FACT

The Magazine of Fertilisers And Chemicals, Travancore Ltd.

Vol. 5. No. 4. October 1950.

Editor & Publisher: P. Sreedharan Pillai B. A.

The Newly Constructed Spray Pond-Ammonia Division-F. A. C. T.

New Type of Tractor for efficient Ploughing.

[Photo by courtesy of Messrs. Volkart Bros. Ltd.]

FACT

Vol. 5 No. 4
October 1950

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Books and Pamphlets on scientific, industrial and allied themes are accepted for review in this Journal.

Editor.

In this Issue.........

Wise Saws

Alexander the Great, when he had conquered Greece, went with his courtiers to visit Diogenes whom he found seated in his tub, his head bent in study. Pitying the poverty of the great scholar, the great conqueror saluted and asked if there was any way in which he could serve him. "Yes," replied Diogenes, bluntly, and without so much as raising his head, "you can stand out of my light."

* * *

While discoursing, gravely, on the practice of virtue, Diogenes observed his auditors dropping off, stealthily, one by one; whereupon, quite suddenly, he began to bawl out some utterly ribald song, when immediately a great crowd of interested listeners gathered about him. "See," said he, stopping in his song, "how willingly a fool is listened to, while a wise man is neglected and forsaken."

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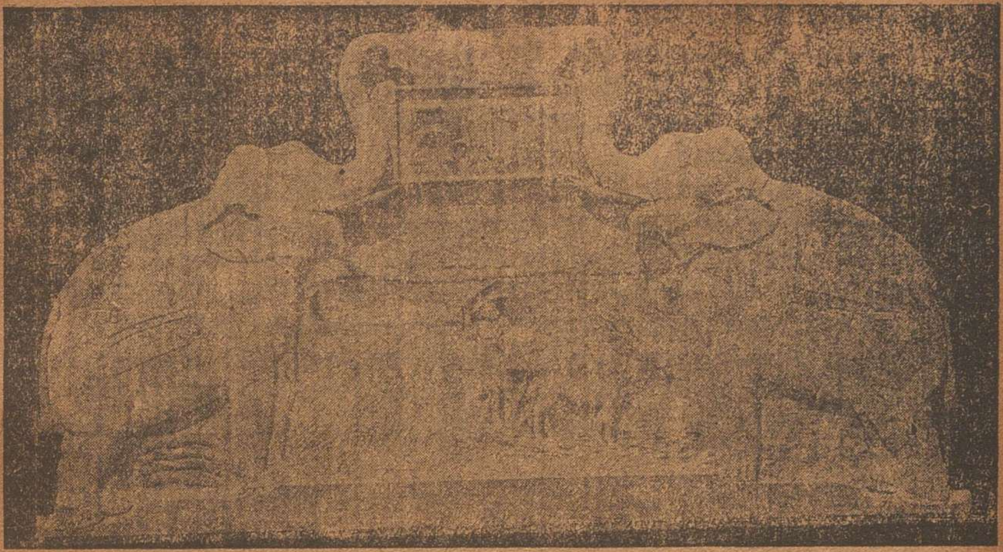
On a certain occasion, while discoursing, Diogenes was thus addressed by one who stood by—"Hark, they deride you." Well answered the philosopher, "Nay, I am not derided until I consent to be discomposed by their ridicule."

* * *

Egremont's speech in parliament on the presentation of the national petition created some perplexity among his aristocratic relatives and acquaintances. It was free from the slang of faction; the voice of a noble who had upheld the popular cause, who had pronounced that the rights of labour were as sacred as those of property, that the social happiness of the millions should be the statesman's first object.

* * *

For my part, I cannot find that it is my duty to maintain the present order of things. In nothing in our religion, our government, our manners, do I find faith. And if there is no faith, how can there be any duty ? We have ceased to be a nation. We are a mere crowd, kept from utter anarchy by the remains of an old system which we are daily destroying.



VOL. 5 | OCTOBER 1950 | NO. 4

EDITORIAL.

F. A. O. Publication on Rice.

THE Rice Study Group of the F. A. O. have brought out a publication recently embodying far-reaching recommendations dealing with each and every aspect of Rice Culture. The Study Group consisted of representatives of all the countries where rice is being cultivated on a large scale. They held two important sessions, one at Trivandrum in 1947, and the other a few months back at Bangkok. Their findings are of vital interest to all connected in anyway with the production and distribution of rice. As this would roughly amount to about one-third the population of the whole world, the vast significance of the report needs no further emphasis.

Among a good number of detailed suggestions for the improvement of Rice cultivation in general, the Study Group made the undermentioned specific recommendations for the guidance and consideration of participating governments.

Each country should report to F. A. O. statistics pertaining to its rice industry in metric tons and in hectares to facilitate international comparison and analysis. Weights and measures are to be standardised with a view to securing fair price for the producer. Terms in vogue in the rice market such as a 'paddy' 'rough rice', 'husked rice' etc. are also to be standardised. In the report about fourteen of such terms in ordinary use have been codified and brought under definition.

Besides the forgoing, they have gone into such varified problems as increasing rice production by expansion of area and improvements in culture, irrigation and drainage, prevention of water wastages, land development, reclamation, and mechanisation. The problems in respect of the utilisation of fair prices and the creation of reserves, agricultural credit, animal power, organisation of scientific and technical personnel, plant breeding, nutrition research, manures and chemical fertilisers etc. have also been discussed and dealt with.

Of these, the last item, namely, their recommendations on manures and fertilisers are of immediate and absorbing interest to us of F. A. C. T. not because we are directly engaged in the large scale production of chemical fertilisers, but because the more intensive use of fertilisers is the only sure short-term course open to cultivators to increase immediate yields so as to combat the food scarcity prevalent throughout the countries in which rice happens to be the staple diet. So we summarise below the results of F. A. O's deliberations on this particular aspect of rice culture. The report states that:—

1. Green manuring with phosphates gives 10 per cent higher yields over green manuring alone.
2. Under high humidity and high rainfall conditions the most suitable form of readily available nitrogenous fertilisers are ammonium sulphate and cyanamide. Ammonium sulphate gives 15 to 35 per cent increases over no manure in different localities.
3. Prolonged use of single nutrient (ammonium sulphate) may be discouraged as it may upset the balance of essential elements in the soil make-up.
4. In Java, Indo-China, super or rock phosphate has given 25 to 50 percent increased yields over no phosphate plots.
5. Japan uses 75 kilograms nitrogen, 65 kilogroms P_2O_5, 47 kilograms K_2O per hectare (2.6 acres) and gets an average yield of 3.8 metric tons per hectare.

They go on to observe however, that the two aspects which require solution are the problem of obtaining adequate supplies of ammonium sulphate, and the effective distribution and utilisation of such supplies. These, they remark, have to be solved as best as possible by each country. Mere lack of response to phosphate should not be the deciding factor as to its use. Application to pulse crops in rotation with rice may be a line of investigation that may yield better and more encouraging results.

They therefore recommend that more experimental work should be carried out by the rice-producing countries to determine the most efficient practices with respect to kinds of fertilisers, rates time, and method of application, and the use of chemical fertilisers in combination with organic manures. Such results as are obtained should be pooled and made available to all rice-producing countries.

Taken on the whole, the report is a very interesting and informative document and we trust that the governments of rice growing countries would adopt it wholeheartedly and try not only to implement the several recommendations but actively co-operate in further study and research to make rice cultivation a worthwhile occupation to the average cultivator.

FERTILITY UNDER THE GROUND

Storehouse of Rich Subsoil.

Results of Experiment in U. S. Farm.

By

LOUIS W. F.

(Below the depleted topsoils of an American farm there was an untouched storehouse of mineral fertility. The owner, a wellknown novelist, tells how he tapped this wealth with deep-rooted legumes and grass.)

A farmer can learn as much from his own land as any school of agriculture can teach him-if he keeps his eyes open to what is going on around him in his own fields. It was thus that we discovered at Malabar Farm, in the midwestern state of Ohio, the full extent of the great fertility of our deep good subsoils and began to feed our cattle on forage from three to 20 feet down and give the tired, depleted top-soils a rest.

At Malabar Farm we took over four "worn-out farms" and one in fair condition. They had reached the point where tenants would no longer undertake them. Yet we knew that, fundamentally, all this was rich land, with soil of glacial origin known as Wooster silt loam, largely the terminal moraine of the second great glacier deposited on top of a clay and sandstone base. We also knew the history of that soil since the coming of the first white settler in the United States.

That first settler found the hills around Malabar Farm covered by beautiful hard-wood forest which in summer achieved a tropical luxuriance and density. For a million years the trees had grown deep down in the glacial subsoil, gradually absorbing its rich inorganic mineral fertility and translating it through leaves, twigs and trunks into organic form which was deposited on top of the original subsoils. By the time the first settler arrived he discovered, once the land had been cleared of trees, a rich topsoil filled with organic material to a depth of a foot or more. He raised abundant crops without fertiliser, and for several generations his successors did well indeed. Then the land began to fail and went downhill in production from then on until the day we took over. During 130 years the land was farmed indifferently or poorly, but the most damaging factor was that it was farmed only 8 or 9 inches deep, often without any attempt at replenishing the fertility of the soil. Mean-while erosion took a heavy toll; and minerals, together with bought commercial fertiliser, leaked steadily down into the sub-soil where they were of no avail. By the time we arrived one of two things had happened, either the remnants of that originally rich topsoil had been eroded away or where the shallow top-soil remained, it had become so depleted that wherever a ground hog dug a burrow, the good rich gravel and still loam he brought from, the subsoils to the surface acted like fertiliser on the topsoil.

Soil Tests.

We had the usual superficial soil tests made and the results were far from encouraging, but, as we found out later, they were often misleading. The tosts were run to the depth of about 18 inches and they showed, considering the low yields, a surprising amount of potash and phosphorous, but an almost total lack of calcium. What the tests did not tell us was whether the potash and phosphorous were available.

With regard to the potash, we discovered the superficiality and error of the simple soil test within the very first year. At that time the whole acreage of the farms would not feed adequately 25 head of cattle, winter or summer, and we were forced to raise Wilson soybeans for hay. We put out a large field with 200 pounds to the acre of 3.12.12 fertiliser (3 per cent nitrogen, 12 per cent phosphoric acid, 12 per cent potash). As the summer progressed, the field looked yellow and the beans displayed brown spots of potash deficiency except in irregularly placed large circular areas resembling gigantic polka dots which appeared here and there in the field. Here the hay beans grew rich and rank and were a dark green. All through the summer the odd appearance of the field puzzled us.

By the end of the summer, after much reflection, I hit upon the reason for the handsome, healthy green polka dots. At some time—certainly generations earlier — when the forest had been cleared, the brush and logs had been piled and burned; and where this had occurred there had been created great residues of excess potash in highly available form, so great that they showed up generations later in a field where otherwise the potash had been used up by shallow farming. After that experience we increased our potash fertiliser with good results.

But it was not until we got thoroughly into a programme of deep-rooted grass and legumes that we began to find some astonishing answers to a great many of our problems, ranging from breeding troubles, anaemia and other sickness, to low yields.

Rotation of Crops.

Gradually, over a period of years, we moved through the conventional four-year rotation into greater and greater acreages in deep-rooted grasses and legumes. The faster we moved, the greater became the fertility of our soil until to-day we raise no more corn or row crops of any kind, but only a rotation of deep-rooted grasses and legumes into wheat or oats and back again into grasses and legumes. In 1950 we are replacing wheat with spring barley, to avoid heavy lodging of the wheat, to get better seedings of the heavy grasses and legumes. Barley will replace corn and make it unnecessary to buy the corn we do not want to raise because of the high costs of labour, fertiliser and depletion.

Before we could raise the legumes we had to put on as a "starter" over the whole farm *2* tons of ground dolomitic limestone to the acre. This quite literally "poisoned" the broom sedge and the poverty grass and permitted us to grow the nitrogen-producing legumes and the better, deeper-rooted grasses which in time crowded out the poor-land vegetation. At this point we made another remarkable discovery.

During the first year of an alfalfa seeding, when the plants rooted little more than 18 inches, they displayed signs of many deficiencies—notably, manganese, potash and boron. They had spindly stems, and the leaves had brown and yellow spots with yellowish bands along the edges; but in the second year, when the roots had penetrated 3 or 4 feet into the soil, the alfalfa turned rank and lush. We made another interesting observation—that our best alfalfa, ladino, and grass grew not on the fields where the badly depleted top-soils remained but on the banks where there was no topsoil at all.

Rich Subsoils.

One thing was clear; that the shallow and superficial soil test had been fairly accurate about the conditions of our topsoils but it told us absolutely nothing about the conditions in our minerally rich subsoils. Scientists from the Ohio State Agricultural Experiment Station at Wooster, with whom we work very closely, made deep borings to a depth of 10 to 12 feet, and the results showed what the alfalfa had already told us—that deep down we had a remarkably high rate of mineral fertility and that the subsoil, instead of being sour, had a pH (alcalinity) of 7 to 9, almost too much lime.

At this point we opened one of the gravelly banks where the alfalfa ladino, and brome grass grew more rankly than on any other spot on the farm. We made a sharp cut about 20 feet in depth. The gravel pit became a revelation and demonstration for the countless farmers who visit Malabar Farm each year.

The cut revealed mostly deposits of gravel, roughly stratified with thin streaks of sand. It also revealed fragments and glaciated bits of stone and conglomerates of almost every kind existing from Hudson Bay in the northern part of the American continent to our part of Ohio. There was in particular a very high percentage of limestone in small pieces, ranging from soft chalk through dolomitic limestone, which carries a good many trace elements as well as pure calcium.

In that cross-section we found some other fascinating and important evidence: That the brome grass in cross section showed a fanlike distribution of fine hair-like roots penetrating to a depth between 3 and 4 feet. The alfalfa roots (on the 3-year-old plants) penetrated to an average depth of 15 feet, and the longest measured root had gone down to a depth of nearly 20 feet! We could see now where the plants were getting all the mineral nutrition they could utilise and why the second-year and older plants showed no signs whatever of mineral deficiencies. They were getting all they wanted and more.

The cut in the gravel bank also illustrated a factor which many farmers tend to forget—that the roots of deep-rooted plants produce great quantities of organic material which later becomes translated into humus. The roots have a great importance both as humus and for their high mineral content which is in organic form and therefore highly available to the crop which follows when a deep-rooted sod is ploughed under. The cross section also illustrated the factor of good drainage essential to the growth and development of deep-rooted legumes.

It was apparent that after the first year of seeding we were scarcely using the long-overworked, depleted and leached-out top-soil at all but were drawing upon the fertility of the deep sub-soils. This factor accounted for the astonishing jumps in yield of oats and wheat and, in the beginning, even of corn, which occurred when a manured sod field was ploughed and new crop seeded. Actually we were and are farming those silt-loam soils from 3 to 20 feet deep after more than a hundred years of farming them only 8 to 9 inches deep.

Other effects of the deep-rooted grass and legume programme showed up presently in the livestock themselves. In the beginning, while the topsoils were still worn out, the rate of disease and infections among livestock was high, despite the fact that we kept constantly before them in a compartment next to the salt box a mineral mixture containing 22 trace elements. It is notable that in the beginning the animals consumed very nearly as much of the mineral mixture as salt. Once the programme of deep-rooted grasses and legumes got under way, their consumption of these minerals declined rapidly. The obvious deduction is that once we tapped the deep-down fertility, the animals began to get an abundance and more than a sufficiency of minerals and vitamins of all kinds and no longer sought them elsewhere.

The old infections and diseases which plagued our livestock in the beginning have virtually disappeared from the farm. In a constant milking string of 50 cows, the mastitis record today is zero. Perhaps the most interesting factor is that it was the plants themselves which first revealed to us by the spots and discolourations on their leaves the deficiencies of the top few inches of worn-out soil. After two or three applications of manure and two or three ploughings in of deep-rooted grass and legume sods, the spots and discolourations on the alfalfa leaves during the first year when the roots only penetrated to a depth of 18 inches also disappeared as the available mineral fertility was restored.

All these facts were discovered almost wholly by observation, close and thoughtful, of our own land. By the employment of the sweet clovers we have been able to tap and utilize the almost inexhaustible fertility of our deeper soils. In this process, including as well limestone and a reasonable amount of chemical fertilizer as "starters", we have raised yields of crops as much as 10 times in a fewer number of years.

Our practical experiences are recorded primarily as observations. At Malabar Farm we do not pretend to know search itself has not provided all the answers. We do know that these things happened and that the listed methods worked. We also know that the expenditures involved were 4 tons of lime to the acre and never, except in the case of trash-much seedings, more than 200 pounds of commercial fertiliser to the acre and sometimes less. It is reasonable to assume that the tremendous gains in yields could not be attributed to commercial fertiliser alone.

NEED FOR INCREASED PRODUCTION

By

Mr. A. V. MATHEW, B. A., B. L., Kottayam.

LOW productivity, low capital investment and over-population are some of the salient features of Indian agricultural economy. Maximising production is the prime need of the hour. But at present there is stagnation of industrial production in India mainly due to lack of sufficient capital for industrial development, lack of enterprise and technical knowledge and uncertainty in the economic policies of the Government. Most of our industries are now working at a low capacity, in some cases to the extent of 50 per cent, apart from the fact that because of the limited supply of capital goods, India now finds it difficult to start large-scale industries, although the Fiscal Commission has acknowleged the intimate connection between India's foreign trade and the growth and development of ancilliary services such as banking, shipping and insurance, the encouragement of which is, as said by the Prime Minister in the Constituent Assembly on 6th April, 1949, the avowed policy of the Government of India. In its memorandum to Mr. C. D. Deshmukh, the Finance Minister, the All-India Manufacturers' Association says: "In spite of the reliefs provided by the budgets of last two years, the savings in industries are hardly sufficient to finance further development of industries and for the fuller utilisation of our natural resources. As the situation stands today they have not proved adequate, considering the long-range needs of the industry. Production being the need of the hour, for fighting inflation and raising the standard of living, capital formation for productive purposes ought to govern the policy of the Government in matters of taxation of industries."

One of the most disquieting features in the present Indian economy is the continuance of high level of prices. Ever increasing prices and wages have put the economic conditions of the country in a vicious cycle. Much industrial unrest is caused in the country due to the vicious race between prices and wages. Because of the high level of prices our agricultural and industrial commodities, we find it difficult to bring down the cost of living. The present high prices in India may be said to be the direct result of the pressure of unspent purchasing power of the past years and the continuing purchasing power of today. We do not see as yet any very marked reversal of the upward trend of wholesale prices. Hard work linked with the new ideas of planning and social effort, and not mere monetary measures of control machinery, is the apt solution for high prices. Price levels should always be sufficient to maintain production and employment at safe levels. There should be maximum production of articles at minimum costs, and such articles should be distributed among the people at reasonable prices, consistent with their purchasing capacity. Serious impediments in the way of increased production will occur if there be enforced maintenance of uneconomic prices. Hence the Government should adopt the policy of keeping down the prices of essential goods to the lowest possible levels. Attempts should be made to effect a rise in agricultural and industrial production, to encourage compulsory saving on a wide scale and to control consumption. Immediate repercussions are sure to be created if there be any maladjustment in prices. The whole burden of the future planning in India is dependent on bringing down the high costs which have created many economic difficulties in the country. Cutting production costs or profits can help to reduce prices.

Only adequate supplies of food would ultimately bring down prices. Almost all the countries of the world are now deeply concerned over the economic, social and political implications of food scarcity. The concern about food is undoubtedly the dominant emotion in every Indian's mind. India is deficient in food and the production of food in the country is not sufficient to meet our total demand. Ever since India was threatened with the severe food shortage of 1943, the Government of India appointed several Committees, such as the Gregory Foodgrains Policy Committee, the Woodhead Commission on Bengal Famine, the Commodities Prices Board, the Krishnamachari Sub-Committee and the Maitra Committee on Foodgrains. Our food policy should never be fluctuating, unpredictable, lopsided and unbalanced. There must be unified direction in matters of food policy between the Centre and the States. A predominantly agricultural country like India must be able to make up its deficit in food requirements and get a better outturn of crops through better seeds, proper manuring and additional irrigation facilities. As recently observed in the course of his broadcast speech by Mr. A. B. Shetty, Agricultural Minister, Madras, our people must be made more manure-minded. The introduction of chemical fertilisers had been an important factor in raising agricultural efficiency in America and Europe; deficiency of nitrogen in the soil is the main manurial problem in India, and ammonium sulphate which has a large nitrogen content can, if applied, increase the crop yields. The Government of Madras have by distributing about 5,02, 506 tons of ammonium phosphate and 11,900 tons of phosphate manures over an area of 18 lakhs of acres, already realised upto the middle of this year 42,901 tons of foodgrains and further expect to obtain an aggregate yield of 1,15,000 tons of foodgrains. The success of the 'Grow More Food Compaign' is in the demand that is made for its progress, and the significance of such a campaign to India's economy cannot be overemphasized at a time like the present when the food position in India cannot guarantee the maintenance of our population at anything other than semi-starvation level.

PRESERVATION OF SOIL FERTILITY.

AIDS TO INTELLIGENT CULTIVATION.

Scientific farming must take into consideration the various factors which go to make agriculture not only productive but economical. Maintenance of soil fertility, application of labour-saving devices, introduction of simple but efficient methods of use of farm-yard manures are some of the most important objects which have constantly to be kept in view if agriculture is to be a paying proposition. The article below gives in brief some of the results of the research undertaken at the Indian Agricultural Research Institute at New Pusa on these lines.

THE obviously fundamental basis on which agriculture can flourish is a fertile soil and how soil fertility can be preserved for generation on end is a question which has caused concern to all agriculturists. Experiments on the improvement of soil fertility have been going on at the Indian Agricultural Research Institute, New Pusa, for the last 35 years on the following lines: (1) Application of farmyard manure; (2) Application of nitrogenous phosphatic and potassic fertilisers; and (3) Introduction of legumes in the crop rotation and as green manure crops.

FUEL GAS PLANT.

One of the best methods of improving soil fertility is to apply farmyard manure but in India most of the cow-dung cakes are used as fuel with the result that they cannot be used for manurial purposes. An interesting invention at the Institute is a Fuel Gas Plant which can produce fuel out of cow-dung without affecting its manurial property. It is a dual purpose machine in which 1 lb. of cow-dung cake can produce 1 c. ft. of gas which would burn for 10 minutes at normal cooking temperature. The quantity of cow-dung can be increased according to the capacity of the plant. The cost of a small plant does not exceed 500 rupees. Further experiments are being undertaken at the Institute to utilise the plant commercially.

Nothing is considered too low or useless in the Institute provided experiments show that it has potentialities for improving agricultural production. An instrument has been devised at the Institute for the preservation of human urine which contains concentrated nitrogen, far in excess of what artificial fertilisers can supply. The device which is a simple one preserves the urine on a soil base which after sometime forms good manure straight-way applicable to the fields.

GREEN MANURES.

Application of nitrogenous fertilisers is restricted in India as internal production is negligible. The introduction of legumes in crop rotation and as green manure crops, therefore, is of great potential value as they not only enrich the soil, but are also good fodder. At the Institute, research has been carried on to find the effect of various types of legumes on different types of soils. Experiments have shown that inclusion of legume crops such as gram and peas, in rotation recuperates the soil and thereby increases the out-turn of the succeeding crop.

A fundamental requisite in planning agricultural production is soil survey i. e. an expert analysis of soil composition and its fertility level, without which maximum results from crop planning cannot be obtained.

How lack of proper soil survey affects production in spite of other advantages, was exemplified recently when it was noticed that some of the irrigated lands in the Punjab gradually went out of cultivation through no apparent faults, either of cultivation methods, or lack of water. Investigation of the soils concerned showed that as a result of seepage of water from unlined canals and also because of heavy irrigation, injurious salts which were present in the lower layers were brought to the surface, rendering the soil unfit for cultivation.

One of the methods which the Institute is developing for a quick assessment of soil fertility is through the use of indicator plants, which test the nutritional properties of particular types of soil, on which crop planning can be based.

A big Pot House is maintained at the Institute in which plants are kept and the effects of the various treatment given to them are watched. The pots are kept under a shed with necessary arrangements for providing water and other requirements for plant growth. The floor is laid with iron rails so that the pots can be moved out into the sun, in trollies without upsetting their equilibrium in any way.

CULTIVATOR'S HOLDINGS.

A special type of research at present on hand, is an investigation which seeks to make an integrated approach to the solution of the problem of agriculture with special reference to the small farmstead. Most of the cultivators' holdings in India are small and a pair of bullocks or buffaloes determines the unit. The Institute is investigating into the possibilities as to how far a six-acre plot could be an economic holding for an average cultivator with a family of four including three adults, one child and two bullocks or buffaloes. This investigation aims at applying all the improved methods of agriculture on the six-acre unit with a view to find out whether the food and fodder requirements of the cultivators can be met from this plot alone. The investigation is still in an experimental stage but interesting results are expected. It may not be out of place to point here that in Japan where up-to-date methods of agriculture are adopted, a cultivator owning a four-acres plot meets all his requirements from the soil including even the cotton and silk worm for his clothes.

DOUBLE PLOUGH.

Certain results have already been obtained, the most recent one being the designing of a new type of plough which with a single pair of bullocks can do twice the work of a normal "Desi" plough. The new plough is simple in construction and consists of the bottoms only of two standard local "Desi" ploughs, suitably coupled together by means of an iron angle frame-work and pulled by a single central beam. The ploughs are so placed in relation to each other that indentical furrows are cut and they carry out in one operation work which would be performed by two operations by a single standard plough. The draught is within the capacity of a normal pair of bullocks and the cost is only 50 per cent more than that of the single "Desi" plough.

MECHANICALLY OPERATED REAPER.

A small machanically operated reaper with a 2 h. p. capacity has been designed at the Institute and the experimental model is in the process of development. It is hoped that the finally designed machine will be capable of reaping 5 to 6 acres per day of 10 hours. The cost of the machine is not expected to exceed Rs. 1,000.

A hand operated rotary screen has also been evolved in the Institute which is useful for screening rotted material in municipal dumps, which have fertiliser value. Very large quantities of rotted material of fertiliser value equal to good quality compost is usually wasted in these dumps. They can be put to use provided they are suitably screened. The rotary screen evolved in the Institute produces 1 md. of screened manure per minute.

TESTING OF FOREIGN MACHINES.

Another important aspect of research in this Division is the testing of machines and implements coming into the country e. g. tractors, thrashing machines etc., with a view to testing their suitability under Indian conditions. It has been found that due to climate factors, soil surfaces, and the farming methods in India, imported machines require considerable adjustment before they can be employed on the fields. A typical example was the case of small tractors, usually employed in private gardens in the U. S. A. and the United Kingdom, which, when used in Indian fields, were found unsuitable. These tractors after being subjected to field trials under conditions which would prevail with any average cultivator were found to be unserviceable within 150 working hours, the main cause being excessive wear and tear, dust and excessive heat, the stresses and strains imposed in negotiating bunds and irrigation channels during the operations, which are common features in India. Further it was noticed that an operator found it impossible to use the machine longer than one hour continuously owing to excessive fatigue.

Larger tractors have been subjected to field controls and such weaknesses as non-efficient tilling system and lack of due latitude for expansion in summer temperatures of certain working parts, have been discovered and the manufactures advised.

Thrashing machines purchased from Denmark have been remodelled to suit Indian conditions. One trasher has been evolved, costing not more than Rs. 15,000 which can produce 15 to 20 mds. of finished grain per hour.

New Fields for Phosphorus.

PHOSPHORUS in elemental form has not been regarded as a major industrial chemical. Even in the match industry it had a chequered history. Industry's interest has largely been expressed in terms of phosphates and occasionally other combined forms, and for most processing phosphoric acid or one of the phosphates have usually been considered adequate. This background is rapidly changing, particularly in the United States. Elemental phosphorus rather than phosphoric acid is increasingly playing the key part. The recent news that a phosphorus plant costing 1 million is to be built in Britain and will be the largest in the United Kingdom appears to recognise this development.

The major raw material source of phosphorus and its compounds is mineral rock phosphate, of which there are many large deposits around the world. This is generally a complex form of calcium phosphate into which other elements, notably fluorine, have entered by geological infiltration. To make this material "active" or "chemically convertible," de-fluorination and simplification of the molecular structure are required, and this has largely been achieved by acid treatment, of which the well-known fertiliser process for superphosphate is the foremost example. Alternatives are the high temperature fusion treatments, which have been much less used. Once a simpler calcium phosphate material has been obtained, further refinement can produce soluble phosphates. For fertiliser purposes cruder material containing known proportions of soluble phosphate are sufficient.

Readers of American chemical publications in the past decade might often have supposed that the Tennessee Valley Authority was backing a wild horse in making phosphoric acid by first producing elementary phosphorus in electric furnaces. It was commonly believed that this new path to phosphoric acid was made economically possible only because TVA developments were aided by State funds. This criticism is still made by some other fertiliser producers in America. More significant, however, is the fact that chemical companies in the United States are rapidly adopting the electric furnace method, and the older acid or wet-process methods of converting rock phosphate into phosphoric acid are losing ground, except perhaps in fertiliser production were low price economics and only rough purity standards prevail. But even in this field it is an open question whether the electric furnace method would not be the best route to higher-analysis phosphatic fertilisers, ammonium phosphate, triple or double superphosphate. Where electric power is cheap and abundant the case for the TVA electric method is attractive.

In 1944 American production of elemental phosphorus was at its war-time peak, about 85,000 tons; two years later it had dropped slightly to 80,000 tons. But a recent estimate for 1949 shows that

1,16,000 tons had been made, and current U. S. expansion plans show that a plant capacity for making 1,60,000 tons per year will soon be reached. Previous producers are erecting more furnaces and new producers are entering the market. Elemental phosphorus itself is rarely required as an end-product; most of it is converted into phosphoric acid for the further manufacture of a range of phosphates, while something like 7 per cent of the total tonnage of phosphorus is converted into the pent-oxide, oxychloride, chlorides, or sulphides.

New demands for phosphorus compounds in a fairly pure state account for this remarkable expansion. One of the most striking is in soap and detergent manufacture. In the United States at least 18 per cent of the elemental phosphorus now produced is required for conversion into phosphates for soap or detergents. The paradox is that soapless detergents should have made less headway in a soap-rationed country, which Britain has been since 1942, than in the United States. That, however, will probably not continue indefinitely. Some experts believe that eventually the modern detergent will become almost as widely accepted here, and the existence of numerous hard-water areas of Britain lends support to this belief.

Another increasing use of phosphorus chemicals is in the production of plastics and surface coatings, especially for metal surface protection. Phosphate esters are required in substantial amounts as plasticisers for vinyl resins; American expansion in this one use is estimated at 200 per cent since 1946. Phosphates are increasingly used as anti-rust and anti-corrosion coatings. A smaller but possibly significant new use is in the production of the several new organo-phosphorus insecticides, all of which require phosphorus compounds as initial material for their synthesis. Parathion, for example, has created a new demand for phosphorus pentasulphide. Whether these insecticides will create a substantial and lasting demand remains to be seen. The toxic dangers associated with their use have raised serious doubts about their future expansion. On the whole, it is likely, however, that tighter regulations safeguarding their use will remove these doubts.

It may be doubted whether the British future for phosphorus production will show an expansion as spectacular as that of America. We have no deposits of high grade mineral phosphate but we require large tonnages for soil application. The possibility of rock phosphate imports being restricted can never be entirely dismissed. Fertilisers would then have to be given the major share. Another fundamental for the fuller use of phosphorus chemicals is electric power, which should be abundant and preferably cheap. It is neither in Britain today. Nevertheless, the extremely promising home demand for phosphates and the increasing export opportunity for compounds of phosphorus unavoidably suggests that in this country the industry deserves at least as much encouragement as it has had in recent years in the U. S. A.

TELLING THE WORKER

WORKS INFORMATION AT I. C. I.'s BILLINGAM FACTORY

TO-DAY, most enlightened managements appreciate that if they are to obtain the wholehearted co-operation of their employees they must give them the fullest information about the activities of the firm, its organization policy and practice, and about developments in industry and trade generally which are likely to affect the firm and its employees. The value of what is usually called "Works Information" in promoting better understanding and improved relationships within the undertaking is increasingly recognized. Below, we publish details about a successful and progressive scheme in this important field of industrial activity.

At the Billingham Division of Imperial Chemical Industries in County Durham—the largest chemical factory in the British Empire—more than 16,000 employees work in plants, workshops and offices spread over a thousand-acre site. To them, the publicising of information—about the Company, its products and processes, welfare schemes, production efficiency and even Government-sponsored campaigns like Blood Transfusion and National Savings—is just as much a part of their daily working lives as collecting the weekly wage packet. They know that when anything happens which may affect their employment, or which it would be to their advantage to know about, the management—through their supervisors or the Works Relations Section of the Labour Department—will see that they are told.

The policy of "Telling the worker" is not new at Billingham. For more than 20 years they have had—through a wide-spread network of Woiks Councils—an effective system of Joint Consultation between all grades of management and workers. But it is only since 1943 that the Division has had a department specifically organized for the circulation of information within the factory.

Waiting Room Exhibition.

When the prospective recruit arrives at Billingham to be interviewed for a job he is shown into a waiting room which is also an exhibition. Here—while waiting for a series of interviews with labour officers, the works medical officer and his prospective foreman—he has the opportunity of learning, in his own way, something about the Company he is going to work with, and what sort of job it can offer him. Moving models and coloured transparency panels will tell him something of the factory's range of products and how they are used in agriculture and industry. Works panels, by pictures and captions, will give him a broad outline of the raw materials, processes and products of every plant in the factory and show how the bye-products of one plant become the raw materials of another. Other panels explain the structure of the I. C. I. as a whole; the organization of the Billingham Division; how the Division fits into the framework of the parent Company; brief explanations of the many welfare schemes; and a pictorial presentation of the amenities offered to the 12,000 members of the Works Club.

When the interviews are over and the applicant—now engaged—starts work in his plant or workshop he already has some idea of what working for I. C. I. will mean to him. Now comes a week of "settling in" on the job, getting to know his workmates and supervisors and finding his way around the factory. During this time he continues to be given more information. His foreman or chargehand will see that he knows who his Works Councillor and Shop Steward are, and where he can find them. The Billingham "News Sheet"—published fortnightly and displayed on plant and office notice-boards throughout the factory—will enable him to read about a variety of subjects concerned with life in this great factory; about people and products, sales and sports. The "News Sheet" will also give him the dates and times of all Works Councils and Committee Meetings to be held during the following fortnight, so that he will have an opportunity of contacting his local representative in advance.

During his first month at Billingham the newcomer will almost certainly have seen a canteen lunch-time film show. Every month a mobile film unit visits canteens in the factory. The programmes, lasting about twenty minutes, usually include a C. O. I. "General Interest" film and a Billingham film—made by the Division's own film unit—which may describe a chemical process, explain the working of some department or be a sports newsreel of one of the club's athletic sections. In all, thirty such film shows are given every month.

Induction Course.

When he has been at work for about a week the new employee attends a two half-days' induction course. Organized by the Labour Department, and usually given to about thirty newcomers at a time, the course consists of a series of talks and films covering every phase of I. C. I.'s labour policy—wages, conditions of employment, promotion, joint consultation, safety and welfare schemes. The whole atmosphere of the course is completely informal. Open discussion on every topic is encouraged during the talks, at the tea-break midway through the afternoon and at the final summing-up by the Labour Manager or his deputy. At the end of the course everyone is given two booklets—one on the Works Council scheme and the other explaining the procedure followed for negotiations with Trade Unions.

The new employee has now been given a broad outline of the activities of I. C. I. and its Billingham factory—from the catering service to consultative machinery, and from the pension scheme to promotion. He has his Works Rules Book for ready reference. He knows where to go and who to see for further information or advice—his foreman, works councillor or shop steward—whether it affects his job or not. And he can rely on being kept up-to-date on everything likely to affect him by the publicity service of the Works relations Section.

CATTLE IMPROVEMENT IN INDIA

INDIA is one of the largest livestock countries of the world, having 136 million cattle and 40 million buffaloes, which together comprise about a quarter of the world's total bovine population. In addition, India has 37.7 million sheep, 46.5 million goats and 3.2 million other animals consisting of horses, mules, donkeys and camels, all of which play a vital part in the agricultural economy of the country. Both per head of the human population and per acre of cultivated land, the number of livestock in India exceeds those in most other countries. It is however well-known that they are in a very undeveloped state and that the per capita production is perhaps the lowest in the world. It has been demonstrated that livestock in India do possess potentialities for increased production, but the main problem is how to husband the resources of the country to develop these potentialities. It is not easy in a vast country like India with a large diversity of environmental conditions to plan for the development and to execute that plan in a uniform manner. All the technical knowledge and all the available talents for organisation should be harnessed for increasing production in the interest of the social and economic wellbeing of the people as a whole.

Livestock improvement requires simultaneous attention to a number of factors which may be classified into 4 main heads namely: breeding, feeding, disease control and management. Breeding gives to the animal a certain amount of inherited capacity to produce. Feeding, disease control and management enable the animal to express that inherited capacity in actual production. Any amount of feeding or disease control will not make the animal produce more than what has been predetermined by heredity. The first esssential is therefore to provide the necessary number of bulls of known ability to transmit qualities of production to their off-spring. Unfortunately, the number of such bulls available is far short of the requirements. The total number required is a million whereas we only have 1/200 of that number. The main problem of breeding is how to produce this number and how to distribute them and to utilize them in the most effective way.

In regard to feeding, the country is not, at present, able to maintain all the livestock which exist, but the limit of production of cattle feeds has not been reached. Feeding stuffs should consist of 2 parts, carbohydrates and proteins. Concentrated feeds like oil-cakes, oil-seeds and gram which provide protein part of the diet are in very short supply. It is roughly estimated that the quantity at present available would suffice only for about 28% of the population. Roughages like green fodder, hay, straw etc. which supply the carbo-hydrates are also not sufficient for the existing population. It is roughly estimated that the roughages would suffice for only about 75% of the population. How to increase the production of fodder and concentrates is another vital problem facing the country.

It is well-known that diseases, especially contagious diseases, are widely prevalent in India and cause untold loss to the industry, both because of mortality and the debilitation through disease. The Veterinary Departments in the various States are at present not large enough for tackling this problem on the required wide scale. It is estimated that a minimum of one Veterinary Surgeon is required for about 25,000 animals. The State Governments are working towards the achievement of this goal. It also requires a considerable amount of propaganda in order to persuade the owners who are generally poor and illiterate, to adopt the measures recommended by the departments.

On the side of management, which in short, are all the factors affecting the comfort and wellbeing of the animals, much has to be done in order to remove prevailing ignorance. This also is mainly a matter of persuading the people to adopt methods which science has proved to be the best.

Among matters which require immediate attention, is marketing. Unless the producer obtains a reasonable margin of profit he will not have the incentive to exert himself in the improvement of his stock. Legislation is necessary for the grading of produce, prevention of adulteration of animal products, quarantine and prevention of spread of disease, for compulsory castration of scrub bulls and the like.

In a large country like India with a wide variety of conditions, no measures will be successful unless they are carefully planned and applied systematically.

"O Lord God of Israel, I come to Thine ancient dwelling-place to pour forth the heart of tortured Europe. Why does no impulse from Thy renovating will strike again into the soul of man? Faith fades and duty dies, and a profound melancholy falls upon the world. Our kings cannot rule, our priests doubt, and our multitudes toil and moan, and call in their-madness upon unknown gods. If this transfigured mount may not again behold Thee, if Thou wilt not again descend to teach and console us, send, oh send, one of the starry messengers that guard Thy throne, to save Thy creatures from their despair."

(DISRAEL, BENJAMIN, EARL OF BEACONS-FIELD).

Rice Production in the United States.

RICE production in the United States has been increased and improved by the mechanization of planting, harvesting, and other crop operations, and by scientific seed selection which has developed new rice types especially adapted to the different rice-producing areas of this country.

In California, one of the four major rice-growing regions of the United States, more than 90 percent of the rice acreage is seeded from low-flying airplanes. In the other major rice areas, Louisiana, Texas, and Arkansas, the planting is done by machine-seeders or drills pulled by tractors. In all of them harvesting and threshing are handled mostly by machines. Very little rice is planted or harvested by hand anywhere in the United States, except in a small part of the Louisiana rice country known as the Bayou Tache, where some rice still is cut with hand sickles and bound into sheaves.

The United States in 1949 produced a record rough rice crop of 4,000 million pounds, compared with 2,200 million before World War II. Exportable supplies of rice in the Far East are estimated by United States Department of Agriculture Exports at about one-third of prewar rice exports. Asian countries are both the greatest rice-producing and rice-consuming areas of the earth. World War II and postwar developments disturbed the economy of those countries. Experts say Asia could absorb the surplus rice production of the United States if tranquility were established so that its disrupted economy could be improved. Also, given tranquility, the Great Rice Bowl—Indo-China, Burma and Thailand—could provide rice to supplement the production of India, China, Japan, Korea, and Formosa. The United States consumes about half of its rice crop and exports about half, largely to other Western Hemisphere countries. The high quality of United States rice is its chief advantage in the competition for Western Hemisphere markets. A dozen other American countries produce rice, but not enough for their own needs. Four–Chile, Peru, Argentina and Guatemala–are self-sufficient in rice production.

Rice-Producing Areas in U.S.

The main American rice belt is a stretch of flat coastal prairie along the Gulf of Mexico in southwest Louisiana and southeast and south Texas, which is warm, humid and watered by sluggish streams and bays. Other big growing areas are in eastern Arkansas, where deep wells provide irrigation water, and in the irrigated valleys of north central California. Some rice is grown near the coasts of the Carolinas, Georgia, and Mississippi, but the total is relatively small.

Rice is planted on the sultry flatlands in April and May and harvested in the autumn. In the United States rice is grown in about the same way as other grain crops, such as wheat, oats and barley, except that rice is irrigated and the land is kept under from four to eight inches of water until the heads are nearly ripe and the crop is ready to drain for harvesting. About the same kinds of farm machinery are used to sow and harvest rice as are used for other cereal grains.

Except in California, where the greater portion of the rice acreage is seeded into water by airplane, the farmers seed with a grain drill or broadcast seeder. In Texas and Louisiana, riceland is ploughed in the autumn, then cultivated and pulverized in the spring with disks or harrows, preparatory to seeding. In Arkansas and California the land is both plowed and harrowed just before seeding time. In California about 400 acres a day can be seeded by airplane, compared with 25 to 40 acres by seeders or drills pulled by a tractor.

Extensive irrigation systems, pumping stations, canals, and cross ditches are used in the rice areas, the cost of water ranging from $10 an acre.

Harvesting Done With Grain Binders or Combines.

Harvesting is usually with grain binders of combines. Rice cut with a binder is automatically tied into bundles, which are placed in shocks to dry before threshing. The combine cuts and threshes the rice with one operation. Combined rice is high in moisture content and must be passed through a drier immediately. Otherwise in storage it will heat and spoil. Driers pass blasts of very hot air through the grain and dry huge quantities within a few hours.

Rough rice is delivered to mills, warehouses, or shipping points by trucks which can carry 20 tons. In California a trailer of equal capacity is usually attached to the truck, so 40 tons of rice can be hauled on each trip to the warehouse or mill. Threshed rice, when properly dried, is stored in barns, warehouses, and grain elevators, or sold at once directly to a mill. Many of the warehouses are owned by farmers' co-operatives or by individual growers, and others are owned by rice millers and irrigation companies. The time at which the farmer sells his rice depends on the state of the market and his need for funds. He may hold for a better price and keep his rice stored in a warehouse as long as he pleases. The United States Department of Agriculture maintains a market-news service which helps farmers plan production and marketing programmes.

Time dissipates to shining ether the solid angularity of facts. No anchor, no cable, no fences avail to keep a fact a fact. Babylon, and Troy, and Tyre, and even early Rome are passing already into fiction. The Garden of Eden, the Sun standing still in Gideon, is poetry thencefor-ward to all nations. Who cares what the fact was, when we have thus made a constellation of it to hang in heaven an immortal sign ?

SOIL, AGRICULTURE AND CIVILISATION

MODERN man is sometimes deceived into believing that if he can convert the minerals and metals of the earth into gadgets, he can be sure of his food. But we cannot eat gadgets, only the food for which they can be exchanged. And for food we are dependent on the living soil. Rightly did the ancients call the soil, 'Mother Earth'. It is essential therefore that we should conserve soil for posterity, as it provides food, shelter and all our requirements in life. If we take care of the soil, it will take care of us, our children and the succeeding generations. Let us consider only one factor, tapping the soil for producing food which is the fundamental necessity of all mankind. If we go on raising crop after crop and reap harvests without caring to replenish the soil, Nature will soon go on strike.

Our aim should be to continue to reap harvests and maintain the fertility of the soil. This is possible through careful soil mechanics and water conservation. This envisages the use of methods that will maintain soil fertility and productivity at a high level. In India about a third of the agricultural lands are subject to one type of damage or other, and each year several million acres become unproductive, resulting in tremendous national loss. In the Gangetic basin every year, approximately 1 per cent of good agricultural land is becoming sub-marginal and 5 per cent of the sub-marginal land is going out of production.

Soil Erosion.

Wind and water are two main active forces of soil deterioration. They are active all the time, but more so when there is no cover on the ground and the land is located on slopes. For about three months in the year, high westerly winds carry light soil particles and sand, and deposit them hundreds of miles away. Sand is silica and wherever it is deposited it makes the land less productive and ultimately the fields become barren.

When the rain-drops strike bare ground, the light particles of soil are dislodged. Water at first seeps into the ground but once the soil is saturated, the rain sluices into the rivers, carrying away particles of soil, and gradually the top soil from the fields. First there is sheet erosion, then gradually more serious damage.

Remedies.

To combat these, there should be cover on the ground. In arid and semi-arid regions "shelter belts" at regular distances, prevent the drift of sand and soil particles, on the fertile lands. In wastelands and on slopes of more than 15 per cent, there should be a cover of trees, shrubs and grass. The trees act as an umbrella and break the force of striking water. If afforestation is done on the contour, it will break the force of water so that rain-water gets a chance to get back into the ground. This will also prevent floods so devastatingly common every year in this country.

In agricultural lands these forces of nature could be combated by simpler means within the reach of individual cultivator. At harvest time the cultivator could leave stalks 4 to 6 inches high in the field, the stalk and stubble mulch will hold the soil until another crop is sown, and protect the top soil from wind and water erosion. At the time of ploughing, the stalks may be ploughed into the soil. Besides preventing erosion, it will improve the mellowness of the soil, make it more porous and increase its water-holding capacity.

Instead of ploughing up and down, if the farmers plough and cultivate on or along the contour, it will not only lessen the strain on the bullocks and implements but also avoid runoff. Each furrow on the contour forms a miniature terrace which prevents runoff and holds the soil.

Strip-cropping has been known in India for many generations, but neither is the width of the strip determined scientifically, nor are the crops which are grown in the strips, chosen judiciously. Usually, legumes and non-legumes should be sown in alternate strips, or the strips should be alternated with inter-cultivated crops and crops which are close-sown. Strip-cropping prevents finer particles of soil from being washed away.

"*Vatt bundhi*" or "*Daul bundhi*" are field embankments known to Indian farmers from times immemorial. If bunding is done on the contour the water will spread evenly and produce the pressure of water against such bunds. Where the slope of land is steep and where farming is a necessity, benches or terraces are cut in the hillside, thus making flat, narrow fields for cultivation.

Green manure crops protect the soil when it is not being used by the main crop. This practice prevents erosion, conserves moisture, holds plant food that might be leached out and in some cases supplies considerable food for livestock, The greatest benefit from fertilizers is obtained by applying them to legumes, Fertilizers increase crop growth and the crops following are benefitted by a greater degree of soil protection, and by a greater quantity of organic matter and plant food.

By draining wet and swampy areas, some of the most fertile soils can be reclaimed, which will otherwise remain unproductive. By digging open drains of appropriate sizes, a problem area can become most productive. A little determination and a spade is all that is required.

A considerable increase in production is possible by improving detelict wells and tanks.

Tapping the available sources for irrigation is a quicker and more effective method, than waiting for such times when canals can be constructed. The adoption of sound methods of water application alone will pay big dividends in increased yields.

FACTS THAT INTEREST.

Swiss Variable-Speed Gear.

The Kopp Variator, developed in Switzerland, is a stepless variable speed gear. Power range is ¼-12 h.p. with a mechanical efficiency of 90%.

The coaxial input output shafts of the gear each carry at their inner ends a hardened steel disk. Peripheries of disks bear against a series of steel balls that transmit the driving power between shafts.

When balls rotate on spindles normally parallel to shaft axes, output speed equals input speed. Moving balls about their centres and tilting their axes of rotation by movement of a control plate changes contact areas and therefore output-input speed ratio.

Range of speed variation is from one-third below input speed to three times above it, a total of 9 to 1.

New Food Plant for Mexico.

Monterrey, Mexico, now boasts a modern, $2-million food processing plant. Anderson, Clayton & Co., Inc. designed and built the plant.

Products will be hydrogenated vegetable shortenings, margarine, cooking and salad oils, salad dressings, and peanut butter. Annual capacity is 50-million lb.

Central feature of the new plant is a four-story processing building. Tank cars bring crude cottonseed oil to this building from oil plants in various parts of Mexico.

Oil is refined to remove fatty acids and further purified by several washings. A 72-hr. cold treatment crystalizes steariness in the oil. Steariness are then removed by filtration.

Pre-Weld Reinforcing Mat.

Reinforcing steel used on a California housing project is pre-assembled and welded in templets saving time and eliminating costly replacement errors. Four templets are used to form the eight mat shapes used, opposite-hand reinforcing assemblies being made simply by turning templets over. Mats are 12x16 ft.

Templetes are wood with trough-shaped 5/8x1½x2-in. blocks to hold steel. Stook, in desired length, is stored next to templets. Four men place steel. Welder tacks steel just frequently enough for mat to remain intact.

World's largest Pumps Assembled by Welding.

King-size job being done by the Pelton Wheel Co. is the manufacture of six huge pumps for the Grand Coulee pumping plant on the Columbia River, not far from Spokane, Washington. The six pumps will furnish 850-million gal. of water per day to irrigate 11 million acres of desert-like land.

The pumps, claimed to be the world's largest, are being fabricated to a large extent by welding. Steel up to 5 in. thick must be welded. As the heavy sections tend to crack when welded, lime ferritic E-6016 electrodes have been adopted after various types were tried.

Their low hydrogen content minimizes hydrogen pickup in the weld areas. A slight preheat also helps to prevent cracking. Another advantage of the lime-ferritic electrode that influenced its choice is that vertical welding in a deep-groove weld is practical.

Pump casings are fabricated in halves, which will be bolted together to form the entire volute. Casing sections are joined by stringer welds, turned over, flame-gouged, welded, turned, flame-gouged to clean the weld, then finish welded. A turnbuckle, when casing is welded to shoulder casting, holds the two together; it is removed after tack welding.

One point of interest is that once a weld is started, welding does not stop until the weld is completed. Twenty-four hours of continuous welding is not uncommon.

Bores Semicircular Holes.

To bore semicircular holes for reinforced concrete soldier piles, Sure-Bottom Foundation Co. first bored 18-in. dia. holes to desired depth. Then cutter-bucket, driven by an air hammer, made hole semicircular.

Bucket is round-hole size with trap-door bottom. Cutter has two flights. In driving, the lower flight makes pilot cut, the upper completing cut, clay drops into bucket.

Fir Bark—New Source of Wax.

Wax will be extracted from fir bark by the Oregon Wood Chemical Co. This will be done in addition to making molasses from wood waste.

The process was developed at the Oregon Forest Products Laboratory. Ground bark is treated batchwise with hot benzene, hexane, or chlorinated hydrocarbons for 3 hr. The extract is then pumped to an evaporation chamber were the solvent is distilled off with steam, leaving wax in the bottom of the evaporator.

The wax is harder than beeswax. Yield is estimated at 120 lb. per ton of oven-dry bark.

Simplifies Brake Relining.

Brake linings can be replaced without removing shoes by using explosive rivets. Mechanic releases lower shoe from the brake shoe spring and blocks it so all riveting can be done from above. If shoes are frozen to anchor pins, they must be removed.

New lining is clamped firmly to the shoe, with holes in lining and shoe aligned. Explosion should be toward the floor. Rivet strength, permanence, and firmness are comparable to solid rivets.

Spray-Pond Design Factors.

Where water supplies are limited, evaporate cooling by spray pond will save water for industry. A spray pond has about the same cooling capacity as a cooling pond fifty times as large.

A typical spray pond consists of a basin above which are nozzles to spray water upward. Usual practice locates nozzles 5-6 ft. above water surface, depending on water depth and curb level.

Nozzle pressure is 5-7 psi. with nozzles spraying 25-50 gpm. each. Nozzles should be spaced so that average water delivered to the surface varies from 0.1 gpm. per sq. ft. for small ponds to 0.4 gpm. per sq. ft. for large ponds.

Outer nozzles should be at least 20 ft. from edge of basin. Lower fences, up to 12 ft. high, are needed for roof locations and where ground space is limited.

Propellers to Drive Planes faster than Sound.

About 18 months from today the first supersonic turboprop driven hairplane may pass through the sonic barrier. Leading United States propeller designers are testing new ultra-thin straight blades in scale model propellers with diameters of 3 and 4 ft. High-speed propeller model tests recently indicated air stream speeds equivalent to Mach 0.92.

Before supersonic propeller-driven planes can become a reality several engineering problems must be overcome. Full-scale blades, at least as thin as the model blades, yet very wide of chord and super strong, must be produced. Problems of propeller gearing and controls must be overcome.

Until recently the top limit for a propeller-driven plane was put somewhere about 500 mph. Aerodynamic research since World War II has accounted for the big jump in propeller airplane speeds now forecast. A supersonic propeller blade can be shaped either by making it very thin, or by sweeping back its leading edge.

Sweep-back propellers have been largely discarded in favour of a thin blade because of structural requirements. For reasonable efficiency around Mach 1 a thickness-to-chord ratio of the blade tip of about 2% is estimated.

Main economy of the high-speed propeller aircraft is expected to be in its efficiency at low speeds as compared to the turbo jet engine.

Separation of Fine Iron Ore by Cyclone Action.

Tests conducted in a continuous pilot plant of the Hanna Ore Mining Co. were directed at finding a workable process for handling iron ores in the size fractions 3/16-in. down through 65 mesh.

The main unit was a Dutch State Mines cyclone separator. This is a dynamic separator multiplying gravity and increasing the specific gravity differences of mineral particles. Separation is effected by centrifugal and centripetal forces in the cone-shaped section of the unit.

The ore to be treated is suspended in a magnetide medium and water. The fine ore is floated out an overflow.

System consisted of an ore flow and a medium flow. All products were washed and the medium recovered by magnetic separators. Total medium usually consisted of 50% drained and 50% cleaned.

The feed ore was screened through a 3/16-in. square screen and washed in a primary rake classifier. Average feed ore rate was 6 dry long tons per hour.

All the world is built upon the system that each one of us shall have to yield precedence to some other one, as well as to enjoy a certain power of abusing his fellows. Without such a provision the world could not get on at all, and simple chaos would ensue.

News & Notes

Circuits buried in Plastic.

One of our electronic's most useful design tools is potting of components and circuits into clear or opaque plastic materials.

Currently popular polyesters with proper physical and electrical properties are used for embedment compounds. Polystyrene gives optimum electrical characteristics. Mineral-filled polyesters resist high temperatures (300° C. for half-four tests), while proper blending of fillers varies expansion co-efficients.

Plasticizers and reinforcing-type fillers are effective for low-temperature operation (-80°C). Metallic fillers or cooling fins achieve good thermal conductivity. Special application properties can be made to order.

How to Pack Tinplate.

Packaging of tinplate is a good example of the utility and protection requirements that the steel industry faces. Tinplate is sold as base box-31,360 sq. in. or 112 sheets of tinplate.

Weirton Steel Co. has studied this packaging problem for some time and concluded that:

Water repellent paper will not prevent loss from severe sweating of the sheets.

Paper linings can best be sealed at the platform by full length angles laid along the bottom of the wooden platform skids.

All corner angles must be cushioned to prevent tearing the paper lining.

A metal wrapper and metal container will not prevent loss from sweating without a large overlap of joints or use of waterproof paper lining.

Rust inhibitors will not prevent loss from severe sweating.

During sweating, water forms on the outside of the package and penetrates wrapping or lining if it is not waterproof.

Makes Sea-Water Potable.

Two pints of fresh water per day are converted from sea-water by a 24-in. dia. solar still developed by U. S. Fibre & Plastics Corp. The U. S. Navy is using the still as standard equipment for air men downed at sea.

Outer skin is 6-mil inflatable Vinylite film. Inner skin is black cotton cloth. Skins are held apart by 32 vinyl tabs welded to plastic skin. To operate, a drain cloth at the bottom is first soaked. The still is then thrown overboard and water is poured through its funnel. When the tube running through the sphere is full, the sphere is held upright in the water.

Sun's rays pass through the vinyl skin and heat sea-water on the black cloth, causing evaporation. Vapour condenses on the inside of the outer skin and drips down into a trap at the bottom.

Warm Glass, Warm Hands.

Cold glass on a counter where clerks work constantly can cause swollen fingers, cracked skin, and even chills from heat loss through their fingers.

An American travel bureau solved this problem by installing a soil heating cable beneath the counter. The cable was laid flat on an asbestos sheet covering a false bottom in the counter. and fastened to notched wooden headers nailed to the false bottom.

The 1¼-in. deep cavity was then filled with sand to store the heat and distribute it evenly over the whole surface. The sand was covered with a veneer board and cloth.

A thermostat controls the temperature. Energy consumption at 70° F. air temperature is 100-120 kw.-hr. per month. At this room temperature, the thermostat is set at 100° F.

How to Save Water.

Water scarcity in many areas of the world has increased the necessity to reduce water consumption. Air-conditioning systems can be large water wasters. Here are some ideas on how to conserve cooling water:

Recirculating cooling water by using a cooling tower or an evaporative condenser. The evaporative condenser replaces the regular condenser.

Using cooling water for other processes after passing through condenser.

Air cooling, not water cooling.

Installing automatic controls; they also boost system efficiency and save power.

Raising compressor head pressure to reduce cooling-water flow. More power is used, but less water.

Reducing air-conditioning load.

Maintaining system properly.

Driling own ground well. Usually two wells are needed—one to draw from and the other for discharge.

Pneumatic Concrete Homes.

Home construction costs can be cut 50 cents per sq. ft. below conventional wood frame and stucco houses. Martin Gunite Homes, Inc., is doing it. Company says use of pneumatically-applied gunite saves through increased construction speeds. The company is building 180 such houses, completing one per day.

Schedule runs as follows: 1st Day—Footing trenches dug. 2nd Day—Rough plumbing and electrical work. 3rd Day—Footing and floor slabs. 4th Day—Wall forms built and placed. 5th Day—Reinforced steel for walls prepared. 6th-7th Day—Steel placed in forms. 8th Day—Exterior and interior walls shot into place with Gunite.

9th Day—Form panels stripped from walls. 10th Day—Exterior and interior walls sprayed with color. 11th Day—Beams and preliminary roofing placed; windows glazed. 12th Day—Built-up roof installed. 13th-14th Day—Exterior and interior trim bath and kitchen enamel coated. 15th Day—Hardware and heating installed.

New Pest Weapon Made.

Allethrin, a clear brownish liquid, is a bug-killer. Practically as good as pyrethrum, it is the allyl homolog of Cinerin I. But more exciting, it is now synthesized commercially by Union Garbide & Carbon Corp. Processing is complex. Twelve different steps are involved, and 11 different intermediates are processed. To make 1 lb. of allethrin, almost 200 lbs. of about 25 different chemicals are handled.

Glass Ground Faster.

Glass grinding at Tayloe Glass Co., Inc., has been speeded up considerably by using a metal-faced platen. The new type of platen, which replaces leather-faced platens on the belt grinding machines, is a sandwhich affair. It consists of a ¼-in. layer of sponge rubber between two metal plates. The new platens, besides increasing production and cutting grinding costs, also permit glass to be applied to the grinding belt with lighter pressure, resulting in greater precision in work. (*McGraw-Hill Digest, Aug. 1950.*)

Titanium Enamel and Steel Cut Range-Production Cost.

Production costs dropped, chipping reduced, cølor improved, shipping costs shrank when Westinghouse Electric Corp. started production of electric ranges using titanium steel and titanium enamel. Even in the face of rising labour and material costs, they have cut costs per sq. ft. to the 1941 level.

Westinghouse tried Inland Steel Co.'s tri-enamel, a titanium-bearing steel. It was developed for one-coat enameling processing. The titanium acts as a stabilizer, keeping impurities from "boiling out" and thus eliminating the ground coat. Benefits of the titanium process have been:

1. Steels resist sag, simplifying bracing and finishing.

2. hinner coats—down to 0.006 in. are possible.

3. Ground coat and processing are eliminated.

4. Sharp corners are possible.

5. Titanium coating is more resistant than previous coats to acid; more resistant to scratching.

Packing costs have been cut 50%. Although first cost is higher, over-all savings are great.

Things are not so ill with you and me as they might have been, half owing to the number who lived faithfully a hidden life, and rest in unvisited tombs.

(Eliort, George).

* * *

When we see a soul whose acts are all regal, graceful and pleasant as roses, we must thank God that such things can be, and are, and not turn sourly on the angel and say, "Crump is a better man with his grunting resistance to all his native devils."

* * *

There is less intention in history than we ascribe to it. We impute deep-laid far-sighted plans to Caesar and Napoleon; but the best of their power was in nature, not in them. Men of extraordinary success, in their honest moments, have always sung, "Not unto us, not unto us."

(Emerson, Ralph Waldo)

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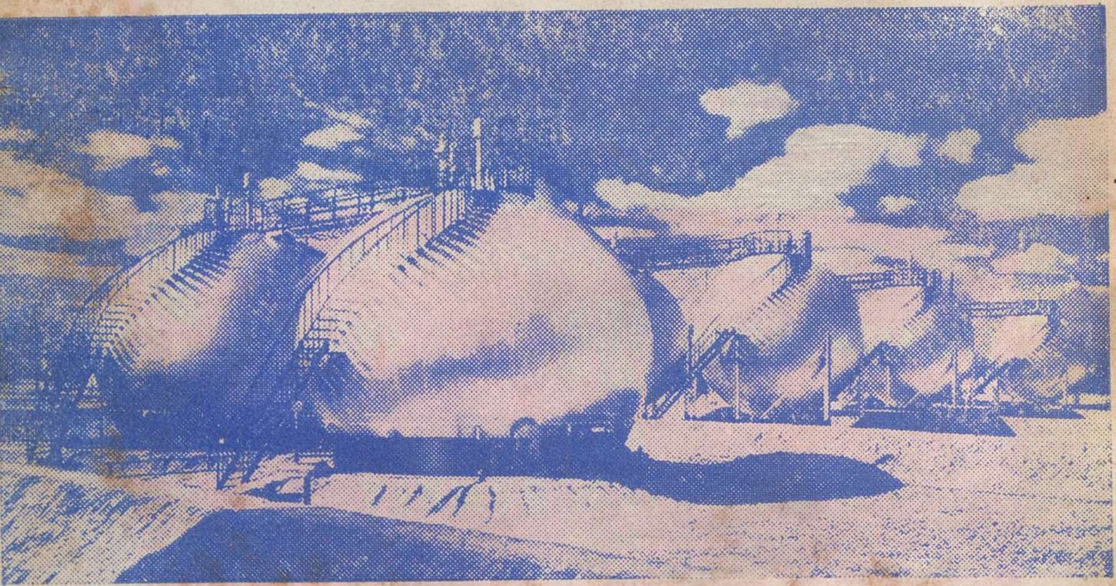
The Photograph shows an aerial view of Stuyvesant Town (foreground) and Peter Cooper Village (immediately beyond), two large rental housing developments in New York City completed during 1949.



The photograph shows new, modern tanks being used by a leading United States petroleum refinery in the southwestern State of Texas for storage of natural gasoline, butane, and isobutane.

Printed by P. Sreedharan Pillai at the S. G. Press, Parur and Published by him for