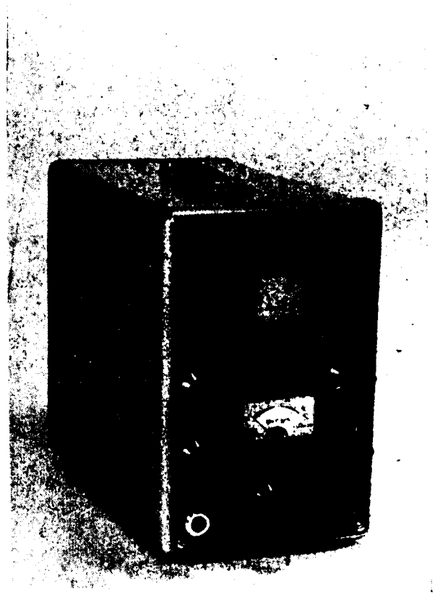


All these defects can be located severally, independently of each other. The apparatus not only indicates the existing fault of a spark plug but also shows up such plugs as are likely to fail under adverse service conditions.

The test process and the artificial production of various service conditions is greatly facilitated by an incorporated electronic revolution counter which indicates the number of main shaft turns.

*2. Magnetic Fissure Tester*

The MRV II type fissure tester, incorporating two electromagnetic systems, is used for the detection of cracks and similar defects in ferromagnetic materials by iron powder or iron-oil emulsion indication.



The circular magnetization method makes use of the known physical law that a current, when passing through an electric conductor, gives rise to concentric magnetic lines of force which form a magnetic field. A ferromagnetic test specimen placed into that field will become magnetic by induction. If the specimen contains fissures or other defects, the density of the lines of force or their directions will change according to the particular fault in the specimen. If the specimen is strewn with fine iron powder or coated with an oil emulsion of iron dust, the iron grains will settle along the fissure and make it visible.

Longitudinal tests are performed with two d. c. excited magnetic poles applied to the ferromagnetic test specimen thrown in the way of the magnetic lines



of force. Fissures of defects in the specimen will cause a non-homogeneity in the lines of force, which can be made visible with dry or emulsified iron powder.

The equipment is designed for convenient approach of the workpiece and is therefore used for the examination of specimens which, owing to their size or location, are hardly if at all transportable. The unit trundles on castors and can be used for the testing of welved and riveted steel constructions, tanks, cast and forged workpieces.

## ELECTRIC FURNACES

Within the ever growing steel production of the world, the rate of high-alloyed quality steel has, during the past decades, been steadily increasing, compared with common carbon steel. This is mainly due to the ever growing demands made on the quality of steel by the engineering industry and other steel consuming industries.

This shift of production has also been due to the increasing shortage in raw materials which induced constructors to use steels of higher strength value to reduce the quantity of raw material needed. Under the circumstances it has become imperative to design ever more perfect equipment for the production and heat treatment of steel. The features of electric and heat-treatment furnaces that make them suitable for the production of the best-quality steels are generally known. Here we wish to refer to the progress recently made in Hungary in the manufacturing of electric furnaces. It should be noted in this connection that Hungary is rather poor in raw materials. Our iron ore production falls short of the requirements and even large quantities of the blast-furnace coke needed for the production of steel must be imported. In the light of this, especial stress had to be laid on the economy factor in trying to improve the quality of steels produced.

This aim may be best achieved by improving the manufacturing methods of electric steel, which has called for a new approach to the building of electric furnaces. Today we are already in a position to cover not only the domestic demand in heat-treating and electric melting furnaces, but the requirements of foreign markets can be satisfied by the up to-date Hungarian products.

Regular buyers of electric furnaces are the following countries: Czechoslovakia, Rumania, Poland, Yugoslovia, China, Korea, Argentina, India and Sweden.

When designing the individual types of furnace, the aim in view is to combine safe operation and

5-ton aluminium melting furnace during erection.

maximum efficiency. This again is due to the fact that in Hungary electric power is rather expensive, so that it is well worth while increasing the efficiency even at the cost of a higher initial outlay.

Here follow the photos of two types of electric furnace manufactured in Hungary.

1. 1,5 ton electric furnace (built for Sweden).

2. Five ton aluminium melting furnaces under construction (for Czechoslovakia).

## OXYGEN PLANT KOMPLEX 50

*Air Separator for Producing Oxygen and Nirogen*

Air separating plants are widely used now to seperate air into its chief components, oxygen and nitrogen.

The products of such plants, built in various sizes and based of various systems, are used in a number of ways in the heavy industries.

The products of the small-sized Oxygen Plant "KOMPLEX" 50, pure oxygen and nitrogen, are used for the following purposes:

Oxygen in the iron and metal industry for welding and cutting; in the chemical industry for oxidation and partial oxidation, e. g. for producing carboxylic acids or sodium peroxide from metallic sodium, and generally in such oxidizing processes where ballast gases hinder the isolation of the product; other applications are in glass-making, and in therapy (artificial breathing).

Nitrogen as an inert gas is used in various industries to eliminate explosion or fire hazards, its other applications include glass-making and the production of cyanamides and nitrides.

The high-purity oxygen required for the above purpose is supplied by "Oxygen Plant KOMPLEX 50" in a particularly economical way.

Neither oxygen nor nitrogen can be transported economically over long distances in steel cylinders. A cylinder weighing approx. 154 lbs. holds no more than 213 cu. ft. i. e. 19 lbs. of oxygen, that is scarcely 11% of the gross weight. This involves excessively high transport charges.

In many cases it does not pay to transport oxygen or nitrogen even over a distance of 60 miles, since the cost of transport exceeds the production costs of the gas.

To judge the economy of an Oxygen Plant, it should be borne in mind that an oxygen plant with a capacity of 1,775 cu. ft. produces approx. 13,200,000 cu. ft. of oxygen in a year of 310 work days, if the same quantity of oxygen has to be transported from a distance of say 30 miles, then within about two years the transport costs will exceed the cost of erecting the oxygen plant.

Taking further into consideration (*a*) that the average circulation time of cylinders increases considerably with distance, i. e. more steel cylinders are needed per cu. ft.; (*b*) that the wear of the cylinders per cu. ft. will also increase with distance; (*c*) that the same conditions apply to the sale of nitrogen, it may be safely concluded that "Oxygen Plant KOMPLEX 50" will completely pay for itself within less than one year.

In regions with moderate oxygen requirements, where oxygen has to be delivered from more than 30 miles, it will always be a paying proposition to install a small Oxygen Plant to save transport costs.

In continuous operation "Oxygen Plant KOMPLEX 50" produces from dry air of 68° F temperature and 29″ Hg pressure 1,775 cu. ft. oxygen of 99,5—99,7% purity and four times as much nitrogen. If the plant is operated for 310 days a year, production will amount to 13,200,000 cu. ft. oxygen. Changes in air pressure, humidity or temperature will cause variations in output.

If the plant is used in the production of oxygen of lower purity, the same amount of power and material will yield a greater quantity. The production

price will, of course, decrease accordingly. If purity is lowered to 98%, output will increase by 10%, i. e. to approx. 1952 cu. ft. per hour.

For the continuous manufacture and bottling of 1,775 cu. ft. of oxygen of 99.5—99,7% purity, three workers are needed per shift: 1 skilled worker for the machines and instruments, 1 semi-skilled worker, 1 hand for filling.

It is understood that operation is directed and administration provided centrally in conjunction with other plants.



"Oxygen Plant KOMPLEX 50" operates safely and economically, is easy to handle and suitable for the production of oxygen of any purity up to 99,5—99,7%, according to requirements, because:

(*a*) Operation at medium pressure is less dangerous and less liable to leakage than operation in high pressure systems;

(*b*) Thanks to its ample dimensions, the apparatus needs little repair and has a long service life;

(*c*) The air separating column, due to the gasometer inserted, works in a uniform and shock-free manner;

(*d*) The almost perfect purification of air from its carbonic acid, oil and moisture content by two lye washing towers prevents clogging;

(*e*) "Oxygen Plant KOMPLEX 50" is delivered with lye regenerating equipment resulting in low lye consumption.

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A new combined transporter and workshop for racing cars, based on an underfloor-engine bus chassis, made by Leyland Motors Ltd., will make its debut with a new racing team at major European circuits this year. It will carry three Formula 1 Cooper racing cars. A lightweight chassis, which normally operates with a 41-seater bus body, it is powered by a 104 h. p. six-cylinder Leyland horizontal diesel engine mounted in unit construction with a six speed gearbox below frame level. To give the transporter a maximum speed of over 65 m. p h., engine r. p. m. have been increased to 2,400, a sixth-speed overdrive has been incorporated in the gearbox, and a rear axle with a ratio of 5.2 to 1 has been fitted. It is equipped with vacuum hydraulically-operated brakes on all wheels. Special two-deck bodywork, in the form of a pantechnicon with integral cab, has been built on the chassis which gives an overall length of 30 ft., a height of 11 ft. 4 in. and a breadth of 8 ft.

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A primer paint which combines the properties of a rust killer and a rust inhibitor has been developed by a Yorkshire company—A. Sanderson & Co. Ltd. It is claimed to neutralise rust up to 0.001 in. thick, anything in excess of this being exceptionally thick and removable by wire brushing.

Neutralisation is achieved by a phosphoric acid content which turns the rust into iron phosphate. Where the rusting is less than 0.001 in. thick a lighter than normal coating is recommended to ensure that excessive amounts of free acid are not present. Although intended as a primer only, an unprotected coat gives protection for several months, but owing to the thin nature of the film, maximum protection is only achieved when the total film thickness is built up to the recognised minimum of 0.005 in. Any type of oil or synthetic paint can be used on top of the primer. One of the advantages is that it dries within about an hour and adheres strongly even in the presence of water. The company sees this as an aid to speedier turn round of ships in dry dock, and for all concerns where rust is an ever-present problem.

The paint is currently being tested by steel structural engineers and ship owners in many parts of the world including the United States, the Middle East and Europe.

***

A new synthetic resinous agent for the hardening and protection of timber surfaces, which is particularly effective in the treatment of timber used in the shuttering and moulding of concrete, has been developed by Stuart B. Dickens Ltd., the concrete waterproofing consultants and manufacturers of London.

Known as "Moldcote", the new liquid hardener is the product of intensive laboratory research on the improvement of the surface finish of concrete and lengthening of the economic life of formwork. When applied to timber by spray or brush, it imparts a smooth, impermeable and highly-glazed finish which is claimed to afford lasting protection against moisture or alkalis from concrete. The hard protective veneer allows a materially increased number of formwork uses without deterioration and conduces to a fine even concrete surface texture. "Moldcote" is an inexpensive treatment which yields real economies in the construction of formwork by reason of the increased number of uses obtained. Greatly improved surface quality dispenses with the need for lengthy concrete finishing operations.

## MECHANICAL HANDLING EXHIBITION IN LONDON

Ranging from small and uncomplicated devices to intricate mechanical monsters, a vast array of the latest equipment is being lined up for the 1960 Mechanical Handling Exhibition which—at Earls Court, London, from May 3 to 13—will be pointing the way towards complete automation. Occupying more than 500,000 sq. ft., the Exhibition will be the largest and the most diversified of its kind ever held. In a message commending the exhibits to buyers from countries overseas, Mr. John Rodgers, Parliamentary Secretary to Britain's Board of Trade, has this to say: "The contribution that the wider use of mechanical handling equipment can make in increasing productivity and reducing costs is well-known. What is not so generally appreciated is the scope which remains, in the less developed as well as the highly industrialised countries, for achieving further increases of productivity and reductions in cost, by the use of such equipment. The sales overseas last year of mechanical handling equipment made in the United Kingdom amounted to some £ 24,000,000. This is a measure of the success of the industry in finding out and meeting the requirements of customers in export markets. I have every hope it will maintain and expand its contributions to the development of industry and the growth of international trade."

### BIG OR LITTLE

That this is the intention of the British manufacturers concerned is evident, not only from the products they will be exhibiting, but from the many services and expert advice which individual firms have to offer to present and potential customers in many lands. From the comprehensive displays at Earls Court, the buyer will be able to select perhaps some small new device which he can incorporate as an integral part of a production line, or, perhaps, obtain advice on—and indeed, order—a vast, complete electronically-controlled custom-built factory installation.

As an example of what United Kingdom manufacturers are doing, the English Electric Company Ltd., will be introducing, among other new electric motors and actuators, a rocking motor which vibrates at the rate of 1,500 or 3,000 times a minute. It can be adjusted to vibrate continuously for 24 hrs., or at regular pre-determined intervals. Equipped with heavy-duty bearings, robust shafts and out-of-balance weights which set up vibration, it has many applications, from slimming appliances to coal grading machinery, and it can even be used for withering tea leaves. Withering is the process of removing moisture from the leaf before rolling, fermenting and drying. The conventional withering method is to spread the leaves on racks and leave them for 12 to 18 hrs. Mechanical withering, in which the leaves are subjected to rapid vibration, is much quicker and produces better results. But it requires a specially-designed electric motor of this sort for the purpose. At the other end of the scale, this exhibitor has developed an ingenious system of automatic control to increase the quality and efficieney of steel production. The majority of rolling mill drives are at present manually controlled, all the movements of the roller tables carrying the metal to and from the mill, the adjustment of the distance between the mill rolls, the manipulation of the piece of metal into the correct rolling channel and the control of the mill drive itself, being done by hand or foot-operated levers.

### PATTERN OF MOVEMENT

These operations follow a definite pattern of movement which can be reproduced in electro-mechanical form and stored in the "memory" of the equipment ready for immediate selection. The number of movements for rolling an ingot slab or bloom into a smaller section can be correctly sequenced to become the "rolling programme". Any number of rolling programmes can be made up to suit different sizes of material to be fed into the mill and stored ready to select and put into operation by pushing a single button.

The heart of this programming equipment is a component called a translator unit, a motorised switching device first suggested for this duty by the British Iron and Steel Research Association. The English Electric Company has developed and modified this unit to make it suitable for the very rugged and continuous duty required by the metal-making and rolling industries. The benefits are a more consistent quality of rolled product, greater productivity, less maintenance on the rolling mill and the more efficient use of the operating personnel. The type of programming and automatic control equipment demonstrated by the company can also be used with other industrial drives where a definite pattern of controlling movements is followed through in sequence and repeated many times. A different pattern of sequence merely requires the storage of a different programme.



# Mining Industries Annual Supplement

## Coal Washery at Durgapur Steelworks Begins to Operate

By Public Relations Officer,
ISCON, Calcutta

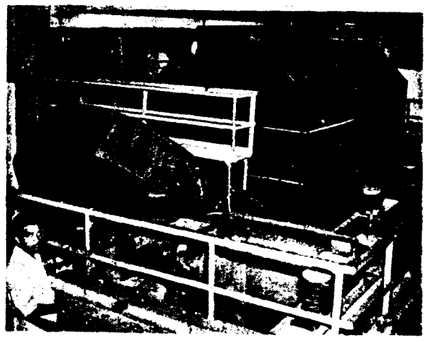
OPERATION has commenced at the Coal Washery at Durgapur Steelworks.

The capacity of the washery is 360 tons per hour. Raw coal above ½" in size is treated in the Dense Medium section of the plant which uses a finely ground suspension of magnetite ore in water. The raw coal below ½" passes to a feldspar jig. This section of the plant is equipped with a very extensive water clarification unit which is an important feature in the treatment of small coal.

Rawcoal from the Jharia coalfield is crushed to 3" and conveyed to the washery via an hundred ton balance bunker.

The coal washing process is in accordance with the most recent British practice and automatic control is introduced to ensure uniformity of the products.

The design of the washery has been envolved to suit Indian climatic conditions and each wall is equipped



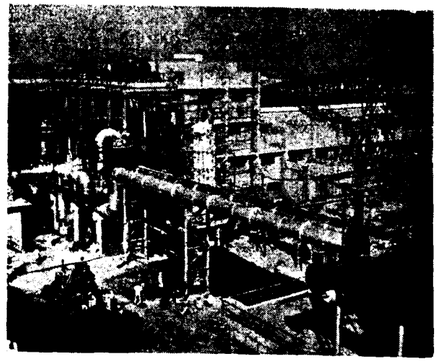
Interior of Coal Washery Plant at Durgapur Steelworks.

with adjustable louvres to obtain the best conditions of ventilation. The building is a concrete structure and is consequently cool and spacious.

The washery was designed and built by Simon-Carves Ltd., a Member Company of ISCON—the British Consortium constructing the Steelworks at Durgapur. The key H.S.L. Indian operators were trained by Simon-Carves Ltd., on a modern plant of similar type in the United Kingdom.

### PRODUCTIVITY INCREASES AT DURGAPUR STEELWORKS

The sulphate of Ammonia Plant at Durgapur Steelworks has gone into production. This plant utilises the gas available from the Coke Ovens for the manufacture of Ammonium Sulphate crystals, which can then be put on the market as a fertiliser.



Sulphate of Ammonia Plant at Durgapur Steelworks.

This plant is a unit of the By-Products Plant. Its rated capacity of production is 57 tons of Ammonium Sulphate per day from 2 Million cu. ft. of gas.

These crystals are formed in a Saturator Bath and are then ejected automatically to a continuously discharging centrifuge machine for preliminary drying. They are then fed by conveyor to a Rotary Hot Air Drier and are then automatically weighed into the bags, ready for sale to consumers Automatic control

s achieved by a comprehensive system of instruments.

The plant has been designed and built by Simon-Carves Ltd.,—a Member Company of ISCON—the British Consortium building the Steelworks at Durgapur.

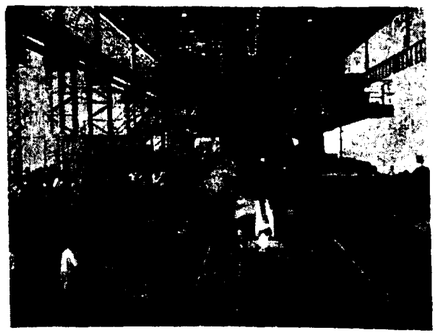
## THE FIRST INGOT MOULD IS CAST AT DURGAPUR

The first 7-ton ingot mould was cast on Saturday April 30th at Durgapur Steelworks at the Iron & Steel Foundry which is designed to produce 20,000 such moulds each year for the casting of steel ingots. Equipped with the most modern production aids the Foundry has been designed as a Service Department of the Steelworks and will draw most of its raw materials from within the Works, thus making a distinct contribution to economy in operation and to the efficiency of the Steelworks.

Ahead of Schedule—Steel Making in progress at the First Open Hearth Furnace at Durgapur Steelworks which went into operation on April 25th, a week ahead of the Target Date.

The erection and construction work for the Foundry has been the responsibility of Messrs. Davy & United Engineering Company Ltd.,—a Member Company of ISCON—the British Consortium constructing the Steelworks at Durgapur.

ISCON announce that at Durgapur Steelworks the Second Unit of the Rolling Mills Plant the 32" Intermediate Mill was commissioned within two days of the Primary Mill—the 42" Blooming Mill—having gone into operation.



ISCON'S 32" Intermediate Mill which was commissioned at Durgapur Steelworks yesterday (11-5-60) within two days of the 42" Blooming Mill having gone into operation.

The commissioning of two mills within the short space of three days is an achievement of which ISCON and DAVY UNITED, the Plant manufacturers, are justly proud.

The 32" Intermediate Mill will receive 12" square blooms from the 42" Mill and effect a further reduction to 7" square. Then the blooms are cropped to length at the 700-ton Hot Shear before being transferred to stock.

## LOCOS LINKING PACIFIC AND CARIBBEAN COASTS

The first of seven locomotive units were recently shipped to Colombia for use in the construction of that country's Atlantic Railroad—an ambitious plan which will link Colombia's Pacific and Caribbean coasts together.

Made by General Electric's Locomotive & Car Equipment Dept. in the U.S.A., the locomotives are being sent to Buenaventura, the Pacific coast terminus of the Atlantic Railway.

Colombian National Railways officials say they expect the line to be finished sometime in 1960. Work is currently going on on sections to the North of Bogota in the Magdalena Valley.

# COALCUTTERS & CONVEYORS FOR OUR COAL MINES

*By A Special Correspondent*

FOR many years coalcutters and conveyors manufactured by British Jeffrey-Diamond Ltd. of Wakefield, England, have been used in Indian coal mines. Specially suited to the short-wall method of mining, predominently employed in India, the B.J-D 35-BB coalcutter is in use in many mines.

Very substantially made, yet simple in design, the 35-BB has a cast steel frame supporting the motor and gears. Attached to the underside of the frame is a channel shaped sledge plate, enclosing a rigid jib. This jib runs the full length of the machine, discharging the cuttings at the rear to make easy their subsequent removal.

The cutting routine in shortwall working being to sump in at the right hand corner, cut across the face and out on the left hand rib, calls for easy handling and flexible control. These demands are fully met by the 35-BB. Two wire rope drums—a feed drum and a handling drum on opposite sides of the machine—are independently controlled to give maximum manoeuvrability.

An effective undercut of 7 ft. is obtained with the standard 7 ft. 6 in. cutter bar. The cutter bar takes a $5\frac{1}{8}$ in. kerf. The machine in $67\frac{1}{2}$ in. long, 44 in. wide, $26\frac{1}{2}$ in. high, and weighs 2 tons 16 cwts.

In designing the 35-BB, the manufacturers have grouped the main controls in the safest and most convenient position for the operator, the left corner of the machine. The principal controls consist of starting switch handle, cutter chain clutch control, and feed and handling drum clutch control wheels.

To give longer life and cut maintenance costs, the 35-BB has the simplest of gear trains. A single bevel gear reduction from the motor drives the cutter chain at 455 ft. per minute. All the gearing is accessible by removing one cover.

A 40 h.p. electric motor, complying fully with the safety regulations, is fitted for use with up to 650V. A.C. The motor is totally enclosed and flameproof.

To meet the needs of large or smaller outputs and various working conditions, British Jeffrey-Diamond manufacture three scraper chain conveyors designed especially for use in shortwall mining.

Durable materials are used to ensure long service, and the conveyors are compact and lightweight in design to facilitate easy and frequent moving. The simple coupling of sections speeds up the daily progress.

The 61-W Room Conveyor has the largest capacity of the three; it is recommended as a gathering conveyor, according to the pit layout, for up to 5 rooms. Under favourable conditions this sturdy conveyor has a capacity of two tons per minute, and will operate over a maximum length of 300 ft. The standard chain speed is 110 ft. per minute, and within limits the capacity of the conveyor can be altered by varying this speed.

The 20 h. p. B.J-D flameproof electric motor and speed reducer can be arranged on either side of the drivehead. Alternatively, a B.J-D V. 4 Air Engine can be fitted for compressed air supply. Both power units are reversible to enable the conveyor to carry supplies to the face.

Employing the 15 h.p. air or electric drives, and of generally similar design, the 61-AM Room Conveyor

B. J-D 61AM and 61HG Scraper Chain Conveyors
35-BB Coalcutter in background.

as smaller troughs and a slower chain speed. Its full apacity is 1 to 1½ tons per minute.

Ordinarily the 61-AM has sufficient capacity to onvey coal loaded by 4 to 8 men. The conveyor is quipped with a diverging delivery end to reduce lump reakage, and elin.inate the possible bending of flights s they pass over the delivery sprocket.

Available in lengths of 15 ft. to 90 ft. the 61-HG Conveyor is designed to operate on the face of the oom and is sturdy enough to withstand the exceptional demands place upon it, such as the blowing of he coal, and yet is light enough in construction to be asily and quickly moved. A 5 h. p. electric motor rovides the drive.

In British mines, due to the depth of the coal eams below the surface, the longwall system is more uitable than room and pillar working. In this field ritish Jeffrey-Diamond have achieved outstanding esults.

For many years the 'Ace' Coalcutter has been very ery popular as an undercut machine in view of its erformance and reliability. To meet many differing eam conditions, a great variety of jib and multi-jib rrangements have been developed.

The increasing demand for small coal for use in ower stations, etc., has heralded the development of ne Shearer-Loaders. B J-D manufacture two Anderon Shearer-Loaders, the 80 h. p. and the 125 h.p. hich is becoming an increasingly important factor in ower loading.

Both these Shearers are equipped with B.J-D's xclusive MAGNAMATIC transmission. This hydrauc haulage unit automatically adjusts the cutting speed

B. J-D 125 H.P. Anderton Shearer-Loader, with side controls, at work underground.

as conditions vary along the face, resulting in smooth, vibrationless working, less wear and tear on components, and maximum output at all times.

MAGNAMATIC transmission may also be fitted to the 'Ace' coalcutters.

The 125 h.p. Shearer Loader can be fitted with a ranging jib directly above the cutting drum to enable the machine to work in thick seams. Like all other Shearers, this machine ploughs on its return to the stable hole.

British Jeffrey-Diamond Ltd. have very great experience with the Anderton Shearer Loader, and have proved the versatility of the machine under a wide range of mining conditions. In so doing, they have pioneered many of the improvements that have taken place since the machine was first introduced.

As a companion to the Shearer, the B J-D C.20 armoured conveyor has been equally successful.

## POLYETHYLENE GLYCOL

Work carried out by Mr. W. E. Lewis, assistant irector of Britain's Tin Research Institute, on the use f polyethylene glycol as a vehicle for acid fluxes has own that the flux spreads more smoothly over a ider area and gives scarcely any sputtering. Dipping he bit is also easier, since the solution does not boil, s water flux does, in contact with the hot iron.

Used on steel the new flux spread evenly over nearly vice the area covered by the water flux and the solder llowed the flux closely. Water flux also produced vere rusting on standing for a few days; the polyhylene glycol flux did not; and the flux remaining after soldering was easily washed away. The new solvent is preferable to ethyl alcohol as a medium for resinous fluxes, since its higher boiling point reduces evaporation and also the excessive pick up of resins which gives trouble, for instance, with printed circuits.

Fluxes tried included hydrazine hydrochloride and bromide, organic amine hydrochlorides and acidified resins, as well as the usual zinc chloride. Further advantages of the polyethylene glycol are that its flash point is high, ensuring a low fire risk, there is no unpleasant odour, and no risk of intoxication from fumes.

# COAL PRODUCTION DURING THE YEAR 1959

( By The Indian Mining Federation )

THE year 1959 began and ended on the note of uncertainty. At the beginning the uncertainty was due to the delay on the part of the Government in arriving at a decision in regard to the increase in coal prices claimed by the Industry. Though the Coal Prices Revision Committee, set up by the Government, submitted its report towards the end of 1958, nineteen months after its appointment, truly a marathon performance in slow motion, the Government went on shilly-shallying for another eight months, after which a paltry increase in price of 0.50 nP. per ton was announced in August. The inadequacy of this increase as an incentive to production made itself felt soon enough and before the year was out there was reason for apprehension about the level of coal production. At the time of writing this report the prospects seem hardly bright for the fulfilment of the Plan targets. The country faces a shortage of coal, particularly coking coal and the Industry has already indicated to the Government that against an estimated additional output of 52 million tons per annum including 7 million tons of coking coal during the third Five Year Plan period, the coal mines in the private sector can achieve an additional output of 16.3 million tons including 5 million tons of coking coal subject to certain basic requirements, also described as "ideal conditions," being fulfilled. What these basic conditions are in the view of the Industry have been communicated in detail to the Government.

Throughout the year the Committee of the Federation kept careful watch on the wagon position. Besides the routine meetings of the Coal Advisory and Coal Transport Advisory Committees, discussions were held at special meetings with representatives of the Railways and an endeavour was made to impress on the latter the need for adjustment of wagon supply to the inevitable seasonal variation in the level of coal production. The inadequacy of siding facilities, harshness of demurrage rules etc. were also brought up at these meetings.

The Committee for promoting voluntary amalgamation of collieries made some progress during the year, and at the end of 1959, 22 proposals for amalgamation had been approved. There was a proposal mooted in the Committee for legislation to enforce compulsory amalgamation of collieries. The proposal was strongly opposed by the Industry through its Joint Working Committee which recommended the adoption of compulsory measure only as a last resort when efforts for voluntary amalgamation have failed.

Mention has been made in the course of the report of the difficulty on the part of colliery owners in obtaining an adequate supply of mining equipment and of electric power. In the first case, there is the added complication of inadequate finance, due particularly to the acute position of foreign exchange. It is on this account that the Government had advised all collieries to take advantage of the credits offered by the Export/Import Bank of the U.S.A. for importing mining machinery and equipment from the U.S.A. How this can be facilitated was discussed at a meeting between representatives of the private sector of the Industry and the U. S. A. Trade Mission held in the office of the Coal Controller on 31 March during the year.

To end this introductory part of the report on a note of hope mention may be made here that about 35 items of mining machinery will be available in the country when the factory being built for the purpose at Durgapur with the assistance of the U.S.S.R. comes into production at the end of 1962 as at present estimated.

## B. COAL PRODUCTION

Various factors, such as, the embargo imposed on private collieries restricting the operation of their mines within the limits of their existing working and immediately contiguous areas, the inordinate delay in obtaining permission for the opening of new seams, inadequacy of transport, difficulties in getting siding and loading accommodation and also in obtaining supplies of adequate mining machinery and equipment accounted for the rather meagre increase of .79 million tons in the output of coal in the private sector, excluding the production of Singareni collieries during the year under review. The total output of coal in 1959 was about 47 million tons which is much below expectation, although it is nearly 1.71 million tons higher than the output of about 45.3 million tons in 1958. At this rate, there is reason to fear, that production may not exceed 52 million tons at the end of the Second Plan period against a target of 60 million tons.

As a result of repeated representations made by the ıdustry to the Government urging the fixation of an ɔconomic price-structure of coal, the Government nnounced a niggardly price increase of 0.50 nP. per ɔn only against the demand of the Industry to the xtent of Rs. 3.50 nP. per ton and even that after a elay of two years. In the absence of an economic ırice-structure, the Industry is deprived of the develop- nent finance, urgently required for its expansion plans or the additional production allocated to it in the Plan. It is difficult to understand why the Govern- nent is so reluctant to apply the principle of auto- inancing in the case of such an important industry as Coal and it is high time that the Government adopted ı rational and realistic policy in this regard. The ɔosition of the coal shares in the Stock Market clearly ndicates that the prospects of getting new investments ıre now practically nil in view of uneconomic price- ıtructure of coal. It is needless to mention that ɔroduction cost has been steadily going up as a result ɔf larger amenities being given to labour owing to a gradually soaring price index and fresh demands being made from time to time and also owing to an increase in the cost of machinery, stores, iron and other materials, electricity charges, etc. It will, therefore, appear that the existing uneconomic price-structure of coal allows hardly any scope for any further develop- ment work and even for maintaining the existing production of the collieries. All these factors have had a cumulative effect on production and it is needless to mention that without adequate price increase it will not be possible for production to maintain its tempo and this is just what happened in the year under review.

The apprehension of a coal shortage has already begun to cast its shadow on the Industry, a number of mills and factories are reduced to desperate straits try- ing to find adequate coal for their mills. If the posi- tion continues like this, it seems fairly certain that the export of coal may have to be curtailed or prohibited for some time. Restrictions on export would not only affect our foreign exchange earnings, may be for the time being, but also do permanent damage to the coal industry itself owing to its market being highly com- petitive, for it would be very difficult to win back the foreign market once the foreign customers are forced to buy coal from alternative sources.

Production of coal has to be increased to meet the growing needs of the expanding industries of the country and the Government should, therefore, seriously consider about giving greater encouragement to the private collieries. Coal prices have not been increased for several years to any appreciable extent as repeatedly urged by the Industry and it is high time that the Industry should be allowed a sufficient margin of profit so as to make it possible for them to plough back enough money for expansion. The private collieries should be allowed without further delay to re-open closed mines and open out new and adjacent areas more freely for replacing the output of the gradually exhausting mines. As development work usually takes three to five years, further delay by the Government might well lead to a situation in which it will be impossible to make good the shortage.

## C. COAL TARGETS FOR THE THIRD FIVE YEAR PLAN

In view of the fact that the Second Five Year Plan has only another year to go, both the Government and Coal Industry are naturally anxious to settle the details of the Third Plan. The subject featured on the agenda at a meeting between representatives of the Industry and Sri N. S. Mani, I.C.S., Joint Secretary, Ministry of Steel, Mines and Fuel, held on 14 April, when targets for the Third Plan were discussed. The subject was again discussed at some length on 28 July, at New Delhi when the representatives of the Industry met Sri N. S. Mani, Joint Secretary. It was once again discussed in detail by the representatives of the Industry at a meeting held at New Delhi on 12 January, 1960 with the Members of the Planning Commission.

The Third Five Year Plan, which is now in the process of preparation, envisages an additional output of 52 million tons of coal per annum including 7 million tons of coking coal. The representatives of the industry have, however, given the Government to understand that the coal mines in the private sector could achieve an additional output of 16.3 million tons per annum subject to certain basic requirements being fulfilled. These basic requirements are detailed in a memorandum which was handed to the Ministry of Steel, Mines and Fuel during the meeting on 28 July referred to above. The whole position in this regard is fully explained in a letter addressed by the Joint Working Committee on 18 January, 1960, to Sri C. M. Trivedi, Member, Planning Commission, which is printed as Appendix "A" along with a copy of the memorandum detailing the basic requirements. Briefly, the main items of the basic requirements, also described as "ideal conditions", are economic coal prices, additional financial assistance to meet capital requirements of the Industry for installation of stowing equipment and washeries, provision of adequate facilities for stowing and washing, transport and siding facilities, adequate supply of stores and materials and the guaranteeing of certain legal rights.



## D. SHORTAGE OF COKING COAL

A disquieting feature of the operation of the Coal Industry during the year was its inability to keep abreast of the target figure of output of the Second Plan. A shortage of coal in general, particularly of coking coal, became rather pronounced at the end of the year. The Industry lost no time in bringing the position to the notice of the Government with a view to devising adequate remedies. At a meeting held with the Ministry of Steel, Mines & Fuel at New Delhi in the month of July, the representatives of the Industry made it clear that the maximum increase they could effect in the production of coking coal, including that of Grade III, was 5 million tons per annum to be achieved by the year 1965 and that this increase could only be achieved under ideal conditions. As the position became increasingly serious a special Sub-Committee of the Coal Council of India was constitut- ed to consider the matter.

At a meeting of the Sub-Committee, held on 13 November, Sri A. Zaman, Coal Controller, and the Chairman of the Coal Board, who was also Chairman of the Sub-Committee, pointed out that the coking coal requirements by 1965 had been reassessed at 21 million tons per annum marking an increase of 2 million tons over the figure indicated by the Ministry in July. The revised figure represented an increase of 9 million tons over the current production of 12 million tons of Selected 'A', Selected 'B' and Grade I coking coal. The representatives of the Industry present at the meeting recalled the statement made by them at the Delhi meeting held in July and emphasized that unless the Government made a realistic approach to the problem, it was impossible to increase the production of coking coal to any considerable extent.

The deputation from the Industry, which visited Delhi on 17 and 18 November to discuss the provisions of the Mines (Amendment) Bill, 1959 with the Hon'ble Minister for Steel, Mines & Fuel, took the oppor- tunity to discuss the situation arising out of the shortage of coking coal with Sri N. S. Mani, Joint Secretary, Ministry of Steel, Mines & Fuel, who later came down to Calcutta for a discussion of this matter with representatives of the Industry on 28th November. Among other things, the question of subsidy for deep, gassy and in general difficult mines was discussed at this meeting at which the Coal Controller was also present. Sri Mani was of the view that if a colliery were to qualify for subsidy it should experience more than one kind of difficulty. This view being strongly opposed by the representatives of the industry, the matter was referred to the Technical Advisory Com- mittee of the Coal Board. It was also decided to constitute two sub-committees with representatives of the Industry and of the Government to report at an early date as to how the production of coking and non- coking coal respectively could be stepped up. The Special Sub-Committee, constituted with three Chair- men of the Associations/Federation and two technical advisers appointed by the Coal Council, consider the position created by the shortage of coking coal, submitted a report to the Coal Controller on 16th December. The report made the following recommen- dations among others :

(1) The Mines Department should be brought under the Ministry of Production.

(2) Closure liaison should be maintained between the Mines Department, the Coal Board and the Industry to avoid the long delays in granting sanction to applications for projects and operations necessary to increase production.

(3) Stowing assistance should be paid in full without any ceiling being imposed.

(4) Assistance should be granted for removal of overburden in excess of the economic limit in cases where some reserves of coking coal lay at relatively shallow depth and which could be suitably recovered by open- cast mining.

(5) The subsidy for deep, gassy and difficult mines should be implemented without delay.

(6) The previous grading should be granted provisionally along with the permission to re-open seams.

(7) Selective Mining should be allowed in develop- ment and in extraction with stowing with due consideration of the requirements of conservation.

(8) Financial assistance should be given for trans- portation from pithead to siding in the case of considerable distance from the exist- ing siding accommodation.

(9) The difficulties in obtaining Import licences for mining plant, the import of spares, should receive urgent consideration by the Government.

(10) In view of the non-availability of adequate number of qualified Statutory Supervisory Staff to meet current production, the Coal Mines Regulations regarding the employment of qualified statutory supervisory staff should be relaxed.

In a letter dated 16th December, addressed to the Coal Controller, the Joint Working Committee made detailed suggestions with relevant figures to step up the output of coking coal. (See Appendix "B").

Another meeting of the Sub-Committee was held on 23rd December when the position was further considered. Since the end of the year there have been three further meetings of the Sub-Committee, the first being held in the coalfield on 7th January, 1960, followed by a meeting in Calcutta on 8th January, 1960, and a final meeting at Delhi on 11th January, 1960, under the auspices of the Ministry of Steel, Mines & Fuel. On the next day there was a meeting with the Planning Commission, the subject discussed being coal targets for the Third Five Year Plan. So far as coking coal (Selected 'A', Selected 'B' and Grade I) was concerned, the representatives of the Industry were given to understand that the additional output envisaged in the Third Five Year Plan was 7 million tons per annum. The representatives of the Industry indicated that, subject to the fulfilment of the basic requirements held by them in the statement relating to all grades of coal handed to the Ministry of Steel, Mines & Fuel on 28th July and copy of which was later furnished to the Planning Commission, the extra output of coking coal of the grades mentioned would be 5 million tons by 1965—66. (See section on Coal Targets for the Third Five Year Plan).

## E. HIGH VOLATILE COAL CRISIS

The existing crisis in the production of coal as a result of which the country is facing a shortage of coal in the near future emphasizes the need for making an all-out attempt to increase the production of all grades of coal. So far as high volatile coal, produced in the Raniganj field, is concerned, the technical personnel of two Associations and the Federation have investigated the matter in detail. The result of the investigation, which has been communicated to the Coal Controller in a letter dated 9th February, 1960, by the



Joint Working Committee, is that additional production of coal in the Raniganj field will be attained to the extent of about 1,80,000 tons monthly as from April 1960, this being the extra production over the level of output in December, 1959. This average monthly increase in output will be maintained on an average for the remainder of 1960, and will consist of the following grades of coal approximately :—

| | | |
|---|---|---|
| Selected 'A' | .. | 15,000 tons monthly |
| Selected 'B' | .. | 1,20,000 tons monthly |
| Grade I & II | .. | 45,000 tons monthly |
| Total : | .. | 1,80,000 tons monthly |

This increased output will be attained by vigorous efforts on the part of the Private Sector to overcome the existing critical shortage of coal.

The Coal Controller has been informed that the basic conditions for attaining this increase are the same as those detailed in the statement furnished to the Planning Commission relating to the additional production of coking coal.

## F. GRADING OF COLLIERIES IN THE OUTLYING FIELDS

The coals of the Bengal-Bihar fields were graded in 1944, following the introduction of price control, but coals produced in the outlying fields remained ungraded till as recently as 16th November, 1959, in spite of a persistent demand from collieries in the outlying fields as well as from consumers served by these fields. Such a demand is explained by the fact that grading provides an incentive for improving the quality of production and despatches.

It may be re-called that the Coal Advisory Committee considered on 28—9—56 the report of a Technical Sub-Committee which had suggested a revision of the specifications for coal grading in Bengal-Bihar and had recommended grading of coal in the other coalfields excepting Assam. A Sub-Committee was then appointed by the Coal Advisory Committee to prepare a scheme of coal grading in the outlying fields and to suggest a corresponding basis for the fixation of prices. The recommendations of the Sub-Committee to consider the proposed grading of coals in the outlying fields were published in the Committee's report for 1956.

The Coal Price Revision Committee also stressed in their report that collieries in Madhya Pradesh, Bombay and Orissa should be graded in accordance with the procedure which had been adopted in the case of collieries in the Bengal/Bihar as from 1944.

The following basis for grading in the outlying fields was suggested in the report of the Coal Price Revision Committee :

| | | Ash plus moisture content. |
|---|---|---|
| Selected Grade | .. | Not exceeding 19% |
| Grade I | .. | Exceeding 19% but not exceeding 24% |
| Grade II | .. | Exceeding 24% but not exceeding 28% |
| Grade III | .. | Exceeding 28% but not exceeding 35% |

On the basis of production figures for 1957 the Coal Price Revision Committee found that production was likely to be shared between these four grades approximately in the following proportion :

| | |
|---|---|
| Selected Grade | 4% |
| Grade I | 28% |
| Grade II | .. 49% |
| Grade III | .. 19% |

The above Committee also recommended the following prices :

| | R.O.M. and Slack. Rs. | Steam and Rubble. Rs. | Average. Rs. |
|---|---|---|---|
| Selected Grade | 21.85 | 22.85 | 22.45 |
| Grade I | 21.10 | 22.10 | 21.70 |
| Grade II | 20.35 | 21.35 | 20.95 |
| Grade III | 19.75 | 20.75 | 20.35 |

Although the report of the Coal Price Revision Committee, which was published by the Government on 24th August, 1959, recommended, amongst others, the grading and price fixation of the collieries in the outlying coalfields, the grades of the collieries in the outlying fields, were sanctioned by the Coal Board on 16th November, 1959, and a *pro tanto* revision of prices was announced on the same date.

The names of the collieries for which grading had been sanctioned by the Coal Board and also a copy of the Government Notification in respect of the revision

of prices of coal/coke in the above field appear in Appendix "C".

## G. ABOLITION OF THE COAL GRADING BOARD

The Coal Grading Board which was constituted in 1925 for purposes of grading of various categories of coal produced from the mines in India for export has been dissolved by an Act passed by the Parliament and the Government decided that the Coal Grading Board (Repeal) Act should come into force from 14th August, 1959.

The facility of certificate of shipment from the Coal Grading Board will, however, continue to collieries who will now obtain such certificates from the Coal Controller.

The following procedure has accordingly been introduced from August 14, 1959 in connection with the issue of certificates by the Coal Controller.

(i) On application by any graded colliery (i.e. a colliery of which the grade or grades of all or any seams, or section of a seam, has been determined by the Coal Board in pursuance of the provisions of the Coal Mines (Conservation and Safety) Rules, 1554, desiring to export coal from India, the Coal Controller shall, if he is satisfied after such inspection as he may deem necessary with the quality and condition of the coal, grant a certificate of shipment in the form that has been prescribed by the Government for the purpose ;

(ii) For the purpose of the issue of such certificates, the term 'export' shall be interpreted as meaning the shipment of coal as cargo from a port in the Indian Union to a port outside the Indian Union ;

(iii) Every application for a certificate of shipment shall state the name of the colliery at which and the quantities in which the coal intended for export are to be loaded. The Coal Controller shall arrange for the coal to be inspected both at the colliery and at the docks where it is to be shipped, and a certificate of shipment in respect of such coal shall be granted by the Coal Controller provided he is satisfied with the quality and condition of coal and in particular that the coal has been loaded without being mixed—either underground or on the surface—with any other coals which are either not graded or are graded in an inferior class ;

(iv) The inspection of coal at the colliery as well as at the docks shall be done by such officers of the Coal Controller's Organisation as may, from time to time, be specifically authorized in this behalf by the Coal Controller.

## H. MINERAL ADVISORY BOARD

During the year the Mineral Advisory Board held its seventh meeting at Calcutta on 22nd July, 1959. Sri B. N. Banerjee, Federation's representative on the Board, attended the meeting. There was no specific items on the agenda relating to the Coal Industry.

Dr. B. C. Roy who inaugurated the Session emphasized the need of judicious exploitation of the country's mineral wealth on a planned basis so as to avoid all forms of waste and to ensure a balanced development. He stated that provision had been made in the West Bengal Estates Acquisition Act for the vesting of all mines and mineral rights in the State on payment of a suitable compensation and for doing away with all rent and royalty receiving interests and he added that it was the policy of the Government that only persons actually carrying on mining operations should be permitted to continue in possession of mining areas as lessees directly under the State.

Dr. Roy made the following observations in the course of his speech in regard to the Coal Industry:

"Coal happens to be our most important mineral. We have made a significant start with the Durgapur Coke-Oven, around which a number of ancillary and derivative industries are bound to grow in course of the next decade. In order to help such coal-based industries and to increase the production of coal, it is urgently necessary that we should open up virgin coal-bearing areas, particularly in the Raniganj area, where high-grade coal lying at some depth still remains unexploited. Otherwise, we shall never be able to achieve the momentum needed for increasing our coal production to 100 million tons during the Third Five-Year Plan period. We should remember that eight to ten years are needed to bring a new mine under full production.

"In accordance with their declared decision to reserve all coal mines for the Public Sector, the Central Government have set up the National Coal Development Corporation (Private) Ltd. and this organization has been entrusted with the colossal task of producing twelve additional million tons of coal within the Second Five-Year Plan period. We are at the tail-end of that period, but I do not know how far the target has been achieved. If the tentative target for the Third Plan (100 million tons) is to be reached, a very substantial part of the increased production (40 million tons), will, perhaps, have to be allocated to the N. C. D. C. This target of 100 millions will, naturally, increase progressively during every successive Plan period, and it is fairly obvious that the organisation of the N.C.D.C. would soon become too unwieldy for efficient operation. In the circumstances, it would perhaps be advisable for the Government of India to lay greater stress on regional development and to set up separate corporations on a regional basis, run jointly by the Centre and the State Governments concerned. There may, however, be one central policy-making body or Board, which should co-ordinate the activities of the various regional corporations and arrange for allocation of finances, procurement of imported machinery, etc. etc."



## I. COAL WASHERIES

Washing is an important measure of conserving the better quality of coking coals. Lower grade coking coals, if they are beneficiated, can be used economically for metallurgical purposes. If the Grade I and Grade II coking coals are not washed, larger quantities of Selected Grade coking coals would have to be required with the result that the limited resources of metallurgical coals in the country would be rapidly exhausted. In view of the projected expansion of the steel industry during the Second and Third Plan periods and the urgency of washing coking coals, the Government of India decided to establish the following three central washeries in the Jharia coalfield for the beneficiation of coals required for the new Steel Plants.

| Washery to be located at. | Capacity. | To wash the output of raw coking coal from: |
|---|---|---|
| (a) Dugda | 500 tons per hour. | Mohuda, Bhaga and Katras Depot Sections. |
| (b) Bhojudih | 250 ,, ,, | Bhojudih Depot Section. |
| (c) Pathardih | 800 ,, ,, | Jharia and Pathardih Depot Sections of the Jharia Coalfield. |

It appears from the Annual Report of the Coal Board for 1957—58 that the Board's responsibility would be limited to examination of the general questions and methods of washing proposed in the various washeries and the supply of raw coking coal to the washeries. It was also stated in the Annual Report that "considering the progress so far made, it was however doubtful if some of these washeries would be completed before 1961." The above report of the Coal Board proved disappointing to the Industry. It also appeared from the press reports that the contract for Dugda Washery has been recently finalized and that it was expected to be ready for operation about the end of 1961 and further that the progress in respect of the other two washeries was not known. Since the production of steel is inextricably linked with the supply of coking coal, there is reason for apprehension that without washeries the new Steel Plants will be practically ineffective.

## J. PEGGING OF PRODUCTION OF COKING COALS

In exercise of the powers conferred by sub-section (1) of Section 7 of the Coal Mines (Conservation and Safety) Act, 1952, the Government of India have decided that the production of Selected 'A' and 'B' grades of coking coals in 1960 should be limited to the overall ceiling of 9 million tons. The Government have also fixed the following ceilings for the production of coking coal of Grade I and Grade II for 1960.

Grade I —6.5 million tons as against 5.5 million tons in 1959.

Grade II —3.7 million tons as against 3.7 million tons in 1959.

It has also been announced by the Government that the ceilings of production of the various grades of coking coal in individual collieries in 1960 should be fixed by the Coal Board with due regard to the actual production and the ceiling fixed for 1959 and will be subject to the following terms and conditions :

(i) There will be no excessive retrenchment of labour. For this purpose, however, any increase in production or any increase in labour force, effected after the policy of fixing production was first announced, will be ignored.

(ii) The limit fixed will not render the working of a colliery uneconomic.

(iii) The collieries carrying out stowing or washing

or proposing to carry out washing during 1960 or 1961 may be allowed higher ceilings of production.

(iv) Pegging shall be regulated by the supply of wagons. Each colliery shall be given a wagon despatch target for the year, which may include stocks left over from the raisings of 1959, and determined as on the 31st December, 1959. Once that target has been completed no further wagons would be supplied to the colliery during the year.

(v) For the purpose of this scheme all the collieries under one ownership or managing agency may be treated as one group and the production quota for each grade may, with the prior approval of the Board, be transferred from one colliery to another within the group provided that the total output of each grade of coal of the group does not exceed the limit fixed by the Board and the closure of any colliery is not involved.

(vi) All collieries (including Government collieries) shall be subject to the scheme.

(vii) Attempts by individual collieries to downgrade their coals with a view to defeating the purpose of pegging will be deprecated.

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Large gasholders cost hundreds of thousands of pounds to build and require regular painting and maintenance. One of the Regional Gas Boards in Britain has, it considers, saved about £ 500,000, by storing gas in an underground cavern formed as the result of brine extraction from a deep seam of salt. A 1,000-ft. deep borehole was made to the cavity and the brine pumped out. The engineers were so confident of the gas-tightness of the seam that a preliminary test with air was considered unnecessary; so 17,000,000 c.ft. of gas were pumped underground and compressed to 710 lb. per sq. in., 160 per cent. of the contemplated working pressure. This pressure was held without loss for a week. The capacity of the chamber is up to 10,000,000 c.ft. and this storage has cost to date only £ 96,752, compared with an estimated £ 600,000 for a comparable capacity conventional gasholder.





# The Value of the Saunders Diaphragm Valve to Mining and Other Industries

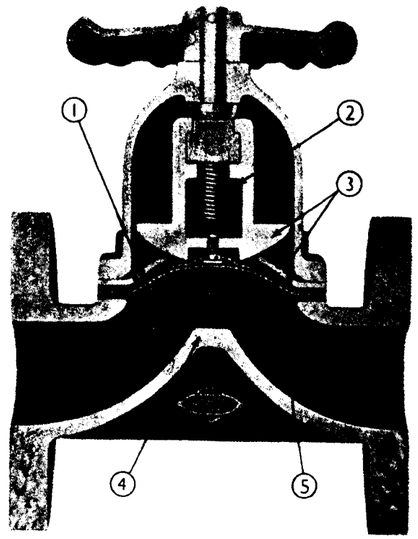
EVERY year the introduction of new fluid products and by-products, brings to industry its crop of new problems for handling those fluids.

By this process, as well as by the increasing use for such universal fluids as air, water, oil, gas has the scope of the Saunders Diaphragm Valve expanded until to-day it would be difficult to find a country or an industry not benefiting by the sure control it provides.

In mining for example, the 'parent' industry for which the Saunders Diaphragm Valve was originally designed, two of the principal applications were the compressed air and water services and, for these duties alone, many hundreds of Saunders Valves have been installed in Great Britain, U. S. A., Canada, South Africa, Australia, Holland, India, and, indeed, throughout the world. Avoiding waste, by the sure closure of the flexible diaphragm; standing up to rough usage, by virtue of their robust construction; providing long, trouble-free service because the valve mechanism is isolated from pipeline contents and, simplifying inspection and reconditioning, when either of these is necessary—these are some of the valve's attributes.

Apart from these two general duties (on air and water) the Saunders Diaphragm Valve renders many other services to industry. To list but a few of the countless applications of the valve will emphasize its versatility and dependability. Acids, brine, chemicals, gases, foodstuffs beverages, pulps, abrasives, solution, solvents, slurries, sludges, syrups, oil, glue, latex—these are typical of the everyday uses to which the Saunders Valve is put and amongst the industries served it will suffice, if only as an indication of variety, to mention aluminium, and synthetic fibres factories, breweries, dairies, laundries, quarries, sugar refineries, paper mills, railways, potteries, gas, iron, steel works and of course coal and metal mines.

Inspection of the valve reveals the features that enable it to render such practical and lasting service. In the accompanying photograph the Diaphragm (1)




is clearly seen in the open position, allowing streamline flow to the fluid through the body passage (5). In the centre of the body is the weir (4) on which the diaphragm seats when closing. Within the bonnet all the mechanism (2 & 3) is housed and, in this 'engine room of its own', it is isolated from pipeline contents. This means that all working parts are safe from the damaging effect of abrasive or corrosive fluids and cannot contaminate the most delicate fluids. Furthermore the valve spindle has no need of gland or packing as it is quite impossible for any leakage to atmosphere to take place.

Of especial interest to many engineers is the ability of the valve to make perfect closure, even with grit and small solids in suspension. Should such particles intervene at the time of closing, the flexible diaphragm envelops them and compresses sufficiently to make good contact with the weir. At the next opening the solids are released, and neither diaphragm nor seat is damaged, as would be the case with metal-to-metal seatings.

For normal duty the makers supply the handwheel form of operation but where quicker operation is required, as for instance in some processing plants, lever control models can be supplied. There are also 'power' operated valves suitable for remote and automatic control. Where hand operation is inconvenient or inadequate Power Operated Saunders Valves provide a practical solution.

The simplicity of maintenance of the Saunders Diaphragm Valve appeals strongly to engineers and demonstration of this feature is readily made by the removal of the bonnet assembly—which includes the diaphragm. If the diaphragm shows signs of wear it should be discarded and a new one fitted. This is the work of a few moments as there are no metal-to-metal surfaces calling for lengthy and laborious grinding-in. With this simple service the valve is as good as new again and the operation can be performed without disturbing the pipeline. If the same duty as before is required a similar diaphragm should be inserted (provided, of course, that the original was correct for that duty) but if the valve should be required to operate on any other service the appropriate grade of diaphragm should be obtained.

The diaphragm, and indeed all parts, are readily interchangeable. Numerous grades of diaphragm are available and for duties more difficult than air or water every care should be given to the selection of a suitably compounded part.

Apart from the diaphragm the body is the only other part of the Saunders valve in contact with the pipeline fluid. For duty with normal fluids malleable iron bodies are generally supplied but, to meet special requirements, stainless steel, acid-resisting bronze, aluminium and plastic bodies are available and, due to the smooth, pocketless passage it is possible to line the body with rubber, lead or even glass. On these points of diaphragm and body variation the maker's literature is very useful in classifying the appropriate material for many of the difficult and delicate fluids encountered in modern industry.

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### Rolls-Royce Gas Turbine Engines

Rolls-Royce jet and prop-jet engines have completed their first 10,000,000 hrs. in airline service. This represents more than 85 per cent. of the flying carried out by all the civil gas turbines throughout the world, claimed the company in a recent announcement. These 10,000,000 hrs. have been flown by Dart prop-jets in Vickers Viscounts, Fokker Friendships and Fairchild F-27s, and by Avon turbo-jets in de Havilland Comet 4s and Sud Aviation Caravelles. They have been flown over long-, medium- and short-range routes by 58 airlines on six continents. In North America alone, 4,500,000 hrs. have been flown. Overhaul life of the Dart prop-jet started at 400 hrs. and has now reached 2,500 hrs., the highest ever approved for any æro engine. At this figure a Dart engine flies an average of 625,000 miles between overhauls. The Avon jet, which embodies much of the experience learned from the Dart, started at 1,000 hrs. between overhauls and after only 12 months in service this was increased to 1,600 hrs., during which period the engine flies more than 700,000 miles. During the whole overhaul life no scheduled component changes or internal inspections are required.

Rolls-Royce Ltd., is the world's leading supplier of gas turbine engines for civil aircraft. They built the Dart, the first prop-jet to enter airline service; the Avon, the first civil jet on the North Atlantic route; the Conway, the world's first large by-pass jet; the Tyne, the first high-power, high-economy prop-jet. More than 70 airlines have ordered Rolls-Royce jets and prop-jets.





# Proceedings of the Seminar in Electrochemistry recently held in the Central Electrochemical Research Institute, Karaikudi

DEPOSITION of lead dioxide on graphite or carbon base materials is a work that is being carried out in the Central Electrochemical Research Institute with a view to develop useful anodes for electrolytic oxidations. The possibilities of using such a deposit of lead dioxide or the lead dioxide formed on metallic lead for purposes of rectifier preparation was discussed in the first paper presented. This was followed by a discussion on the evaporation system for caustic soda liquor from diaphragm electrolytic cells. The author from DCM Chemical Works indicated that from the point of view of capital investment and operating costs involved, triple effect system with backward feed is the most economical of the systems considered, for evaporating caustic liquors.

A primary wet cell using aluminium as anode and ferric chloride as a depolarizer in place of the usual Leclanche cell developed by the Institute was then presented. X-ray study of the Indian manganese ores and comparison of the results with the battery grade ores, and the buffer capacities of the mixtures of ammonium sulphate and manganese sulphate normally employed as electrolyte for the electro-winning of manganese metal were then presented from the Institute. The significant improvement effected in the process of electrochemical etching of aluminium for the purpose of electrolytic capacities was also discussed.

The second session relating to Electrode Kinetics and Polarography was presided over by Prof. S. N. Bagchi. The seat of electrochemical reaction is the metal solution interface. It is but natural therefore that a considerable amount of fundamental work carried out by several scientists with a view to understand the nature of this region and the changes occurring there have come up for discussion. Six papers were presented dealing with reactions occurring at dropping mercury electrode, illustrative of the various parameters which affect such reactions including the influence of addition agents and surface active agents etc. In the study of the electrode reactions, absorption is a very important phenomenon to be taken into consideration and the paper from the well-known Russian electrochemist A. N. Frumkin dealt in great detail with the recent developments in the field. Equally important is the mechanism of hydrogen evolution at a cathode which controls cathodic reactions and determines the nature of the metal deposition to a great extent. Papers presented by Devanathan and his co-workers and by Roger Parsons have greatly contributed to this field of knowledge. Two papers relating to the phenomenon of redoxokinetic effect, work on which has been going on for sometime in this Institute have thrown considerable light on the physical picture of the phenomena in addition to providing a general equation for the same.

In the evening Shri P. K. Seshan, Secretary, Development Council (Alkalies) gave a lecture on "Electrochemical Industries in India—Present and Future" with Dr. S. D. Mahant in the chair. This was followed by lively discussions.

The section on electrolytic preparations was started on 24th morning with Dr. Anjaneyulu of the Defence Metallurgical Laboratory, Ishapur in the chair. The eleven papers presented in this session related mainly to the work that is being carried out in the Institute. The preparation of synthetic cryolite for use in fused salt electrolysis, the know-how on production of sodium and magnesium metals as well as misch metal from rare earth chlorides came up for discussion. While it was generally felt that some of these are of strategic importance, it was expressed that the work now going on in the Institute should be intensified with a view to set up pilot plants. The production of zinc, iron and lead powders by the electrolysis of the corresponding salt solutions as well as the electrolytic production of chromium metal from chromium ore were then discussed. The production of fine chemicals by electrolytic techniques which is being investigated in this Institute formed the subject of two papers which came up for discussion next. The subject matter of one of the papers was the electrolytic oxidation of benzene to quinone. Large quantities of benzidines and substituted benzidines are required in the country for the production of direct cotton colours. The process developed in this Institute using rotating cathode type cell for the production of the same and the advantages of the technique for the

production of dichlorobenzidine was discussed in the other paper.

The section on metal finishing and growth of metal deposits was presided over by Prof. M. A. V. Devanathan, the distinguished delegate from Ceylon. All the papers in this section were contributed by the research workers from this Institute. The subject matters included investigations relating to brighteners to be employed in nickel plating and the technique of electro-polishing of mild steel. An important aspect of great interest to a practical electroplater is the performance of a bath, as indicated by its ability to give a good throwing power. The factors affecting this as well as the micro-throwing power were then discussed. The mechanism of crystal growth in electrodeposits with special reference to nickel plating was discussed at length in the next 3 papers. The measurement of thickness of electroplates by the anodic dissolution technique employing different electrolytes was also discussed.

The fifth session on electrolytic equilibria was presided over by Prof. K. S. G. Doss, Director of the Institute.

Prof. M. A. V. Devanathan, of the Department of Chemistry, University of Ceylon presented, what may be considered as an outstanding achievement, his new theory of strong electrolytes based on the cell lattice model. He also gave a statistical analysis of the model and showed the superiority of his theory to that of Debye. He showed how he took into account the non-coulombic forces. The parameters in his equation were shown to be determined by the ion-dipole and dipole-dipole interactions. Data on fifteen electrolytes were cited in support of the theory.

This was followed by a critical paper of the recent improvements in the Debye-Huckel theory of strong electrolytes by Prof. S. N. Bagchi of University College of Science, Calcutta, who also discussed the relation of his theory to the other theories. Lively discussions that followed the presentation of the papers indicated the great contributions that have been made in the field of strong electrolytes which have just been presented for the first time in this seminar. One paper which came up for discussion was the measurement of conductance of fused cryolite in aluminium baths with additives from the Indian Aluminium Company, Calcutta and the other one was on the absolute single electrode potentials by Prof. S. N. Bagchi.

On the 25th afternoon, the final session of the seminar, papers relating to the subject on corrosion were taken up for discussion. Dr. J. P. Kapur of DCM Chemicals presided. Following an introductory speech by Shri M. B. Shankar of Hindustan Aircraft Limited, Bangalore, the papers on the inhibition of corrosion of aluminium in acid solutions and the anodic corrosion of nickel-iron alloys in the pyro-phosphate solutions were discussed. Important electrochemical studies of paint and varnish films of metals under immersed conditions in sea water, carried out in the Naval Chemical and Metallurgical Laboratory dealt with the assessment of underwater compositions and the mechanism of breakdown of such films. A series of papers presented from the Institute related to polarisation studies of metal surfaces with finishes such as painting, phosphatising etc. Polarisation studies carried out on corrosion inhibitors was also presented, followed by a paper which dealt with the assessment of the corrosion inhibition property of various concrete mixtures also by polarisation studies. An attempted study on galvanic corrosion using copper-steel couple also came up for discussion.

The contribution to the field of pH-potential diagrams was the subject matter of a paper by Pourbaix. The paper showed the great importance of these data in general corrosion studies.

This was followed by a discussion of a paper regarding passivation by the German electrochemist Sohwabe.

Other papers dealt with subjects such as electro-dialysis, electrophoresis, thermodynamics of irreversible electrochemical processes, polyelectrolytes, electrochemistry of non-aqueous solutions and electrochemistry of colloids.

Special full-day discussions were held on the following subjects in supplementary meetings arranged on the two days following the seminar :

(1) " Electric Double Layer " initiated by Dr. M. A. V. Devanathan

(2) " Application of Statistical Mechanics for obtaining the Thermodynamic properties of concentrated solutions of strong electrolytes " initiated by Prof. S. N. Bagchi.



# Statement Showing Raisings and Despatches of Coal in India during 1958 & 1959

| | Raisings 1958 (in tons) | 1959 (in tons) |
|---|---|---|
| January | 39,47,427 | 40,86,019 |
| February | 37,12,113 | 39,38,963 |
| March | 37,00,990 | 39,57,110 |
| April | 38,01,657 | 39,83,965 |
| May | 38,83,822 | 40,14,683 |
| June | 35,54,419 | 38,14,752 |
| July | 37,49,030 | 38,59,738 |
| August | 35,38,972 | 37,50,390 |
| September | 38,48,186 | 39,36,442 |
| October | 37,46,601 | 36,07,595 |
| November | 36,87,722 | 37,86,753 |
| December | 41,48,752 | 42,94,639 |
| Total : | 4,53,19,691 | 4,70,31,049 |

| | Despatches 1958 (in tons) | 1959 (in tons) |
|---|---|---|
| January | 33,25,642 | 34,35,849 |
| February | 30,62,660 | 31,12,271 |
| March | 33,53,638 | 34,85,544 |
| April | 34,32,528 | 35,28,802 |
| May | 33,73,611 | 33,96,212 |
| June | 31,06,367 | 33,55,692 |
| July | 33,67,971 | 35,93,976 |
| August | 34,77,605 | 36,08,720 |
| September | 34,74,966 | 35,84,241 |
| October | 34,73,875 | 34,25,960 |
| November | 33,72,507 | 34,66,810 |
| December | 35,05,890 | 34,93,068 |
| Total : | 4,03,28,260 | 4,14,87,145 |

*Comparative Statement of Raisings between the Private and Public Sectors in Coal Industry*

| Period | Private Sector | Public Sector | Total |
|---|---|---|---|
| 1952 | 33,022,877 | 3,278,988 | 36,301,865 |
| 1953 | 32,839,799 | 3,139,368 | 35,979,167 |
| 1954 | 33,808,071 | 2,984,520 | 36,792,591 |
| 1955 | 35,357,305 | 2,858,412 | 38,215,717 |
| 1956 | 36,443,041 | 2,990,755 | 39,433,796 |
| 1957 | 40,117,193 | 3,386,878 | 43,504,071 |
| 1958 | 41,660,339 | 3,659,352 | 45,319,691 |
| 1959 | 42,541,881 | 4,489,168 | 47,031,049 |

*Allotment and Loading*

Comparative Daily Average Wagon Loading by Eastern and South Eastern Railways in 1958 & 1959.

| | E. Rly. 1958 | E. Rly. 1959 | S. E. Rly. 1958 | S. E. Rly. 1959 | Total 1958 | Total 1959 |
|---|---|---|---|---|---|---|
| January | 2,808 | 3,017 | 908 | 866 | 3,716 | 3,883 |
| February | 2,829 | 3,040 | 884 | 842 | 3,713 | 3,882 |
| March | 2,911 | 3,161 | 894 | 891 | 3,805 | 4,052 |
| April | 3,052 | 3,247 | 966 | 867 | 4,018 | 4,114 |
| May | 3,022 | 2,952 | 821 | 890 | 3,843 | 3,842 |
| June | 2,830 | 2,944 | 855 | 922 | 3,685 | 3,866 |
| July | 2,974 | 3,241 | 927 | 990 | 3,901 | 4,231 |
| August | 3,147 | 3,349 | 954 | 893 | 4,101 | 4,242 |
| September | 3,213 | 3,421 | 963 | 923 | 4,176 | 4,344 |
| October | 3,115 | 3,057 | 945 | 778 | 4,060 | 3,835 |
| November | 3,066 | 3,203 | 918 | 777 | 3,984 | 3,980 |
| December | 3,085 | 3,042 | 831 | 848 | 3,916 | 3,890 |
| Average for the Year | 3,004 | 3,139 | 906 | 874 | 3,910 | 4,013 |

*Average Daily Allotment and Loading of Coal Wagons in West Bengal and Bihar Coalfields*

| Year | Allotment | Loading |
|---|---|---|
| 1952 | 3,163 | 3,163 |
| 1953 | 3,100 | 3,111 |
| 1954 | 3,237 | 3,205 |
| 1955 | 3,254 | 3,262 |
| 1956 | 3,456 | 3,405 |
| 1957 | 3,696 | 3,667 |
| 1958 | 3,934 | 3,910 |
| 1959 | 4,039 | 4,013 |

*Statement Showing Fieldwise Raisings, Despatches and Stocks of Coal (Quantities in tons)*

*I. Raisings :*

| *Names of Fields* | 1957 | 1958 | 1959 |
|---|---|---|---|
| Andhra | 19,19,492 | 21,16,560 | 22,30,074 |
| Assam | 5,79,416 | 5,45,8[illegible] | 6,43,129 |
| Darjeeling | 37,332 | 29,312 | 5,912 |
| West Bengal | 1,36,37,016 | 1,42,16,308 | 1,49,52,819 |
| Bihar | 2,11,05,277 | 2,18,14,376 | 2,23,50,424 |
| Bombay | 6,24,398 | 6,60,650 | 6,73,203 |
| Orissa | 5,32,353 | 5,33,601 | 6,09,542 |
| Madhya Pradesh | 50,51,239 | 53,90,510 | 55,41,519 |
| Rajasthan | 17,546 | 12,262 | 24,427 |
| Madras | 2 | 300 | -- |
| Total : | 4,35,04,071 | 4,53,19,691 | 4,70,31,049 |

*II. Despatches :*

| *Names of Fields* | 1957 | 1958 | 1959 |
|---|---|---|---|
| Andhra | 18,14,462 | 20,08,674 | 21,44,465 |
| Assam | 5,16,035 | 5,35,063 | 5,83,362 |
| Darjeeling | 30,987 | 22,189 | 12,097 |
| West Bengal | 1,25,17,154 | 1,33,62,614 | 1,40,94,914 |
| Bihar | 1,69,10,921 | 1,80,62,716 | 1,81,11,375 |
| Bombay | 5,88,409 | 6,35,086 | 6,70,407 |
| Orissa | 4,96,399 | 4,99,024 | 5,72,569 |
| Madhya Pradesh | 47,94,659 | 51,92,412 | 52,76,208 |
| Rajasthan | 16,965 | 10,482 | 21,448 |
| Madras | 4 | — | 300 |
| Total : | 3,76,85,995 | 4,03,28,260 | 4,14,87,145 |

III. Comparative Statement Showing Stocks of Coal as on 1957,1958 and 1959.

| *Names of Fields* | 1957 | 1958 | 1959 |
|---|---|---|---|
| Andhra | 35,532 | 38,126 | 44,020 |
| Assam | 22,690 | 30,722 | 35,381 |
| Darjeeling | 3,691 | 8,866 | 6,705 |
| West Bengal | 6,62,381 | 6,39,039 | 5,53,261 |
| Bihar | 24,21,266 | 19,30,508 | 19,05,240 |
| Bombay | 17,365 | 22,728 | 2,222 |
| Orissa | 6,023 | 5,364 | 11,857 |
| Madhya Pradesh | 1,09,756 | 87,657 | 1,24,803 |
| Rajasthan | 82 | 906 | 2,599 |
| Madras | — | 300 | — |
| Total : | 32,78,786 | 27,64,216 | 26,86,088 |



GRADEWISE RAISINGS IN WEST BENGAL AND BIHAR COALFIELDS ( 1955—1959 )

| Grade : | West Bengal | | | | | Bihar | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1955 | 1956 | 1957 | 1958 | 1959 | 1955 | 1956 | 1957 | 1958 | 1959 |
| Selected 'A' | 49,19,866 | 46,86,845 | 57,59,141 | 55,66,487 | 57,18,719 | 22,48,582 | 21,39,403 | 18,43,832 | 18,69,790 | 16,08,634 |
| Selected 'B' | 40,90,424 | 41,95,608 | 47,39,493 | 49,78,453 | 51,32,103 | 61,91,657 | 62,00,593 | 62,33,771 | 62,04,440 | 57,01,720 |
| Grade I | 18,43,540 | 18,93,869 | 25,21,477 | 28,14,045 | 32,27,049 | 44,65,803 | 50,93,568 | 59,66,367 | 63,35,244 | 77,25,127 |
| Grade II | 4,62,895 | 4,23,721 | 5,00,076 | 6,62,018 | 6,97,299 | 49,74,893 | 48,73,858 | 49,86,191 | 50,85,946 | 49,85,429 |
| Grade IIIA | 6,463 | 13,976 | 28,331 | 60,831 | 65,672 | 6,93,724 | 7,13,557 | 6,93,546 | 7,70,682 | 8,63,129 |
| Grade IIIB | 20,196 | 45,914 | 88,498 | 87,698 | 66,108 | 8,60,455 | 10,69,399 | 13,81,570 | 15,23,194 | 13,93,031 |
| Non-Grading | — | — | — | 46,776 | 45,869 | — | — | — | 25,080 | 73,354 |
| Total | 1,13,43,384 | 1,12,59,933 | 1,36,37,016 | 1,42,16,308 | 1,49,52,819 | 1,94,35,114 | 2,00,90,378 | 2,11,05,277 | 2,18,14,376 | 2,23,50,424 |

GRADEWISE DESPATCHES FROM WEST BENGAL AND BIHAR COALFIELDS (1955—1959)

| Grade : | West Bengal | | | | | Bihar | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1955 | 1956 | 1957 | 1958 | 1959 | 1955 | 1956 | 1957 | 1958 | 1959 |
| Selected 'A' | 48,96,707 | 45,77,748 | 55,95,465 | 55,08,819 | 56,58,418 | 21,06,458 | 19,28,574 | 16,89,003 | 17,00,900 | 15,42,908 |
| Selected 'B' | 38,27,708 | 40,98,207 | 44,70,723 | 48,03,780 | 49,07,348 | 59,46,934 | 60,61,641 | 59,66,735 | 60,44,973 | 54,58,269 |
| Grade I | 14,99,801 | 17,94,854 | 21,39,962 | 25,91,634 | 30,34,608 | 41,37,912 | 49,14,154 | 55,18,444 | 58,68,945 | 70,86,597 |
| Grade II | 2,35,297 | 2,94,687 | 2,91,722 | 4,27,112 | 4,58,172 | 27,55,847 | 28,88,212 | 29,10,750 | 34,43,210 | 31,03,928 |
| Grade IIIA | 1,769 | 4,073 | 6,975 | 10,597 | 7,934 | 1,73,206 | 2,38,911 | 2,23,080 | 2,99,021 | 2,90,718 |
| Grade IIIB | 7,825 | 11,106 | 12,307 | 20,672 | 28,434 | 2,18,784 | 3,96,154 | 6,02,909 | 7,05,592 | 6,28,955 |
| Non-Grading | — | — | — | — | — | — | — | — | 75 | — |
| Total | 1,04,69,107 | 1,07,80,675 | 1,25,17,154 | 1,33,62,614 | 1,40,94,91[illegible] | 9,141 | 1,65,27,646 | 1,69,10,921 | 1,80,62,716 | 1,81,11,375 |

GRADEWISE RAISINGS, DESPATCHES AND STOCKS OF COAL IN WEST BENGAL AND BIHAR FIELDS DURING THE YEAR 1959

| Grade : | Raisings : | | Despatches : | | Stocks : | |
|---|---|---|---|---|---|---|
| | West Bengal | Bihar | West Bengal | Bihar | West Bengal | Bihar |
| Selected 'A' .. | 57,18,719 | 16,08,634 | 56,58,418 | 15,42,908 | 99,233 | 49,311 |
| Selected 'B' .. | 51,32,103 | 57,01,720 | 49,07,348 | 54,58,269 | 1,01,292 | 1,31,849 |
| Grade I .. | 32,27,049 | 77,25,127 | 30,34,608 | 70,86,597 | 1,88,742 | 3,87,714 |
| Grade II .. | 6,97,299 | 49,85,429 | 4,58,172 | 31,03,928 | 1,42 211 | 6,61,749 |
| Grade IIIA .. | 65,672 | 8,63,129 | 7,934 | 2,90,718 | 5,473 | 1,72,425 |
| Grade IIIB .. | 66,108 | 13,93,031 | 28,434 | 6,28,955 | 15,240 | 4,75,611 |
| Non-Grading .. | 45,869 | 73,354 | — | — | 1,070 | 26,581 |
| Total .. | 1,49,52,819 | 2,23,50,424 | 1,40,94,914 | 1,81,11,375 | 5,53,261 | 19,05,240 |





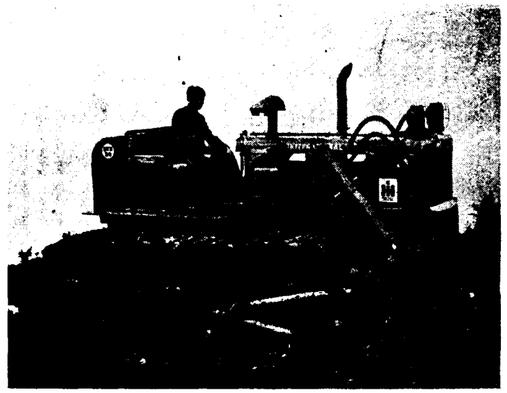
# Rolls-Royce Diesels in Earthmoving Equipment

FEW other fields present the opportunities afforded by earthmoving for operators to take full advantage of the benefits of Rolls-Royce rationalisation.

Rationalisation permits the use of common components throughout the complete range of 4, 6 and 8 cylinder, normally aspirated, supercharged and turbo-charged diesel engines, with power outputs from 60 to 700 b. h. p.; thus an operator using a wide range of equipment can, by standardising on Rolls-Royce diesel engines, reduce his spares holdings to an absolute minimum, at the same time costly down-time awaiting the arrival of missing spares is eliminated.

By concentrating their production on this simplified range of engines and components, Rolls-Royce produce the highest quality engines and spares at competitive prices, while the exceptional fuel economy of the engines and their sustained power, together with traditional Rolls-Royce reliability, mean greater profitability. On jobs where down-time can mean the difference between profit and loss, more and more contractors are turning to Rolls-Royce diesels because they know they can rely on these sturdy performance proved engines.

The range has been designed to enable the user to take advantage of an almost limitless field of application, provision having been made for driving a variety of both main and auxiliary components. Every engine is able to transmit full power from either end of its crankshaft and can be supplied with various mountings, different size flywheels and flywheel housings, inlet and exhaust manifold arrangements, different positioning of oil sumps and gear-cases, various types of starter motors and a variety of sizes and types of generators, air cleaners and heaters, exhaust mufflers and other accessories.



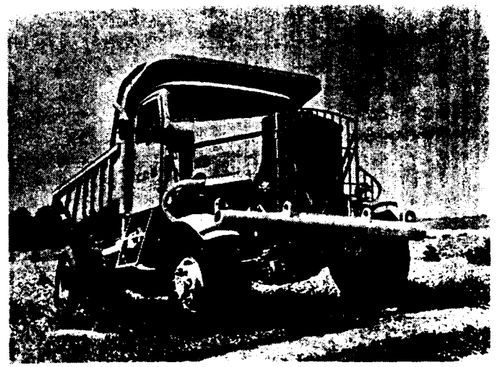
Rolls-Royce diesels are at work in more than 250 different applications and are standard in such equipment as Euclid, Foden and Aveling Barford dumpers : Petbow generators ; Broom & Wade, Consolidated Pneumatic, Air Pumps and Holman compressors ; N. C. K. and Lima excavators ; International Harvester and Vickers crawler tractors and Scammel mountaineers.

## ECONOMY

By the adoption of a direct injection, open chamber, 4-stroke combustion system of advanced design, Rolls-Royce have achieved high thermal efficiency and extremely low specific fuel consumption. Still further economies accrue from long service life between overhauls and from the interchangeability of the majority of parts on all engines in the range, which reduces spare parts holdings to a minimum.

## LONG LIFF

Rolls-Royce diesels were designed from the outset as pressure charged units ; they are not adaptations



*Scammel "Mountaineer" Truck fitted with a Model C6. N.F.L. Series 121 C Engine. Operating at 160 b.h.p. @ 2100 r p.m.*

of normally aspirated engines. All parts are therefore designed to withstand the loads imposed by pressure charging, and as a result, long life is inherent in these robust engines, which are built from high quality materials with superior workmanship, under carefully controlled inspection. This quality is maintained at competitive prices by quantity production resulting from interchangeable parts for all engines.

## HIGH POWER/WEIGHT RATIO

Their unequalled experience in light-weight reciprocating engine design has enabled Rolls-Royce to produce diesel engines which, while being light in weight and compact for the power they develop, are also simple in design and easy to transport, install and service.

Servicing has been made as simple as possible by the choice of an orthodox design which includes wet liners, replaceable thin walled bearing shells, standard fuel injection and electrical equipment, and the incorporation of American unified screw threads. The lubricating fuel and induction systems are fully protected by filters of such generous capacity that a new high standard has been set for the industry. In addition, built-in centrifugal sludge traps are incorporated in the lubrication system.

## RELIABILITY

Careful engineering, high quality materials and workmanship, meticulous attention to detail, and at least five hours of production running-in and dynamometer testing for each and every engine, have resulted in a high degree of dependability, with engine performance remaining constant throughout the life of the engine. Engines can be started without any special aids at 14 deg. F. and with normal aids at—65 deg. F., whilst at the other extreme of temperatures their high thermal efficiency and the built-in oil/coolant heat exchanger ensures optimum service under tropical conditions.

## PERFORMANCE PROVED

In Canada, an engine stripped for examination after seven thousand three hundred hours of continuous operation in a dump truck showed negligible wear

*Vickers VIGOR tractors, with direct drive, operating Vickers Onions Model 12-16 scrapers push-loaded by VIGOR tractors with Torque Converter drive.*

of major components. Torque and horsepower were still within the two and a half per cent limits for a new engine, while fuel consumption was considerably below the published figures. A similar engine with over eight thousand hours service was reconditioned at a component cost of only seventy-six pounds.

On major earthmoving projects throughout the world, contractors are achieving greater profitability from the rugged strength and high quality workmanship of the 60—700 b. h. p. range of Rolls-Royce diesels which are giving greater reliability and operational economy that tough work such as this demands.

# PROBLEMS OF COKING COAL

By

N. N. Das Gupta, M. V. P. Menon & N. N. Chatterjee

Central Fuel Research Institute, Jealgora

*[It is regretted the illustrations mentioned in this article have not been printed owing to the non-availability of the process blocks in time.*—EDITOR]

THE present per capita consumption of steel in India is appallingly low compared to most industrialised countries of the world. In planning for her future the country has therefore justifiably laid emphasis on increasing her iron and steel production.

The extraction of iron from its ores, the conversion of iron into steel and its subsequent processing into a variety of structural and other engineering materials require the use of fuel in some form or other. By far the most important fuel in a steel works is the coke required to the extent of about a ton for every ton of pig iron produced in the blast furnace. Out of the total coal utilized in the iron and steel industry roughly about 70% is consumed for coking.

The conventional carbonization practice in modern large ovens in all countries still demands certain essential qualities in the coals in order that hard coke may be produced from them. Though fortunate in having fairly large reserves of high grade iron ore and lime-stone, the country's resources of superior grades of coking coals are rather meagure and these coals occur only in the upper seams of the Jharia coalfield which has so far largely met the requirement of the carbonizing industries.

It was soon realised that supplies in future would have to be drawn from sources of coals of non-standard qualities both in respect of purity and coking characteristics. Beneficiation of some of these coals and adoption of some form of blending is imperative to maintain the supply of coal of required quality to the steel Industries.

Though the reduction of ash in coals consequent on washing makes it possible to utilize high ash, good coking coals for coking, the reserves of this class of coals are also by no means large. On the other hand, blending of coals enables the use of substantial proportions of coals of the non-coking or inferior coking types in admixture with prime coking coa's. The practice of washing in conjunction with blending thus goes a long way in stretching the reserves of true coking coals and therefore deserves to be pursued with even greater seriousness than in the past.

The occurrence of coking coals in a restricted area has hitherto proved an insurmountable handicap for locating steel plants on a regional basis. As a result of strenuous efforts directed towards the solution of the country's coal problem, it has however been possible to overcome this barrier and establish steel plants even in areas deficient in good coking coals.

The paper discusses some of the aspects of the investigations carried out in the C. F. R. I. towards the objective of conserving reserves of metallurgical coals.

## PRODUCTION AND CONSUMPTION OF STEEL

The production of crude steel in million tons in the year 1953 and the per capita consumption of ingot steel in kilogram in the year 1955 in different countries of the world are shown in Figs. 1 and 2 respectively[1].

It is apparent that, for an Indian population of 390 million, the per capita consumption of 5 kg. of steel is indeed a poor contrast and stresses the magnitude of the task lying ahead for India in her efforts to rank amongst the other industrially developed countries of the world.

## RESERVES AND DEMAND OF COKING COALS

Various conflicting estimates of coal reserves have been made from time to time since 1930. According to an estimate made by the Metallurgical Coal

Conservation Committee in 1951 the reserves of coking coal are as follows[2].

TABLE 1

RESERVES OF COKING COAL

| In Situ Reserves : | Million tons |
|---|---|
| (a) Parent coking coal | |
| Virgin areas—Selected 'A' and Sel. 'B' | 329.6 |
| Working Collieries | |
| Sel. 'A' | 404.0 |
| Sel. 'B' | 577.4 |
| Total : | 1311.0 |
| (b) High Ash coking coal : | |
| Virgin areas | |
| Gr. I | 395.7 |
| Gr. II | 49.1 |
| Working collieries : | |
| Gr. I | 512.9 |
| Gr. II | 504.4 |
| Total : | 1462.1 |

TABLE 2

| | Steel plant to which coal will be supplied. |
|---|---|
| *Washeries in the Public Sector :* | |
| 1. Central Washery at Kargali | Bhilai — 30% |
| | Rourkela — 70% |
| 2. ,, ,, Dugda | Rourkela — 30% |
| | Bhilai — 70% |
| 3. ,, ,, Patheridih | IISCO |
| 4. ,, ,, Bhojudih | TISCO |
| 5. Washery at Durgapur | Durgapur |
| *Washeries in the Private Sector :* | |
| 1. Central Washery at Jamadoba | TISCO |
| 2. Washery at West Bokaro | — do — |
| 3. ,, at Lodna | IISCO |

By assuming that Gr. I and Gr. II coals can be washed with 60% recovery the total in situ reserves of coking coals were estimated as 2100 million tons of which 1600 million tons were considered as recoverable under the best mining conditions (i. e. with 80% recovery).

The target of ingot steel production envisaged in the successive Five Year Plans and the requirements of unwashed coking coal for the respective periods are shown in Fig. 3.

It is apparent that according to the estimated demand for coking coal the reserves are expected to last only about 25 years.

The alarming situation that these small reserves of coking coals eventually creates in the context of vast reserves of good grades of extractable iron ore in the country can only be faced by taking recourse to judicious washing and blending of coals.

## BENEFICIATION OF COAL BY WASHING

Chiefly based on the findings of the C. F. R. I., three washeries were installed some years back in the private sector as shown in Table 2. The washing plant at Kargali, the first of its kind installed in the public sector is now supplying the major part of the coking coal requirements of the Rourkela and Bhilai Steel Projects. A washing plant has lately been commissioned at Durgapur for washing the coking coal supplies from the Jharia field to the Durgapur Steel Project. The washeries at Dugda, Patherdih and Bhojudih which are under construction or are under planning are also meant for supplying coking coals to the steel plants both in the public and private sectors.

The use of washed coals for coking results in uniformity and improvement in the chemical composition and the physical properties of coke and this ultimately leads to an overall economy in the consumption of coke which is so vitally linked up with the problem of conservation of coking coal.

Experiments on the influence of the ash content of coke in blast furnace operation have shown that in general a decrease of 1 per cent ash (in coke) increases the production of pig iron by 5 per cent and decreases the coke consumption by about the same extent. With an improvement in the quality of coke (the ash and physical strength) the fuel consumption per ton of pig iron can be considerably reduced. In Japan, the



production of pig iron has been stepped up from 1100 to 1400 tons per furnace with a coke rate of 12—13 cwts/ton of pig iron using coke of 12.5 to 13% ash[3].

It is further expected that washing some of the semi-coking and poor or non-coking coals would not only produce cleaner coals with lower ash but this would render them more suitable for use in higher proportions in blends.

## BLENDS OF HIGH AND LOW VOLATILE COALS

Detailed study has been made at the C. F. R. I. of the chemical and physical properties of coals from various sources. Pilot plant and confirmatory full-scale coking tests have subsequently been made on blends of various coals and the possibility has been proved of utilizing in general 10—40% of non-coking or semi-coking coals in blends with coking coals[4].

Below are described in some details the results of an investigation which has shown the possibility of producing satisfactory coke even from binary blends of two substandard coals both of which by themselves are incapable of producing hard and strong coke of the metallurgical grade.

The high volatile, younger rank, Dishergarh seam coals of the Raniganj field when carbonized by themselves produce fissured, fingery, friable and weak cokes unsuitable for blast furnace or cupola use. It is attributed to the high fluidity of this class of coals which because of the presence of an excess of fusible material results in the formation of frothy and open textured coke of poor strength.

Some of the lower volatile, higher rank coals of the zero seam of the Jharia field also produce substandard coke due to imperfect binding of the coal particles as a result of too low fluidity of this coal.

Exploratory tests in pilot plants followed by tests in commercial ovens have shown that suitable blends of these two coals produce hard and strong coke satisfying all the requirement for metallurgical use[5].

A scientific explanation of the mechanism of coke formation from these binary blends has lately been found from experimental work in the laboratory and it has been found possible to predict with reasonable precision the optimum proportion of the high and low volatile coals that would produce the best coke from their binary blends[6].

Table 3 shows the quality of coke produced from various binary blends against the composition of the blend. It may be seen that the blend containing 70% of the high volatile Dishergarh coal gives the best results. The exact proportion of the two coals will however depend on the specific properties of the two individual coals, their grainsize etc. etc. A thorough understanding of the petrographic composition of the components of the blends and their crushing in special types of mills (for some of them selectively) appropriate for their inherent crushing characteristics and adoption of efficient blending equipment have been found to be essential to achieve the best results[7],[8].

## IMPLEMENTATION OF THE RESULTS IN INDUSTRIAL PRACTICE

The design of the coal preparation plant of the coke ovens battery of the Durgapur Industries Board owned by the Government of West Bengal (Fig. 4) has been based on the findings of researches carried out in the C. F. R. I.

The coke ovens consume a ternary blend of three distinct groups of coals for each of which there are different crushing mills suiting the characteristics of the individual coal. The primary crusher for the high volatile, Dishergarh and the medium volatile, Laikdih—Ramnagar—Chanch group of coals consists of roll crushers to reduce the size of the coal to about 50 mm. The crushed coal is next fed to a specially designed Hammer type Mill enabling controlled crushing of the essentially bright Dishergarh coal to a size of about 75—80% through 3 mm. and the medium volatile coals to a fineness of about 90% through 3 mm. without the production of much fines. The third group of low voltaile Jharia coals which has comparatively low fluidity and high ash are therefore subjected to more intensive crushing. They are initially crushed in a special type of impact Mill to a size of about 10 mm. and passed over a 3 mm. screen. The oversize fraction on 3 mm. screen is recrushed in smoothing rollers so as to make the entire material pass through 1.5 mm. of which about 60% passes through 0.6 mm. Both the recrushed (oversize) fraction and the material passing through the 3 mm. screen are led by a common conveyor belt to the blending bunker meant for the low volatile coals.

The properties of the coal used in the blend and of the resulting coke are shown in Table 4.

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TABLE 3

*Properties of Coke from Blends from High and Low Volatile Coals*

| Particulars of Blends | Dis.-90% Khas-Kusunda-10% | Dish.-80% Khas-Kusunda-20% | Dish.-70% Khas-Kusunda-30% | Dish.-60% Khas-Kusunda-40% | Dish.-50% Khas-Kusunda-50% | Standard specification (I. S. I.) |
|---|---|---|---|---|---|---|
| Physical Properties of Coke | | | | | | |
| Shatter Index on 1½" | 85.2 | 91.1 | 92.5 | 94.0 | 93.1 | ⩽85 |
| (%) on ½" | 96.2 | 97.1 | 97.8 | 97.9 | 97.2 | ⩽97 |
| Micum Test on 40 mm. | 65.7 | 74.4 | 81.3 | 80.5 | 77.3 | ⩽75 |
| (%) thr. 10 mm. | 11.9 | 12.1 | 9.8 | 11.2 | 14.7 | ⩽10-12 |
| Haven Stability Factor on 1" (%) | 28.6 | 41.9 | 52.9 | 58.9 | 57.5 | ⩽40 |

*Proximate Analysis of Coal :*

| | Moist. | Ash. | V. M. | F.C. | C. I. |
|---|---|---|---|---|---|
| Khas Kusunda 'O' seam (Low Volatile Coal) | 1.6 | 16.6 | 17.0 | 64.8 | 9 |
| Chinakuri (Dishergarh seam) (High Vol. Coal) | 2.0 | 16.2 | 36.2 | 45.6 | 24 |



TABLE 4

*Properties of coal and coke from Durgapur Coke Oven*

Blend used :

| Seam | Colliery | % of coal | Grain size % thr. 3 mm |
|---|---|---|---|
| Dishergarh | Chinakuri | (High Vol.) 30 | 80 |
| Chanch | Chanch | (Med. Vol.) 40 | 90 |
| 'Zero' | Bastacolla / Bassurya | (Low Vol.) 30 | 100 (Selectively crushed) |

*Properties of Coal*

| | Individual coals | | | | |
|---|---|---|---|---|---|
| | Chinakuri | Chanch | Bastacolla | Bassuria | Blend |
| Moist.% | 2.8 | 1.5 | 0.7 | 1.1 | — |
| Ash% | 13.0 | 16.0 | 19.7 | 19.7 | 16.2 |
| V. M.% | 36.7 | 29.3 | 20.5 | 20.8 | 28.2 |
| C. I. | 24 | 20 | 10 | 19 | 20 |

*Gieseler Plastometer Test*

| | | | | |
|---|---|---|---|---|
| Softening temp. °C | 335 | 350 | 375 | 365 |
| Temp. max. fluidity °C | 425 | 435 | 440 | 455 |
| Solidification temp °C | 465 | 470 | 480 | 490 |
| Max. fluidity dial div/min | 650 | 585 | 1.2 | 27 |
| Plastic Range °C | 53 | 54 | — | 38 |

*Ultimate Analysis*

| | | | |
|---|---|---|---|
| Carbon | 84.5 | 97.4 | 91.2 |
| Hydrogen | 5.70 | 5.24 | 4.43 |
| Sulphur | 0.37 | 0.51 | 0.45 |
| Nitrogen | 2.40 | 2.30 | 1.73 |
| C. V. (B. t. u)/lb | 15,216 | 15,330 | 15,600 |
| Phosphorus (dry basis) | 0.107 | 0.109 | 0.017 |

*Properties of coke*

Strength and Hardness of coke from Blend

| (A) Shatter Index | (B) Micum Index | (C) Haven Stability Factor |
|---|---|---|
| % on 1½"-95.0 | % on 40 mm.-78.9 | % on 1"-54.6 |
| % on ½"-98.2 | Thr. 10 mm.-11.9 | |

*Proximate Analysis*
(coke from blend)

| | | |
|---|---|---|
| Moist. % | — | 0.5 |
| Ash. % | — | 22.3 |
| V. M. % | — | 0.4 |

## NEW GENERATION OF ELECTRONIC COMPUTERS

The forerunner of a new generation of all-transistor electronic computers, produced by E. M. I. Electronics Ltd., was demonstrated recently in London. Ordered by leading commercial organisations and Government departments, it is already in quantity production. The system is capable of performing nearly half a million calculations a minute and is designed for all types of clerical work from sales and payroll accounting to stock control and production planning. It also provides management with up to the minute statistics in a fraction of the time taken by conventional methods. Known as the EMIDEC 1100 it uses 10,000 transistors, 60,000 ferrite cores, and 25,000 diodes. A high degree of flexibility has been achieved in the design, and this enables it to be used with a wide variety of input and output equipment. Standard units are so arranged that installations are capable of carrying out a wide range of jobs. Some 1,000 plug in printed circuit cards are employed and these can be quickly replaced when necessary. Any faults that might develop are automatically detected and reported by the computer itself. To meet the needs of an expanding organisation the computer has been designed to be extensible. This ensures that basic units can be extended as demands grow.

Major organisations who have already ordered this type of computer includes Glaxo Laboratories Ltd., who will be using it to carry out the clerical work associated with all their sales activities; Boots Pure Drug Co. Ltd. for merchandise accounting; and I.C.I. (Plastics Division) for sales, purchases and cost accounting. British European Airways are turning to electronic data processing to aid them in their complicated ticket and traffic accounting, whilst Kodak will employ the computer on its sales and production side.

*** *** ***

A rotating table which feeds components to the cutters in quick succession enabling unusually high production to be obtained from a continuous milling machine, is to be featured, by Adcock and Shipley, of Leicester, at the International Machine Tool Exhibition in London, June 25—July 8. Components are loaded in one position and the feed table, which is continuously rotating, carries them round to the milling cutters. Since loading is being carried out at the same time as machining, the operating cycle is governed only by milling time or loading time, whichever is the longer. Where the size of components demands large gaps between fixtures the speed of the table traverse can be increased.

The 26-in. diameter rotary table has eight radial tee slots on to which various types of hand operated, mechanically operated, hydraulically operated or pneumatically operated fixtures can be fitted. Adjustable stops are incorporated to trip the automatic feed at any desired position. Vertical and horizontal adjustments are effected through screw and nut systems which include micrometer dials. In addition to dealing with radiused surfaces the machine can also be used for straddle milling, face milling, side and face milling, slotting, and milling with form tools. For high speed operations, producing a considerable volume of swarf, vacuum units can be attached.

Compact in size, the machine occupies an area of 57 in. × 89½ in. and is 76 in. high. It is equipped with a 3 h. p. motor driving a taper spindle which runs in three spindle bearings. The standard speed range gives eight speeds from 45 to 1,100 r. p. m., but the machine can be fitted with special high speed heads for milling light alloys and heavy duty heads for slower spindle speeds.

Where it is required to mill radii, these can be produced from zero to 16 in. and, by use of a swivelling head, concave or convex spherical surfaces are also obtainable.

*** *** ***

Many of the U. K. Atomic Energy Authority's research and production laboratories have installed considerable numbers of vacuum valves using expendable metal or non-metallic seals. The existing types of metal seals, however, have a very short operational life involving a lot of maintenance, while non-metallic seals cannot be used at high temperatures.

To get round these failings, technicians at the U. K. A. E. A. centre at Harwell have developed a sealing system which provides a new metal seal at each closure to give an efficient vacuum over a much longer life. It consists of a deformable metal valve seat washer which, by plastic flow, forms a seal through pressure from a flange on the nose portion of the valve. When the nose portion is withdrawn, its flange forces the washer to a position similar to its original position in the valve seat.



# BRNO TRADE FAIR 1960 SUPPLEMENT

## INTERNATIONAL TRADE FAIRS IN CZECHOSLOVAKIA

By General Manager
BRNO Fair Administration, BRNO, Czechoslovakia

FOREIGN trade is one of the most important sectors of Czechoslovak economic life. Czechoslovakia is a highly industrialized country, but with an insufficient raw material basis and additional requirements of food. These needs must be covered by imports in exchange for exports of industrial products.

Foreign trade, therefore, and the requirements of its steady and balanced development receive universal care and attention. Reference to statistical data will show that the volume of foreign trade has doubled since 1948. Total turnover in 1958 was 20.7 milliard crowns against 10.3 milliard crowns in 1948. This increase is expected to continue during the coming years as well; while in the course of the preceding ten years turnover has grown by 10 milliards, the next ten-milliard rise will be effected in a much shorter time.

The changes which have taken place in Czechoslovak foreign trade in comparison with the pre-war period, are characterized by two key developments. In the first place, the territorial structure has altered, since over two thirds of foreign trade volume now go to the Soviet Union and the countries of People's Democracy. On the other hand, however, the total volume is rising steadily and there is a significant increase in trade with the other states as well, primarily those with less developed economies.

The second significant change as against the pre-war period concerns the commodity structure of foreign trade. While before the war, consumer goods were a primary export item, a considerable part of the present foreign trade volume is contributed by machinery and products of the engineering industry. These commodities also constitute a prime feature of the renewed Czechoslovak Trade Fairs. The first Fair was held in September, 1959, in Brno, the second largest city of Czechoslovakia, and was a decisive success from the very first.

The Brno Trade Fair in 1959 was attended by exhibitors from altogether thirty countries from Europe as well as overseas. Visitors totalled almost two and a half million, 13,500 of which were foreign visitors from 44 countries. Business done at the Fair by the foreign trade corporations of Czechoslovakia alone, amounted to four milliard crowns, that is one-fifth of the annual total volume of Czechoslovak foreign trade.

The Brno Trade Fair will be held for a second time from September 11 to 25, 1960, and its exhibits will again comprise products of the engineering and metallurgical industries, as well as raw materials and semi-finished products related to these industrial sectors. The exhibits will be shown on an area of 65,000 sq. metres of roofed-in pavilions, and 60,000 sq.metres of open-air space. Improved exhibition facilities against 1959 will include a new ten-storey

# FIRST BRNO INTERNATIONAL TRADE FAIR—1959

By A Special Correspondent

*Attendance*

ON September 20, 1959 the International Trade Fair in Brno came to its close. During the two weeks of its duration the Trade Fair was visited by 2,400,000 persons of whom approximately 15,000 were visitors from abroad. The Brno Trade Fair was attended by 1,500 Czechoslovak and foreign journalists.

*Exhibitors*

Firms from 30 countries exhibited their products at the Trade Fair. Of these the following had official expositions: USSR, Poland, German Democratic Republic, China, Hungary, Bulgaria, Rumania, Federal German Republic, Austria, Yugoslavia, Netherlands, Canada, India, Argentina, Iraq, Tunisia.

Major exhibitors from the socialist countries: USSR, Poland, German Democratic Republic, China, Hungary, Bulgaria, Rumania.

Major exhibitors from the western countries: Federal German Republic, France, Austria, Switzerland, Sweden, Great Britain, Italy, Yugoslavia, Netherlands, Belgium, Denmark, Canada, Spain, India, Argentina, Iraq, Lichtenstein, Tunisia, Japan, Finland, Norway, Portugal.

*Commercial Effect*

During the Trade Fair the contracts concluded between Czechoslovak foreign trade corporations and commercial representatives from 60 countries totalled

Kcs 3,914,156,000

export contracts amounting to Kcs 2,106,251,000, i. e. 53.8%

import contracts amounting to Kcs 1,807,905,000, i. e. 46.2%

However, on the closing date for this issue the exact figure was still unknown, since some transactions

*(Continued from page B.F.3)*

extended by yet further countries and large firms, and that several of last year's exhibitors wish to expand their stands. The Brno Trade Fair also offered an occasion to discuss possibilities of long-term arrangements of mutual exchange of goods with delegations from several countries.

An important aspect of last year's Trade Fair, and one which will this year be maintained, were the technical conferences and international symposia, which offered a meeting place to those who are the creators of technical advance as an instrument of social progress, as well as to those who are responsible for the marketing and economic utilization of technical achievements. Not the least important role of the Brno Trade Fair is to facilitate these significant meetings. Outstanding inventors, designers, scientists, and economists make use of these international gatherings at Brno to work for a solution of those scientific, technical and economic problems which still puzzle the laboratories and drawing offices of the world. The material and experiences which are the fruit of these events cannot be appreciated highly enough. The 1960 International Trade Fair in Brno will dispose of 65,000 sq. m. covered exhibition area in pavilions and exhibition halls, and of 60,000 sq. m. open air grounds.

Czechoslovak foreign trade corporations will take up less than 30,000 sq. m. of pavilion space, while more than 35,000 sq. m. will be distributed among exhibitors from abroad. Information at present available shows that the figure of 30 states which participated in the 1959 Trade Fair, will be exceeded.

The Brno International Trade Fair renders an important contribution to the expansion of international trade, and represents an active contribution by Czechoslovakia to the peaceful co-existence of all countries irrespective of their economic systems. It points the way towards the expansion of exchange of goods on the principle of mutual equality and mutual advantage, towards co-operation among the nations.

were concluded in Praha during the week following the Fair.

Commercial transactions concluded by exhibitors with other than Czechoslovak partners are, however, not included in the figure of Kcs 3,914,156,000. All interesting exhibits were purchased from the majority of exhibitors already during the Trade Fair.

In view of the commercial results achieved and the number of foreign businessmen who attended the Fair the International Trade Fair of Brno already surpasses many trade fairs of a considerably longer tradition.

*Some Selected Import Transactions Concluded on the Occasion of the International Trade Fair in Brno*

| Commodity | Country | Millions of Czech. Crowns at agreed price level |
|---|---|---|
| Cork | Portugal | 7.2 |
| Watches | GDR | 7.3 |
| Equipment for remote control and metering | GFR | 1.3 |
| Counters | GFR | 1.6 |
| Optical instruments | GDR | 2.3 |
| Non-ferrous metals | USSR | 152.0 |
| Copper | Great Britain | 1.4 |
| Nickel | Great Britain | 7.2 |
| Fine sheets | Austria | 10.0 |
| Tungsten | China | 36.5 |
| Passenger cars | Great Britain | 4.1 |
| Passenger cars and tractors | USSR | 58.0 |
| Agricultural machines | Hungary | 76.0 |
| Aniline dyes | Switzerland | 3.2 |
| Crude oil | USSR | 402.0 |
| Crude oil, asphalts | Rumania | 16.6 |
| Television tubes | Netherlands | 2.2 |
| Machine tools | Switzerland | 4.6 |
| Diffusers for sugar mills | GFR | 7.0 |
| Machines for food industry | GDR | 2.3 |
| Melioration machines | Great Britain | 1.1 |
| Ropes | China | 2.1 |
| Blooms | GFR | 12.0 |
| Offset machines | Great Britain | 1.9 |
| Passenger cars | Belgium | 16.0 |
| | USA | 11.0 |
| | GFR | 8.0 |
| | Portugal | 3.7 |
| | USSR | 21.8 |
| Motorcycles | Finland | 1.8 |
| | Rumania | 2.0 |
| Tractors | Poland | 28.4 |
| Tractors, agricultural machines | Hungary | 15.6 |
| Machine tools | USSR | 46.0 |
| | India | 4.7 |
| | Great Britain | 5.0 |
| | USA | 2.1 |
| Mobile steam power stations | China | 12.6 |
| Spare parts for steam power stations | India | 1.1 |
| Small complete plants | India | 1.2 |
| Machines for production of springs | Iraq | 1.3 |

*Negotiations of West-European Firms at the Brno International Trade Fair*

The First international Trade Fair in Brno was a good opportunity for the search of new ways and means enabling further expansion of exchange of goods, primarily of engineering character, between Czechoslovak foreign trade corporations and various firms of Western Europe. Firms, for whom Czechoslovakia has always represented an interesting market, such as, for example, ACEC, FIAT, RIV, RENAULT, PHILIPS etc., availed themselves of the occasion of the International Trade Fair and found interesting types of merchandise, either through the intermediary of TRANSAKTA or by direct contacts, which they will buy on a larger scale than has been the case hitherto. For the purpose of providing the

two parties concerned with a certain perspective for the future, the basic items of the envisaged exchange of goods were either agreed upon in general terms, or such agreements are being negotiated. Italian firms are a good example in this respect by their making every effort to establish truly mutual commercial relations by increased purchases of Czechoslovak products. It may, therefore, be reasonably expected that mutual exchange of goods between Czechoslovakia and Italy will thus continue to show an upward trend.

*Interesting Contract Between the USSR and UK*

Mr. Gubanov, President of Technopromimport, negotiated with representatives of Messrs. Platt Brothers & Company of London the purchase of textile machinery for the USSR. Their successful negotiations resulted in Mr. Gubanov's signing at Brno a contract with Mr. Smith, representative of the abovementioned company, for textile machinery of a value of Kcs 9 million.

*Shell International Chemical Company and TRANSAKTA*

The Brno International Trade Fair enabled representatives of supplying firms to acquire first-hand knowledge on the steadily growing commercial possibilities in Czechoslovakia. Representatives of the Shell International Chemical Company of Great Britain, who visited Brno have established contacts with all appropriate quarters concerned with imports to Czechoslovakia. The International Trade Fair thus provided a very good opportunity for concrete commercial discussions making it possible for representatives of this company to achieve much better results during a very short time than could have been the case under other circumstances.

Representatives of the Shell Company expect that through the intermediary of TRANSAKTA, with whom they agreed on cooperation, an increase in their turnover in Czechoslovakia will be made possible.

*Presidents of Italian Concerns at the Trade Fair*

During the Brno International Trade Fair Mr. Roman Kubicek, commercial director of the Fair, held discussions with Mr. Aldo Fascetti, president of IRI, Mr. Vignuzzi, president of Finmecanica, and Professor Manuelli, president of Finsider. These discussions were primarily directed at finding new ways and possibilities of a substantial expansion of mutual trade between this country and Italy. The above named gentlemen were recommended to send a group of experts who would visit Czechoslovak plants and thus obtain first-hand information about the possibilities of Czechoslovak export, and study the possibilities of purchases. All three gentlemen expressed their admiration of the exhibition grounds as well as technical standard of exhibits. They were impressed by the high technical standard and finish of Czechoslovak machine tools. They contemplate seriously to participate in next year's trade fair with a large exposition in an independent pavilion.

*Scandinavian Countries Interested in Czechoslovak Diesel Engines*

Representatives of Norwegian industrial circles showed interest in the possibility of licensed production of Czechoslovak engines of SKODA and SLAVIA trade marks. Advantageous commercial contracts will also be concluded with representatives of Sudan and Vietnam as a result of talks held in Brno.

*Representatives of Socialist Countries at the Brno International Trade Fair*

On the occasion of negotiations held on the multilateral clearing agreement, representatives of the Council of Mutual Economic Aid visited the International Trade Fair in Brno. They were favourably impressed both by the quality of exhibits, as well as by the Trade Fair's organization.

*The French Plan Larger Participation in 1960*

During the discussions held between representatives of the Czechoslovak Chamber of Commerce and the president of the Czechoslovak-French Chamber of Commerce M. Pisson and its secretary M. Curti, the two gentlemen expressed their appreciation of the services rendered by the International Trade Fair to French exhibitors. According to a statement made by M. Pisson, France is likely to participate with a collective exposition in the 1960 Trade Fair.

*USA Interested in Participation in the 1960 Trade Fair*

The USA contemplates to participate in the International Trade Fair in Brno in 1960. It is assumed that American exhibitors will display products of high technical standard which may be of interest to the Czechoslovak engineering industry.

# ASPECTS OF INDO-CZECH CO-OPERATION

By Jaroslav Jauris

ON January 26, 1960, India celebrated her tenth anniversary as a Republic. The year 1960 is for Czechoslovakia, too, a year of rejoicing for on May 9, Czechoslovakia celebrates 15 years of her liberation by the Soviet Army from Nazi occupation.

The people of Czechoslovakia will always remember with gratitude India's condemnation as expressed by Mr. Jawaharlal Nehru, in 1938 of the betrayal by the Western Powers of Czechoslovakia to Nazi expansionism.

The sympathy and interest of the people of Czechoslovakia for India have their roots in the past. The people of Czechoslovakia, whose longing for freedom and esteem for other nations was fostered by the long and victoriously completed struggle for their own national existence, followed with admiration the century-old fight of India for independence.

## CULTURE SPREADS

After the liberation of Czechoslovakia culture was no longer exclusive; its impact was felt by the masses; the people were not merely passive observers but took an active part in the creation of cultural values. Some results of this transformation of the cultural life of Czechoslovakia were also seen by the Indian public.

At the end of 1959, the Indian public heard concerts by the Czech Philharmonic Orchestra which were preceded at the beginning of the same year of outstanding concerts by a number of artists from Czechoslovakia. Towards the end of 1959 the Czechoslovakia State Circus visited Calcutta and later Bombay. Early last year the Indian public had the opportunity of seeing performances by the Czechoslovak puppet theatre "Radost" (Joy) and some will probably still remember the concerts given in India in 1958 by "SLUK" a Czechoslovak collection of folk songs and dances.

In the past 15 years on the other hand, a number of outstanding Indian artists have toured Czechoslovakia. Among them are Taru Chaudhuri, the dancer, Sitaru Devi, Gopinah, Vyjayanthimala, the group of young dancers from Santiniketan, and a group performing Manipuri dances.

Czechoslovakia is making great preparations for the celebration of the hundredth anniversary of the birth of Rabindranath Tagore. These are being supervised by a special committee appointed by the Government. Almost all Tagore's works have been translated into Czech and all new editions are always very quickly sold out.

An important milestone in the cultural relations between free India and Czechoslovakia was the conclusion of a cultural agreement on February 10 this year which will surely lead to further contacts, extending to the field of art, films, and the theatre.

Further co-operation between both countries has developed in the economic field too. Industrial expansion in Czechoslovakia in the postwar years was seen in the development for her foreign trade. As for trade relations one of Czechoslovakia's most important business partners among the countries of South-East Asia is India.

## INDUSTRIALISATION

In the development of the Indian economy Czechoslovakia is proud to play a part especially in the sphere of industrialisation.

In 1957, Czechoslovakia supplied India with 50 steam locomotives and 2,050 railway trucks. The same year a cane-sugar factory in Panipat in the State of Punjab was set in operation; in 1958 another sugar factory was established in Dergaon in the State of Assam and at present a third one is under construction in Madurantakam in the State of Madras.

Czechoslovakia is not only a source of up-to-date machinery equipment but also of technical assistance. With the delivery of some machines, Czechoslovakia is participating also in the electrification of India; it has helped put into operation the steam power plant in the town of Utram in the State of Gujarat, while a similar power plant of smaller output has been built in Rajkot.



Equipment for the cement and ceramic industry has been installed for a cement mill in Churk in the State of Uttar Pradesh and in Madras. Complete equipment for the manufacture of high-tension insulators will be delivered to the State of Bihar and a plant for the production of refractory material to West Bengal. All these industrial plants will start operations with the aid of Czechoslovak experts who will train local workers.

## METALLURGICAL PLANT

An important contribution of Czechoslovakia will be to provide metallurgical bases for the development of the heavy engineering industry in Bihar. Czechoslovakia will equip a metallurgical plant with a heavy forging shop, a foundry for non-ferrous metals, for cast steel, grey cast iron, a roughing shop and other workshops. Here, rollers for rolling mills will be produced.

The most important item which India has been exporting to Czechoslovakia since 1953 in steadily growing quantities is iron ore. Of other export raw materials mention must be made of manganese ore and mica, agricultural products, raw hides, vegetable and technical oil, spices, tea and tobacco, cotton textiles and artistic cottage industry products.

Friendly relations between both countries, sound economic conditions and planned development of the economy of both countries are the preconditions for a further improvement in trade relations. The Second and Third Indian Five-Year Plans envisage the import of a greater number of complete industrial plants and machines and Czechoslovakia, on the other hand, requires raw materials which she purchases from India.

An important step towards closer economic relations between both countries was the agreement reached on November 24, 1959, on economic co-operation in the construction of certain Indian industrial plants. In the framework of this agreement Czechoslovakia will supply India with equipment for enterprises of engineering, metallurgy, a plant for the manufacture of heavy machine tools and a plant for the manufacture of heavy electrotechnical equipment. India will pay for these deliveries with exports of raw materials and semi-finished products.

Czechoslovak-Indian co-operation in various spheres, based as it is on the principles of mutual understanding and peaceful co-operation of equal partners, should develop further in the years to come.

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A new electronic counter which is specially useful for counting extremely light or fragile articles has been developed by a British firm. The counter, the "Albion 24", is an addition to the Albion counting instruments and measuring machines range produced by B. and F. Carter and Company Ltd., of Lancashire. It can be operated with a "probe" cable which, when lightly touched by a passing component will record it; this is particularly useful for delicate articles. It can be used to count small "untouchable" components by a process of channelling them through an induction coil, or it can be employed with a photo-electric cell. The counter is equipped with a control which can be set to obtain the required depth of sensitivity to achieve perfect results. It is rated up to 250 counts a minute and is extremely compact, weighing only 9 lbs. One of its most notable features is the clarity of its white engraved figures 32 seconds of an inch high, which can be seen perfectly even from a distance of some yards.

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One of the largest and most modern of the world's sewage works is on the East side of London. It is the London County Council's Northern Outfall Works which serves 112 square miles (290 square kilometres) of London and has a dry weather capacity of 178,000,000 gallons (800,000,000 litres) daily. One of its features is that eight Ruston gas turbines, running on sludge gas, are the source of all the power and heat needed by the sewage plant. This use of gas turbines, running on sludge gas, as the primary source of power, distinguishes it from all other sewage works in Britain, if not in the world, says the London journal, "British Engineering and Transport". Two of the services provided by the power house are a continuous flow of air to the diffused air plant for activation of the sewage; and a continuous supply of heat for the covered primary sludge-digestion tanks in which the solid matter is reduced in bulk before being pumped into digestion tanks and finally dumped at sea. The primary digestion tanks are also the source of the sludge gas—a mixture of 70 per cent. methane and 30 per cent. carbon dioxide.

# ENGINEERING INDUSTRY—THE MAIN ITEM IN THE DEVELOPMENT OF THE CZECHOSLOVAK NATIONAL ECONOMY

IT is a well-known fact that Czechoslovakia ranks among the industrially developed countries. After World War II, Czechoslovakia directed all her efforts towards the priority development of her engineering industry in order to ensure a rapid reconstruction of the whole national economy. At the same time economic co-operation with countries passing through a stage of development, in which the importation of machines and production facilities is a matter of necessity, was to be ensured, too. The countries concerned are those which up to that time had been deprived of the possibility to develop their economy fully and in an independent manner.

In the Third Czechoslovak Five-Year Plan i. e. during 1960—1965, the total volume of industrial production will increase at least by one half, with engineering output remaining the main item in the development of the whole national economy.

*Engineering Industry—the Centre of Gravity of Socialist Industrialization*

Since 1945, the Czechoslovak engineering industry has developed very rapidly as can be seen from the following table:

| | 1948 | 1950 | 1952 | 1954 | 1956 | 1958 | 1960 /plan/ |
|---|---|---|---|---|---|---|---|
| Index of growth of industrial production | 100 | 132 | 177 | 202 | 245 | 300 | 360 |
| Index of growth of engineering production | 100 | 156 | 267 | 336 | 419 | 533 | 690 |

The table shows clearly that in 1958 engineering production in Czechoslovakia was fivefold higher than that of 1948. During the respective period the share of engineering production in total industrial output increased considerably. While the share in 1948 made up only 16.5 per cent, this year it will amount to as much as 32.5 per cent.

The rapid development of the engineering industry has enabled a more perfect utilization of labour sources and a further increase in the participation of Slovakia in fulfilling the tasks of the national economy. This development is characterized by a considerable increase in the share of engineering production in Slovakia—from 9 per cent in 1948 to 15.1 per cent in 1960—in the total engineering production of the Czechoslovak Republic.

The growing volume of production has brought about significant changes in the structure of engineering production which have resulted in the reconstruction of certain production sectors, such as those for the manufacture of power engineering equipment, machine tools, agricultural machines, equipment for the light industry, etc., as well as in the introduction of quite new production branches, such as, for example, those for the manufacture of rail-mounted steam power plants, power dredgers, instruments for the regulation and automation of electric and diesel-electric locomotives, antifriction bearings, as well as a number of instruments used in vacuum electrical engineering, etc.

Certain production sectors have developed at an exceptionally fast rate. Thus, for instance, if compared with 1948, by 1958 the production of equipment for the chemical industry increased 15 times, that of antifriction bearings 17.5 times, steam turbines above 6 MW, 8.3 times, oil engines 7.4 times, metallurgical plants 6 times, equipment for cement works 5.6 times, etc.

The engineering sector has been, and continues to be, the backbone of the industrialization of Czechoslovakia. It has assisted in providing in a relatively short time a powerful basis for the heavy industry and in ensuring the transition of agriculture to a mechanized large-scale agricultural production.

It is indisputable that the production of machine and machinery equipment for certain basic sectors of the national economy is very exacting in respect of skillful work of Czechoslovak technicians and workers whose qualities have been recognized by numerous foreign customers throughout the world. That, of course, lays high demands on the consumption of material, often of a rare one, as well as on an expensive capital construction of new plants for the

manufacture of such machines and equipment. Czechoslovakia is known as a country with widely ramified processing capacities on the one hand, and with an insufficient raw materials basis on the other hand. Therefore, it is natural that in mutual economic relations between friendly countries, Czechoslovakia plays an important part in the sphere of production of technically complex machines and equipment for heavy industry branches, such as metallurgical, chemical, power and engineering industries, as well as machinery for the production of building materials and transport. Besides that, Czechoslovakia is interested in the extention of her raw material basis, especially in the field of black and non-ferrous metallurgy and certain chemical raw materials, which requires supplies of machines and equipment enabling rapid exploitation of the resources in other friendly countries.

The supplies for the building-up of new capacities as well as for the reconstruction and modernization of the existing plants, to be effected by the engineering industry, are to increase by 118 per cent by 1965 as compared to those in 1958. The volume of supplies of machines and machinery equipment for the production proper is to rise 75 per cent in 1965 against 1960, and for the needs of foreign trade it is to increase by 82 per cent during the years of the Third Five-Year Plan. The share of machines and equipment in the total export has developed as follows :

| | 1937 | 1948 | 1953 | 1958 | 1960/plan/ |
|---|---|---|---|---|---|
| Share of machines in overall Czechoslovak export in per cent | 6.4 | 20.3 | 42.4 | 43.3 | approx. 43 |

The above-mentioned data include, in the first place, machines intended for production purposes. In addition also consumer goods of an engineering character participate in Czechoslovak exports. They represent now one half of Czechoslovak exports. In comparison with the state prior to World War II, it is the most significant change in the structure of Czechoslovak foreign trade. The experience accumulated during the reconstruction of the Czechoslovak industry as well as during the assistance in building up industrial plants rendered to other countries, allows Czechoslovakia to manufacture now even the most intricate and exacting machines and production facilities. While complete industrial plants represent more than one quarter of overall Czechoslovak exports, also individual industrial machines produced in series as well as means of transport are exported in an ever-rising quantities, as seen in the following table :

| | | 1955 | 1956 | 1957 | 1958 | 1959 |
|---|---|---|---|---|---|---|
| Machine tools | pcs | 5489 | 7911 | 8481 | 10579 | |
| Diesel engines and sets | pcs | 5173 | 7834 | 10091 | 11482 | |
| Electric motors | pcs | 10409 | 20088 | 14582 | 31726 | |
| Wheeled tractors | pcs | 8865 | 9888 | 14445 | 15192 | |
| Lorries | pcs | 2527 | 2486 | 2602 | 4929 | |
| Passenger motor cars | pcs | 9441 | 14718 | 15585 | 25037 | |
| Motorcycles thous. | pcs | 32 | 51 | 80 | 109 | |
| Bicycles thous. | pcs | 111 | 113 | 153 | 170 | |

The share of machines and equipment in total Czechoslovak exports is to reach 53.8 per cent in 1965 as compared to 43 per cent in 1960. Such an increase will enhance the importance of Czechoslovak engineering industry both in Czechoslovakia's relation to the other People's Democracies and in that to the economically less developed countries whereto Czechoslovakia supplies a number of complete industrial plants providing thus for the consolidation of economic independence in those countries. Czechoslovakia thus participates to a decisive extent in the strengthening of the international division of labour. The Czechoslovak Republic holds fifth place in the world in the export of metal-working machine tools. The export figures follow continuously an upward trend also in the case of diesel engines and sets in contradiction to the export of the chief western countries. In the export of diesel engines Czechoslovakia occupies sixth place in the world.

The permanent engineering committee of the Council of Economic Mutual Assistance has discussed the specialization of certain important production sectors, so that Czechoslovakia does not have to devote herself to the whole assortment in those sectors. Czechoslovakia, for example, is to direct herself towards the production of mill trains, sheet and plate rolling trains, blooming mill trains, billet mill trains, section rolling trains, strip mill trains, and the like. The other countries of the CMEA, on the other hand, will supply Czechoslovakia for example with tube rolling trains, tube welding trains, drawing benches, etc. In the field of the production of chemical plants, Czechoslovakia will specialize, for example, in the output of exchanger apparatus, sets for the production of gaseous oxygen and nitrogen, equipment for the production of oxygen, high-pressure apparatus, machines for processing rubber mixtures and plastics, as well as in the production of special glass apparatus, and other facilities.



*Growth of Engineering Production in the Third Five-Year Plan*

The Directives of the Third Five-Year Plan provide for the priority development of the heavy engineering industry, envisaging, at the same time, an increase in the output of precision machines tools, computing machines, measuring and control instruments, electronics, telemechanics, etc. In 1965, the share of engineering production in the total industrial output will attain as much as approximately 36 per cent. This rate corresponds roughly to the level of the industrially most developed countries. The rate of growth of the Czechoslovak engineering production can be characterized, e. g., by stating that only the assumed increments in the last years of the Third Five-Year Plan will be as high as the total engineering output in Czechoslovakia in 1948. By fulfilling the planned tasks up to 1965, Czechoslovakia will leave the industrially most developed countries behind in the output per capita in a number of production sectors, such as the output of machine tools, chemical plants, metallurgical plants, locomotives, and the like. Of the most important products characterizing the structure of those sectors the following quantities are to be produced :

| | Unit | 1957 | 1965 | Index 1965 1960 | Index 1965 1957 |
|---|---|---|---|---|---|
| Steam boilers | t/steam/hr | 2913 | 9200 | 157 | 316 |
| Steam turbines | MW | 606 | 1990 | 168 | 328 |
| Water turbines | MW | 68 | 600 | 122 | 880 |
| Transformers | MVA | 2077 | 6000 | 154 | 289 |
| Rolling mill plants | thous.t | 14 | 59.2 | 174 | 423 |
| Chemical plants | thous. Kcs | — | 2268 | 314 | — |
| Unit-head type machine tools | pcs | — | 740 | 497 | — |
| Equipment for the production of building materials | mill. Kcs | 125 | 760 | 304 | 608 |
| Agricultural machines | mill.Kcs | 516 | 1380 | 180 | 267 |
| Tractors | pcs | 21236 | 43100 | 124 | 203 |
| Electr locomotives | pcs | 23 | 200 | 117 | 870 |
| Diesel locomotives | pcs | 27 | 590 | 513 | 11x |
| Lorries | thous.pcs | 12.5 | 19.8 | 133 | 159 |
| Passenger motor cars | thous. pcs | 34.6 | 110 | 196 | 318 |

This new structure is brought about in the first place by a swift rate of capital construction directed towards the development of the raw material basis, metallurgical industry, chemical industry, building industry and transport, with the envisaged development of mechanization and automation. The output of machines and equipment for these sectors will, therefore, grow at a substantially more rapid rate than the total engineering production. The engineering industry must play a decisive role both in satisfying the needs of home capital construction which represents an increase in the sum allotted to it by one half as compared with that assigned for this purpose in the Second Five-Year Plan, and in covering the requirements of foreign trade and thus also the needs of raw materials for the whole economy. The most important task of the Czechoslovak engineering industry is to develop, produce, and supply both home and foreign markets with products of the highest technical standard, and first-class quality, which would be at the same time economical and reliable in operation. It is quite natural that promptitude in the supplies of machines and equipment is of great importance, too.

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# PRODUCTS OF THE CHEMICAL INDUSTRY

By A Special Feature Writer

THE ever-increasing importance of the chemical industry is reflected in the attention which will be paid to this industrial branch at this year's International Trade Fair in Brno. The exposition of Chemapol, the sole exporter of the products of the Czechoslovak chemical industry, will be based, just as was the case last year, upon those groups of products which are either in direct or indirect relation to engineering. In comparison with the last year, the Chemapol's exposition of 1960 will have a more extensive selection of products and a more favourable environment for negotiation with foreign customers.

The exhibited products will be divided into larger groups, either according to the mode of use or according to their chemical alliance. A group of plastic materials, a group of paints and surface-treatment products as well as a group of various auxiliary products used in many industrial fields, will again be shown. Moreover, the products of Czechoslovak refineries and a group of laboratory and fine chemicals will be represented. Industrial explosives will again enjoy special attention and a special display will be arranged for chemical products used in agriculture.

Of mineral oils, there will be exhibited lubricating, cylinder, transformer, paraffin, fuel, motor car and other oils. Also industrial and pharmaceutical petroleum jellies as well as special greases will be on show. The visitors will see a selection of paraffin waxes of various softening points, also white and yellow ceresins.

Allied to refinery products by their chemical composition as well as commercial character are products derived from the processing of coal—or brown-coal tar, in particular, the group of aromatic hydrocarbons, various kinds of benzenes, toluenes, xylenes, further cresols and their mixtures as well as other products representing primary raw materials for a number of chemical branches.

The group of plastic materials, which will be shown, include among others UMAPLEX organic glass, PERLAPLEX synthetic mother-of-pearl, UMAPOLAR mass for elastometry, further UMALUR urea moulding plastics, ELASTOPLEX plastic material for making models for photoelastometric measurements and other products.

This group also includes the large assortment of epoxy resins with their broad field of application. They are of ever greater importance in modelling and jointing as well as in the working up and surface treatment of metals. They also render good service in the manufacture of paints.

The Czechoslovak chemical industry produces a comprehensive range of products for the surface treatment of machinery, such as carbonizing, nitrating, annealing and hardening salts; moreover, also galvanizing and surface-treatment salts as well as cementing powders are produced. The above products also comprise a rich assortment of paints and varnishes.

Of the products of the industry producing paints, mention should at least be made of cellulose—and alcohol paints and coatings as well as synthetic paints and those based on halogenated rubber. Ample is also the assortment of synthetic lacquer resins.

Carboxymethylcellulose is allied to the products of the engineering industry, apart from others to textile machines and oil-well drilling equipment for the crude oil industry.

Czechoslovakia has for many years been an exporter of sugar factories. Even after a sugar factory has been erected, Czechoslovakia is capable of safeguarding its operation by suppiying a comprehensive assortment of Czechoslovak active carbon, Carboraffin brand. As another complement of Czechoslovak machinery, Chemapol can offer an extensive range of accelerators and antioxydants as well as other chemicals employed in the rubber industry.

The development of basic power sources and the construction of water-works represent some of numerous ways of using industrial explosives.

Finally, we should like to call your attention to a detached display stand of pesticides which will be situated in the exhibition of agricultural machines. Today the Czechoslovak chemical industry is able to supply a number of products protecting agricultural plants against pests of every kind, thus contributing to the development of agricultural production.

# The Second Czechoslovak International Trade Fair

THE International Trade Fair in Brno in Czechoslovakia became already in the year 1959, when it was held for the first time, one of the world's outstanding fairs. It represented a continuation of the three Czechoslovak engineering exhibitions and assembled goods from thirty countries from all over the world in the spirit of the slogan: "Through economic co-operation to peaceful co-existence of all nations". Apart from its commercial importance it had, as one of its aims, the fostering of technical co-operation and an exchange of experience of participating countries.

The Fair specialized in engineering, the main stress being laid on heavy engineering and the key industries. The products exhibited included products of the metallurgical industry and certain raw materials and intermediate products related to the engineering and metallurgical industries.

The First International Trade Fair in Brno had a record number of visitors, both from home as well as from abroad. Among the more than 2,350,000 visitors to the Fair there were more than 13,500 foreigners from 44 countries. They saw in Brno approximately 10,000 different items on display, not only from Czechoslovakia, but also from 29 other countries, such as Argentina, Belgium, Canada, China, France, the German Federal Republic, Japan, the Soviet Union, Switzerland, Yugoslavia, etc.

They displayed their goods on an area of 69,000 sq. metres /743,000 sq. ft./ in covered pavilions and halls and 67,000 sq. metres /721,000 sq. ft./ of open space. Approximately 3,000 of the items on display were exhibited by Czechoslovak factories and more than 7000 by foreign manufacturers.

In the course of the Fair Czechoslovak foreign trade corporations concluded business deals with 48 Western countries and 12 countries of the socialist camp. The total volume of business between Czechoslovakia and all other countries reached a figure of Kcs 4000 million of which exports amounted to 53 per cent and imports to 47 per cent.

The greatest interest of foreign firms was enjoyed by machine tools, industrial equipment and complete plants, sewing machines, textile and shoe-manufacturing machines, typewriters, bearings, sports aircraft, passenger motor cars and lorries, tractors, motorcycles and refrigerators. The interest of Czechoslovak importing corporations was focused on special machine tools, precision electric and measuring instruments, passenger motor cars and many other products.

Preparations for this year's International Trade Fair in Brno are already in full swing. The display of the Czechoslovak Republic will demonstrate the successes which it has achieved in the course of its fifteen years of socialist development. We shall remind visitors of the period of Nazi occupation as well as of the glorious moments of our liberation, of the post-war development with reference to the various branches of engineering and to foreign trade and, last but not least, of the bright prospects of the Third Five-Year Plan.

In the outdoor areas it will be the building display which will demonstrate the rise in building production in Czechoslovakia during the Third Five-Year Plan with emphasis on housing, and a display of agricultural machines. From this part featuring agriculture the rise of the cultural standard and of the standard of living of rural inhabitants in the course of the years of socialist development will be apparent.

The International Trade Fair in Brno captured last year's visitors by its beauty. This side of it has also not been forgotten this year. Some 500,000 plants have been prepared to decorate the open space of the Fair and on an area of 4,200 sq metres /45,210 sq. ft./ 20,000 room flowers are being grown to brighten the inside of the pavilions, offices and conference rooms. In the extensive display of aviation engineering a considerable part of the open space will be occupied by airport lighting equipment of the foreign trade corporation of Omnipol. Several types of airport lights such as obstruction, runway, approach lights, etc., which make possible for the pilot safe handling of his aircraft during the approach as well as a safe completion of the last phase of the landing operation, will be demonstrated on an improvised airport. Above the whole display a rotating beacon will be erected which is so arranged that, when the bulb burns out, another one automatically replaces it and, at the same time, the defect is communicated to the dispatcher by remote control.



The 1960 Brno International Trade Fair will be a survey of the best that Europe and the world have to offer from the production of machine tools, machines for the light industry, passenger motor cars and lorries, equipment for the chemical industry and power stations, cranes, etc. Particular emphasis will be laid on the mission of science and engineering in the atom age.

Last year international symposia and technical conferences were arranged with great success as a part of the Fair. There outstanding inventors, designers, scientists and economists discussed scientific and technical problems. These gatherings will also be held this year. The subjects for this year's Brno Trade Fair are fatigue of large machinery parts, electric variable speed drives, the latest technological trends in engineering, volume yarn and sanitary engineering.

After the success of the International Trade Fair in Brno in 1959 foreign exhibitors have shown great interest in taking part this year. A large number of firms from practically all the European countries have registered for participation and the participation of overseas countries is at present the subject of negotiations. The firms which will participate in the International Trade Fair in Brno include well-known ones such as Renault, Simca, Mercedes-Benz, and also A. C. E. C., Electromechanique, Siemens, Rhode Schwarz, United Construction, etc. New entries are being received all the time and it may be expected that this year's participation will be more extensive than that of last year when approximately 500 foreign exhibitors displayed their goods.

Since particular care will be devoted to the selection of goods to be displayed the Brno Trade Fair will be a survey of world production and a valuable contribution to the development of international trade.

## INSPECTION OF COPPER—BASE ALLOY SAND CASTINGS

The Indian Standards Institution has recently published a standard on Recommended Procedure for Inspection of Copper-Base Alloy Sand Castings (IS : 1408—1959), which recommends suitable procedures for industrial inspection of copper-base alloy sand castings to ensure that the castings comply with the relevant specifications.

A number of Indian Standards on copper-base alloy ingots and castings has been published. A few more are under preparation. With a view to facilitating industrial inspection of these castings, it has been felt that suitable requirements should be formulated for this purpose. Accordingly, these recommendations have been published and it is expected that if these procedures are adopted in industrial inspection of castings, maximum possible information on the properties of sand castings with minimum expenditure of materials and effort would be obtained. Further, the recommended procedures are expected to assist both the designer and the founder in improving the quality of castings. The recommendations are not intended to be rigidly adhered to in all cases, but would indicate the significance and value of the various steps in the inspection procedures and also give guidance to inspecting authorities on the most useful lines of inspection for various classes of castings. These recommendations shall be used in conjunction with the relevant Indian Standard Specifications which lay down acceptance tests for chemical analysis and mechanical properties. The standard also includes an appendix giving some more general information for purchasers, suppliers, designers and founders.

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## RIVETS AND SPLIT COTTER PINS

The Indian Standards Institution has prepared two draft specifications, one for Rivets for General Purposes (below 12 mm diameter) [Doc: EDC 27(543)] and the other for Split Cotter Pins (draft Revision of IS : 549—1954) [Doc: EDC 27(544)] These will be circulated shortly to the interests concerned for their critical comments and suggestions for improvement.

The draft standard for rivets deals with mild steel and high tensile steel rivets for general purposes. The document relating to split cotter pins is the revision of an earlier standard which was published in 1954. The revised draft has been prepared entirely on the metric basis. Both the drafts specify the materials to be used in manufacture, dimensions and methods of tests. They belong to a series of Indian Standards being prepared by ISI on metric screw threads and fasteners.

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# Economic Co-operation between Czechoslovakia and India

CO-OPERATION between the Czechoslovak Republic and India is being continually extended and intensified, being animated by mutual respect and understanding.

At the invitation of the Indian Government, the Prime Minister of the Czechoslovak Republic, Mr. V. Siroky, visited India in January 1958. During this visit he had useful discussions with the President of the Indian Union, Dr. Rajendra Prasad, with the Prime Minister, Mr. J. Nehru, and other prominent persons in India. On 5th January, 1958 a joint statement concerning Indian-Czechoslovak relations and international problems was signed by the Prime Minister of India, Mr. J. Nehru, and the Prime Minister of the Czechoslovak Republic, Mr. V. Siroky. The statement expresses the full satisfaction of both Prime Ministers with the co-operation achieved hitherto as well as their desire to deepen it even further.

*In connection with the Second Brno Trade Fair which begins in Czechoslovakia on 11th September and lasts upto 25th September, 1960, Mr. J. C. Jaks, Trade Commissioner in Bombay of the Govt. of the Czechoslovak People's Republic, addressed a press conference on 27th May, '60 at his residence which was attended by Journalists representing various Dailies, Technical Publications and Periodicals in the city.*

*He explained at length the success achieved at the first Brno Trade Fair and the volume of business done which had encouraged the holding of the Second Brno Trade Fair in which more countries were expected to participate.*

*He also answered various questions put by Journalists concerning the economic co-operation between India and Czechoslovakia and gave details of numerous industrial projects that were being undertaken in India in collaboration with trade interests here.*

*Representatives of the Press had also the opportunity of viewing some films exhibited specially on the occasion at Mr. Jaks's residence, which give clear indication of the vast industrial, cultural, scientific and technological progress made in Czechoslovakia.*

Fulfilment of that part of the statement of the Prime Ministers' concerning the foundry forge plant has been entrusted by the Indian party to the National Industrial Development Corporation and later on the Heavy Engineering Corporation, and by the Czechoslovak party to Technoexport, Foreign Trade Corporation, Praha, Czechoslovakia.

In the year 1959 the Government of the Czechoslovak Republic offered the Government of India credit to the extent of Rs. 231,000,000—(Rs. 23.1 crores) for the construction of :

3rd stage of the foundry forge plant, a heavy machine-tool manufacturing plant, a heavy power equipment plant, and further industrial plants which can subsequently be agreed upon by both Governments.

The agreement about economic co-operation between the Government of the Gzechoslovak Republic and the Government of India covering also the above mentioned credit, was signed on behalf of the Government of the Czechoslovak Republic by the Minister of Foreign Trade, Mr. F. Krajcir, and on behalf of the Government of India by the Minister of Industry, Mr. M. Shah, on 24th November, 1959 in Delhi. This agreement stipulates that the price of the equipment of the plants covered by this credit will be paid off in 8 yearly instalments with favourable rates of interest.

The agreement also presumes that a considerable part of the counter-value of Czechoslovak supplies will be used by Czechoslovak trade corporations for the purchase of Indian goods.

During his visit to India the Minister of Foreign Trade of Czechoslovak Republic, Mr. F. Krajcir, informed the Prime Minister of the Government of India, Mr. J. Nehru, that the Czechoslovak Government had decided to offer as a gift to the Government of India the establishment of an Engineering Institute in India to the value of Rs. 6,000,000. This gift was to include the delivery of machinery and equipment for the institute as well as the sending out of Czechoslovak experts to India to supervise its management. The Indian Government accepted this gift. From the brief outline of the development of co-operation between India and Czechoslovakia it can clearly be seen that the desire expressed by both Prime Ministers in their joint statement of 5th January, 1958, is being realized by both parties to the benefit of the people of both countries.

Czechoslovakia is one of India's traditional partners in foreign trade. The highest rate of increase in trade between the two countries was reached in 1956, with the volume of trade showing a 3.5 fold increase as compared to 1950. In 1959, Czechoslovak exports were adjusted to the needs of Indian economy with the exports of machinery representing a decisive share. Orders for a host of complete plants have been secured, namely, three sugar refineries, two cement works, one plant for the manufacture of high tension insulators, one steam power plant, the first stage of a plant of engineering metallurgy, as well as several minor complete plants.

India, in turn, supplies Czechoslovakia with iron and manganese ores, mica, skins and spices. The above mentioned commodities have represented the leading items of Czechoslovak imports in preceding years. In addition, this country has also imported lesser quantities of oil seeds and technical vegetable oils, shellac, coffee, tea, tobacco, jute products and handicraft products.

The Czechoslovak Government on its part complied with the request of the Government of India that payments relations between Czechoslovakia and India be regulated. On May 30, 1959, a Protocol to the Trade Agreement of September 30, 1957, was signed, according to which payments relations between India and Czechoslovakia are carried out on the basis of clearing in unconvertible Indian rupees.

The lists of goods agreed upon in the above-mentioned Protocol represent an additional increase in the turnover of foreign trade between Czechoslovakia and India, i. e. up to 130 million rupees for each of the two countries.

While the share of Czechoslovak engineering products in the export list represents 68 per cent., metallurgical products 20 per cent., and other than Engineering products 12 per cent., the list of imports ensures, in the first place, raw materials necessary for the national economy of Czechoslovakia, e. g. iron ore, manganese ore, mica, jute, vegetable oils, oil seeds, skins, spices, etc. A provision was also made for the costs of shipping.

The amended agreement negotiated upon the request of the Government of India replaces multilateral payments relations by bilateral payments relations on the basis of balanced trade between the two countries.

These arrangements are resulting in an increased volume of goods exchanged between Czechoslovakia and India.

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A carpet with what is claimed to be the world's largest electrically heated underlay is being prepared for the Electrical Engineers Exhibition to be held in London, April 5—9. This carpet, made by John Crossley & Sons Ltd., of Yorkshire, using a heating unit supplied by Thormalay Ltd., also of Yorkshire, will be 120 ft. long by 9 ft. wide, overlaid with a quality carpet. The total length of heater cable will be in the order of 7,000 to 8,000 ft., and the total loading in the order of 12,400 Watts.

The exhibit will show how an electrically heated underlay can be made up for use as a separate unit for any type of carpet. In this respect it is different from a carpet introduced by Thomas Bond Worth & Sons Ltd., of Worcestershire, at a carpet fair in London in February which was a standard Wilton 12 ft. × 9 ft. with protected heating elements woven in and hidden beneath the pile. Its heating unit was equivalent to a 1,000-watt electric heater.

The advantage of floor warming is principally one of distributing the heat over the whole area of a room at a relatively low temperature rather than having a high temperature focal point radiating in a horizontal position. Another advantage is that the same comfort level can be maintained for half the power input, the reason for this being, primarily, that the all-over radiation from the floor gives direct heating to the objects instead of relying on the heating of air to transfer the warmth to the object.

# All Prerequisites for the 1960 Brno International Trade Fair to be Successful

*560 Exhibitors from Abroad Participating in the 1960 Brno International Trade Fair*
*Improved Service Facilities for Visitors to the 1960 Brno International Trade Fair*
*Programme for Brno Trade Fair Specialist Days of New Technology*
*Information Handbook for Motorists Visiting Czechoslovakia*

ON Saturday, May 14, this year's first meeting of the Fair Committee took place in Brno, in order to ensure and co-ordinate preparations for the Brno International Trade Fair in September, 1960.

The reports discussed by the meeting of the committee show that preparations for this year's Brno International Trade Fair will be greatly improved on the basis of experience gained last year.

On the Fair ground itself there will be a new administrative building, dustfree road surfaces are being laid down and new social amenities provided, and catering and accommodation capacity will be substantially enlarged despite the fact that the total number of visitors is expected to be smaller than last year. Transport services will be expanded; the dispatcher's service on parking grounds is being improved, Brno will receive new tramcars, and the loan of twenty buses from Prague in being discussed. The cultural programme will be considerably enriched; during the Fair some 2,500 performances are to take place in Brno, which is 500 more than last year.

## 560 EXHIBITORS FROM ABROAD PARTICIPATING IN THE 1960 BRNO INTERNATIONAL TRADE FAIR

The Brno Trade Fair Corporation has recently closed the entry for participation in the 1960 International Trade Fair from abroad. The total number of applications from both Europe and overseas is 296, i. e. 65 more against last year's Brno International Trade Fair. The actual number of exhibitors, however, far exceeds the number of entries, since many applications include the participation of several firms. The available data show that this year's Brno International Trade Fair will welcome 560 exhibitors from abroad.

Exhibitors at this year's Brno International Trade Fair will represent the following countries:

Argentina, Austria, Belgium, Bulgarian People's Republic, Canada, Columbia, Czechoslovakia, People's Republic of China, Denmark, France, German Democratic Republic, German Federal Republic, Great Britain, Hungarian People's Republic, Republic of Iraq, Italy, Japan, Liechtenstein, Morocco, Netherlands, Polish People's Republic, Rumanian People's Republic, Spain, Sweden, Switzerland, USA, USSR.

The largest exhibition will be that of the Soviet Union, whose trading organizations will take up an area of about 4,500 sq. m. in Pavilion A and about 1,500 sq. m. open-air ground adjoining Pavilion C. The trading organizations of the German Democratic Republic, Poland, and Hungary will exhibit on the same sites as last year, i. e. in Pavilions H, F and A. The stands of the Bulgarian trading organizations will occupy all of Pavilion D and the adjoining area.

The exhibits shown by countries of the socialist camp will concentrate mainly on engineering products, electrical engineering, transport equipment, and road-making and construction machinery.

Among European countries, those represented by the largest exhibitions at this year's Brno International Trade Fair will be Great Britain, France, Switzerland, Italy, the German Federal Republic, Austria and Belgium.

## IMPROVED SERVICE FACILITIES FOR VISITORS TO THE 1960 BRNO INTERNATIONAL TRADE FAIR

The Brno Trade Fair management has made an agreement with the Paris firm OFFICE FRANCAIS D EXPANSION ECONOMIQUE under which this firm will demonstrate its self-service equipment in full operation on the fair ground itself. The site chosen for this purpose is the restaurant in the building of the Julius Fucik Theatre. The modern equipment exhibited by this firm will make it possible not only to enlarge the selection of food and drink offered to visitors but will help to expand catering capacity and contribute to the smooth operation of the service.

A further important contribution to improved services for foreign visitors will be the technical advisory service and supply operated by the Benzina National Corporation on the fair ground. The complicated mechanisms of machines and equipment of all types, if they are to function and produce with maximum efficiency and precision under altered working conditions, require careful selection of the most suitable and effective lubricants. The Benzina technical advisory and supply service will therefore maintain contact with foreign exhibitors, recommend and supply, with a view to specific working conditions, lubricants both of foreign makes as well as Czechoslovak products which will prove most suitable for specific conditions and requirements.

## PROGRAMME FOR SPECIALIST DAYS OF NEW TECHNOLOGY AT THE BRNO TRADE FAIR

The main subjects to be discussed at the Specialist Days of New Technology as well as the programme of the International Scientific and Technical Symposia organized by the Czechoslovak Society for Scientific Technology in conjunction with the 1960 Brno International Trade Fair, have been published in past issues of the Brno International Trade Fair Information Bulletin. In this issue we bring the programme of themes which will be discussed at the Specialis Days of New Technology.

Lectures and discussions taking place during the eight Specialist Days of New Technology, which will be held in the new administrative building on the Brno Fair ground from Sept. 13 to 23 will concentrate on the following problems:

(1) *Data Processing Machines*

New trends of development in data processing machines

Solving of problems on data processing machines

New types of Aritma punched card machines

Problems of Czechoslovak analogue computers

(2) *Machine Tools and Modernization*

General topic: Raising the productivity of labour in piece and small-lot production by modernization of plant

General principles of raising machining productivity by mechanization and automation of machine-tool working cycles

Elements of mechanization and automation (hydraulic, pneumatic, electric, and mechanical methods) and their economic employment in machine-tools for piece and small-lot production

Programme-controlled machine, tools and their employment in piece and series production

Computers for programme control of machine tools

(3) *Wire and Wireless Telecommunication Technique*

Branch telephone installations

Telegragh technique (teleprint)

Direction links (USW technique)

Carrier telephone systems for short distances

Telecommunication measuring instruments

(4) *Large Rotary Machines*

Turboalternators

Hydroalternators

Rolling-track drive units

Synchronous motors and Schrade motors

Asynchronous motors of 200 to 4,000 kW

DC drives of mining machines

(5) *Surface Finishing*

New methods of surface cleaning including recovery of cleaning agents and materials (e. g. acids) and disposal of waste products (affluents, etc.)

Galvanizing baths for glossy metalplating with neutralizing effect, particularly acidic copper-planting baths for glossy surfaces with the possibility of direct deposition of copper on steel

New methods of applying and drying coats of paint and lacquers, including coating of metal sheets at high speeds and induction or other techniques of drying coated sheets

(6) *Electronic Regulation Systems for Automation of Continuous Technological Processes*

Comprehensive electronic regulation systems: combined electrohydraulic or electropneumatic systems

Employment of these systems for regulation of continuous technological processes particularly in power stations, metallurgy and chemical plants

Brief descriptions of systems stressing the possibilities of application; particular emphasis on results obtained in operation

Trends of further development on the basis of present knowledge; possibilities of normalization and unification. Experience gained in employment of regulation circuits with electronic computers

(7) *Material Handling*

Handling of heavy items

Long-distance transport of bulk materials

Mechanization of loading and unloading

Handling of heavy loads especially in the building industry

(8) *Mechanization of Agriculture and Melioration*

Problems of the complex mechanization of Czechoslovak agriculture and the present state of technical development in this field

Chief tasks of agricultural engineering under the third Five-Year Plan

Selected main items in agricultural mechanization:

Tractors and transport

Machines for mechanization of difficult and peak operations, especially harvesting of root crops and maize

Machinery and equipment for melioration and irrigation work

Problems of universal mobile carrier units with attached cultivating sets.

## INFORMATION HANDBOOK FOR MOTORISTS VISITING CZECHOSLOVAKIA

Towards the end of May or at the beginning of June, the Cedok Travel Bureau will publish an information handbook for foreign motorists visiting Czechoslovakia. The handbook will facilitate travel in Czechoslovakia for many visitors to the Brno International Trade Fair particularly by giving a list of the various services available. The booklet will be published in English, German, and French versions, and will contain, among other things, information about international customs documents in driving licences and technical certificates, insurance regulations, traffic regulations insofar as these differ from current traffic rules abroad, and currency regulations.

An important part of the publication will be a list of service stations, a comparative table of lubricants (some types of foreign lubricants can be supplemented with Czechoslovak products), and driving maps of Prague, Brno, and Bratislava.

## Alloys of Tin with New Metals

Systematic investigations into the alloys of tin with the newer metals—tintanium, Zirconium, and niobium—are being carried out in the U.K., States the annual report of the Tin Research Institute. And further study is being made of the effects of tin in cast iron and steel.

Bright deposits of tin can be made by electrodeposition using wood tar additions in the plating vat — to simplify the process — and the Institute is trying to discover which constituents of the tars are effective.

The investigation on the hot-tinning of small tags, eyelets and terminals used chiefly in radio and electrical industries is practically complete. "It is now possible, as a result of this work, to make definite recommendations to industry for methods of coating these small parts in bulk," adds the report.

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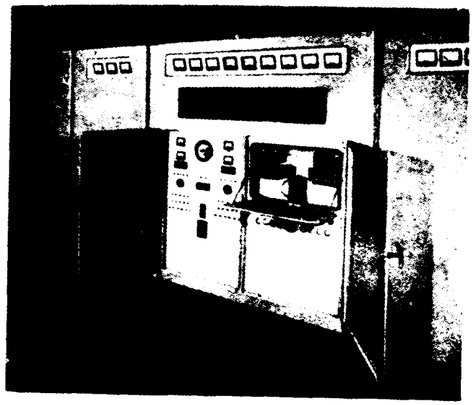

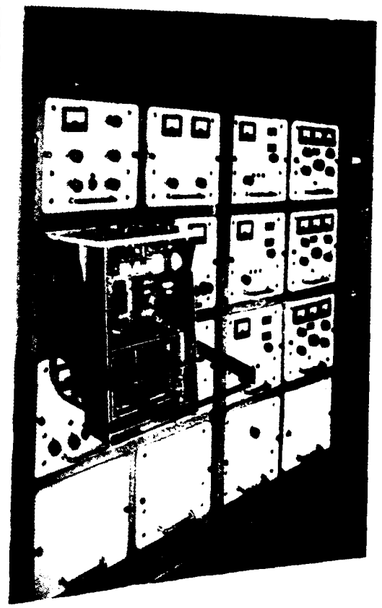

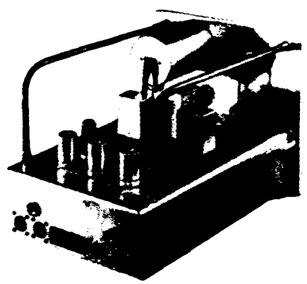

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