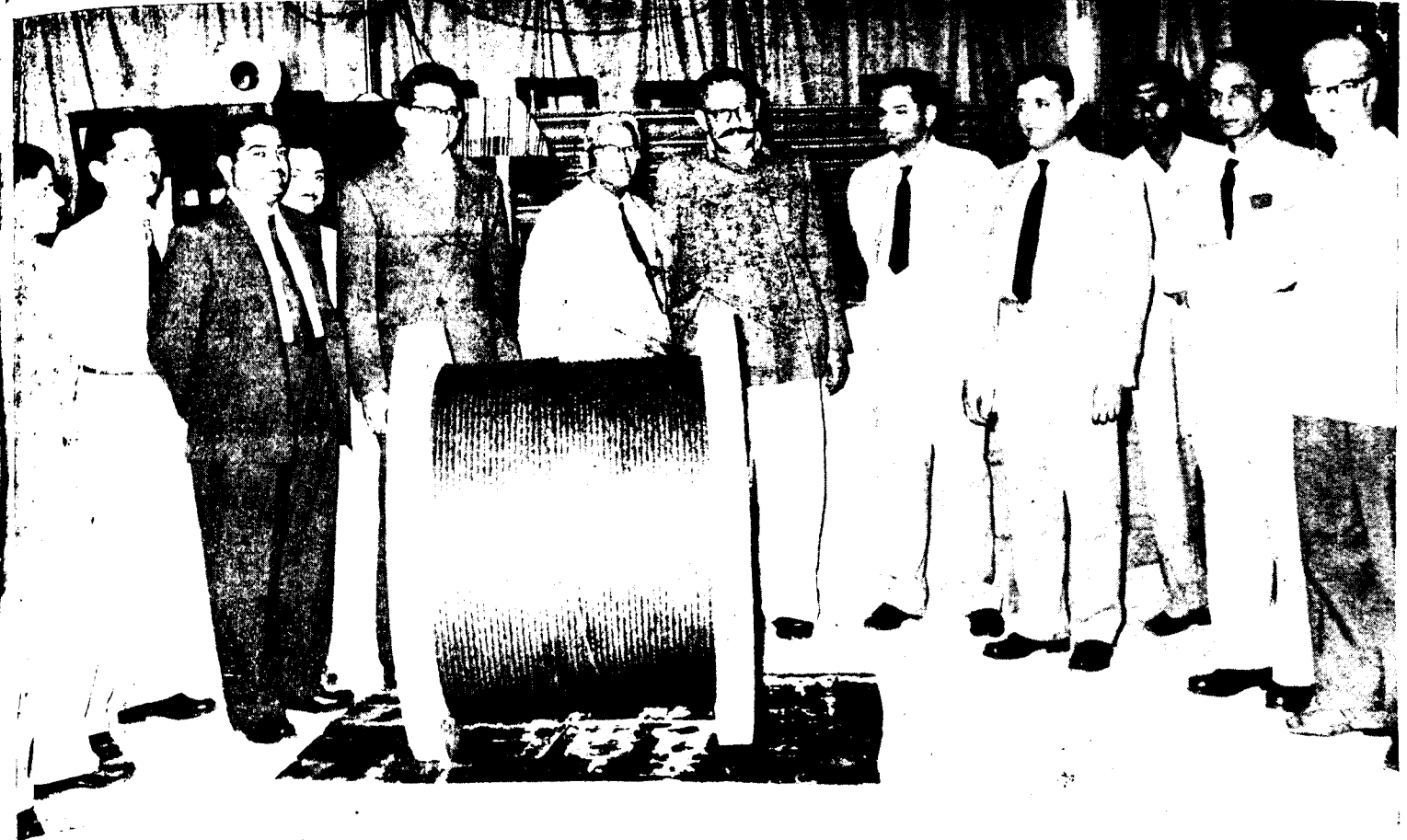


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ALIND



"Handing it at Hirakud" (See Page 31)

In this issue

Indian Electrical Manufacturers' Association Annual Meeting

"Handing it on a platter" — Alind's Hirakud Story

• Neighbours — Indian Aluminium Company Limited, Hirakud

• Friend, The Customer — Mysore State Electricity Board

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Mr. V. Swamy Iyengar, our Director and members of his family at Hirakud.



Mr. A. G. Menon, I.A.S., Secretary to Industries, Mining & Geology Department, flanked on either side by Director B.V.D. Menon and V.G.G. Nayar.

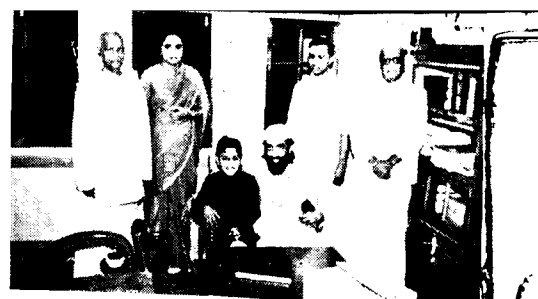


Mr. and Mrs. J. C. Alexander who paid us a visit during the yuletide season.

Mr. Nanjappa ICS of the Atomic Energy Commission is seen signing our Visitors' Diary—others in the picture are: (L-R) Mr. H.K. Khanna of Aluminium Hindustan, Calcutta, (ii) Mr. T. V. Punnoose, General Manager, Kerala Government Ceramics and (iii) Mr. J. N. Zutchi, Chief Administrative Officer, Travancore Mineral Concerns.



Mr. Edmund Hall of Aluminium Wire & Cable Co. U.K.



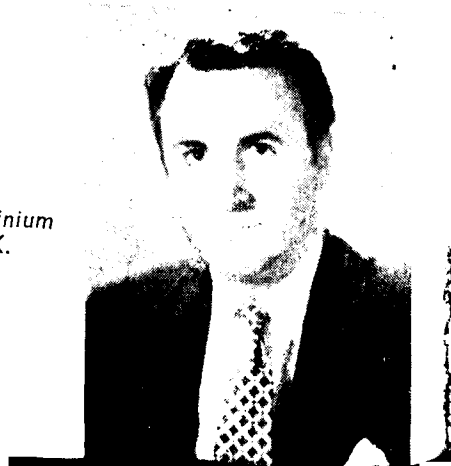
Swami Chinmayanandaji (seated) in centre with Kannan, son of VGG. Others in the picture are Mr. K. A. Parameswaran Menon, Mrs. Nayar, K. Ramarajan and Dr. E. K. Raman Pillai.



With Mrs. Nayar are seen Mrs. Sen, Mr. B. Sen, I.A.S. Collector of Customs Cochin, and members of their family.



L. to R. Mr. S. Krishnan of Marshall Sons (India) Mr. D. R. Richards, Chief Engineer, H. & C. Quilon, Mr. Charles G. Gorton, Mr. C. Hendron of Marshall Richards Machine Co., U.K.



APRIL 1959

No. 16

Editor: R. PARTHASARATHY

THE PURPOSES OF THIS PUBLICATION ARE:

- (i) To record the accomplishments and achievements of our employees, their joys and sorrows so that our other friends like our customers, shareholders and neighbours may get to know our family better;
- (ii) To encourage in our employees pride in workmanship and the high quality of our products;
- (iii) To help create and sustain amongst them a spirit of friendliness; and
- (iv) To tell the story of our business and that of our customers and other friends so that mutual understanding and respect might be fostered.



News & Developments

MR. JAISUKHIAL HATHI, DEPUTY MINISTER for Irrigation and Power, and Chairman, Chambal Control Board, inaugurated recently the erection work of the H.T. line on the fifth mile of the Gandhisagar-Bhanpura road in Madhya Pradesh, by fixing the first bolt on the 132-kV tower. The complete tower was erected in the course of one day.

Mr. V. V. Dravid, Minister for Labour and Chambal, Madhya Pradesh, pointed out the importance of this 132-kV Gandhisagar-Ujjain line which will carry the bulk of the Madhya Pradesh portion of hydel power from the three-power stations to be constructed under the Chambal Scheme. The high tension line will feed power to five important grid step-down sub-stations at Ujjain, Indore, Bhopal, Nagda and Ratlam. The Chambal hydel power is scheduled to be made available at these load centres in 1959-60.

Alind is proud of its contribution to this Project—which is the supply of a little under 1,600 miles of transmission line conductor and accessories, valued approximately at Rs. 1 crore.

International Electro-technical Commission

The 1958 Grouped Meeting of the International Electro-technical Commission broke several records. It was spread over a period of three weeks (30th June to 17th July) instead of the usual fortnight; the number of committees holding meetings was over fifty, an even larger number than on the occasion of the jubilee meeting in Philadelphia; and the number of delegates (about 1,000) was the "highest ever"; and finally, as a direct consequence of the foregoing factors, the meetings were held in four different towns instead of being centralised at one location, the majority of the meetings taking place in Stockholm.

The Council of the I.E.C. normally meets every three years, and a meeting was held in Stockholm on 17th July. The Committee of Action held two meetings, and of the 54 technical committees and sub-committees in the programme, 11 met in Vasteras, three in Lund and three in Copenhagen. The remainder met in Stockholm. In all, 28 countries were represented.

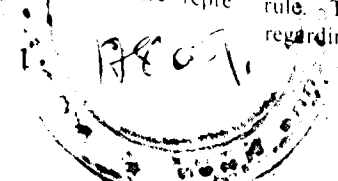
Aluminium at I.E.C.

(Technical Committee No. 7)

This committee has been in existence for very many years, but has hitherto never reached any final conclusions. Provisional agreements reached at one meeting have been modified at subsequent meetings. This state of affairs applies particularly to the draft specification for commercial hard-drawn aluminium wire for electrical conductors. This draft was actually approved for publication last year, although it was known that a few National Committees were not entirely satisfied with the draft, but at the Stockholm meeting a further modification was proposed as regards the value of resistivity, and a revised value, 2,8264 microhm cm. will now be circulated for approval under the two months' procedure. It is confidently expected that this modification will result in the withdrawal of all reservations previously made by some National Committees.

Another draft specification, which has been the subject of considerable discussion, is that relating to galvanized steel wires for steel-cored aluminium conductors. Two types of steel wire are in use, namely, wire galvanized after drawing and wire drawn after galvanizing. Some countries use only one type while others desire freedom to use either type. After agreement had been reached last year on the technical requirements for the two types, the draft specification was circulated for approval under the six months' rule. The voting showed only a small majority in favour of the draft, and the matter was therefore re-opened at the Stockholm meeting. Many of the comments submitted by the National Committees with their votes concerned the question whether the choice of the type of steel wire to be used for a particular contract should be at the discretion of the purchaser or of the conductor manufacturer. An amended draft will now be circulated under the two months' procedure.

The question of galvanized steel wires for use in steel cored aluminium alloy conductors is still under consideration. The characteristics of aluminium alloy of the Al-Mg-Si type for bushbars are now agreed for circulation under the six months' rule. The same position has been reached regarding the characteristics of annealed



commercial aluminium wires larger than one mm. diameter. Wires of other tempers are still under consideration. It was decided that at this stage it was not practicable, or indeed commercially necessary, to establish a value for the resistivity of super-pure aluminium wire. The committee has not so far dealt with specifications for complete aluminium conductors for overhead lines, but this subject has now been included in the programme of future work.

Indian Aluminium Co.'s new smelter at Hirakud

"Aluminium, the youngest of the metals in large-scale use, is gradually coming into its own and is decidedly the metal of the future. It has got multifarious uses and is today the world's premier non-ferrous metal," declared Dr. Harekrushna Mehtab, Chief Minister, Orissa, at the opening ceremony of Indian Aluminium Company's smelter at Hirakud on Feb. 12.

Starting that in the electrical industry steel-covered aluminium cable has become standard for high tension transmission cable while for low tension distribution, aluminium conductors are fast replacing copper throughout the world, the Chief Minister said: "There is considerable scope for the use of aluminium in India which has got a vast power development and electrification programme. In this connection, I am glad to find that the Aluminium Industries Limited has already forged ahead and brought out last month their first coil of aluminium conductor from their production unit at Hirakud. This is a laudable venture."

Continuing, he said: "Apart from bauxite, the principal raw material for production of aluminium, which is available in plenty in the country, electricity is essential for the production of the metal. The expansion of the aluminium industry, is, therefore, dependent primarily upon the availability of cheap power in plenty."

With its capacity of 10,000 tons of aluminium per year which doubles India's production, the smelter has been built at a cost of Rs. 5 crores and forms part of the company's Rs. 14 crore-integrated expansion project.

The Indian Aluminium Company Limited is the first producer of virgin aluminium and rolled products in the country. Starting with the fabrication of sheets and circles from imported ingots, in 1941, the company launched on aluminium production from imported alumina at Alwaye, and in 1953 produced the first alumina from Indian bauxite at Muri near Ranchi in Bihar.

All this process meant of course the carrying of the material back and forth from one end of the country to the other.

Now, however, because of the availability of hydro-electric power at Hirakud, things are made easy for Indaluco.

Realising the importance of electricity costs for this basic industry, the State Government have agreed to supply electricity at the rate of Rs. 120 per kWh, which works out to less than 2 nP. per unit.

As the *Eastern Economist* has rightly pointed out in an editorial comment on the opening: "Thanks must be recorded to the company's Canadian collaborators, who, more than a year ago, signified their willingness to provide foreign exchange resources amounting to about \$6 million required to expand the Hirakud smelter to 20,000 tons annual capacity and for a commensurate expansion of the company's bauxite and alumina production facilities (in Bihar) on which the smelter expansion will be based."

Technical Handbook: The 1959 edition of this useful reference book published by the Madras State Electricity Board Engineers Association was released on Jan. 31. A veritable gold mine of information, data and formulae, the book runs to over 500 pages arranged in nine sections—namely, generation, hydro generation, thermal, transmission, substations, distribution, power system studies, communication, statistics and general tables.

In the present edition, the chapter on "Generation—Hydro" has been considerably revised and the data on the Madras Grid and statistical information brought up-to-date.

Non-ferrous Metals Manufacturers Association:

The Tenth Annual General Meeting of the Indian Non-ferrous Metals Manufacturers Association was held in Calcutta on November 30.

Mr. Lal Bahadur Shastri, Minister for Commerce and Industry, Government of India, inaugurated the proceedings.

Speaking on the occasion Mr. Shastri observed: "The first and foremost problem to-day is that of foreign exchange. Because we must have money enough in foreign currency to finance the purchase of central requirements for the maintenance of our economy and for maintaining and stepping up industrial production, the only way of meeting the situation is to step up our exports."

Indian Electrical Manufacturers' Association

THE ANNUAL GENERAL MEETING WAS held at Calcutta, on January 28. It was inaugurated by Shri Jaisukhlal Hathi, Dy. Minister for Irrigation & Power, Government of India, on behalf of Shri Hafiz Mohammad Ibrahim, Minister for Irrigation & Power.

Speaking on the occasion, Shri Jaisukhlal Hathi said: "There is no doubt that there will be an increasing demand for all kinds of machinery and equipment for the generation, distribution and utilisation of electric power. At the present time, your industry is concentrating on the smaller types of equipment, and the demand for these would be enormous as more power is consumed by the people. Although I am not personally connected with the licensing and manufacturing side of your industries, I am very much concerned with those who purchase and use this equipment. As a user, I am glad to say that Indian Electrical Manufacturers have done well and are proceeding on the right lines in enlarging the scope and standard of manufacture. It is a growing industry and it has to be based on science and technology. It has to set before itself certain high standards of quality."

Referring to the purchase of equipment for the power projects, the Deputy Minister said that "as far as possible we do not allow import of any item of equipment which is being manufactured within this country, and for this purpose the executive departments of our Ministry are in close touch with the concerned Development Wing of the Commerce & Industry Ministry."

NEED FOR STANDARDS

Emphasizing the importance of establishing proper standards from the very beginning, Mr. Hathi said that this could be achieved by agreement with and co-operation among manufacturers, the power supply undertakings and the industrial customers.

"The Indian Standards Institution, the Central Water & Power Commission and the Development Wing of the Ministry of Commerce & Industry would, I am sure, render all assistance towards evolving standard types of equipment", he added.

Continuing he observed: "In a specialised engineering product such as electrical goods, your aim should be to set up quality standards and also provide for the service for the equipment supplied by you. This will help you get the goodwill of customers, which in turn, will earn a reputation for your products. Your industry calls for high scientific and technical knowledge, and so it takes time to build up. There should be no attempt at quick profits, particularly during the period of growth. In the initial periods, a certain amount of preferential treatment for indigenous manufacture will be necessary. The Indian Tariff Commission are fully alive to this fact. The various purchasing departments of Government make due allowance for this and are prepared to buy Indian-made equipment even at a higher price, within certain reasonable limits."

Concluding, the Deputy Minister observed that all sectors of our economy were passing through a large measure of difficulties, and in common with them, electrical manufacturers had their share of difficulties, and that obstacles and impediments were not really thrown across their path, but existed inherently in the effort of promoting rapid industrialization.

ACSR

Touching on the manufacture of ACSR and All-Aluminium Conductors, Mr. K. J. Cleetus, Chairman, said:

"ACSR conductors are standard material for transmission lines. Covered aluminium conductors for weather-proof house service connections and for indoor wiring are being produced on a large scale in the country. The demand for ACSR and All-Aluminium Conductors has increased so much that the original target of capacity for 1960-61 fixed at 21,570 tons has been revised in the upward direction to 30,000 tons. To attain these targets the manufactur-



Mr. Jaisukhlal Hathi, Dy. Minister for Irrigation and Power, delivered the inaugural address.

ing industry will require increasing quantities of aluminium rods and wire. It is therefore gratifying to note that Government have approved plans for increasing production of aluminium in the country to 35,000 tons per annum. It is also expected that this figure will be reached during the next two years. If one may judge from the rising demand for aluminium for general industrial use, and, particularly, the demand from electrical manufacturing industries, about 45,000 tons will be required by 1960-61. Right now, a considerable tonnage of aluminium has to be imported; but there is a prohibitive duty of 35 per cent on imported rods, which is the basic raw material for all-aluminium conductors.

Continuing he observed: The Tariff Commission's attention was drawn to this fact, and it has recommended that aluminium ingots, bars and rods used in the manufacture of ACSR and all-aluminium con-

ductors should be given a uniform concessional duty of 15 per cent *ad valorem*.

"Our Association has made a representation to Government that the anomaly of this high duty should be rectified. The Development Council for Heavy Electrical Industries supported this request, and yet, Government, for reasons not known to us, have still to implement the Tariff Commission's recommendation. The industry cannot afford to let this matter rest inconclusively and would request Government to consider this question immediately and relieve the aluminium conductor manufacturers of this heavy and unfair burden, he added.

P.V.C. and V.I.R. Cables

Making a reference to the manufacture of P.V.C. and V.I.R. cables, Mr. Cleetus said that in order to ensure safety to users, the manufacture of cables of non-standard quality should be prohibited.

A section of the audience.



Technical Notes

ALUMOWELD—A NEW BIMETALLIC WIRE FOR ELECTRICAL AND STRENGTH APPLICATIONS

THE RAPIDLY GROWING AVAILABILITY of aluminium has greatly increased its use in the design and construction of electrical transmission and distribution lines. This has led the forward thinking of the Copperweld Steel Company towards developing a new bimetallic wire, Alumoweld, to combine the conductance and corrosion resistance of aluminium with the strength of steel. Alumoweld fills the requirements for strengthening aluminium-type conductors, retains the advantageous properties of aluminium, and in general, does the jobs for aluminium conductors that Copperweld does for copper conductors.

In the wire industry, most engineers are familiar with the manufacture of Copperweld (copper-covered steel) in which molten copper is cast around a steel ingot and the resulting large diameter bimetallic billet is hot rolled and then cold drawn into wire. This process has been successful for over 40 years and has been changed only in degrees which tend towards greater economy and improved quality control. It was logical, therefore, that this process be considered in the manufacture of aluminium-covered steel wire.

Two major obstacles prevented use of the Copperweld process. The first was the low melting point of aluminium (approximately 1200 F.), which would not permit heating the steel to a temperature sufficiently high for rolling without first melting the aluminium. The second melting the aluminium at the interface of obstacle was the weld at the interface of the two metals. In copper-covered steel, the copper-iron compound formation is ductile and presents no problem. In aluminium-covered steel, the inter metallic compound of aluminium and steel is a problem, as it is brittle. One of our major objectives was to avoid the compound, yet we knew that a metallurgical bond is essential for a wire to be drawn and to resist the normal handling abuse typical of overhead line construction. These paradoxical objectives ultimately led us to the development of a controlled weld.

The services of Battelle Memorial Institute at Columbus, Ohio, were engaged to search for the most suitable method to apply a heavy layer of aluminium over steel, and at the same time, provide a weld between the two metals without inter-metallic compound. After several early methods were explored, Battelle developed a continuous application of atomized

aluminium powder metal onto steel rod, refining both the weld and the cladding with heat and pressure. The details of the process are restricted by Company policy and by patents pending, but the end results have exceeded the original hopes of the inventors and this new bimetallic rod is now being produced on a commercial basis. Also, it is being cold drawn into wires of sizes as used for overhead line applications.

Experience with Copperweld over the years was helpful in deciding on the proportions of aluminium and steel. Although any reasonable proportion of aluminium and steel appears possible in the manufacturing process, the decision was made to concentrate on a design having 25 per cent aluminium by area. The aluminium is concentrically or coaxially distributed over the outer cross section of the wire, providing sufficient corrosion resistance for field conditions. The low frequency electrical conductance is 33 per cent, that is, three Alumoweld wires of a given diameter, when stranded together, will have the same direct current conductance as one EC aluminium wire of the same diameter. At high frequencies the conductance of an Alumoweld wire approaches cent per cent of pure aluminium due to skin effect.

After preliminary trials were successful on mild steel, a high-strength steel practice was developed to give tensile strengths in the order of those already in use for extra high-strength Copperweld or for ACSR core wire. A special aluminium powder was also developed, suitable for a continuous production operation.

Because of its aluminium surface, Alumoweld can be applied to reinforcing aluminium conductors, where Copperweld is not applicable. Applications fall into three classes, generally. In the first grouping are those where an aluminium surface is more or less essential. An example is core wire for ACSR conductors (aluminium wires and steel core wire or wires stranded together). In this application, Alumoweld provides a strength member or core wire having a life similar to the aluminium wires themselves. It also eliminates dissimilar metals in contact. Such contacts, under certain circumstances, can increase the rate of corrosion. An ACSR with equally co-ordinated life is now a reality.

Several other advantages are noted for ACSR with Alumoweld core, known as

ACSR/AW. The Alumoweld wires have a definite 25 per cent of aluminium by area and this aluminium can be applied in the design of composite cables to marginally reduce the size of the aluminium wires, thus providing a compatible and non-rusting core with little increase in cost as compared to present designs. Another possible advantage lies in the stress-strain characteristics of the wire. In the 15 per cent to 60 per cent working range it is quite similar to standard ASTM core wire for ACSR and in the emergency range above 60 per cent it can develop its ultimate strength with less permanent stretch.

Alumoweld wires may be in surface layers of ACSR strands, too. This is a relatively new concept. For example, 7-wire designs of ACSR need not be limited to the configuration of a single core wire with a layer of 6 aluminium wires over it. It now appears possible to have two Alumoweld wires diametrically opposite each other in the outer layer to provide added strength where required. In single layer aluminium ACSR designs, the possible rusting of the core wire or wires close to the surface should not be a problem where the core wires are of Alumoweld. Another interesting Alumoweld application is for performed armour rods and grips. These fittings may be used for dead ending and splicing Alumoweld and aluminium-type conductors.

In the second grouping of applications are uses where both Copperweld and Alumoweld are good. Typical of these are overhead ground wire, guy and messenger strand, and fence. Here, the choice between the two bimetallic wires will depend on the application, the atmosphere, and the economics, so decisions will probably be made locally. In Alumoweld's favour is the fact that it is 20 per cent lighter than copper or Copperweld, and its per pound cost is less. In the case of guy and messenger strand, we have been favourably impressed with the hardness developed in the aluminium covering and its resultant ability to withstand normal abuse.

To conclude: Alumoweld wire is an excellent added tool for the overhead line engineer. It has the quality necessary for outdoor construction and its use will expand greatly over the years.

Courtesy: Electrical World

SIGHTING METHOD IS BEST FOR SAGGING BIG ACSR

Visual method most direct, fastest for wire over 500 MCM, but other methods serve for medium, smaller wire sizes

PHILIP C. EVANS,

Project Supervisor, B. C. Engineering Co., Ltd., Vancouver B. C.

FOR SAGGING HEAVY WIRE (ACSR upwards of 500 MCM), the visual sighting method is most direct, fastest, and gives the most satisfactory results. Correct sagging gives the proper ground clearance under extreme loading conditions, such as under the weight of ice, and limits tension to a value below the maximum for structure design. Medium and small sizes may be sagged by two other methods:

1. Tension may be measured directly at point-of-pull by a dynamometer or similar device. But this method is unsuitable for long sections, as sheave friction causes tension and sag to vary from span to span. Moreover, the dynamometer is difficult to keep in adjustment, so that there is the risk of overstressing both the wire and structures. This difficulty is more pronounced with heavy wire.

2. There is also the stopwatch method. This instrument measures the time for a vibratory wave to make a certain number of reflected returns, the wave having been set up by striking the wire at one end of a selected control span. Time of return is a function of wire tension and, when it has been determined, both tension and sag may be read from the proper curves. Useful on small and medium conductors, this method affords only a rough check on heavy wire.

Allows for sheave friction

Measuring the sag of two spans makes allowance for sheave friction and error in target measurement, or in sighting. When only two are used, they should be near the ends of the section. In a rough or twisting section, one or more intermediate spans should be used as well. Sag must be checked on both sides of a sharp break in either profile or plan, including angle points over 10 deg.

Longer ones are usually selected for control spans. When these are sagged precisely, the shorter spans fall in line, giving the conductor a uniform appearance. When control span length varies considerably from the section's ruling span, error may arise as sag tables and curves often are based on a parabolic relationship which only approximates the catenary.

The effect of using a control span longer than the ruling span how-

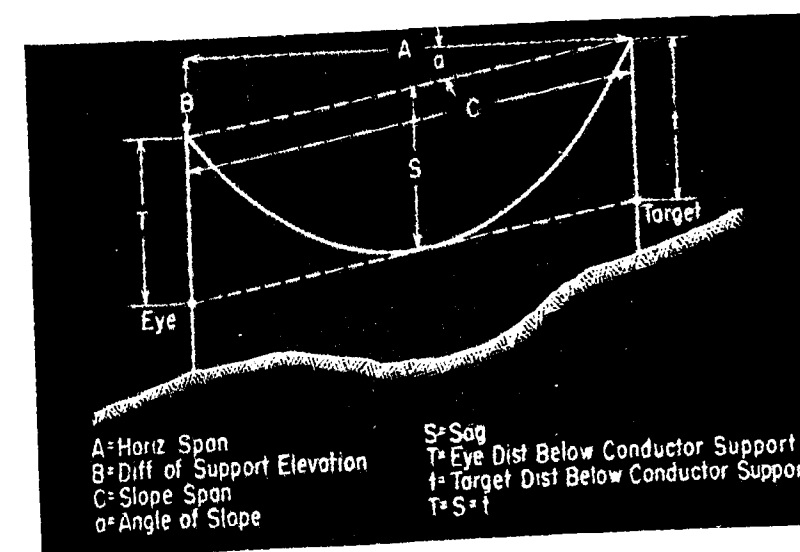


Fig. 1—Direct target method of sagging conductor involves taking a sight from the adjacent structure at an equal distance below the corresponding support.

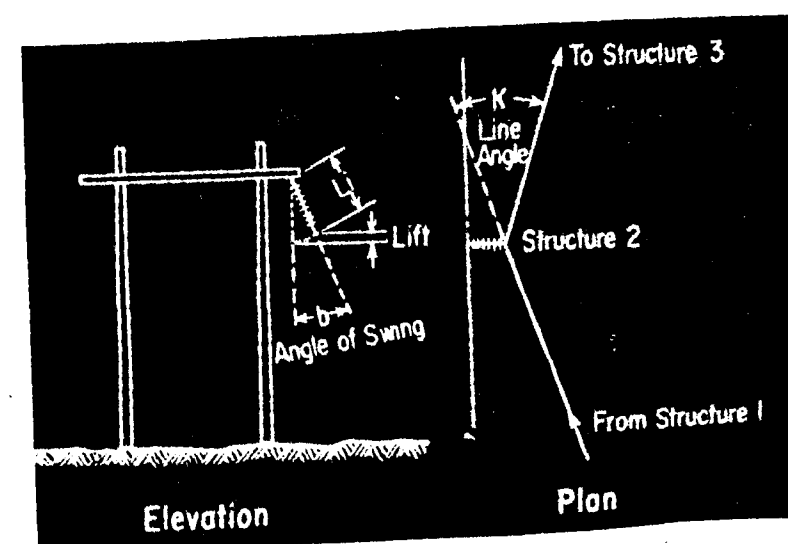


Fig. 2—At line angle the insulator string swings from the vertical under sagging tension, lifting the conductor support. Allow for lift's exact value.

ever, can be balanced by choosing a shorter one as a secondary control. An approximately correct tension for the section is obtained by splitting the sighting difference. Control spans not exceeding 15 per cent grade serve best.

There are three common ways of sagging by eye. The direct-target method sets a target at a distance equal to the desired sag below the conductor support on one structure.

A sight is taken from the adjacent structure at an equal distance below the corresponding support (Fig. 1). In an inclined span, sag is obtained by entering sag table or curve with "equivalent", rather than horizontal span. Equivalent span equals

$$A \pm B^2/4A, \text{ for deadend spans} \\ A \pm B^2/4A, \text{ for suspension spans}$$

where A is horizontal span and B the difference of support elevations.

At a line angle, the insulator string swings from the vertical under sagging tension, lifting the conductor support (Fig. 2). The exact value of this lift should be allowed for:

$$\text{Lift} = L_i - L_i (\cos b) \\ \text{and } b = \tan^{-1} \left(\frac{2T_h \sin \frac{k}{2}}{(VW_c) + W_i/2} \right)$$

where

- L_i length of insulator string, ft.
- b angle of insulator swing from vertical
- T_h horizontal tension in the sheaves, lb
- k line angle
- V effective vertical span, ft
- W_c conductor weight, lb per ft
- W_i insulator string weight, including hardware, lb

A structure's effective vertical span (Fig. 3), scaled from the profile, measures wire length to adjacent spans supported at that structure. In steeply inclined spans, components of weight on one side of a structure may be negative.

Temperature considered

It is customary to locate the target and sighting point for a sag corresponding to the anticipated sagging temperature. If the temperature varies during sighting, it is permissible to allow for sag variation by moving the sighting point up or down a distance equal to double the sag increment.

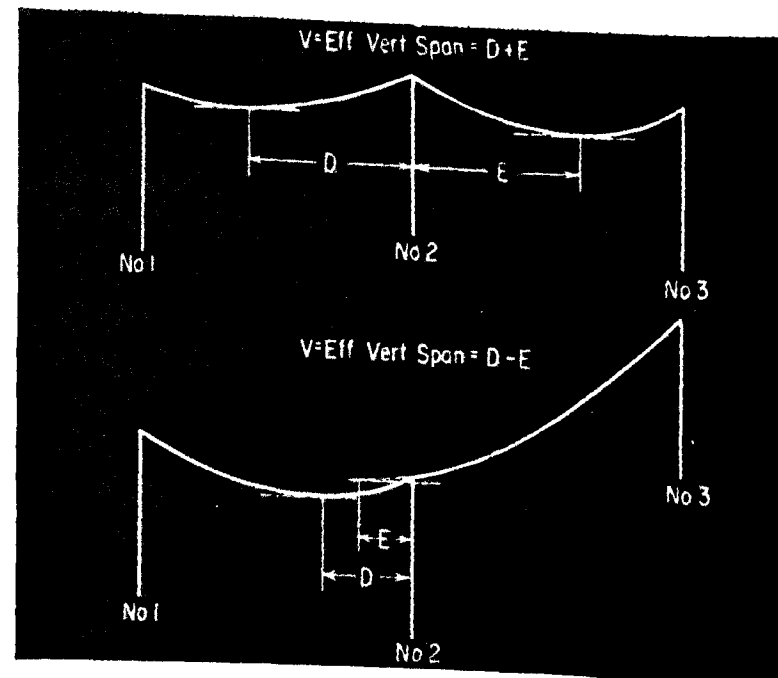


Fig. 3—Effective vertical span of structure, scaled from the profile, measures wire length to adjacent spans supported at that structure, as illustrated.

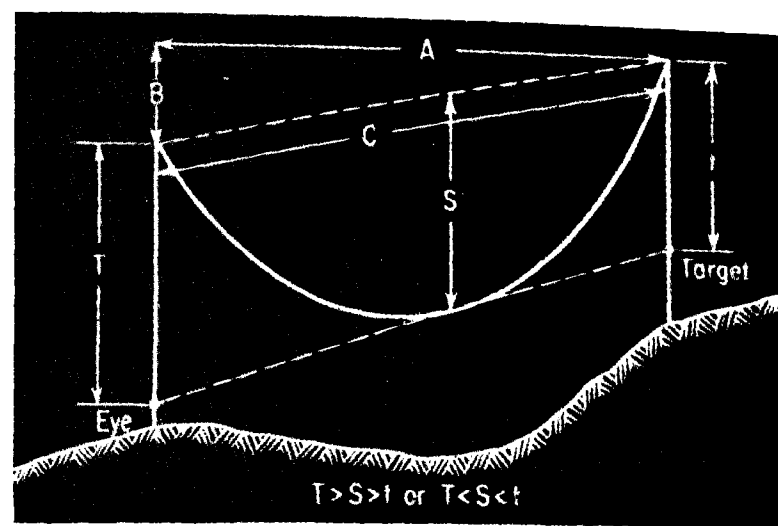


Fig. 4—Computed target method proves useful when sighting from point exact distance below support is impracticable, or by transit from structure's base.

A bracket-mounted transit often facilitates sighting and provides a horizontal cross-hair for levelling the conductors against the target.

When it is not practicable to sight from a point at an exact distance below the conductor support, or it is desirable to sight through a tripod-mounted transit from the structure base, the computed target method is

useful (Fig. 4). A sighting point is chosen at a convenient distance, T , below the conductor support on one structure, and a distance, t , for locating the target on the adjacent structure is computed:

$$t = 4S + 4\sqrt{ST} + T$$

At least two values of t should be computed for values of S corresponding to different sagging temper-

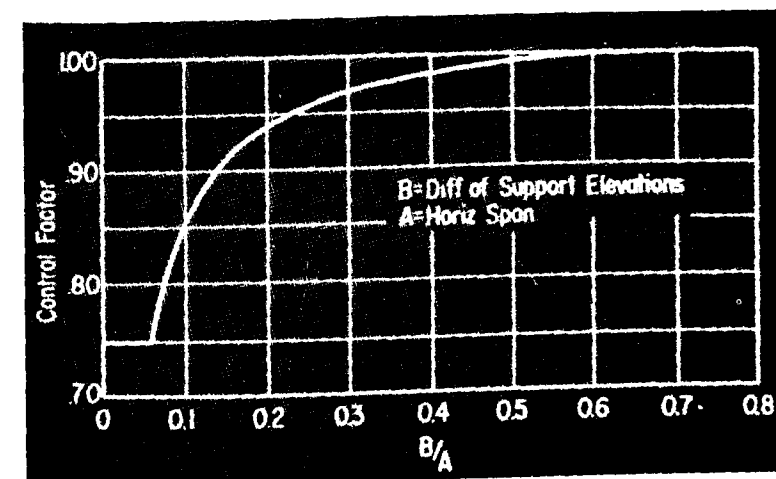


Fig. 5—Control factor should exceed minimum value expressed in curve. It's a function of quotient of support elevations' difference, horizontal span.

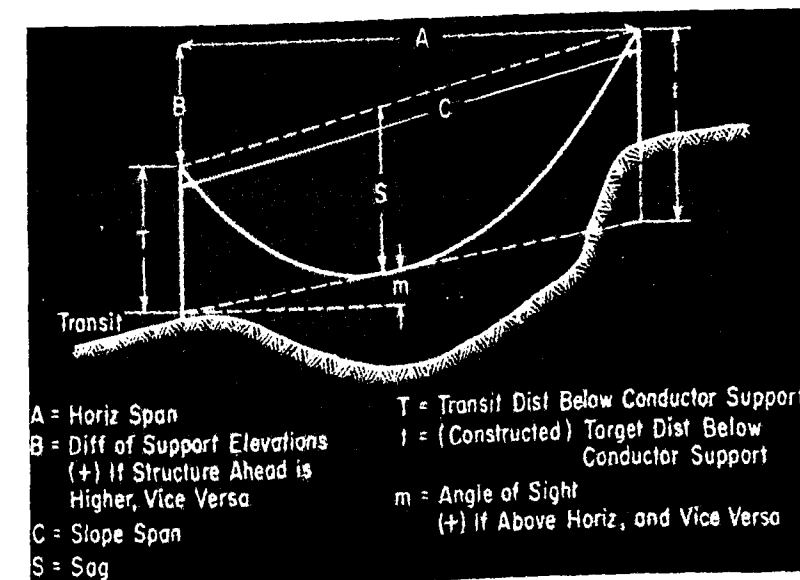


Fig. 6—Vertical angle method is used for a long span where sag is large compared to structure height and the target falls below the base of the structure.

atures. If two targets then are set, it is easy to interpolate visually for intermediate temperatures.

Here, also, allowance must be made for insulator swing if there is a line angle at either structure. If the angle is at the sighting structure, the lift correction obtained is applied to T before calculating t . If the angle is at the target structure,

correction is applied to t before setting target. This method has limitations. If T varies greatly from S , line of sight becomes tangent to the wire at a point too far from maximum ordinate of the catenary, and a basic error, aggravated in steep spans, will arise. A limiting relationship is useful:

$$3/4 S - T - 4/3 S$$

7

If T does not fall within these limits, a control factor should be computed:

$$CF = 1 - \left(\frac{T - t}{4S} \right)^2$$

The control factor should exceed the minimum value allowed by Fig. 5. If the control factor fails to satisfy the minimum value and it is not possible to select a better value of T , it is best to choose another control span.

In a long span, where sag is large compared to structure height, the target may fall below the base of the structure. Here the vertical angle method (Fig. 6) may be used. A sighting point at a convenient distance, T , below the conductor support on one structure is chosen. A vertical angle of sight is computed, and the transit is set at this angle above or below the horizontal. Angle m is obtained by simple geometry if t has already been obtained:

$$m = \tan^{-1} \frac{T + B - t}{A}$$

Also in this method, requirements of a limiting control factor should be met by computing t before computing m .

Again two values of t and m are obtained for two different temperatures, allowing interpolation for intermediate values of the angle corresponding to other temperatures.

Value must be precise

A precise value of B must be used. This cannot be scaled off the profile with sufficient accuracy. A transit shot should be used to determine B precisely by simple triangulation, before computing the vertical angle (Fig. 7). It will be apparent that in every case

$$B = A \tan n - T$$

whence

$$\tan m = \frac{A \tan n - T}{A}$$

Close attention must be paid to the algebraic signs of n and m .

A prime essential for safe and successful sagging is a positive and dependable system of communications, linking the power winch, the various control spans, and the snubbing points.

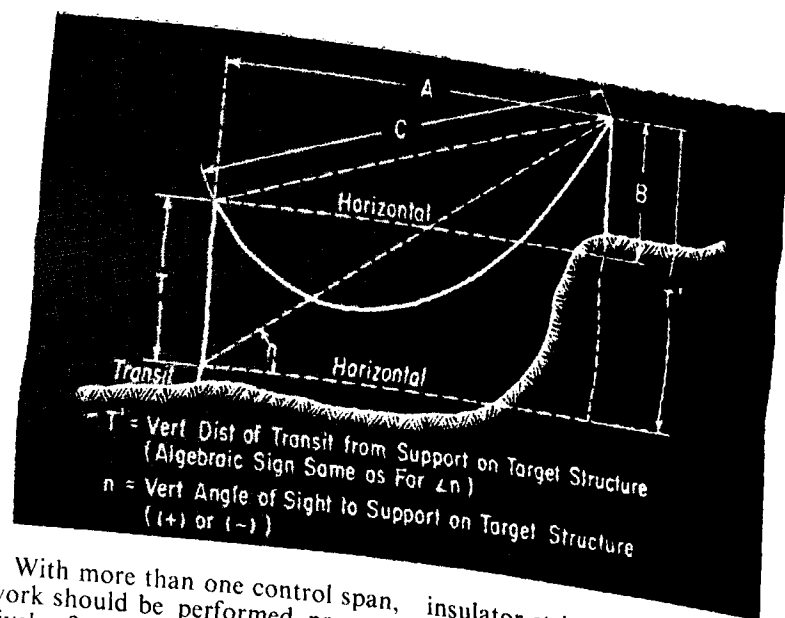


Fig. 7—Transit shot should be used to determine the difference of support elevations precisely by simple triangulation before computation of vertical angle.

With more than one control span, work should be performed progressively forward from the rearmost control span, bringing each span in turn into correct sag. In long sections, or over rough terrain or heavy angles, it is sometimes necessary to adjust the wire up and down several times before correct sag is obtained in all spans. This difficulty is aggravated when friction sheave is excessive. Close attention to care and maintenance of sheaves pays dividends.

Where number of control spans is limited, and the rear end of the section is a clipped suspension structure rather than a deadend, an observer should check position of the

insulator string at the clipped structure. This gives a rough sag check. If tension in the section being sagged is the same as in the previously clipped section, the insulators should settle in the vertical position in which previously clipped. Here again, work should progress from the rear forward, checking the last clipped insulator string plumb before attempting to bring the control span ahead into sag.

If a rough visual check after final sagging is satisfactory, a precise transit check by vertical angle may be employed. As in actual sagging, a sighting point is chosen at a distance, T , below conductor support on one structure. Again, T should

be selected close to the prescribed sag for the span.

Allowance must be made for precise difference of elevation between supports, by measuring angle n (Fig. 7). Angle m (Fig. 6) is measured. Then

$$S = \frac{A (\tan n - \tan m)}{2}$$

Comparison of the value of S , obtained by this check with required sag, indicates precision obtained. The error, if any, may be expressed as a percentage of the required sag. A tolerance of ± 1 per cent usually is allowable.

Courtesy: *Electrical World*.

Erection of ACSR Pair on the 24-Mile Experimental Line at Jabalpur

V. R. ANANTHANARAYANAN, B.Sc.* & S. J. LOUIS, B.A.**

This article deals with the erection of an ACSR pair on the 24-mile experimental line at Jabalpur.

After erection, high frequency tests were taken and the extracted results are given in this article.

ALUMINIUM CONDUCTORS HAVE NOT been used so far for telecommunication purposes in India. The widely fluctuating prices of copper, our dependence on foreign countries for our copper requirements, and the increasing number of copper wire thefts with the consequent dislocation of communication and loss of revenue, have made us think in terms of aluminium conductors in place of the hard-drawn copper wires used at present.

Moreover, India has abundant quantities of bauxite, the raw material from which aluminium is extracted. Though not immediately available in sufficient quantity in the country now, with the development of hydro-electric power envisaged in the Five-Year Plans, aluminium is expected to be available within the country, at a very low cost. If technically found suitable, the use of aluminium conductors will have a bright future in the telecommunication field in India.

But use of aluminium conductors is not without its difficulties. Aluminium conductors by themselves have low tensile strength and, because of the greater coefficient of expansion, have large dip variation which adversely affects cross-talk at carrier frequencies. On exposure, aluminium gets coated with a thin but tough film of aluminium oxide which protects it from further corrosion, but at the same time because of its high dielectric strength the existence of this film renders making of low resistance joints very difficult. Soldering of aluminium is very difficult and joints with other metals like copper, etc., have to be very carefully made and rendered moisture-proof, if bimetallic electrolytic corrosion is to be avoided.

The use of composite conductors like ACSR (aluminium conductor

steel reinforced) which could be designed for the proper tensile strength and dip variation has obviated the difficulty of sag variations. The use of compression type joints, proper jointing technique intended to make the joint moisture-proof and design of special accessories have rendered the corrosion problem less troublesome.

With the background stated above, in order to acquire first-hand experience on the use of aluminium conductors for communication purposes, a pair of ACSR conductors on the 24-mile experimental line at Jabalpur was erected in April last.

Choice of conductor size

Hard drawn copper wire of 200 lbs. per mile gauge is the standard size of conductor adopted in the Indian P. & T. Department for the carrier lines. Naturally as near an equivalent ACSR conductor had to be chosen. Based on this consideration and the data supplied by the Aluminium Union Limited, 5 A.W.G. ACSR 6/1 $\times 0.0743$ was chosen for the experimental line.

The comparative characteristics of the conductors are given below.

	5 A.W.G. ACSR	200 lbs. mile copper
Diameter	0.223	0.112
Ultimate tensile strength	1455 lbs.	640 lbs.
Weight mile	240 lbs.	200 lbs.
D. C. resistance per mile	2.80 ohms.	4.4 ohms at 60 F.
Attenuation		
db mile (dry)		
35 Kc/s.	0.144	0.144
150 Kc/s.	0.30	0.28
Characteristic Impedance	522 ohms.	603 ohms.

* Asst. Divisional Engineer Telegraphs, T and D Circle, Jabalpur.

** Asst. Engineer, T and D Circle, Jabalpur.

The line

The experimental line at Jabalpur is 24 miles long and is ideally constructed with 165 ft. post spacing (32 posts per mile) and is fitted with C8 type 8 wire channel-iron brackets. There are five pairs of copper wires, comprising three pairs on the top bracket and two inner pairs on the second bracket. The ACSR pair is erected as pair 1 on the top bracket. The line consists of three full sections of eight miles, and the wires are transposed according to the L.J. Scheme which has a transposition interval of 165 feet and 256 transposition intervals in a full section of eight miles. The lines have been constructed according to the existing C8 Construction Practice. The line disposition is given in fig. 1. The copper conductor used are 150 lbs./mile.

Erection practice

The normal departmental practice has been followed in the construction of the aluminium pair except where it had to be modified as described below due to the peculiarities of ACSR conductors.

Paying out

The aluminium conductors were supplied on drums having three lengths (approx.) of 11,000 ft. each. These drums were mounted on axles and a party of *mazdoors* (workmen) pulled the wires through, wires being taken over the brackets on bamboo slats tied on the neck of the insulators to prevent damage to the conductor. Wrapping the brackets with gunny was tried, but due to the greater length and standard nature of the conductor, the gunnies were abraded through and could not give the protection of bamboo slats. The conductor was not allowed to trail on the ground. Because of the greater lengths involved there was

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Kundara S. India.

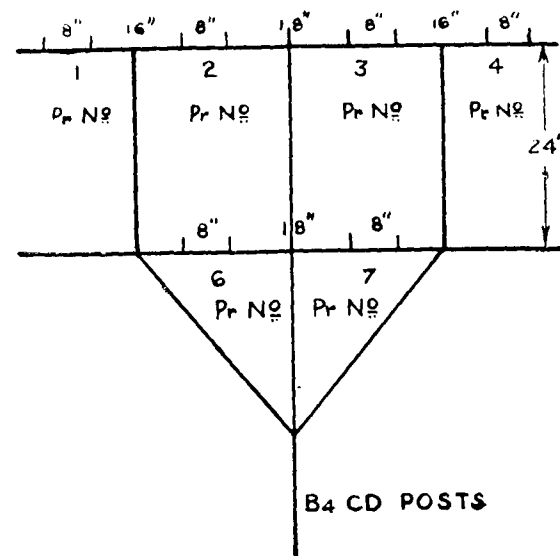


Fig. 1.—Wire disposition on experimental line.

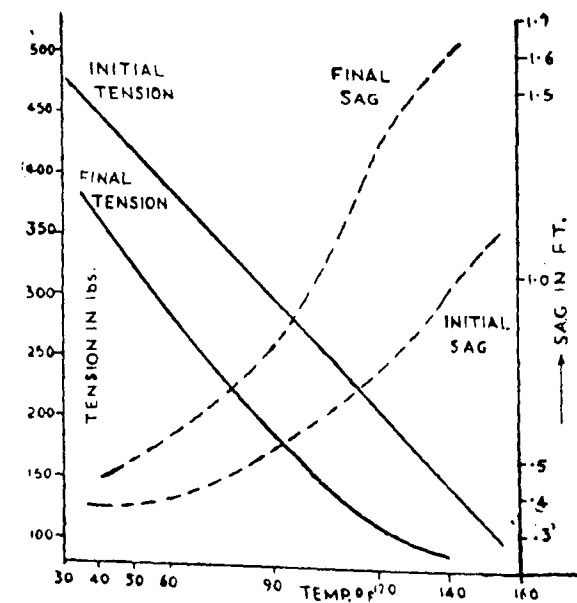


Fig. 2.—Sag tension chart—initial and final for 165-foot span and 15 lbs./sq.in. wind pressure.

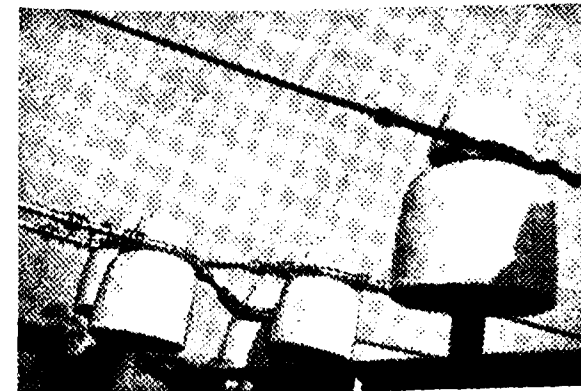


Fig. 8c.—Binding.

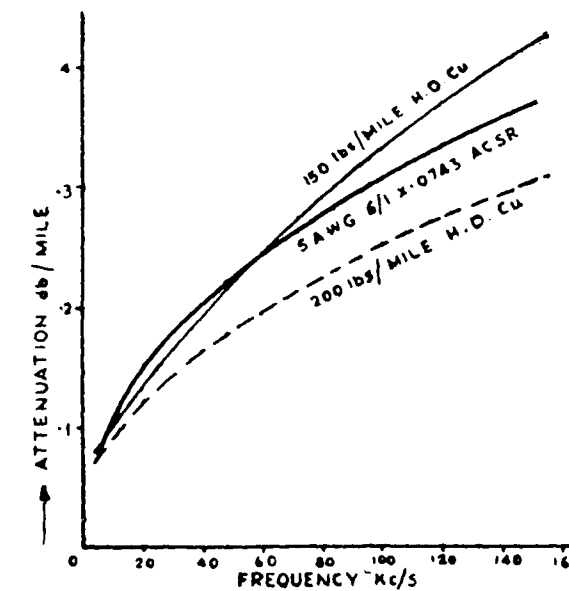
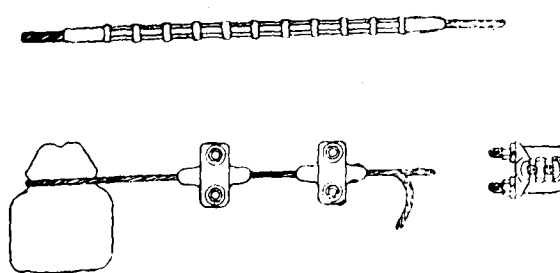


Fig. 9.—Frequency attenuation curve (Dry).



Figs. 3 & 5—Uni-joint and Bolted clips.

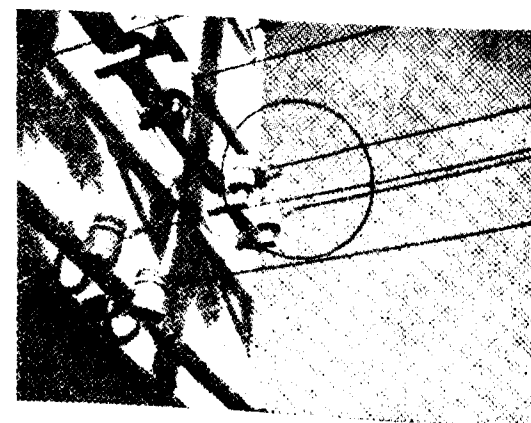
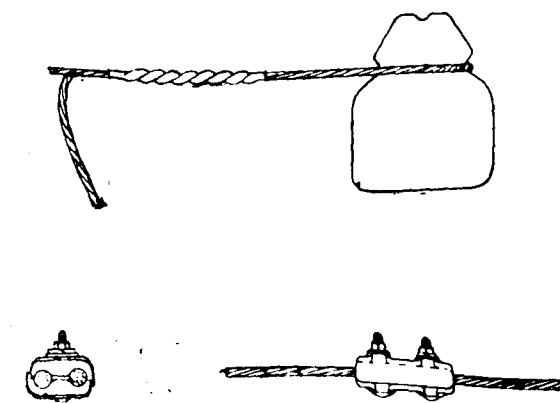
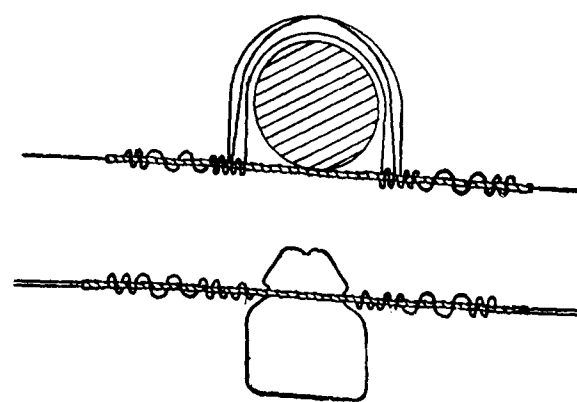


Fig. 4.—Uni-term.



Figs. 6 & 7.—Twisted sleeve parallel groove clamp.



Figs. 8a & 8b.—Binding.

some difficulty, and the labour force had to be increased. Normally, copper wires are less bulky and come in coils of about 100 lbs. each. This difficulty in regard to ACSR conductors can be obviated by obtaining it in shorter lengths, but this will mean the disadvantage of more joints.

Erection

Hard-drawn copper wires are pre-stressed ("killed") before erection. Killing of ACSR has to be done very carefully to avoid stretching the aluminium conductors unduly. Special accessories are required for this purpose. As an alternative, it is usual to erect the wires at an initial sag and tension determined from an initial sag and tension chart, and later to allow the conductors to settle down by themselves under optimum loading conditions to the final sag and tension values specified in the charts. This latter practice is followed in the erection of power transmission lines and the design of the line is based on the final sag tension values. Obviously, such a practice is disadvantageous in trunk line construction where wires may be added based on actual requirements. In such cases, there will always be a difference in the sag of the existing and the newly erected pairs. In addition, the trunk lines are designed for a flat 25 lbs./sq. inch wind pressure; in places where this loading does not occur,

the wires may never settle down to the final sag and tension values. Of course, it is possible to develop charts for each type of loading requirement, but this makes the process cumbersome. Owing to lack of data, for the ACSR pair, the experimental pair was erected on the initial sag and tension data supplied by the Aluminium Union Limited. The initial and final sag and tension charts are shown in fig. 2. The wires were tensioned properly using a dynamometer, and the proper sag and tension determined based on the prevailing temperature during erection. Because a transposition was required at every second post for this pair, the wires could be tensioned for only two spans at a time.

Joints

For copper wires McIntyre sleeve joints are usually used. Even though twisted sleeve joints can be made on ACSR as well, as they cannot be easily sealed against moisture, they tend to develop high resistance in course of time. To produce a strong joint of low resistance, a compression type of joint known as "uni-joint" is used. The uni-joint consists of an aluminium sleeve of proper size with a small nick at the middle and tapered ends. The sleeve is filled with a compound specially composed to give good grip, a good electric contact and keep the

inside moisture-proof. The uni-joints are supplied ready filled with the special compound. The two ends of the wire to be jointed are first cut square. The surface of the aluminium wires is then cleaned with emery paper or a steel wire brush to remove any alumina film and the wires are inserted into the sleeve from the ends. They butt in the middle being stopped by the nick on the sleeve. The compression tool is then applied, which causes the sleeve to be tightly pressed, at intervals $\frac{1}{4}$ in. apart by using hand pressure on the tool. Such joints are claimed to have a tensile strength not below 90 per cent of that of the conductor, and to have stable low resistance. A typical joint is illustrated in fig. 3.

Terminations

The wires have to be terminated at lead-in points, L-pods, and section terminals used. For copper wires, a McIntyre sleeve is used. For ACSR conductors, three types of terminations or dead-ends are common. These are:

- Uni-terms.
- Bolted clips.
- Twisted sleeves.

Dead-end using uni-terms

A uni-term consists of a simple aluminium tube with a galvanized steel wire loop fastened into one end. The tube is filled with a special compound. The correct length of

TABLE 2
Attenuation-Frequency test
(Dry Weather)

Frequency Kc/s	Attenuation db/mile	
	5 AWG ACSR	150 lbs/m. copper
4 Kc/s	0.07	0.08
20 Kc/s	0.15	0.13
40 Kc/s	0.20	0.19
100 Kc/s	0.36	0.33
152 Kc/s	0.37	0.43

TABLE 3
Far end cross-talk values (Worst)

Disturbing pair							Disturbing pair					
1	2	3	4	6			7	6	4	3	2	
62	57	56	57	53	db	7	62	57	80	45	55	
124	136	124	112	124	Kc/s		143	128	152	148	148	
55	49	60	77		db	6	59	53	5	56	db	
116	136	124	100		Kc/s		148	136	148	112	Kc/s	
75	46	69			db	4	54	59	65	db		
120	148	136			Kc/s		148	148	136	Kc/s		
50	56				db	3	59	70		db		
104	112				Kc/s		100	124		Kc/s		
55					db	2	62			db		
72					Kc/s		76			Kc/s		

TABLE 4
Near-end cross talk test
(Worst Values)

Near-end cross talk of the ACSR pair with respect to the others only were taken in the frequency range 4 Kc/s—152 Kc/s at 12 Kc/s intervals and the results are given below.

Disturbing pair						
1	2	3	4	6	7	
53						db
76						
	47					Kc/s
	148					
		65				
		64				
			54			
			136			
				68		
				148		

ACSR wire to be terminated is marked and the excess cut off. The end is then cleaned with emery paper and inserted into the free end of the uni-term which is then compressed by the hand compression tool. The steel loop is slipped on to the neck of the insulator. Uni-terms have been used at the window terminals at the two ends of the present line as shown in fig. 4.

Bolted clip dead-end

The correct length of wire is marked off and a loop is made. The two wires of the loop are then bolted together by a pair of clips as shown in fig. 5. The loop is slipped over the neck of the insulator subsequently.

Twisted sleeve dead-ends

Aluminium sleeves of the McIntyre type are used for this and the ACSR wires are terminated in the same manner as in the case of copper wires as shown in fig. 6. Both bolted clip termination and sleeve type termination have been used at the L-pods and section terminals of the experimental pair to study their comparative merits and demerits.

Through connections

The wires between two section terminals are jointed through by a bolted arrangement known as the parallel-groove clamp. The ends of the terminated wires are cleaned, a steel brush being used, after applying a special grease known as "No-Oxid" grease. Such application ensures a very clean surface. The two grooves of the P.G. clamps are similarly cleaned. The two wire ends are positioned in the cleaned grooves of the parallel-groove clamps which are then bolted into position with grease being applied liberally over the clamp. This arrangement is shown

in fig. 7. In certain places universal parallel-groove clamps have been used as a trial measure.

Binding

Copper wires are wrapped with a thin copper strip for a short length where they touch the necks of the insulators and they are bound to the necks of the insulators with copper binder wires. In the case of ACSR, the wires are wrapped with soft annealed aluminium strips known as "flat armour tape" (0.03 in. $\times$ 0.25 in. $\times$ 2 ft. 6 in.) and are then bound to the necks of the insulators with a short length of soft aluminium wire (0.162 in. $\times$ 3 ft. 6 in.) corresponding with the copper binder as shown in fig. 8.

Lead-in

Copper wires are led into the offices by lead sheathed V.I.R. single wire soldered into the line near the pothead. In the case of aluminium, soldering being difficult, a special accessory known as a compression tap-off "connector" is used. The tap-off connector is fitted just beyond the uni-term, the copper conductor of the lead-in L.S. wire being passed through a small hole provided in the connector. The ACSR wire surface is cleaned and the tap-off connector compressed into position on it and a liberal coating of "No-Oxid" grease applied.

Tests

The following tests were taken after erection of the ACSR pair, after removing all possible faults on the alignment :

- Earth and cross insulation.
- D. C. Resistance.
- Attenuation—frequency characteristic.
- Far-end crosstalk tests.
- Near-end crosstalk tests.

The results are given below.

Near end cross talk of the ACSR pair with respect to the others only were taken in the frequency range 4 Kc/s—152 Kc/s at 12 Kc/s intervals and the results are given below.

The tests taken immediately after construction compare satisfactorily with the tests on copper conductors. However, no definite conclusion can be drawn at this stage until the tests spread over various seasons are completed and the performance of the experimental line is compiled and determined fully.

Acknowledgements

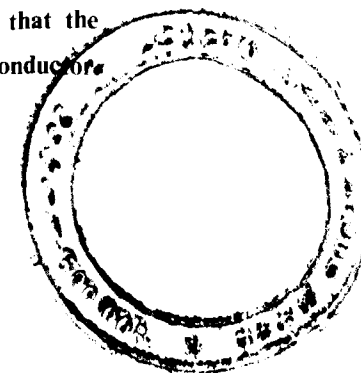
The experimental pair was constructed with the full co-operation of Messrs. Aluminium Union Limited who had sent one of their Engineers Shri Y. K. Kaul to assist the departmental staff. Certain items of accessories such as uni-joints, uni-terms, etc., were also supplied by this firm as samples.

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- (3) Conductor Accessories Sheets of Aluminium Company of Canada Ltd.
- (4) ACSR-Graphic Method for Sag-Tension Calculations published by Aluminium Company of Canada Ltd.
- (5) Use of ACSR in open-wire Telephone and Telegraph Lines. Aluminium Company of Canada Ltd.

Courtesy : Telecommunications.

A point of special interest to our readers will be that the erected line consists of Alind ("Thrush") ACSR conductor.



Our Family

We said farewell to . . .

M. K. C. Pillai (Foreman, Rod Mill).

Chandran, as he was known to friends, joined ALIND in November 1954 as an Apprentice. He has been working in various capacities in our rod mill, wire mill, covered conductors plant and electrical section. By dint of hard work, he worked his way up to the rank of a Foreman in our rod mill.

An intelligent and a very practical engineer, he never disdained working with his hands. Outside working hours, he was taking a very keen interest in all our extra-plant activities like sports and dramatics. He had put in a considerable amount of constructive work for the Co-operative Society.

By his winsome manners and capacity for leadership, Chandran had endeared himself to one and all of us here in ALIND, and we are going to miss his genial personality, very much, indeed.

In his new assignment with the Hindustan Steel at Bhilai, we wish him every success.

They were married . . .

Our congratulations and good wishes to the following newly-weds :

M. Sreenivasan, Stores, with Miss Sarojam.
S. Gregory, Rod Mill with Miss Subackia.

Jerome Harry D'Cruz, Wire Mill, with Miss Mary Sheila.
Terrence D'Cruz, Inspection, with Miss Arch Angel, and
G. Antony, Wire Mill, with Miss Floria.
Janardhanan Asari, with Miss Vijayamma.

Births . . .

To the wife of :

P. Madhavan—a son.
G. D. Rozario—a son.



Members of the Alind Supervisory Study Group who gave a farewell party to M. K. C. Pillai (centre).



Jerome Harry D'Cruz—Mary Sheila.



Terrence D'Cruz Arch Angel.



Janardhanan Asari Vijayamma.

Obituary

THE DEATH OCCURRED OF M. P. MAMMEN, (49) Charge-man, Inspection, on February 25.

For some months now, Mammen had been taking treatment for diabetes, and following an operation, he died. He is survived by his widow, four daughters and two sons.

Mammen joined FACT back in 1944. During its early construction days, he came to Alind joining as a Stores Clerk/Maistry. Since then he had been working in various capacities until he became a Charge-man in the Inspection Section.

A fluent and forceful speaker, Mammen invariably had his "say" on Factory Day, although latterly he had not been coming out much.

To the members of the bereaved family ALIND CHRONICLE extends deep sympathy.

The icy hand of death fell on another of our employees—K. Pankajakshan, Helper, Foundry, on March 14. Typhoid took toll of his life.

Pankajakshan was also one of our earliest employees, having joined Alind in 1947. A well-liked person, it is a pity that death should have claimed him at the very early age of 26. Special poignancy is lent to his passing away for this reason—namely, that the house he had been building has not yet been completed; also, his parents were planning to follow up the house-warming ceremony with the celebration of his marriage.

To his heart-broken parents, and friends in Alind, we offer sincere sympathy.

Another obituary item which should actually have been reported in an earlier issue pertains to G. OOMMINI ASARI, Reel Shop, whose death occurred on July 14, 1958.

To his two sons Vidyadharan and Gangadharan of Reel Shop, sympathy is extended.



P. Aravindakshan.

Delhi Sales Engineering Office

EFFECTIVE FROM FEBRUARY OF THIS year, we have set up a small, sales engineering unit in New Delhi. Coming within its purview are the States of Bombay, Rajasthan, Madhya Pradesh, Uttar Pradesh, Delhi, Punjab and Kashmir.

The office is located at Hotel Marina and is in charge of P. Aravindakshan, Asst. Engineer.

A graduate in electrical engineering (with power engineering as his special subject) of the Kerala University, Aravindakshan has had a brilliant college career. He obtained a high second class in his engineering degree examination and a first class in his intermediate-in-arts. After a brief stint with the Kerala State Electricity Board, Aravindakshan joined Alind as a Sales Engineer in October 1957.

Bhubaneswar Office

FROM MARCH 28, 1958, WE HAVE our own office in Bhubaneswar, India's cathedral city, with our very own Representative in the person of M. V. G. Menon! A product of the University College, Trivandrum, where he says he saw "many pebbles polished and diamonds dimmed", he said g'bye to the dear old *alma mater* after a stay of five years during which period he casually collected two degrees—B.Sc. (Zoology) and B.Sc. (Chemistry). Mr. Menon is a go-getter—that is, he is the sort of

chap who will talk you into buying a bulldozer even if you cannot find an immediate use for it—his argument will be that the trees to be mown down can be planted afterwards! A very well-read person, he can quote profusely from the English poets.

Menon is our liaison at Bhubaneswar. He joined Aluminium Industries in 1956 when the Hirakud dream was acquiring some semblance of a shape.



M. V. G. Menon.



Aluminaries

S. PEER MOHAMMED *Works Manager*

BACK IN 1938, A COLLEGE PROFESSOR in Trivandrum was sending out students from his class not in single file; he believed in bundling them out in a battalion. Light-hearted undergraduates got literally the air from him. To make good with such a temperamental professor was something like getting a Padma Bhushan from the President! And with such a professor a boy once made good; he scored in one of this professor's papers 43 marks out of 50!

All along not quite an apt pupil, this surprisingly good performance on his part really opened his eyes... to his text-books! And so he whipped the offending Adam out of him and started swotting it up. Never was such a sudden scholar made; never came reformation in a flood with such a heady current scouring faults. The upshot of it all was that the class, to the last man, chose him for the "good conduct" prize—strictly speaking to the last woman—for what actually swung the voting in his favour were the ballot papers of all the (rather attractive) co-eds in the class!

This lad unparallel'd, this paragon of virtues, this epitome of excellences, this bonhomous bean, is none other than our peerless Peer Mohammed!

A classmate and close friend of V. G. G. Nayar, Peer holds a glittering array of degrees—B.A. (Maths) from Madras, B.Sc. (Engg.) from Travancore and M.S. from Pittsburgh.

Peer joined the erstwhile Electricity Department of the Travancore Government in 1943, put in about two years' service as Station Engineer and later as Technical Assistant in the office of the Chief Engineer.

In 1946, he left for the United States of America on a Government of India scheme sponsored by the State Government. While in the States, in addition to obtaining a post-graduate degree from the University of Pittsburgh Peer underwent a special course for over six months in the graduate school and Pittsburgh works of Westinghouse. (You can be sure...if some one is a Westinghouse product!) Later, he made a study of the electrical systems of TVA with special reference to the interconnections of the systems. He also worked for a brief spell with the Buffalo Niagara Electric Corporation in their Relay Engineering Department.

On the return trip, Peer spent a few weeks in England and on the Continent visiting important power systems.

For about three years—as soon as he was back in circulation—he was engaged on the construction of 66 kV, 11 kV and distribution lines in South Travancore and the extension of power supply to about 30 new distribution centres. Incidentally, he was among the first few to handle ALIND ACSR and AAC.

In 1951 Peer Mohammed was posted back to the office of the Chief Engineer as Technical Assistant. He was also holding additional charge as Personal Assistant to the Chief Engineer. Meanwhile things were happening, rather, were not happening, at Electrical & Allied Industries (Travancore) Limited, Kundara, a concern in which the State Government holds an interest. As EAIT was in bad shape, Peer was named its Works Manager in 1955.

In a little under two years, he galvanised this moribund outfit into such a bee-hive of bustle and activity as to leave people who had known the company in its bad, old days speechless with wonder. Maybe, it was his nous that did the trick, maybe it was his personality *plus*; whatever it was, EAIT was once again a going, indeed, very much of a running concern.

The bosses were obviously so impressed with what Peer had been able to do for Electrical & Allied that they soon put him in additional charge as General Manager of the newly-started Kerala Government Ceramics. A double-tunnel electric kiln of two-ton capacity was in installation around the time he took charge—this he brought into operating shape during his term, and before he gave up Government service to join us.

Peer Mohammed is the founder-Secretary of the former Travancore Electricity Department Engineers' Association.

His social gifts, his fund of (mostly unprintable) stories, his gaiety and his gusto are such assets that a party is not the same without him.

Volleyball, badminton and tennis are his chief sporting interests.

Wodehouse is the author chappie he likes to go to bed with, although it is common knowledge in Kundara he borrows old copies of *Esquire* from VGG, ostensibly to read, mark and inwardly digest a serious article like the one that the journal carried on V. K. Krishna Menon, and which VGG, in his *naivete*, thinks Peer will devour with his (VGG's) own enthusiasm, but really, as this

writer suspects, he borrows those copies to look at all those cuties in colour, and thereby work off his polygamous instincts!

Considerable as Peer Mohammed's success is as an engineer, what makes him "click", wherever he goes, with men in the East or women in the West, is a particular brand of ineffable charm he alone seems capable of exuding. He is simply superb in the department of human relations. PR with him means no Private Reserve, it means just plain, old-fashioned Public Relations—sincerity, courtesy, consideration, and what it takes to make a leader carry his men with him. Which is what accounts for his high Personality Rating. His very name spells PR—the beginning and ending of Peer!

—R. P.

Form IV

Rule 8

(As prescribed in the Registration of Newspapers (Central) Rules, 1956)

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'DYNAMICS OF MANAGEMENT'

M. R. G. Menon attends study course at Bangalore

FROM DECEMBER 15 TO DECEMBER 23, 1958, the Indian Institute of Science, Bangalore, conducted a residential study course on "Dynamics of Management". The course was one of a series planned and conducted by the Indian Institute of Science, Bangalore.

M. R. G. Menon, P.A. to the General Manager (O. & M.) attended the course.

Here's a brief report on the course by him.

The participants in the Residential Study Course—twenty-four in all—came from leading industrial concerns in South India. Conducted under the auspices of the depart-

ments of Economics and Social Science, and Industrial Engineering and Administration, nine subjects covering practically all the techniques employed in modern industrial management, such as statistical quality control, cost and budgetary control, production control, work-study, etc., were discussed in detail. Lectures by eminent professors and top executives of big industrial organizations, like the Hindustan Aircraft Limited, and Hindustan Machine Tool Limited, were regular features. These lectures were followed by group discussions in which the participants exchanged views, and were able to arrive at proper conclusions with guidance from experts.

Visits to important factories in and around Bangalore were also arranged.

By organising a course like this, the Institute is, indeed, rendering yeoman service to industry in that such studies help build up a band of competent senior executives, well-equipped with a thorough knowledge of modern management techniques.

This report will hardly be complete without at least a passing reference to some of the personalities behind this laudable endeavour, particularly to Prof. R. Natarajan and Dr. M. C. Munshi of the Institute. Both were human dynamos of energy!



C. S. Kaladharan Pillai.



A. Carlose.

N. Madhavan Pillai.



Character Actor

C. S. KALADHARAN PILLAI, STORE-KEEPER, JOINED ALIND in 1950, directly he obtained his release from the Royal Indian Army Supply Corps, where, too, he worked as a store-holder.

Fond of sports, he plays volleyball, football and badminton. While with the Army, he once cleared a height of 5 ft. 4 in. in a high jump contest, landing the first prize of the event.

But Kaladharan Pillai's Alind reputation largely rests on his acting ability. He could play character roles in particular with consummate ease.

Hindi pictures and humorous plays are his principal off-work distractions.

A persevering, hard-working, pleasant-mannered person, Kaladharan is quite a popular Alinder.

* * *

Local Product

A. CARLOSE, OPERATOR, ROD MILL, IS A LOCAL MAN WITH attachments purely local.

One of the early few to join Alind—he came to the Company in 1946—Carlose was first a Helper, then a Junior Fitter, before moving over to his present position as Operator.

Short stories and novelettes constitute his favourite reading matter.

Smart and energetic, Carlose is a forceful talker too.

* * *

Practical Economist

N. MADHAVAN PILLAI, SQUAD LEADER, SECURITY, ALSO belongs to our early band of employees having joined Alind in 1947.

Before coming to us, he was working for a rubber works in Trivandrum.

A Sanskrit scholar, Madhavan Pillai is an ardent lover of *kathakali*, Kerala's great art of dance-drama.

A practical economist, he is a pupil after Polonius's own heart—one of Madhavan Pillai's cherished maxims in life being, 'Neither a borrower nor a lender be'.

The boys drove him nuts!

V. P. SAMUEL, PURCHASE ASSISTANT, ENGINEERING SECTION, is a former teacher and scout-master. He threw up teaching after slogging away at it for twelve hard years to become Yard and Godown Supervisor with Peirce Leslie who deal, among other things, in cashew—a clear case of boys driving their master nuts!

In 1946, Samuel joined Alind.

Basketball and football vastly interested him while at school—as a boy—but now he spends such spare time as he has pottering about his garden.

Religion is another of his great interests. With the *New Testament* passage which reads, "Pure religion and undefiled before God and the Father is this—to visit the fatherless and widows in their affliction and to keep himself unspotted from the world," Samuel's own mind is in perfect accord.

* * *

Sales Tax Specialist

M. O. ABRAHAM, SALES, WHO JOINED ALIND IN 1948, IS A former Army man, also a former FACT employee. His varied experience includes brief spells of service as a railway guard with the Southern Railway, as a dock foreman at Karachi, Bombay, Calcutta and Vizag during the war years, and as an independent oil-mill owner.

Here at Alind, he was first with Despatch, later he moved over to Stores, and is now with Sales. A "Sales Tax" specialist, what he does not know about this levy, cannot take more space to write than one side of a *naya Paisa* coin!

On Jan. 1, Abraham moved over to his own newly-built house, christened *Santhalaya*, which incidentally is wired with ALIND KER-AL-LITE!

* * *

He plays the game!

K. BHASKARAN PILLAI, LABORATORY, WAS IN THE YEAR of his joining Alind—which was 1951—just an on-looker, seeing most of the game. From 1952 onwards, he forswore this passive, looking-on role, and started actively participating in games. What's even more important, he has since been walking away with the prizes too! Badminton and table-tennis are two games of which he is specially fond and at which he is specially good, although volleyball, ring tennis and caroms have also claims on his affections, and in which games, too, he can acquit himself quite creditably. What's remarkable about Bhaskaran's athletic achievement is that he learnt all these games—and learnt them well—only after he joined Alind, having had to leave school in his seventh class.

A handy man at the Lab., he is a well-liked lad both on and off the sporting fields.

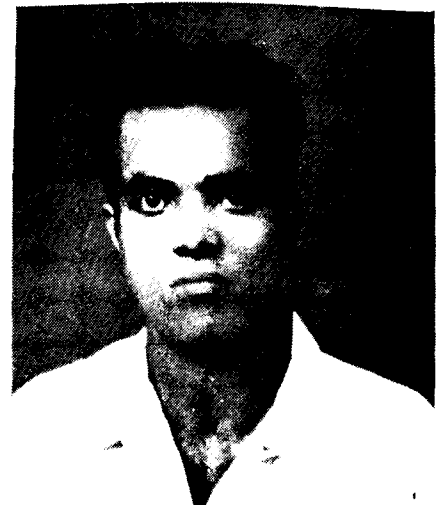


V. P. Samuel.



M. O. Abraham.

K. Bhaskaran Pillai.



Christmas Party



His Grace Mathews Mar Coorilose.



Vijayalakshmi, first prize winner in the up-to-three years class.



Sreekumar, second prize winner.

"SUFFER LITTLE CHILDREN TO COME unto me, and forbid them not; for such is the kingdom of God."

What a sentiment and how beautifully the *New Testament* expresses it?

Christmas came round once again—or twice again to Alind—considering we had our gala, children's party on December 21.

His Grace Mathews Mar Coorilose, Assistant Bishop, Orthodox Syrian Diocese, Quilon, was the guest of honour.

The venue this time was the lawn in front of our new Administration Block, specially done up (but as usual) with festooned fairy lights, bunched balloons and various other effects that go to make for decorative paraphernalia and lend the necessary seasonable, carnival touch.

Earlier in the evening, we had our Baby Show. In the category of babies "up-to-three years" V.G.G. Nayar's little daughter Vijayalakshmi was declared first prize-winner. Sreekumar, son of M. K. Chandrasekharan Pillai got the second prize. In the "above-three years" class, the first and second prize-winners were Prasannakumari, daughter of P. K. Varadarajan Pillai, and Indira, daughter of G. K. Warriar.

The judges were: Dr. Sumitra, District Medical Officer, Quilon, Dr. E. K. Raman Pillai, Company Medical Officer and Dr. Cheriyan, of Nirmala Hospital, Quilon.

The song-and-dance sequence, introduced last Christmas, was repeated with the same success this year, too—thanks largely to Jayachandra Babu, son of Sanku Asari—an illustrious chip off the old block!



Santa Claus (Tom Levario) and his merry band.



Ibrahimkutty's little "gold-digger"! She scooped out a gold necklace in the Lucky Dip.



The children clustering round Santa to receive prizes.



Prasannakumari, first prize-winner in the second category.



Nun—Kannan.



"Little Kainikkara" Profulla Chandran.



Okay for sound! (Vijayalakshmi being examined.)



Saraswathi—Anita.



Kerala belle—Rema.



Indira, second prize-winner in the second category.

Fancy Dress got a big hand as in other years. The disguises deftly put over included those of a nun, (Kannan, son of V. G. G. Nayar) "Little Kainikkara"—complete with goatee and uniform (this a real case of bearding the lion in its own den for the imitation sought to be portrayed was that of Alind's Security Officer and he was there in the flesh) (Profulla Chandran, son of M. R. C. Nair), a Kerala belle, (Rema Menon, daughter of T. R. Menon), an Arab, trader (Vijayakumar, son of B. B. Kaimal) Rama and Lakshmana, (Bhagyalakshmi and Molykutty, daughters of K. R. Sankaranarayanan and M. K. Varughese). "Sree Saraswati", (Anita, daughter of P. Raghavan Nair) Bhagavathar, (Babuji, son of P. Raghavan Nair) Buffoon, (Mohammed Ali, nephew of P. A. Ibrahim) and a ghost, son of N. P. Krishna Pillai.



Lakshmana and Rama—Molykutty-Bhagyalakshmi.



1. Participants in the Lime and Spoon Race.
3. Tug-of-war (girls).
5. Step Race for Boys

2. Biting the bun for Boys.
4. Tug-of-war (Boys): Boys beat girls.
6. Lime and Spoon Race in progress.

The nun and the "little colonel" were adjudged first and second prize-winners.

Delivering an illuminating Christmas message, His Grace observed: "Christmas is the day of the incarnation of the Holy Ghost to re-establish righteousness, also the incarnation of the power which is, within us, a power incomprehensible, even with intelligence, which in itself is a gift from that power, a spiritual power manifesting itself in children like those present here."

Continuing, His Grace said: "There is already a heavenly spirit in children. Develop that spirit. You can make a god of yourself—you can make a god of even a criminal".

Around 7-30 p.m., along rolled Santa Claus (Tom Levario) as usual in his legendary gown and white beard, perched on a delightfully decorated diesel truck and accompanied by a band of musicians and melody-makers. He parked his wagon close to the glittering, present-bedecked Christmas tree. Santa's arrival, in itself sufficiently exciting, became even more so, as he started handing out the presents to the children from the large Christmas tree.

The wide assortment of gifts included such all-time favourites as dolls, bunnies, pop-guns and mechanical toys.

The luckiest of all the lucky children was Salina, daughter of S. Ibrahimkutty, Cashier, who got the best prize out of the lot—a gold necklace. (Note how Dame Fortune distributes her favours. Gold must needs go to one who knows its value!)

The usual sports events were held earlier in the day between 8 a.m. and 12 noon.

The Christmas party was one of our biggest successes of 1958. And don't forget we had in the year such an event as the official opening of the Administration Block!



With V. G. G. Nayar (first from left) are Mr. C. S. Padmanabha Iyer and Mr. C. N. Sreekantan Nair—Club Day guests.

Republic Day—Recreation Club Day

ARC Captain—Captain of Kerala Olympic Team;
flood-lit Tennis — now a regular sports feature

FOR SOME YEARS NOW, WE HAVE been combining our Republic Day celebration with our that of Club Day—a sort of Alind twin core! And in accordance with this practice which is fast becoming a tradition, this year, again, we repeated the "mixture"!

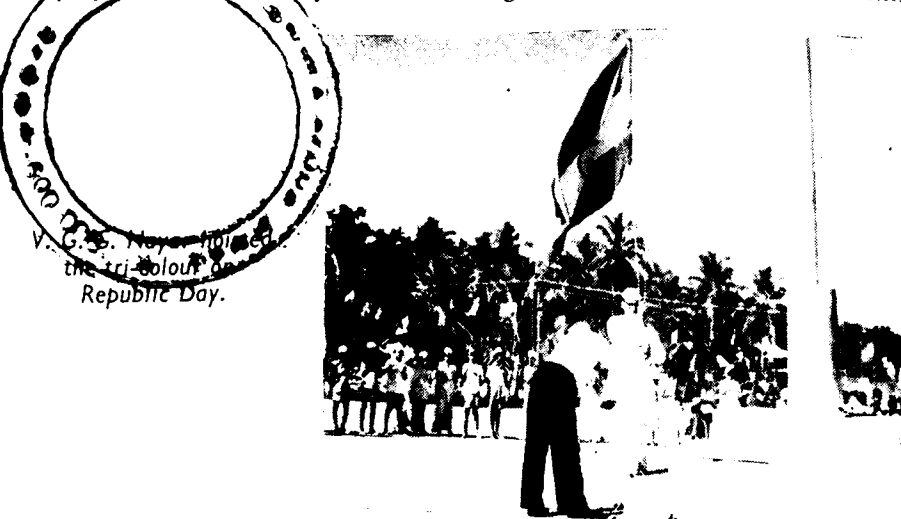
In the morning, we had the usual procession of Alind Juniors (in all their khadi-capped glory) which, going round the colony finally halted at the flagmast near the works. To the strains of the National Anthem, V. G. G. Nayar hoisted the tri-colour. In a brief speech, he explained the significance of our flag, how it had been evolved, how we ought to continue to wage a relentless war against poverty, unemployment and illiteracy, and how

we should all whole-heartedly strive for the attainment of the socialistic pattern of society.

The Club Day got off to a good start with a musical overture by Kumari Ambika of Trivandrum—1958, winner of a Presidential award.

S. Peer Mohamed, Works Manager, welcomed the gathering present, including the guests of honour Mr. C. S. Padmanabha Iyer, Chief Operation Engineer, Kerala State Electricity Board, and Mr. C. N. Sreekantan Nair, Editor, *Kaumudi*, Trivandrum.

"The Kerala Electricity Board" said Mr. Padmanabha Iyer in the course of an interesting address, "is engaged on an important job of nation-building activity by developing the electrical resources of this



State and by the supply of electricity to various industrial establishments. Alind is playing a prominent part in the fulfilment of this duty by its supplies of conductors and other appliances."

"No progress in any direction will be possible without the active co-operation of all the persons concerned, and in developing this spirit of co-operation, such a club as yours has a very useful role to fill," he added.

Continuing, he observed: "A Club can shape the destinies of men, can develop the latent histrionic and other talents of its members."

Mr. Iyer recalled, in this connection, how, in the early days in Munnar—a lonely spot amid thick jungle in the High Ranges—a club helped foster *esprit-de-corps* among the *mazdoors* and the personnel of the Electricity Department.

Earlier, K. Ramarajan, Hon. Secretary, presented his report for the year. The sports activity calendar had included, among other games, tennis too, and flood-lit tennis at that, according to the report.

The report also contained a well-deserved tribute to our football team. To quote the relevant extract: "Our football team is the pride of our club. Our Captain, Madhavan Nair is captaining the Kerala State Team. Congratulations to him because of the vicarious kick we ourselves get! The team continues to be the holders of the District League Shield".

We also gathered from the report that the Club had its culture-cultures, too! In any event, it now boasted of a library of 1,500 books in English and Malayalam covering various subjects.

In a powerful speech, Mr. Sreekanth Nair debunked several dearly-held, literary theories. He also put forward the plea that members of our club should develop a poetic susceptibility to beauties in art and literature.

With a vote of thanks proposed by M. N. Vasudevan Nair, the function came to a close.



Flanking K. Ramarajan, Hon. Secretary (Centre), on either side are the Joint Secretaries M. Philip (Left) and M. N. Vasudevan Nair (Right).

List of Prize-winners in Club Day Tournaments

Badminton : (Singles)

Winner—

K. B. Pillai.

Runner-up—

R. Velappan Nair.

Badminton : (Doubles)

Winners—

K. B. Pillai and C. G. Balakrishna Pillai.

Runners-up—

R. Velappan Nair and A. Shahul Hameed.

Table Tennis : (Singles)

Winner—

K. B. Pillai.

Runner-up—

P. K. Chandrasekhar.

Table Tennis : (Doubles)

Winners—

T. K. Radhamonie and K. Seetharaman.

Runners-up—

G. K. Warrior and M. Sreenivasan.

Ring Tennis : (Singles)

Winner—

P. Sukumaran Nair.

Runner-up—

T. R. Raghunandan.

Ring Tennis : (Doubles)

Winners—

P. Sukumaran Nair and T. R. Raghunandan.

Runners-up—

K. B. Pillai and O. C. Chacko.

Basketball :

Winners—

Rajan Nairan's team.

Runners-up—

C. G. Balakrishna Pillai's team.

Volleyball :

Winners—

P. M. Joseph's team.

Runners-up—

P. Sukumaran Nair's team.

Caroms : (Singles)

Winner—

P. G. Damodara Panicker.

Runner-up—

A. K. Thirivikraman Nair.

Caroms : (Doubles)

Winners—

P. G. Damodara Panicker and A. Rajan Philips.

Runners-up—

A. K. Thirivikraman Nair and T. K. Radhamonie.

Chess :

Winner—

A. K. Thirivikraman Nair.

Runner-up—

V. O. Mathew.

Badminton : (Fives)

Winners—

R. Velappan Nair.

A. Rajan Philip.

P. G. Damodara Panicker.

C. S. K. Pillai and

M. V. Johnson.

Runners-up—

T. K. Radhamonie.

O. C. Chacko.

N. N. Iyer.

T. P. George.

G. R. C. Nair.

S. Damodaran and

N. K. Menon.

Alind Amateurs team up with actresses in Club Day Play

"Marriages are made in Heaven"



Kumari Ambika of Trivandrum who gave a music recital.

Below : Prof. Sankarankutty in his role as Krishna.



A NOTEWORTHY FEATURE OF THIS year's Club Day drama was that the feminine cast was well and truly feminine. A few outside ladies had specially been "imported" for staffing the distaff side, no manning of women, this year, or do we mean no "womanning" by men?

But, was it a success? The answer is yes-and-no. Only those who witnessed the play would get the correct import of this answer.

G. Sankara Pillai's *Vivaham Swargathil Nadakkunnu* (Marriages are made in Heaven) was not a play of structure—that is, it was not a play which had everything plotted out in an easily recognizable pattern; it was a play in which Aristotle, the Greek critic, would have found much to cavil at. But, luckily, audiences to-day do not want "structure plays"; what they ask for is a story in which they can never quite catch up with what a character is going to do next. Such characters, we had a-plenty in this play.

Briefly, the story is this : A father picks up a bride for his son. Son won't marry this girl. Indeed, sonny has already secretly married girl of his own choice. Mother develops sneaking sympathy for daughter-in-law, after giving latter a *dekk*.

Vikraman and Gopalakrishnan who gave a display of kalari payattu.



Thomas Muthalali and C. S. K. Pillai in a scene from *Vivaham Swargathil Nadakkunnu*.



M. P. Aravindakshan, K. N. Nair and Radhamonie

and
M. P. Aravindakshan and Pattom Saraswathi Amma in two other scenes from the same play.



rather, after latter gets her head bashed or some such incident or accident, although originally her sympathies are ranged on father's side.

At play's end, papa, and presumably is licked, learns moral: 'Hanging and wiving goes by destiny'.

Dialogue throughout was fast-paced and spiced with wit, giving the play its life and magnetism.

M. P. Aravindakshan, K. N. Nair, Thomas Muthalaly and C. S. Kaladharan Pillai who had major roles to sustain acted with conspicuous

ability. In the minor roles, Neelakanta Iyer, Radhamonie and Kalyanakrishnan turned in little gems of performance.

A big bouquet must be handed to Kainikkara for his deft direction.

The Club Day repertoire also included a programme of orchestral music by Hindustan Music Club, Quilon. (if song-hits from the silver screen are your cup of musical tea, you'd have thoroughly enjoyed this item), a dance recital by Professor Sankarankutty and party and a display of *kalaripayattu* (Kerala's art of self-defence with sticks and swords) by two Alinders.



Two members of Prof. Sankarankutty's party strike an attractive attitude in one of their numbers.

"We will, by God's grace, play a set..."

—Shakespeare

TENNIS WAS THE ONE GAME WHICH ALIND HAD BEEN LACKING ALL along, and even this lacuna was made good, when the first ball was served on December 1, 1958. Ever since, an unflagging interest has been shown, and despite the forebodings of some well-meaning friends who saw but a dim future for this rather expensive game, the ranks of enthusiasts have been swelling. And as though to confound our prophets of gloom we've flood-lit the courts ensuring for the game a bright future!

Among Alind's present players are such former State Champions as Mr. K. E. Eapen of Electrical & Allied Industries and Mr. Madhavan Nair, Asst. Engineer, Kerala Electricity Board.



A young artiste of the party in a fine pose.

ALIND RECREATION CLUB

Office-bearers for 1959-60

M. Philips	... Hon. Secretary	P. Rajan	... Capt. Tennis
M. N. Vasudevan Nair and P. M. Joseph	... Jt. Secretaries	P. K. Chandrasekhar	... Table Tennis
S. Ibrahimkutty	... Treasurer	P. G. Damodara Panicker	... Caroms
K. K. Madhavan Nair	... Capt. Football	V. O. Mathew	... Chess
Rajan Ninan	... Basketball	M. P. Aravindakshan Nair and K. N. Nair	... Committee members for Films & Entertainment
Shahul Hameed	... Badminton	K. Rama Rajan and S. Damodaran	... Committee members General
C. G. Krishnakutty Nair	... Volleyball		
T. R. Raghunandan	... Ring Tennis		

REPORT FROM HIRAKUD

(i) Wire Mill

The wire mill is now in regular production and the first consignment of cable reels was railed on March 13.

Erection of equipment in the aluminium rod rolling mill is progressing fast. Mr. Ernest Schuren, erector from Messrs Russ Electroofen, West Germany, is helping us in the installation of the electrical furnaces in this mill.

A meeting of the Board of Directors of the Company was held at Hirakud on February 15. This is the first board meeting to be held at Hirakud.

(ii) Visitors

The following distinguished persons visited our plant :

Mr. M. S. Thirumale Iyengar, Chief Engineer, Hirakud Dam Project ; Mr. M. S. Sivaraman, I.C.S., Planning Commission, Govt. of India ; Mr. P. V. A. Narayanamurthy, Chief Engineer, Electricity Department, Govt. of Orissa ; Mr. K. S. Chandrasekharan, I.A.S., Deputy Commissioner, Sambalpur ; Mr. A. K. Mazumdar, I.A.S., Additional Secretary, Political and Services ; and Mr. P. M. Menon, Works Manager, Indian Aluminium Company Limited, Alupuram.

(iii) Personnel

We said welcome to...

Felix Tiga—Jr. Draughtsman—Engg; H. B. Mahakud—Probationer—Stores ; Sibaprasad Churia—Probationer—Office ; P. Padmanabhan Nair—Probationer—Office ; Janardan Dani—Driver ; Nabin Kishore Patnaik—Driver ; Loknath Paisingh—Guard—Security ; Abdul Hakim—Guard—Security ; Durjodan Das—Guard—Security ; Koshy Luke—Apprentice—Laboratory ; Krupa Sindhu Panda—Trainee—Electrical ; S. K. Ray—Trainee—Electrical ; G. N. Biswakarma—Trainee—Rod Mill ; Amesh Chandra Dey—Trainee—Rod Mill ; Viswamitra Misra—Trainee—Rod Mill ; Prafulla Chandra Pustri—Trainee—Rod Mill ; Kasinath Das—Trainee—Rod Mill ; Satyabathi Sabath—Trainee—Rod Mill ; Nityanand Paricha—Trainee—Rod Mill ; Ramakrishna Sahoo—Trainee—Rod Mill ; Umesh Chandra Mandal—Trainee—Rod Mill ; Gaurang Sunder Rey—Trainee—Wire Mill ; Bhagirathi Tripathy—Trainee—Wire Mill ; Santhosh Kumar Pujari—Trainee—Die Shop.

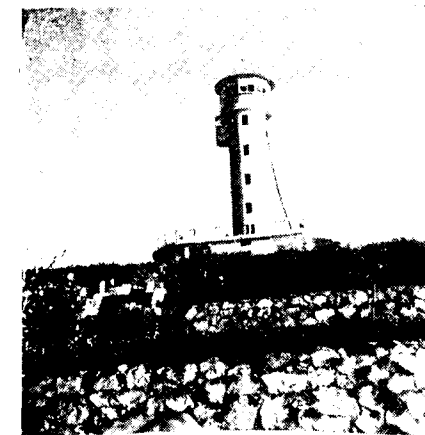
To R. Madhusoodanan Nair, Operator, Wire Mill, Kundara works, temporarily deputed for work at Hirakud, welcome is also extended.

We bade farewell to...

Tarini Prasad Tripathy, Jr. Operator, Die Shop, Kul Bahadur Mall, Guard, Watch and Ward.



Directors who attended the first meeting at Hirakud. From left to right Mr. V. Swamy Iyengar, Mr. V. G. G. Nayar, General Manager, Mr. K. C. Sood, Mr. S. Narayanaswami, Mr. B. V. D. Menon, Mr. G. Sreenivasulu Chetty, Mr. Abdullabhoj M. Bhagat and Mr. N. J. Nair.



Gandhi Minar at Hirakud wired with ALIND KER-AL-LITE.

Our Hirakud staff went gay on Holi sprinkling coloured water on all and sundry! The "enchantress" in the group is Gopi, Office Manager!





The party that went places!

ON 28TH DECEMBER 1958, A PARTY OF 32 employees belonging to the various sections of the Factory and the Administrative offices went on an excursion to the High Ranges.

A special bus of the State Transport Department had been chartered for the entire journey. With the blessings of our General Manager Mr. V. G. G. Nayar, we set out at 8-15 a.m. On the first lap of our journey we visited the substation at Pallom where Mr. G. K. Malloor, Asst. Engineer, received us and showed us round.

We then proceeded to the factory of the Travancore Cements Limited at Kottayam. Here we were the guests of the South Indian Timber Industries Limited, Kodimathai, Kottayam, where Mr. V. G. Karunakara Panicker, its proprietor, received us.

After lunch we proceeded to Chittirapuram reaching the place at about 7-30 p.m. Mr. P. K. Govindan Kutty Menon and Mr. C. Raman Menon, Asst. Engineers who received us had already made comfortable arrangements for our stay.

Pallivasal

On the morning of 29th December 1958, we visited the Power House at Chittirapuram (Pallivasal) where Mr. P. K. Govindan Kutty Menon,

Asst. Engineer in charge of generation and distribution, and his deputy Mr. Prabhakaran Pillai took us in batches and explained to us the different aspects of the fascinating business of producing and distributing electricity.

This hydel project commissioned in the year 1940 is the first scheme to be developed in the State. The head available is 2,000 feet. The power station had an installed capacity of 9,000 kW in the first stage—which has been increased in the second stage to 37,500 kW by the installation of additional generating sets and the construction of two storage reservoirs. A pump house from where water is pumped to the Sengulam Dam is also situated at the site of the Pallivasal power house. This arrangement enables the tail race waters to be pumped from Pallivasal to the Sengulam Dam.

Sengulam

We then proceeded to Vellathuval and visited the power house at Sengulam. Below the Pallivasal power house, the Mudirapuzha river continues to cascade down, and in the course of about six miles, drops by a height of about 1,200 feet. This fall is utilised for power development in the Sengulam Project. The installed capacity of the power

EXCURSION TO PALLIVASAL, SENGULAM and MATTUPATTY DAM

by T. K. KRISHNAN, Convener

station is 48,000 kW. Mr. Puduval, Mr. Mohammed and Mr. Ramachandran, officers of the Sengulam power station received us, and showed us round. Since the dams at Kallarkutty and Panniyar are still only in the construction stage, we cut short our proposed visit to these two places and returned to Chittirapuram for lunch. In the afternoon we proceeded to Mattupatty Dam via Munnar. On both sides of the road, the tea estates of the Kannan Devan Hills Produce Company Limited, presented a picturesque scenery.

This reservoir is seven miles down stream of the Sethuparvathipuram Dam across the Kundala gorge. The free catchment area for this reservoir is 39 sq. miles, the average annual rainfall being 90 inches. The Dam is an all-concrete structure—first of its kind to be built in the country—about 800 feet long at crest, and 150 feet high above the river bed. The capacity of this reservoir is 1,900 million cubic feet.

Mr. C. Raman Menon, Asst. Engineer, who accompanied us to Mattupatty, explained to us in full detail, the works at Mattupatty and the head stations.

We returned to Kundara on December 30.



The handing over of the symbolic reel to the Chief Engineer, Hirakud Dam Project.

Hirakud Dam Project Chief Engineer receives the first reel of conductor made at Alind's new Orissa plant

Why—Hirakud

Earlier, Director B. V. D. Menon welcomed the guests.

"I AM VERY HAPPY TO BE HERE ON this occasion of the handing over of the first reel of conductor made at the new plant of the Aluminium Industries at Hirakud. In our electrification plans, we require more and more of such cable reels. This reel of cable, I understand, will be used for taking power from Hirakud to Balasore," declared Mr. Sailendranath Bhanj Deo, Minister for Works, Orissa State, on the occasion of the ceremonial handing over of the first reel of aluminium conductor made at our new Hirakud works.

The colourful function which came off on January 16 was presided over by the Minister.

A large gathering of government officials, local citizens and company executives was present. We were particularly happy that it was possible for Mr. Charles G. Gorton, our London Representative, to be present on the occasion.

Mr. Menon said : " Exactly nine years ago, we commenced, for the first time in India, commercial production of aluminium conductors for transmission and distribution purposes at our Kundara works in Kerala State. Our installed capacity was about 1,500 tons, our employee strength was around 75 and our capital was Rs. 10 lakhs. Since then we have been steadily progressing, and to-day, not taking into account the capacity of this new plant, we have a capacity of 9,000 tons of bare aluminium conductors, an employee strength of nearly 500, and a capital of Rs. 80 lakhs. Further, we have pioneered the manufacture in India of a wide range of conductor accessories and tools for using with overhead applications of aluminium conductors, the

manufacture of aluminium rods from ingots by the ' Properzi Continuous Process,' and the manufacture of covered (insulated) aluminium conductors. This progress has been possible chiefly on account of the assistance and support we have been receiving from the Central Government and State Electricity Departments and the various Power Projects."

Continuing, he said : " The reason for our setting up the plant at Kundara was that the Indian Aluminium Company had put up an aluminium smelter at Alwaye in Kerala State. It is, therefore, but natural that we have now followed them from Kundara to far-away Hirakud, and established our factory, too, next door to them."

Mr. Menon went on : " Our greatest contribution to national economy is that through our manufacture of aluminium conductors,

the country will be saving its resources of foreign exchange—which has been of the order of Rs. 200 lakhs during the past eight years. And I hope it will be possible for our new factory to commence production of aluminium conductors from out of indigenous metal that will be available from our good friends and neighbours, from the third quarter of this year. Then savings in foreign exchange will be even more, say, Rs. 300 lakhs."

Touching briefly on employer-employee relations, Mr. Menon said: "Although our employment potential is small, we have excellent and harmonious employer-employee relations. We are firm believers in collective bargaining of labour and in a democratic form of management."

"The Hirakud Dam Project and the Government of Orissa are not our new or recent customers. We have been associated with them for some years now—having supplied to them hundreds of miles of aluminium conductor. It is a happy coincidence that the first order which

this factory has put down on its order book, and the first reel of conductor made at this factory, is for the State of Orissa," concluded Mr. Menon.

Service—our business

Requesting Mr. Thirumale Iyengar to accept the reel, V. G. G. Nayar, General Manager, said that the reel crystallised in itself the experience of the company as pioneer manufacturers of aluminium conductors—an experience acquired through the manufacture of 150,000 miles of conductor. "It is, indeed, a happy augury for Alind to have as the first customer of the new works, a personality of the eminence of Mr. Iyengar whose very touch has spelt success to several outstanding engineering projects in this country," he added.

Continuing, Nayar said: "Quality first in the product and service first to the customer have always been Alind's watchwords and with the new facilities now available at Hirakud, we feel even more confident of living up to these two cherished

ideals of ours. By handing over the first reel of conductor made here to the Chief Engineer of the Hirakud Dam Project, we symbolically dedicate the production of this plant and the services that go with it, to all our customers in Orissa and the neighbouring States".

Presenting the Project Report of the new works, R. K. Nair, Project Engineer, said that the total floor area of the factory buildings was a little over 50,000 sq. ft. and that a considerable quality of aluminium sheets had been used for roofing and side-cladding, and aluminium conductors for electric power and lighting wiring.

"Power and light wiring inside the factory and office buildings has been done exclusively with the covered aluminium conductors manufactured at our Kundara works. The distribution of power in the factory and colony areas has also been done with Alind all-aluminium conductors," he added.

The wire mill consists of a high-speed, non-stop, wire-drawing machine for drawing aluminium

wires, and cabling machines for stranding both steel-cored and plain aluminium conductors.

The Plant

The plant, when completed, will consist of an aluminium rod-rolling mill with a capacity of 4,000 tons of electrical, conductor-grade aluminium rods a year, and a wire mill for the manufacture of aluminium conductors—both plain and steel-cored—of a similar capacity, a machine shop and other ancillary shops, and a fully equipped testing laboratory for physical and chemical tests on the finished products.

The rod mill which is the second of its kind in this country—the first one too having been installed by us at our Kundara works—incorporates an aluminium rolling mill of the 'Properzi' continuous model, and induction furnaces for melting aluminium. Erection of equipment at this mill is proceeding rapidly enough, and the mill is expected to be commissioned in July of this year.

Accepting the reel on behalf of the Hirakud Dam Project, Mr. Thirumale Iyengar said that about nine years ago, the company had established a factory at Kundara, for the manufacture of aluminium conductors and that they had now erected a new factory at Hirakud, next door to their raw material supplier—the Indian Aluminium Company Limited.

"Conductors are the life-lines of the transmission and distribution networks of a country and they will continue to remain so until technological developments progressed to such an extent as to make conductorless transmission and distribution system possible. Until then, the conductor-manufacturing industry will occupy a supreme position in the electrical field, continuing to fulfill its role of feeding power to heavy and small industries in various parts of the country", he said.

K. R. O. Nair, Assistant Engineer, Technical, proposed a vote of thanks.

Other features of the function which deserve mention here are:

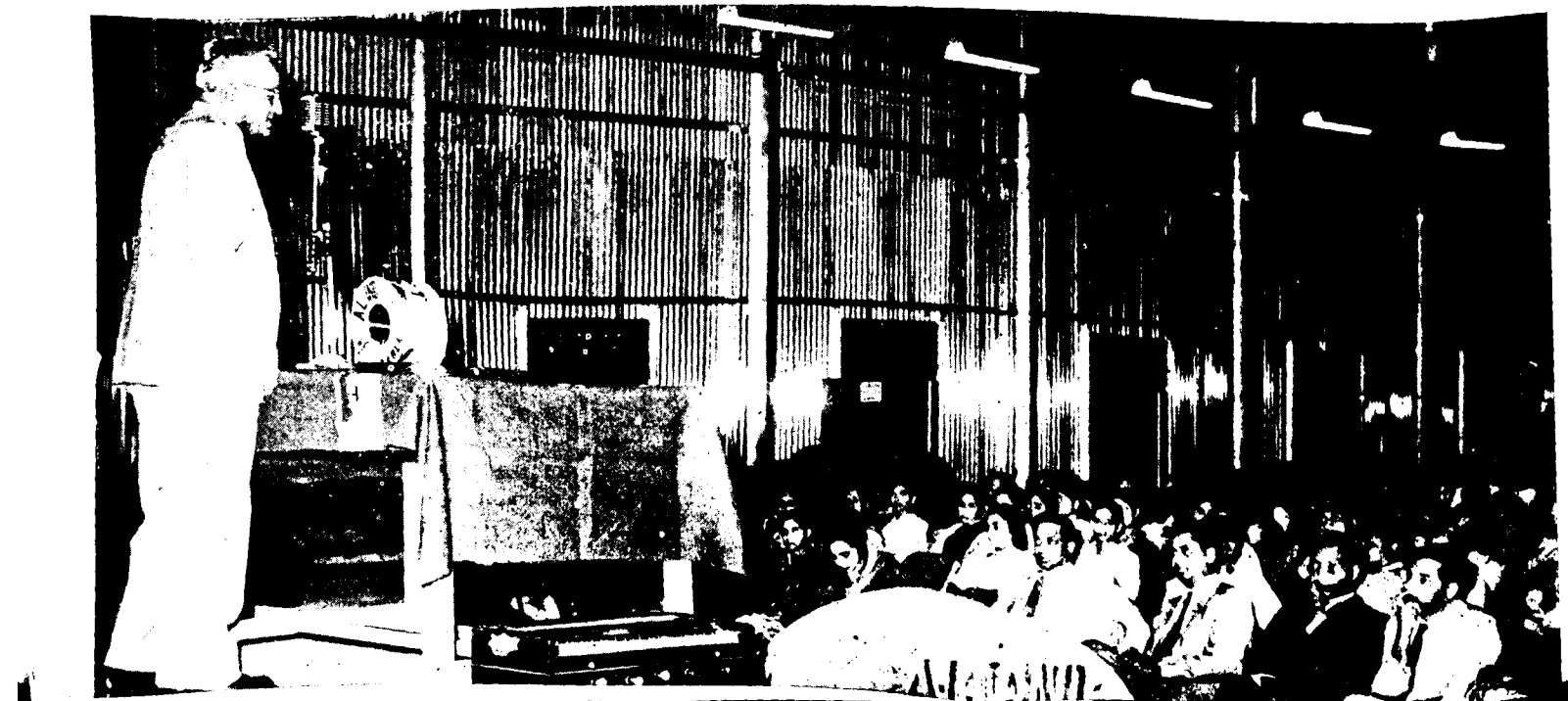
On the opening day we came out with a large-size press advertisement captioned: 'Now...at Hirakud, we're ON WITH THE SHOW—OFF TO A GOOD START!'

We also brought out an attractive dedication brochure entitled, *Hirakud-Alind's Second Home*.

Press coverage of the function included stories both before and after the function, in Calcutta papers like the *Statesman*, *Anrita Bazaar Patrika*, and *Hindustan Standard*; *The Hindu* and *Indian Express*, Madras; and *Praja Tantra*, *Samaja* and *Mathrubhoomi*, Cuttack.

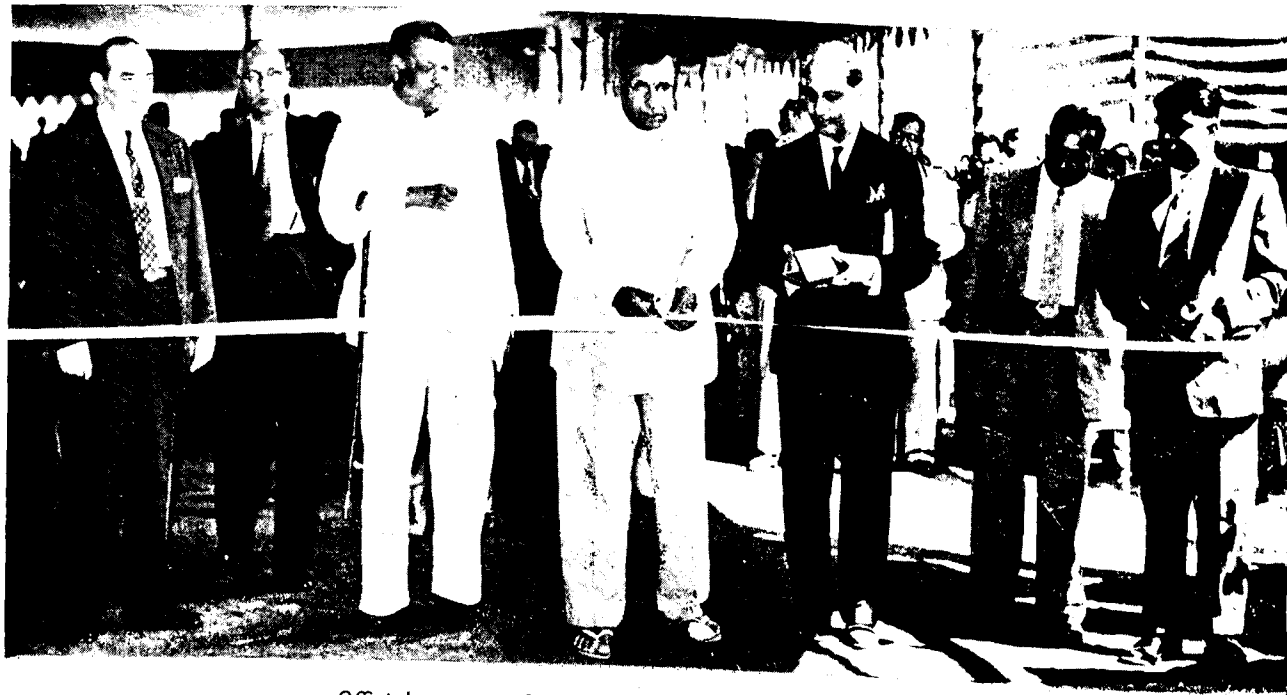
Foreign journals which carried the dedication story included: *Wire Industry*; *Wire and Wire Products* and *Light Metals*.

Mr. Thirumale Iyengar who accepted the reel is seen addressing the gathering.



THE COVER: Picture shows Mr. Sailendra Nath Bhanj Deo, Minister for Works, Orissa State (centre), and Mr. M. S. Thirumale Iyengar, Chief Engineer, Hirakud Dam Project (close to the reel). Others in the picture are (from L. to R.) K. R. O. Nair, S. Narayanan Nair, R. K. Nair, K. N. Gopinathan Nair, and V. G. G. Nayar.

To the Minister's left are Mr. K. S. Chandrasekharan, I.A.S., Deputy Commissioner, Sambalpur, Director B. V. D. Menon, M. Aundy Pillai, R. Parthasarathy and Charles G. Gorton, our London Representative.



Official opening of the new 10,000-ton smelter of Indalco.

Our Neighbours— INDIAN ALUMINIUM COMPANY LIMITED

WHEN ON FEBRUARY 12TH 1959, by Dr. Harekrushna Mehtab, Orissa's Chief Minister, cut the ribbon at the entrance to the pot rooms of Indian Aluminium Company's new Hirakud smelter, he wasn't performing just "another opening ceremony". By a stroke of those ornamental scissors used for the opening, he was simultaneously writing (if you'd pardon the mixed metaphor) a new and dynamic chapter in the history of the country's aluminium production. For, the Chief Minister's symbolic act contained a connotation far beyond a colourful, opening function—India was doubling its production of aluminium, the theme metal of the twentieth century.

As Indian Aluminium Company's "distant" neighbours in Kerala—their Alupuram reduction works is 100-odd miles from our Kundara works—but now as a company sitting pretty next door to them at Hirakud, as our good friends and

raw material suppliers, the new expansion project of Indian Aluminium has a special significance for us—hence the Hirakud smelter story in this issue of the CHRONICLE.

LOCATION

Relatively few areas in the world are suitable for large-scale production of aluminium. The selection of an appropriate location for an aluminium smelter is governed by many considerations, the most important of which is the availability of low-cost electric power.

The assurance of adequate electric power from the Hirakud power project at a cost which would be conducive to economic smelting operations was largely responsible for Indian Aluminium's decision to establish its new smelter at Hirakud. Its relative proximity to the bauxite deposits of Bihar and Madhya Pradesh and to the Company's existing alumina plant at Muri, together with the existence of good

transportation facilities from its sources of raw materials on the one hand, and to the markets for its metal production on the other, were additional factors commending the new location.

Designed with the assistance of the Company's technical consultants in Canada, Aluminium Laboratories Limited, the Hirakud smelter has an initial, annual ingot capacity of 10,000 tons, capable of easy expansion to 50,000 tons or more, as circumstances permit. The Company has signed an agreement with the Orissa Government for the supply of 26,500 kW of firm power for the first stage of 10,000 tons production. Negotiations are also well under way for the supply of an additional 23,500 kW required for stepping up production to 20,000 tons per annum. Construction of the additional capacity will be taken in hand as soon as present negotiations are completed.

The establishment of smelting capacity at Hirakud is based on commensurate expansion of the Company's existing bauxite and alumina production facilities at Bagru Hill and Muri. The foreign exchange required for the expansion has largely come from the Company's Canadian shareholder, Aluminium Limited.

Before conducting your round on a figurative tour of the new smelter, let us consider the process and the principal raw materials.

The essential process, which is electrolytic, takes place in a series of identical, carbon-lined steel vessels, called "pots". The pot contains a liquid "bath" of molten cryolite (at almost 1,000 deg.C). Purified aluminium oxide (alumina) is dissolved in the cryolite. A large block of very pure carbon (the anode) is suspended in the cryolite bath, and serves to introduce the electric current. The current, after passing through the bath, is conducted from the bottom (the cathode) by means of an aluminium "busbar" to the next pot in the series. The electricity dissociates the aluminium oxide into aluminium and oxygen. The former settles to the bottom of the pot in a molten pool, from which it is periodically siphoned into crucibles. The latter burns the carbon anode, which must therefore be continuously augmented.

RAW MATERIALS

The chief raw materials are :

(i) **Electric Power** : Some 10 kWh of electrical energy is consumed for each pound of aluminium produced.

(ii) **Alumina** : The richest ore of aluminium is bauxite. This is mined and processed in Bihar to produce aluminium oxide of high purity in the form of a white powder, which is brought to Hirakud by rail from Muri Junction.

(iii) **Petroleum Coke and Pitch** : These are processed at Hirakud to produce carbon anode material ("paste"). The paste is charged into an anode container above

the pot, where it is baked by electrically generated heat to form the hard carbon anode in a continuous fashion.

(iv) **Cryolite** : Cryolite is a mineral found only in Greenland. This is imported as a purified powder, and melted in the pots.

THE PROCESS

The pot rooms

First, we will enter one of the two buildings called "pot rooms," where the electrolytic process takes place in a series of eighty pots. As we walk down one section of the first building, we see a typical group of pots in electrical series, each carrying about 50,000 amps of electric current. The surface of the molten cryolite bath is frozen, but the liquid is still seen through occasional openings. The white powder on the surface is aluminium oxide, ready to be stirred into the melt as required. Suspended above the bath, and dipping into it, is the carbon anode.

Rectifier Station

After passing through the pot room, we enter the rectifier station. Here the alternating current received from Hirakud Power House is converted into direct current, necessary for the electrolytic process. This is done by mercury arc rectifier units, housed in this building.

Outdoor Power Station

Just behind the Rectifier Station, and visible as we leave the building and walk towards the back, is the receiving station for power from the Hirakud Power House. The transmission line, carrying power at 132,000 V. can be seen, as well as the transformers which reduce the voltage first to 11,000 V. and next to the 450 V. required to deliver the direct current to the pots.

Alind's own contribution to the technical features of the new smelter includes the plain aluminium cable used for the busbar system and several thousand core yards of ALIND ALL-WEATHER AND ALIND

KER-AL-LITE for indoor and outdoor wiring.

Service Building

Passing down the main road through the plant, we see on our left the building which houses the various service departments : Chemical Laboratory, Maintenance and Machine Shop, and a well-equipped Store for spare parts, etc.

Paste Plant

On the right, to the service building, are the two black cylindrical tanks for the storage of soft pitch. The tall structure near by is the paste plant, where petroleum coke and pitch are processed to form paste for the anodes.

Alumina Storage

The two tall steel cylindrical tanks on the right are the silos for the storage of alumina received from the Company's processing plant at Muri (Bihar State).

Furnace Building

As we walk further along, the storage tanks for the fuel oil required at various centres come into view.

Finally, we come to the furnace building which houses the two remelt furnaces just taking shape and the equipment to cast molten aluminium into ingots, ready for shipment to consumers.

In our *News and Developments* feature, we carry a brief note about the opening of the new smelter. It only remains for us now to add here that at the official function Mr. B. V. D. Menon, Managing Director, and Mr. V. G. G. Nayar, General Manager, were present to tender our company's congratulations personally.

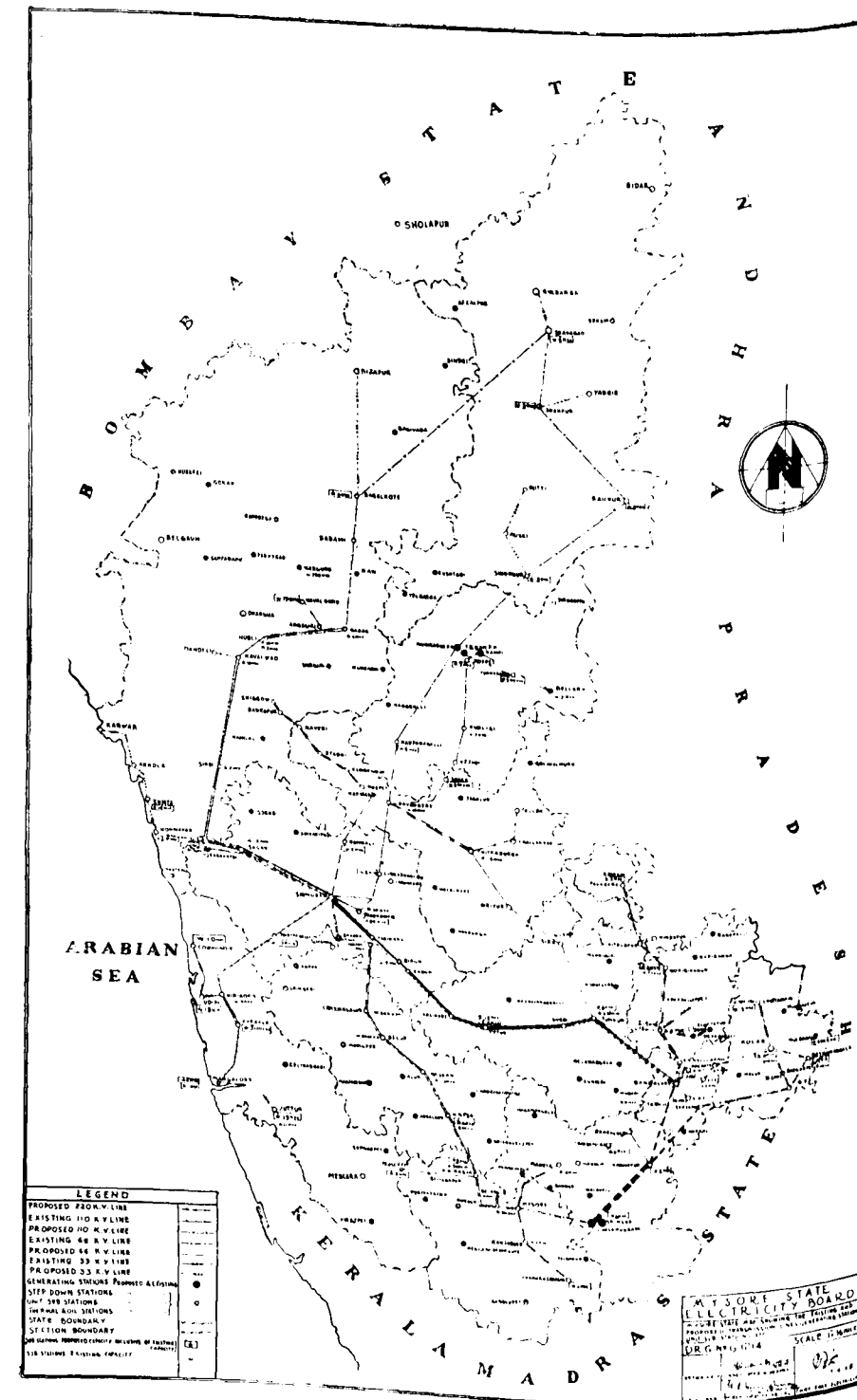
The tie-up ad. we issued to newspapers (reproduced at Page 36 in this issue) on the occasion of the opening about sums up our sentiments best.

THE CUSTOMER WHOM WE HAVE THE honour of presenting in this issue is the Mysore State Electricity Board. Indeed, their story is overdue in these pages, and we are very happy to hand you 'Mysore' through the columns of the CHRONICLE!

Way back in 1900, ways and means had to be found for the utilisation of power—to justify the starting of a hydro-electric power station.

But, to-day, the demand for electric power is so intense that the pace of industrialisation will receive a setback, if power is not provided.

If hydro-electric power was developed in the State of Mysore as early as 1900, it was principally because of the establishment of the Kolar Gold Fields Mining Company which was then using steam for its various operations. As this important industry was capable of utilising electric power, the stage was set for harnessing the Cauvery river to generate power at Sivasamudram—which project was undertaken in 1895. But, as the industry was located at a distance of 90 miles from the proposed site of the generating station, the long-distance-transmission factor involved acted initially as a damper. The technical obstacle was, however, very soon overcome, and an agreement was concluded with the Kolar Gold Fields Mining Company for the supply of hydro-electric power to the extent of 4,000 h.p. The potential of the Cauvery river was gauged at 6,000 h.p. But, it took a great deal of persuasion on the part of the State authorities to make the then Government of India approve the project. Effective from 30th June 1902, power



Our Friend—The Customer

MYSORE STATE ELECTRICITY BOARD

started flowing to Kolar Gold Fields. With the construction of a dam across the river Cauvery at Krishnarajasagar in the 30's, power generation at Sivasamudram gradually went up from 3,000 kW in 1902 to 45,000 kW in 1939.

MOUNTING DEMAND FOR POWER

Year by year, the demand for power was rising, and in 1936, the possibilities were investigated for further sources of hydel power. This decision led to the diversion of 300 cusecs of water from the Cauvery

river to Shimshapura, where a head of 610 feet was available as against 410 feet at Sivasamudram. Two units of 8.6 mW each were commissioned at Shimshapura in 1940.

Installed capacity of the 25 cycle-generating system underwent an

upward revision every ten years as shown below. The development of hydro power was so well-planned by the State that the power needs of the various industries and domestic services were met without any restriction till about 1944.

	Installed Capacity in mW
1902	4.40
1910	9.40
1920	16.80
1930	37.00
1940	62.20

According to a load forecast prepared in 1940, it was estimated that an additional load of 26 mW would materialise in the next few years.

The first stage of power development at Jog consisting of four units of 12 mW each was inaugurated on February 5, 1939, and the first unit was commissioned in December 1947. The second stage consisting of four units of 18 mW each was sanctioned in 1946, and the first and the last units were serviced during June and September 1952. By the end of 1952, the State Electricity System had a total installed capacity of 1,79,200 kW.

During the first Five-Year Plan period, no fresh power projects were taken up for execution and the power position assumed a critical stage from the close of this period.



Mr. John D'Sa, Chief Engineer.

PROJECTS UNDER SECOND PLAN

During the Second Plan period, the following three power projects were included and works connected with them are in progress.

	Installed capacity in mW.
Tungabhadra Left Bank Project	27.00
Bhadra Power Project	33.20
Sharavathi Valley Project (First Stage)	178.20
Total	238.40

In accordance with the Indian Electricity Supply Act of 1948, the Mysore State Electricity Board, an autonomous body was constituted. This body took over the functions

of the State Electricity Department from 30th September, 1957 onwards.

The Board is entrusted with all the duties formerly performed by the Department excepting for the execution of the three major projects—namely, the Bhadra, Sharavathi and the Munirabad Left Bank Projects. These projects continue to be administered by the State Government, the construction set-up being under a Chief Engineer, Hydro-Electric Construction Projects.

A total provision of Rs. 803.04 lakhs for the various schemes coming under the Board's purview has been made in the Second Five-Year Plan, the details of which are:

	Provision Rs. (in lakhs.)
Rural Electrification...	336.34
Transmission Lines ...	192.34
Step-down Stations ...	101.41
Extension and Improvements to Distribution System ...	132.75
Frequency Conversion Scheme ...	40.00
Total ...	803.04
Power supply to Irrigation Pump Sets under Grow More Food Scheme ...	190.00

Under the Plan, it is programmed to extend 753 miles of transmission lines and to erect 25 H.T. substations, thereby extending power to most of the urban and rural parts of greater Mysore.

To Mysore State, Alind's contribution so far has been a little over 5,000 miles of various sizes of aluminium conductors—4,754 miles of ACSR and 320 miles of All-Aluminium.

The Editor wishes to render his grateful thanks to the officials of the Board and to Mr. A. S. Lakshmanan of Messrs. A. G. Senapathy & Co., Bangalore, for the assistance rendered in the preparation of this article.

Bouquets to

INDIAN ALUMINIUM COMPANY LIMITED

our good friends and neighbours

on the occasion of the official opening
of their new plant at Hirakud!



In Kerala, we're their neighbours,
...sort of: because Kundara
where we have our own well-known works
is a 100-odd miles away
from Alway where they have
their reduction plant.

But, in Orissa—to which far-off State—
we followed them
as faithfully as Mary's Little Lamb,
things are different
For, at Hirakud, we're sitting pretty next door,
practically within an ingot's throw of them!

A brand-new, 10,000-ton smelter for our neighbour,
a multi-purpose project from which
we can draw all the electric power
we need, and thou, dear customer,
of Andhra and Assam, Bengal and Bihar
Orissa and Uttar Pradesh, beside us,
Hirakud is paradise enow!

But to-day, we ought not to be plugging away
like this about ourselves.
To-day is Indalco's big day.
Once again, congratulations to our
good friends and neighbours.



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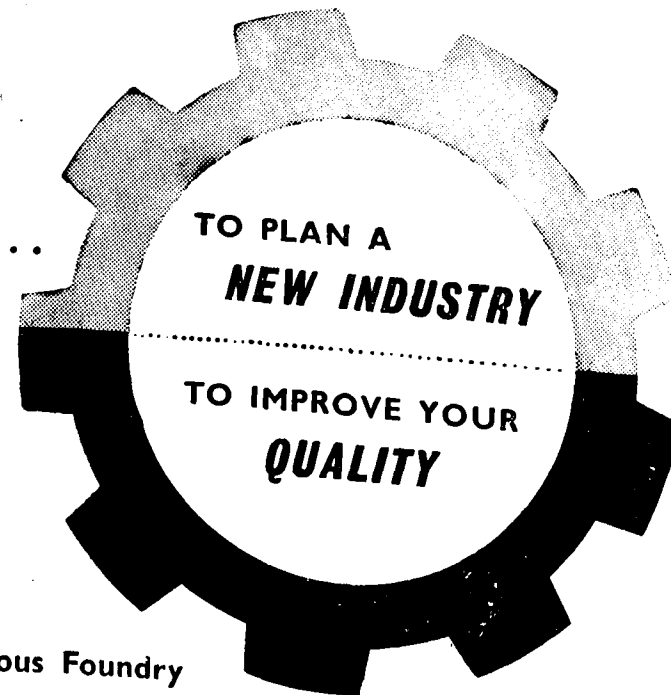
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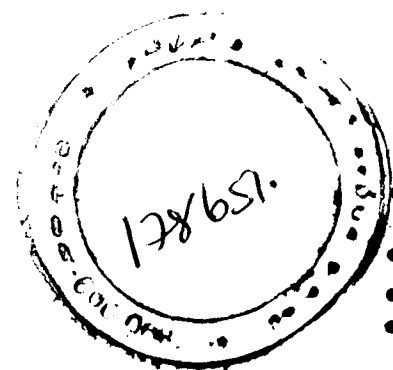
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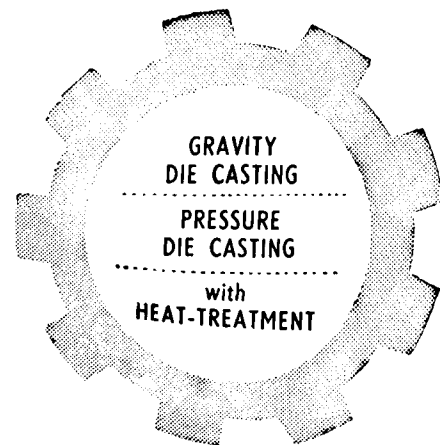
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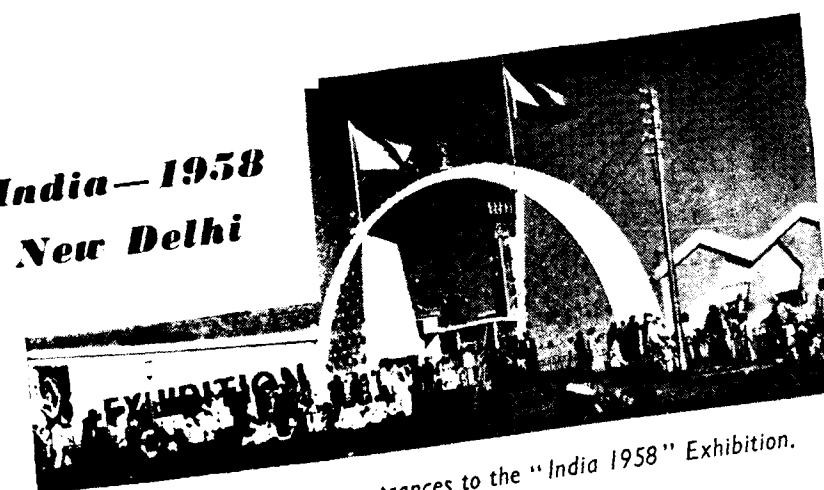
Write immediately to above address for further details of the service I can render as your European representative.

"'Tis not in mortals to command success but we'll do more—deserve it."—Shakespeare.



Dr. A. R. Menon, Minister for Health,
Kerala State.

India—1958
New Delhi



One of the four impressive entrances to the "India 1958" Exhibition.



A party of newsmen who visited the stand.

Visitors
at the
Alind Stall



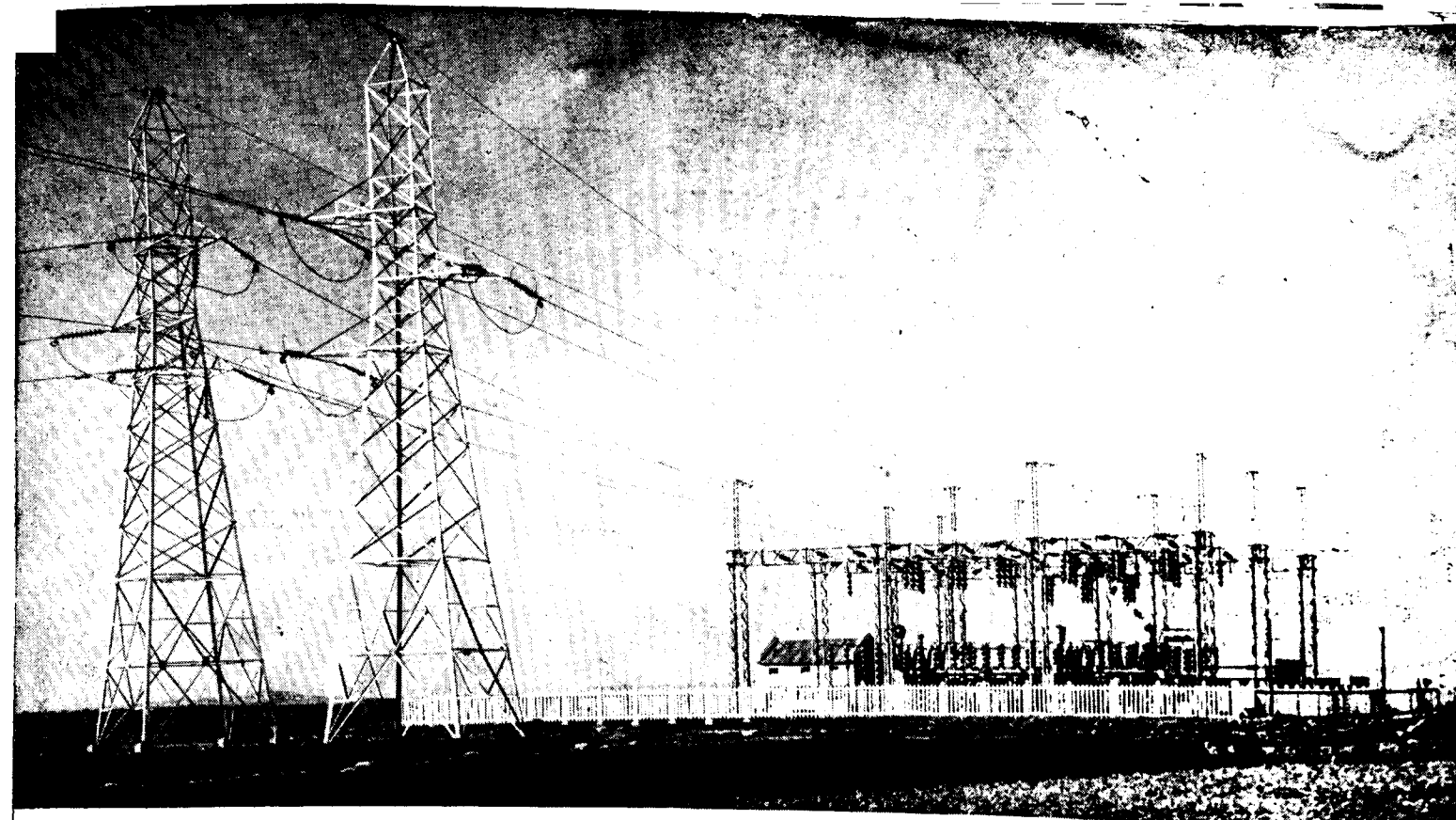
Mr. E. M. S. Namboodripad,
Chief Minister (right.)



Dr. B. Ramakrishna Rao, Governor,
Kerala State, and Mrs.
Ramakrishna Rao. Mr. P. K.
Panikar, Director of Exhibitions, is
at extreme left. Immediately
behind the Governor is N. K. B.
Nair.



Mr. K. P. Gopalan, Kerala Minis-
ter of Industries (right) and Mr.
Abdussalam, I.A.S. Secretary to
Govt., Industries Dept. Kerala,
(left) with NKB.



Hirakud power is delivered to Cuttack and Bhubaneswar through Alind ACSR—Seen above is the 132-kV substation at Chainpal together with the transmission lines.

Below : A close-up of the substation.

